WESTWOOD
STITTSVILLE

Transportation Impact Assessment – Step 4*:* Analysis

CRT Phase 4

IBI

Prepared for CRT Development Inc.
by IBI Group
May 6, 2022

TIA Plan Reports - Certification

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associate documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below:

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;

2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;

3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and

4. I am either a licensed[1] or registered[1] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering □ or transportation planning □.

[1] **License or registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

Dated at Ottawa this 6th day of May, 2022.
(City)

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Signature of Individual certifier that she/he meets the above four criteria

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Executive Summary

IBI Group (IBI) was retained by CRT Development Inc. to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for the proposed CRT Phase 4 "Westwood" residential development to be located at 1555 Shea Road and 5500 Abbott Street East, Ottawa. Access to the site will be provided via two new all-movement intersections, including direct connections from Abbott Street East and Shea Road, as well as internally through CRT Phases 1 to 3 via the Fernbank & Goldhawk intersection to the south and the Robert Grant & Cope roundabout to the east.

The proposed development will consist of 286 single-family homes, 270 street townhomes and 54 back-to-back townhomes for a total of 610 residential dwelling units. The proposed CRT Phase 4 development is anticipated to be constructed in a single phase, with full occupancy of the development by end of 2025. A horizon year of 2030 was, therefore, assumed in this study. There are twelve known developments of significance in the vicinity of the proposed development that were considered in the analysis for this TIA.

Based on the traffic analysis results in this study, the proposed residential development is expected to generate up to 480 and 517 two-way person-trips during the weekday morning and afternoon peak hours, respectively. These person-trips were assigned mode share targets and trip distributions, consistent with the Kanata/Stittsville Traffic Assessment Zone (TAZ) in the 2011 O-D Survey with further adjustments to account for the slightly substandard transit coverage. The resulting two-way vehicular trip generation is, therefore, 253 and 276 vehicles during the weekday morning and afternoon peak hours, respectively.

As indicated by the analysis conducted for this study, all study area intersections are expected to operate at an acceptable level of service (i.e. LOS 'D' or better) during the weekday peak hours under Future (2025) Total Traffic conditions. By 2030, the Fernbank & Goldhawk intersection may approach its theoretical capacity as an unsignalized intersection due to increased through traffic on Fernbank Road, however this condition is expected to be resolved once the Cope Drive extension to Shea Road is implemented as part of subsequent phases of CRT Lands west of the hydro corridor. Given that these capacity issues are not exacerbated by or a direct consequence of the proposed development and that there is sufficient spare capacity at the key study area intersections to accommodate site-generated vehicular traffic upon full build-out, it can be concluded that the Cope Drive extension is required as a long-term solution to support increased background traffic growth in the area.

An all-way stop warrant analysis conducted for the Cope & Goldhawk intersection indicated that the intersection would operate at an acceptable Level of Service as a two-way stop-controlled intersection, but would ultimately require configuration as an all-way stop-controlled intersection upon the extension of Cope Drive to Shea Road. As a central junction within the proposed subdivision lands, this form of traffic control will also facilitate increased pedestrian mobility and access to City facilities, including potential bus stop locations, as well as a park and school block identified on the Draft Plan adjacent to this intersection.

Based on the queue length analysis conducted for the Fernbank & Goldhawk intersection, the design components proposed within the RMA Materials submitted as part of the CRT Phase 3 study would experience some potential exceedance. This queuing issue, however, has been shown to be resolved with the planned extension of Cope Drive to provide an alternative east-west travel option for vehicles and therefore no revisions are required to the functional design of this intersection.

A segment-based multi-modal analysis of identified deficiencies in the site's boundary streets and potential remediation measures have been suggested which the City could consider to meet the prescribed targets, however it is not expected that such measures would be addressed within the horizon year of this study.

The proposed Abbott Street East & Granite Ridge intersection requires off-site road modifications to incorporate the Bobolink Ridge extension and allow for its conversion from a 3-legged to 4-legged junction. As such, an RMA Materials (i.e. functional design and preliminary cost estimate) was prepared to support

the redesign of this intersection to include Bobolink as its southern leg. Since all study area intersections are expected to operate acceptably with the inclusion of site-generated traffic at full build-out/occupancy of the proposed development, a post-development Monitoring Plan is not required as part of this TIA.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network with the recommended actions and modifications in place.

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1 Introduction

IBI Group (IBI) was retained by CRT Development Inc. to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for the proposed CRT Phase 4 “Westwood” residential development to be located at 1555 Shea Road and 5500 Abbott Street East, Ottawa.

In accordance with the City of Ottawa’s Transportation Impact Assessment Guidelines, published in June 2017, the following report is divided into four major components:

- **Screening** – Prior to the commencement of a TIA, an initial assessment of the proposed development is undertaken to establish the need for a comprehensive review of the site based on three triggers: Trip Generation, Location and Safety.
- **Scoping** – This component of the TIA report describes both the existing and planned conditions in the vicinity of the development and defines study parameters such as the study area, analysis periods and analysis years of the development. It also provides an opportunity to identify any scope exemptions that would eliminate elements of scope described in the TIA Guidelines that are not relevant to the development proposal, based on consultation with City staff.
- **Forecasting** – The Forecasting component of the TIA is intended to review both the development-generated travel demand and the background network travel demand and provides an opportunity to rationalize this demand to ensure projections are within the capacity constraints of the transportation network.
- **Analysis** – This component documents the results of any analyses undertaken to ensure that the transportation related features of the proposed development are in conformance with prescribed technical standards and that its impacts on the transportation network are both sustainable and effectively managed. It also identifies a development strategy to ensure that what is being proposed is aligned with the City of Ottawa’s city-building objectives, targets and policies.

Throughout the development of a TIA report, each of the four study components above are submitted in draft form to the City of Ottawa and undergo a review by a designated Transportation Project Manager. Any comments received are addressed to the satisfaction of the City’s Transportation Project Manager before proceeding with subsequent components of the study. All technical comments and responses throughout this process are included in **Appendix A**.

Dependent on the findings of this report, the complete submission of this Transportation Impact Assessment may also require Functional Design Drawings of recommended roadway improvements to support a Roadway Modification Application (RMA). This submission may also require a post-development Monitoring Plan to track performance of the planned TIA Strategy. The need for these two elements will be confirmed through the analysis undertaken for this report.

2 TIA Screening

An initial screening was completed to confirm the need for a Transportation Impact Assessment by reviewing the following three triggers:

- **Trip Generation**: Based on the proposed number of residential dwelling units, the minimum development size threshold has been exceeded and therefore the Trip Generation trigger is satisfied.
- **Location**: The proposed development's internal road network includes the Cope Drive extension, a major collector, which is designated as part of the Spine Bicycle network and will bisect the subject lands. As such, the Location trigger is satisfied.
- **Safety**: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent the site. As the subject development proposes an access intersection within a horizontal curve on Shea Road and less than 300 metres from the Fernbank & Shea roundabout, there may be potential for safety concerns. As such, the Safety trigger is satisfied.

As the proposed development meets the Trip Generation, Location and Safety triggers, the need to undertake a Transportation Impact Assessment is confirmed.

A copy of the Screening Form is provided in **Appendix B**.

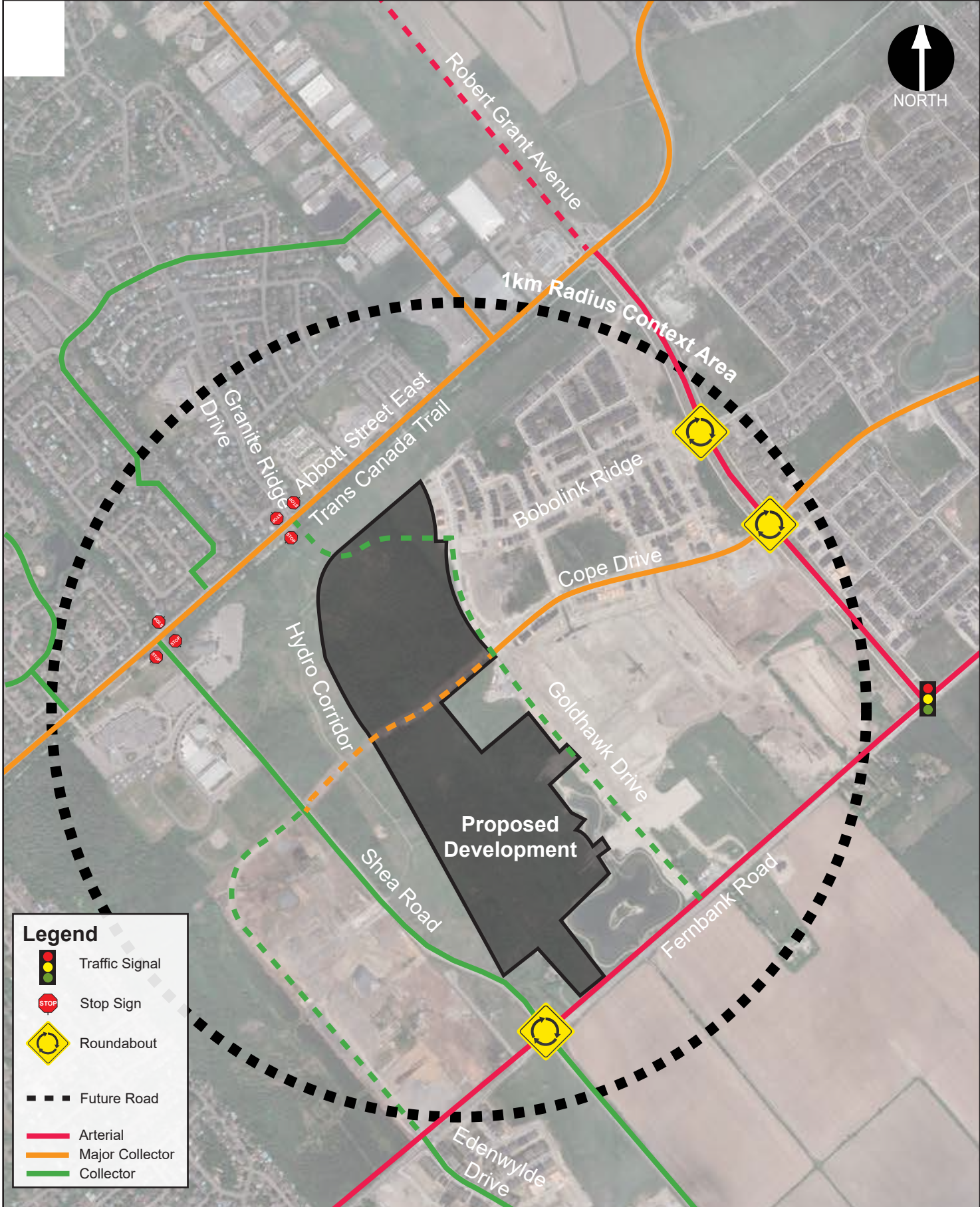
3 Project Scoping

3.1 Description of Proposed Development

3.1.1 Site Location

The proposed development is located at 1555 Shea Road and 5500 Abbott Street East in the Stittsville community of Ottawa, Ontario. The site occupies approximately 37 hectares and is generally bound by Abbott Street to the north, Phases 1-3 of the CRT Westwood subdivision (under construction) to the east, Fernbank Road to the south and a hydro corridor to the west.

The site location and its surrounding context is illustrated in **Exhibit 1**.



IBI

CRT Phase 4
Transportation Impact Assessment

Exhibit 1:
Site Location

PROJECT No. 136944

SCALE: 0m 125m 250m

3.1.2 Land Use Details

Table 1 below summarizes the proposed land uses included in this development.

Table 1 - Land Use Statistics

LAND USE	SIZE (APPROX. # OF UNITS)
Single-Family Homes	286
Street Townhomes	270
Back-to-Back Townhomes	54
Total	**610**

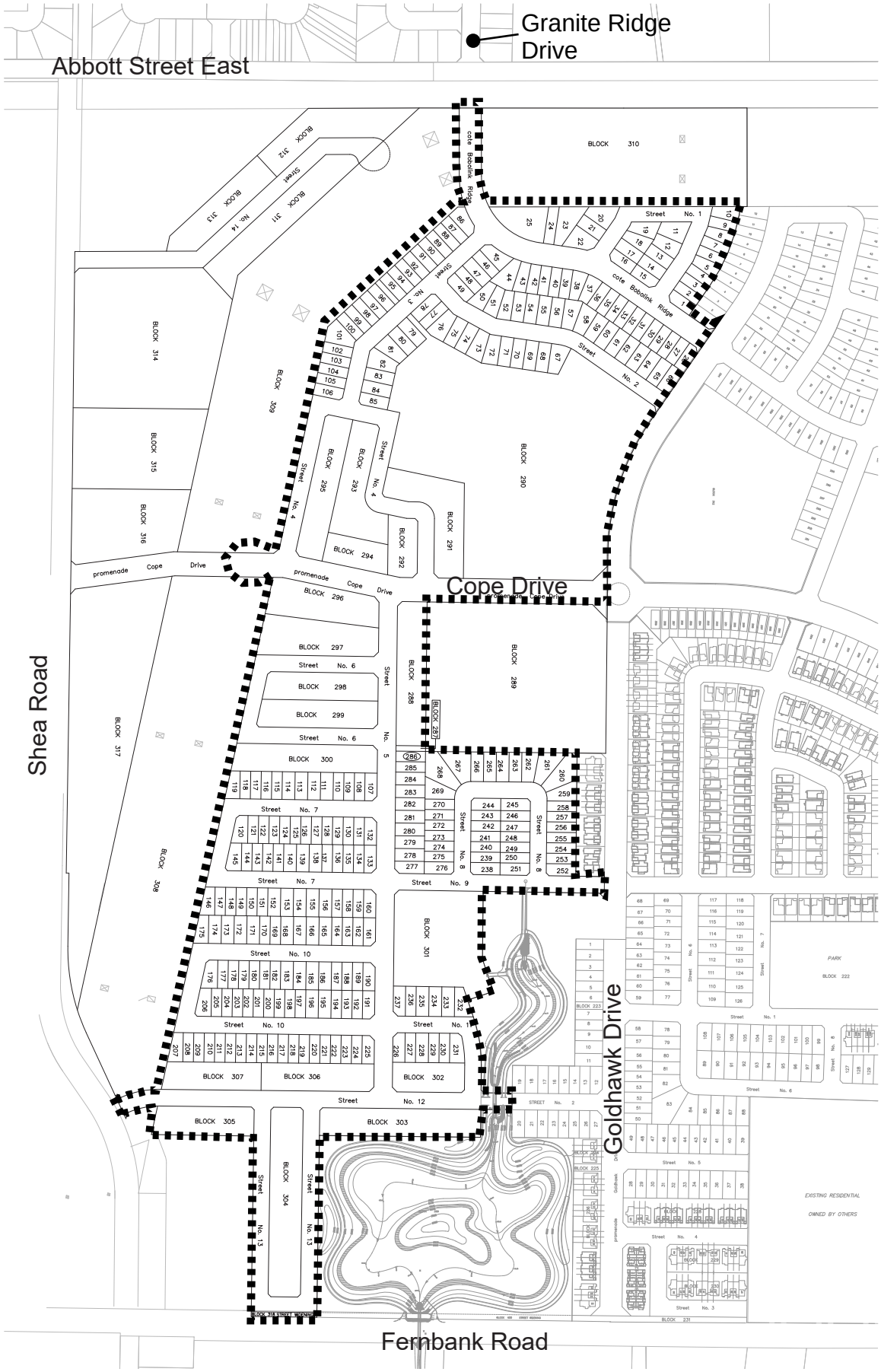
The Draft Plan of Subdivision for the proposed development is illustrated in **Exhibit 2** below.

Direct access to the site will be provided via two external all-movement connections: one on Shea Road and one on Abbott Street East. Five internal intersections will also connect the proposed development to CRT Phases 1 to 3 which will be constructed immediately to the east. The functional need for the extension of Cope Drive to Shea Road to accommodate the travel demands of the proposed Phase 4 development will be assessed as part of this study.

The subject site is currently an undeveloped greenfield site and, according to GeoOttawa, is zoned DR – Development Reserve.

3.1.3 Development Phasing & Date of Occupancy

The proposed CRT Phase 4 development is anticipated to be built out and occupied in a single phase by the end of 2025.



CRT Phase 4
Transportation Impact Assessment

Exhibit 2:
Proposed Development

PROJECT No. 136944

SCALE: 0m 50m 100m

3.2 Existing Conditions

3.2.1 Existing Road Network

3.2.1.1 Roadways

The proposed development is bound by the following streets:

- **Fernbank Road** is a rural arterial road under the jurisdiction of the City of Ottawa that extends from Dwyer Hill Road in the west to Eagleson Road in the east. Fernbank Road currently has a 26.0m Right-of-Way (ROW) through the context area and a ROW protection of 37.5m. It presently consists of a two-lane cross-section with paved shoulders and a posted speed limit of 80km/h that becomes 60km/h on the westbound approach to the Shea Road. West of the Shea Road roundabout, the posted speed limit is further reduced to 40km/h.
- **Abbott Street East** is a major collector road under the jurisdiction of the City of Ottawa that extends from Stittsville Main Street in the west to Terry Fox Drive in the east. The existing cross-section of Abbott Street E is two lanes, undivided and the posted speed limit is 40km/h during school days between 7-9:30 AM and 2-5 PM within the school zones in close proximity to the site and 50km/h otherwise. Abbott Street E currently has a ROW of 20.0m and a ROW protection of 26m.
- **Shea Road** is a rural collector road under the jurisdiction of the City of Ottawa that currently extends from Abbott Street East in the north to Perth Street in the south. Shea Road has a 20.0m ROW with a two-lane cross-section and a posted speed limit of 60 km/h that transitions to 50km/h approximately 400m south of Abbott Street E to its northern terminus.
- **Robert Grant Avenue** is an urban arterial road under the jurisdiction of the City of Ottawa that currently extends from Abbott Street East in the north to Fernbank Road in the south. Robert Grant Avenue has a variable-width ROW up to 51.5m (ROW protection 44.5m) with a two-lane, undivided cross-section and a posted speed limit of 60 km/h.

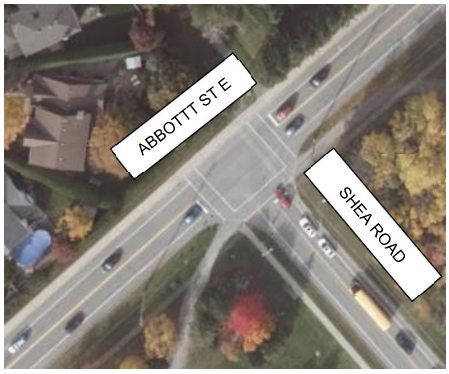
Other streets within the vicinity of the proposed development are as follows:

- **Cope Drive** is a major collector road under the jurisdiction of the City of Ottawa that currently extends from Eagleson Road to approximately 700m west of Robert Grant Avenue. It has a 26.0m ROW, a two-lane urban cross-section and an unposted speed limit of 50 km/h.
- **Bobolink Ridge** is a local road under the jurisdiction of the City of Ottawa that currently extends from Asturcon Street to approximately 700m west of Robert Grant Avenue at Angel Heights within CRT Phase 1. It has a 24.0m ROW with a two-lane cross section and a posted speed limit of 40km/h.
- **Granite Ridge Drive** is a local road under the jurisdiction of the City of Ottawa that extends north from Abbott Street East to Harry Douglas Drive. It has a 20.0m ROW, a two-lane urban cross-section, and a posted speed limit of 40 km/h.

3.2.1.2 Intersections

The following existing intersections have the greatest potential to be impacted by the proposed development:

- **Fernbank Road & Shea Road** is a four-legged roundabout with a single circulating lane. Type “D” pedestrian crossovers (PXO’s) are provided on each leg of the junction. This roundabout is located southwest of the subject site.



- **Abbott Street East & Shea Road** is a three-legged all-way stop-controlled intersection with on-street bicycle lanes and pedestrian crosswalks on all three approaches. The Trans-Canada Trail passes along the southern leg of the intersection. This stop-controlled intersection is located northwest of the subject site.

- **Abbott Street East & Granite Ridge Drive** is a three-legged all-way stop-controlled intersection with bike lanes on both sides of Abbott Street E and pedestrian crosswalks on the west and north legs. This stop-controlled intersection is located north of the subject site and Bobolink Ridge will form the south leg of this intersection.

- **Robert Grant Avenue & Cope Drive** is a four-legged roundabout with a single circulating lane. Type “D” pedestrian crossovers (PXO’s) are provided on each leg of the intersection. Grade-separated cycle tracks exist on both the north and south legs. This roundabout is located east of the subject site.

3.2.1.3 Driveways Adjacent to Development Access

Granite Ridge Care Community has two driveways within 200m of the proposed access intersection on Abbott Street. No driveways currently within 200m of the proposed intersection on Shea Road.

3.2.1.4 Traffic Management Measures

There are currently no existing traffic management or traffic calming measures on the boundary streets within the vicinity of the proposed development. Traffic calming measures, however, have been planned along the internal collector roads (Cope Drive and Goldhawk Drive) in prior phases of the CRT Westwood subdivision now under construction. The measures are limited to curb extensions which periodically narrow the road from 11.0 metres to between 7.0 and 7.8 metres.

3.2.2 Existing Bicycle and Pedestrian Facilities

The following cycling and pedestrian facilities exist within the context area:

- On-Street cycling facilities on Abbott Street East
- Trans-Canada Trail multi-use path (MUP) parallel to Abbott Street E with a connection near Granite Ridge;
- Concrete sidewalks on the north side of Abbott Street E;
- A MUP on the north side of Cope Drive and a concrete sidewalk on the south side;
- There are no pedestrian facilities on Shea but paved shoulders are provided for cyclists;
- Concrete sidewalks on select local roads are under construction within Phases 1 to 3 of the CRT Westwood subdivision.

3.2.3 Existing Transit Facilities and Service

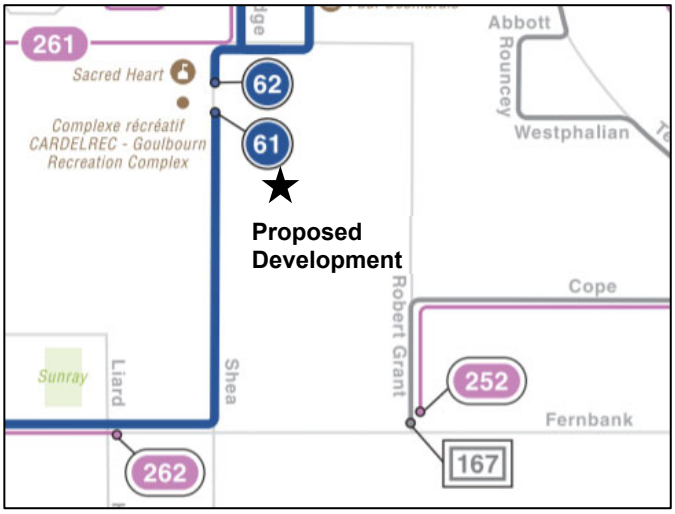
The following transit routes, operated by OC Transpo, exist within the vicinity of the site:

- **Route #61 & #62** provides regular, all-day service between Tunney's Pasture Station and the CARDELREC – Goulbourn Complex and operates on 15- to 30-minute headways. During weekday peak periods, select buses serving Route #61 extended to Gatineau.
- **Route #167** provides regular, weekday service between the intersection of Cope Drive & Yellowtail Walk and the Terry Fox Park & Ride and operates on 30- to 60-minute headways.
- **Route #252** provides weekday peak period service between the intersection of Cope Drive & Yellowtail Walk and Tunney's Pasture Station and operates with 15-minute headways.
- **Route #261** provides weekday peak period service between the Tunney's Pasture Station & Stittsville and operates on 30-minute headways.
- **Route #262** provides weekday peak period service between the Tunney's Pasture Station & West Ridge and operates on 30-minute headways.

The nearest bus stops to the proposed development are presently located near the future site access intersection of Abbott/Granite Ridge, providing access to Route #62.

The existing transit network within the vicinity of the proposed development is illustrated in **Figure 1**. Transit service maps for the individual routes above are provided in **Appendix C**.

Figure 1 - Existing Transit Service



Source: OC-Transpo

3.2.4 Collision History

A review of historical collision data has been conducted for the road network surrounding the proposed development. The TIA Guidelines require a safety review of at least six collisions for any one movement or of a discernible pattern, over a five-year period have occurred. **Table 2** summarizes all reported collisions between January 1, 2015 and December 31, 2019.

Table 2 – Reported Collisions within Vicinity of Proposed Development

LOCATION	# OF REPORTED COLLISIONS
INTERSECTIONS	
Abbott Street East & Granite Ridge Drive	8
Abbott Street East & Shea Road	2
Robert Grant Avenue & Bobolink Ridge	2
Fernbank Road & Robert Grant Avenue	1
Fernbank Road & Shea Road	13
SEGMENTS	
Fernbank Road – Urban Boundary to Shea Road	9
Shea Road – Abbott Street East to Fernbank Road	5

Based on the collision history noted above, the intersections of Abbott Street East & Granite Ridge Drive and Fernbank Road & Shea Road along with the segment of Fernbank Road from the Urban Boundary to Shea Road may require further review.

Detailed collision records are provided in **Appendix D**.

3.3 Planned Conditions

3.3.1 Transportation Network

3.3.1.1 Future Road Network Projects

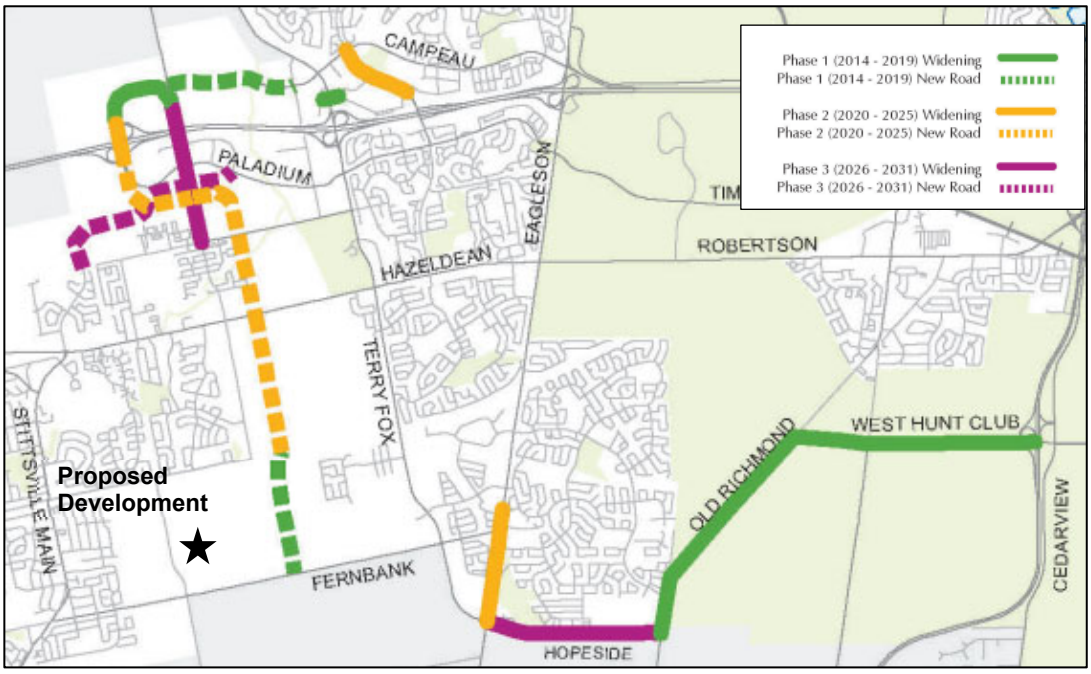
Goldhawk Drive is presently under construction within previous phases of the CRT Westwood subdivision (Phases 1 & 2). As part of Phase 3, Goldhawk Drive will connect to Fernbank Road and will operate as a stop-controlled intersection. A roadway Modification Application (RMA) is currently in progress through the Phase 3 subdivision approvals process.

The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Network'. The following projects were noted that may have an impact on area traffic within the vicinity of the site:

- **Stittsville North-South Arterial (Phase 2)** – Planned extension of the Stittsville North-South Arterial from Abbott Street East to Palladium Drive (Phase 2: 2022-2025). Robert Grant Avenue from Fernbank Road to Abbott Street East was Phase 1 of the Stittsville North-South Arterial.
- **Eagleson Road** – Planned widening from two to four lanes from north of Fernbank Road to Terry Fox Drive / Hope Side Road (Phase 2: 2022-2025).
- **Hope Side Road** – Planned widening from two to four lanes between Eagleson Road and Old Richmond Road (Phase 3: 2026-2031).

Figure 2 below illustrates the planned changes to the arterial road network projects in the broader area, as per the TMP 'Affordable Network'. It should be noted that the first phase of the Stittsville North-South Arterial has been constructed, and that the Old Richmond Road/West Hunt Club Road widening (also known as the Kanata South Link project) was completed in early 2021.

Figure 2 - Future Road Network Projects



Source: 2013 Transportation Master Plan – Map 11 '2031 Affordable Network'

Development Charges Background Study

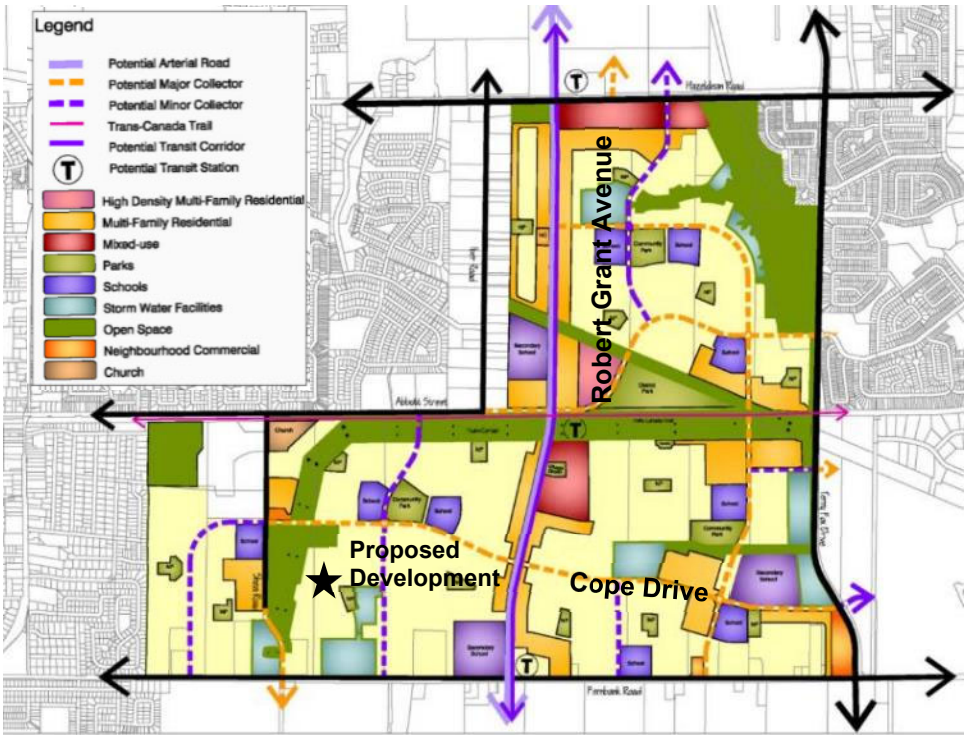
The Development Charges Background Study (March 2019), published well after the 2013 TMP, indicates that the timeframe for the above projects has been revised as follows:

- **Stittsville North-South Arterial**: According to the DC Background Study, this project was expected to be fully implemented between 2022 and 2024, however based on further discussions with City staff, it is our understanding that the portion of Robert Grant from Abbott Street East to Hazeldean Road is slated for construction in 2023, while the remaining segment from Hazeldean to Palladium has no specific timing but is expected prior to the City's 2031 planning horizon.
- **Eagleson Road** widening is expected to be implemented between 2025 and 2029.
- **Hope Side Road**: According to the DC Background Study, this road widening is expected to be implemented between 2030 and 2031, however subsequent to this report, City technical staff have indicated that the timeline for the implementation of this project is uncertain.

Fernbank CDP

The Fernbank Community Design Plan (CDP) identifies the proposed network of arterial and collector roads that will serve the Fernbank Community, as indicated in **Figure 3**. Cope Drive will ultimately extend west to intersect with Shea Road before curving south to intersect with Fernbank Road. The CDP also indicates a collector road extending from Abbott Street to Fernbank Road through the CRT Westwood subdivision, however the alignment has since been modified. South of Cope Drive, the alignment has been maintained and is presently under construction, however the connection to Abbott Street will now be made as an extension of Bobolink Ridge to Granite Ridge, approximately 350 metres to the west.

Figure 3 - Fernbank Community Design Plan - Network Concept



Source: Fernbank Community Design Plan

3.3.1.2 Future Transit Facilities and Services

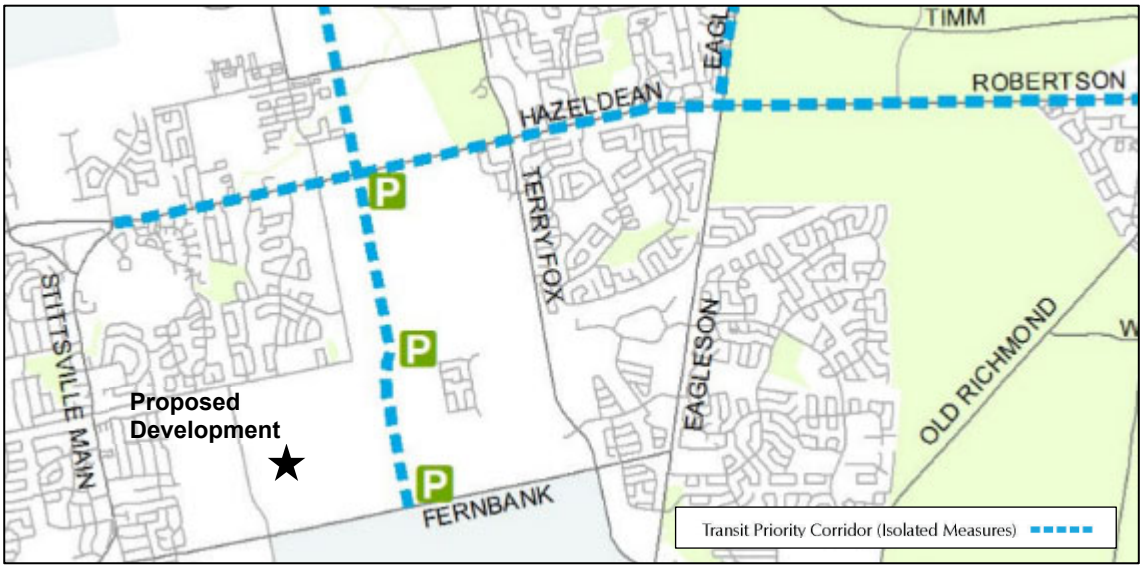
The 2013 TMP outlines the future rapid transit and transit priority (RTTP) network. The following projects were noted in the 'Affordable RTTP Network' that may have a future impact on study area traffic:

- **Stittsville North-South Arterial Transit Priority Corridor** – This corridor, now referred to as Robert Grant Avenue, is expected to be upgraded with transit signal priority and/or queue jump lanes between Palladium Drive and Fernbank Road. There is presently no specific timing available for the implementation of this project, as segments of this corridor have yet to be constructed.

Figure 4 below shows the transit infrastructure projects in the vicinity of the proposed development that are part of the 2031 Affordable Network.

As shown previously in **Figure 3**, the Fernbank CDP identifies the eventual construction of a Rapid Transit Corridor in the future median of Robert Grant Avenue. The implementation of this corridor, however, is presently not expected to occur within the City's 2031 planning horizon.

Figure 4 - Future 'Affordable RTTP Network Projects'



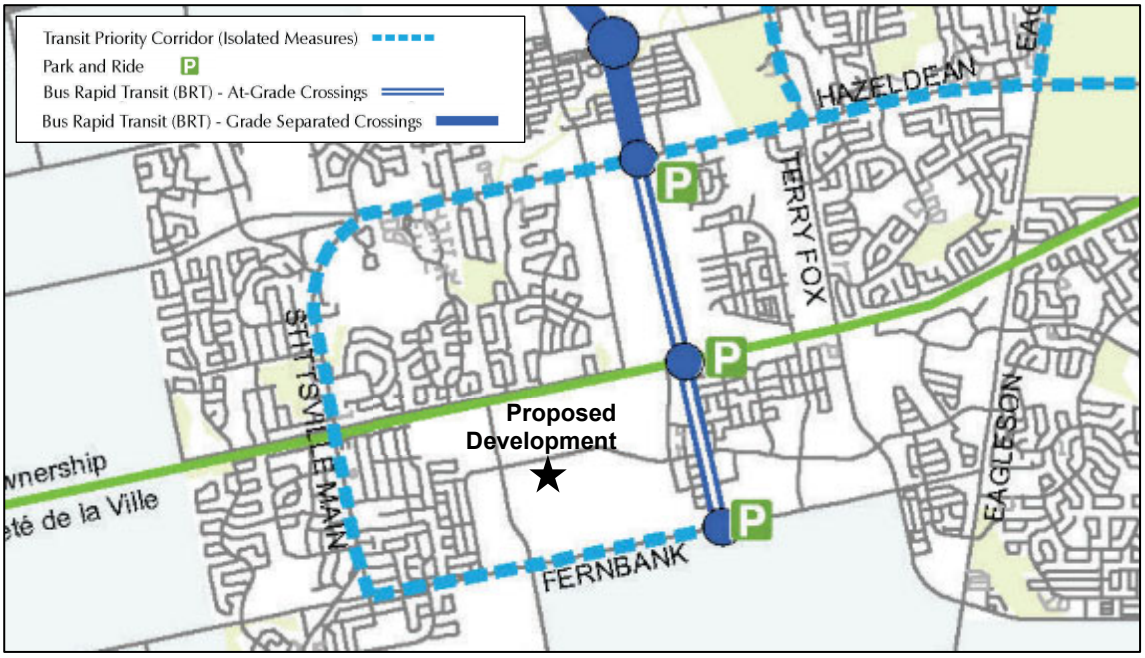
Source: 2013 Transportation Master Plan – Map 5 '2031 Affordable Network'

The 2013 TMP also notes the following projects in the 2031 'Network Concept' that may have an impact on the study area in the longer term:

- **Stittsville Main Street** – Transit signal and queue jump lanes between Fernbank Road and Light Rail Transit (LRT) with Hazeldean Road.

Figure 5 below shows the transit infrastructure projects in the vicinity of the proposed development that are part of the 2031 'Network Concept'.

Figure 5 – Future 'RTTP Network Concept'



Source: 2013 Transportation Master Plan – Map 4 '2031 Network Concept'

3.3.1.3 Future Cycling and Pedestrian Facilities

The Transportation Master Plan (TMP) designates Fernbank Road, Robert Grant Avenue and Cope Drive as 'Spine' or City-wide Cycling Routes, which form part of a system linking the commercial, employment, institutional, residential and educational nodes throughout the city. The Ottawa Cycling Plan identifies a Major Pathway within the hydro corridor immediately to the west of the subject site.

The TransCanada Trail currently extends east-west along the south side of Abbott Street East. The Fernbank CDP recommended that sufficient right-of-way (ROW) be protected along this corridor for the long-term grade-separation of the TransCanada Trail at Robert Grant Avenue, if and when required. It also recommended that cycling facilities be provided along all arterial corridors, such as Fernbank Road and Robert Grant Avenue. Segregated cycling facilities have since been established on the existing section of Robert Grant, while there are no immediate plans to urbanize Fernbank Road in the near future to accommodate enhanced cycling facilities.

In late 2019, Ottawa City Council approved a set of Neighborhood Collector Road Guidelines intended to encourage future network roadways within developing communities that provide a more balanced distribution of infrastructure within the City right-of-way to support active transportation modes while calming traffic. The proposed development includes the construction of portions of Cope Drive (major collector) and Bobolink Ridge (collector). The specific design of these roadways will be established through the Draft Plan approval process in consultation with City Staff, however it should be noted that portions of these roads beyond the site limits have already been approved through adjacent development applications and therefore, for consistency, the extension of these collector roads may include similar configurations.

3.3.2 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specify that all significant developments proposed within the surrounding area which are likely to occur within the study's

horizon year must be identified and taken into consideration in the development of future background traffic projections.

There are currently 12 development applications of significance in the vicinity of the proposed development, as shown in **Table 3** below:

Table 3 - Future Adjacent Developments

DEVELOPMENT	LAND USE	EXPECTED BUILD-OUT YEAR
700 Cope Drive - OCDSB Stittsville High School	• Secondary school accommodating ~1,460 students	2024
Fernbank Crossing (Phase 3 – Block 129)	• 96 residential units	2019[1]
Fernbank Crossing (Phase 3 – Block 135)	• 58 residential units	2019[1]
Fernbank Crossing (Phase 4)	• 146 residential units	2025
CRT Phase 1 & 2	Phase 1: • 658 residential dwelling units • Elementary school for ~500 students Phase 2: • 216 residential dwelling units	2025
CRT Phase 3	• 206 single family homes • 261 street townhomes • 130 back-to-back townhomes	2025
Blackstone (Phase 4-8)	• 955 residential units • Elementary school for ~650 students	2025
René's Court	• 504 residential units	2023
5769 Fernbank Road	• ~70 residential units	2025
5969 Fernbank Road	• 357 residential units	2020[1]
6041 Fernbank Road	• 638 residential units	2025
Davidson Lands	• 792 residential units	2023

Notes:
1- Assumed to be built out by 2025 to coincide with the full build-out of CRT Phase 4

All known developments of significance in the vicinity of the proposed development indicated above are shown in **Exhibit 3**.

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CRT Phase 4
Transportation Impact Assessment

Exhibit 3:
Adjacent Developments

PROJECT No. 136944

SCALE: 0m 200m 400m

3.3.3 Network Concept Screenline

Not Applicable: The Fernbank CDP planned for CRT Phase 4 to be primarily 'low density residential', which is consistent with the proposed Draft Plan shown previously in **Exhibit 2**. Further, screenline analysis was conducted as part of the CDP to account for this development, therefore Module 4.8 – Network Concept is not required for this TIA.

3.4 Study Area

With consideration of the information presented thus far, a study area bound by Abbott Street to the north, Fernbank Road to the south, Robert Grant Avenue to the east and Shea Road to the west will provide a sufficient assessment of the development's impact on the adjacent transportation network.

The following intersections have been identified as being most impacted by the proposed development and will be assessed for vehicular capacity as part of this study:

- Abbott Street East & Shea Road (existing All-Way Stop Control intersection)
- Abbott Street East & Granite Ridge Drive (existing All-Way Stop Control intersection)
- Robert Grant Avenue & Cope Drive (existing roundabout)
- Fernbank Road & Goldhawk Drive (future intersection)
- Fernbank Road & Shea Road (existing roundabout)
- Abbott Street East & Street 12 (future intersection)

This study will also review conditions at key internal collector junctions, including Cope/Goldhawk and Goldhawk/Bobolink at the study horizon year only to confirm the appropriate level of intersection control.

The Robert Grant & Bobolink roundabout was excluded from the study area, as site-generated traffic will contribute less to this roundabout relative to Robert Grant & Cope due to traffic dilution.

A preliminary analysis of site traffic generation and trip distribution suggests that an extension of Cope Drive beyond the Hydro Corridor to Shea road is not necessary to accommodate the mobility needs of the CRT Westwood development. The exclusion of the future Cope/Shea intersection from this study will provide a baseline evaluation of network conditions without the connection and determine if this connection is required to address any impacts directly related to traffic generated by the subject development phases. If required as a mitigation measure to address network capacity concerns, supplemental analysis will be undertaken to determine the relative network impacts on travel patterns and intersection capacity relating to the establishment of this transportation link within the community.

An intersection-based Multi-Modal Level of Service (MMLOS) evaluation will be conducted only for the locations noted above if traffic signals are identified as a future form of traffic control. Stop-controlled intersections and roundabouts are exempt from this analysis, as no methodology currently exists for evaluating MMLOS at unsignalized intersections. Intersection control requirements for future intersections will be determined through intersection capacity analyses and control warrants, which will be undertaken in subsequent components of this study. Segment-based MMLOS analysis will only be conducted for the segments of Abbott Street East and Shea Road to which the proposed development will provide direct access.

3.5 Time Periods

As the proposed development will consist solely of residential land uses, traffic generated during the weekday morning and afternoon peak hours is expected to result in the most significant impact to traffic operations on the adjacent network.

3.6 Existing Lane Configurations & Traffic Volumes

3.6.1 Existing Lane Configurations

The existing lane configurations and traffic controls for the study area are shown in **Exhibit 4** below.

3.6.2 Existing Traffic Volumes

As the proposed development will consist solely of residential land uses, the weekday peak hour traffic conditions will be most affected by the associated increase in traffic. The following weekday morning and afternoon peak hour turning movement counts at intersections within close proximity to the site were therefore obtained:

- Abbott Street East & Granite Ridge Drive (December 2021)
- Robert Grant Avenue & Cope Drive (June 2019)
- Fernbank Road & Shea Road (December 2021)
- Abbott Street East & Shea Road (December 2021)

A growth rate was applied to the above noted turning movement count data to approximate existing (2022) traffic volumes. Justification of background growth rates is discussed further in the Forecasting section of this study.

A review of link volumes at the Fernbank & Shea roundabout was conducted, comparing the pre-pandemic traffic data collected by the City of Ottawa at Fernbank & Robert Grant (August 2018), with nominal growth applied to new data collected in December 2021. Based on this comparison, the 2021 volumes were determined to be representative of typical conditions and therefore the no growth factor was applied to data collected during the COVID-19 pandemic as part of this study.

Peak hour traffic volumes representative of existing conditions are shown in **Exhibit 5**. The traffic count data is provided in **Appendix E**.

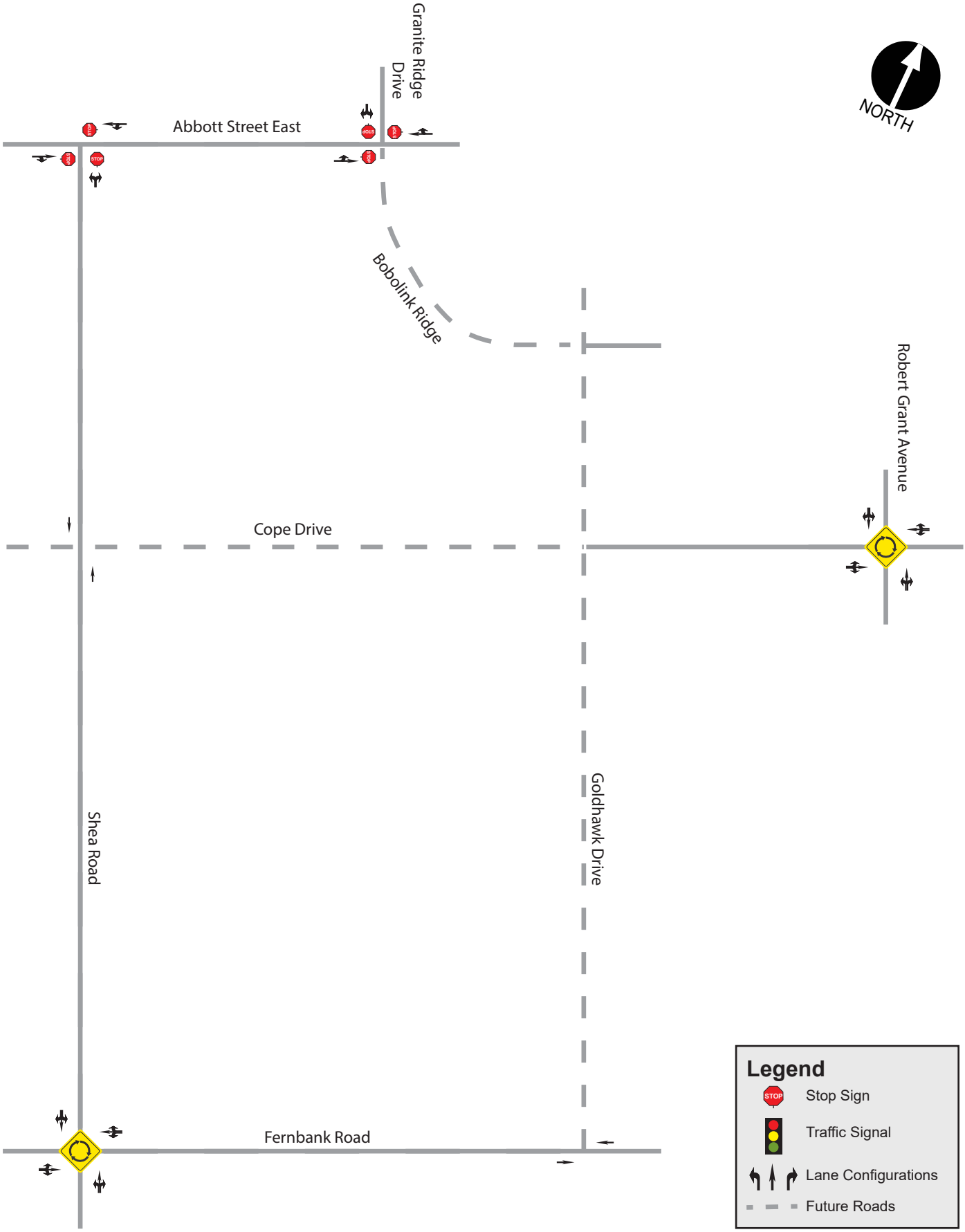

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Exhibit 4: Existing Lane Configurations and Traffic Control

PROJECT No. 136944

SCALE: N.T.S.

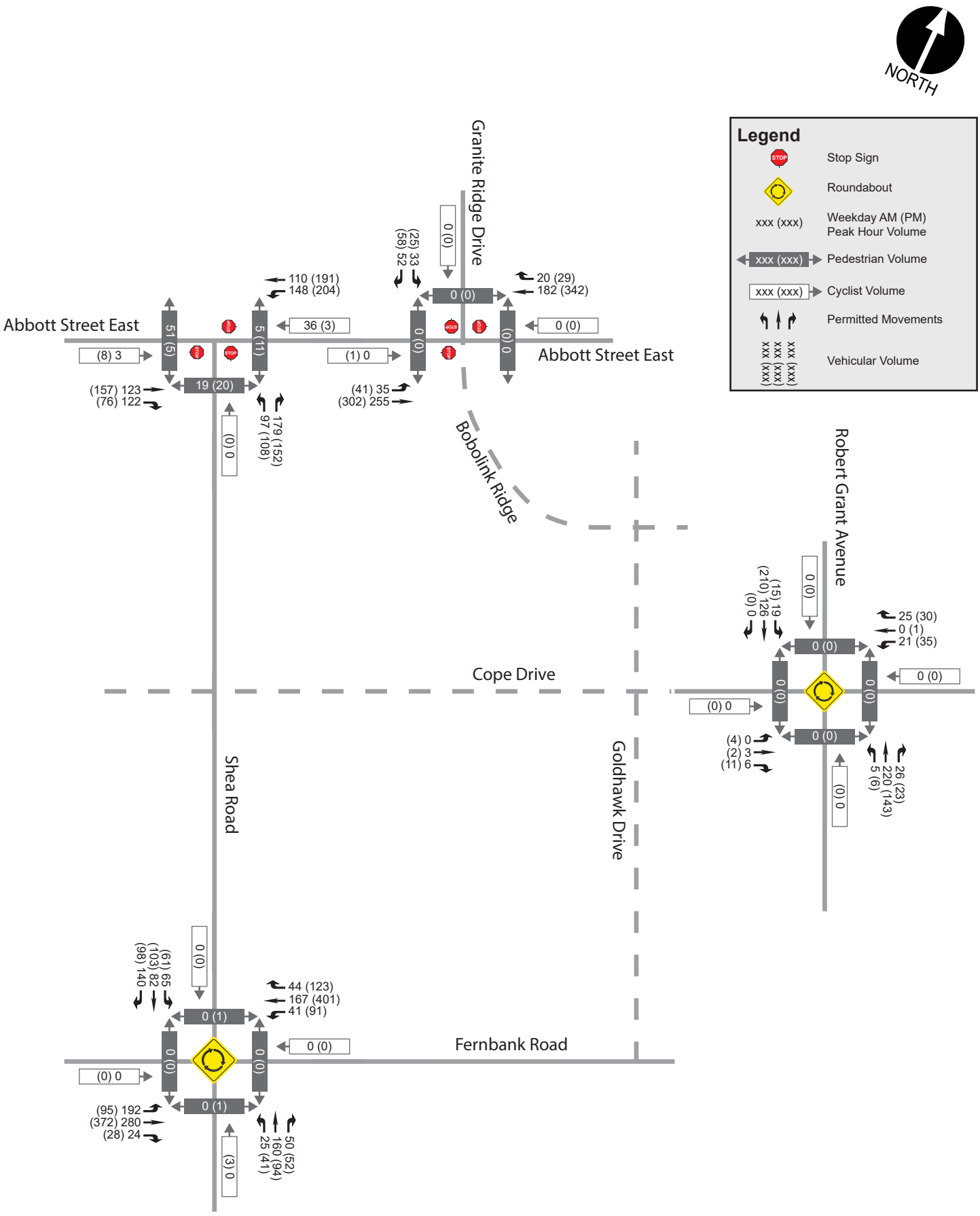

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Exhibit 5 - Existing
(2022) Traffic

PROJECT No. 136944

SCALE: N.T.S.

3.7 Analysis Years

The following future analysis years will be assessed in this study:

- Year 2025 – Full Build-out / Occupancy of Proposed Development
- Year 2030 – 5 Years Beyond Full Build-out/ Occupancy

3.8 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 3** summarizes the TIA modules that are not applicable to this study.

Table 4 - Exemptions Review

TIA MODULE	ELEMENT	EXEMPTION CONISDERATIONS	REQUIRED
DESIGN REVIEW COMPONENT			
4.1 Development Design	4.1.2 Circulation and Access	• Only required for site plans	✗
	4.1.3 New Street Networks	• Only required for plans of subdivision	✓
4.2 Parking	4.2.1 Parking Supply	• Only required for site plans	✗
	4.2.2 Spillover Parking	• Only required for site plans where parking supply is 15% below unconstrained demand	✗
NETWORK IMPACT COMPONENT			
4.5 Transportation Demand Management	All Elements	• Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	✓
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	• Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	✓
4.8 Network Concept	n/a	• Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	✗

4 Forecasting

4.1 Development Generated Traffic

4.1.1 Trip Generation Methodology

Peak hour residential site-generated traffic volumes were developed using the 2020 TRANS Trip Generation Summary Report. The TRANS trip generation rates are based on blended rates derived from the 49 trip generation studies undertaken between 2008 and 2012, the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition) and the 2011 TRANS O-D Travel Survey. Separate peak period person-trip generation rates were developed for single-detached housing, low-rise multifamily housing (i.e. two storeys or less) and high-rise multifamily housing (i.e. three storeys or more). Site-generated peak period person-trips were estimated using these rates and subsequently subdivided based on representative mode share percentages applicable to the study area. Mode-specific adjustment factors were then applied to these peak period person-trips to determine the number of peak hour vehicle, passenger, transit, cycling and pedestrian trips.

Local mode share targets were based on the 2020 TRANS Trip Generation Summary Report which provides blended mode share distributions based on the 2011 TRANS Origin-Destination (O-D) Survey for select land uses for each of the Traffic Assessment Zones (TAZs) in the O-D Survey. The proposed development is located within the Kanata/Stittsville TAZ, which has been referenced for this study.

4.1.2 Trip Generation Results

4.1.2.1 Peak Period Person-Trip Generation

Peak period person-trip volumes associated with the CRT Phase 4 development were derived using trip generation rates from the 2020 TRANS Trip Generation Summary Report.

The peak period person-trip generation results for the proposed development have been summarized in **Table 5** below. Relevant sections of the 2020 TRANS Trip Generation Summary Report are included in **Appendix F**.

Table 5 – Peak Period Person-Trip Generation Results

LAND USE	SIZE	PERIOD	GENERATED TRIPS		
			IN	OUT	TOTAL
Single-Family Units	286 units	AM	176	410	586
		PM	440	270	709
Multi-Unit (Low-Rise) Residential	270 units	AM	109	255	365
		PM	239	188	427
Multi-Unit (High-Rise) Residential [1]	54 units	AM	13	30	43
		PM	28	20	49
TOTAL		**AM**	**299**	**695**	**994**
		PM	**707**	**478**	**1,184**

Notes: [1] Defined as 3 storeys or higher in the 2020 TRANS Trip Generation Summary Report.

4.1.2.2 Mode Share Proportions

The 2020 TRANS Trip Generation Summary Report provides approximations of the existing modal share within the Kanata/Stittsville Traffic Assessment Zone (TAZ).

The proposed mode share targets were developed using a weighted average (i.e. blended rate) of the three dwelling types defined in the 2020 TRANS, according to their respective proportions within the proposed development, and further refined to account for specific characteristics of the site. Based on a preliminary analysis of transit coverage for the subject development, 85% of units are expected to be within a 400-metre walking distance of an existing or potential transit stop relative to the City's target of 95%. A factor of 85/95 was therefore applied to decrease the transit mode, reflecting the slightly substandard transit coverage expected within the proposed development, and the difference was allocated to the auto driver mode share.

The existing mode share and proposed mode share targets for each analysis year are identified for the Kanata/Stittsville TAZ in **Table 6** below. Relevant extracts from 2020 TRANS Trip Generation Summary Report and the 2011 O-D Survey are provided in **Appendix F**.

Table 6 – Existing Mode Share & Proposed Mode Share Targets

TRAVEL MODE	EXISTING MODE SHARE - 2020 TRANS						BLENDED MODE SHARE	MODE SHARE TARGETS[1]
	SINGLE FAMILY DETACHED		LOW-RISE MULTIFAMILY RESIDENTIAL		HIGH-RISE MULTIFAMILY RESIDENTIAL			
	AM	PM	AM	PM	AM	PM		
Auto Driver	52%	56%	52%	58%	43%	55%	51%	53%
Auto Passenger	15%	19%	14%	17%	26%	19%	16%	16%
Transit	20%	14%	22%	17%	28%	21%	22%	20%
Cycling	1%	1%	0%	0%	0%	0%	1%	1%
Walking	12%	9%	11%	8%	4%	5%	10%	10%
TOTAL	**100%**	**99%**	**99%**	**100%**	**101%**	**100%**	**100%**	**100%**

Notes:
[1] Adjusted mode share targets based on overall proximity to potential transit routes.

As discussed in the TIA Scoping, there is currently no timeline for the implementation of transit priority measures along Robert Grant Avenue and there are no specific plans to upgrade regional pedestrian/cycling facilities in the vicinity of the proposed development. It is therefore assumed that the local transit, pedestrian and cyclist mode shares will not change significantly within the timeframe of this study.

4.1.2.3 Trip Generation by Mode

The mode share targets identified previously in **Table 6** were segregated by travel mode for both peak periods and are summarized in **Table 7** below.

Table 7 – Peak Period Person-Trips by Mode

MODE	AM		PM	
	IN	OUT	IN	OUT
Auto Driver	158	368	375	253
Auto Passenger	48	111	113	76
Transit	60	139	141	96
Cycling	3	7	7	5
Walking	30	70	71	48
Total Person-Trips	**952**		**1,137**	

4.1.2.4 Peak Hour Trip Generation

The *peak period* to *peak hour* conversion factors for TRANS trip generation rates vary by trip type and are applied to the peak period trips resulting from the mode share distribution.

The results after applying the appropriate conversion factors have been summarized in **Table 8** below.

Table 8 – Peak Hour Person-Trips by Mode

MODE	PEAK HOUR CONVERSION FACTOR (AM/PM)	AM		PM	
		IN	OUT	IN	OUT
Auto Driver	0.48/0.44	76	177	165	111
		253		276	
Auto Passenger	0.48/0.44	23	53	50	34
Transit	0.55/0.47	33	76	66	45
Cycling	0.58/0.42	2	4	3	2
Walking	0.58/0.52	17	40	37	25
Total Person-Trips	**0.50/0.44**	**480**		**517**	

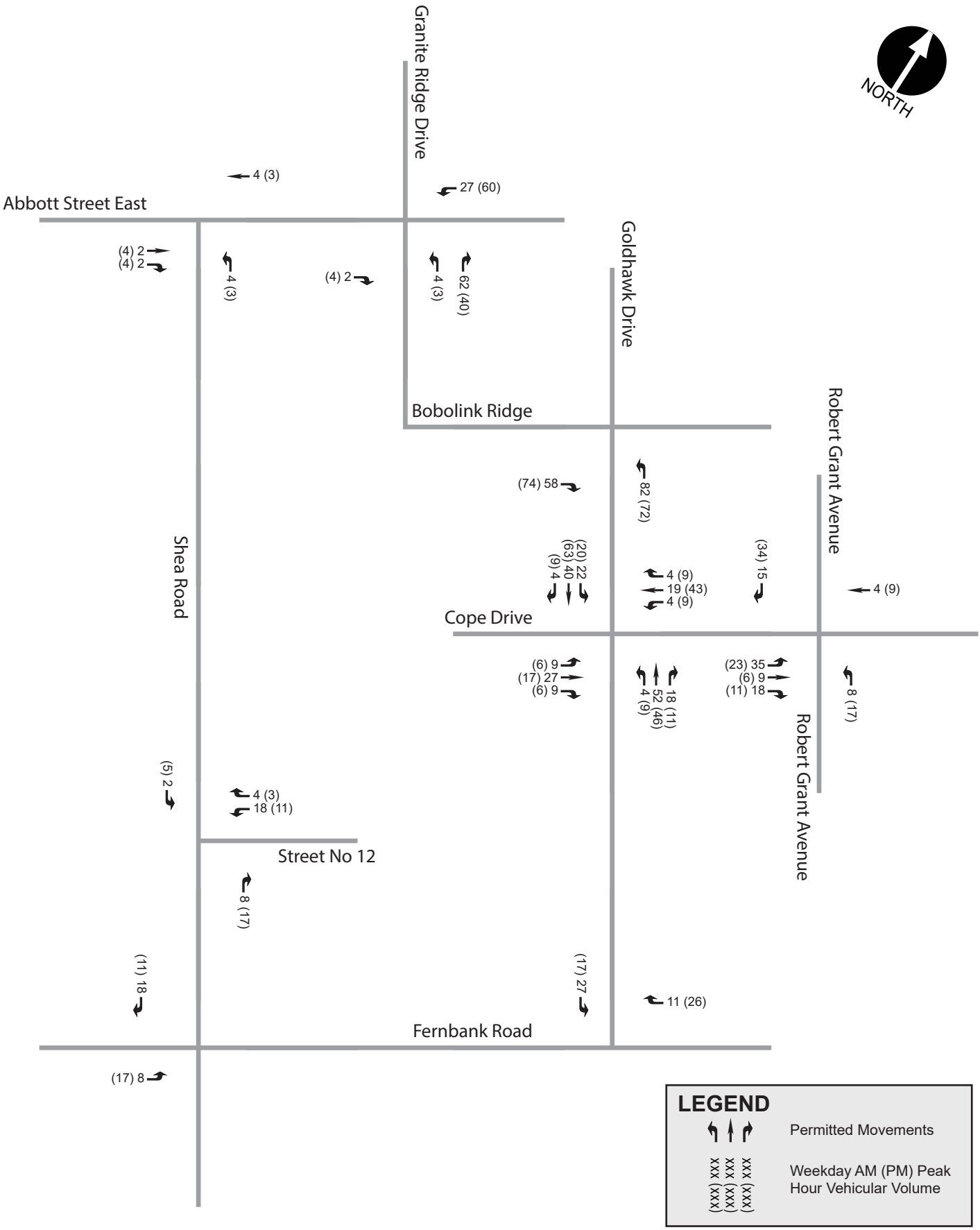
4.1.3 Trip Distribution and Assignment

With consideration that the proposed development will consist solely of residential land uses, it is anticipated that the distribution of site-generated traffic in each of the four cardinal directions will align with the AM Peak commuter flow patterns identified in the 2011 O-D Survey. Assignment of site-generated traffic along logical routes for each direction has been based on engineering judgement, concentration of commercial and employment nodes within the Kanata/Stittsville TAZ, travel times during weekday peak hour conditions and intersection-level traffic count data at each of the study area intersections. It should be noted as well that the global distribution assumed for this study is consistent with other recently conducted TIAs in support of adjacent developments:

- 45% to/from the North
    - 30% on Robert Grant Avenue [1]
    - 15% on Iber Road/Huntmar Road
- 40% to/from the East
    - 25% on Fernbank Road
    - 10% on Abbott St E
    - 5% on Cope Drive
- 5% to/from the South
    - 5% Shea Road
- 10% to/from the West
    - 5% on Abbott Street East
    - 5% on Fernbank Road

Note: [1] Assumes that Robert Grant Avenue is extended further north of Abbott Street East to intersect with Hazeldean Road prior to build-out/occupancy of the subject site.

Applying the estimated number of new auto trips to the above distribution, future site-generated traffic volumes from **Table 8** are illustrated in **Exhibit 6** below at each of the study area intersections.



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CRT Phase 4
Transportation Impact Assessment

Exhibit 6 - Site Generated Traffic

PROJECT No. 136944

SCALE: N.T.S.

4.2 Background Network Traffic

4.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, planned modifications to the transportation network that may impact travel patterns or demand within the study area have been considered. The Scoping section of this TIA reviewed the anticipated changes to the study area transportation network based on the Transportation Master Plan (TMP) and the 2019 Development Charges (DC) Amendment Background Study. Based on a review of these planning policy documents, the following major transportation network modifications are anticipated within the timeframe of this study and within the 2025 build-out year of the proposed development:

- The extension of Robert Grant Avenue (Stittsville North-South Arterial) is expected to be implemented from Abbott Street East to Hazeldean Road by the end of 2023.
- The extension of Goldhawk Drive to Fernbank Road is anticipated to be constructed in 2023.

4.2.2 General Background Growth Rates

The background growth rate is intended to represent regional growth from outside the study area that will travel along the adjacent road network. Consistent with approved TIAs completed in the broader study area, a linear growth rate of 2% per annum is proposed for the calculation of future background traffic estimates. This growth rate has been applied to all through movements on Fernbank Road and Robert Grant Avenue. No growth rates have been applied to collector or lower-order roads, as traffic generation relating to all known future adjacent developments has been explicitly accounted for in the analysis.

4.2.3 Other Area Development

All current adjacent development applications and future potential developments of significance within the study area were previously identified in **Exhibit 5**. Each of these developments have been accounted for in the estimation of future background volume projections. Site-generated traffic volumes were extracted from each of the TIAs, interpolated to align with the analysis years of this study and assigned to the study area intersections. The developments represent specific areas of growth within the study area and are therefore considered in addition to the general background growth rate discussed previously.

4.3 Demand Rationalization

The purpose of this section is to rationalize future travel demands within the study area to account for potential capacity limitations in the transportation network and its ability to effectively absorb the additional demand generated by a new development.

4.3.1 Description of Capacity Issues

As previously shown in **Exhibit 4**, weekday morning and afternoon peak hour volumes on Fernbank Road and Robert Grant Avenue are in the order of 260 and 620 vehicles per hour, respectively, in the peak direction which are both within the capacity limitations for two-lane arterial roadways.

The 5969 Fernbank Road TIA (Parsons, 2018) identified potential capacity issues at the Fernbank & Shea roundabout, however the study assumed a 3% growth rate which indicates that this single-lane roundabout may experience capacity constraints in the future. The Analysis section of this TIA will confirm any additional traffic operational issues at each study area intersection under both background and total traffic conditions and suggest mitigation measures where applicable.

4.3.2 Adjustment to Development Generated Demands

In accordance with the TIA Guidelines, the effects of peak-hour spreading have been considered in future analysis years of this study. It is anticipated that as traffic volumes continue to gradually increase, trips will have a natural tendency to be more evenly distributed across the peak hour (PHF = 1.0) and eventually increase demands in the shoulders of the peak as well. The impacts of peak spreading are accounted for in the Synchro modelling, completed as part of the Analysis component of this study.

As discussed previously, the mode share targets proposed for this study will remain unchanged relative to the existing blended mode share derived from the 2020 TRANS Trip Generation Summary Report, with the exception of a slight decrease in the transit mode share to account for overall coverage of only 85% which is assumed based on the configuration of the internal collector road network from the Fernbank Community Design Plan.

4.3.3 Adjustment to Background Network Demands

The mode share targets developed for this study were limited to site-generated traffic volumes and therefore were not applied to existing and future adjacent development volumes. It is important to note, however, that many of the background developments referenced in this study have likely assumed a higher auto mode share and were developed using the 2009 TRANS Trip Generation Study methodology. Further, the extension of Robert Grant Avenue from Abbott to Hazeldean will help to strengthen the arterial road network within the broader area and provide additional vehicular capacity which was not considered in many of these previous TIAs.

The CRT Phases 1 & 2 TIA Memorandum (IBI, 2011) traffic volumes were conducted prior to the usage of the 2009 TRANS methodology and therefore the residential traffic volumes developed for that study have been adjusted by multiplication factors of 0.60 and 0.64 during the weekday morning and afternoon peak hours, respectively, to better align with the residential trip rates prescribed in the 2020 TRANS Trip Generation Summary Report.

Since the Fernbank CDP was developed, the north-south collector road network through the subject site has also been modified to include a vehicular connection on Abbott Street opposite Granite Ridge. This connection will now be located approximately 360 metres west of the original location planned for in the CDP and, as a result, is less likely to serve as an attractive route for CRT Phase 1 & 2 traffic travelling north or east. Northbound right-turn and westbound left-turn traffic volumes generated by CRT Phases 1 & 2 through the Abbott Street East & Granite Ridge/Bobolink intersection were consequently decreased by an additional 25% to account for the re-routing of some traffic to the Cope & Bobolink intersection.

The proposed connection of Bobolink to Abbott Street will result in a minor redistribution of traffic from previous Phases of CRT. Volumes at the internal subdivision intersections of Goldhawk/Bobolink and Goldhawk/Cope were not previously developed and have therefore been estimated for the purposes of establishing appropriate intersection control under future Total Traffic conditions with consideration of Phase 4 traffic volumes.

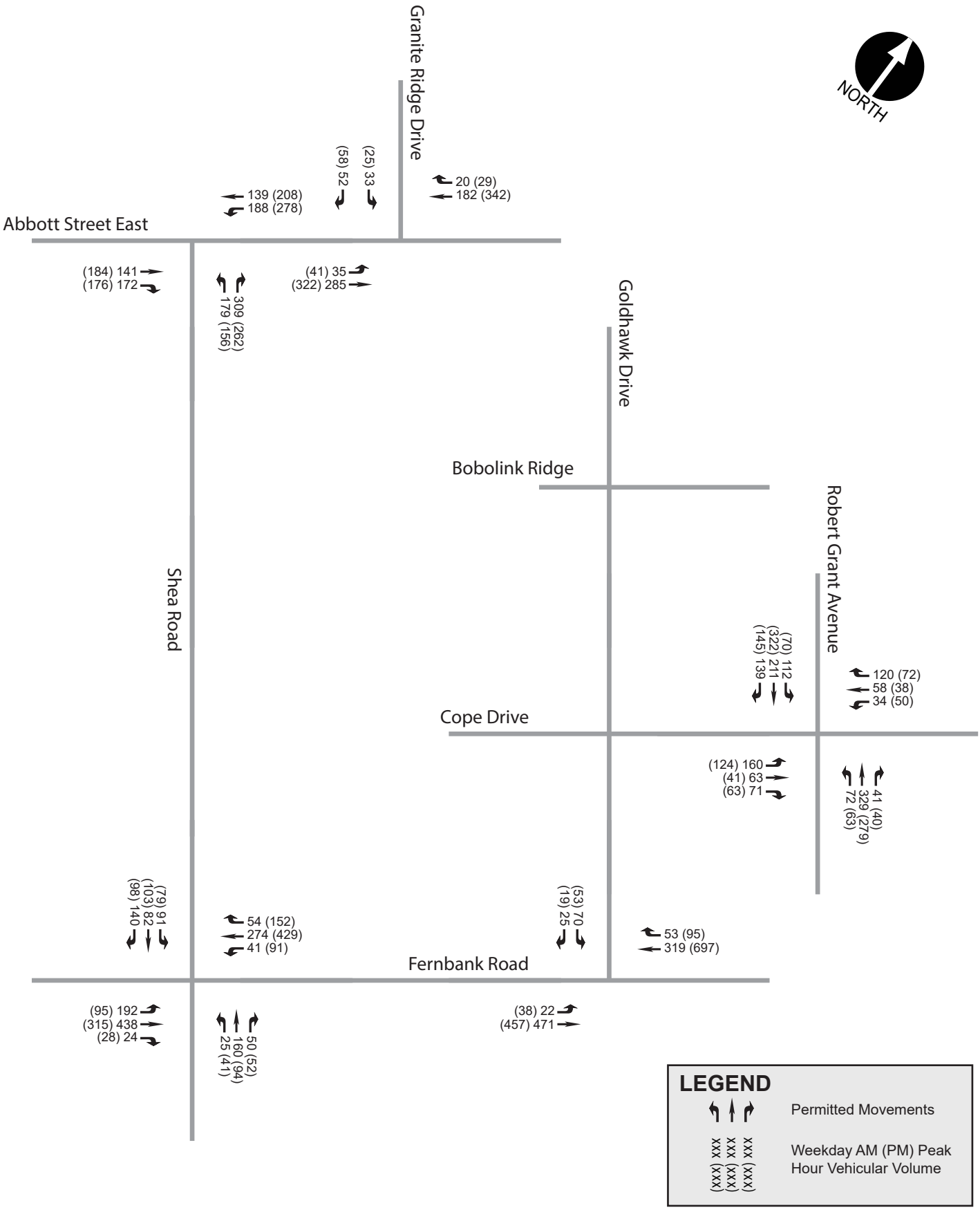
4.4 Traffic Volume Summary

4.4.1 Future Background Traffic Volumes

Future background traffic volume projections have been established by superimposing adjacent development traffic and background traffic derived through the application of a growth rate, as discussed previously. **Exhibit 7** and **Exhibit 8** present the future background traffic volumes anticipated for the 2025 and 2030 analysis years, respectively.

4.4.2 Future Total Traffic Volumes

Future total volumes have been derived by combining site-generated traffic volumes with future background volumes, and with consideration of latent demand associated with the introduction of a south leg at the existing Abbott & Granite Ridge intersection. **Exhibit 9** and **Exhibit 10** present the future total traffic volumes anticipated for the 2025 and 2030 analysis years, respectively.



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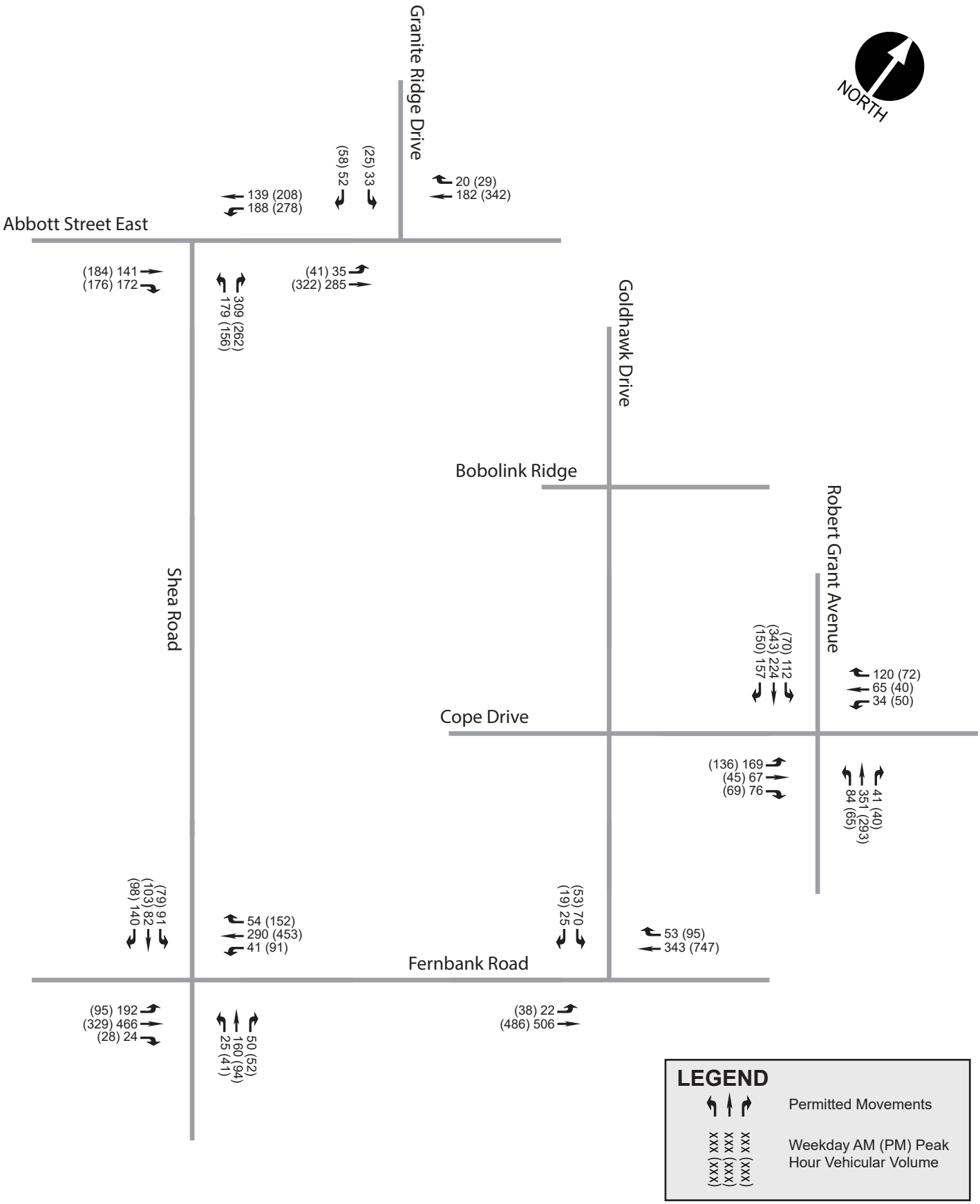
CRT Phase 4
Transportation Impact Assessment

Exhibit 7 - Future (2025)
Background Traffic

PROJECT No. 136944

SCALE: N.T.S.



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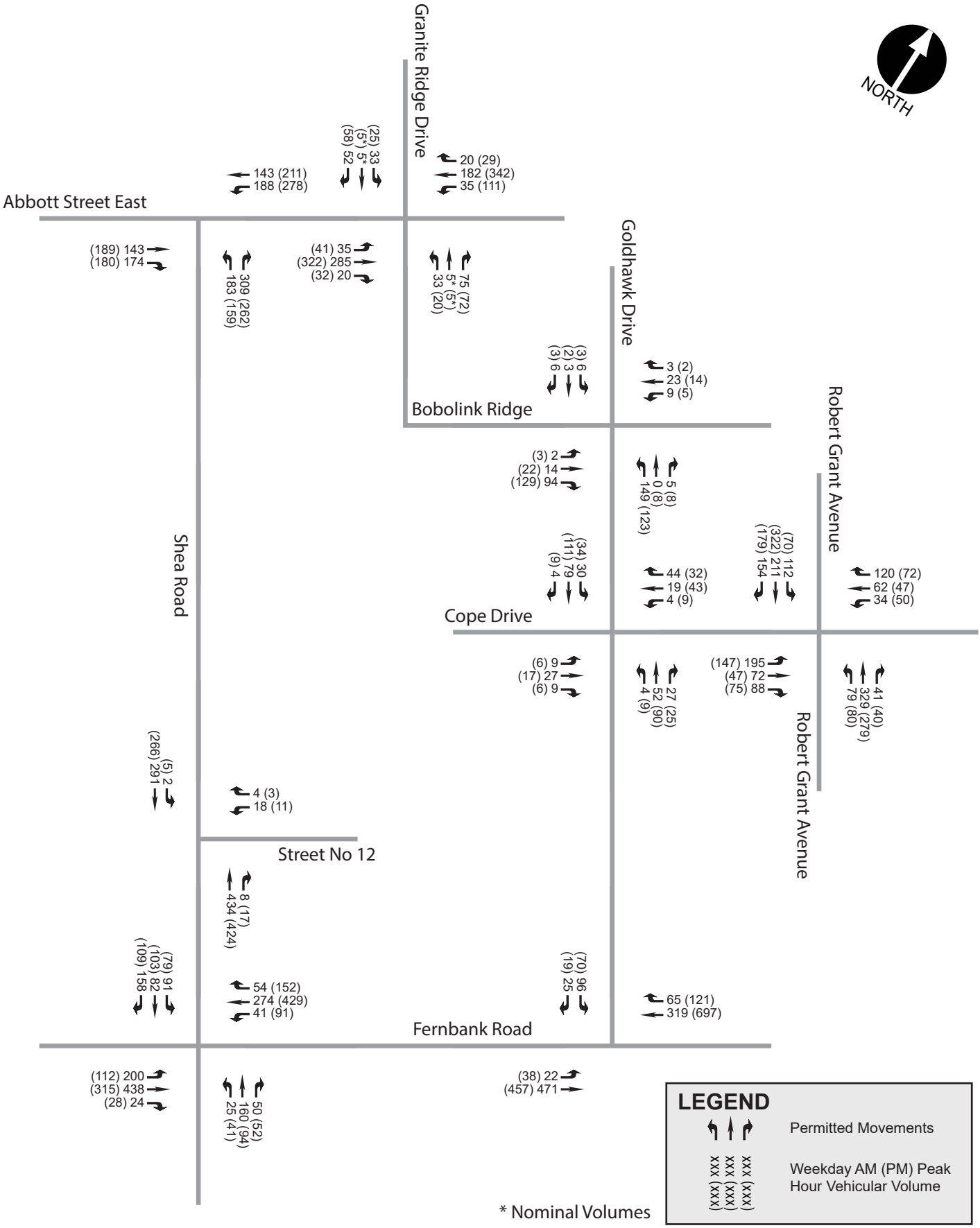
CRT Phase 4
Transportation Impact Assessment

Exhibit 8 - Future (2030) Background Traffic

PROJECT No. 136944

SCALE: N.T.S.



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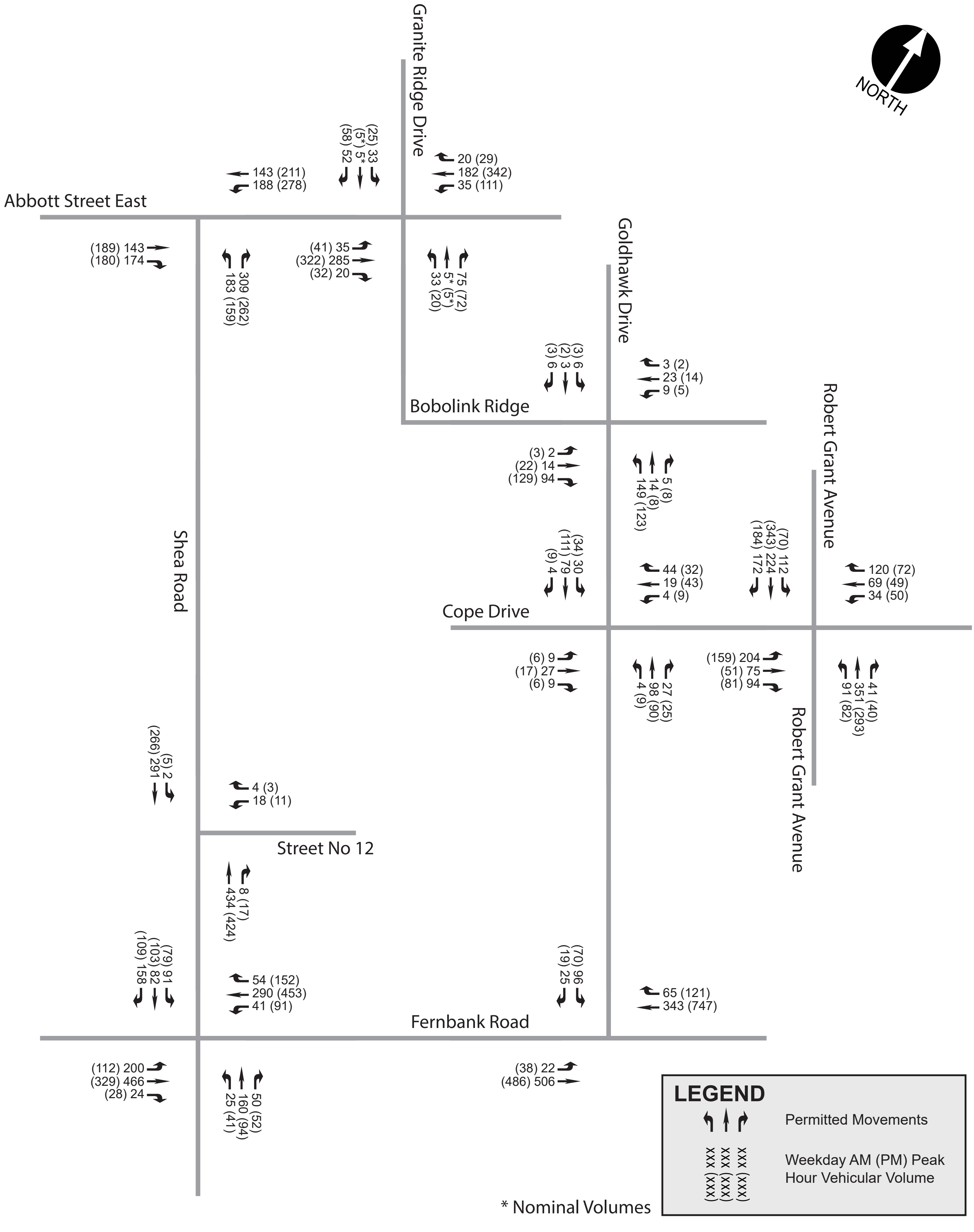
CRT Phase 4
Transportation Impact Assessment

Exhibit 9 - Future (2025)
Total Traffic

PROJECT No. 136944

SCALE: N.T.S.



CRT Phase 4
Transportation Impact Assessment

Exhibit 10 - Future (2030) Total Traffic

PROJECT No. 136944

SCALE: N.T.S.

5 Analysis

5.1 Development Design

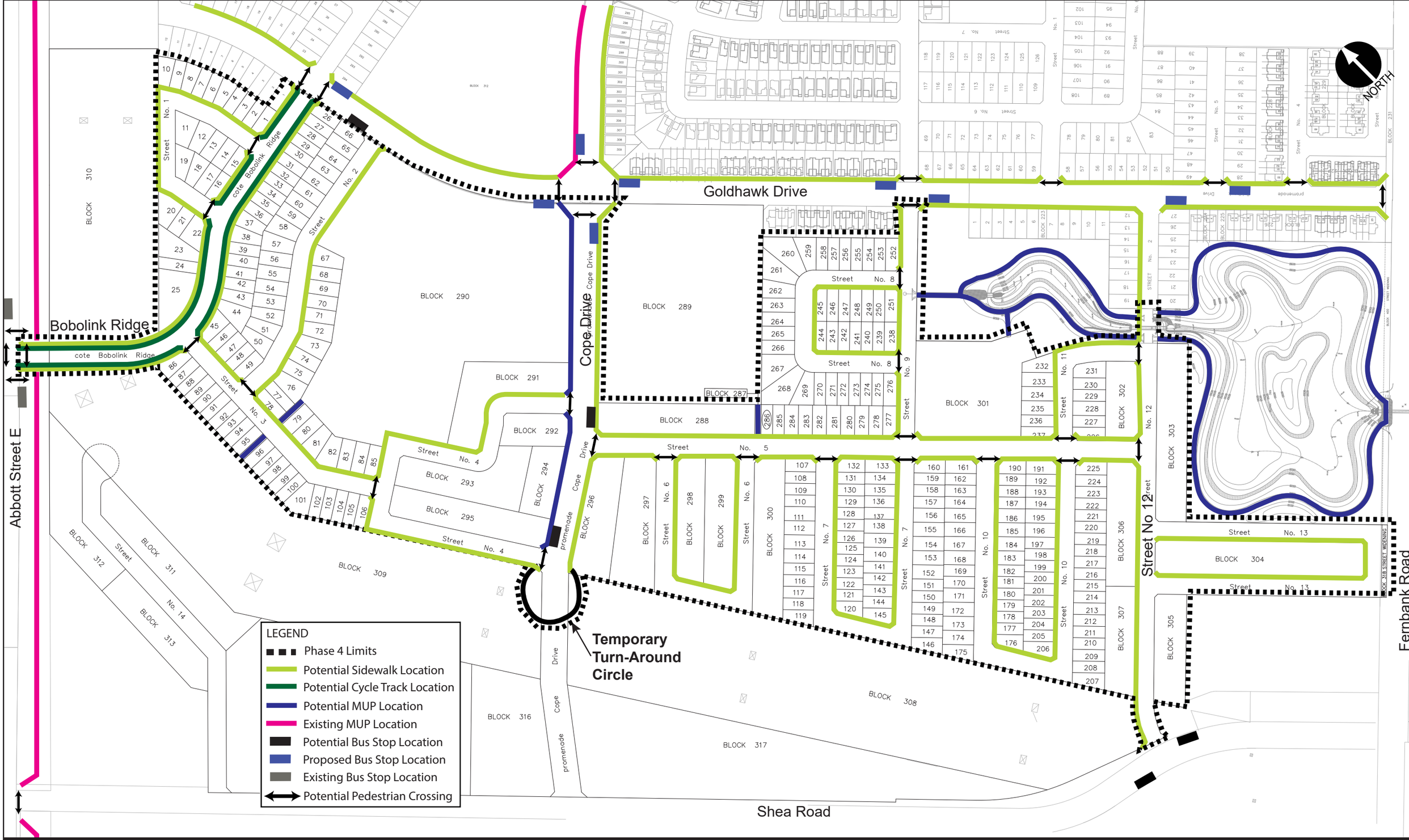
5.1.1 Design for Sustainable Modes

The City of Ottawa transit coverage target is for 95% of units to be within 5-minute (400m) walking distance of transit. Currently, the nearest bus stop to the proposed development is located near the intersection of Abbott St E & Granite Ridge. Approximately 81 dwelling units are within a 400m walking distance from this stop, representing just 14% of units within the proposed development. As such, additional transit stops and modifications to transit routes will be required to achieve high transit coverage. The collector road network within the subject lands will be extended further north to intersect with Abbott Street East opposite Granite Ridge as part of this development which will permit transit routes to circulate internally through the site. A temporary turning circle is proposed within the hydro corridor to allow for buses on Cope Drive to turn-around prior to its future connection to Shea Road. New bus stops on Goldhawk Drive near Bobolink, Cope, Street 9, Street 12, as well as Shea Road near Street 12 would significantly increase the transit coverage for the site to approximately 85%, which is just marginally below the City's target.

Within the proposed development, it is expected that Cope Drive will be extended further west through the subject site and maintain the cross-section from CRT Phase 1 & 2 which consists of a multi-use path on the north side and a sidewalk on the south side, while the segment of Bobolink Ridge through the subject lands will accommodate sidewalks and cycle tracks on both sides per the 2019 Collector Road Guidelines. Goldhawk Drive will maintain the cross-section that was approved as part of CRT Phase 2 but will include concrete sidewalks on both sides for the final 500m section between Street 9/Barnsbury Road and Fernbank Road within Phase 3. Per the new Official Plan, concrete sidewalks will also be provided on at least one side of all local roads within Phase 4 to facilitate safe pedestrian mobility within the subdivision. The internal road network has been designed using a modified grid pattern with short block lengths and frequent minor intersections to provide permeability for active transportation modes.

The proposed mobility plan for the subject site is illustrated in **Exhibit 11** below.

The TDM-Supportive Development Design and Infrastructure Checklist is only applicable to multi-family or residential condominium developments and, as such, is not required for this study.


Goldhawk Drive
Bobolink Ridge
cote Bobolink Ridge
Cope Drive
Abbott Street E
Street No 12
Fernbank Road
Shea Road
Temporary Turn-Around Circle
NORTH
BLOCK 310
BLOCK 290
BLOCK 289
BLOCK 291
BLOCK 292
BLOCK 293
BLOCK 294
BLOCK 295
BLOCK 296
BLOCK 297
BLOCK 298
BLOCK 299
BLOCK 300
BLOCK 301
BLOCK 302
BLOCK 303
BLOCK 304
BLOCK 305
BLOCK 306
BLOCK 307
BLOCK 308
BLOCK 309
BLOCK 311
BLOCK 312
BLOCK 313
BLOCK 316
BLOCK 317
BLOCK 287
BLOCK 288
LEGEND
Phase 4 Limits
Potential Sidewalk Location
Potential Cycle Track Location
Potential MUP Location
Existing MUP Location
Potential Bus Stop Location
Proposed Bus Stop Location
Existing Bus Stop Location
Potential Pedestrian Crossing

5.1.2 Circulation and Access

Not Applicable: The Circulation and Access element is exempt from this TIA, as defined in the study scope. This element is not required for Draft Plan of Subdivision applications.

5.1.3 New Street Networks

The road network within the proposed development is organized in a modified grid pattern with relatively short road segments to create a more porous, walkable community in accordance with the Building Better and Smarter Suburbs policy framework. The overall road network design will promote driver behaviour that is consistent with the roadway classifications.

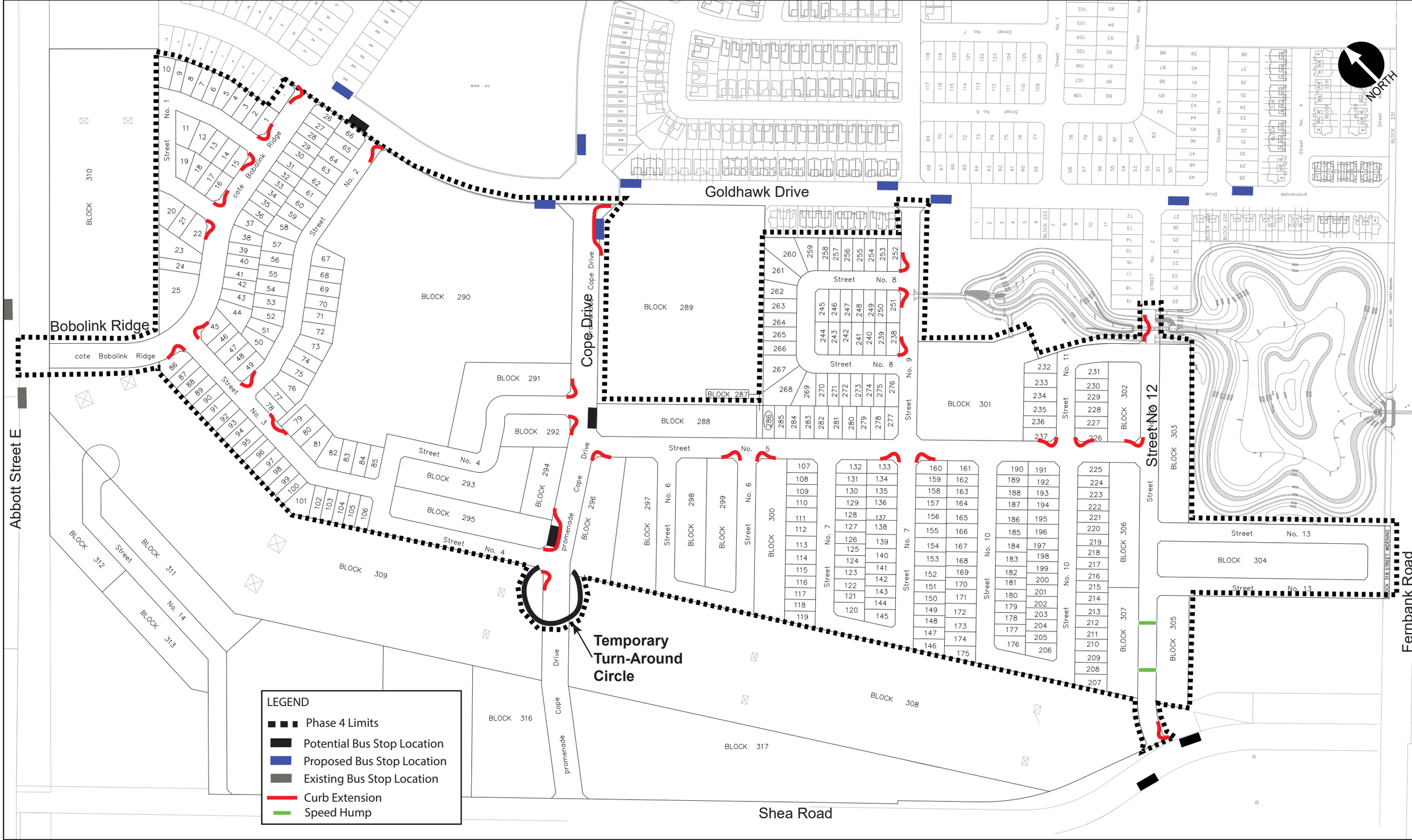
In late 2019, Ottawa City Council approved a set of Neighborhood Collector Road Guidelines intended to encourage future network roadways within developing communities that provide a more balanced distribution of infrastructure within the City right-of-way to support active transportation modes while calming traffic. Within the limits of this subdivision, active transportation facilities including cycle tracks and concrete sidewalks are planned on both sides of the extension of Bobolink Ridge through the subject lands. The remainder of the internal collector road network will maintain the cross-section elements which were previously-approved as part of CRT Phases 1 & 2, as discussed previously.

In accordance with the City of Ottawa's Local Residential Streets 30km/h Design Toolbox (September 2021), specific design elements such as bulb-outs, speed humps, chicanes and reduced curb radii will be considered within the site's internal road network following Draft Approval and prior to Registration of the subdivision lands.

A conceptual traffic calming plan for the proposed development is provided in **Exhibit 12** below.

5.2 Parking

Not Applicable: The Parking Supply and Spillover Parking elements are exempt from this TIA, as previously defined in the Scoping section. These elements are not required for a Draft Plan of Subdivision application.



CRT Phase 4
Transportation Impact Assessment

Exhibit 12: Proposed Traffic Calming Plan

PROJECT No. 136944

SCALE: 0m 30m 60m

5.3 Boundary Streets

The proposed development is accessed by Fernbank Road, Shea Road and Abbott Street East. Segment-based Multi-Modal Level of Service (MMLOS) analysis has been completed for all boundary streets.

5.3.1 Mobility

The MMLOS targets for each road vary based on a variety of factors such as the Official Plan designation/policy area, as well as road classification, cycling network and transit network classification and whether the road is on a truck route.

Segment-based MMLOS results for segments of Fernbank Road, Shea Road and Abbott Street East directly abutting the site are provided in **Table 9** below. Details of the MMLOS analysis are provided in **Appendix G**.

Table 9 – Segment-based MMLOS

LOCATION	LEVEL OF SERVICE BY MODE			
	PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
SEGMENTS				
Fernbank Road	**F** (Target: C)	**F** (Target: C)	D (Target: D)	C (Target: E)
Shea Road	**F** (Target: C)	**F** (Target: D)	D (Target: D)	D (Target: N/A)
Abbott Street East	C (Target: C)	C (Target: B)	D (Target: D)	C (Target: N/A)

The results of the segment-based MMLOS presented in **Table 9** above indicate that both Shea Road and Fernbank Road are not meeting their PLOS targets and that all three segments analyzed are not meeting their respective BLOS targets.

In order to achieve these targets, the following modifications have been identified which could improve conditions for each boundary street:

- **Fernbank Road** – An analysis indicates that 2.0m wide sidewalks with 2.0m wide boulevards combined with a reduction in operating speeds to 60 km/h or less would permit Fernbank Road to meet its PLOS target. For consistency with the portion of Fernbank Road near Shea Road, however, an extension of the multi-use path on the north side of this arterial would sufficiently address the existing cycling and pedestrian level of service deficiencies noted along the site's frontage. These improvements would likely require a complete reconstruction and urbanization of Fernbank Road, however no such capital project is planned by the City within the timeframe of this study.
- **Shea Road** – The introduction of 1.5m wide sidewalks with 2.0m wide boulevards along with an operating speed reduction to 60km/h or less would allow Shea Road to meet the City's PLOS target of C, based on supplementary analysis conducted for this road segment. Implementation of these measures would likely require urbanization of Shea Road and there are no known plans for the City to undertake such improvements in the foreseeable future.
- **Abbott Street East** – Despite the BLOS of C being below the City's BLOS target of B, the presence of the MUP along the south side provides an alternative route with a more comfortable experience for cyclists.

It should be noted that these deficiencies in the segment-based MMLOS along the boundary streets represent existing conditions. The implementation of formal pedestrian and cycling facilities should be considered by the City upon future reconstruction or renewal of these key roadways in the study area.

5.3.2 Road Safety

A summary of all reported collisions within the study period over the past five years was presented in the Scoping component of this report. The City requires a safety review if at least six collisions for any one movement or of a discernible pattern have occurred over the study period. Based on these criteria, the segment of Fernbank Road from Shea Road to 520m east of Robert Grant Avenue along with the Fernbank & Shea and Abbott & Granite Ridge intersections warrant further analysis, as presented in **Table 10** below.

Table 10 - Detailed Collision Analysis

INTERSECTION/SEGMENT	COLLISION TYPE						COLLISIONS PER MVE[1]
	Angle	Turning Movement	Rear-End	Single Motor Vehicle	Other	Total	
Abbott Street E & Granite Ridge	4	1	3			8	0.24
Fernbank & Shea	11		1	1		13	0.20
Fernbank Road – Shea to 520m east of Robert Grant		1	2	5	1	9	n/a
Total	15	2	6	6	1	30	-

[1] – Million Vehicles Entering (MVE)

As indicated above in **Table 10**, the results of the detailed collision analysis show no significant collision patterns within the noted segment of Fernbank Road and the intersection of Abbott Street E & Granite Ridge. No mitigation measures are recommended at those locations.

Based on the collision records reviewed for this study, there were 11 angle collisions reported at the Fernbank & Shea roundabout between January 2015 and December 2019. The majority of these collisions occurred within the weekday morning peak period, suggesting that peak hour congestion could be a potential cause. Nearly all of the angled collisions involved eastbound vehicles (see **Figure** 6 below) entering the roundabout and colliding with vehicles already within the circulating lanes. This pattern could indicate the existence of a sightline issue which should be investigated further by the City. It should be noted that all of the reported collisions within the Fernbank & Shea junction resulted in property damage only and therefore can be considered minor in nature.

Figure 6 – Eastbound Approach to Fernbank & Shea Roundabout

Source: Google Streetview (August 2019)

5.4 Access Intersections

5.4.1 Location and Design of Access

The proposed development will provide direct access to the adjacent road network at these locations:

- **Abbott Street East & Granite Ridge Drive/Bobolink Ridge** – An existing three-legged, unsignalized intersection with access to the proposed development through the new fourth leg as the extension of Bobolink Ridge. All four approaches will be stop-controlled, as confirmed by the intersection capacity analysis in subsequent sections of this report.
- **Goldhawk Drive & Bobolink Ridge** – A new four-legged intersection approximately 330m south of Abbott Street E,
- **Goldhawk Drive & Street #2** – A new three-legged intersection approximately 450m south of Abbott Street E,
- **Goldhawk Drive & Street #12** – A new three-legged intersection approximately 230m north of Fernbank Road,
- **Goldhawk Drive & Cope Drive** – A new four-legged intersection approximately 750m west of the Robert Grant Avenue & Cope Drive roundabout; and
- **Shea Road & Street #12** – A new three-legged intersection approximately 230m north of the Fernbank Road & Shea Road roundabout.

The above noted intersections include both the external all-movement connections and the internal connections which will provide access to not only the proposed development but also the adjacent development of CRT Phases 1 through 3 which will be constructed immediately to the east.

5.4.2 Intersection Control

5.4.2.1 Traffic Signal Warrants

Based on the projected traffic volumes presented in this study, none of the site access intersections warrant traffic signals under Future (2030) Total Traffic conditions.

The results of the traffic signal warrants are provided in **Appendix H**.

5.4.2.2 Roundabout Analysis

As per the City's Roundabout Implementation Policy, intersections that satisfy any of the following criteria should be screened utilizing the Roundabout Initial Feasibility Screening Tool:

- At any new City intersection
- Where traffic signals are warranted
- At intersections where capacity or safety problems are being experienced

The Street 12 & Shea, Fernbank & Goldhawk, Cope & Goldhawk and Goldhawk & Bobolink intersections satisfy the first criterion as 'new City intersections', therefore the Roundabout Feasibility Screening Tool was utilized to assess the feasibility of implementing a roundabout at these locations. The results of the screening tool indicate that roundabouts may be problematic due to significant differences in directional flows (i.e. primarily east-west traffic) and/or a lack of suitability factors (i.e. no safety or capacity issues anticipated) at these locations. The results of the Roundabout Feasibility Screening Tool are provided in **Appendix H**.

5.4.2.3 All-Way Stop Control (AWSC) Warrants

The Ontario Traffic Manual (OTM) indicates that all-way stop control should only be considered at a minor road when the following conditions are met:

- *Total vehicle volume on all approaches exceeds 350 vehicles per hour for the highest hour;*
- *Volume split does not exceed 65/35. Volume is defined as vehicle only.*

Table 11 below provides a summary of projected weekday morning and afternoon peak hour volumes under Future (2030) Total Traffic conditions. It should be noted that the traffic volumes analysed at the Cope & Goldhawk intersection considers the shift in travel patterns anticipated to occur in the longer-term once the extension of Cope Drive to Shea Road is implemented and fully operational.

Table 11 – AWSC Warrant Analysis Results

SCENARIO	PEAK HOUR PERIOD	NORTH-SOUTH APPROACHES		EAST-WEST APPROACHES		TOTAL VEHICLE VOLUME
		VEHICLE VOLUME	VOLUME SPLIT	VEHICLE VOLUME	VOLUME SPLIT	
GOLDHAWK & BOBOLINK						
2030 Total Traffic	AM	183	56%	144	44%	327
	PM	148	46%	174	54%	322
GOLDHAWK & COPE						
2030 Total Traffic (with Cope Extension) [1]	AM	261	33%	426	67%	687
	PM	271	35%	504	65%	775

Note: [1] Considers long-term traffic impacts associated with the Cope Drive connection with Shea Road.

As indicated by the results presented in **Table 11** above, it is not expected that the Goldhawk & Bobolink intersections will sustain traffic volumes above the minimum 350-vehicle threshold during either weekday peak hour and therefore it can be concluded that all-way stop control is not appropriate for this intersection.

Based on the re-routing of traffic expected to occur with the future Cope Drive connection to Shea Road, the Goldhawk & Cope intersection is likely to experience traffic volumes well above the 350-vehicle threshold, as well as a balanced split of at least 35/65 during the weekday afternoon peak hour. The all-way stop control warrant is therefore expected to be triggered once the Cope Drive extension is complete, which is likely to occur by the 2030 horizon year of this study.

An intersection capacity analysis conducted in subsequent sections of this TIA will verify the operational performance of the Goldhawk & Cope intersection configured with this form of traffic control. It should be noted that implementing AWSC at this location will also allow for improved pedestrian connectivity, which is an important consideration given its proximity to public facilities including a future park, school and potential bus stop locations.

5.4.3 Access Intersection-Based MMLOS

The proposed site access intersections will remain unsignalized and therefore no intersection-based Multi-Modal Level of Service (MMLOS) analysis is required.

5.5 Transportation Demand Management (TDM)

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce automobile dependence, particularly during the weekday peak travel periods. All private development applications are also required to include a TDM strategy by identifying proposed measures to reduce the overall vehicular impact of the development.

5.5.1 Context for TDM

As described in the Forecasting section of this report, the mode share targets referenced from the Kanata/Stittsville Traffic Assessment Zone (TAZ) in the 2020 TRANS Trip Generation Summary Report and used to estimate future development traffic were based on the expected blend of residential dwelling types planned for within the proposed development. Further adjustments were applied to reflect the slightly substandard transit coverage of 85% of units within a 400-metre walking distance of an existing or potential transit stop relative to the City's target of 95%, with the difference allocated to the auto driver mode share.

The proposed development aligns with the objectives of the Building Better and Smarter Suburbs (BBSS) policy document that promotes sustainable and compact growth. More than half of all dwelling units are either street townhomes or back-to-back townhomes, which is considered an appropriate level of density given the suburban context of this development. It should be noted as well that this development is not located within close proximity to either a Transit-Oriented Development (TOD) zone or Design Priority Area (DPA).

5.5.2 Need and Opportunity

To promote sustainable transportation for local trips, the internal road network of the proposed development has been configured with short street segments and frequent intersections to provide direct connections to the internal collector roads which will be capable of supporting transit service. Sidewalks and appropriate pedestrian connections will be provided throughout the subdivision to facilitate access to local amenities, recreational pathways, as well as the adjacent road and transit network.

Consideration has been given to strategically locating bus stops at regular intervals along the internal collector road network, including Goldhawk Drive, Cope Drive and Bobolink Ridge to maximize the number dwelling units that are within a 5-minute walk of a bus stop. Providing regular, all-day transit service within the community will help promote the use of transit as a convenient and efficient mode of transportation, thereby reducing dependence on private automobile usage. Transit routes and specific bus stop locations will be established in consultation with OC Transpo, following Draft Approval and prior to detailed design of the internal road network. As prior phases of the CRT Westwood subdivision are already under construction, it is expected that transit access within reasonable walking to the Phase 4 development will be available upon first occupancy.

5.5.3 TDM Program

The proposed development conforms to the City's TDM principles by providing convenient and direct connections to adjacent pedestrian, cycling and transit facilities where available.

The City of Ottawa's TDM Measures Checklist was completed for the proposed development and is provided in **Appendix I**. In order to promote sustainable transportation, new residents will be provided with a multi-modal travel information package to educate the community about existing pedestrian and bicycle networks, as well as, identify nearby transit routes and stops.

5.6 Neighbourhood Traffic Management

5.6.1 Adjacent Neighbourhoods

As the development is reliant on collector and major collector roads for access, a review of Neighbourhood Traffic Management thresholds is required as part of the TIA process. The results of the Livability Threshold Review are summarized in **Table 12** below.

Table 12 - Livability Threshold Review

BOUNDARY STREET	CLASSIFICATION	LIVABILITY THRESHOLD (PER LANE)	FUTURE (2030) TOTAL TRAFFIC PEAK DIRECTION VOLUMES
Abbott Street East	Major Collector Road	600 Vehicles/Hour (5,000 Vehicles/Day)	452 Vehicles/Hour (AM Peak) 489 Vehicles/Hour (PM Peak)
Cope Drive	Major Collector Road	600 Vehicles/Hour (5,000 Vehicles/Day)	375 Vehicles/Hour (AM Peak) 315 Vehicles/Hour (PM Peak)
Goldhawk Drive	Collector Drive	300 Vehicles/Hour (2,500 Vehicles/Day)	169 Vehicles/Hour (AM Peak) 159 Vehicles/Hour (PM Peak)
Shea Road	Collector Road	300 Vehicles/Hour (2,500 Vehicles/Day)	616 Vehicles/Hour (AM Peak) 477 Vehicles/Hour (PM Peak)

The TIA Guidelines prescribe a liveability threshold of 300 vehicles per hour per lane (vphpl) for collector roads and 600 vphpl for major collector roads. As shown in **Table 12** above, all boundary streets are operating within the livability threshold for their respective road classifications with the exception of Shea Road. Shea is currently classified as a collector road but has characteristics of a higher-order road due to its minimal direct frontage. The volumes projected on Shea Road under the 2025 and 2030 Total Traffic conditions are expected to remain under the 600 vehicle per hour threshold in the PM peak hour but may occasionally exceed this threshold in the AM peak hour. It is not uncommon, however, for collector roads which provide direct access to the arterial road network to exceed liveability thresholds within close proximity to a major intersection. It should be noted that this is an existing condition that will be exacerbated by background growth and not traffic generated by the proposed development. The eventual extension of Cope Drive to Shea Road may alleviate this condition by providing an additional east-west route through the community.

5.7 Transit

5.7.1 Route Capacity

The estimated Future (2030) Total transit ridership within the study area was provided previously in the Forecasting component of this study. The results have been summarized in **Table 13** below.

Table 13 - 2030 Development Generated Transit Demand

PERIOD	PEAK HOUR DEMAND		
	IN	OUT	TOTAL
AM	33	76	109
PM	66	45	111

As indicated in **Table 13** above, the proposed development is expected to contribute approximately 109 to 111 additional two-way transit trips during the weekday peak hours. This represents a significant increase in transit ridership along existing routes. Given that there are currently six transit routes operating in the vicinity of the proposed development and that a typical OC Transpo bus can only accommodate 100 passengers, it is recommended that OC Transpo review the local transit routes to ensure that there is sufficient capacity and coverage to accommodate the additional demand.

5.7.2 Transit Priority Measures

The Transportation Master Plan 2031 'Affordable Rapid Transit and Transit Priority Network' identifies Robert Grant Avenue as a future transit priority corridor with isolated transit priority measures such as transit signal priority and/or queue jump lanes. It is expected that these measures will sufficiently offset any additional delay induced by site-generated transit demand. As such, no further transit priority measures are recommended.

5.8 Review of Network Concept

Not Applicable: The Fernbank CDP planned for the subject lands now referred to as CRT Phase 4 to be primarily 'low density residential', which is consistent with the proposed Draft Plan shown previously in **Exhibit 2**. Further, screenline analysis was conducted as part of the CDP to account for this development, therefore Module 4.8 – Network Concept is not required for this TIA.

5.9 Intersection Design

5.9.1 Intersection Control

The results of the intersection control warrants discussed below are provided in **Appendix H**.

5.9.1.1 Traffic Signal Warrants

Traffic signal warrants for site access intersections were discussed previously in Section 5.4. The remaining study area intersections presently exist as roundabouts or are expected to operate at acceptable levels of service throughout the timeframe of this study, with the exception of the Fernbank & Goldhawk intersection which may experience some minor capacity issues by the horizon year of the study.

Traffic signal warrant analysis for the future Fernbank & Goldhawk intersection was conducted under Future (2030) Total Traffic conditions, confirming that the need for traffic signalization is not triggered. In the longer term with the build-out of the final phase of the CRT Westwood development (i.e. west of the hydro corridor) and the connection of Cope Drive to Shea Road, the traffic volumes on Fernbank Road are expected to decline as a result of redistributed east-west traffic demand, thereby further decreasing the likelihood that traffic signal warrants would be met.

5.9.1.2 Roundabout Analysis

Roundabout analysis for site access intersections was discussed previously in Section 5.4. The remaining study area intersections are either presently configured as roundabouts or do not meet the criteria requiring the completion of a Roundabout Initial Feasibility Screening Tool.

5.9.2 Intersection Analysis Criteria (Automobile)

The following section outlines the City of Ottawa's methodology for determining motor vehicle Level of Service (LOS) at unsignalized and roundabout intersections.

5.9.2.1 Intersection Capacity Analysis Methodology

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an unsignalized intersection, the Level of Service is defined in terms of the average movement delays at the intersection. This is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this includes the time required for a vehicle to travel from the last-in-queue position to the first-in-queue position. The average delay for any particular minor movement at the un-signalized intersection is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersection and roundabouts, related to average movement delays at the intersection, as indicated in **Table 14** below.

Table 14 - LOS Criteria for Unsignalized Intersections & Roundabouts

LOS	UNSIGNALIZED	ROUNDABOUT
	DELAY (seconds)	DELAY (seconds)
A	<10s	<10s
B	>10s and <15s	>10s and <20s
C	>15s and <25s	>20s and <35s
D	>25s and <35s	>35s and <50s
E	>35s and <50s	>50s and <70s
F	>50s	>70s

The unsignalized intersection capacity analysis technique included in the HCM and used in the current study provides an indication of the Level of Service for each movement of the intersection under consideration. By this technique, the performance of the unsignalized intersection can be compared under varying traffic scenarios, using the Level of Service concept in a qualitative sense. One unsignalized intersection can be compared with another unsignalized intersection using this concept. Level of Service 'E' represents the capacity of the movement under consideration and generally, in large urban areas, Level of Service 'D' is considered to represent an acceptable operating condition. Level of Service 'E' is considered an acceptable operating condition for planning purposes for intersections located within proximity to major rapid transit stations, as well as Ottawa's Urban Core and its vicinity. Level of Service 'F' indicates that the movement is operating beyond its design capacity.

5.9.3 Intersection Capacity Analysis

Following the established intersection capacity analysis criteria described above, the existing and future conditions are analysed using the weekday peak hour traffic volumes derived in this study.

The subsequent section presents the results of the intersection capacity analysis. All tables summarize study area intersection LOS results during the weekday morning and afternoon peak hour periods.

The intersection capacity analysis reports have been provided in **Appendix J**.

5.9.3.1 Existing Traffic

An intersection capacity analysis has been undertaken using the Existing (2022) Traffic volumes presented previously in **Exhibit 5**.

The results of the intersection capacity analysis are summarized in **Table 15** below.

Table 15 - Intersection Capacity Analysis: Existing (2022) Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Abbott Street E & Shea Road	Unsignalized	B (12.3s)	WBTL (12.3s)	C (17.4s)	WBTL (17.4s)
Abbott Street E & Granite Ridge Drive	Unsignalized	B (10.7s)	EBTRL (10.7s)	B (12.5s)	WBTRL (12.5s)
Robert Grant Avenue & Cope Drive	Roundabout	A (5.8s)	NBTRL (5.8s)	A (5.7s)	SBTRL (5.7s)
Fernbank Road & Shea Road	Roundabout	B (11.9s)	NBTRL (11.9s)	B (13.9s)	WBTRL (13.9s)

The results of the analysis indicate that the study area intersections in **Table 15** above are operating at acceptable Levels of Service (i.e. LOS 'D' or better) under existing traffic conditions during both the weekday morning and afternoon peak hours.

5.9.3.2 Future (2025) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2025) Background Traffic volumes presented previously in **Exhibit 7**.

The results of the intersection capacity analysis are summarized in **Table 16** below.

Table 16 - Intersection Capacity Analysis: Future (2025) Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Abbott Street E & Shea Road	Unsignalized	C (23.4s)	NBRL (23.4s)	D (31.5s)	WBTL (31.5s)
Abbott Street E & Granite Ridge Drive	Unsignalized	B (11.1s)	EBTRL (11.1s)	B (13.4s)	WBTRL (13.4s)
Robert Grant Avenue & Cope Drive	Roundabout	B (13.1s)	NBTRL (13.1s)	B (11.5s)	SBTRL (11.5s)
Fernbank Road & Goldhawk Drive	Unsignalized	C (17.3s)	SBRL (17.3s)	D (28.7s)	SBRL (28.7s)
Fernbank Road & Shea Road	Roundabout	C (18.4s)	EBTRL (18.4s)	C (22.3s)	WBTRL (22.3s)

The results of the intersection capacity analysis presented in **Table 16** above indicate that the study area intersections are operating at acceptable Levels of Service (i.e. LOS 'D' or better) under Future (2025) Background Traffic conditions during both the weekday morning and afternoon peak hours.

5.9.3.3 Future (2030) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2030) Background Traffic volumes presented previously in **Exhibit 8**.

The results of the intersection capacity analysis are summarized in **Table 17** below.

Table 17 - Intersection Capacity Analysis: Future (2030) Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Abbott Street E & Shea Road	Unsignalized	C (23.4s)	NBRL (23.4s)	D (31.5s)	WBTL (31.5s)
Abbott Street E & Granite Ridge Drive	Unsignalized	B (11.1s)	EBTRL (11.1s)	B (13.4s)	WBTRL (13.4s)
Robert Grant Avenue & Cope Drive	Roundabout	B (14.8s)	NBTRL (14.8s)	B (12.2s)	SBTRL (12.2s)
Fernbank Road & Goldhawk Drive	Unsignalized	C (18.6s)	SBRL (18.6s)	D (32.8s)	SBRL (32.8s)
Fernbank Road & Shea Road	Roundabout	C (20.2s)	EBTRL (20.2s)	C (24.5s)	WBTRL (24.5s)

The results of the intersection capacity analysis presented in **Table 17** above indicate that the study area intersections are expected to operate at acceptable levels of service (i.e. LOS ‘D’ or better) under Future (2030) Background Traffic conditions.

5.9.3.4 Future (2025) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2025) Total Traffic volumes presented previously in **Exhibit 9**.

The results of the intersection capacity analysis are summarized in **Table 18** below.

Table 18 - Intersection Capacity Analysis: Future (2025) Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Abbott Street E & Shea Road	Unsignalized	C (24.3s)	NBRL (24.3s)	D (32.9s)	WBTL (32.9s)
Abbott Street E & Granite Ridge Drive/Bobolink Ridge	Unsignalized	B (11.9s)	EBTRL (11.9s)	C (17.3s)	WBTRL (17.3s)
Robert Grant Avenue & Cope Drive	Roundabout	B (14.6s)	NBTRL (14.6s)	B (13.1s)	SBTRL (13.1s)
Fernbank Road & Goldhawk Drive	Unsignalized	C (19.2s)	SBRL (19.2s)	D (33.1s)	SBRL (33.1s)
Fernbank Road & Shea Road	Roundabout	C (18.9s)	EBTRL (18.9s)	C (23.6s)	WBTRL (23.6s)
Shea Road & Street 12	Unsignalized	B (14.1s)	WBRL (14.1s)	B (11.3s)	NBTR (11.3s)
Cope Drive & Goldhawk Drive	Unsignalized	A (7.9s)	SBTRL (7.9s)	A (8.3s)	SBTRL (8.3s)
Goldhawk Drive & Bobolink Ridge	Unsignalized	B (10.1s)	NBTRL (10.1s)	B (10.0s)	NBTRL (10.0s)

Based on the intersection capacity analysis shown in **Table 18** above, all study area intersections are expected to operate at an acceptable levels of service (i.e. LOS 'D' or better) under Future (2025) Total Traffic conditions. This analysis provides an indication that the adjacent road network has sufficient capacity to accommodate site-generated and background traffic demand without the Cope Drive extension to Shea Road.

5.9.3.5 Future (2030) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2030) Total Traffic volumes presented previously in **Exhibit 10**.

The results of the intersection capacity analysis are summarized in **Table 19** below.

Table 19 - Intersection Capacity Analysis: Future (2030) Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Abbott Street E & Shea Road	Unsignalized	C (24.3s)	NBRL (24.3s)	D (32.9s)	WBTL (32.9s)
Abbott Street E & Granite Ridge Drive/Bobolink Ridge	Unsignalized	B (11.9s)	EBTRL (11.9s)	C (17.3s)	WBTRL (17.3s)
Robert Grant Avenue & Cope Drive	Roundabout	C (16.7s)	NBTRL (16.7s)	B (14.1s)	SBTRL (14.1s)
Fernbank Road & Goldhawk Drive	Unsignalized	C (20.9s)	SBRL (20.9s)	**E (38.4s)**	**SBRL (38.4s)**
	Unsignalized[1]	C (19.4s)	SBRL (19.4s)	D (30.7s)	SBRL (30.7s)
Fernbank Road & Shea Road	Roundabout	C (20.8s)	EBTRL (20.8s)	D (26.1s)	WBTRL (26.1s)
Shea Road & Street No 12	Unsignalized	B (14.1s)	WBRL (14.1s)	B (13.6s)	WBRL (13.6s)
Cope Drive & Goldhawk Drive	Unsignalized	A (8.0s)	SBTRL (8.0s)	A (8.3s)	SBTRL (8.3s)
	Unsignalized[1]	B (10.2s)	EBTRL (10.2s)	B (11.1s)	WBTRL (11.1s)
Goldhawk Drive & Bobolink Ridge	Unsignalized	B (10.2s)	NBTRL (10.2s)	B (10.0s)	NBTRL (10.0s)

Notes: [1] Includes redistribution of traffic volumes to reflect future Cope Drive extension to Shea Road.

Based on the intersection capacity analysis shown in **Table 19** above, all study area intersections are expected to operate at an acceptable levels of service (i.e. LOS 'D' or better) under Future (2030) Total Traffic conditions with the exception of the Fernbank & Goldhawk intersection which may approach its theoretical capacity during the weekday afternoon peak hour.

It is important to recognize, however, that this potential capacity constraint is limited to the study horizon year of 2030, where considerable uncertainty exists with respect the build-out of the

collector road network and timing of future phases of CRT Lands. This TIA has assumed as a worst case without the Cope Drive extension, however it is possible that the Cope Drive connection to Shea Road will be constructed prior to 2030, which would provide sufficient capacity to allow the Fernbank & Goldhawk intersection to operate at LOS 'D' during the critical weekday peak hour, as indicated above.

5.9.4 Intersection-Based MMLOS

Not Applicable – An Intersection-based Multi-Modal Level of Service (MMLOS) analysis is only required for signalized intersections, as no methodology presently exists for evaluating other forms of traffic control, including stop-controlled intersections or roundabout. Given that none of the study area intersections are presently configured with traffic signals or are proposed to operate with this form of traffic control throughout the timeframe of this study, an intersection-based MMLOS evaluation is not required for this TIA.

5.10 Geometric Review

The following section provides a review of all geometric requirements for proposed vehicular connections to the adjacent road network as part of the subject development.

5.10.1 Sight Distance and Corner Clearances

The site access intersection proposed on Abbott Street East will form the southern leg of an existing three-legged, all-way stop-controlled intersection which exists on a segment of road with no significant horizontal or vertical constraints.

The Street 12 intersection with Shea Road is proposed within the area of influence of a roundabout, as identified in the TIA Screening Form. Although this access is planned within a horizontal curve, the curvature of this road segment is gradual enough to achieve the minimum stopping sight distance of 105 metres both upstream and downstream. Further, given that this is a local road intersection, it is expected that traffic volumes using this access intersection will be minimal.

Sight distances and corner clearances are therefore not expected to be a concern at either of the above noted locations. As such, no further review of this proposed intersection with respect to sightline visibility is required as part of this study.

5.10.2 Auxiliary Lane Analysis

Auxiliary lane analyses were limited to the Fernbank & Goldhawk and Shea & Street 12 intersections for this study, with the following rationale provided for exempting the remaining study area intersections:

- Existing or proposed All-Way Stop Control intersections were exempt from this analysis, as it is generally not desirable to have a multi-lane approach controlled with a stop-controlled sign. Further, the three AWSC study area intersections were shown to operate at acceptable levels of service under Future (2030) Total Traffic conditions.
- The Fernbank & Shea and Robert Grant & Cope roundabouts were recently constructed and are expected to operate at acceptable levels of service throughout the timeframe of this study with their existing configurations, therefore these junctions were also exempt from any auxiliary lane analysis.
- Despite the high northbound left- and eastbound right-turn volumes at the Bobolink & Goldhawk intersection, which are in the order of 100-150 vehicles per hour, the through volumes on these approaches are projected to be very low at no more than 25 vehicles per hour. As such, shared approaches can effectively be used as de-facto turning lanes

to accommodate these higher turning volumes. The intersection is expected to operate at LOS 'A' throughout the timeframe of this study under the weekday peak hours conditions as well, therefore no auxiliary left- or right-turn lanes were deemed necessary for this location.

5.10.2.1 Auxiliary Left-Turn Lane Requirements (Unsignalized Intersections)

Auxiliary left-turn lane warrants were conducted under Future (2030) Total Traffic conditions for the Fernbank & Goldhawk intersection. This analysis was conducted with and without the Cope Drive extension and was limited to the critical weekday afternoon peak hour.

The operating speed on Fernbank Road was assumed to be 90 km/h, representing 10 km/h above the posted speed limit.

The results of the left-turn lane warrant analyses are summarized in **Table 20** below. Relevant extracts from the MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads have been provided in **Appendix K**.

Table 20 - Auxiliary Left-Turn Storage Analysis at Unsignalized Intersections

	APPROACH	VOLUME ADVANCING (V_A)	VOLUME OPPOSING (V_O)	% LEFT TURN (V_A)	PARALLEL LANE LENGTH (M)	STORAGE DEFICIENCY RELATIVE TO RMA (M)
Fernbank Road & Goldhawk Drive [1]	EB	524	747	7%	30m	5m
Fernbank Road & Goldhawk Drive [2]	EB	465	663	8%	25m	Storage Adequate

Notes:
[1] Does not include Cope Drive extension to Shea Road.
[2] Includes redistribution of traffic volumes to reflect Cope Drive extension to Shea Road.

As shown in **Table 20** above, the left-turn warrant evaluation for the eastbound approach at the proposed Fernbank & Goldhawk intersection indicates a slight exceedance of the 25-metre left-turn auxiliary lane length included in the RMA functional design for the CRT Phase 3 TIA (IBI, 2021).

This slight deficiency of 5 metres represents less than one standard vehicle length and is expected to be a temporary constraint, until Cope Drive is extended to Shea Road. Once this extension is implemented, the two-way projected vehicular volumes on Fernbank Road at Goldhawk Drive are expected to decrease. As such, in the longer-term, the 25-metre parallel lane length designed for in the RMA functional design will sufficiently accommodate traffic volumes and therefore no revisions are required to the functional design for this intersection.

The Shea Road & Street 12 intersection is forecasted to experience nominal left-turning volumes on the southbound approach of at most 5 vehicles during the weekday peak hours. These negligible volumes are at most 1.8% of the overall approach volumes and therefore a southbound left-turn auxiliary lane is not warranted at this location.

5.10.2.2 Auxiliary Right-Turn Lane Requirements (Unsignalized Intersections)

The Transportation Association of Canada (TAC) suggests that auxiliary right-turn lanes be considered "when the volume of decelerating or accelerating vehicles compared with through vehicles causes undue hazard." Consideration for auxiliary right-turn lanes is typically given when the right-turning traffic exceeds 10% of the approach volume and is at least 60 vehicles per hour, particularly on high-speed arterial roads.

Consistent with the RMA carried for the CRT Phase 3 TIA, the westbound approach at the intersection of Fernbank & Goldhawk was identified as requiring a right-turn auxiliary lane. The westbound right-turn volume under Future (2030) Total Traffic conditions is forecasted to be in the order of 120 vehicles during the weekday afternoon peak hour, which constitutes approximately 15% of the overall approach volume. As both of the criteria for a right-turn lane are met and this segment of Fernbank Road can be classified as a 'high-speed arterial road', it has been confirmed that a right-turn lane is warranted at this location.

The Street 12 & Shea intersection is projected to experience nominal northbound right-turn volumes of 8 and 17 vehicles during the weekday peak hours, respectively. A northbound right-turn auxiliary lane is not required at this intersection.

5.11 Summary of Recommended Improvements

Based on the intersection capacity analyses, Segment-based Multi-Modal Level of Service (MMLOS) and auxiliary lane analyses results presented above, off-site improvements to the adjacent road network have been recommended in order to accommodate multi-modal demands of both background and site-generated traffic.

5.11.1 Abbott Street East & Granite Ridge Drive/Bobolink Ridge

The Bobolink site access intersection will form the fourth leg of this existing all-way stop-controlled intersection. As such, RMA Materials (i.e. functional design and preliminary cost estimate) were prepared for these off-site road network modifications and are included in **Appendix L**.

With the inclusion of this fourth leg, the Abbott & Granite Ridge intersection is expected to continue operating at an acceptable level of service (i.e. LOS 'D' or better) beyond the 2030 study horizon year, as shown through the analysis conducted for this study.

5.11.2 Abbott Street East & Shea Road

The results of the intersection capacity analysis indicate that the Abbott Street East & Shea Road intersection is expected to operate at an acceptable level of service (i.e. LOS 'D') with its existing all-way stop control configuration. As such, no modifications to this intersection are expected to be required within the 2030 study horizon year, based on the analysis conducted in this study.

5.11.3 Robert Grant Avenue & Cope Drive

The results of the intersection capacity analysis indicate that the Robert Grant Avenue & Cope Drive junction is expected to operate at an acceptable level of service (i.e. LOS 'D') with its existing single-lane roundabout configuration. As such, no modifications to this roundabout are expected within the 2030 study horizon year, based on the analysis conducted in this study.

5.11.4 Fernbank Road & Goldhawk Drive (future intersection)

Based on the intersection capacity analysis conducted for this study, the proposed Fernbank Road & Goldhawk Drive intersection may experience slight capacity issues under Future (2030) Total Traffic conditions.

The potential for any capacity constraints, however, is limited to the weekday afternoon peak hour at the study horizon year and is not a direct consequence of site-generated traffic. Instead, these capacity constraints are a potential consequence of increased background traffic on Fernbank Road traffic abutting the site, until the extension of Cope Drive to Shea Road is implemented which will provide a more direct east-west vehicular connection for adjacent developments west of Shea Road and allow the Fernbank & Goldhawk intersection to operate at LOS 'D' during the critical weekday peak hour in the longer-term.

RMA materials were previously submitted for off-site road network modifications as part of the CRT Phase 3 TIA (IBI, 2021). An updated auxiliary lane analysis exercise conducted as part of this study indicated a potential slight exceedance of the 25-metre eastbound left-turn parallel lane length by the 2030 study horizon year. It is also possible that this potential constraint will already be addressed through the extension of Cope Drive to Shea Road through future CRT phases by this time. Given the temporary nature of this potential minor capacity issue and its long-term horizon, no modifications or resubmission of the Fernbank & Goldhawk RMA functional design are deemed necessary to support CRT Phase 4.

5.11.5 Fernbank & Shea Road

The results of the intersection capacity analysis indicate that the Fernbank & Shea roundabout is expected to operate at an acceptable level of service (i.e. LOS 'D') with its existing single-lane roundabout configuration. As such, no modifications to this roundabout are expected within the 2030 study horizon year, based on the analysis conducted in this study.

5.11.6 Shea Road & Street 12

The proposed Shea Road & Street 12 intersection will be configured as a two-way stop-controlled intersection, with shared lanes configured on each approach.

Based on the capacity analysis conducted as part of this study, this intersection is expected to operate at LOS 'B' under Future (2030) Total Traffic conditions both weekday peak hours.

5.11.7 Cope & Goldhawk

The Cope & Goldhawk intersection is expected to trigger the all-way stop control warrants, based overall traffic volumes exceeding 350 vehicles per hour and a balanced volume split exceeding 35/65 under Future (2030) Total Traffic volumes re-routed with consideration of the Cope Drive extension.

Providing AWSC at this key internal intersection within the proposed development will provide controlled pedestrian crossings on each approach, which is appropriate given its proximity to amenities, including a park, school block and bus stops.

With an all-way stop control configuration implemented, the Cope & Goldhawk intersection is expected to operate at well within acceptable standards. An additional scenario was tested under Future (2030) Total Traffic conditions, indicating that this intersection would operate at LOS 'B' and well within acceptable standards, even with added traffic resulting from the extension of Cope Drive to Shea Road.

5.11.8 Goldhawk & Bobolink

The Bobolink & Goldhawk was evaluated for all-way stop control, however unlike the Cope & Goldhawk intersection, this location did not meet the overall volume criteria of 350 vehicles during each weekday peak hour.

Configured as a two-way stop-controlled intersection with stop signs in the north-south directions on Goldhawk Drive and shared lane configurations on each approach, this intersection is projected to operate at LOS 'B' under Future (2030) Total Traffic conditions.

6 Conclusion

The proposed CRT Phase 4 development is expected to generate up to 480 and 517 two-way person-trips during the weekday morning and afternoon peak hours, respectively. These person-trips were assigned mode share targets and trip distributions, consistent with the Kanata/Stittsville Traffic Assessment Zone (TAZ) in the 2020 TRANS Trip Generation Summary Report, with further refinements to account for the slightly substandard transit coverage, resulting from limitations to the collector road network established by the Fernbank CDP.

The resulting two-way vehicular trip generation is, therefore, 253 and 276 vehicles during the weekday morning and afternoon peak hours, respectively. Site-generated traffic will access the adjacent road network directly via two new all-movement intersections on Abbott Street East and Shea Road, as well as internally through CRT Phases 1 to 3 via the Fernbank & Goldhawk intersection to the south and the Robert Grant & Cope roundabout to the east.

As indicated by the analysis conducted for this study, all study area intersections are expected to operate at an acceptable level of service (i.e. LOS 'D' or better) during the weekday peak hours under Future (2025) Total Traffic conditions. By 2030, the Fernbank & Goldhawk intersection may approach its theoretical capacity as an unsignalized intersection due to increased through traffic on Fernbank Road, however this condition is expected to be resolved once the Cope Drive extension to Shea Road is implemented as part of subsequent phases of CRT Lands west of the hydro corridor. Given that these capacity issues are not exacerbated by or a direct consequence of the proposed development and that there is sufficient spare capacity at the key study area intersections to accommodate site-generated vehicular traffic upon full build-out, it can be concluded that the Cope Drive extension is required as a long-term solution to support increased background traffic growth in the area.

An all-way stop warrant analysis conducted for Cope & Goldhawk indicated that this intersection would operate at an acceptable Level of Service with a two-way stop-controlled configuration, but would ultimately require configuration as an all-way stop-controlled intersection upon the extension of Cope Drive to Shea Road. As a central junction within the proposed subdivision lands, this form of traffic control will also facilitate increased pedestrian mobility and access to City facilities, including potential bus stop locations, as well as a park and school block identified on the Draft Plan adjacent to this intersection.

Based on the queue length analysis conducted for the Fernbank & Goldhawk intersection, any potential exceedance of the RMA design components identified in the CRT Phase 3 would be short-term and therefore the functional design submitted for the CRT Phase 3 TIA remains valid.

A segment-based multi-modal analysis of identified deficiencies in the site's boundary streets and potential remediation measures have been suggested which the City could consider to meet the prescribed targets, however it is not expected that such measures would be implemented within the horizon year of this study.

The proposed Abbott Street East & Granite Ridge intersection requires off-site road modifications to incorporate the Bobolink Ridge extension and allow for its conversion from a 3-legged to 4-legged junction. As such, RMA Materials were prepared to support the redesign of this intersection to include Bobolink as its southern leg. Since all study area intersections are expected to operate acceptably with the inclusion of site-generated traffic at full build-out/occupancy of the proposed development, a post-development Monitoring Plan is not required as part of this TIA.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network with the recommended actions and modifications in place.

Appendix A – City Circulation Comments

Step 1 Submission (TIA Screening) Pre-Application Consultation Meeting - Comments

Meeting Held: December 10, 2021
Comments Received: February 7, 2022
Transportation Project Manager: Patrick McMahon

Note: The following represent only relevant transportation comments and do not constitute the complete set of comments resulting from the pre-application consultant meeting.

Transportation

1. Follow Traffic Impact Assessment Guidelines
   - Please proceed with scoping.
   - Applicant advised that their application will not be deemed complete until the submission of the draft steps 1-4, including the RMA package if applicable.

2. Cope Drive has a right of way protection of 24m, however a cross-section of 26m is recommended for consistency within the area.

3. As the site proposed is residential, AODA legislation applies for all areas accessible to the public (i.e. outdoor pathways, parking, etc.).

4. Geometric Road Design (GRD) drawings will be **required with the first submission of underground infrastructure and grading drawings.** These drawings should include such items as, but is not limited to:
   - Road Signage and Pavement Marking for the subdivision;
   - Intersection control measure at new internal intersections; and,
   - Location of depressed curbs and TWSIs.

5. Include traffic calming measures on roads within the limits of the subdivision to limit vehicular speed to 30 kph and improve pedestrian safety. These measures may include either vertical or horizontal features.

6. Sight triangles at the following locations on the final plan will be required:
   - Local Road to Local Road: 3 metre x 3 metres;
   - Local Road to Collector Road: 5 metre x 5 metres; and,
   - Collector Road to Collector Road: 5 metre x 5 metres.

7. Any Development Charge road work may be front ended by the applicant, so long as the work is listed in the affordable network. Repayment will be based on warrants, as determined solely by Transportation Services Department. A Front Ending application is required.

8. Construction of the Robert Grant extension south of Hazeldean is expected to begin in late 2022.

Step 2 Submission (Scoping) – Circulation Comments & Response

Report Submitted: January 17, 2022
Comments Received: January 21, 2022
Transportation Project Manager: Patrick McMahon

1) Section 3.2.1.1 Roadways: Include the paved shoulders on Fernbank Road. Note that the protected ROW for Abbott Street E is 26m. Include Goldhawk Drive.

   - **IBI Response: Section 3.2.1.1 of the TIA has been updated accordingly. A desktop review of the study area indicates that Goldhawk Drive is not open to the public and is therefore not an existing roadway based on Google Earth aerial imagery dated June 2021. See Section 3.3.1.1 Future Road Network Projects.**

2) Section 3.2.1.2 Intersections: There are inconsistencies between intersections with how sidewalks/cycling facilities are described. Please describe them all. There is no crosswalk on the east leg of Granite Ridge/Abbott E intersection.

   - **IBI Response: Section 3.2.1.2 of the TIA has been updated with the appropriate descriptions.**

3) Section 3.2.3 Existing Transit Conditions: Figure 1 appears to be outdated with respect to what is shown on OC Transpo's website. Please also update with transit stops shown on the figure.

   - **IBI Response: Noted. Figure 1 in Section 3.2.3 of the TIA has been updated accordingly.**

4) Section 3.4 Study Area: While a conservative analysis is appreciated, the study should be evaluating both access onto Shea road as they are planned for the future. Is it the developer's intention to only construct the accesses and not connect to Shea until the development abutting Shea directly is constructed? Early connection would be supported even if the network intersections demonstrate capacity.

   - **IBI Response: The proposed connection of Cope Drive to Shea Road is not included in the core study, as it will not be functionally required to support CRT Phase 4 traffic. Including this connection may result in a significant amount of through-traffic from the Edenwylde, Idylea and Cavanagh developments west of Shea which could be problematic until construction is substantially complete for CRT Westwood. Additionally, the design of the Cope/Shea intersection would require knowledge of the traffic demands of CRT Phase 5 which are not known yet. Because of this, the Cope/Shea connection is being treated as a supplemental analysis to determine if the connection is required to reduce the background traffic at other study area intersections. This rationale was accepted by the City Transportation Project Manager via email on January 21, 2022.**

Step 3 Submission (Forecasting) – Circulation Comments & Response

Report Submitted: February 8, 2022
Comments Received: February 25, 2022
Transportation Project Manager: Patrick McMahon

1) Transportation Engineering Services: Review the total peak period person trips from table 7 (AM and PM) as they are lower than the values provided in table 5. Similarly, review the total peak-hour person trips from table 8 (AM and PM) as they are also low.

   - **IBI Response: Noted, Section 4.1.2.1 of the TIA has been updated accordingly. Projected traffic volumes in Tables 7 and 8 have been confirmed and updated.**

Appendix B – Screening Form

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	1555 Shea Road, 5500 Abbott Street East
Description of Location	Stittsville - North of Fernbank Road, east of Shea Road and south of Abbott Street East 
Land Use Classification	Residential
Development Size (units)	286 Single Family Homes 336 Townhome Units 54 Back-to-back Townhome Units
Development Size (m^2)	N/A
Number of Accesses and Locations	Two (2) external all-movement access intersections: one (1) on Shea Road & one (1) on Abbott Street East Five (5) internal all-movement access intersections with Goldhawk Dr.
Phase of Development	Single Phase
Buildout Year	2025

SKETCH TO ILLUSTRATE

CRT DEVELOPMENT - PHASE 4

CITY OF OTTAWA

Prepared by Annis , O'Sullivan , Vollebekk Ltd.

May 31, 2021

Scale 1 : 1500

60 45 30 15 0 30 60 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

LEGEND

- NUMBER OF 11.30 (37 FOOT) UNITS = 203
- NUMBER OF 13.75 (45 FOOT) UNITS = 83
- NUMBER OF TOWNHOUSE UNITS = 336
- NUMBER OF BACK TO BACK UNITS = 54
- INSTITUTIONAL
- PARK
- COMMERCIAL
- MEDIUM DENSITY

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No.22099-D Dwg# PLN 26 27 OD 00 PH4 N DFS DI | N

2. Trip Gen Trigger

Considering the Development's Land Use Type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size	
Single-family homes	40 units	☑
Townhomes or apartments	90 units	☑
Office	3,500 m^2	☐
Industrial	5,000 m^2	☐
Fast-food restaurant or coffee shop	100 m^2	☐
Destination Retail	1,000 m^2	☐
Gas Station or convenience market	75 m^2	☐

**If the development has a land use type other than what is presented in the table above, estimates of person trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

Based on the above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	☑	☐
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*	☐	☑

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6) See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA.*

Based on the above, the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street 80km/hr or greater?	☐	☑
Are there any horizontal/vertical curvatures on a boundary street that limit sight lines at a proposed driveway?	☑	☐
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/suburban conditions?)	☑	☐
Is the proposed driveway within auxiliary lanes of an intersection?	☐	☑
Does the proposed driveway make use of an existing median break that serves an existing site?	☐	☑
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	☐	☑
Does the development include a drive-thru facility?	☐	☑

Based on the above, the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?	☑	☐
Does the development satisfy the Location Trigger?	☑	☐
Does the development satisfy the Safety Trigger?	☑	☐

Based on the results of the TIA Screening Form, the Trip Generation, Location and Safety Triggers are satisfied. As such, a TIA is required for the proposed development.

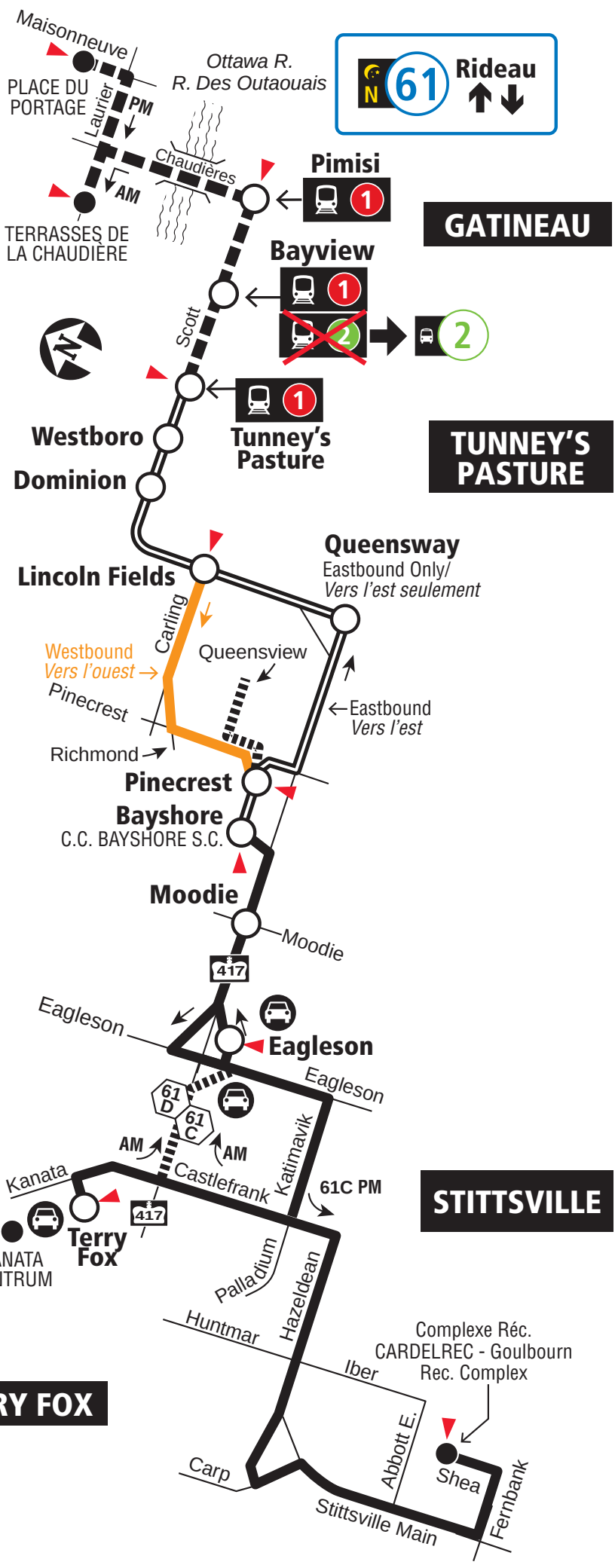
Appendix C – OC Transpo Routes

61 Rapide

TERRY FOX STITTSVILLE
TUNNEY'S PASTURE GATINEAU

7 days a week / 7 jours par semaine

All day service and limited overnight
Service toute la journée et limité la nuit



Transitway & Station
Peak trips / Trajets de pointe
Selected time periods / Périodes sélectionnées
Park & Ride / Parc-o-bus
Timepoint / Heures de passage

When O-Train Line 1 is not running overnight, Route 61 will be extended downtown to Rideau Station. / Lorsque la Ligne 1 de l'O-Train ne circule pas la nuit, le circuit 61 sera prolongée au centre-ville jusqu'à la station Rideau.

2021.12

Schedule / Horaire 613-560-1000
Text / Texto* 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres
*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective December 19, 2021
En vigueur 19 décembre 2021

OC Transpo
INFO 613-560-5000
octranspo.com

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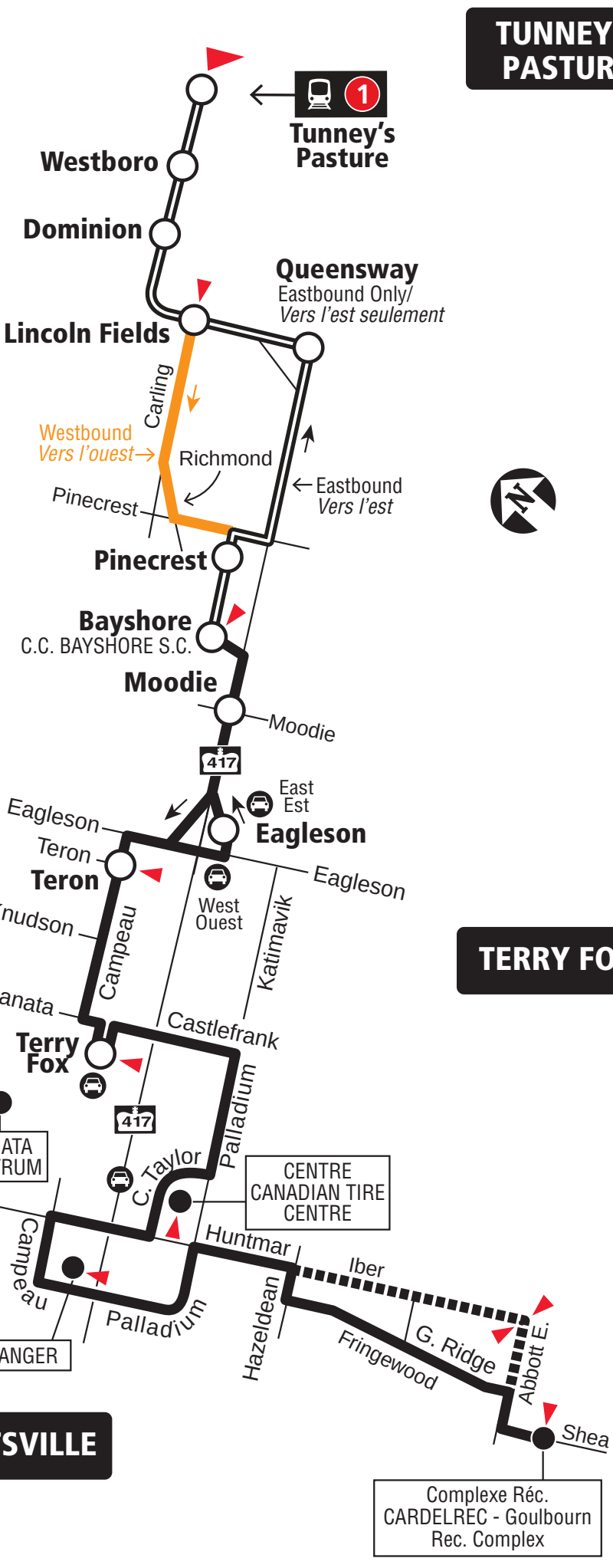
TERRY FOX STITTSVILLE
TUNNEY'S PASTURE

7 days a week / 7 jours par semaine

All day service
Service toute la journée



Transitway & Station

Weekday southbound trips before noon and weekday northbound trips between noon and 8 p.m. travel via Iber and Abbott E.

Trajets en semaine vers le sud en avant midi et trajets en semaine vers le nord entre midi et 20 h via Iber et Abbott E.

Park & Ride / Parc-o-bus

Timepoint / Heures de passage

2021.12

Schedule / Horaire 613-560-1000

Text / Texto* 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus **613-563-4011**

Security / Sécurité **613-741-2478**

Effective December 19, 2021
En vigueur 19 décembre 2021

OC Transpo

INFO 613-560-5000
octranspo.com

167

TERRY FOX

COPE

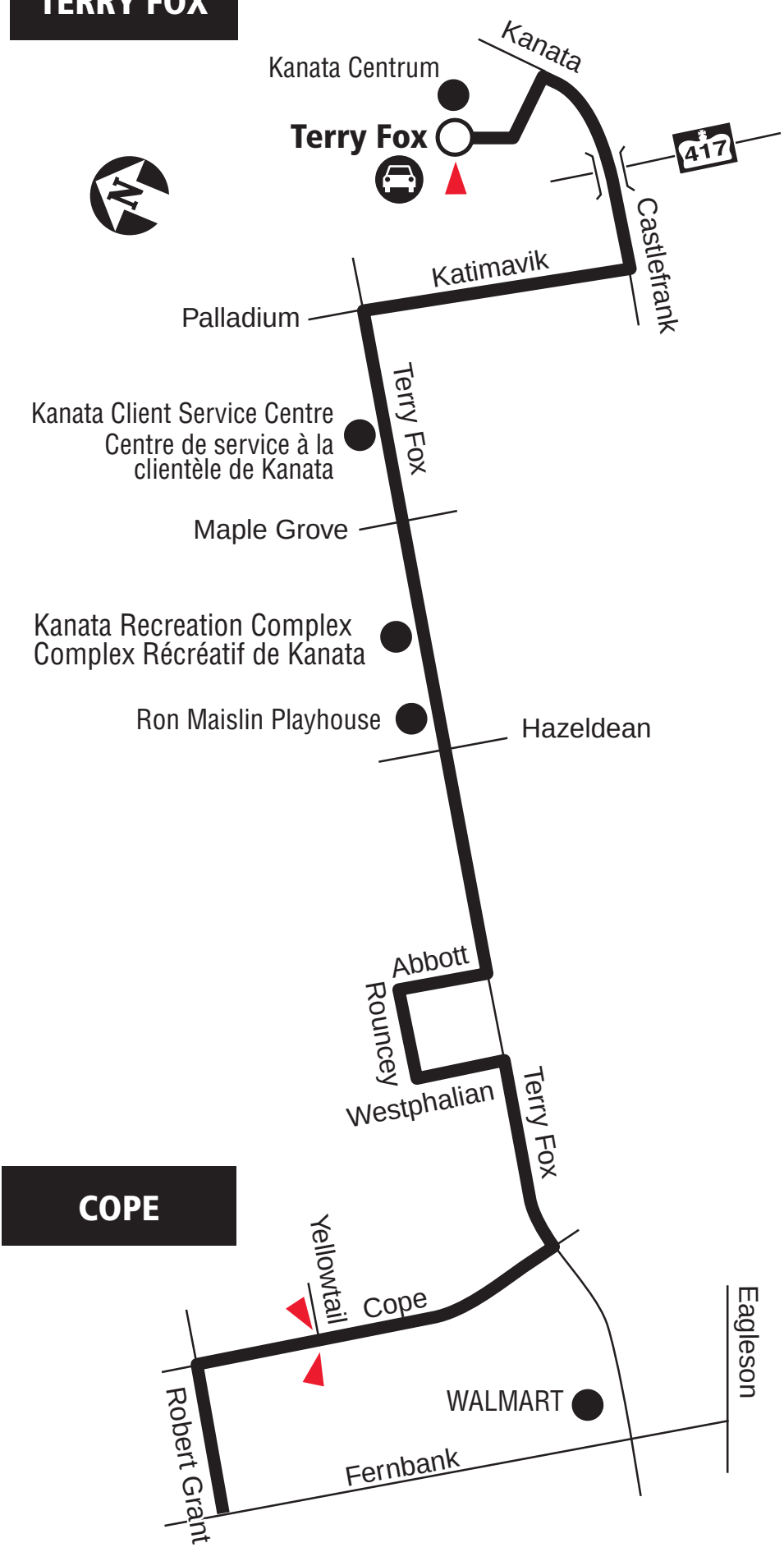
Local

Monday to Friday/ Lundi au vendredi

Selected time periods

Périodes selectionnées

TERRY FOX



Transitway Station / Station du Transitway

Park & Ride / Parc-o-bus

Timepoint / Heures de passage

2021.09

Schedule / Horaire 613-560-1000

Text / Texto* 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 5, 2021

En vigueur 5 septembre 2021

OC Transpo

INFO 613-560-5000
octranspo.com

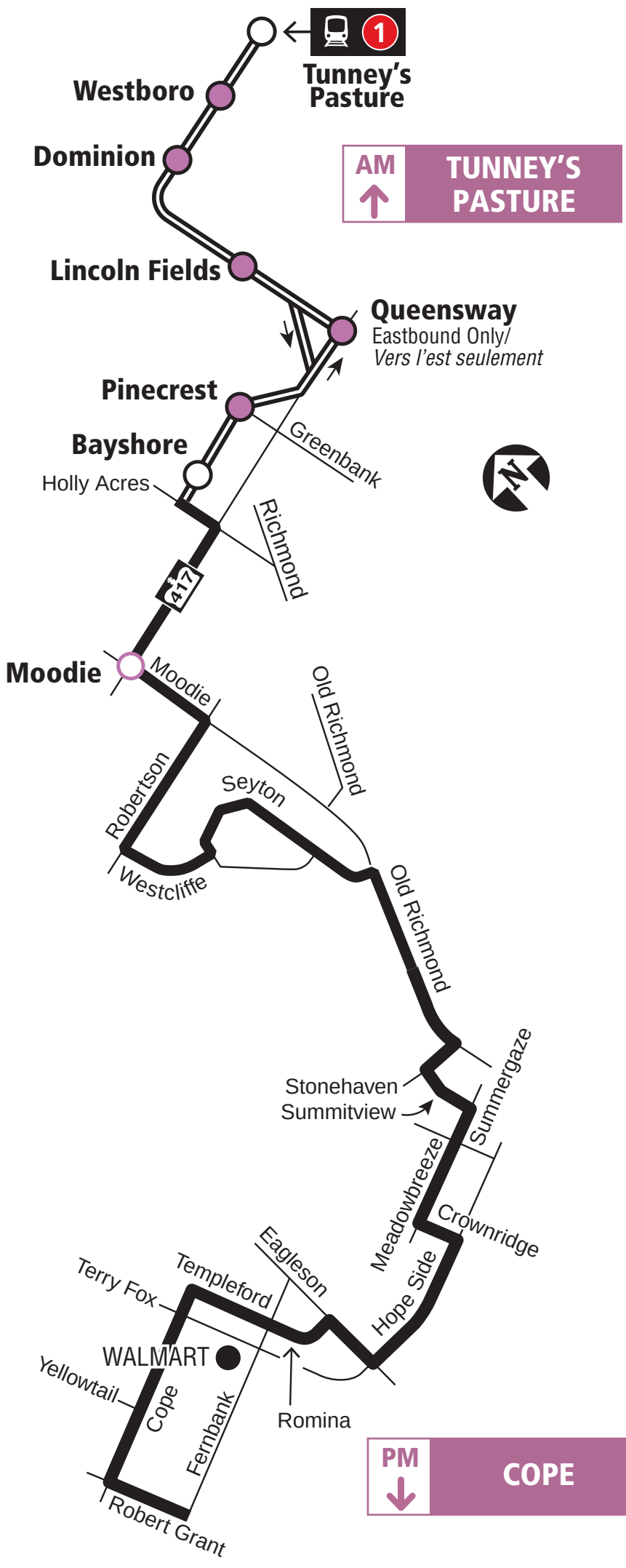
252 Connexion

TUNNEY'S PASTURE
COPE

Monday to Friday / Lundi au vendredi

Peak periods only

Périodes de pointe seulement



Transitway & Station

Limited stops: Off only in AM / No stop in PM
Arrêts limités : débarquement en AM seul. / aucun arrêt en PM

AM: Off only - PM: Full Service
AM : débarquement seul. - PM : service complet

2021.09

Schedule / Horaire 613-560-1000

Text / Texto* 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 5, 2021

En vigueur 5 septembre 2021

OC Transpo

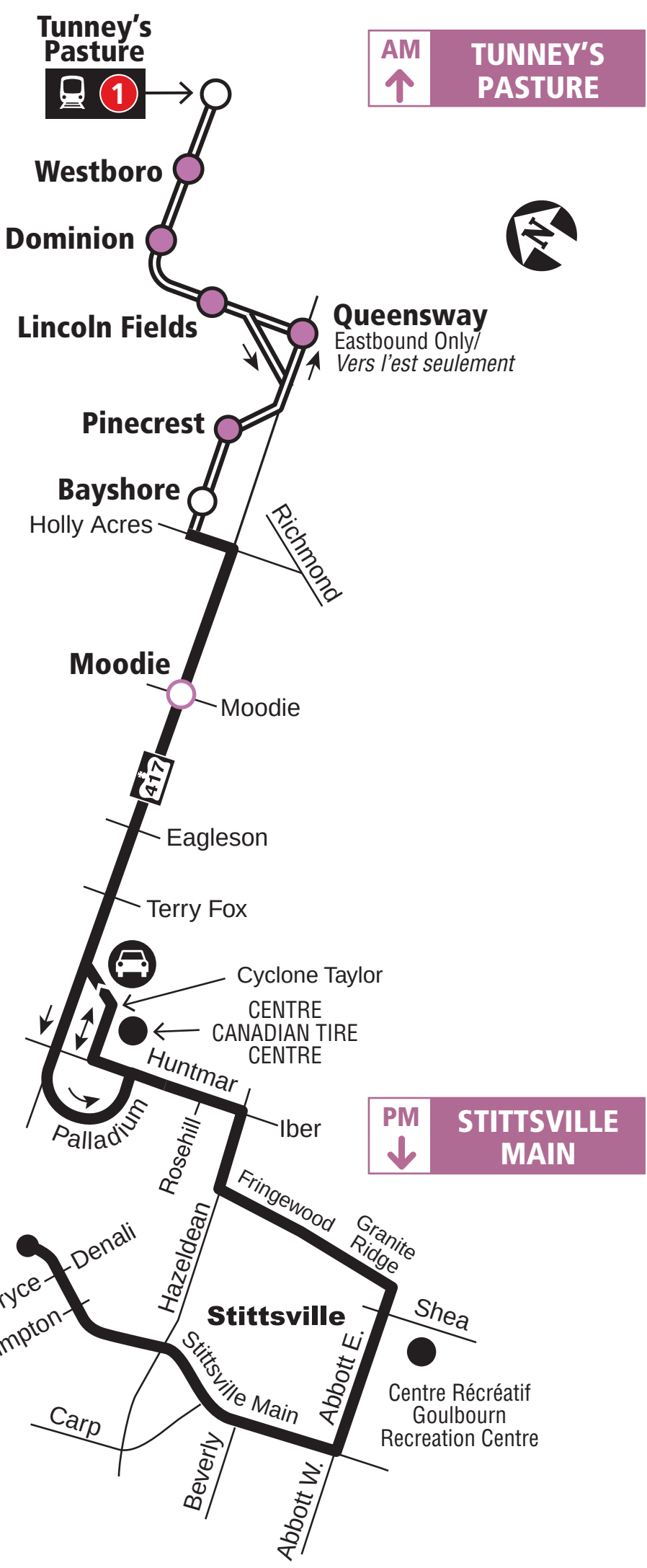
INFO 613-560-5000
octranspo.com

261 Connexion

STITTSVILLE MAIN
TUNNEY'S PASTURE

Monday to Friday / Lundi au vendredi

Peak periods only
Périodes de pointe seulement



Transitway & Station

Limited stops: Off only in AM / No stop in PM
Arrêts limités : débarquement en AM seul. / aucun arrêt en PM

AM: Off only - PM: Full Service
AM : débarquement seul. - PM : service complet

Park & Ride / Parc-o-bus

2021.09

Schedule / Horaire 613-560-1000
Text / Texto* 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 5, 2021
En vigueur 5 septembre 2021

OC Transpo

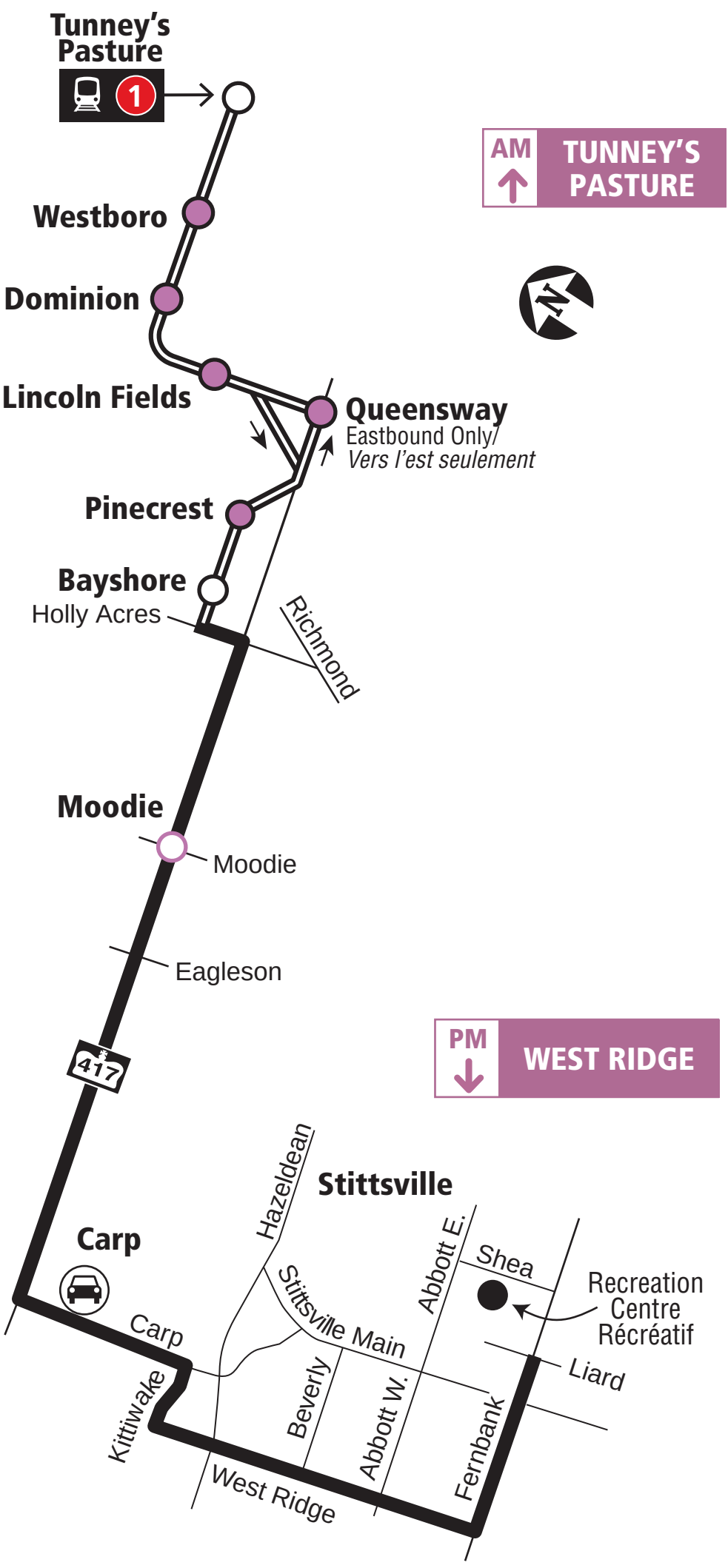
INFO 613-560-5000
octranspo.com

262 Connexion

WEST RIDGE
TUNNEY'S PASTURE

Monday to Friday / Lundi au vendredi

Peak periods only
Périodes de pointe seulement



Transitway & Station

Limited stops: Off only in AM / No stop in PM
Arrêts limités : débarquement en AM seul. / aucun arrêt en PM

AM: Off only - PM: Full Service
AM : débarquement seul. - PM : service complet

Park & Ride / Parc-o-bus

2021.09

Schedule / Horaire 613-560-1000
Text / Texto* 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

*Standard message rates may apply / Les tarifs réguliers de messagerie texte peuvent s'appliquer

Customer Service
Service à la clientèle **613-560-5000**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective September 5, 2021
En vigueur 5 septembre 2021

OC Transpo

INFO 613-560-5000
octranspo.com

Appendix D – Collision Data

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2015 **To:** December 31, 2019

Location: ABBOTT ST @ GRANITE RIDGE DR

Traffic Control: Stop sign **Total Collisions:** 8

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Mar-31, Tue,08:00	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Jun-29, Thu,15:15	Rain	Angle	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Dec-14, Thu,15:00	Clear	Angle	Non-fatal injury	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					West	Going ahead	Pick-up truck	Other motor vehicle	
2018-Sep-22, Sat,17:15	Clear	Turning movement	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2019-Sep-07, Sat,17:06	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Cyclist	0
					North	Going ahead	Bicycle	Other motor vehicle	
2019-Oct-21, Mon,13:30	Clear	Angle	P.D. only	Dry	South	Going ahead	Bicycle	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Cyclist	
2019-Oct-25, Fri,14:33	Clear	Rear end	P.D. only	Dry	East	Going ahead	Unknown	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2019-Nov-13, Wed,19:02	Clear	Rear end	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

Location: ABBOTT ST @ SHEA RD

Traffic Control: Stop sign **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Apr-18, Tue,21:43	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Skidding/sliding	0
2019-Dec-05, Thu,12:04	Clear	Angle	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					North	Turning left	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2015 **To:** December 31, 2019

Location: BOBOLINK RDG @ ROBERT GRANT AVE

Traffic Control: Roundabout **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Oct-05, Thu,12:40	Clear	Angle	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Apr-10, Wed,06:50	Clear	Angle	P.D. only	Wet	West	Merging	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: FERNBANK RD @ ROBERT GRANT AVE

Traffic Control: Traffic signal **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jun-23, Thu,20:08	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: FERNBANK RD @ SHEA RD

Traffic Control: Roundabout **Total Collisions:** 13

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Jan-23, Sat,08:54	Clear	Angle	P.D. only	Dry	North	Merging	Pick-up truck	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-May-31, Tue,09:21	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2016-Nov-04, Fri,12:21	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Pick-up truck	Other motor vehicle	
2017-Feb-15, Wed,19:14	Snow	Angle	P.D. only	Loose snow	East	Merging	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Mar-08, Thu,19:35	Snow	Rear end	P.D. only	Ice	West	Slowing or stopping	Pick-up truck	Skidding/sliding	0
					West	Slowing or stopping	Automobile, station wagon	Skidding/sliding	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2015 **To:** December 31, 2019

Location: FERNBANK RD @ SHEA RD

Traffic Control: Roundabout **Total Collisions:** 13

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Jul-27, Fri,18:03	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-10, Fri,11:00	Clear	Angle	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Nov-14, Wed,07:46	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Jan-21, Mon,14:03	Drifting Snow	SMV other	P.D. only	Packed snow	West	Slowing or stopping	Passenger van	Skidding/sliding	0
2019-Feb-26, Tue,08:58	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Apr-01, Mon,07:10	Clear	Angle	P.D. only	Dry	West	Merging	Passenger van	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Nov-06, Wed,07:15	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Dec-04, Wed,10:28	Clear	Angle	P.D. only	Wet	North	Merging	Passenger van	Other motor vehicle	0
					East	Going ahead	Delivery van	Other motor vehicle	

Location: FERNBANK RD btwn GO/KA BOUNDARY & SHEA RD

Traffic Control: No control **Total Collisions:** 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Apr-12, Sun,16:37	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2015-Jun-11, Thu,22:59	Clear	SMV other	P.D. only	Dry	West	Going ahead	Pick-up truck	Ditch	0
2015-Nov-17, Tue,22:05	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild	0

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2015 **To:** December 31, 2019

Location: FERNBANK RD btwn GO/KA BOUNDARY & SHEA RD

Traffic Control: No control **Total Collisions:** 9

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Feb-20, Sat,12:40	Rain	Other	P.D. only	Wet	East	Overtaking	Pick-up truck	Other motor vehicle	0
					West	Reversing	Automobile, station wagon	Other motor vehicle	
2018-Oct-04, Thu,17:09	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Passenger van	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
2019-Mar-08, Fri,14:40	Clear	SMV other	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Ran off road	0
2019-Jul-17, Wed,18:00	Clear	Turning movement	P.D. only	Dry	West	Making "U" turn	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Aug-07, Wed,01:30	Clear	SMV other	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Animal - wild	0
2019-Nov-14, Thu,08:50	Clear	SMV other	P.D. only	Dry	West	Turning left	Automobile, station wagon	Pole (sign, parking meter)	0

Location: SHEA RD btwn ABBOTT ST E & FERNBANK RD

Traffic Control: No control **Total Collisions:** 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Jan-15, Thu,19:28	Snow	Turning movement	P.D. only	Loose snow	South	Turning left	Passenger van	Other motor vehicle	0
					South	Overtaking	Pick-up truck	Other motor vehicle	
2016-Nov-05, Sat,19:04	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Ran off road	0
2017-Mar-31, Fri,21:16	Snow	SMV other	P.D. only	Slush	South	Going ahead	Automobile, station wagon	Skidding/sliding	0
2018-Nov-22, Thu,07:47	Clear	SMV other	Non-fatal injury	Loose snow	North	Going ahead	Automobile, station wagon	Pole (utility, power)	0
2019-May-30, Thu,17:30	Clear	Turning movement	P.D. only	Dry	South	Making "U" turn	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	

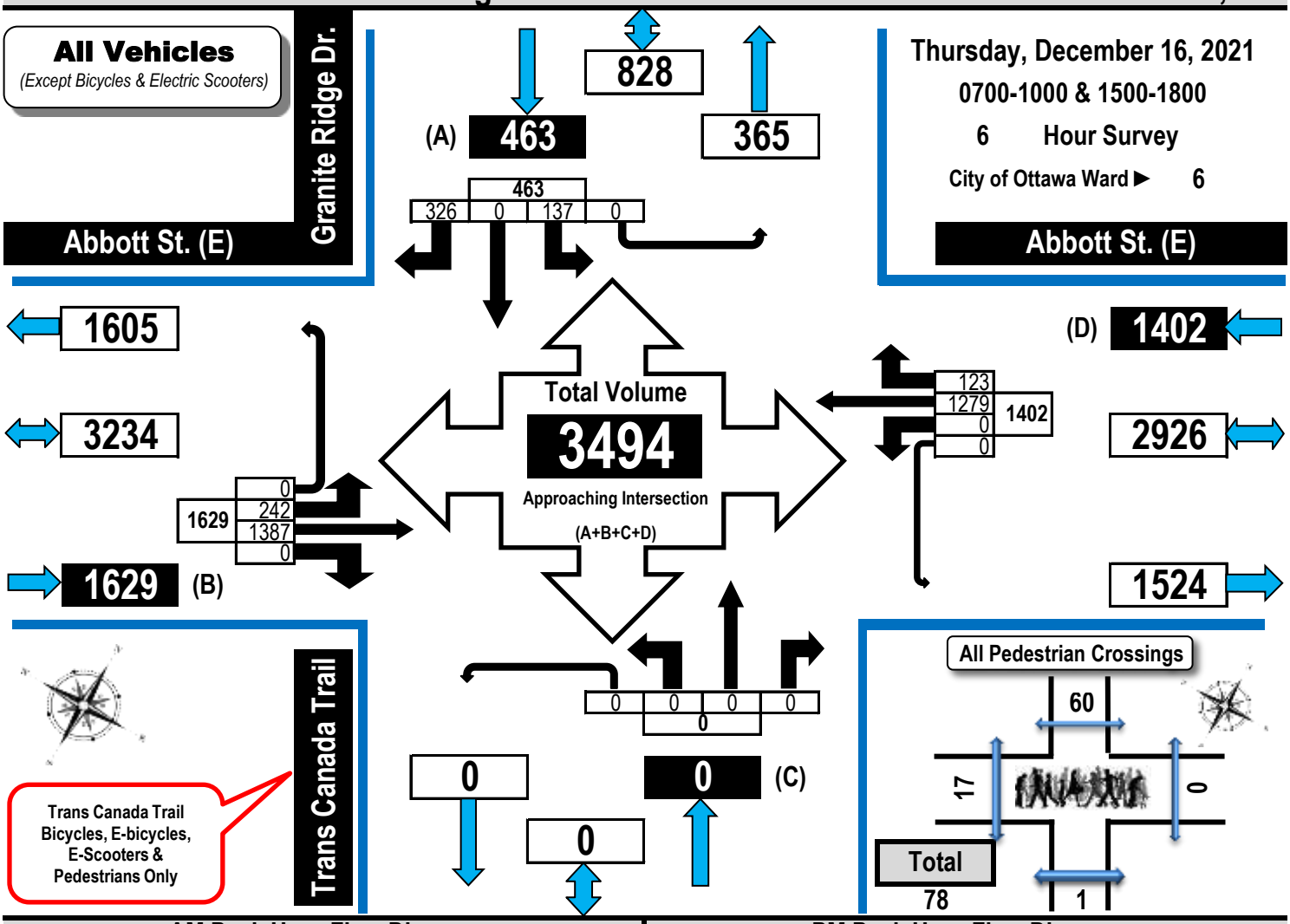
Appendix E – Traffic Count Data

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams
All Vehicles Except Bicycles

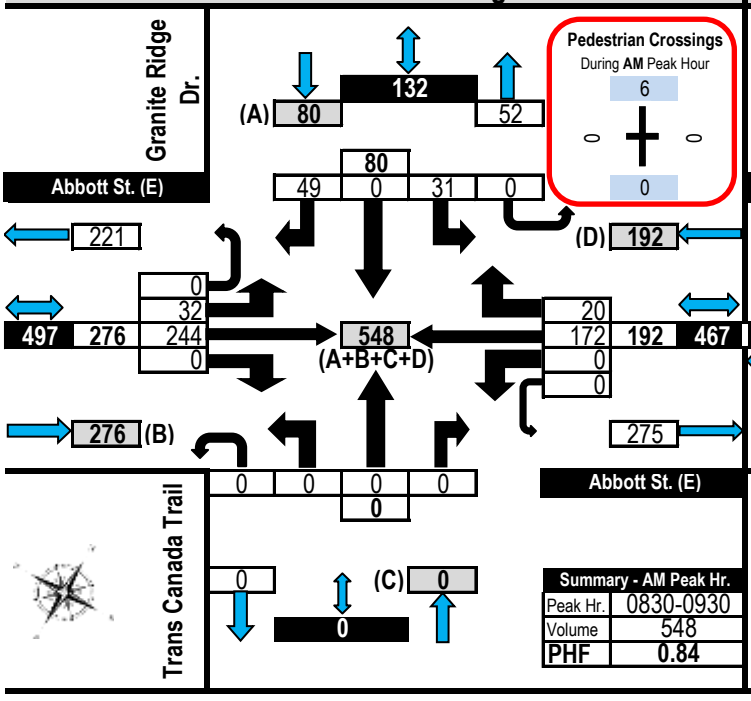
Abbott Street East & Granite Ridge Drive — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Thursday, December 16, 2021
0700-1000 & 1500-1800
6 Hour Survey
City of Ottawa Ward ▶ 6

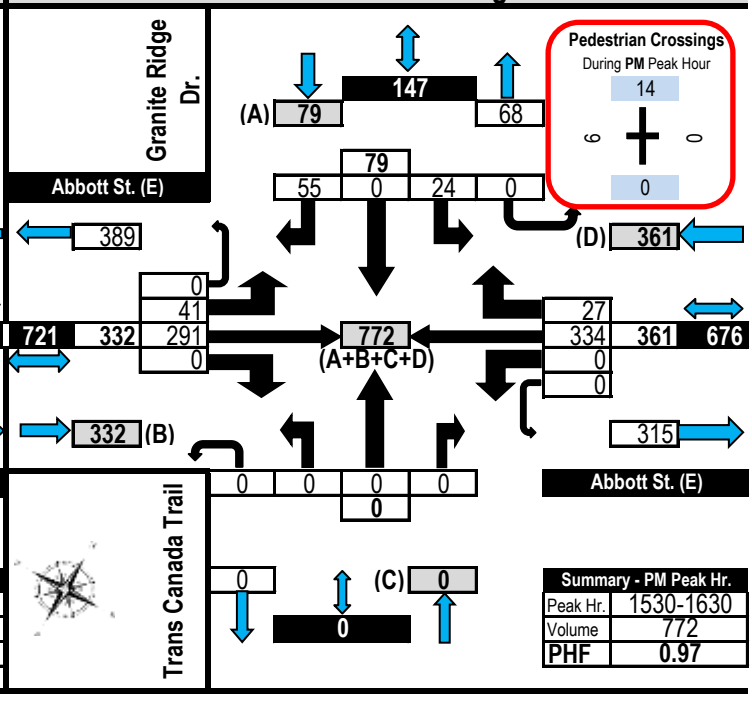


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0830-0930
Volume	548
PHF	0.84

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1530-1630
Volume	772
PHF	0.97

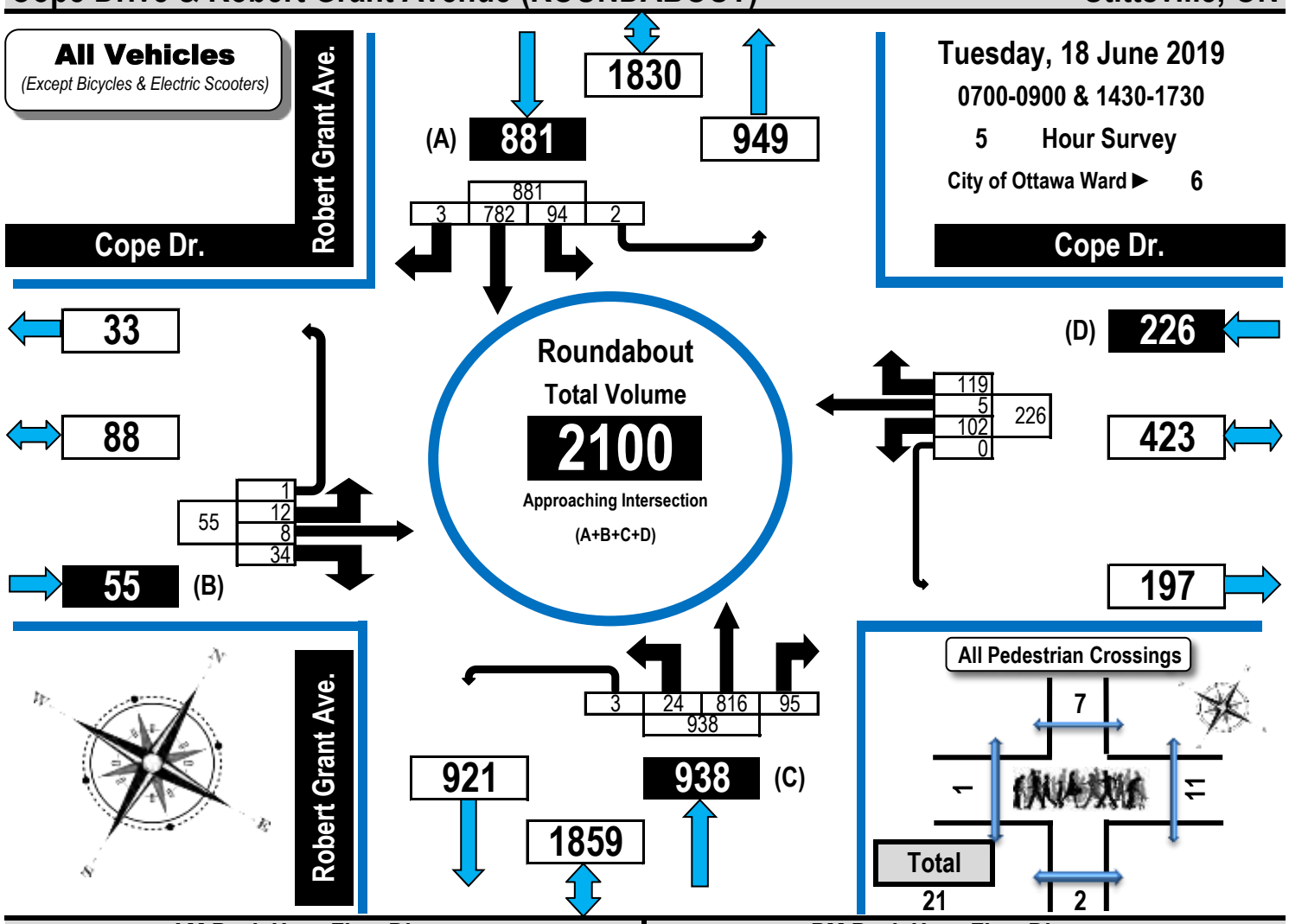
Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

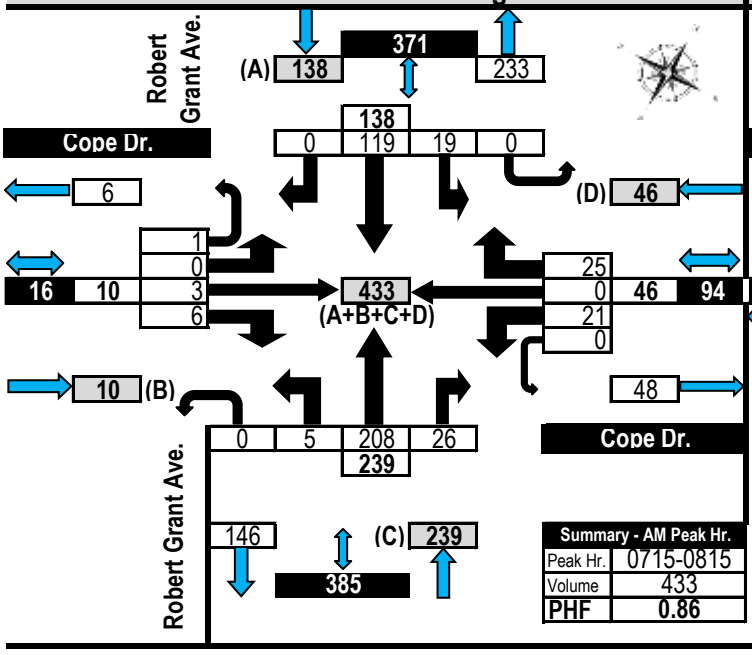
Cope Drive & Robert Grant Avenue (ROUNDABOUT) — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Tuesday, 18 June 2019
0700-0900 & 1430-1730
5 Hour Survey
City of Ottawa Ward ▶ 6

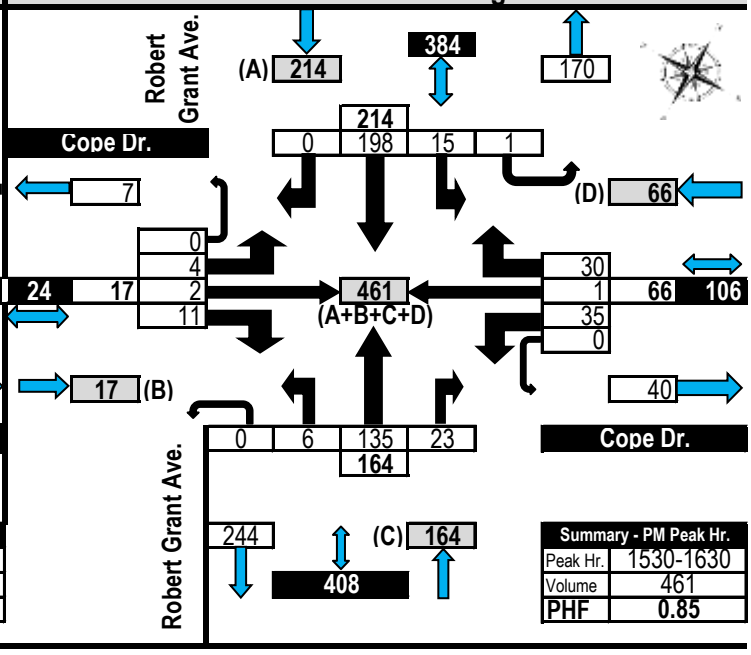


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0715-0815
Volume	433
PHF	0.86

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1530-1630
Volume	461
PHF	0.85

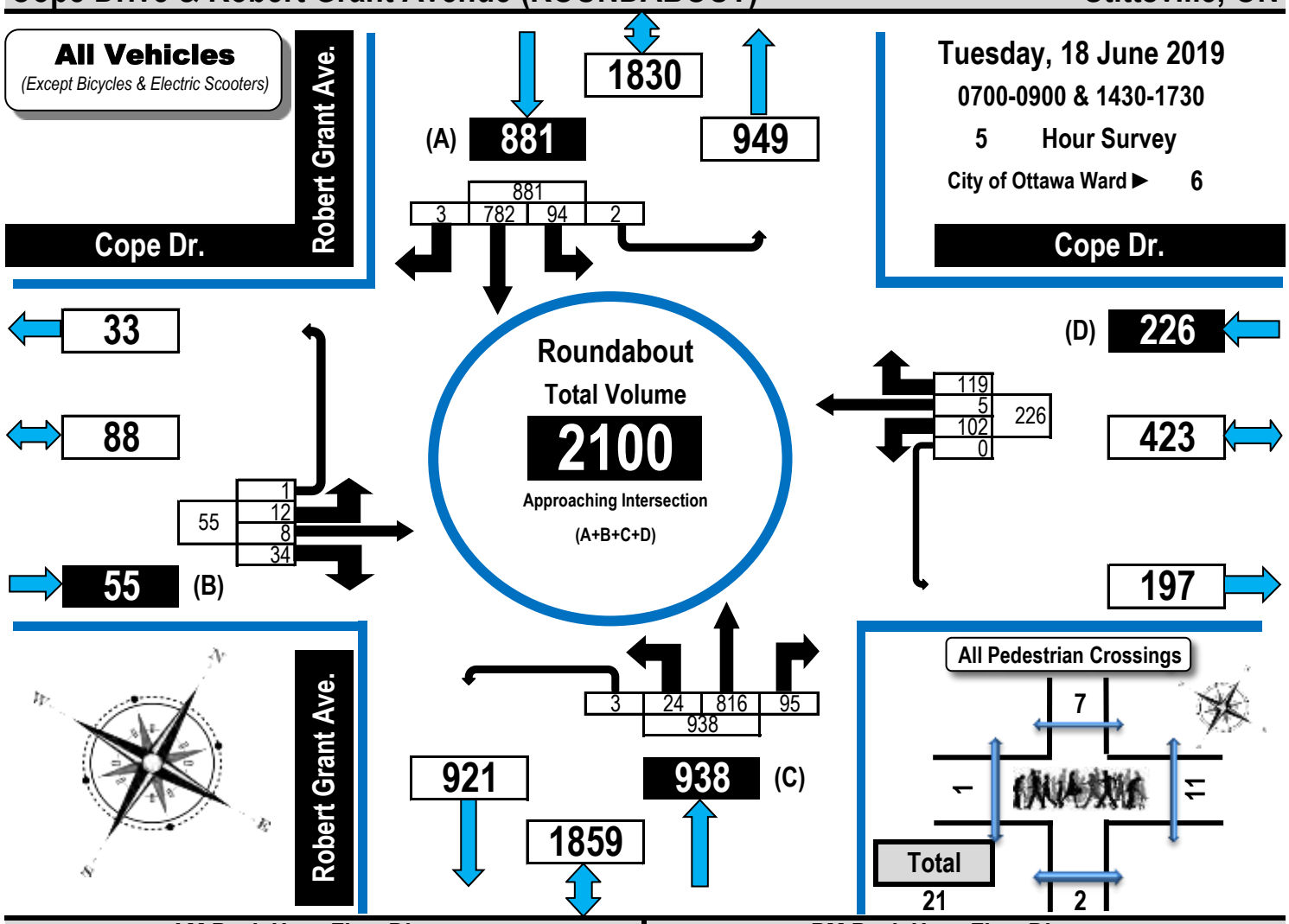
Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams

Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses

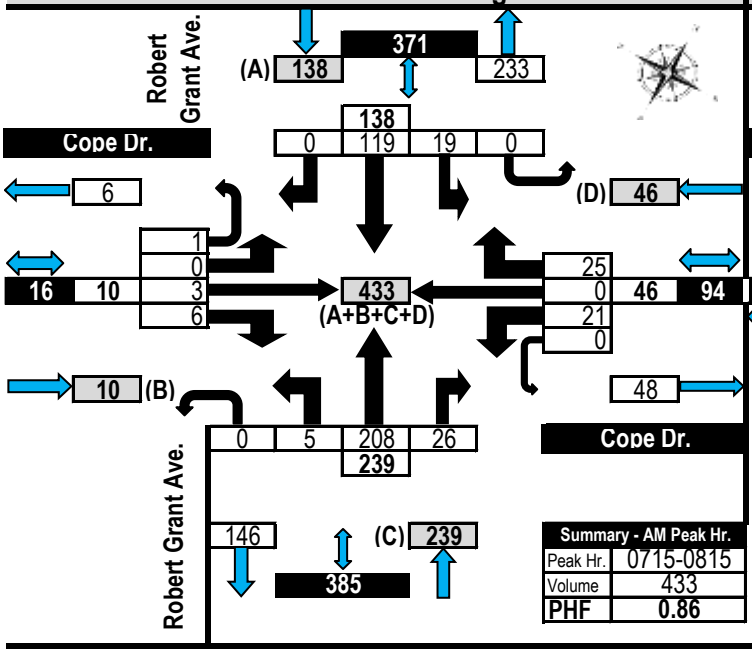
Cope Drive & Robert Grant Avenue (ROUNDABOUT) — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Tuesday, 18 June 2019
0700-0900 & 1430-1730
5 Hour Survey
City of Ottawa Ward ▶ 6

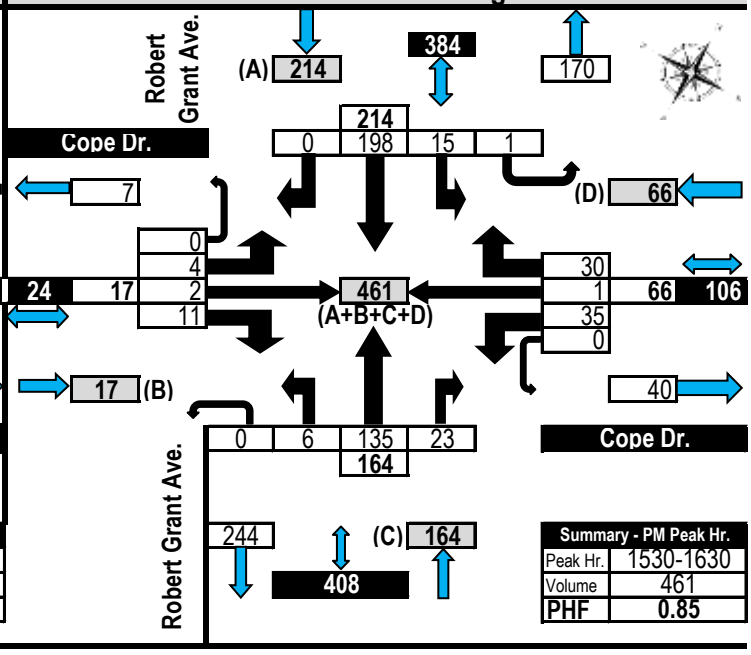


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0715-0815
Volume	433
PHF	0.86

PM Peak Hour Flow Diagram



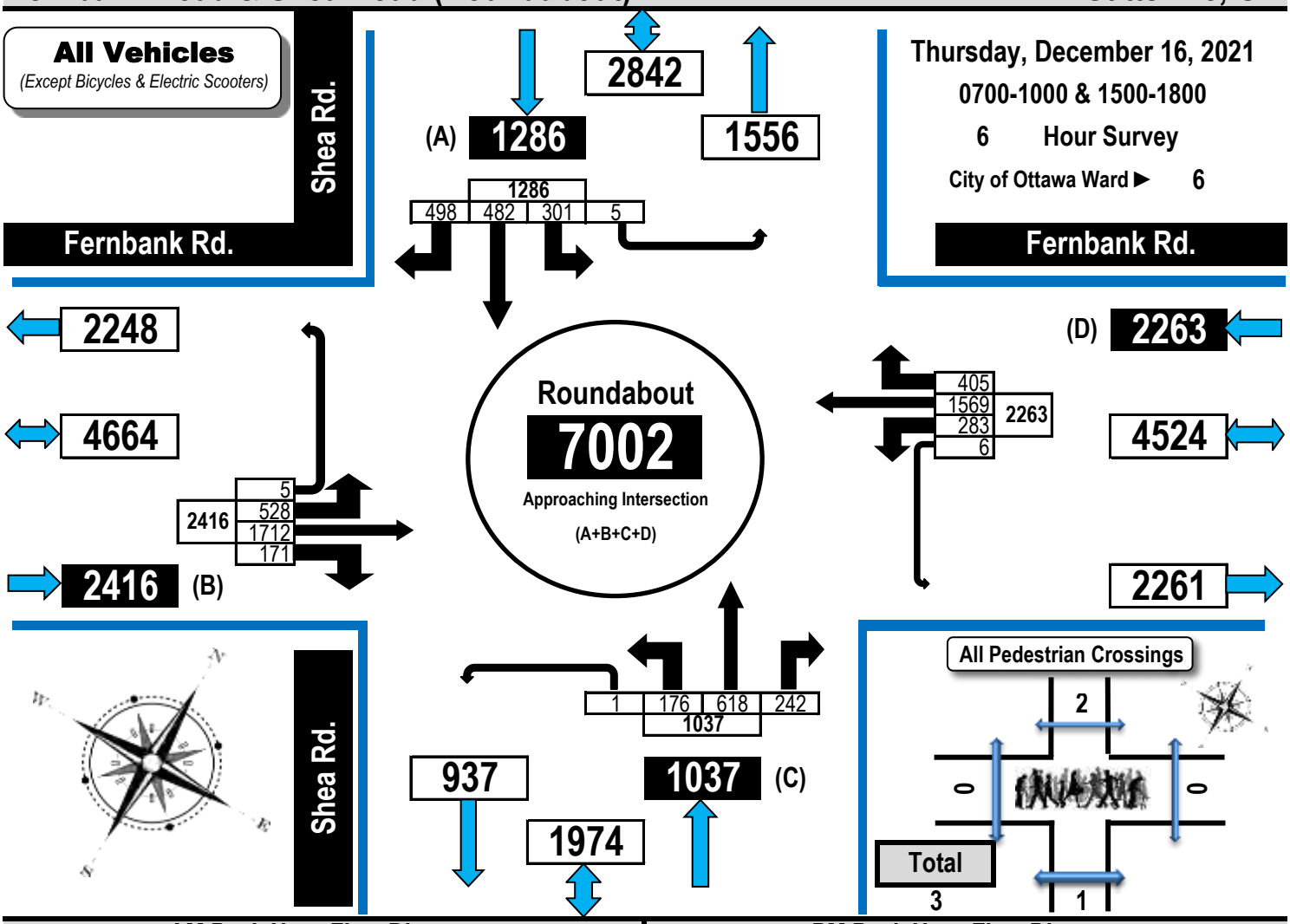
Summary - PM Peak Hr.	
Peak Hr.	1530-1630
Volume	461
PHF	0.85

Turning Movement Count
Summary, AM and PM Peak Hour Flow Diagrams
All Vehicles Except Bicycles

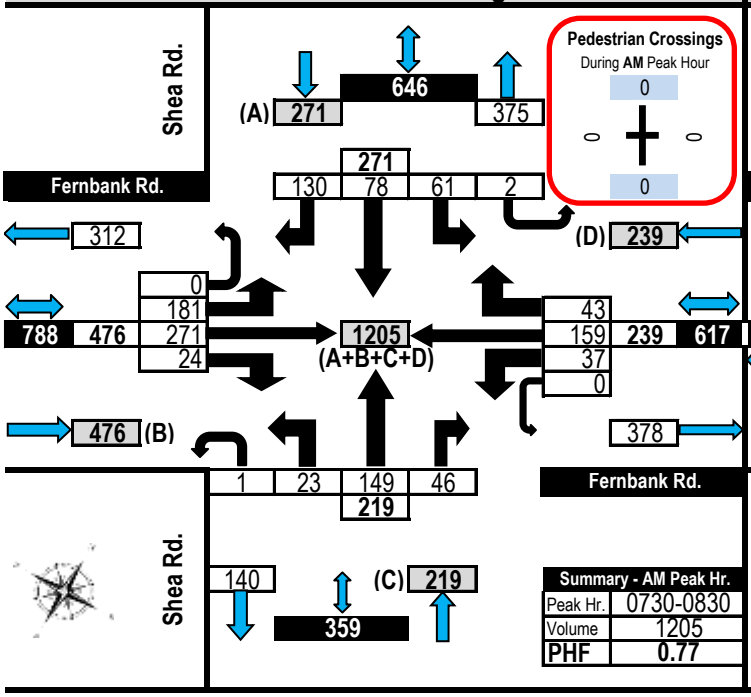
Fernbank Road & Shea Road (Roundabout) — Stittsville, ON

All Vehicles
(Except Bicycles & Electric Scooters)

Thursday, December 16, 2021
0700-1000 & 1500-1800
6 Hour Survey
City of Ottawa Ward ▶ 6

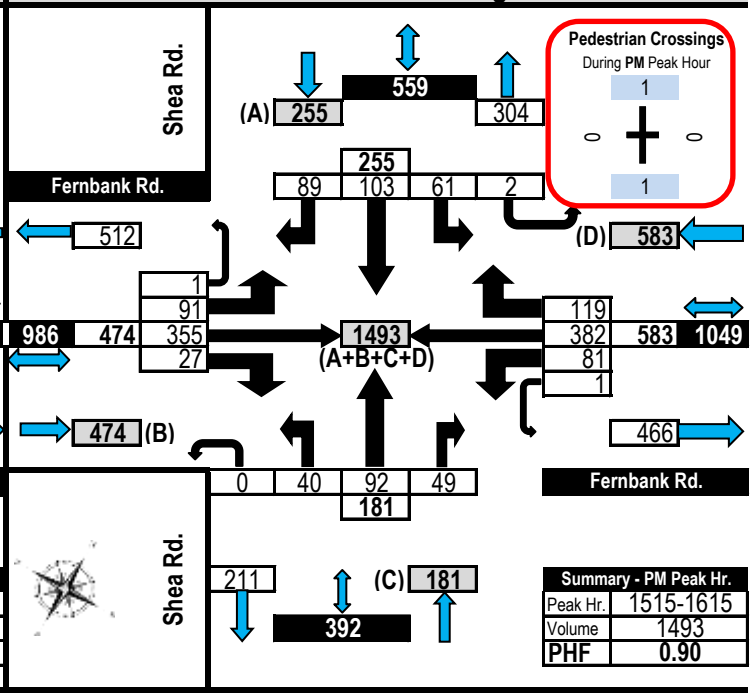


AM Peak Hour Flow Diagram



Summary - AM Peak Hr.	
Peak Hr.	0730-0830
Volume	1205
PHF	0.77

PM Peak Hour Flow Diagram



Summary - PM Peak Hr.	
Peak Hr.	1515-1615
Volume	1493
PHF	0.90

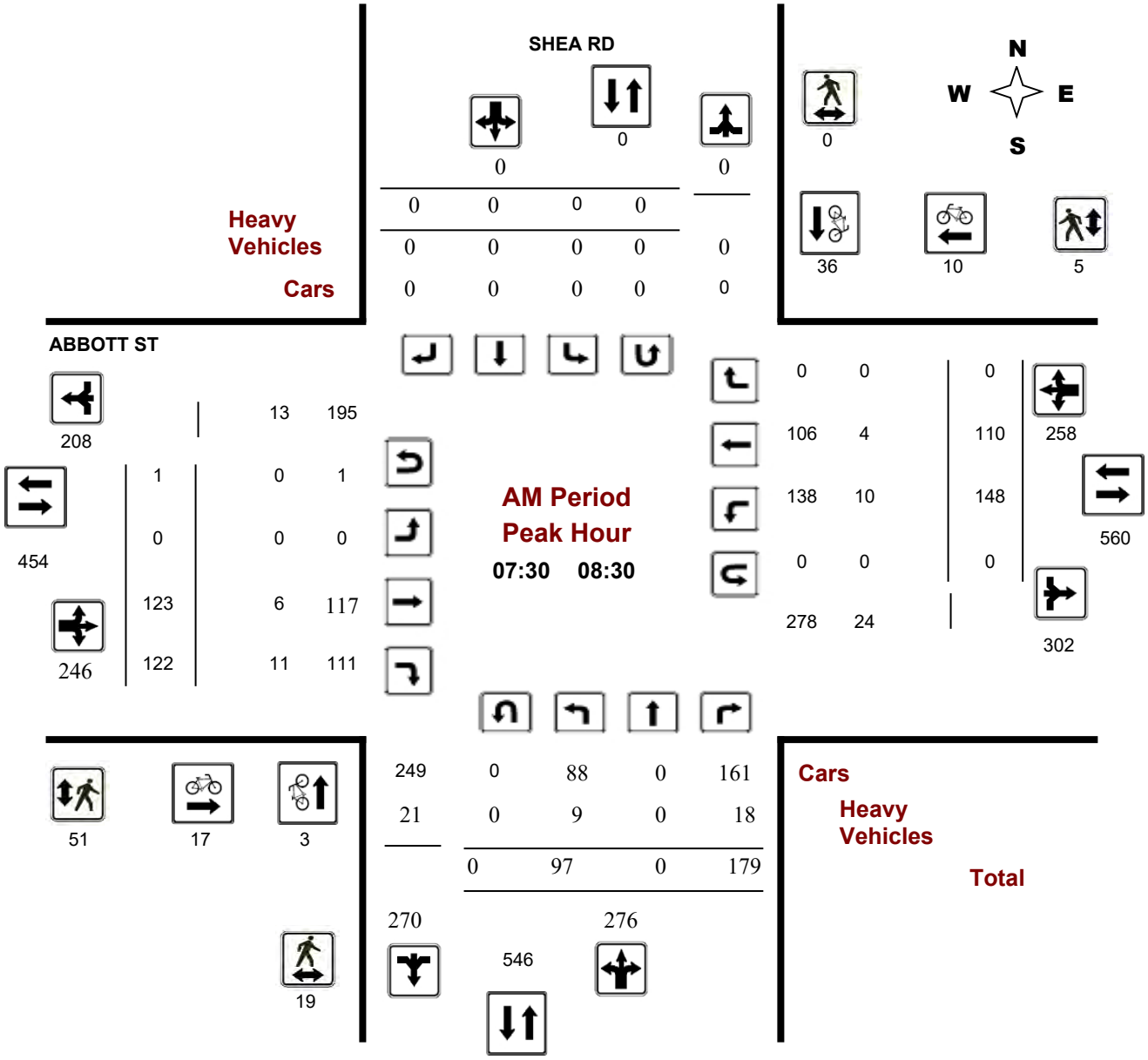
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ABBOTT ST @ SHEA RD

Survey Date: Wednesday, September 16, 2020 **WO No:** 39709

Start Time: 07:00 **Device:** Miovision



Comments

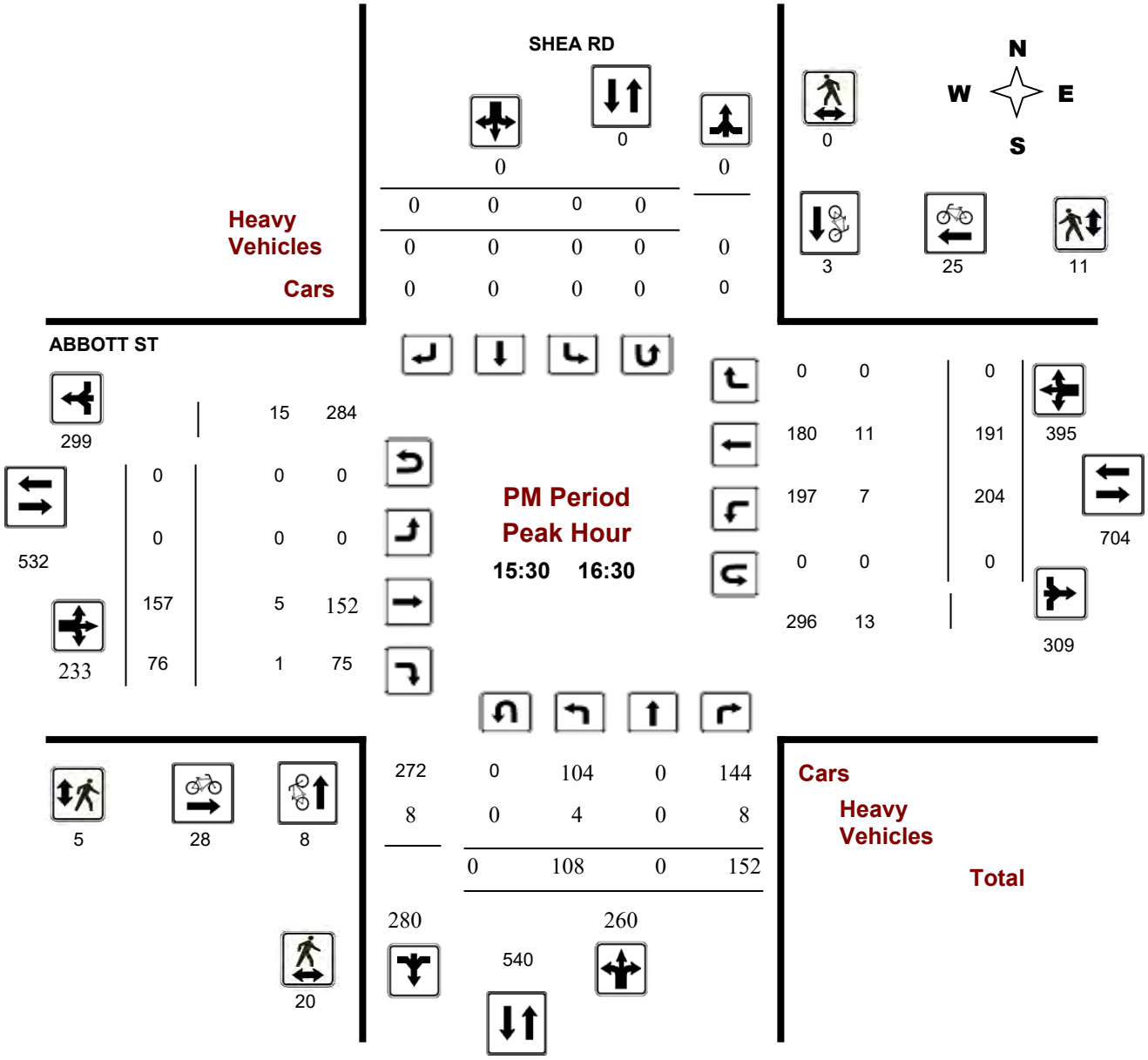
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ABBOTT ST @ SHEA RD

Survey Date: Wednesday, September 16, 2020 **WO No:** 39709

Start Time: 07:00 **Device:** Miovision



Comments

Appendix F – Trip Generation Data

3.2 Recommended Residential Trip Generation Rates

A blended trip rate was developed from the three data sources through application of a rank-sum weighting process, considering the strengths and weaknesses of each dataset for the dwelling type in question. The recommended blended **residential person-trip rates** are presented in **Table 3**. All rates represent person-trips per dwelling unit and are to be applied to the **AM or PM peak period.**

Table 3: Recommended Residential Person-trip Rates

ITE Land Use Code	Dwelling Unit Type	Period	Person-Trip Rate
210	Single-detached	AM	2.05
		PM	2.48
220	Multi-Unit (Low-Rise)	AM	1.35
		PM	1.58
221 & 222	Multi-Unit (High-Rise)	AM	0.80
		PM	0.90

3.3 Adjustment Factors – Peak Period to Peak Hour

The various trip generation data sources require some adjustment to standardize the data for developing robust blended trip rates. The peak period conversion factor in **Table 4** may be used where applicable to develop trip generation rate estimates in the desired format.

Table 4: Adjustment Factors for Residential Trip Generation Rates

Factor	Application	Apply To	Period	Value
Peak Period Conversion Factor	**Peak period to peak hour conversion.** Because the 2020 TRANS Trip Generation Study reports trip generation rates by peak period, factors must be applied if the practitioner requires peak hour rates. In practice, the conversion to peak hour trip rates should occur **after** the application of modal shares.	Person-trip rates per peak period	AM	0.50
			PM	0.44
		Vehicle trip rates per peak period	AM	0.48
			PM	0.44
		Transit trip rates per peak period	AM	0.55
			PM	0.47
		Cycling trip rates per peak period	AM	0.58
			PM	0.48
		Walking trip rates per peak period	AM	0.58
			PM	0.52

Table 6: Residential Mode Share for Single-Detached Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	37%	13%	17%	9%	25%
	PM	36%	12%	13%	8%	30%
Ottawa Inner Area	AM	36%	13%	17%	9%	25%
	PM	35%	12%	13%	9%	30%
Île de Hull	AM	46%	13%	13%	0%	28%
	PM	53%	12%	11%	0%	24%
Ottawa East	AM	45%	15%	20%	9%	11%
	PM	48%	15%	17%	9%	12%
Beacon Hill	AM	51%	15%	20%	2%	12%
	PM	52%	21%	16%	4%	8%
Alta Vista	AM	49%	15%	21%	4%	11%
	PM	52%	18%	16%	3%	12%
Hunt Club	AM	48%	15%	29%	1%	7%
	PM	51%	19%	23%	1%	7%
Merivale	AM	52%	16%	21%	3%	8%
	PM	54%	18%	17%	3%	9%
Ottawa West	AM	43%	15%	19%	6%	16%
	PM	43%	13%	15%	6%	23%
Bayshore/Cedarview	AM	49%	15%	27%	2%	7%
	PM	52%	18%	21%	2%	7%
Hull Périphérie	AM	49%	17%	22%	4%	8%
	PM	51%	18%	18%	4%	9%
Orleans	AM	48%	14%	27%	1%	9%
	PM	54%	17%	22%	1%	6%
South Gloucester / Leitrim	AM	54%	24%	12%	1%	9%
	PM	55%	25%	9%	1%	10%
South Nepean	AM	51%	14%	25%	1%	9%
	PM	53%	19%	18%	1%	10%
Kanata - Stittsville	AM	52%	15%	20%	1%	12%
	PM	56%	19%	14%	1%	9%
Plateau	AM	47%	17%	24%	4%	7%
	PM	49%	19%	21%	3%	9%
Aylmer	AM	53%	17%	23%	2%	6%
	PM	55%	21%	17%	2%	5%
Pointe Gatineau	AM	55%	15%	22%	2%	7%
	PM	55%	17%	19%	2%	7%
Gatineau Est	AM	54%	16%	20%	0%	10%
	PM	60%	18%	14%	1%	7%
Masson-Angers	AM	62%	13%	13%	11%	1%
	PM	62%	18%	12%	8%	1%
Other Rural Districts	AM	60%	14%	24%	2%	0%
	PM	67%	17%	14%	2%	0%

Table 7: Residential Mode Share for Low-Rise Multifamily Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	27%	9%	25%	9%	30%
	PM	31%	10%	20%	9%	30%
Ottawa Inner Area	AM	27%	8%	26%	9%	30%
	PM	31%	9%	20%	9%	31%
Île de Hull	AM	27%	9%	25%	9%	30%
	PM	34%	22%	16%	5%	22%
Ottawa East	AM	36%	11%	38%	7%	8%
	PM	39%	16%	29%	5%	11%
Beacon Hill	AM	45%	9%	35%	1%	10%
	PM	48%	16%	24%	1%	11%
Alta Vista	AM	38%	15%	35%	1%	10%
	PM	38%	19%	31%	2%	10%
Hunt Club	AM	44%	11%	38%	1%	6%
	PM	47%	15%	29%	1%	8%
Merivale	AM	44%	11%	32%	6%	7%
	PM	44%	12%	29%	4%	11%
Ottawa West	AM	36%	12%	24%	10%	19%
	PM	35%	12%	16%	10%	27%
Bayshore/Cedarview	AM	43%	11%	31%	1%	13%
	PM	44%	14%	25%	1%	15%
Hull Périphérie	AM	46%	22%	22%	4%	6%
	PM	46%	17%	22%	3%	11%
Orleans	AM	47%	15%	29%	1%	9%
	PM	51%	19%	24%	1%	6%
South Gloucester / Leitrim	AM	59%	20%	16%	1%	4%
	PM	62%	18%	17%	1%	3%
South Nepean	AM	49%	13%	26%	2%	9%
	PM	49%	13%	24%	2%	12%
Kanata - Stittsville	AM	52%	14%	22%	0%	11%
	PM	58%	17%	17%	0%	8%
Plateau	AM	44%	18%	28%	4%	6%
	PM	47%	17%	26%	2%	8%
Aylmer	AM	52%	18%	23%	0%	7%
	PM	52%	16%	20%	1%	12%
Pointe Gatineau	AM	46%	17%	23%	0%	14%
	PM	52%	16%	19%	1%	12%
Gatineau Est	AM	54%	17%	20%	1%	8%
	PM	56%	21%	16%	0%	7%
Masson-Angers	AM	60%	15%	21%	4%	1%
	PM	63%	15%	17%	3%	1%
Other Rural Districts	AM	66%	13%	21%	1%	0%
	PM	62%	19%	16%	3%	0%

Table 8: Residential Mode Share for High-Rise Multifamily Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	18%	2%	26%	1%	52%
	PM	17%	9%	21%	1%	52%
Ottawa Inner Area	AM	26%	6%	28%	5%	34%
	PM	25%	8%	21%	6%	39%
Île de Hull	AM	27%	3%	37%	12%	21%
	PM	26%	8%	27%	11%	28%
Ottawa East	AM	39%	7%	38%	2%	13%
	PM	40%	14%	28%	3%	15%
Beacon Hill	AM	48%	9%	30%	3%	10%
	PM	52%	16%	28%	0%	4%
Alta Vista	AM	38%	12%	42%	2%	7%
	PM	45%	16%	28%	2%	9%
Hunt Club	AM	39%	6%	44%	1%	9%
	PM	44%	11%	35%	2%	9%
Merivale	AM	41%	6%	42%	2%	8%
	PM	41%	11%	33%	2%	13%
Ottawa West	AM	28%	11%	41%	3%	16%
	PM	33%	11%	26%	7%	23%
Bayshore/Cedarview	AM	40%	12%	38%	2%	8%
	PM	40%	15%	33%	1%	11%
Hull Périphérie	AM	48%	11%	30%	1%	10%
	PM	47%	15%	23%	3%	13%
Orleans	AM	54%	7%	29%	0%	10%
	PM	61%	13%	21%	0%	6%
South Gloucester / Leitrim	AM	50%	15%	25%	1%	9%
	PM	53%	17%	21%	1%	9%
South Nepean	AM	58%	6%	30%	2%	4%
	PM	54%	15%	25%	0%	7%
Kanata - Stittsville	AM	43%	26%	28%	0%	4%
	PM	55%	19%	21%	0%	5%
Plateau	AM	53%	9%	35%	3%	1%
	PM	65%	7%	25%	2%	1%
Aylmer	AM	45%	17%	25%	0%	13%
	PM	31%	21%	23%	4%	20%
Pointe Gatineau	AM	44%	15%	24%	3%	14%
	PM	52%	15%	20%	2%	11%
Gatineau Est	AM	53%	10%	25%	0%	12%
	PM	61%	10%	25%	0%	4%
Masson-Angers	AM	63%	15%	19%	0%	3%
	PM	64%	18%	16%	0%	1%
Other Rural Districts	AM	63%	15%	19%	0%	3%
	PM	64%	18%	16%	0%	1%

Kanata - Stittsville

Demographic Characteristics

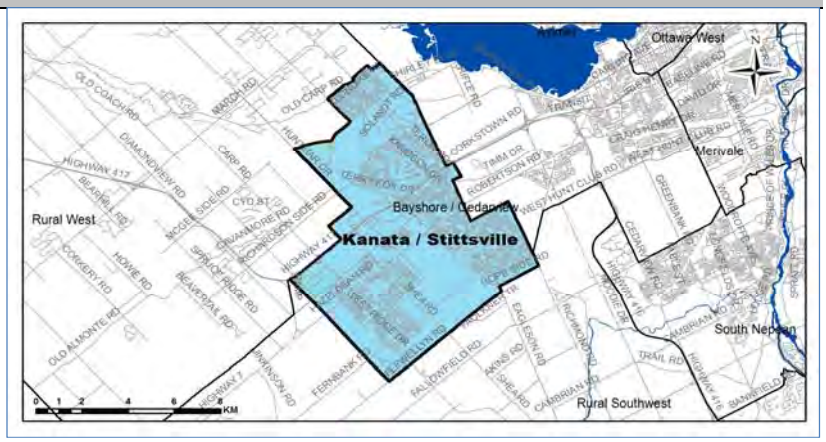
Population	105,210	Actively Travelled	83,460
Employed Population	49,640	Number of Vehicles	64,540
Households	38,010	Area (km^2)	82.6

Occupation

Status (age 5+)	Male	Female	Total
Full Time Employed	24,670	19,590	44,260
Part Time Employed	1,540	3,840	5,380
Student	13,630	13,410	27,040
Retiree	6,480	8,350	14,820
Unemployed	850	940	1,790
Homemaker	160	3,310	3,470
Other	350	1,010	1,360
Total:	47,690	50,440	98,120

Traveller Characteristics	Male	Female	Total
Transit Pass Holders	5,940	6,920	12,860
Licensed Drivers	36,280	36,790	73,070
Telecommuters	200	380	580
Trips made by residents	135,300	143,330	278,630

Selected Indicators	
Daily Trips per Person (age 5+)	2.84
Vehicles per Person	0.61
Number of Persons per Household	2.77
Daily Trips per Household	7.33
Vehicles per Household	1.70
Workers per Household	1.31
Population Density (Pop/km2)	1270

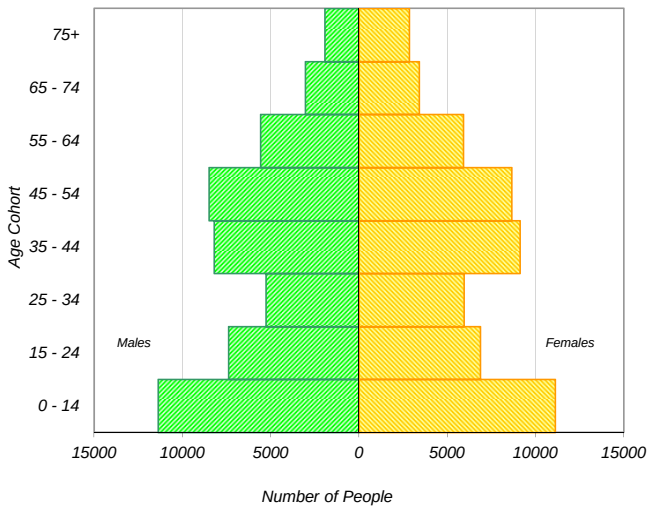


Household Size		
1 person	5,810	15%
2 persons	11,660	31%
3 persons	7,490	20%
4 persons	8,890	23%
5+ persons	4,160	11%
Total:	38,010	100%

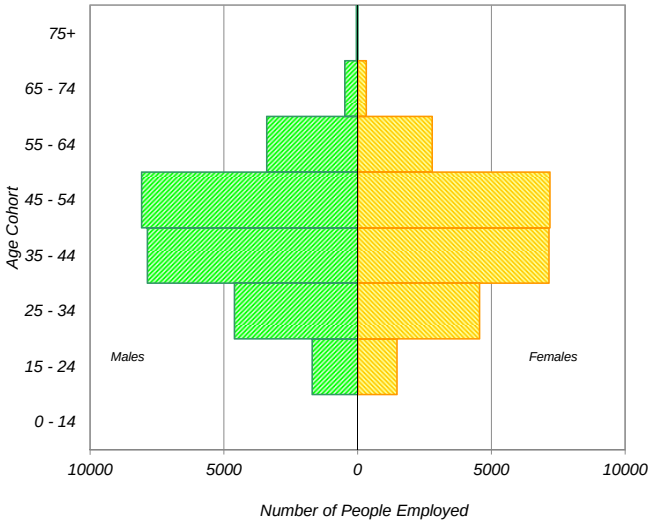
Households by Vehicle Availability		
0 vehicles	1,050	3%
1 vehicle	14,090	37%
2 vehicles	19,110	50%
3 vehicles	3,000	8%
4+ vehicles	770	2%
Total:	38,010	100%

Households by Dwelling Type		
Single-detached	21,610	57%
Semi-detached	3,890	10%
Townhouse	10,550	28%
Apartment/Condo	1,960	5%
Total:	38,010	100%

Population



Employed Population

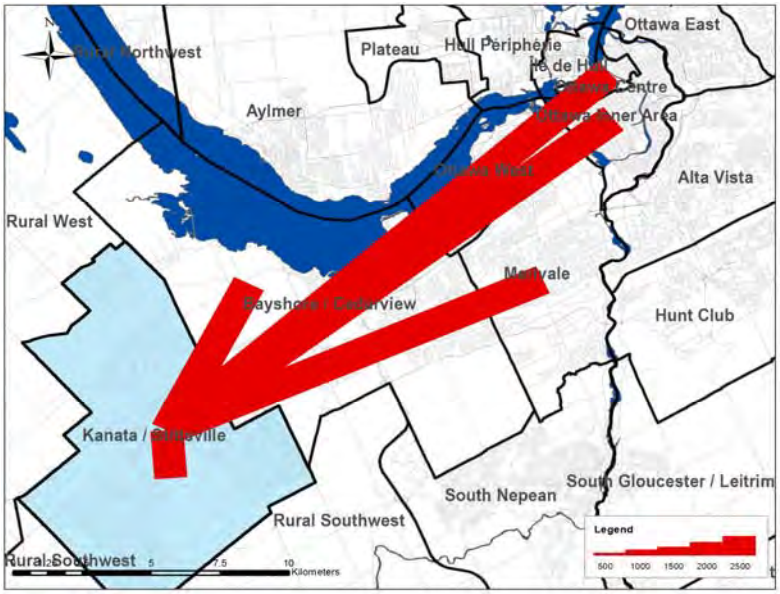


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from Kanata - Stittsville

AM Peak Period



Summary of Trips to and from Kanata - Stittsville

AM Peak Period (6:30 - 8:59)	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Ottawa Centre	4,560	8%	140	0%
Ottawa Inner Area	3,350	6%	970	2%
Ottawa East	660	1%	260	1%
Beacon Hill	280	0%	170	0%
Alta Vista	1,810	3%	660	1%
Hunt Club	490	1%	420	1%
Merivale	3,410	6%	1,200	3%
Ottawa West	2,020	4%	840	2%
Bayshore / Cedarview	5,010	9%	2,420	5%
Orléans	290	1%	500	1%
Rural East	100	0%	30	0%
Rural Southeast	50	0%	260	1%
South Gloucester / Leitrim	60	0%	140	0%
South Nepean	690	1%	1,800	4%
Rural Southwest	1,130	2%	1,850	4%
Kanata / Stittsvile	30,360	54%	30,360	66%
Rural West	1,050	2%	3,250	7%
Île de Hull	670	1%	30	0%
Hull Périphérie	160	0%	30	0%
Plateau	100	0%	230	0%
Aylmer	0	0%	190	0%
Rural Northwest	20	0%	60	0%
Pointe Gatineau	20	0%	80	0%
Gatineau Est	0	0%	60	0%
Rural Northeast	30	0%	50	0%
Buckingham / Masson-Angers	30	0%	10	0%
Ontario Sub-Total:	55,320	98%	45,270	98%
Québec Sub-Total:	1,030	2%	740	2%
Total:	56,350	100%	46,010	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	27,180	29%	17,020	18%	14,550	9%
School	7,070	7%	2,500	3%	15,110	9%
Shopping	6,070	6%	9,150	10%	22,480	14%
Leisure	8,450	9%	10,590	11%	17,090	11%
Medical	2,520	3%	1,170	1%	2,660	2%
Pick-up / drive passenger	6,570	7%	5,470	6%	15,190	9%
Return Home	33,610	35%	45,620	48%	65,770	41%
Other	3,560	4%	3,590	4%	8,440	5%
Total:	95,030	100%	95,110	100%	161,290	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	18,030	69%	11,020	70%	7,430	24%
School	4,890	19%	2,280	15%	11,740	39%
Shopping	170	1%	320	2%	760	3%
Leisure	340	1%	400	3%	780	3%
Medical	330	1%	230	1%	350	1%
Pick-up / drive passenger	1,260	5%	580	4%	4,760	16%
Return Home	290	1%	380	2%	1,980	7%
Other	670	3%	430	3%	2,560	8%
Total:	25,980	100%	15,640	100%	30,360	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	390	2%	350	1%	930	2%
School	370	2%	0	0%	90	0%
Shopping	1,030	5%	1,910	7%	5,100	14%
Leisure	2,140	11%	3,080	11%	4,130	11%
Medical	230	1%	180	1%	400	1%
Pick-up / drive passenger	1,980	10%	1,980	7%	3,410	9%
Return Home	12,130	64%	20,550	71%	21,560	58%
Other	680	4%	860	3%	1,850	5%
Total:	18,950	100%	28,910	100%	37,470	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	351,430		46%
AM Peak Period	71,980	20%	42%
PM Peak Period	85,330	24%	44%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	63,470	67%	63,830	67%	92,190	57%
Auto Passenger	15,220	16%	14,920	16%	31,880	20%
Transit	12,200	13%	12,270	13%	4,050	3%
Bicycle	360	0%	410	0%	960	1%
Walk	40	0%	50	0%	21,080	13%
Other	3,730	4%	3,660	4%	11,130	7%
Total:	95,020	100%	95,140	100%	161,290	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	15,360	59%	11,530	74%	13,630	45%
Auto Passenger	2,450	9%	1,160	7%	5,050	17%
Transit	6,230	24%	1,290	8%	1,210	4%
Bicycle	30	0%	80	1%	220	1%
Walk	0	0%	40	0%	5,730	19%
Other	1,900	7%	1,560	10%	4,510	15%
Total:	25,970	100%	15,660	100%	30,350	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	13,850	73%	17,660	61%	21,240	57%
Auto Passenger	3,240	17%	4,270	15%	8,570	23%
Transit	1,270	7%	5,980	21%	670	2%
Bicycle	40	0%	100	0%	260	1%
Walk	40	0%	0	0%	4,570	12%
Other	520	3%	910	3%	2,160	6%
Total:	18,960	100%	28,920	100%	37,470	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.24	1.23	1.35
AM Peak Period	1.16	1.10	1.37
PM Peak Period	1.23	1.24	1.40

Transit Modal Split	From District	To District	Within District
24 Hours	13%	13%	3%
AM Peak Period	26%	9%	6%
PM Peak Period	7%	21%	2%

Appendix G – MMLOS Analyses

Multi-Modal Level of Service - Segments Form

Consultant	**IBI Group**	**Project**	**CRT Phase 4 136944**
Scenario	**Existing/Future Conditions**	**Date**	
Comments			

SEGMENTS		Fernbank	Shea	Abbott	Section	Section	Section	Section	Section	Section
		1	2	3	4	5	6	7	8	9
Pedestrian	Sidewalk Width Boulevard Width	no sidewalk n/a	no sidewalk n/a	1.8 m 0.5 - 2 m						
	Avg Daily Curb Lane Traffic Volume	> 3000	≤ 3000	> 3000						
	Operating Speed On-Street Parking	> 60 km/h no	> 60 km/h no	> 30 to 50 km/h no						
	Exposure to Traffic PLoS	**F**	**F**	**C**	**-**	**-**	**-**	**-**	**-**	**-**
	Effective Sidewalk Width	2.0 m	1.5 m	2.0 m						
	Pedestrian Volume	250 ped/hr	250 ped/hr	250 ped/hr						
	Crowding PLoS	**B**	**B**	**B**	**-**	**-**	**-**	**-**	**-**	**-**
	Level of Service	**F**	**F**	**C**	**-**	**-**	**-**	**-**	**-**	**-**
Bicycle	Type of Cycling Facility	Mixed Traffic	Mixed Traffic	Curbside Bike Lane						
	Number of Travel Lanes	2-3 lanes total	2-3 lanes total	≤ 1 each direction						
	Operating Speed	≥ 60 km/h	≥ 60 km/h	≤ 50 km/h						
	# of Lanes & Operating Speed LoS	**F**	**F**	**A**	**-**	**-**	**-**	**-**	**-**	**-**
	Bike Lane (+ Parking Lane) Width	~~≥ 1.8 m~~	~~≥1.5 to <1.8 m~~	≥ 1.8 m						
	Bike Lane Width LoS	**~~A~~**	**~~B~~**	**A**	**-**	**-**	**-**	**-**	**-**	**-**
	Bike Lane Blockages	~~Rare~~	~~Rare~~	Rare						
	Blockage LoS	**~~A~~**	**~~A~~**	**A**	**-**	**-**	**-**	**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge						
	No. of Lanes at Unsignalized Crossing	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes						
	Sidestreet Operating Speed	>50 to 60 km/h	>50 to 60 km/h	>50 to 60 km/h						
	Unsignalized Crossing - Lowest LoS	**C**	**C**	**C**	**-**	**-**	**-**	**-**	**-**	**-**
	Level of Service	**F**	**F**	**C**	**-**	**-**	**-**	**-**	**-**	**-**
Transit	Facility Type	Mixed Traffic	Mixed Traffic	Mixed Traffic						
	Friction or Ratio Transit:Posted Speed	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8						
	Level of Service	**D**	**D**	**D**	**-**	**-**	**-**	**-**	**-**	**-**
Truck	Truck Lane Width	≤ 3.5 m	≤ 3.3 m	≤ 3.5 m						
	Travel Lanes per Direction	1	1	1						
	Level of Service	**C**	**D**	**C**	**-**	**-**	**-**	**-**	**-**	**-**

Appendix H – Intersection Control Warrants

IBI

OTM BOOK 12* - TRAFFIC SIGNAL WARRANT

Project: CRT Phase 4 **Date:** March 30, 2022

Project #: 136944

Location: Abbott Street E (*Major Roadway*) at Granite Ridge/Bobolink (*Minor Roadway*)

Orientation: East/West North/South

Municipality: Ottawa **Scenario:** Future (2030) Total Traffic

Justification 1 - Minimum Vehicle Volume

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, all approaches	480	720	480	**720**	770 100%	385 53%	385 53%	385 53%	1052 100%	526 73%	526 73%	526 73%	72%
B. Vehicle volume along minor roads	120	170	120	**170**	194 100%	97 57%	97 57%	97 57%	175 100%	87 51%	87 51%	87 51%	66%

Justification 2 - Delay to Cross Traffic

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, along artery	480	720	480	**720**	576 80%	288 40%	288 40%	288 40%	877 100%	438 61%	438 61%	438 61%	60%
B. Combined vehicle and pedestrian volume crossing artery from minor roads	50	70	50	**70**	66 95%	33 47%	33 47%	33 47%	45 64%	22 32%	22 32%	22 32%	50%

Justification 3 - Volume/Delay Combination

JUSTIFICATION	SATISFIED TO 80% OR MORE?	BOTH SATISFIED TO 80% OR MORE?
Justification 1 - Minimum Vehicular Volume	NO	NO
Justification 2 - Delay to Cross Traffic	NO	

Justification 7 - Projected Volumes

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL AHV	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	576	**864**	456	53%	45%
	B. Vehicle volume along minor roads (Average Hour)	120	170	144	**204**	92	45%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	576	**864**	364	42%	31%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	60	**90**	28	31%	

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	↑	20
52	0	33	←		182
↙	↓	↘	↙		35
	35	↗	↖	↑	↗
	285	→	33	0	75
	20	↘			

PM Peak Hour Volumes

			↖	↑	29
58	0	25	←		342
↙	↓	↘	↙		111
	41	↗	↖	↑	↗
	322	→	20	0	72
	32	↘			

Average Hourly Volumes (AHV)

			↖	↑	12
28	0	15	←		131
↙	↓	↘	↙		37
	19	↗	↖	↑	↗
	152	→	13	0	37
	13	↘			

Eight Hour Traffic Volumes:**

Hour	Major Road						Minor Road						Ped*
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
7:00 AM	35	285	20	35	182	20	33	0	75	33	0	52	0
8:00 AM	18	143	10	17	91	10	17	0	38	17	0	26	0
9:00 AM	18	143	10	17	91	10	17	0	38	17	0	26	0
10:00 AM	18	143	10	17	91	10	17	0	38	17	0	26	0
3:00 PM	41	322	32	111	342	29	20	0	72	25	0	58	0
4:00 PM	21	161	16	56	171	15	10	0	36	13	0	29	0
5:00 PM	21	161	16	56	171	15	10	0	36	13	0	29	0
6:00 PM	21	161	16	56	171	15	10	0	36	13	0	29	0

** Number of pedestrians crossing the major road*
*** These are projected 8-hour traffic volumes.*

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above.

1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

4-legged Intersection

5. All flow values for Justification 1 and 2 are to be increased by 20% in the case of new intersections, Justification 3 is to only be used for existing intersections and all flow values for Warrant 1 and Warrant 2 of Justification 7 are to be increased by 20% for existing intersections and by 50% in the case of new intersections.

Existing Intersection

6. The crossing volumes are defined as the sum of:
   (a) Left-turns from both minor road approaches.
   (b) The heaviest through volume from the minor road.
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left-turn volume >120 vph
      (ii) the left-turn volume plus the opposing volume >720 vph
   (d) Pedestrians crossing the main road.

CONCLUSION: The intersection does NOT meet the minimum warrants for traffic control signals.

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - TRAFFIC SIGNAL WARRANT

Project: CRT Phase 4 **Date:** March 30, 2022

Project #: 136944

Location: Fernbank Road (Major Roadway) at Goldhawk Drive (Minor Roadway)

Orientation: East/West North/South

Municipality: Ottawa **Scenario:** Future (2030) Total Traffic

Justification 1 - Minimum Vehicle Volume

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, all approaches	480	720	**576**	864	1056 100%	528 92%	528 92%	528 92%	1482 100%	741 100%	741 100%	741 100%	97%
B. Vehicle volume along minor roads	120	170	**216**	306	121 56%	61 28%	61 28%	61 28%	90 41%	45 21%	45 21%	45 21%	31%

Justification 2 - Delay to Cross Traffic

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, along artery	480	720	**576**	864	935 100%	467 81%	467 81%	467 81%	1392 100%	696 100%	696 100%	696 100%	93%
B. Combined vehicle and pedestrian volume crossing artery from minor roads	50	70	**60**	84	96 100%	48 80%	48 80%	48 80%	70 100%	35 59%	35 59%	35 59%	77%

Justification 3 - Volume/Delay Combination

JUSTIFICATION	SATISFIED TO 80% OR MORE?	BOTH SATISFIED TO 80% OR MORE?
Justification 1 - Minimum Vehicular Volume	N/A	N/A
Justification 2 - Delay to Cross Traffic	N/A	

Justification 7 - Projected Volumes

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL AHV	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	**720**	1080	635	88%	20%
	B. Vehicle volume along minor roads (Average Hour)	120	170	**270**	383	53	20%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	**720**	1080	582	81%	56%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	**75**	113	42	56%	

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	←	65			
25	↓	96	↙	↓	343			
↙		↘	↙	←	0			
	22	↗	↖	↑	↗			
	506	→	0	0	0			
	0	↘						

PM Peak Hour Volumes

			↖	←	121			
19	↓	70	↙	↓	747			
↙		↘	↙	←	0			
	38	↗	↖	↑	↗			
	486	→	0	0	0			
	0	↘						

Average Hourly Volumes (AHV)

			↖	←	46			
11	↓	42	↙	↓	273			
↙		↘	↙	←	0			
	15	↗	↖	↑	↗			
	248	→	0	0	0			
	0	↘						

Eight Hour Traffic Volumes:**

Hour	Major Road						Minor Road						Ped*
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
7:00 AM	22	506	0	0	343	65	0	0	0	96	0	25	0
8:00 AM	11	253	0	0	171	32	0	0	0	48	0	13	0
9:00 AM	11	253	0	0	171	32	0	0	0	48	0	13	0
10:00 AM	11	253	0	0	171	32	0	0	0	48	0	13	0
3:00 PM	38	486	0	0	747	121	0	0	0	70	0	19	0
4:00 PM	19	243	0	0	374	60	0	0	0	35	0	10	0
5:00 PM	19	243	0	0	374	60	0	0	0	35	0	10	0
6:00 PM	19	243	0	0	374	60	0	0	0	35	0	10	0

** Number of pedestrians crossing the major road*
*** These are projected 8-hour traffic volumes.*

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above.

1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

Free Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

3-legged Intersection

5. All flow values for Justification 1 and 2 are to be increased by 20% in the case of new intersections, Justification 3 is to only be used for existing intersections and all flow values for Warrant 1 and Warrant 2 of Justification 7 are to be increased by 20% for existing intersections and by 50% in the case of new intersections.

New Intersection

6. The crossing volumes are defined as the sum of:
   (a) Left-turns from both minor road approaches.
   (b) The heaviest through volume from the minor road.
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left-turn volume >120 vph
      (ii) the left-turn volume plus the opposing volume >720 vph
   (d) Pedestrians crossing the main road.

CONCLUSION: The intersection does NOT meet the minimum warrants for traffic control signals.

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - TRAFFIC SIGNAL WARRANT

Project: CRT Phase 4 **Date:** March 30, 2022

Project #: 136944

Location: Shea Road (Major Roadway) at Street 12 (Minor Roadway)

Orientation: North/South East/West

Municipality: Ottawa **Scenario:** Future (2030) Total Traffic

Justification 1 - Minimum Vehicle Volume

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, all approaches	480	720	**576**	864	757 100%	379 66%	379 66%	379 66%	727 100%	363 63%	363 63%	363 63%	73%
B. Vehicle volume along minor roads	120	170	**216**	306	22 10%	11 5%	11 5%	11 5%	14 7%	7 3%	7 3%	7 3%	5%

Justification 2 - Delay to Cross Traffic

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, along artery	480	720	**576**	864	735 100%	367 64%	367 64%	367 64%	712 100%	356 62%	356 62%	356 62%	72%
B. Combined vehicle and pedestrian volume crossing artery from minor roads	50	70	**60**	84	18 30%	9 15%	9 15%	9 15%	11 19%	6 10%	6 10%	6 10%	15%

Justification 3 - Volume/Delay Combination

JUSTIFICATION	SATISFIED TO 80% OR MORE?	BOTH SATISFIED TO 80% OR MORE?
Justification 1 - Minimum Vehicular Volume	N/A	N/A
Justification 2 - Delay to Cross Traffic	N/A	

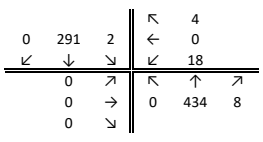
Justification 7 - Projected Volumes

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL AHV	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	**720**	1080	371	52%	3%
	B. Vehicle volume along minor roads (Average Hour)	120	170	**270**	383	9	3%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	**720**	1080	362	50%	9%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	**75**	113	7	9%	

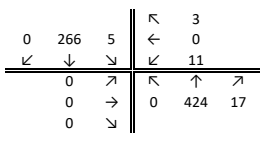
Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

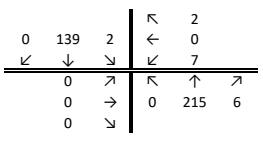
AM Peak Hour Volumes



PM Peak Hour Volumes



Average Hourly Volumes (AHV)



Eight Hour Traffic Volumes:**

Hour	Major Road						Minor Road						Ped*
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	
7:00 AM	0	434	8	2	291	0	0	0	0	18	0	4	0
8:00 AM	0	217	4	1	146	0	0	0	0	9	0	2	0
9:00 AM	0	217	4	1	146	0	0	0	0	9	0	2	0
10:00 AM	0	217	4	1	146	0	0	0	0	9	0	2	0
3:00 PM	0	424	17	5	266	0	0	0	0	11	0	3	0
4:00 PM	0	212	9	3	133	0	0	0	0	6	0	1	0
5:00 PM	0	212	9	3	133	0	0	0	0	6	0	1	0
6:00 PM	0	212	9	3	133	0	0	0	0	6	0	1	0

** Number of pedestrians crossing the major road*
*** These are projected 8-hour traffic volumes.*

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above.

1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

Free Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

3-legged Intersection

5. All flow values for Justification 1 and 2 are to be increased by 20% in the case of new intersections, Justification 3 is to only be used for existing intersections and all flow values for Warrant 1 and Warrant 2 of Justification 7 are to be increased by 20% for existing intersections and by 50% in the case of new intersections.

New Intersection

6. The crossing volumes are defined as the sum of:
   (a) Left-turns from both minor road approaches.
   (b) The heaviest through volume from the minor road.
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left-turn volume >120 vph
      (ii) the left-turn volume plus the opposing volume >720 vph
   (d) Pedestrians crossing the main road.

CONCLUSION: The intersection does NOT meet the minimum warrants for traffic control signals.

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - TRAFFIC SIGNAL WARRANT

Project: CRT Phase 4 **Date:** March 30, 2022

Project #: 136944

Location: Cope Drive (Major Roadway) at Goldhawk Drive (Minor Roadway)

Orientation: East/West North/South

Municipality: Ottawa **Scenario:** Total (2030) Traffic

Justification 1 - Minimum Vehicle Volume

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, all approaches	480	720	576	**864**	687 80%	344 40%	344 40%	344 40%	775 90%	387 45%	387 45%	387 45%	53%
B. Vehicle volume along minor roads	120	170	144	**204**	262 100%	131 64%	131 64%	131 64%	271 100%	136 66%	136 66%	136 66%	74%

Justification 2 - Delay to Cross Traffic

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, along artery	480	720	576	**864**	426 49%	213 25%	213 25%	213 25%	503 58%	252 29%	252 29%	252 29%	34%
B. Combined vehicle and pedestrian volume crossing artery from minor roads	50	70	60	**84**	146 100%	73 87%	73 87%	73 87%	149 100%	75 89%	75 89%	75 89%	91%

Justification 3 - Volume/Delay Combination

JUSTIFICATION	SATISFIED TO 80% OR MORE?	BOTH SATISFIED TO 80% OR MORE?
Justification 1 - Minimum Vehicular Volume	N/A	N/A
Justification 2 - Delay to Cross Traffic	N/A	

Justification 7 - Projected Volumes

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL AHV	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	**1080**	365	34%	34%
	B. Vehicle volume along minor roads (Average Hour)	120	170	180	**255**	133	52%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	**1080**	232	21%	21%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	**113**	72	64%	

Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

AM Peak Hour Volumes

			↖	←	48
17	73	26	↙	←	115
↙	↓	↘	↙	←	7
	7	↗	↖	↑	↗
	224	→	24	96	26
	24	↘			

PM Peak Hour Volumes

			↖	←	40
11	98	24	↙	←	242
↙	↓	↘	↙	←	16
	16	↗	↖	↑	↗
	164	→	27	87	24
	27	↘			

Average Hourly Volumes (AHV)

			↖	←	22
7	43	13	↙	←	89
↙	↓	↘	↙	←	6
	6	↗	↖	↑	↗
	97	→	13	46	13
	13	↘			

Eight Hour Traffic Volumes:**

Hour	Major Road						Minor Road						Ped*
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
7:00 AM	7	224	24	7	115	48	24	96	26	26	73	17	0
8:00 AM	4	112	12	4	58	24	12	48	13	13	37	8	0
9:00 AM	4	112	12	4	58	24	12	48	13	13	37	8	0
10:00 AM	4	112	12	4	58	24	12	48	13	13	37	8	0
3:00 PM	16	164	27	16	242	40	27	87	24	24	98	11	0
4:00 PM	8	82	13	8	121	20	13	43	12	12	49	5	0
5:00 PM	8	82	13	8	121	20	13	43	12	12	49	5	0
6:00 PM	8	82	13	8	121	20	13	43	12	12	49	5	0

** Number of pedestrians crossing the major road*
*** These are projected 8-hour traffic volumes.*

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above.

1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

4-legged Intersection

5. All flow values for Justification 1 and 2 are to be increased by 20% in the case of new intersections, Justification 3 is to only be used for existing intersections and all flow values for Warrant 1 and Warrant 2 of Justification 7 are to be increased by 20% for existing intersections and by 50% in the case of new intersections.

New Intersection

6. The crossing volumes are defined as the sum of:
   (a) Left-turns from both minor road approaches.
   (b) The heaviest through volume from the minor road.
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left-turn volume >120 vph
      (ii) the left-turn volume plus the opposing volume >720 vph
   (d) Pedestrians crossing the main road.

CONCLUSION: The intersection does NOT meet the minimum warrants for traffic control signals.

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

IBI

OTM BOOK 12* - TRAFFIC SIGNAL WARRANT

Project: CRT Phase 4 **Date:** March 30, 2022

Project #: 136944

Location: Goldhawk Drive (Major Roadway) at Bobolink Ridge (Minor Roadway)

Orientation: North/South East/West

Municipality: Ottawa **Scenario:** Future (2030) Total Traffic

Justification 1 - Minimum Vehicle Volume

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, all approaches	480	720	576	**864**	327 38%	164 19%	164 19%	164 19%	322 37%	161 19%	161 19%	161 19%	23%
B. Vehicle volume along minor roads	120	170	144	**204**	144 71%	72 35%	72 35%	72 35%	174 85%	87 43%	87 43%	87 43%	49%

Justification 2 - Delay to Cross Traffic

WARRANT	MINIMUM REQUIREMENT				COMPLIANCE								SECTIONAL PERCENT
	FREE FLOW	RESTR. FLOW	ADJUST. FREE FLOW	ADJUST. RESTR. FLOW	7:00 AM	8:00 AM	9:00 AM	10:00 AM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
A. Vehicle volumes, along artery	480	720	576	**864**	183 21%	92 11%	92 11%	92 11%	148 17%	74 9%	74 9%	74 9%	12%
B. Combined vehicle and pedestrian volume crossing artery from minor roads	50	70	60	**84**	33 40%	17 20%	17 20%	17 20%	30 35%	15 18%	15 18%	15 18%	24%

Justification 3 - Volume/Delay Combination

JUSTIFICATION	SATISFIED TO 80% OR MORE?	BOTH SATISFIED TO 80% OR MORE?
Justification 1 - Minimum Vehicular Volume	N/A	N/A
Justification 2 - Delay to Cross Traffic	N/A	

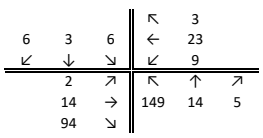
Justification 7 - Projected Volumes

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT				COMPLIANCE		
		FREE FLOW	RESTRICTED FLOW	ADJUSTED FREE FLOW	ADJUSTED RESTRICTED FLOW	SECTIONAL AHV	SECTIONAL %	ENTIRE %
1. MINIMUM VEHICULAR VOLUME	A. Vehicle volumes, all approaches (Average Hour)	480	720	720	**1080**	163	15%	15%
	B. Vehicle volume along minor roads (Average Hour)	120	170	180	**255**	80	31%	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volumes, along artery (Average Hour)	480	720	720	**1080**	83	8%	8%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads (Average Hour)	50	75	75	**113**	13	12%	

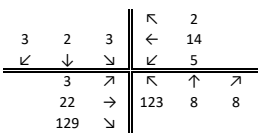
Projected Traffic Volumes:

Average Hourly Volume (AHV) Equation: AHV = (amPHV + pmPHV)/4

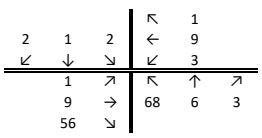
AM Peak Hour Volumes



PM Peak Hour Volumes



Average Hourly Volumes (AHV)



Eight Hour Traffic Volumes:**

Hour	Major Road						Minor Road						Ped*
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	
7:00 AM	149	14	5	6	3	6	2	14	94	9	23	3	0
8:00 AM	75	7	3	3	1	3	1	7	47	4	11	1	0
9:00 AM	75	7	3	3	1	3	1	7	47	4	11	1	0
10:00 AM	75	7	3	3	1	3	1	7	47	4	11	1	0
3:00 PM	123	8	8	3	2	3	3	22	129	5	14	2	0
4:00 PM	61	4	4	2	1	2	1	11	65	3	7	1	0
5:00 PM	61	4	4	2	1	2	1	11	65	3	7	1	0
6:00 PM	61	4	4	2	1	2	1	11	65	3	7	1	0

** Number of pedestrians crossing the major road*
*** These are projected 8-hour traffic volumes.*

Notes:

1. Vehicle volume warrant (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction should be 25% higher than the values given above.

1 Lane per Direction

2. Warrant values for free flow apply when the 85th percentile speed of artery traffic equals or exceeds 70 km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. Warrant values for restricted flow apply to large urban communities when the 85th percentile speed of artery traffic does not exceed 70 km/h.

Restricted Flow

3. The lowest sectional percentage governs the entire warrant.

4. For "T" intersections the warrant values for the minor road should be increased by 50% (Warrant 1B only).

4-legged Intersection

5. All flow values for Justification 1 and 2 are to be increased by 20% in the case of new intersections, Justification 3 is to only be used for existing intersections and all flow values for Warrant 1 and Warrant 2 of Justification 7 are to be increased by 20% for existing intersections and by 50% in the case of new intersections.

New Intersection

6. The crossing volumes are defined as the sum of:
   (a) Left-turns from both minor road approaches.
   (b) The heaviest through volume from the minor road.
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left-turn volume >120 vph
      (ii) the left-turn volume plus the opposing volume >720 vph
   (d) Pedestrians crossing the main road.

CONCLUSION: The intersection does NOT meet the minimum warrants for traffic control signals.

* "Ontario Traffic Manual, Book 12 (March 2012)", Ontario Ministry of Transportation.

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	CRT Phase 4`
2	Intersection:	Fernbank Road & Goldhawk Drive
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection will be located approximately 700m west of the Fernbank Road & Robert Grant Avenue intersection. Both roadways have or will have a two-lane cross-section.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Two-way stop-control
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	Single-lane roundabout
6	Why is a roundabout being considered?	As an alternative to two-way stop-control

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7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☒ No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes ☐ No ☒
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐ No ☒
3	Are capacity problems currently being experienced, or expected in the future? [1]	Yes ☒ No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

[1] Although slight exceedance of the acceptable capacity analysis thresholds may be experienced withing the timeframe of this study, longer-term capacity issues will be resolved through the extension of Cope Drive with Shea Road.

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Given the significant differences in directional flow (i.e. primarily east-west traffic) anticipated and the lack of suitability factors met, a roundabout is not recommended at this location.

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City of Ottawa
Roundabout Initial Feasability Screening Tool

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1	Project Name:	CRT Phase 4
2	Intersection:	Shea Road & Street #12
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection will be located approximately 230m north of the Fernbank Road & Shea Road intersection. Both roadways have or will have a two-lane cross-section.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Two-way stop-control
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	Single-lane roundabout
6	Why is a roundabout being considered?	As an alternative to two-way stop-control

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☒ No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes ☐ No ☒
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐ No ☒
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☐ No ☒
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Given the significant differences in directional flow (i.e. primarily north-south traffic) anticipated and the lack of suitability factors met, a roundabout is not recommended at this location.

City of Ottawa
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1	Project Name:	CRT Phase 4
2	Intersection:	Cope Drive & Goldhawk Drive
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection will be located approximately 750m west of the Cope Drive & Robert Grant Avenue intersection. Both roadways have or will have a two-lane cross-section.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	All-way stop-control
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	Single-lane roundabout
6	Why is a roundabout being considered?	As an alternative to all-way stop-control

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☒ No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes ☐ No ☒
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐ No ☒
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☐ No ☒
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Given the significant differences in directional flow (i.e. primarily east-west traffic) anticipated and the lack of suitability factors met, a roundabout is not recommended at this location.

City of Ottawa
Roundabout Initial Feasability Screening Tool

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1	Project Name:	CRT Phase 4
2	Intersection:	Bobolink Ridge & Goldhawk Drive
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection will be located approximately 330m south of the Abbott Street East & Goldhawk Drive intersection. Both roadways have or will have a two-lane cross-section.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	All-way stop-control
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	Single-lane roundabout
6	Why is a roundabout being considered?	As an alternative to all-way stop-control

7 Are there contra-indications for

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☐ No ☒
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes ☐ No ☒
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐ No ☒
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☐ No ☒
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Given the lack of suitability factors met, a roundabout is not recommended at this location.

Appendix I – Transportation Demand Management

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐ Not Applicable to Subdivisions
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐ Not Applicable to Subdivisions
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☐ Not Applicable to Subdivisions
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐ Not Applicable to Subdivisions
		3.2	**Transit fare incentives**	
BASIC	★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3	**Enhanced public transit service**	
BETTER	★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
		3.4	**Private transit service**	
BETTER		3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐ Not Applicable to Subdivisions
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☐ Not Applicable to Subdivisions
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐ Not Applicable to Subdivisions
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐ Not Applicable to Subdivisions
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☐ Not Applicable to Subdivisions
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐ Not Applicable to Subdivisions
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐ Not Applicable to Subdivisions

TDM measures: *Residential developments*				Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

Appendix J – Intersection Capacity Analyses

Existing (2022) Traffic

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	1	123	122	148	110	97	179
Future Vol, veh/h	1	123	122	148	110	97	179
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	9	7	4	9	10
Mvmt Flow	1	137	136	164	122	108	199
Number of Lanes	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	10.8	12.3	12.2
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	35%	0%	57%
Vol Thru, %	0%	50%	43%
Vol Right, %	65%	50%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	276	246	258
LT Vol	97	0	148
Through Vol	0	124	110
RT Vol	179	122	0
Lane Flow Rate	307	273	287
Geometry Grp	1	1	1
Degree of Util (X)	0.44	0.371	0.426
Departure Headway (Hd)	5.166	4.88	5.355
Convergence, Y/N	Yes	Yes	Yes
Cap	699	738	674
Service Time	3.181	2.9	3.383
HCM Lane V/C Ratio	0.439	0.37	0.426
HCM Control Delay	12.2	10.8	12.3
HCM Lane LOS	B	B	B
HCM 95th-tile Q	2.3	1.7	2.1

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	255	182	20	33	52
Future Vol, veh/h	35	255	182	20	33	52
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	9	4	5	0	6	6
Mvmt Flow	39	283	202	22	37	58
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	10.7	9.3	8.7
HCM LOS	B	A	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	0%	39%
Vol Thru, %	88%	90%	0%
Vol Right, %	0%	10%	61%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	290	202	85
LT Vol	35	0	33
Through Vol	255	182	0
RT Vol	0	20	52
Lane Flow Rate	322	224	94
Geometry Grp	1	1	1
Degree of Util (X)	0.408	0.281	0.13
Departure Headway (Hd)	4.556	4.514	4.938
Convergence, Y/N	Yes	Yes	Yes
Cap	789	795	724
Service Time	2.584	2.544	2.978
HCM Lane V/C Ratio	0.408	0.282	0.13
HCM Control Delay	10.7	9.3	8.7
HCM Lane LOS	B	A	A
HCM 95th-tile Q	2	1.2	0.4

Intersection	
Intersection Delay, s/veh	14.5
Intersection LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	157	76	204	191	108	152
Future Vol, veh/h	157	76	204	191	108	152
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	3	1	3	6	4	5
Mvmt Flow	174	84	227	212	120	169
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	11.4	17.4	12.8
HCM LOS	B	C	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	42%	0%	52%
Vol Thru, %	0%	67%	48%
Vol Right, %	58%	33%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	260	233	395
LT Vol	108	0	204
Through Vol	0	157	191
RT Vol	152	76	0
Lane Flow Rate	289	259	439
Geometry Grp	1	1	1
Degree of Util (X)	0.44	0.377	0.643
Departure Headway (Hd)	5.485	5.24	5.277
Convergence, Y/N	Yes	Yes	Yes
Cap	656	686	685
Service Time	3.524	3.277	3.309
HCM Lane V/C Ratio	0.441	0.378	0.641
HCM Control Delay	12.8	11.4	17.4
HCM Lane LOS	B	B	C
HCM 95th-tile Q	2.2	1.8	4.7

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	302	342	29	25	58
Future Vol, veh/h	41	302	342	29	25	58
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	4	2	7	4	5
Mvmt Flow	46	336	380	32	28	64
Number of Lanes	0	1	1	0	1	0

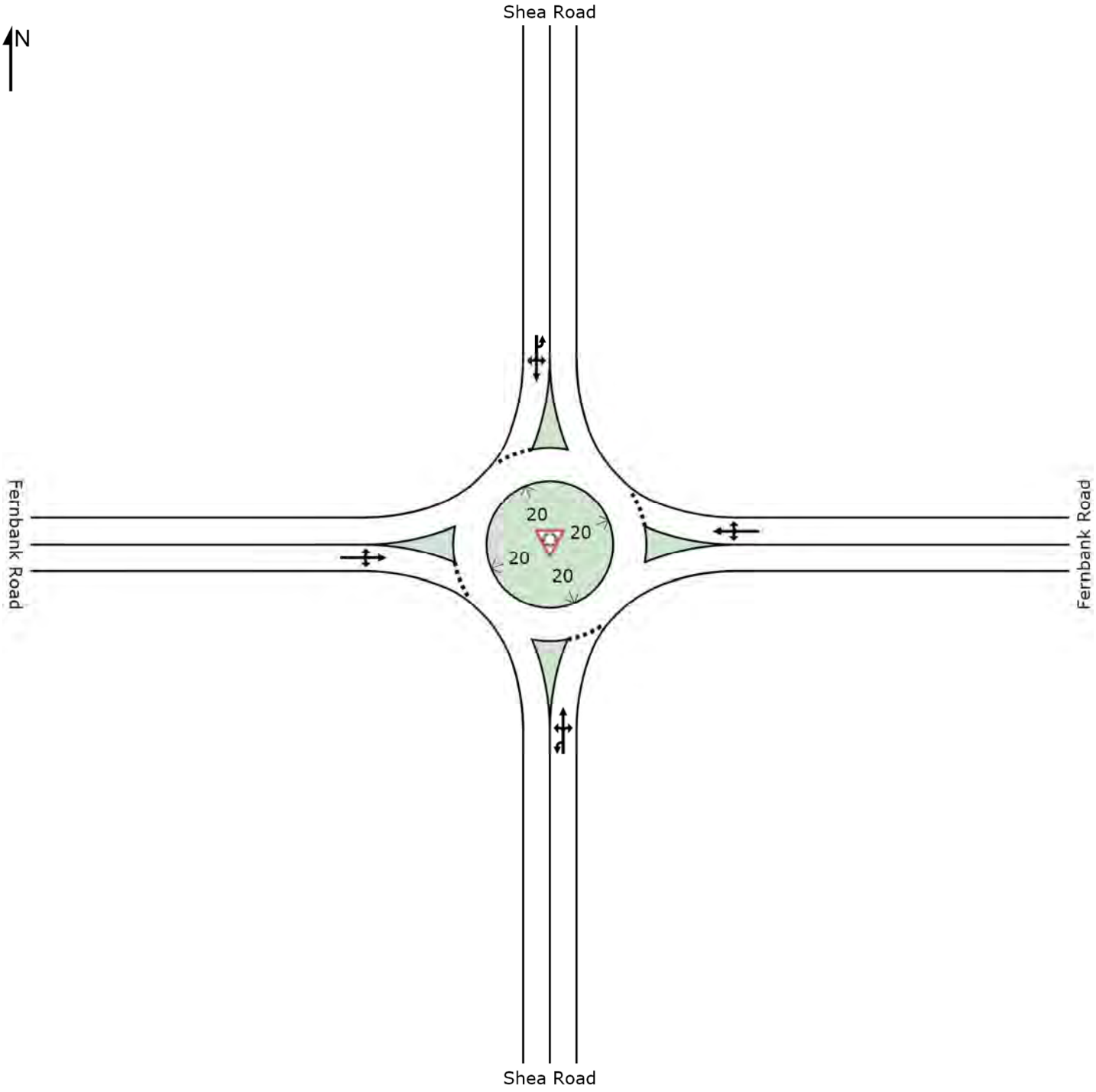
Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	12	12.5	9.2
HCM LOS	B	B	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	0%	30%
Vol Thru, %	88%	92%	0%
Vol Right, %	0%	8%	70%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	343	371	83
LT Vol	41	0	25
Through Vol	302	342	0
RT Vol	0	29	58
Lane Flow Rate	381	412	92
Geometry Grp	1	1	1
Degree of Util (X)	0.488	0.521	0.136
Departure Headway (Hd)	4.611	4.546	5.327
Convergence, Y/N	Yes	Yes	Yes
Cap	777	791	668
Service Time	2.656	2.59	3.401
HCM Lane V/C Ratio	0.49	0.521	0.138
HCM Control Delay	12	12.5	9.2
HCM Lane LOS	B	B	A
HCM 95th-tile Q	2.7	3.1	0.5

SITE LAYOUT

Site: ExistingAM

Fernbank Road & Shea Road
Existing (2022) Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: ExistingAM

Fernbank Road & Shea Road
Existing (2022) Traffic
AM Peak Hour
Roundabout

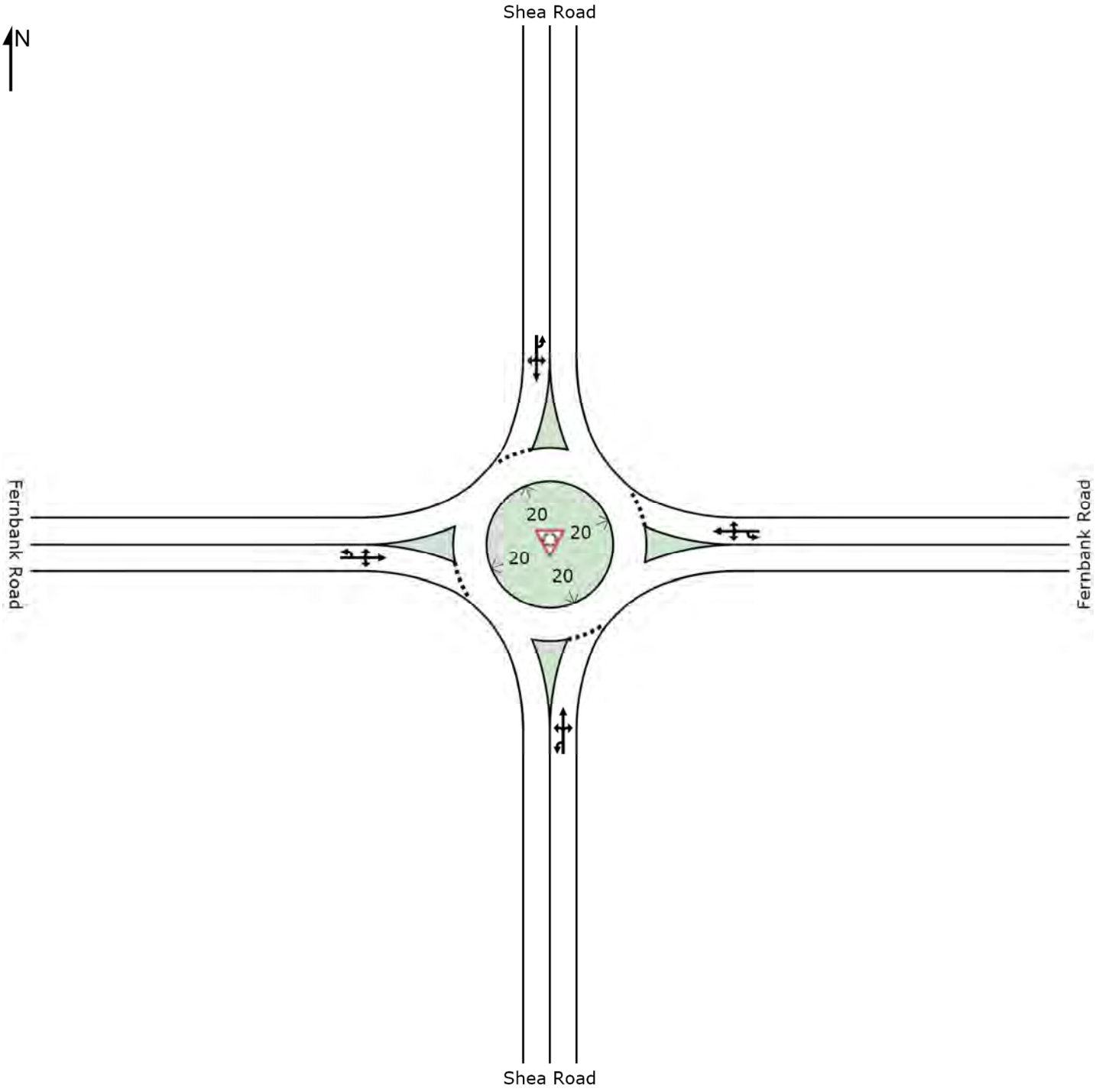
Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.417	11.9	LOS B	1.8	14.4	0.63	0.66	51.0
3	L2	28	2.0	0.417	11.9	LOS B	1.8	14.4	0.63	0.66	50.1
8	T1	178	2.0	0.417	11.9	LOS B	1.8	14.4	0.63	0.66	50.2
18	R2	56	8.0	0.417	11.9	LOS B	1.8	14.4	0.63	0.66	48.9
Approach		262	3.3	0.417	11.9	LOS B	1.8	14.4	0.63	0.66	49.9
East: Fernbank Road											
1	L2	41	2.0	0.344	9.2	LOS A	1.4	10.9	0.54	0.52	51.8
6	T1	167	2.0	0.344	9.2	LOS A	1.4	10.9	0.54	0.52	51.9
16	R2	44	2.0	0.344	9.2	LOS A	1.4	10.9	0.54	0.52	50.8
Approach		252	2.0	0.344	9.2	LOS A	1.4	10.9	0.54	0.52	51.7
North: Shea Road											
7u	U	4	50.0	0.337	7.9	LOS A	1.5	11.4	0.44	0.35	50.8
7	L2	65	2.0	0.337	7.9	LOS A	1.5	11.4	0.44	0.35	52.5
4	T1	82	2.0	0.337	7.9	LOS A	1.5	11.4	0.44	0.35	52.6
14	R2	140	2.0	0.337	7.9	LOS A	1.5	11.4	0.44	0.35	51.5
Approach		291	2.7	0.337	7.9	LOS A	1.5	11.4	0.44	0.35	52.0
West: Fernbank Road											
5	L2	192	2.0	0.547	11.4	LOS B	3.2	24.9	0.52	0.41	49.6
2	T1	281	2.0	0.547	11.4	LOS B	3.2	24.9	0.52	0.41	49.7
12	R2	24	2.0	0.547	11.4	LOS B	3.2	24.9	0.52	0.41	48.7
Approach		497	2.0	0.547	11.4	LOS B	3.2	24.9	0.52	0.41	49.6
All Vehicles		1302	2.4	0.547	10.3	LOS B	3.2	24.9	0.53	0.47	50.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: ExistingPM

Fernbank Road & Shea Road
Existing (2022) Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: ExistingPM

Fernbank Road & Shea Road
Existing (2022) Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

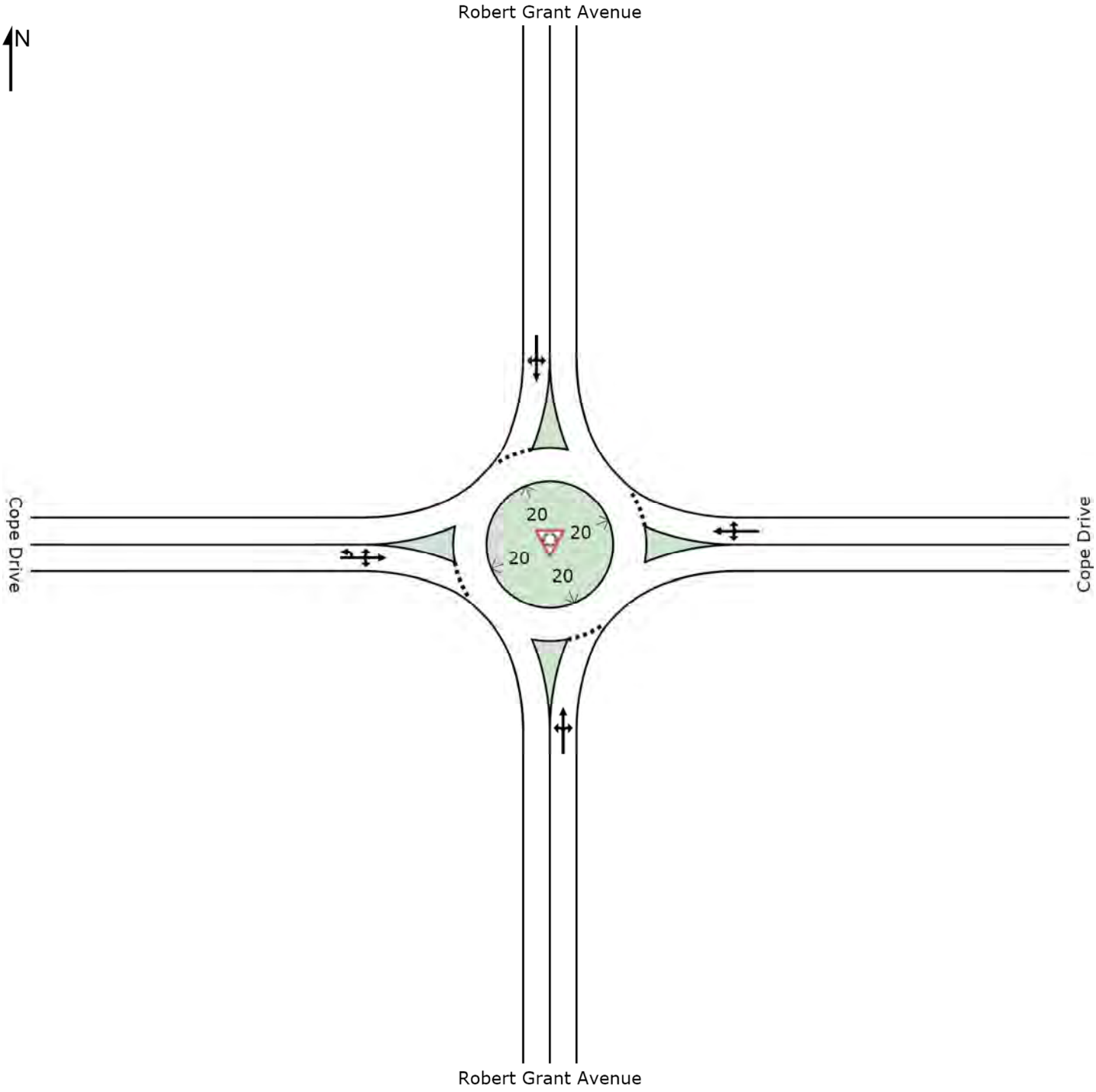
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.270	7.7	LOS A	1.1	8.2	0.48	0.43	53.6
3	L2	46	2.0	0.270	7.7	LOS A	1.1	8.2	0.48	0.43	52.6
8	T1	104	2.0	0.270	7.7	LOS A	1.1	8.2	0.48	0.43	52.8
18	R2	58	6.0	0.270	7.7	LOS A	1.1	8.2	0.48	0.43	51.5
Approach		209	3.1	0.270	7.7	LOS A	1.1	8.2	0.48	0.43	52.4
East: Fernbank Road											
1u	U	1	0.0	0.606	13.9	LOS B	4.0	31.5	0.62	0.58	49.3
1	L2	101	11.0	0.606	13.9	LOS B	4.0	31.5	0.62	0.58	48.1
6	T1	259	3.0	0.606	13.9	LOS B	4.0	31.5	0.62	0.58	48.6
16	R2	137	3.0	0.606	13.9	LOS B	4.0	31.5	0.62	0.58	47.6
Approach		498	4.6	0.606	13.9	LOS B	4.0	31.5	0.62	0.58	48.2
North: Shea Road											
7u	U	4	50.0	0.419	10.8	LOS B	1.9	14.8	0.58	0.60	48.8
7	L2	68	0.0	0.419	10.8	LOS B	1.9	14.8	0.58	0.60	50.5
4	T1	114	0.0	0.419	10.8	LOS B	1.9	14.8	0.58	0.60	50.6
14	R2	109	9.0	0.419	10.8	LOS B	1.9	14.8	0.58	0.60	49.2
Approach		296	4.1	0.419	10.8	LOS B	1.9	14.8	0.58	0.60	50.0
West: Fernbank Road											
5u	U	2	50.0	0.367	8.9	LOS A	1.6	12.4	0.49	0.43	49.7
5	L2	106	4.0	0.367	8.9	LOS A	1.6	12.4	0.49	0.43	51.3
2	T1	157	3.0	0.367	8.9	LOS A	1.6	12.4	0.49	0.43	51.5
12	R2	31	4.0	0.367	8.9	LOS A	1.6	12.4	0.49	0.43	50.3
Approach		295	3.8	0.367	8.9	LOS A	1.6	12.4	0.49	0.43	51.3
All Vehicles		1297	4.1	0.606	11.1	LOS B	4.0	31.5	0.56	0.53	49.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: EX2022AM

Robert Grant Avenue & Cope Drive
Existing (2022) Traffic
AM Peak Hour
Roundabout



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MOVEMENT SUMMARY

Site: EX2022AM

Robert Grant Avenue & Cope Drive
Existing (2022) Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

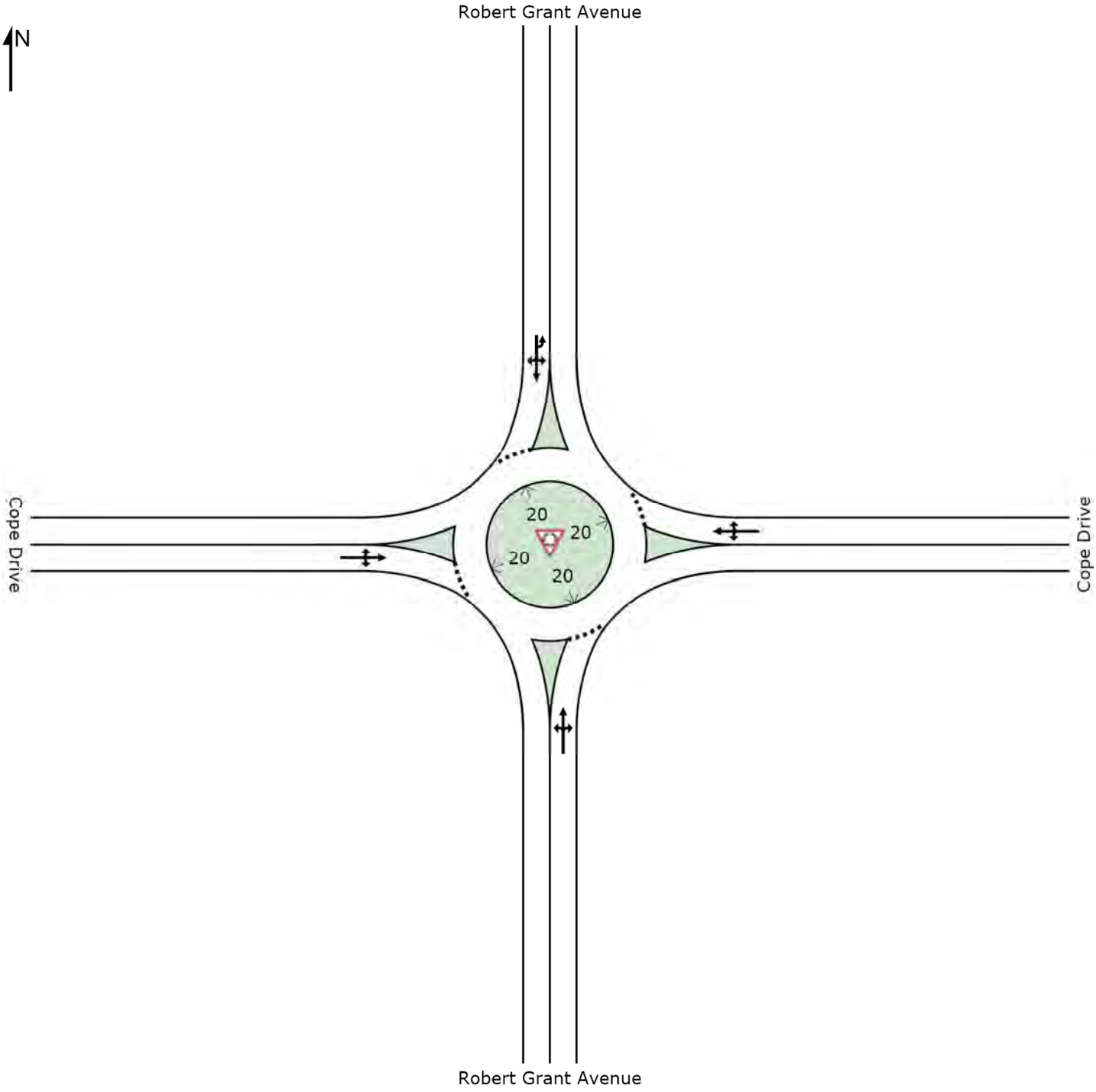
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	6	2.0	0.259	5.8	LOS A	1.1	8.8	0.12	0.04	54.8
8	T1	244	2.0	0.259	5.8	LOS A	1.1	8.8	0.12	0.04	55.0
18	R2	29	2.0	0.259	5.8	LOS A	1.1	8.8	0.12	0.04	53.8
Approach		279	2.0	0.259	5.8	LOS A	1.1	8.8	0.12	0.04	54.9
East: Cope Drive											
1	L2	23	2.0	0.061	4.8	LOS A	0.2	1.6	0.35	0.24	54.2
6	T1	1	2.0	0.061	4.8	LOS A	0.2	1.6	0.35	0.24	54.4
16	R2	28	2.0	0.061	4.8	LOS A	0.2	1.6	0.35	0.24	53.1
Approach		52	2.0	0.061	4.8	LOS A	0.2	1.6	0.35	0.24	53.6
North: Robert Grant Avenue											
7	L2	21	2.0	0.151	4.7	LOS A	0.6	4.5	0.12	0.04	55.3
4	T1	140	2.0	0.151	4.7	LOS A	0.6	4.5	0.12	0.04	55.5
14	R2	1	2.0	0.151	4.7	LOS A	0.6	4.5	0.12	0.04	54.2
Approach		162	2.0	0.151	4.7	LOS A	0.6	4.5	0.12	0.04	55.5
West: Cope Drive											
5u	U	1	2.0	0.013	4.0	LOS A	0.0	0.3	0.29	0.15	56.6
5	L2	1	2.0	0.013	4.0	LOS A	0.0	0.3	0.29	0.15	55.6
2	T1	3	2.0	0.013	4.0	LOS A	0.0	0.3	0.29	0.15	55.8
12	R2	7	2.0	0.013	4.0	LOS A	0.0	0.3	0.29	0.15	54.5
Approach		12	2.0	0.013	4.0	LOS A	0.0	0.3	0.29	0.15	55.1
All Vehicles		506	2.0	0.259	5.3	LOS A	1.1	8.8	0.15	0.06	54.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: EX2022PM

Robert Grant Avenue & Cope Drive
Existing (2022) Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: EX2022PM

Robert Grant Avenue & Cope Drive
Existing (2022) Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	7	2.0	0.177	4.9	LOS A	0.7	5.4	0.11	0.03	55.5
8	T1	159	2.0	0.177	4.9	LOS A	0.7	5.4	0.11	0.03	55.7
18	R2	26	2.0	0.177	4.9	LOS A	0.7	5.4	0.11	0.03	54.4
Approach		191	2.0	0.177	4.9	LOS A	0.7	5.4	0.11	0.03	55.5
East: Cope Drive											
1	L2	39	2.0	0.079	4.6	LOS A	0.3	2.1	0.29	0.18	54.0
6	T1	1	2.0	0.079	4.6	LOS A	0.3	2.1	0.29	0.18	54.2
16	R2	33	2.0	0.079	4.6	LOS A	0.3	2.1	0.29	0.18	53.0
Approach		73	2.0	0.079	4.6	LOS A	0.3	2.1	0.29	0.18	53.5
North: Robert Grant Avenue											
7u	U	1	2.0	0.239	5.7	LOS A	1.0	7.8	0.17	0.07	55.7
7	L2	17	2.0	0.239	5.7	LOS A	1.0	7.8	0.17	0.07	54.7
4	T1	233	2.0	0.239	5.7	LOS A	1.0	7.8	0.17	0.07	54.9
14	R2	1	2.0	0.239	5.7	LOS A	1.0	7.8	0.17	0.07	53.7
Approach		252	2.0	0.239	5.7	LOS A	1.0	7.8	0.17	0.07	54.9
West: Cope Drive											
5	L2	4	2.0	0.023	4.6	LOS A	0.1	0.6	0.36	0.24	55.1
2	T1	2	2.0	0.023	4.6	LOS A	0.1	0.6	0.36	0.24	55.3
12	R2	12	2.0	0.023	4.6	LOS A	0.1	0.6	0.36	0.24	54.0
Approach		19	2.0	0.023	4.6	LOS A	0.1	0.6	0.36	0.24	54.4
All Vehicles		536	2.0	0.239	5.2	LOS A	1.0	7.8	0.17	0.08	54.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Future (2025) Background Traffic

Intersection	
Intersection Delay, s/veh	18.8
Intersection LOS	C

Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	1	141	172	188	139	179	309
Future Vol, veh/h	1	141	172	188	139	179	309
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	5	9	7	4	9	10
Mvmt Flow	1	141	172	188	139	179	309
Number of Lanes	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	14	16.6	23.4
HCM LOS	B	C	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	45%	43%
Vol Right, %	63%	55%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	488	314	327
LT Vol	179	0	188
Through Vol	0	141	139
RT Vol	309	173	0
Lane Flow Rate	488	314	327
Geometry Grp	1	1	1
Degree of Util (X)	0.75	0.489	0.554
Departure Headway (Hd)	5.532	5.603	6.104
Convergence, Y/N	Yes	Yes	Yes
Cap	649	637	589
Service Time	3.596	3.681	4.182
HCM Lane V/C Ratio	0.752	0.493	0.555
HCM Control Delay	23.4	14	16.6
HCM Lane LOS	C	B	C
HCM 95th-tile Q	6.7	2.7	3.4

Intersection	
Intersection Delay, s/veh	5
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	285	182	20	33	52
Future Vol, veh/h	35	285	182	20	33	52
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	9	4	5	0	6	6
Mvmt Flow	35	285	182	20	33	52
Number of Lanes	0	1	1	0	0	0

Approach	EB	WB
Opposing Approach	WB	EB
Opposing Lanes	1	1
Conflicting Approach Left		
Conflicting Lanes Left	0	0
Conflicting Approach Right		
Conflicting Lanes Right	0	0
HCM Control Delay	5	5
HCM LOS	A	A

Lane	EBLn1	WBLn1
Vol Left, %	11%	0%
Vol Thru, %	89%	90%
Vol Right, %	0%	10%
Sign Control	Stop	Stop
Traffic Vol by Lane	320	202
LT Vol	35	0
Through Vol	285	182
RT Vol	0	20
Lane Flow Rate	320	202
Geometry Grp	0	0
Degree of Util (X)	0	0
Departure Headway (Hd)	0	0
Convergence, Y/N	Yes	Yes
Cap	0	0
Service Time	0	0
HCM Lane V/C Ratio	0	0
HCM Control Delay	5	5
HCM Lane LOS	N	N
HCM 95th-tile Q	0	0

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	471	319	53	70	25
Future Vol, veh/h	22	471	319	53	70	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	471	319	53	70	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	372	0	-	0	834	319
Stage 1	-	-	-	-	319	-
Stage 2	-	-	-	-	515	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1186	-	-	-	338	722
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	600	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1186	-	-	-	332	722
Mov Cap-2 Maneuver	-	-	-	-	332	-
Stage 1	-	-	-	-	723	-
Stage 2	-	-	-	-	600	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	17.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1186	-	-	-	387
HCM Lane V/C Ratio	0.019	-	-	-	0.245
HCM Control Delay (s)	8.1	-	-	-	17.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	184	176	278	208	156	262
Future Vol, veh/h	184	176	278	208	156	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	3	1	3	6	4	5
Mvmt Flow	184	176	278	208	156	262
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	17.3	31.5	22.3
HCM LOS	C	D	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	51%	43%
Vol Right, %	63%	49%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	418	360	486
LT Vol	156	0	278
Through Vol	0	184	208
RT Vol	262	176	0
Lane Flow Rate	418	360	486
Geometry Grp	1	1	1
Degree of Util (X)	0.705	0.593	0.824
Departure Headway (Hd)	6.073	5.933	6.105
Convergence, Y/N	Yes	Yes	Yes
Cap	598	608	593
Service Time	4.095	3.976	4.131
HCM Lane V/C Ratio	0.699	0.592	0.82
HCM Control Delay	22.3	17.3	31.5
HCM Lane LOS	C	C	D
HCM 95th-tile Q	5.7	3.9	8.5

Intersection	
Intersection Delay, s/veh	5
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	322	342	29	25	58
Future Vol, veh/h	41	322	342	29	25	58
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	4	2	7	4	5
Mvmt Flow	41	322	342	29	25	58
Number of Lanes	0	1	1	0	0	0

Approach	EB	WB
Opposing Approach	WB	EB
Opposing Lanes	1	1
Conflicting Approach Left		
Conflicting Lanes Left	0	0
Conflicting Approach Right		
Conflicting Lanes Right	0	0
HCM Control Delay	5	5
HCM LOS	A	A

Lane	EBLn1	WBLn1
Vol Left, %	11%	0%
Vol Thru, %	89%	92%
Vol Right, %	0%	8%
Sign Control	Stop	Stop
Traffic Vol by Lane	363	371
LT Vol	41	0
Through Vol	322	342
RT Vol	0	29
Lane Flow Rate	363	371
Geometry Grp	0	0
Degree of Util (X)	0	0
Departure Headway (Hd)	0	0
Convergence, Y/N	Yes	Yes
Cap	0	0
Service Time	0	0
HCM Lane V/C Ratio	0	0
HCM Control Delay	5	5
HCM Lane LOS	N	N
HCM 95th-tile Q	0	0

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	457	697	95	53	19
Future Vol, veh/h	38	457	697	95	53	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	457	697	95	53	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	792	0	-	0	1230	697
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	533	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	838	-	-	-	198	444
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	593	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	838	-	-	-	189	444
Mov Cap-2 Maneuver	-	-	-	-	189	-
Stage 1	-	-	-	-	476	-
Stage 2	-	-	-	-	593	-

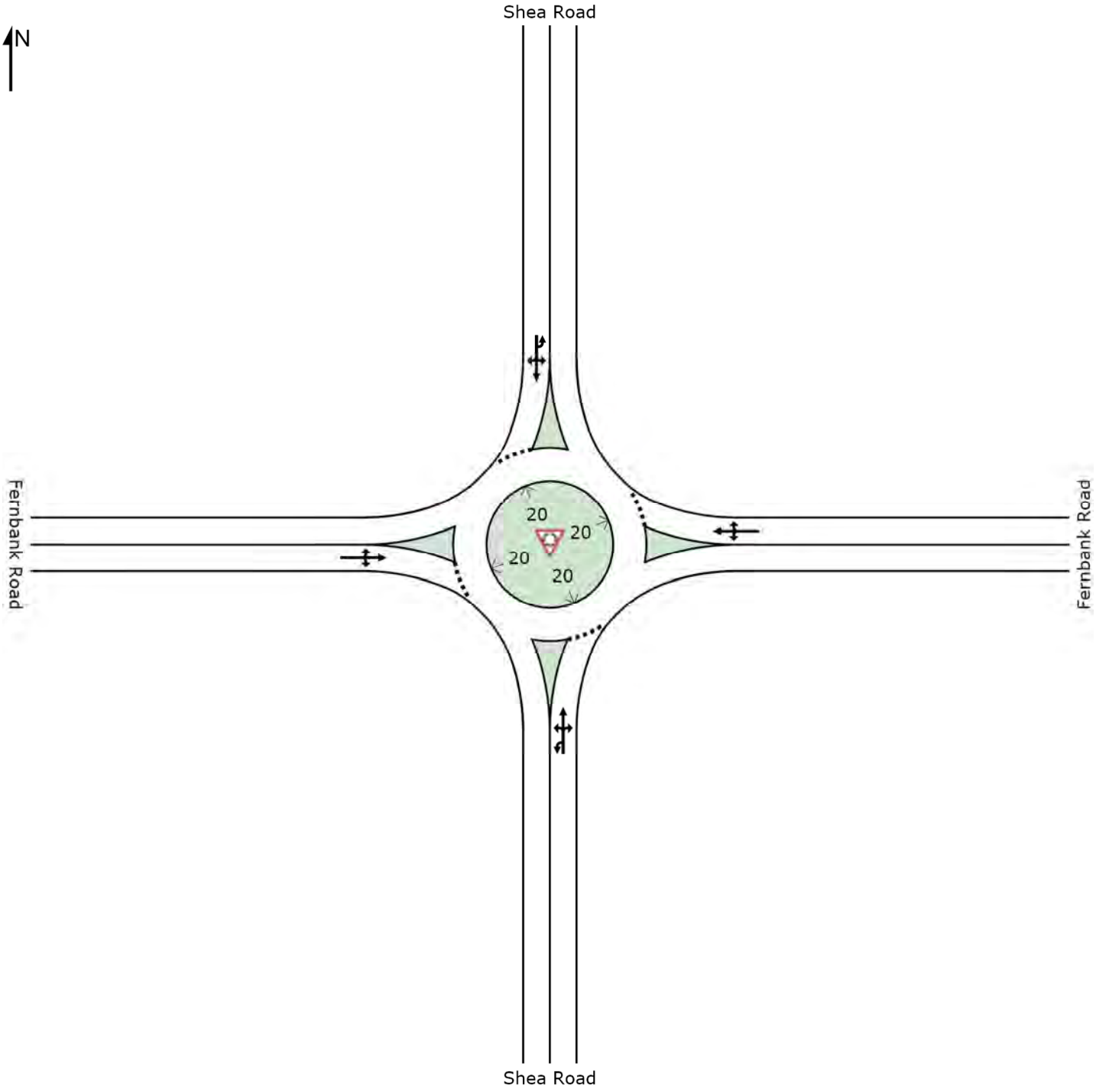
Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	28.7
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	838	-	-	-	223
HCM Lane V/C Ratio	0.045	-	-	-	0.323
HCM Control Delay (s)	9.5	-	-	-	28.7
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.3

SITE LAYOUT

Site: BG2025AM

Fernbank Road & Shea Road
Future (2025) Background Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2025AM

Fernbank Road & Shea Road
Future (2025) Background Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

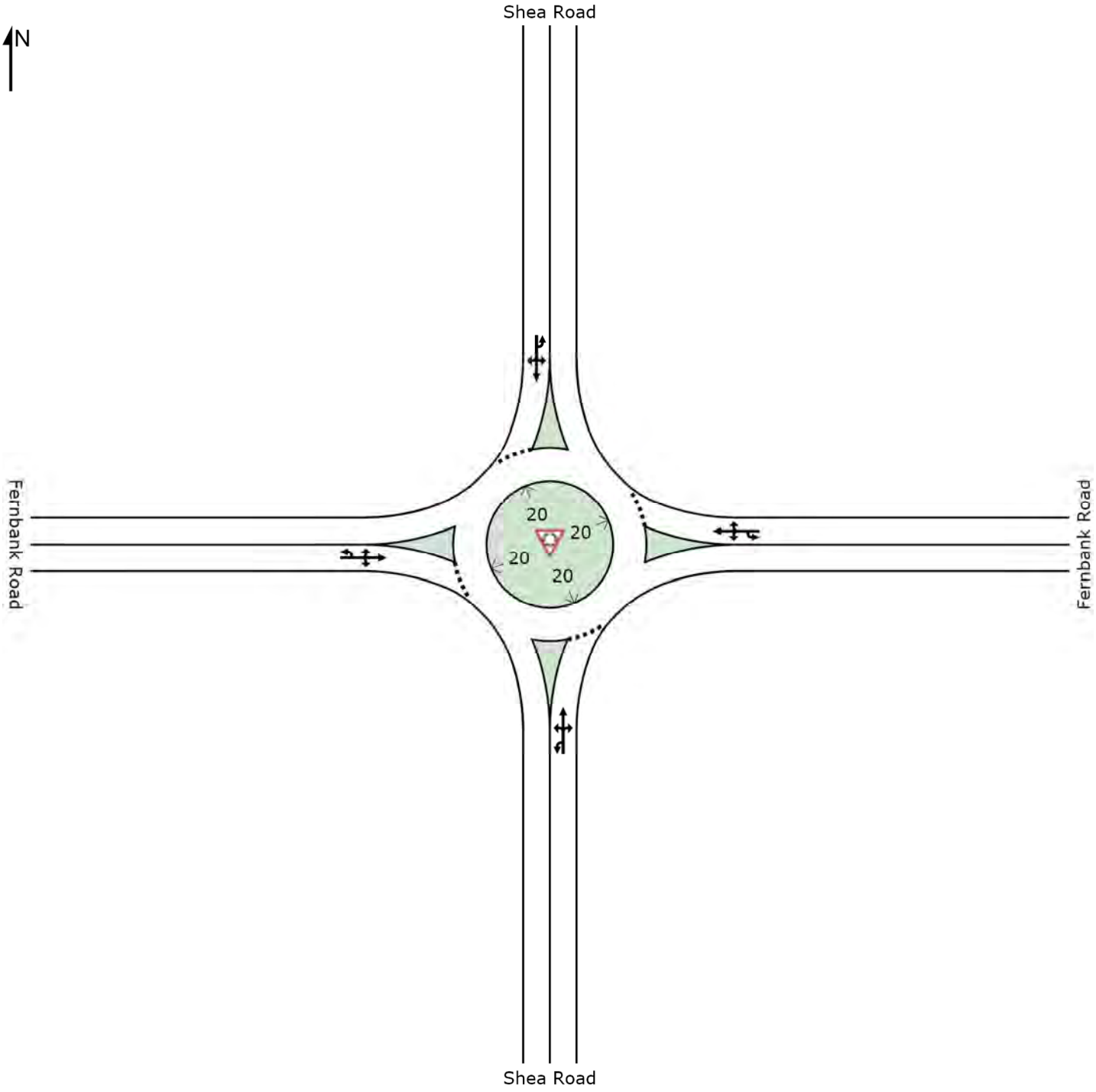
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.453	14.8	LOS B	2.0	15.5	0.68	0.73	49.0
3	L2	25	2.0	0.453	14.8	LOS B	2.0	15.5	0.68	0.73	48.2
8	T1	160	2.0	0.453	14.8	LOS B	2.0	15.5	0.68	0.73	48.3
18	R2	50	8.0	0.453	14.8	LOS B	2.0	15.5	0.68	0.73	47.1
Approach		236	3.3	0.453	14.8	LOS B	2.0	15.5	0.68	0.73	48.1
East: Fernbank Road											
1	L2	41	2.0	0.493	11.8	LOS B	2.6	20.2	0.61	0.63	50.1
6	T1	274	2.0	0.493	11.8	LOS B	2.6	20.2	0.61	0.63	50.2
16	R2	54	2.0	0.493	11.8	LOS B	2.6	20.2	0.61	0.63	49.2
Approach		369	2.0	0.493	11.8	LOS B	2.6	20.2	0.61	0.63	50.1
North: Shea Road											
7u	U	4	50.0	0.408	9.8	LOS A	1.8	14.2	0.54	0.50	49.3
7	L2	91	2.0	0.408	9.8	LOS A	1.8	14.2	0.54	0.50	50.9
4	T1	82	2.0	0.408	9.8	LOS A	1.8	14.2	0.54	0.50	51.1
14	R2	140	2.0	0.408	9.8	LOS A	1.8	14.2	0.54	0.50	50.0
Approach		317	2.6	0.408	9.8	LOS A	1.8	14.2	0.54	0.50	50.5
West: Fernbank Road											
5	L2	192	2.0	0.739	18.4	LOS C	7.3	56.6	0.74	0.68	45.6
2	T1	438	2.0	0.739	18.4	LOS C	7.3	56.6	0.74	0.68	45.7
12	R2	24	2.0	0.739	18.4	LOS C	7.3	56.6	0.74	0.68	44.9
Approach		654	2.0	0.739	18.4	LOS C	7.3	56.6	0.74	0.68	45.7
All Vehicles		1576	2.3	0.739	14.6	LOS B	7.3	56.6	0.66	0.64	47.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2025PM

Fernbank Road & Shea Road
Future (2025) Background Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2025PM

Fernbank Road & Shea Road
Future (2025) Background Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

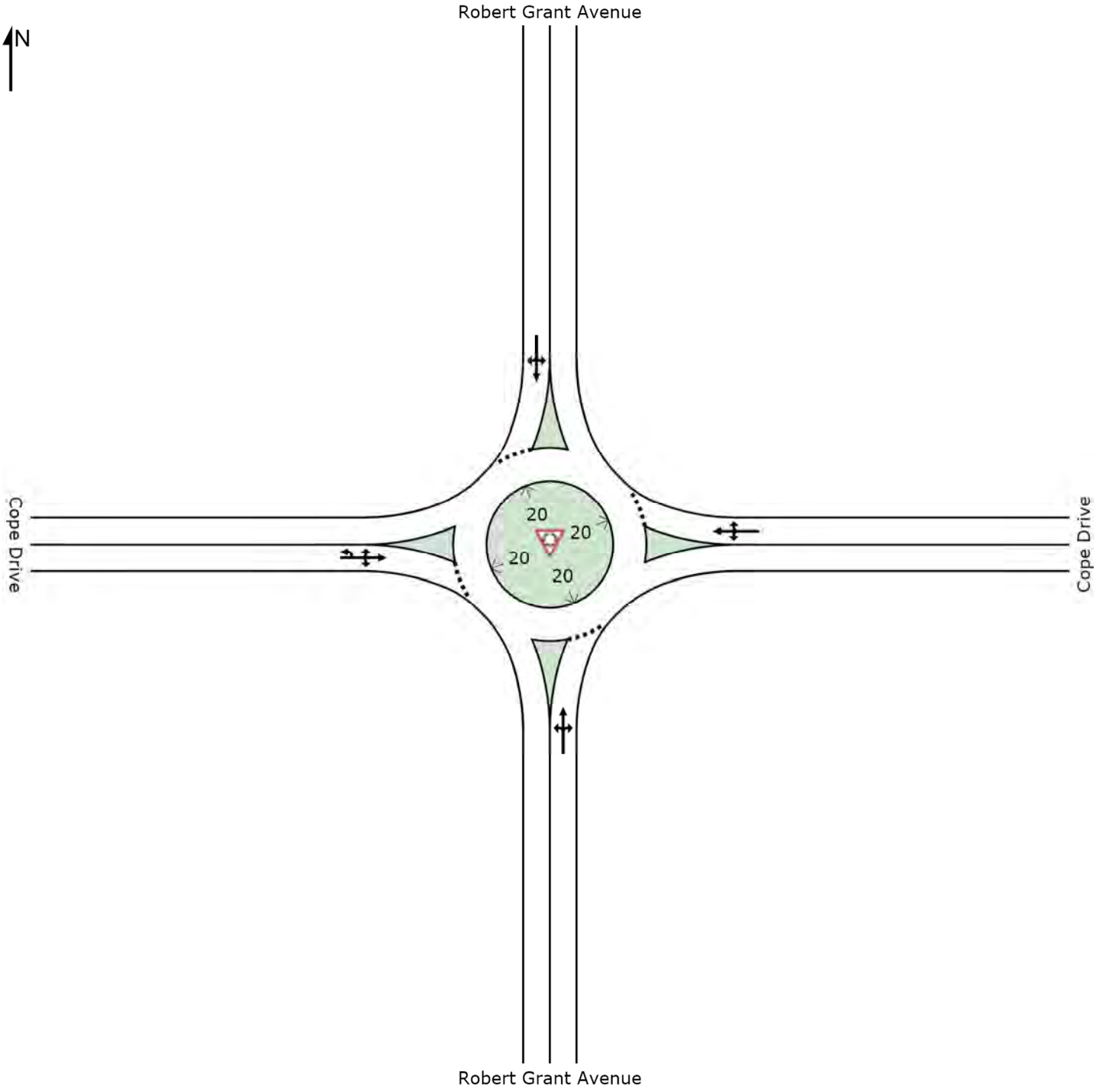
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.286	9.1	LOS A	1.1	8.4	0.56	0.56	52.6
3	L2	41	2.0	0.286	9.1	LOS A	1.1	8.4	0.56	0.56	51.6
8	T1	94	2.0	0.286	9.1	LOS A	1.1	8.4	0.56	0.56	51.8
18	R2	52	6.0	0.286	9.1	LOS A	1.1	8.4	0.56	0.56	50.5
Approach		188	3.1	0.286	9.1	LOS A	1.1	8.4	0.56	0.56	51.4
East: Fernbank Road											
1u	U	1	0.0	0.793	22.3	LOS C	8.8	68.8	0.81	0.81	44.5
1	L2	91	11.0	0.793	22.3	LOS C	8.8	68.8	0.81	0.81	43.5
6	T1	429	3.0	0.793	22.3	LOS C	8.8	68.8	0.81	0.81	43.9
16	R2	152	3.0	0.793	22.3	LOS C	8.8	68.8	0.81	0.81	43.1
Approach		673	4.1	0.793	22.3	LOS C	8.8	68.8	0.81	0.81	43.7
North: Shea Road											
7u	U	4	50.0	0.471	13.5	LOS B	2.2	17.3	0.66	0.71	47.0
7	L2	79	0.0	0.471	13.5	LOS B	2.2	17.3	0.66	0.71	48.6
4	T1	103	0.0	0.471	13.5	LOS B	2.2	17.3	0.66	0.71	48.7
14	R2	98	9.0	0.471	13.5	LOS B	2.2	17.3	0.66	0.71	47.4
Approach		284	3.8	0.471	13.5	LOS B	2.2	17.3	0.66	0.71	48.1
West: Fernbank Road											
5u	U	2	50.0	0.539	12.1	LOS B	3.1	24.4	0.58	0.54	48.1
5	L2	95	4.0	0.539	12.1	LOS B	3.1	24.4	0.58	0.54	49.5
2	T1	315	3.0	0.539	12.1	LOS B	3.1	24.4	0.58	0.54	49.7
12	R2	28	4.0	0.539	12.1	LOS B	3.1	24.4	0.58	0.54	48.6
Approach		440	3.5	0.539	12.1	LOS B	3.1	24.4	0.58	0.54	49.6
All Vehicles		1585	3.8	0.793	16.4	LOS C	8.8	68.8	0.69	0.69	46.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2025AM

Robert Grant Avenue & Cope Drive
Future (2025) Background Traffic
AM Peak Hour
Roundabout



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MOVEMENT SUMMARY

Site: BG2025AM

Robert Grant Avenue & Cope Drive
Future (2025) Background Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

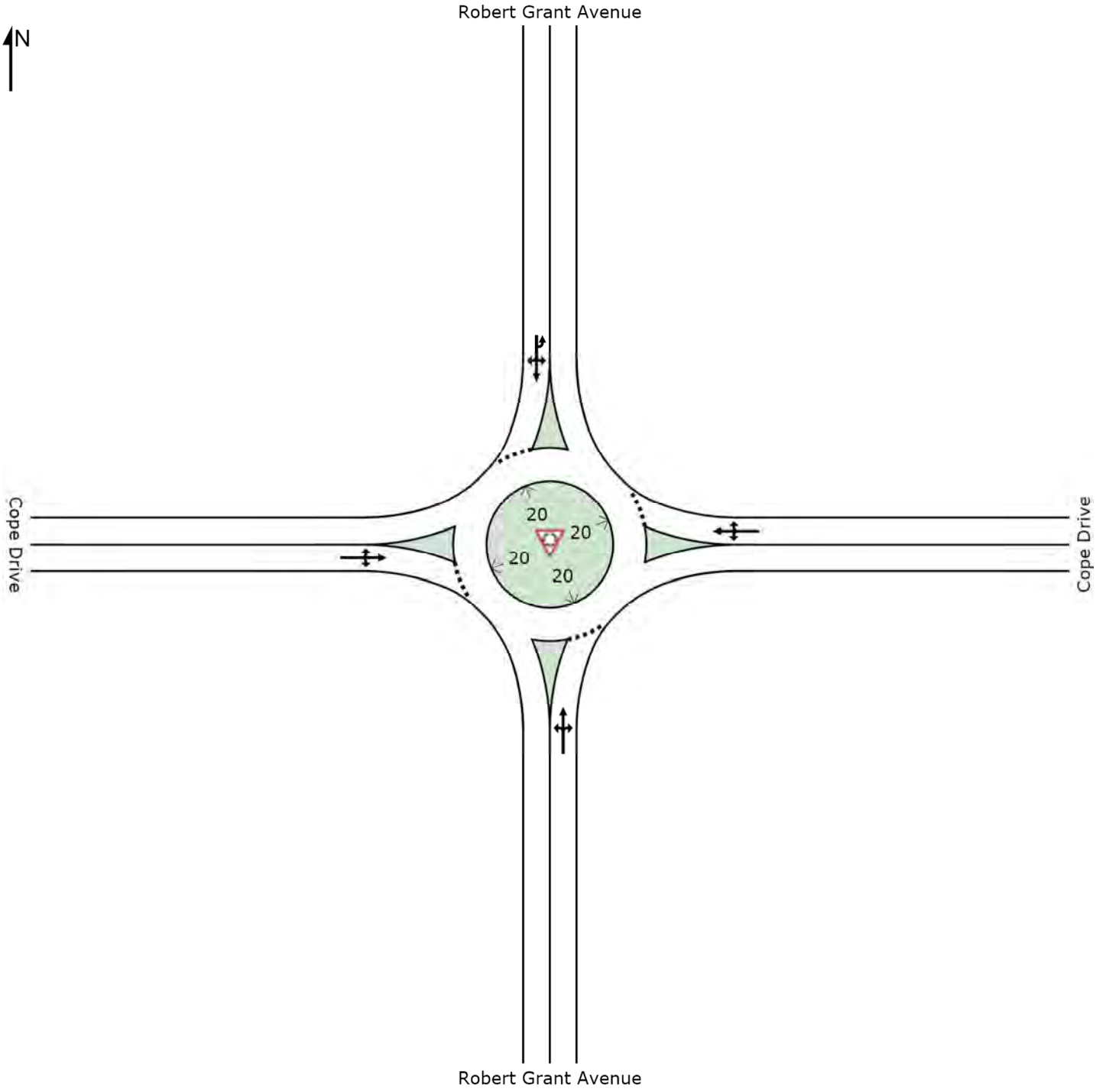
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	72	2.0	0.562	13.1	LOS B	3.5	26.7	0.63	0.64	49.1
8	T1	329	2.0	0.562	13.1	LOS B	3.5	26.7	0.63	0.64	49.2
18	R2	41	2.0	0.562	13.1	LOS B	3.5	26.7	0.63	0.64	48.2
Approach		442	2.0	0.562	13.1	LOS B	3.5	26.7	0.63	0.64	49.1
East: Cope Drive											
1	L2	35	2.0	0.341	10.4	LOS B	1.4	10.5	0.60	0.61	50.9
6	T1	58	2.0	0.341	10.4	LOS B	1.4	10.5	0.60	0.61	51.1
16	R2	120	2.0	0.341	10.4	LOS B	1.4	10.5	0.60	0.61	50.0
Approach		213	2.0	0.341	10.4	LOS B	1.4	10.5	0.60	0.61	50.4
North: Robert Grant Avenue											
7	L2	112	2.0	0.494	10.0	LOS B	2.7	21.1	0.45	0.33	50.9
4	T1	211	2.0	0.494	10.0	LOS B	2.7	21.1	0.45	0.33	51.1
14	R2	139	2.0	0.494	10.0	LOS B	2.7	21.1	0.45	0.33	50.0
Approach		462	2.0	0.494	10.0	LOS B	2.7	21.1	0.45	0.33	50.7
West: Cope Drive											
5u	U	1	2.0	0.384	9.5	LOS A	1.7	12.9	0.54	0.50	51.2
5	L2	160	2.0	0.384	9.5	LOS A	1.7	12.9	0.54	0.50	50.4
2	T1	63	2.0	0.384	9.5	LOS A	1.7	12.9	0.54	0.50	50.5
12	R2	71	2.0	0.384	9.5	LOS A	1.7	12.9	0.54	0.50	49.5
Approach		295	2.0	0.384	9.5	LOS A	1.7	12.9	0.54	0.50	50.2
All Vehicles		1412	2.0	0.562	10.9	LOS B	3.5	26.7	0.55	0.51	50.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2025PM

Robert Grant Avenue & Cope Drive
Future (2025) Background Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2025PM

Robert Grant Avenue & Cope Drive
Future (2025) Background Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	63	2.0	0.439	9.5	LOS A	2.2	16.6	0.49	0.40	51.5
8	T1	279	2.0	0.439	9.5	LOS A	2.2	16.6	0.49	0.40	51.7
18	R2	40	2.0	0.439	9.5	LOS A	2.2	16.6	0.49	0.40	50.6
Approach		382	2.0	0.439	9.5	LOS A	2.2	16.6	0.49	0.40	51.5
East: Cope Drive											
1	L2	50	2.0	0.234	8.0	LOS A	0.9	6.7	0.53	0.51	52.2
6	T1	39	2.0	0.234	8.0	LOS A	0.9	6.7	0.53	0.51	52.3
16	R2	72	2.0	0.234	8.0	LOS A	0.9	6.7	0.53	0.51	51.2
Approach		161	2.0	0.234	8.0	LOS A	0.9	6.7	0.53	0.51	51.8
North: Robert Grant Avenue											
7u	U	1	2.0	0.567	11.5	LOS B	3.5	27.4	0.49	0.35	51.1
7	L2	70	2.0	0.567	11.5	LOS B	3.5	27.4	0.49	0.35	50.3
4	T1	322	2.0	0.567	11.5	LOS B	3.5	27.4	0.49	0.35	50.4
14	R2	145	2.0	0.567	11.5	LOS B	3.5	27.4	0.49	0.35	49.3
Approach		538	2.0	0.567	11.5	LOS B	3.5	27.4	0.49	0.35	50.1
West: Cope Drive											
5	L2	124	2.0	0.323	9.1	LOS A	1.3	10.0	0.55	0.55	50.6
2	T1	41	2.0	0.323	9.1	LOS A	1.3	10.0	0.55	0.55	50.8
12	R2	63	2.0	0.323	9.1	LOS A	1.3	10.0	0.55	0.55	49.7
Approach		228	2.0	0.323	9.1	LOS A	1.3	10.0	0.55	0.55	50.4
All Vehicles		1309	2.0	0.567	10.1	LOS B	3.5	27.4	0.50	0.42	50.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Future (2030) Background Traffic

Intersection	
Intersection Delay, s/veh	18.8
Intersection LOS	C

Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	1	141	172	188	139	179	309
Future Vol, veh/h	1	141	172	188	139	179	309
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	5	9	7	4	9	10
Mvmt Flow	1	141	172	188	139	179	309
Number of Lanes	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	14	16.6	23.4
HCM LOS	B	C	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	45%	43%
Vol Right, %	63%	55%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	488	314	327
LT Vol	179	0	188
Through Vol	0	141	139
RT Vol	309	173	0
Lane Flow Rate	488	314	327
Geometry Grp	1	1	1
Degree of Util (X)	0.75	0.489	0.554
Departure Headway (Hd)	5.532	5.603	6.104
Convergence, Y/N	Yes	Yes	Yes
Cap	649	637	589
Service Time	3.596	3.681	4.182
HCM Lane V/C Ratio	0.752	0.493	0.555
HCM Control Delay	23.4	14	16.6
HCM Lane LOS	C	B	C
HCM 95th-tile Q	6.7	2.7	3.4

Intersection	
Intersection Delay, s/veh	5
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	285	182	20	33	52
Future Vol, veh/h	35	285	182	20	33	52
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	9	4	5	0	6	6
Mvmt Flow	35	285	182	20	33	52
Number of Lanes	0	1	1	0	0	0

Approach	EB	WB
Opposing Approach	WB	EB
Opposing Lanes	1	1
Conflicting Approach Left		
Conflicting Lanes Left	0	0
Conflicting Approach Right		
Conflicting Lanes Right	0	0
HCM Control Delay	5	5
HCM LOS	A	A

Lane	EBLn1	WBLn1
Vol Left, %	11%	0%
Vol Thru, %	89%	90%
Vol Right, %	0%	10%
Sign Control	Stop	Stop
Traffic Vol by Lane	320	202
LT Vol	35	0
Through Vol	285	182
RT Vol	0	20
Lane Flow Rate	320	202
Geometry Grp	0	0
Degree of Util (X)	0	0
Departure Headway (Hd)	0	0
Convergence, Y/N	Yes	Yes
Cap	0	0
Service Time	0	0
HCM Lane V/C Ratio	0	0
HCM Control Delay	5	5
HCM Lane LOS	N	N
HCM 95th-tile Q	0	0

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	506	343	53	70	25
Future Vol, veh/h	22	506	343	53	70	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	506	343	53	70	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	396	0	-	0	893	343
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	550	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1163	-	-	-	312	700
Stage 1	-	-	-	-	719	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1163	-	-	-	306	700
Mov Cap-2 Maneuver	-	-	-	-	306	-
Stage 1	-	-	-	-	705	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	18.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1163	-	-	-	359
HCM Lane V/C Ratio	0.019	-	-	-	0.265
HCM Control Delay (s)	8.2	-	-	-	18.6
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	184	176	278	208	156	262
Future Vol, veh/h	184	176	278	208	156	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	3	1	3	6	4	5
Mvmt Flow	184	176	278	208	156	262
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	17.3	31.5	22.3
HCM LOS	C	D	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	51%	43%
Vol Right, %	63%	49%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	418	360	486
LT Vol	156	0	278
Through Vol	0	184	208
RT Vol	262	176	0
Lane Flow Rate	418	360	486
Geometry Grp	1	1	1
Degree of Util (X)	0.705	0.593	0.824
Departure Headway (Hd)	6.073	5.933	6.105
Convergence, Y/N	Yes	Yes	Yes
Cap	598	608	593
Service Time	4.095	3.976	4.131
HCM Lane V/C Ratio	0.699	0.592	0.82
HCM Control Delay	22.3	17.3	31.5
HCM Lane LOS	C	C	D
HCM 95th-tile Q	5.7	3.9	8.5

Intersection	
Intersection Delay, s/veh	5
Intersection LOS	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	41	322	342	29	25	58
Future Vol, veh/h	41	322	342	29	25	58
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	4	2	7	4	5
Mvmt Flow	41	322	342	29	25	58
Number of Lanes	0	1	1	0	0	0

Approach	EB	WB
Opposing Approach	WB	EB
Opposing Lanes	1	1
Conflicting Approach Left		
Conflicting Lanes Left	0	0
Conflicting Approach Right		
Conflicting Lanes Right	0	0
HCM Control Delay	5	5
HCM LOS	A	A

Lane	EBLn1	WBLn1
Vol Left, %	11%	0%
Vol Thru, %	89%	92%
Vol Right, %	0%	8%
Sign Control	Stop	Stop
Traffic Vol by Lane	363	371
LT Vol	41	0
Through Vol	322	342
RT Vol	0	29
Lane Flow Rate	363	371
Geometry Grp	0	0
Degree of Util (X)	0	0
Departure Headway (Hd)	0	0
Convergence, Y/N	Yes	Yes
Cap	0	0
Service Time	0	0
HCM Lane V/C Ratio	0	0
HCM Control Delay	5	5
HCM Lane LOS	N	N
HCM 95th-tile Q	0	0

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	486	747	95	53	19
Future Vol, veh/h	38	486	747	95	53	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	486	747	95	53	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	842	0	-	0	1309	747
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	562	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	802	-	-	-	177	416
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	575	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	802	-	-	-	169	416
Mov Cap-2 Maneuver	-	-	-	-	169	-
Stage 1	-	-	-	-	450	-
Stage 2	-	-	-	-	575	-

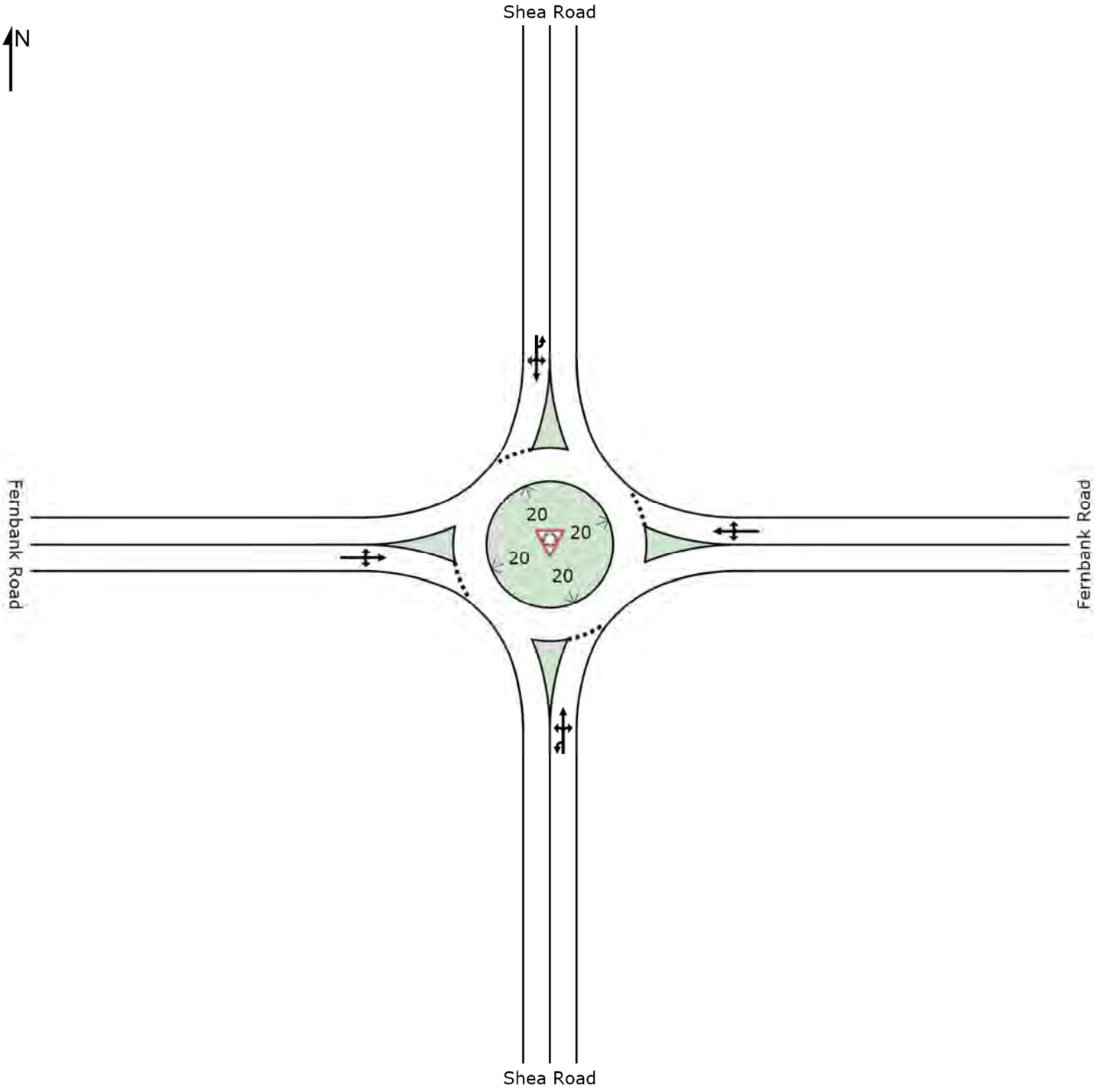
Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	32.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	802	-	-	-	200
HCM Lane V/C Ratio	0.047	-	-	-	0.36
HCM Control Delay (s)	9.7	-	-	-	32.8
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.5

SITE LAYOUT

Site: BG2030AM

Fernbank Road & Shea Road
Future (2030) Background Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2030AM

Fernbank Road & Shea Road
Future (2030) Background Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

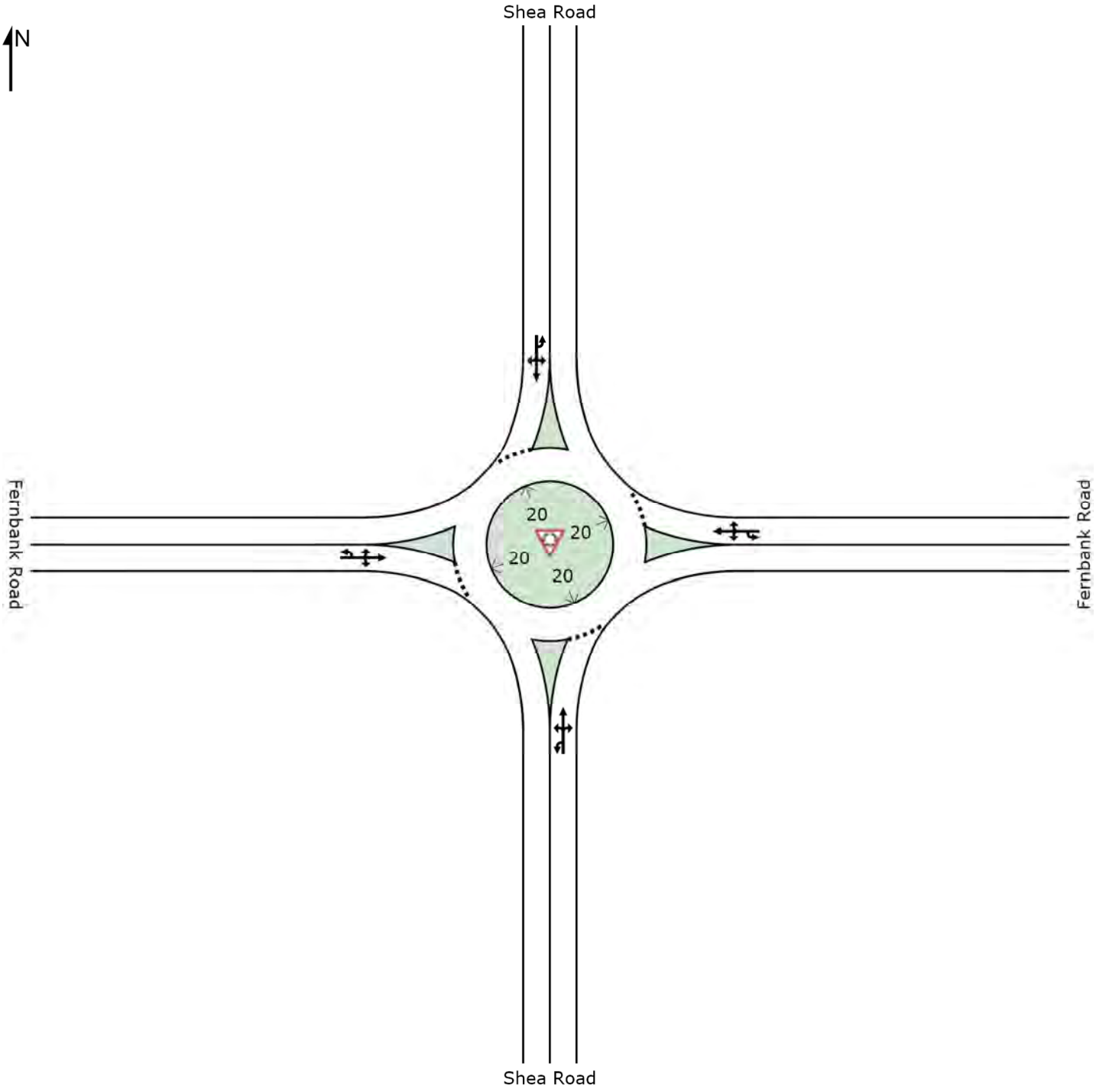
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.466	15.5	LOS C	2.1	16.0	0.69	0.75	48.5
3	L2	25	2.0	0.466	15.5	LOS C	2.1	16.0	0.69	0.75	47.7
8	T1	160	2.0	0.466	15.5	LOS C	2.1	16.0	0.69	0.75	47.9
18	R2	50	8.0	0.466	15.5	LOS C	2.1	16.0	0.69	0.75	46.7
Approach		236	3.3	0.466	15.5	LOS C	2.1	16.0	0.69	0.75	47.6
East: Fernbank Road											
1	L2	41	2.0	0.514	12.3	LOS B	2.8	21.9	0.62	0.65	49.8
6	T1	290	2.0	0.514	12.3	LOS B	2.8	21.9	0.62	0.65	49.9
16	R2	54	2.0	0.514	12.3	LOS B	2.8	21.9	0.62	0.65	48.9
Approach		385	2.0	0.514	12.3	LOS B	2.8	21.9	0.62	0.65	49.7
North: Shea Road											
7u	U	4	50.0	0.414	10.1	LOS B	1.9	14.7	0.55	0.53	49.1
7	L2	91	2.0	0.414	10.1	LOS B	1.9	14.7	0.55	0.53	50.7
4	T1	82	2.0	0.414	10.1	LOS B	1.9	14.7	0.55	0.53	50.9
14	R2	140	2.0	0.414	10.1	LOS B	1.9	14.7	0.55	0.53	49.8
Approach		317	2.6	0.414	10.1	LOS B	1.9	14.7	0.55	0.53	50.3
West: Fernbank Road											
5	L2	192	2.0	0.771	20.2	LOS C	8.4	65.0	0.79	0.74	44.6
2	T1	466	2.0	0.771	20.2	LOS C	8.4	65.0	0.79	0.74	44.8
12	R2	24	2.0	0.771	20.2	LOS C	8.4	65.0	0.79	0.74	43.9
Approach		682	2.0	0.771	20.2	LOS C	8.4	65.0	0.79	0.74	44.7
All Vehicles		1620	2.3	0.771	15.7	LOS C	8.4	65.0	0.69	0.68	47.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2030PM

Fernbank Road & Shea Road
Future (2030) Background Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2030PM

Fernbank Road & Shea Road
Future (2030) Background Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

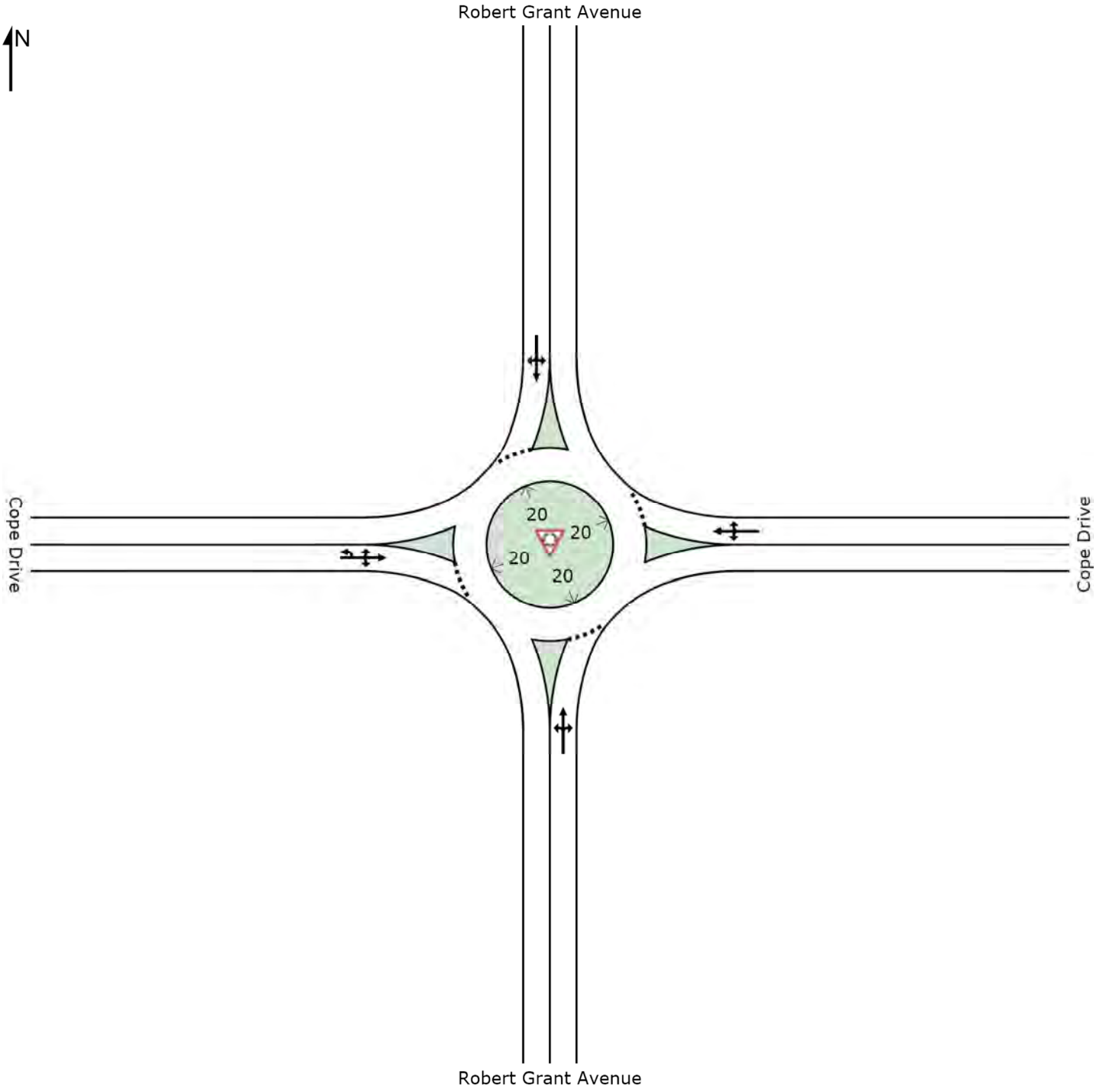
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.290	9.3	LOS A	1.1	8.5	0.56	0.56	52.5
3	L2	41	2.0	0.290	9.3	LOS A	1.1	8.5	0.56	0.56	51.5
8	T1	94	2.0	0.290	9.3	LOS A	1.1	8.5	0.56	0.56	51.7
18	R2	52	6.0	0.290	9.3	LOS A	1.1	8.5	0.56	0.56	50.4
Approach		188	3.1	0.290	9.3	LOS A	1.1	8.5	0.56	0.56	51.3
East: Fernbank Road											
1u	U	1	3.0	0.820	24.5	LOS C	9.9	78.1	0.85	0.86	43.3
1	L2	91	11.0	0.820	24.5	LOS C	9.9	78.1	0.85	0.86	42.4
6	T1	453	3.0	0.820	24.5	LOS C	9.9	78.1	0.85	0.86	42.9
16	R2	152	3.0	0.820	24.5	LOS C	9.9	78.1	0.85	0.86	42.1
Approach		697	4.0	0.820	24.5	LOS C	9.9	78.1	0.85	0.86	42.6
North: Shea Road											
7u	U	4	50.0	0.482	14.1	LOS B	2.3	17.9	0.67	0.72	46.7
7	L2	79	0.0	0.482	14.1	LOS B	2.3	17.9	0.67	0.72	48.2
4	T1	103	0.0	0.482	14.1	LOS B	2.3	17.9	0.67	0.72	48.3
14	R2	98	9.0	0.482	14.1	LOS B	2.3	17.9	0.67	0.72	47.0
Approach		284	3.8	0.482	14.1	LOS B	2.3	17.9	0.67	0.72	47.8
West: Fernbank Road											
5u	U	2	3.0	0.555	12.5	LOS B	3.3	26.0	0.59	0.56	50.0
5	L2	95	4.0	0.555	12.5	LOS B	3.3	26.0	0.59	0.56	49.2
2	T1	329	3.0	0.555	12.5	LOS B	3.3	26.0	0.59	0.56	49.4
12	R2	28	4.0	0.555	12.5	LOS B	3.3	26.0	0.59	0.56	48.4
Approach		454	3.3	0.555	12.5	LOS B	3.3	26.0	0.59	0.56	49.3
All Vehicles		1623	3.7	0.820	17.5	LOS C	9.9	78.1	0.71	0.72	46.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2030AM

Robert Grant Avenue & Cope Drive
Future (2030) Background Traffic
AM Peak Hour
Roundabout



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MOVEMENT SUMMARY

Site: BG2030AM

Robert Grant Avenue & Cope Drive
Future (2030) Background Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

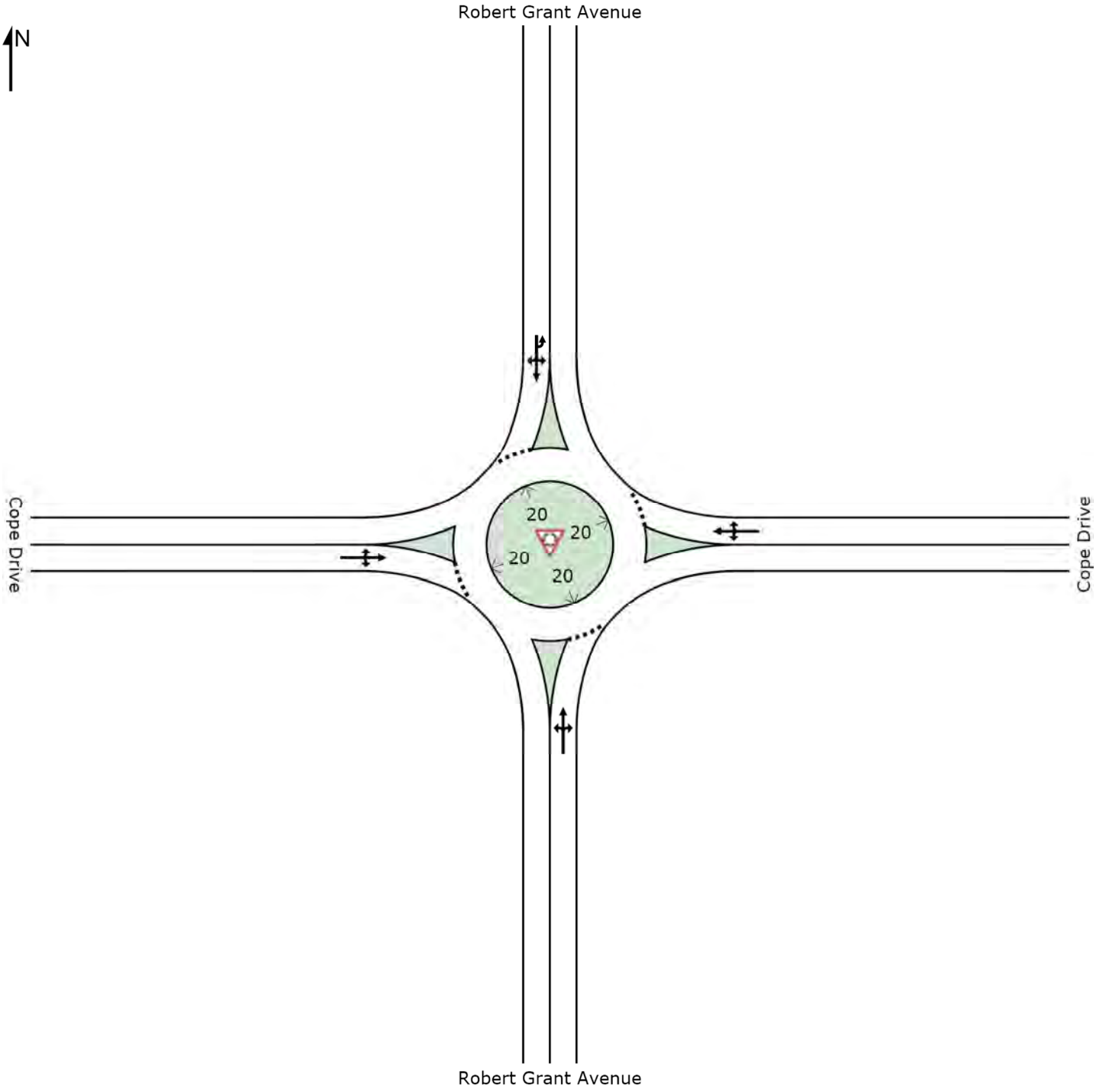
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	84	2.0	0.613	14.8	LOS B	4.2	32.1	0.68	0.72	48.0
8	T1	351	2.0	0.613	14.8	LOS B	4.2	32.1	0.68	0.72	48.1
18	R2	41	2.0	0.613	14.8	LOS B	4.2	32.1	0.68	0.72	47.2
Approach		476	2.0	0.613	14.8	LOS B	4.2	32.1	0.68	0.72	48.0
East: Cope Drive											
1	L2	35	2.0	0.368	11.3	LOS B	1.5	11.7	0.63	0.65	50.3
6	T1	65	2.0	0.368	11.3	LOS B	1.5	11.7	0.63	0.65	50.4
16	R2	120	2.0	0.368	11.3	LOS B	1.5	11.7	0.63	0.65	49.4
Approach		220	2.0	0.368	11.3	LOS B	1.5	11.7	0.63	0.65	49.8
North: Robert Grant Avenue											
7	L2	112	2.0	0.537	11.1	LOS B	3.1	24.0	0.50	0.38	50.3
4	T1	224	2.0	0.537	11.1	LOS B	3.1	24.0	0.50	0.38	50.4
14	R2	157	2.0	0.537	11.1	LOS B	3.1	24.0	0.50	0.38	49.3
Approach		493	2.0	0.537	11.1	LOS B	3.1	24.0	0.50	0.38	50.0
West: Cope Drive											
5u	U	1	2.0	0.412	10.1	LOS B	1.9	14.6	0.56	0.54	50.8
5	L2	169	2.0	0.412	10.1	LOS B	1.9	14.6	0.56	0.54	50.0
2	T1	67	2.0	0.412	10.1	LOS B	1.9	14.6	0.56	0.54	50.1
12	R2	76	2.0	0.412	10.1	LOS B	1.9	14.6	0.56	0.54	49.1
Approach		313	2.0	0.412	10.1	LOS B	1.9	14.6	0.56	0.54	49.8
All Vehicles		1502	2.0	0.613	12.1	LOS B	4.2	32.1	0.59	0.56	49.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: BG2030PM

Robert Grant Avenue & Cope Drive
Future (2030) Background Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: BG2030PM

Robert Grant Avenue & Cope Drive
Future (2030) Background Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	65	2.0	0.465	10.1	LOS B	2.3	18.0	0.52	0.43	51.1
8	T1	293	2.0	0.465	10.1	LOS B	2.3	18.0	0.52	0.43	51.3
18	R2	40	2.0	0.465	10.1	LOS B	2.3	18.0	0.52	0.43	50.2
Approach		398	2.0	0.465	10.1	LOS B	2.3	18.0	0.52	0.43	51.1
East: Cope Drive											
1	L2	50	2.0	0.242	8.3	LOS A	0.9	6.9	0.54	0.54	52.0
6	T1	40	2.0	0.242	8.3	LOS A	0.9	6.9	0.54	0.54	52.1
16	R2	72	2.0	0.242	8.3	LOS A	0.9	6.9	0.54	0.54	51.0
Approach		162	2.0	0.242	8.3	LOS A	0.9	6.9	0.54	0.54	51.6
North: Robert Grant Avenue											
7u	U	1	2.0	0.596	12.2	LOS B	3.9	30.1	0.51	0.37	50.5
7	L2	70	2.0	0.596	12.2	LOS B	3.9	30.1	0.51	0.37	49.8
4	T1	343	2.0	0.596	12.2	LOS B	3.9	30.1	0.51	0.37	49.9
14	R2	150	2.0	0.596	12.2	LOS B	3.9	30.1	0.51	0.37	48.9
Approach		564	2.0	0.596	12.2	LOS B	3.9	30.1	0.51	0.37	49.6
West: Cope Drive											
5	L2	136	2.0	0.362	10.0	LOS A	1.5	11.7	0.58	0.58	50.1
2	T1	45	2.0	0.362	10.0	LOS A	1.5	11.7	0.58	0.58	50.2
12	R2	69	2.0	0.362	10.0	LOS A	1.5	11.7	0.58	0.58	49.2
Approach		250	2.0	0.362	10.0	LOS A	1.5	11.7	0.58	0.58	49.9
All Vehicles		1374	2.0	0.596	10.7	LOS B	3.9	30.1	0.53	0.45	50.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Future (2025) Total Traffic

Intersection	
Intersection Delay, s/veh	19.4
Intersection LOS	C

Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	1	143	174	188	143	183	309
Future Vol, veh/h	1	143	174	188	143	183	309
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	5	9	7	4	9	10
Mvmt Flow	1	143	174	188	143	183	309
Number of Lanes	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	14.3	16.9	24.3
HCM LOS	B	C	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	45%	43%
Vol Right, %	63%	55%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	492	318	331
LT Vol	183	0	188
Through Vol	0	143	143
RT Vol	309	175	0
Lane Flow Rate	492	318	331
Geometry Grp	1	1	1
Degree of Util (X)	0.761	0.498	0.564
Departure Headway (Hd)	5.565	5.636	6.135
Convergence, Y/N	Yes	Yes	Yes
Cap	645	636	583
Service Time	3.63	3.717	4.215
HCM Lane V/C Ratio	0.763	0.5	0.568
HCM Control Delay	24.3	14.3	16.9
HCM Lane LOS	C	B	C
HCM 95th-tile Q	7	2.8	3.5

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	285	20	35	182	20	33	0	75	33	0	52
Future Vol, veh/h	35	285	20	35	182	20	33	0	75	33	0	52
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	9	4	0	0	5	0	0	0	0	6	0	6
Mvmt Flow	35	285	20	35	182	20	33	0	75	33	0	52
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.9	10	9	9.1
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	10%	15%	39%
Vol Thru, %	0%	84%	77%	0%
Vol Right, %	69%	6%	8%	61%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	108	340	237	85
LT Vol	33	35	35	33
Through Vol	0	285	182	0
RT Vol	75	20	20	52
Lane Flow Rate	108	340	237	85
Geometry Grp	1	1	1	1
Degree of Util (X)	0.151	0.454	0.314	0.123
Departure Headway (Hd)	5.018	4.803	4.772	5.221
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	706	745	747	679
Service Time	3.107	2.868	2.843	3.314
HCM Lane V/C Ratio	0.153	0.456	0.317	0.125
HCM Control Delay	9	11.9	10	9.1
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.5	2.4	1.3	0.4

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	471	319	65	96	25
Future Vol, veh/h	22	471	319	65	96	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	471	319	65	96	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	384	0	-	0	834	319
Stage 1	-	-	-	-	319	-
Stage 2	-	-	-	-	515	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1174	-	-	-	338	722
Stage 1	-	-	-	-	737	-
Stage 2	-	-	-	-	600	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1174	-	-	-	332	722
Mov Cap-2 Maneuver	-	-	-	-	332	-
Stage 1	-	-	-	-	723	-
Stage 2	-	-	-	-	600	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	19.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1174	-	-	-	374
HCM Lane V/C Ratio	0.019	-	-	-	0.324
HCM Control Delay (s)	8.1	-	-	-	19.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.4

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	4	434	8	2	291
Future Vol, veh/h	18	4	434	8	2	291
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	18	4	434	8	2	291

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	733	438	0	0	442	0
Stage 1	438	-	-	-	-	-
Stage 2	295	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	391	623	-	-	1129	-
Stage 1	655	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	390	623	-	-	1129	-
Mov Cap-2 Maneuver	390	-	-	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	758	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	418	1129	-
HCM Lane V/C Ratio	-	-	0.053	0.002	-
HCM Control Delay (s)	-	-	14.1	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	27	9	4	19	44	4	52	27	30	79	4
Future Vol, veh/h	9	27	9	4	19	44	4	52	27	30	79	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	9	27	9	4	19	44	4	52	27	30	79	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.6	7.3	7.5	7.9
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	20%	6%	27%
Vol Thru, %	63%	60%	28%	70%
Vol Right, %	33%	20%	66%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	83	45	67	113
LT Vol	4	9	4	30
Through Vol	52	27	19	79
RT Vol	27	9	44	4
Lane Flow Rate	83	45	67	113
Geometry Grp	1	1	1	1
Degree of Util (X)	0.092	0.054	0.074	0.132
Departure Headway (Hd)	3.996	4.318	3.997	4.191
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	884	834	901	846
Service Time	2.08	2.32	1.998	2.262
HCM Lane V/C Ratio	0.094	0.054	0.074	0.134
HCM Control Delay	7.5	7.6	7.3	7.9
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.2	0.2	0.5

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	14	94	9	23	3	149	0	5	6	3	6
Future Vol, veh/h	2	14	94	9	23	3	149	0	5	6	3	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	2	14	94	9	23	3	149	0	5	6	3	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	26	0	0	108	0	0	112	109	61	111	155	25
Stage 1	-	-	-	-	-	-	65	65	-	43	43	-
Stage 2	-	-	-	-	-	-	47	44	-	68	112	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1601	-	-	1495	-	-	870	785	1010	872	741	1057
Stage 1	-	-	-	-	-	-	951	845	-	976	863	-
Stage 2	-	-	-	-	-	-	972	862	-	947	807	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1601	-	-	1495	-	-	858	780	1010	863	736	1057
Mov Cap-2 Maneuver	-	-	-	-	-	-	858	780	-	863	736	-
Stage 1	-	-	-	-	-	-	950	844	-	975	858	-
Stage 2	-	-	-	-	-	-	957	857	-	941	806	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.9	10.1	9.1
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1601	-	-	1495	-	-	898
HCM Lane V/C Ratio	0.179	0.001	-	-	0.006	-	-	0.017
HCM Control Delay (s)	10.1	7.3	0	-	7.4	0	-	9.1
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1

Intersection	
Intersection Delay, s/veh	25.4
Intersection LOS	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	189	180	278	211	159	262
Future Vol, veh/h	189	180	278	211	159	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	3	1	3	6	4	5
Mvmt Flow	189	180	278	211	159	262
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	18	32.9	23.1
HCM LOS	C	D	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	38%	0%	57%
Vol Thru, %	0%	51%	43%
Vol Right, %	62%	49%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	421	369	489
LT Vol	159	0	278
Through Vol	0	189	211
RT Vol	262	180	0
Lane Flow Rate	421	369	489
Geometry Grp	1	1	1
Degree of Util (X)	0.716	0.612	0.835
Departure Headway (Hd)	6.119	5.966	6.146
Convergence, Y/N	Yes	Yes	Yes
Cap	594	605	592
Service Time	4.142	4.015	4.177
HCM Lane V/C Ratio	0.709	0.61	0.826
HCM Control Delay	23.1	18	32.9
HCM Lane LOS	C	C	D
HCM 95th-tile Q	5.9	4.1	8.8

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	41	322	32	111	342	29	20	0	72	25	0	58
Future Vol, veh/h	41	322	32	111	342	29	20	0	72	25	0	58
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	4	0	0	2	7	0	0	0	4	0	5
Mvmt Flow	41	322	32	111	342	29	20	0	72	25	0	58
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	17.3	9.8	9.9
HCM LOS	B	C	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	10%	23%	30%
Vol Thru, %	0%	82%	71%	0%
Vol Right, %	78%	8%	6%	70%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	92	395	482	83
LT Vol	20	41	111	25
Through Vol	0	322	342	0
RT Vol	72	32	29	58
Lane Flow Rate	92	395	482	83
Geometry Grp	1	1	1	1
Degree of Util (X)	0.148	0.552	0.664	0.137
Departure Headway (Hd)	5.779	5.031	4.962	5.934
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	619	715	728	603
Service Time	3.83	3.065	2.994	3.987
HCM Lane V/C Ratio	0.149	0.552	0.662	0.138
HCM Control Delay	9.8	14.1	17.3	9.9
HCM Lane LOS	A	B	C	A
HCM 95th-tile Q	0.5	3.4	5.1	0.5

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	457	697	121	70	19
Future Vol, veh/h	38	457	697	121	70	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	457	697	121	70	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	818	0	-	0	1230	697
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	533	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	819	-	-	-	198	444
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	593	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	819	-	-	-	189	444
Mov Cap-2 Maneuver	-	-	-	-	189	-
Stage 1	-	-	-	-	475	-
Stage 2	-	-	-	-	593	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	33.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	819	-	-	-	215
HCM Lane V/C Ratio	0.046	-	-	-	0.414
HCM Control Delay (s)	9.6	-	-	-	33.1
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.9

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	3	424	17	5	266
Future Vol, veh/h	11	3	424	17	5	266
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	3	424	17	5	266
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	8.6	11.3	9.5
HCM LOS	A	B	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	79%	2%
Vol Thru, %	96%	0%	98%
Vol Right, %	4%	21%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	441	14	271
LT Vol	0	11	5
Through Vol	424	0	266
RT Vol	17	3	0
Lane Flow Rate	441	14	271
Geometry Grp	1	1	1
Degree of Util (X)	0.502	0.021	0.329
Departure Headway (Hd)	4.102	5.425	4.365
Convergence, Y/N	Yes	Yes	Yes
Cap	864	662	829
Service Time	2.195	3.439	2.367
HCM Lane V/C Ratio	0.51	0.021	0.327
HCM Control Delay	11.3	8.6	9.5
HCM Lane LOS	B	A	A
HCM 95th-tile Q	2.9	0.1	1.4

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	17	6	9	43	32	9	90	25	34	111	9
Future Vol, veh/h	6	17	6	9	43	32	9	90	25	34	111	9
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	17	6	9	43	32	9	90	25	34	111	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.7	7.8	7.9	8.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	21%	11%	22%
Vol Thru, %	73%	59%	51%	72%
Vol Right, %	20%	21%	38%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	124	29	84	154
LT Vol	9	6	9	34
Through Vol	90	17	43	111
RT Vol	25	6	32	9
Lane Flow Rate	124	29	84	154
Geometry Grp	1	1	1	1
Degree of Util (X)	0.145	0.036	0.101	0.184
Departure Headway (Hd)	4.212	4.528	4.34	4.305
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	854	793	828	839
Service Time	2.224	2.544	2.354	2.305
HCM Lane V/C Ratio	0.145	0.037	0.101	0.184
HCM Control Delay	7.9	7.7	7.8	8.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.3	0.7

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	22	129	5	14	2	123	8	8	3	2	3
Future Vol, veh/h	3	22	129	5	14	2	123	8	8	3	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	22	129	5	14	2	123	8	8	3	2	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	16	0	0	151	0	0	121	119	87	126	182	15
Stage 1	-	-	-	-	-	-	93	93	-	25	25	-
Stage 2	-	-	-	-	-	-	28	26	-	101	157	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1615	-	-	1442	-	-	859	775	977	852	716	1070
Stage 1	-	-	-	-	-	-	919	822	-	998	878	-
Stage 2	-	-	-	-	-	-	994	878	-	910	772	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1615	-	-	1442	-	-	851	771	977	835	712	1070
Mov Cap-2 Maneuver	-	-	-	-	-	-	851	771	-	835	712	-
Stage 1	-	-	-	-	-	-	917	820	-	996	875	-
Stage 2	-	-	-	-	-	-	986	875	-	892	770	-

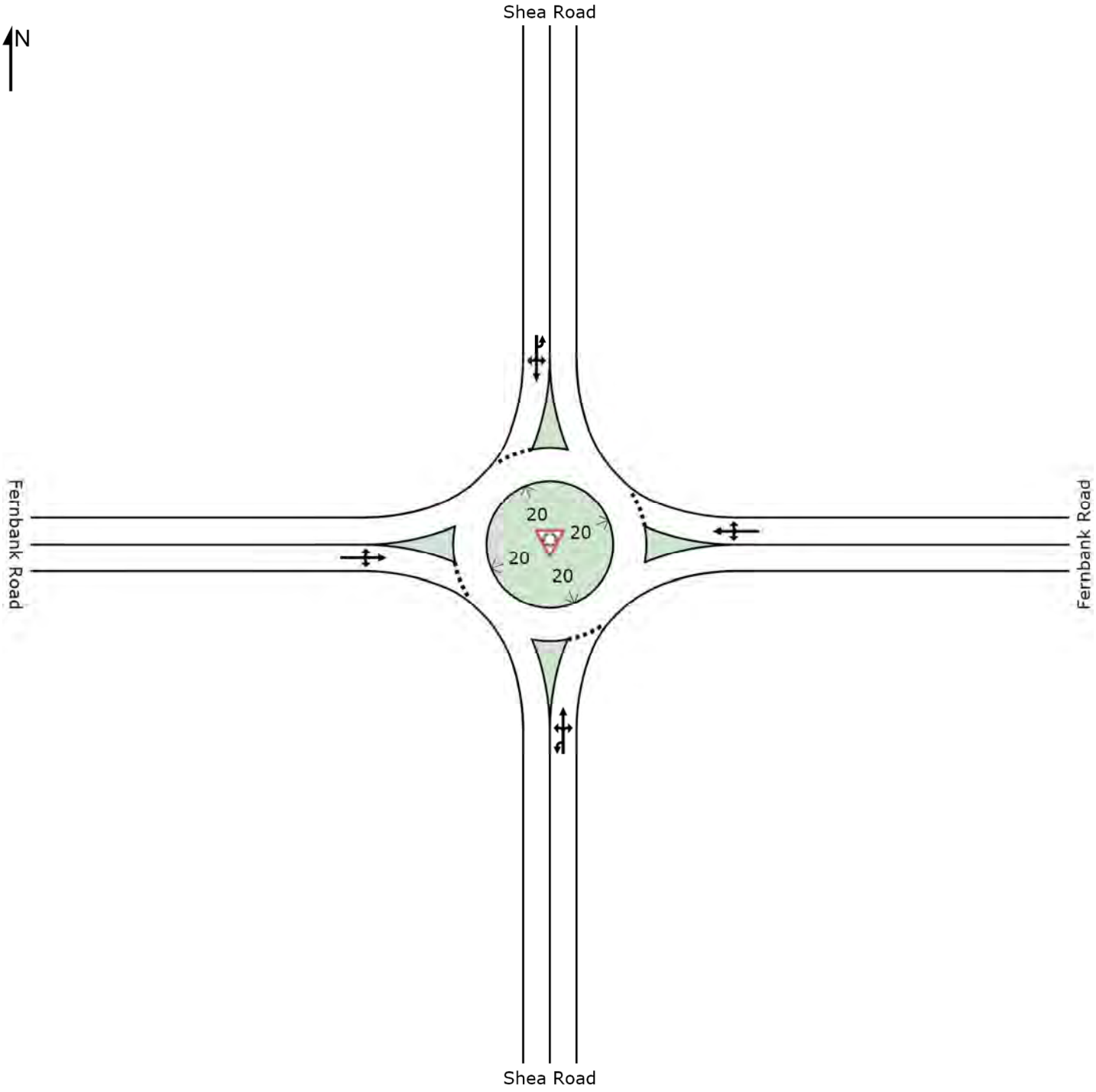
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.8	10	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	852	1615	-	-	1442	-	-	869
HCM Lane V/C Ratio	0.163	0.002	-	-	0.003	-	-	0.009
HCM Control Delay (s)	10	7.2	0	-	7.5	0	-	9.2
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0

SITE LAYOUT

Site: TT2025AM

Fernbank Road & Shea Road
Future (2025) Total Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TT2025AM

Fernbank Road & Shea Road
Future (2025) Total Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

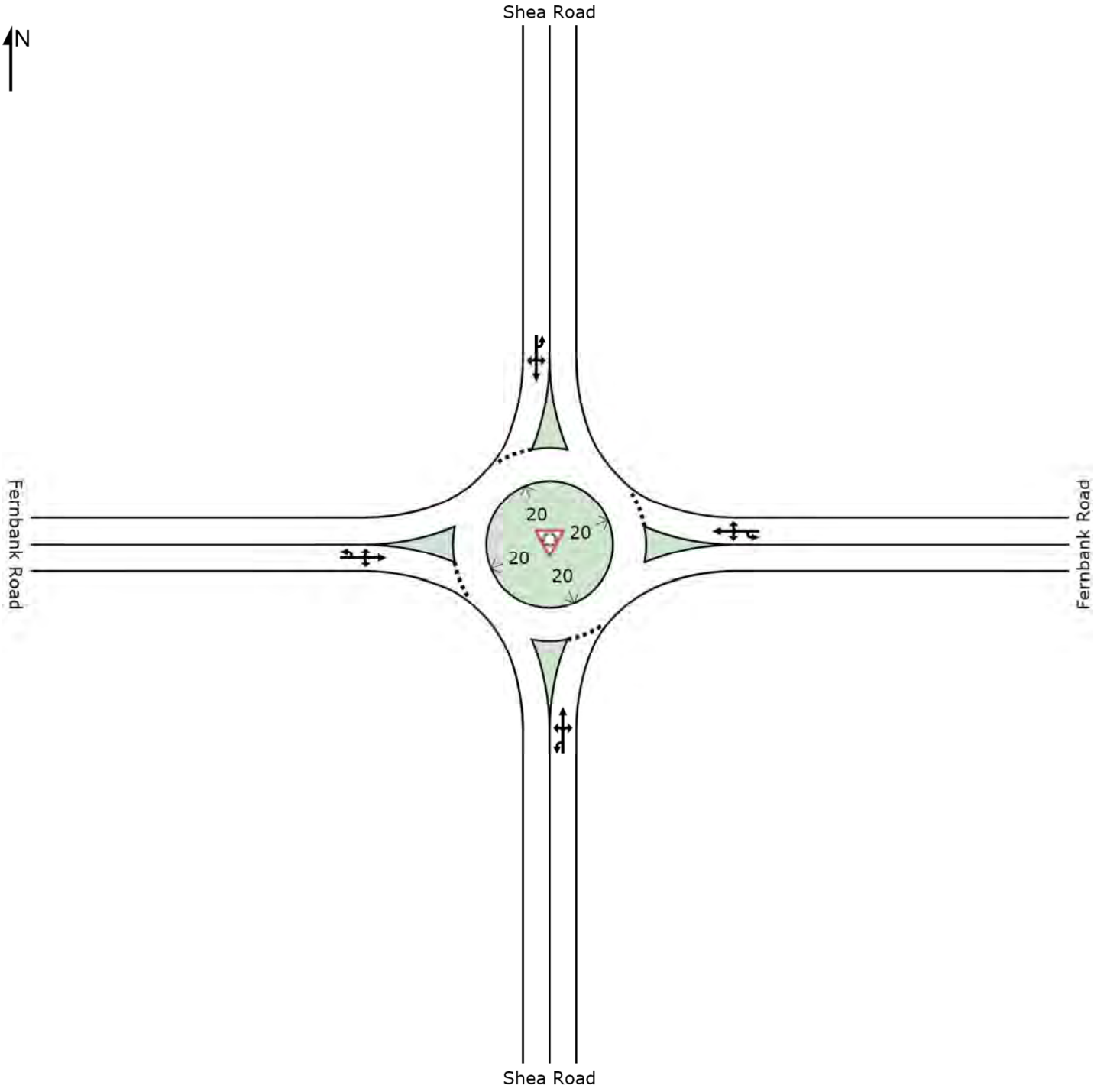
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.456	15.0	LOS B	2.0	15.7	0.69	0.74	48.9
3	L2	25	2.0	0.456	15.0	LOS B	2.0	15.7	0.69	0.74	48.1
8	T1	160	2.0	0.456	15.0	LOS B	2.0	15.7	0.69	0.74	48.2
18	R2	50	8.0	0.456	15.0	LOS B	2.0	15.7	0.69	0.74	47.0
Approach		236	3.3	0.456	15.0	LOS B	2.0	15.7	0.69	0.74	47.9
East: Fernbank Road											
1	L2	41	2.0	0.497	12.0	LOS B	2.6	20.5	0.62	0.64	50.0
6	T1	274	2.0	0.497	12.0	LOS B	2.6	20.5	0.62	0.64	50.1
16	R2	54	2.0	0.497	12.0	LOS B	2.6	20.5	0.62	0.64	49.1
Approach		369	2.0	0.497	12.0	LOS B	2.6	20.5	0.62	0.64	49.9
North: Shea Road											
7u	U	4	50.0	0.431	10.2	LOS B	2.0	15.7	0.55	0.52	49.1
7	L2	91	2.0	0.431	10.2	LOS B	2.0	15.7	0.55	0.52	50.7
4	T1	82	2.0	0.431	10.2	LOS B	2.0	15.7	0.55	0.52	50.8
14	R2	158	2.0	0.431	10.2	LOS B	2.0	15.7	0.55	0.52	49.7
Approach		335	2.6	0.431	10.2	LOS B	2.0	15.7	0.55	0.52	50.2
West: Fernbank Road											
5	L2	200	2.0	0.749	18.9	LOS C	7.6	58.8	0.75	0.70	45.3
2	T1	438	2.0	0.749	18.9	LOS C	7.6	58.8	0.75	0.70	45.4
12	R2	24	2.0	0.749	18.9	LOS C	7.6	58.8	0.75	0.70	44.6
Approach		662	2.0	0.749	18.9	LOS C	7.6	58.8	0.75	0.70	45.4
All Vehicles		1602	2.3	0.749	14.9	LOS B	7.6	58.8	0.67	0.66	47.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TT2025PM

Fernbank Road & Shea Road
Future (2025) Total Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TT2025PM

Fernbank Road & Shea Road
Future (2025) Total Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

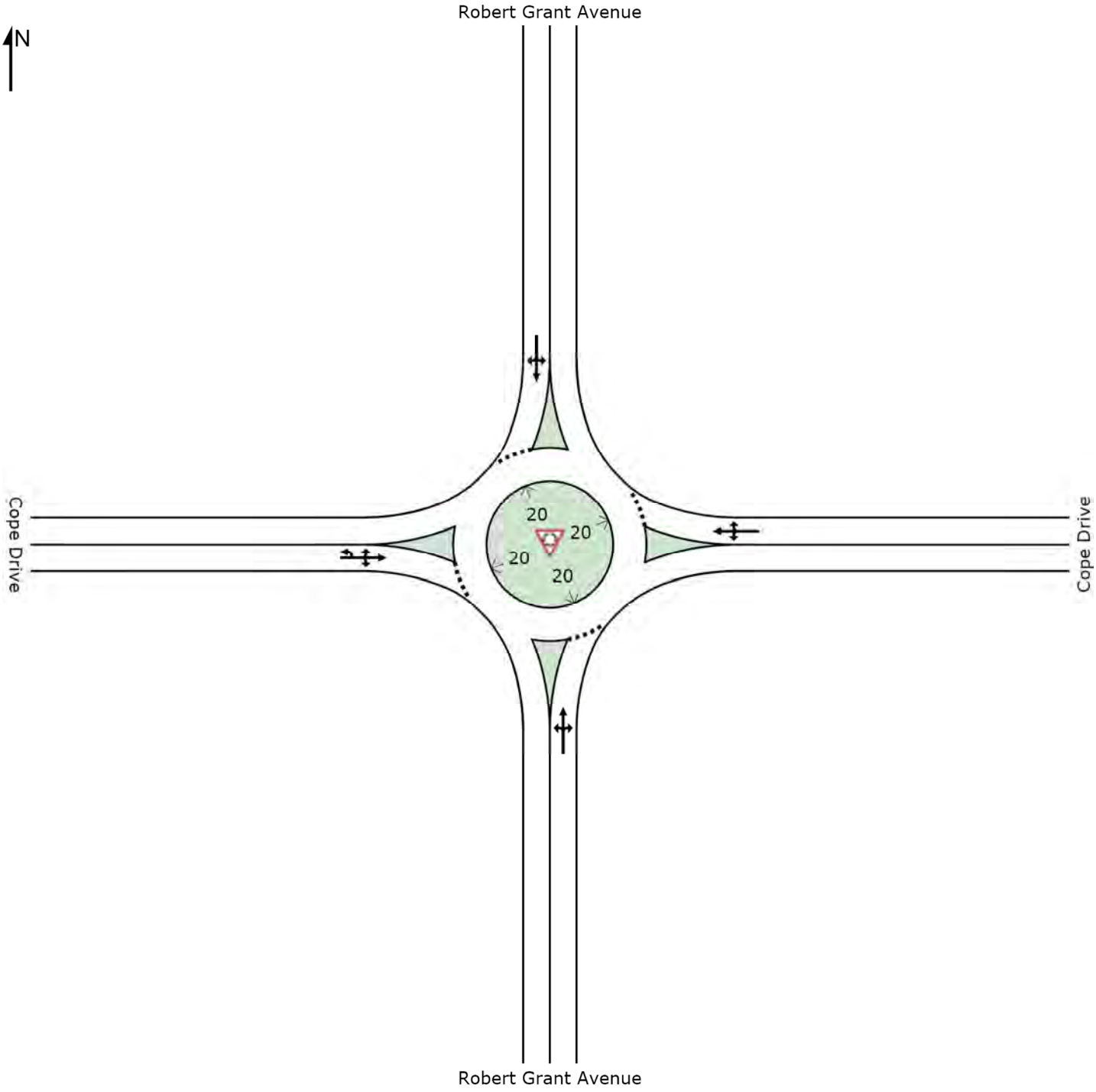
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.291	9.3	LOS A	1.1	8.5	0.57	0.57	52.4
3	L2	41	2.0	0.291	9.3	LOS A	1.1	8.5	0.57	0.57	51.5
8	T1	94	2.0	0.291	9.3	LOS A	1.1	8.5	0.57	0.57	51.6
18	R2	52	6.0	0.291	9.3	LOS A	1.1	8.5	0.57	0.57	50.4
Approach		188	3.1	0.291	9.3	LOS A	1.1	8.5	0.57	0.57	51.3
East: Fernbank Road											
1u	U	1	3.0	0.807	23.6	LOS C	9.2	72.1	0.84	0.86	43.7
1	L2	91	11.0	0.807	23.6	LOS C	9.2	72.1	0.84	0.86	42.8
6	T1	429	3.0	0.807	23.6	LOS C	9.2	72.1	0.84	0.86	43.3
16	R2	152	3.0	0.807	23.6	LOS C	9.2	72.1	0.84	0.86	42.5
Approach		673	4.1	0.807	23.6	LOS C	9.2	72.1	0.84	0.86	43.0
North: Shea Road											
7u	U	4	50.0	0.489	14.0	LOS B	2.4	18.5	0.67	0.72	46.7
7	L2	79	0.0	0.489	14.0	LOS B	2.4	18.5	0.67	0.72	48.3
4	T1	103	0.0	0.489	14.0	LOS B	2.4	18.5	0.67	0.72	48.4
14	R2	109	9.0	0.489	14.0	LOS B	2.4	18.5	0.67	0.72	47.1
Approach		295	4.0	0.489	14.0	LOS B	2.4	18.5	0.67	0.72	47.8
West: Fernbank Road											
5u	U	2	3.0	0.559	12.6	LOS B	3.4	26.4	0.60	0.56	49.9
5	L2	112	4.0	0.559	12.6	LOS B	3.4	26.4	0.60	0.56	49.1
2	T1	315	3.0	0.559	12.6	LOS B	3.4	26.4	0.60	0.56	49.3
12	R2	28	4.0	0.559	12.6	LOS B	3.4	26.4	0.60	0.56	48.2
Approach		457	3.3	0.559	12.6	LOS B	3.4	26.4	0.60	0.56	49.2
All Vehicles		1613	3.7	0.807	17.1	LOS C	9.2	72.1	0.71	0.72	46.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TO2025AM

Robert Grant Avenue & Cope Drive
Future (2025) Total Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TO2025AM

Robert Grant Avenue & Cope Drive
Future (2025) Total Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

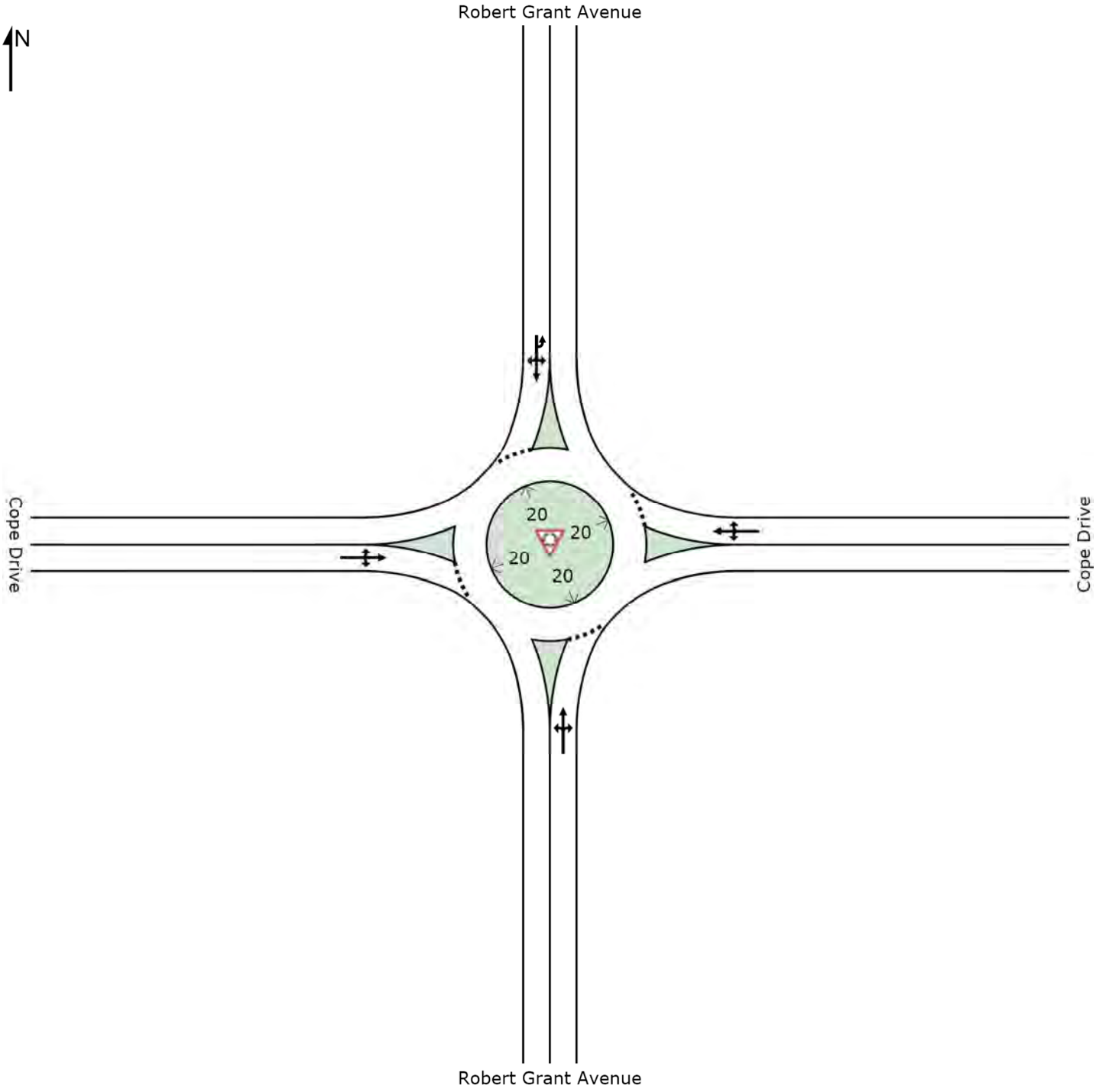
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	79	2.0	0.597	14.6	LOS B	3.9	29.8	0.68	0.73	48.1
8	T1	329	2.0	0.597	14.6	LOS B	3.9	29.8	0.68	0.73	48.2
18	R2	41	2.0	0.597	14.6	LOS B	3.9	29.8	0.68	0.73	47.3
Approach		449	2.0	0.597	14.6	LOS B	3.9	29.8	0.68	0.73	48.1
East: Cope Drive											
1	L2	35	2.0	0.363	11.2	LOS B	1.5	11.5	0.62	0.64	50.4
6	T1	62	2.0	0.363	11.2	LOS B	1.5	11.5	0.62	0.64	50.5
16	R2	120	2.0	0.363	11.2	LOS B	1.5	11.5	0.62	0.64	49.4
Approach		217	2.0	0.363	11.2	LOS B	1.5	11.5	0.62	0.64	49.9
North: Robert Grant Avenue											
7	L2	112	2.0	0.516	10.5	LOS B	2.9	22.5	0.48	0.36	50.6
4	T1	211	2.0	0.516	10.5	LOS B	2.9	22.5	0.48	0.36	50.8
14	R2	154	2.0	0.516	10.5	LOS B	2.9	22.5	0.48	0.36	49.7
Approach		477	2.0	0.516	10.5	LOS B	2.9	22.5	0.48	0.36	50.4
West: Cope Drive											
5u	U	1	2.0	0.463	11.0	LOS B	2.3	18.0	0.58	0.57	50.2
5	L2	195	2.0	0.463	11.0	LOS B	2.3	18.0	0.58	0.57	49.4
2	T1	72	2.0	0.463	11.0	LOS B	2.3	18.0	0.58	0.57	49.5
12	R2	88	2.0	0.463	11.0	LOS B	2.3	18.0	0.58	0.57	48.5
Approach		356	2.0	0.463	11.0	LOS B	2.3	18.0	0.58	0.57	49.2
All Vehicles		1499	2.0	0.597	12.0	LOS B	3.9	29.8	0.58	0.56	49.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TO2025PM

Robert Grant Avenue & Cope Drive
Future (2025) Total Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TO2025PM

Robert Grant Avenue & Cope Drive
Future (2025) Total Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	80	2.0	0.472	10.4	LOS B	2.4	18.6	0.53	0.46	50.8
8	T1	279	2.0	0.472	10.4	LOS B	2.4	18.6	0.53	0.46	51.0
18	R2	40	2.0	0.472	10.4	LOS B	2.4	18.6	0.53	0.46	49.9
Approach		399	2.0	0.472	10.4	LOS B	2.4	18.6	0.53	0.46	50.8
East: Cope Drive											
1	L2	50	2.0	0.256	8.6	LOS A	1.0	7.4	0.55	0.55	51.8
6	T1	47	2.0	0.256	8.6	LOS A	1.0	7.4	0.55	0.55	52.0
16	R2	72	2.0	0.256	8.6	LOS A	1.0	7.4	0.55	0.55	50.8
Approach		169	2.0	0.256	8.6	LOS A	1.0	7.4	0.55	0.55	51.4
North: Robert Grant Avenue											
7u	U	1	2.0	0.618	13.1	LOS B	4.3	33.6	0.56	0.44	50.0
7	L2	70	2.0	0.618	13.1	LOS B	4.3	33.6	0.56	0.44	49.2
4	T1	322	2.0	0.618	13.1	LOS B	4.3	33.6	0.56	0.44	49.4
14	R2	179	2.0	0.618	13.1	LOS B	4.3	33.6	0.56	0.44	48.3
Approach		572	2.0	0.618	13.1	LOS B	4.3	33.6	0.56	0.44	49.0
West: Cope Drive											
5	L2	147	2.0	0.382	10.1	LOS B	1.6	12.7	0.58	0.59	50.0
2	T1	47	2.0	0.382	10.1	LOS B	1.6	12.7	0.58	0.59	50.1
12	R2	75	2.0	0.382	10.1	LOS B	1.6	12.7	0.58	0.59	49.1
Approach		269	2.0	0.382	10.1	LOS B	1.6	12.7	0.58	0.59	49.7
All Vehicles		1409	2.0	0.618	11.2	LOS B	4.3	33.6	0.55	0.49	49.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Future (2030) Total Traffic

Intersection	
Intersection Delay, s/veh	19.4
Intersection LOS	C

Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	1	143	174	188	143	183	309
Future Vol, veh/h	1	143	174	188	143	183	309
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	5	9	7	4	9	10
Mvmt Flow	1	143	174	188	143	183	309
Number of Lanes	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	14.3	16.9	24.3
HCM LOS	B	C	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	37%	0%	57%
Vol Thru, %	0%	45%	43%
Vol Right, %	63%	55%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	492	318	331
LT Vol	183	0	188
Through Vol	0	143	143
RT Vol	309	175	0
Lane Flow Rate	492	318	331
Geometry Grp	1	1	1
Degree of Util (X)	0.761	0.498	0.564
Departure Headway (Hd)	5.565	5.636	6.135
Convergence, Y/N	Yes	Yes	Yes
Cap	645	636	583
Service Time	3.63	3.717	4.215
HCM Lane V/C Ratio	0.763	0.5	0.568
HCM Control Delay	24.3	14.3	16.9
HCM Lane LOS	C	B	C
HCM 95th-tile Q	7	2.8	3.5

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	285	20	35	182	20	33	0	75	33	0	52
Future Vol, veh/h	35	285	20	35	182	20	33	0	75	33	0	52
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	9	4	0	0	5	0	0	0	0	6	0	6
Mvmt Flow	35	285	20	35	182	20	33	0	75	33	0	52
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.9	10	9	9.1
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	10%	15%	39%
Vol Thru, %	0%	84%	77%	0%
Vol Right, %	69%	6%	8%	61%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	108	340	237	85
LT Vol	33	35	35	33
Through Vol	0	285	182	0
RT Vol	75	20	20	52
Lane Flow Rate	108	340	237	85
Geometry Grp	1	1	1	1
Degree of Util (X)	0.151	0.454	0.314	0.123
Departure Headway (Hd)	5.018	4.803	4.772	5.221
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	706	745	747	679
Service Time	3.107	2.868	2.843	3.314
HCM Lane V/C Ratio	0.153	0.456	0.317	0.125
HCM Control Delay	9	11.9	10	9.1
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.5	2.4	1.3	0.4

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	506	343	65	96	25
Future Vol, veh/h	22	506	343	65	96	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	506	343	65	96	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	408	0	-	0	893	343
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	550	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1151	-	-	-	312	700
Stage 1	-	-	-	-	719	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1151	-	-	-	306	700
Mov Cap-2 Maneuver	-	-	-	-	306	-
Stage 1	-	-	-	-	705	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	20.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1151	-	-	-	346
HCM Lane V/C Ratio	0.019	-	-	-	0.35
HCM Control Delay (s)	8.2	-	-	-	20.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.5

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	4	434	8	2	291
Future Vol, veh/h	18	4	434	8	2	291
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	18	4	434	8	2	291

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	733	438	0	0	442	0
Stage 1	438	-	-	-	-	-
Stage 2	295	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	391	623	-	-	1129	-
Stage 1	655	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	390	623	-	-	1129	-
Mov Cap-2 Maneuver	390	-	-	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	758	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	418	1129	-
HCM Lane V/C Ratio	-	-	0.053	0.002	-
HCM Control Delay (s)	-	-	14.1	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	27	9	4	19	44	4	98	27	30	79	4
Future Vol, veh/h	9	27	9	4	19	44	4	98	27	30	79	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	9	27	9	4	19	44	4	98	27	30	79	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.7	7.4	7.9	8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	20%	6%	27%
Vol Thru, %	76%	60%	28%	70%
Vol Right, %	21%	20%	66%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	129	45	67	113
LT Vol	4	9	4	30
Through Vol	98	27	19	79
RT Vol	27	9	44	4
Lane Flow Rate	129	45	67	113
Geometry Grp	1	1	1	1
Degree of Util (X)	0.146	0.055	0.076	0.133
Departure Headway (Hd)	4.062	4.425	4.102	4.227
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	868	814	878	836
Service Time	2.153	2.427	2.103	2.316
HCM Lane V/C Ratio	0.149	0.055	0.076	0.135
HCM Control Delay	7.9	7.7	7.4	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.2	0.2	0.5

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	14	94	9	23	3	149	14	5	6	3	6
Future Vol, veh/h	2	14	94	9	23	3	149	14	5	6	3	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	2	14	94	9	23	3	149	14	5	6	3	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	26	0	0	108	0	0	112	109	61	118	155	25
Stage 1	-	-	-	-	-	-	65	65	-	43	43	-
Stage 2	-	-	-	-	-	-	47	44	-	75	112	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1601	-	-	1495	-	-	870	785	1010	863	741	1057
Stage 1	-	-	-	-	-	-	951	845	-	976	863	-
Stage 2	-	-	-	-	-	-	972	862	-	939	807	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1601	-	-	1495	-	-	858	780	1010	842	736	1057
Mov Cap-2 Maneuver	-	-	-	-	-	-	858	780	-	842	736	-
Stage 1	-	-	-	-	-	-	950	844	-	975	858	-
Stage 2	-	-	-	-	-	-	957	857	-	918	806	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.9	10.2	9.1
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	855	1601	-	-	1495	-	-	889
HCM Lane V/C Ratio	0.196	0.001	-	-	0.006	-	-	0.017
HCM Control Delay (s)	10.2	7.3	0	-	7.4	0	-	9.1
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	0.1

Intersection	
Intersection Delay, s/veh	25.4
Intersection LOS	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	189	180	278	211	159	262
Future Vol, veh/h	189	180	278	211	159	262
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	3	1	3	6	4	5
Mvmt Flow	189	180	278	211	159	262
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	18	32.9	23.1
HCM LOS	C	D	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	38%	0%	57%
Vol Thru, %	0%	51%	43%
Vol Right, %	62%	49%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	421	369	489
LT Vol	159	0	278
Through Vol	0	189	211
RT Vol	262	180	0
Lane Flow Rate	421	369	489
Geometry Grp	1	1	1
Degree of Util (X)	0.716	0.612	0.835
Departure Headway (Hd)	6.119	5.966	6.146
Convergence, Y/N	Yes	Yes	Yes
Cap	594	605	592
Service Time	4.142	4.015	4.177
HCM Lane V/C Ratio	0.709	0.61	0.826
HCM Control Delay	23.1	18	32.9
HCM Lane LOS	C	C	D
HCM 95th-tile Q	5.9	4.1	8.8

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	41	322	32	111	342	29	20	0	72	25	0	58
Future Vol, veh/h	41	322	32	111	342	29	20	0	72	25	0	58
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	4	0	0	2	7	0	0	0	4	0	5
Mvmt Flow	41	322	32	111	342	29	20	0	72	25	0	58
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	17.3	9.8	9.9
HCM LOS	B	C	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	10%	23%	30%
Vol Thru, %	0%	82%	71%	0%
Vol Right, %	78%	8%	6%	70%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	92	395	482	83
LT Vol	20	41	111	25
Through Vol	0	322	342	0
RT Vol	72	32	29	58
Lane Flow Rate	92	395	482	83
Geometry Grp	1	1	1	1
Degree of Util (X)	0.148	0.552	0.664	0.137
Departure Headway (Hd)	5.779	5.031	4.962	5.934
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	619	715	728	603
Service Time	3.83	3.065	2.994	3.987
HCM Lane V/C Ratio	0.149	0.552	0.662	0.138
HCM Control Delay	9.8	14.1	17.3	9.9
HCM Lane LOS	A	B	C	A
HCM 95th-tile Q	0.5	3.4	5.1	0.5

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	486	747	121	70	19
Future Vol, veh/h	38	486	747	121	70	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	486	747	121	70	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	868	0	-	0	1309	747
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	562	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	785	-	-	-	177	416
Stage 1	-	-	-	-	472	-
Stage 2	-	-	-	-	575	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	785	-	-	-	169	416
Mov Cap-2 Maneuver	-	-	-	-	169	-
Stage 1	-	-	-	-	449	-
Stage 2	-	-	-	-	575	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	38.4
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	785	-	-	-	194
HCM Lane V/C Ratio	0.048	-	-	-	0.459
HCM Control Delay (s)	9.8	-	-	-	38.4
HCM Lane LOS	A	-	-	-	E
HCM 95th %tile Q(veh)	0.2	-	-	-	2.2

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	3	424	17	5	266
Future Vol, veh/h	11	3	424	17	5	266
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	3	424	17	5	266

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	709	433	0	0	441	0
Stage 1	433	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	404	627	-	-	1130	-
Stage 1	658	-	-	-	-	-
Stage 2	775	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	402	627	-	-	1130	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	771	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	435	1130	-
HCM Lane V/C Ratio	-	-	0.032	0.004	-
HCM Control Delay (s)	-	-	13.6	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	17	6	9	43	32	9	90	25	34	111	9
Future Vol, veh/h	6	17	6	9	43	32	9	90	25	34	111	9
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	6	17	6	9	43	32	9	90	25	34	111	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.7	7.8	7.9	8.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	21%	11%	22%
Vol Thru, %	73%	59%	51%	72%
Vol Right, %	20%	21%	38%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	124	29	84	154
LT Vol	9	6	9	34
Through Vol	90	17	43	111
RT Vol	25	6	32	9
Lane Flow Rate	124	29	84	154
Geometry Grp	1	1	1	1
Degree of Util (X)	0.145	0.036	0.101	0.184
Departure Headway (Hd)	4.212	4.528	4.34	4.305
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	854	793	828	839
Service Time	2.224	2.544	2.354	2.305
HCM Lane V/C Ratio	0.145	0.037	0.101	0.184
HCM Control Delay	7.9	7.7	7.8	8.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.1	0.3	0.7

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	22	129	5	14	2	123	8	8	3	2	3
Future Vol, veh/h	3	22	129	5	14	2	123	8	8	3	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	3	22	129	5	14	2	123	8	8	3	2	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	16	0	0	151	0	0	121	119	87	126	182	15
Stage 1	-	-	-	-	-	-	93	93	-	25	25	-
Stage 2	-	-	-	-	-	-	28	26	-	101	157	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1615	-	-	1442	-	-	859	775	977	852	716	1070
Stage 1	-	-	-	-	-	-	919	822	-	998	878	-
Stage 2	-	-	-	-	-	-	994	878	-	910	772	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1615	-	-	1442	-	-	851	771	977	835	712	1070
Mov Cap-2 Maneuver	-	-	-	-	-	-	851	771	-	835	712	-
Stage 1	-	-	-	-	-	-	917	820	-	996	875	-
Stage 2	-	-	-	-	-	-	986	875	-	892	770	-

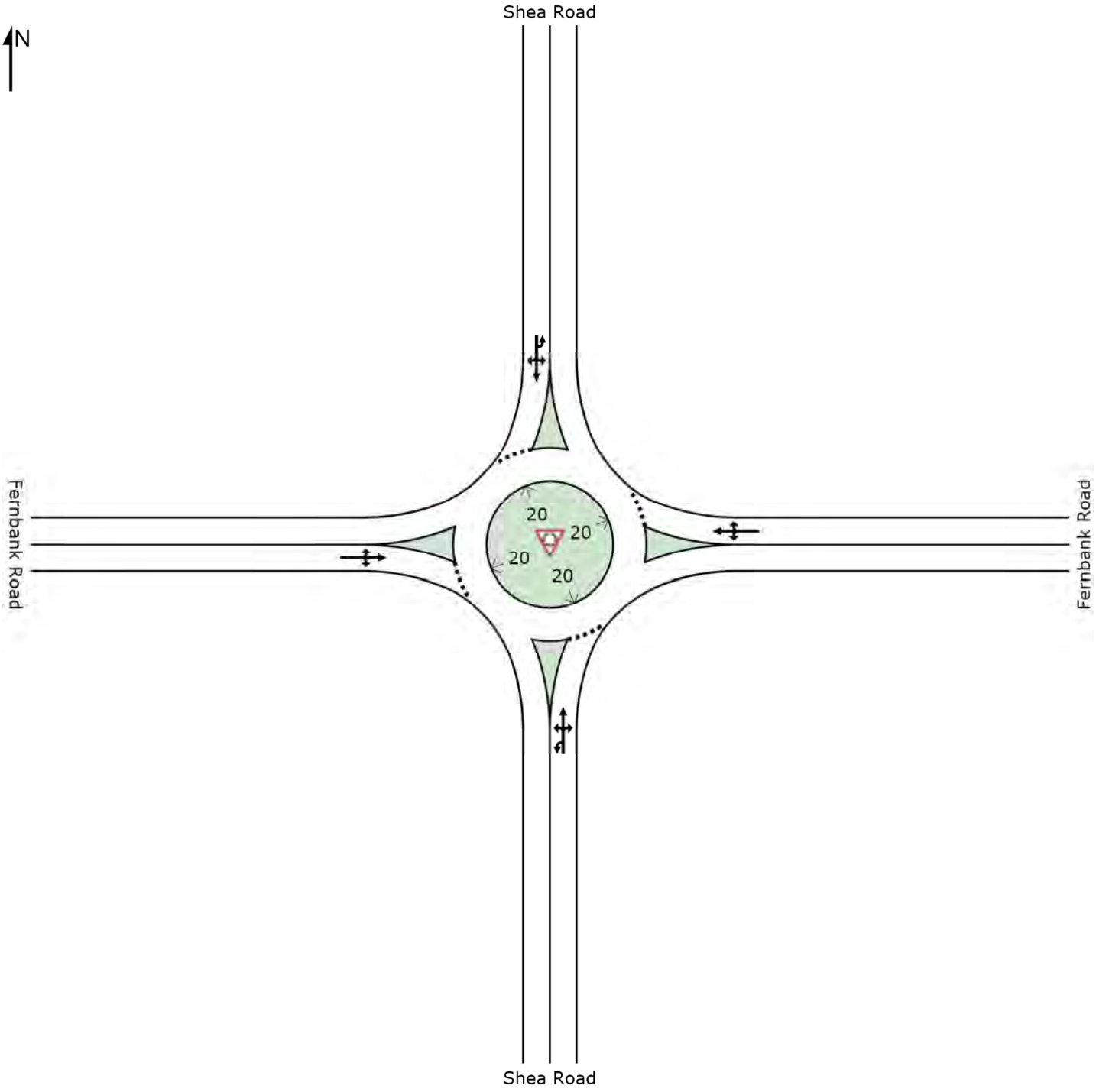
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.8	10	9.2
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	852	1615	-	-	1442	-	-	869
HCM Lane V/C Ratio	0.163	0.002	-	-	0.003	-	-	0.009
HCM Control Delay (s)	10	7.2	0	-	7.5	0	-	9.2
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0

SITE LAYOUT

Site: TT2030AM

Fernbank Road & Shea Road
Future (2030) Total Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TT2030AM

Fernbank Road & Shea Road
Future (2030) Total Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

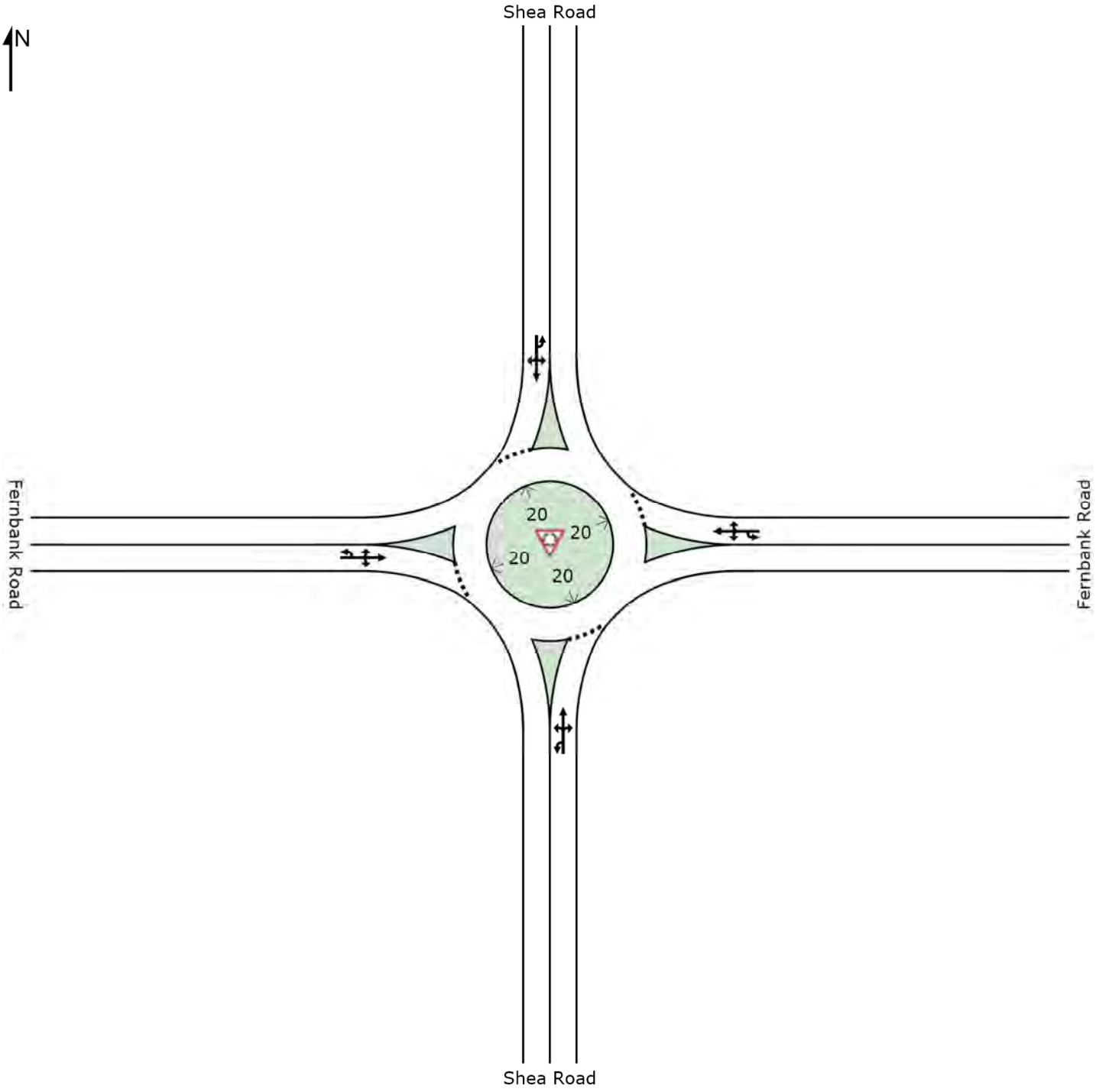
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.470	15.7	LOS C	2.1	16.2	0.70	0.75	48.4
3	L2	25	2.0	0.470	15.7	LOS C	2.1	16.2	0.70	0.75	47.6
8	T1	160	2.0	0.470	15.7	LOS C	2.1	16.2	0.70	0.75	47.7
18	R2	50	8.0	0.470	15.7	LOS C	2.1	16.2	0.70	0.75	46.6
Approach		236	3.3	0.470	15.7	LOS C	2.1	16.2	0.70	0.75	47.5
East: Fernbank Road											
1	L2	41	2.0	0.518	12.5	LOS B	2.9	22.2	0.63	0.66	49.6
6	T1	290	2.0	0.518	12.5	LOS B	2.9	22.2	0.63	0.66	49.8
16	R2	54	2.0	0.518	12.5	LOS B	2.9	22.2	0.63	0.66	48.7
Approach		385	2.0	0.518	12.5	LOS B	2.9	22.2	0.63	0.66	49.6
North: Shea Road											
7u	U	4	50.0	0.438	10.5	LOS B	2.1	16.2	0.57	0.55	48.9
7	L2	91	2.0	0.438	10.5	LOS B	2.1	16.2	0.57	0.55	50.5
4	T1	82	2.0	0.438	10.5	LOS B	2.1	16.2	0.57	0.55	50.6
14	R2	158	2.0	0.438	10.5	LOS B	2.1	16.2	0.57	0.55	49.6
Approach		335	2.6	0.438	10.5	LOS B	2.1	16.2	0.57	0.55	50.1
West: Fernbank Road											
5	L2	200	2.0	0.780	20.8	LOS C	8.8	67.8	0.80	0.76	44.3
2	T1	466	2.0	0.780	20.8	LOS C	8.8	67.8	0.80	0.76	44.4
12	R2	24	2.0	0.780	20.8	LOS C	8.8	67.8	0.80	0.76	43.6
Approach		690	2.0	0.780	20.8	LOS C	8.8	67.8	0.80	0.76	44.4
All Vehicles		1646	2.3	0.780	16.0	LOS C	8.8	67.8	0.70	0.69	47.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TT2030PM

Fernbank Road & Shea Road
Future (2030) Total Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TT2030PM

Fernbank Road & Shea Road
Future (2030) Total Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

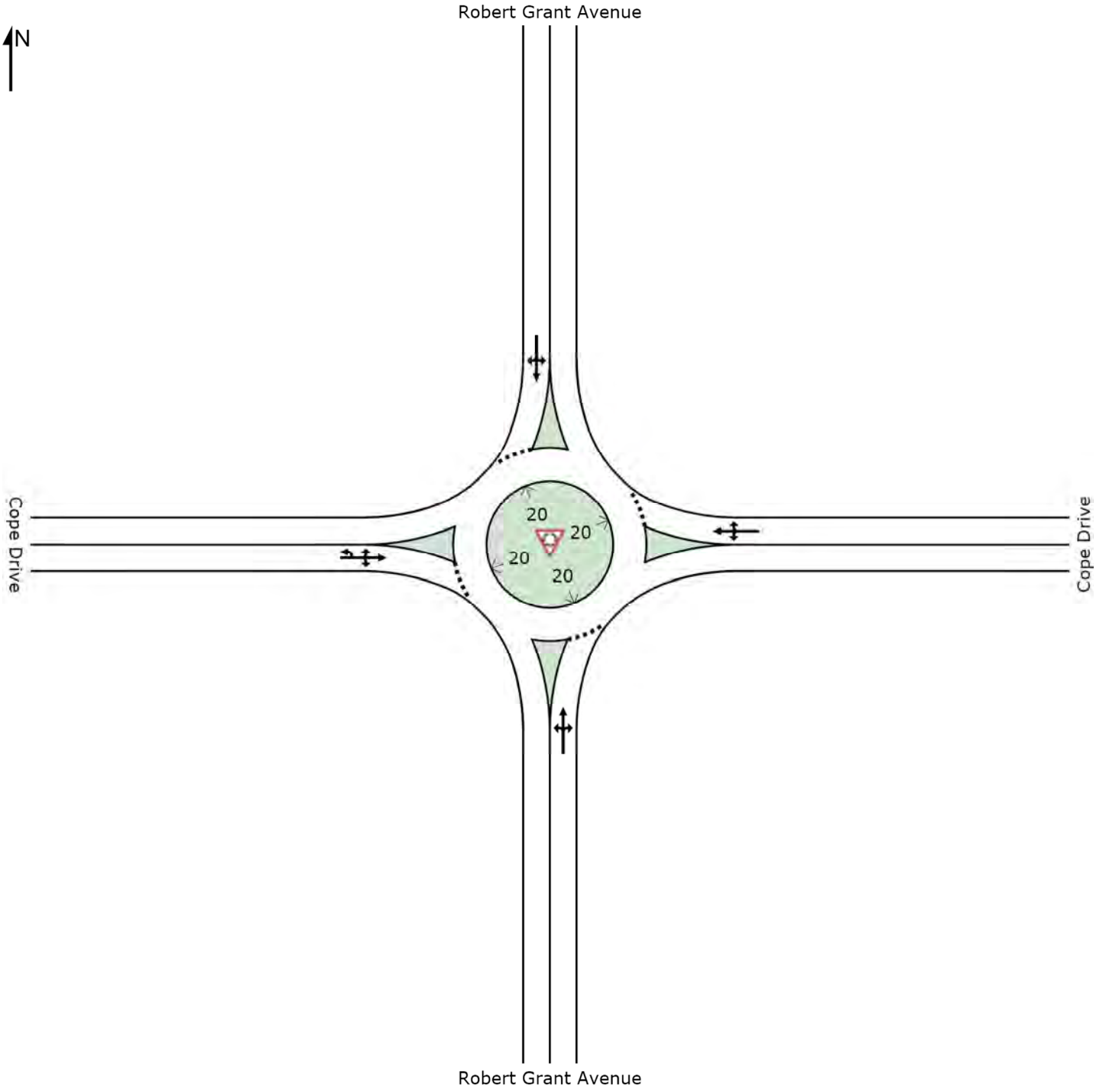
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shea Road											
3u	U	1	0.0	0.295	9.5	LOS A	1.1	8.6	0.57	0.57	52.3
3	L2	41	2.0	0.295	9.5	LOS A	1.1	8.6	0.57	0.57	51.4
8	T1	94	2.0	0.295	9.5	LOS A	1.1	8.6	0.57	0.57	51.5
18	R2	52	6.0	0.295	9.5	LOS A	1.1	8.6	0.57	0.57	50.2
Approach		188	3.1	0.295	9.5	LOS A	1.1	8.6	0.57	0.57	51.1
East: Fernbank Road											
1u	U	1	3.0	0.835	26.1	LOS D	10.5	82.4	0.88	0.93	42.5
1	L2	91	11.0	0.835	26.1	LOS D	10.5	82.4	0.88	0.93	41.7
6	T1	453	3.0	0.835	26.1	LOS D	10.5	82.4	0.88	0.93	42.0
16	R2	152	3.0	0.835	26.1	LOS D	10.5	82.4	0.88	0.93	41.3
Approach		697	4.0	0.835	26.1	LOS D	10.5	82.4	0.88	0.93	41.8
North: Shea Road											
7u	U	4	50.0	0.502	14.6	LOS B	2.4	19.1	0.68	0.73	46.4
7	L2	79	0.0	0.502	14.6	LOS B	2.4	19.1	0.68	0.73	47.9
4	T1	103	0.0	0.502	14.6	LOS B	2.4	19.1	0.68	0.73	48.0
14	R2	109	9.0	0.502	14.6	LOS B	2.4	19.1	0.68	0.73	46.7
Approach		295	4.0	0.502	14.6	LOS B	2.4	19.1	0.68	0.73	47.5
West: Fernbank Road											
5u	U	2	3.0	0.576	13.1	LOS B	3.6	28.2	0.61	0.58	49.6
5	L2	112	4.0	0.576	13.1	LOS B	3.6	28.2	0.61	0.58	48.8
2	T1	329	3.0	0.576	13.1	LOS B	3.6	28.2	0.61	0.58	49.0
12	R2	28	4.0	0.576	13.1	LOS B	3.6	28.2	0.61	0.58	48.0
Approach		471	3.3	0.576	13.1	LOS B	3.6	28.2	0.61	0.58	48.9
All Vehicles		1651	3.7	0.835	18.5	LOS C	10.5	82.4	0.73	0.76	45.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TO2030AM

Robert Grant Avenue & Cope Drive
Future (2030) Total Traffic
AM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TO2030AM

Robert Grant Avenue & Cope Drive
Future (2030) Total Traffic
AM Peak Hour
Roundabout

Movement Performance - Vehicles

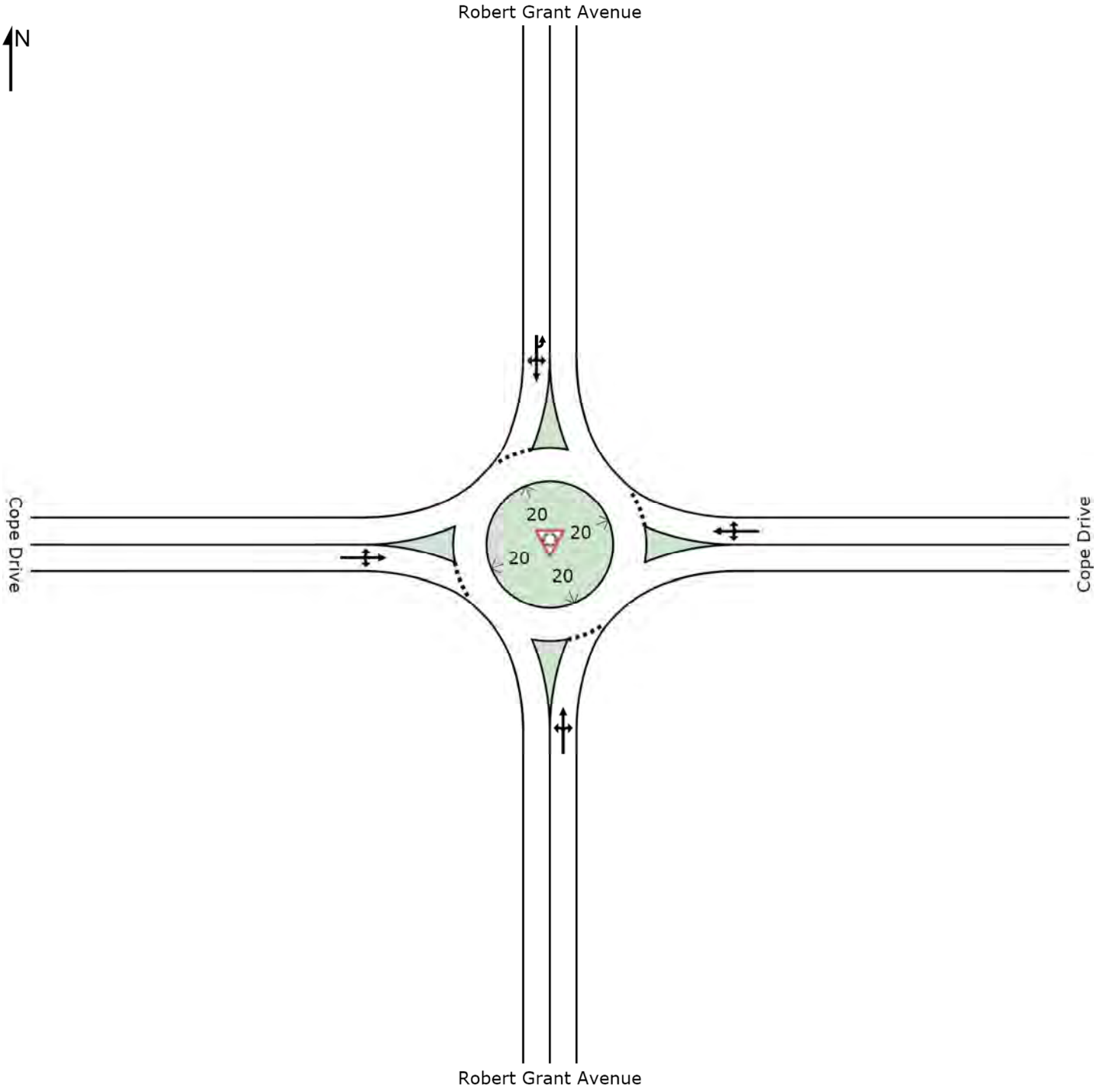
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	91	2.0	0.651	16.7	LOS C	4.6	35.9	0.73	0.80	46.8
8	T1	351	2.0	0.651	16.7	LOS C	4.6	35.9	0.73	0.80	46.9
18	R2	41	2.0	0.651	16.7	LOS C	4.6	35.9	0.73	0.80	46.0
Approach		483	2.0	0.651	16.7	LOS C	4.6	35.9	0.73	0.80	46.8
East: Cope Drive											
1	L2	35	2.0	0.391	12.2	LOS B	1.6	12.7	0.65	0.67	49.7
6	T1	69	2.0	0.391	12.2	LOS B	1.6	12.7	0.65	0.67	49.8
16	R2	120	2.0	0.391	12.2	LOS B	1.6	12.7	0.65	0.67	48.8
Approach		224	2.0	0.391	12.2	LOS B	1.6	12.7	0.65	0.67	49.3
North: Robert Grant Avenue											
7	L2	112	2.0	0.560	11.7	LOS B	3.4	26.4	0.53	0.42	49.9
4	T1	224	2.0	0.560	11.7	LOS B	3.4	26.4	0.53	0.42	50.0
14	R2	172	2.0	0.560	11.7	LOS B	3.4	26.4	0.53	0.42	49.0
Approach		508	2.0	0.560	11.7	LOS B	3.4	26.4	0.53	0.42	49.6
West: Cope Drive											
5u	U	1	2.0	0.494	11.8	LOS B	2.6	20.4	0.61	0.62	49.6
5	L2	204	2.0	0.494	11.8	LOS B	2.6	20.4	0.61	0.62	48.9
2	T1	76	2.0	0.494	11.8	LOS B	2.6	20.4	0.61	0.62	49.0
12	R2	94	2.0	0.494	11.8	LOS B	2.6	20.4	0.61	0.62	48.0
Approach		375	2.0	0.494	11.8	LOS B	2.6	20.4	0.61	0.62	48.7
All Vehicles		1590	2.0	0.651	13.3	LOS B	4.6	35.9	0.62	0.62	48.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: TO2030PM

Robert Grant Avenue & Cope Drive
Future (2030) Total Traffic
PM Peak Hour
Roundabout



MOVEMENT SUMMARY

Site: TO2030PM

Robert Grant Avenue & Cope Drive
Future (2030) Total Traffic
PM Peak Hour
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Robert Grant Avenue											
3	L2	82	2.0	0.499	11.1	LOS B	2.7	21.0	0.56	0.51	50.4
8	T1	293	2.0	0.499	11.1	LOS B	2.7	21.0	0.56	0.51	50.5
18	R2	40	2.0	0.499	11.1	LOS B	2.7	21.0	0.56	0.51	49.4
Approach		415	2.0	0.499	11.1	LOS B	2.7	21.0	0.56	0.51	50.4
East: Cope Drive											
1	L2	50	2.0	0.266	9.0	LOS A	1.0	7.7	0.56	0.56	51.5
6	T1	49	2.0	0.266	9.0	LOS A	1.0	7.7	0.56	0.56	51.7
16	R2	72	2.0	0.266	9.0	LOS A	1.0	7.7	0.56	0.56	50.6
Approach		171	2.0	0.266	9.0	LOS A	1.0	7.7	0.56	0.56	51.2
North: Robert Grant Avenue											
7u	U	1	3.0	0.649	14.1	LOS B	5.0	38.5	0.59	0.48	49.3
7	L2	70	2.0	0.649	14.1	LOS B	5.0	38.5	0.59	0.48	48.6
4	T1	343	2.0	0.649	14.1	LOS B	5.0	38.5	0.59	0.48	48.7
14	R2	184	2.0	0.649	14.1	LOS B	5.0	38.5	0.59	0.48	47.7
Approach		598	2.0	0.649	14.1	LOS B	5.0	38.5	0.59	0.48	48.4
West: Cope Drive											
5	L2	159	2.0	0.422	11.1	LOS B	1.9	15.0	0.61	0.63	49.3
2	T1	51	2.0	0.422	11.1	LOS B	1.9	15.0	0.61	0.63	49.5
12	R2	81	2.0	0.422	11.1	LOS B	1.9	15.0	0.61	0.63	48.5
Approach		291	2.0	0.422	11.1	LOS B	1.9	15.0	0.61	0.63	49.1
All Vehicles		1475	2.0	0.649	12.0	LOS B	5.0	38.5	0.58	0.53	49.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Future (2030) Total Traffic
Including Cope Extension

Intersection	
Intersection Delay, s/veh	9.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	224	24	7	115	48	24	96	26	26	73	17
Future Vol, veh/h	9	224	24	7	115	48	24	96	26	26	73	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	9	224	24	7	115	48	24	96	26	26	73	17
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.2	9.1	9.3	9.1
HCM LOS	B	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	16%	4%	4%	22%
Vol Thru, %	66%	87%	68%	63%
Vol Right, %	18%	9%	28%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	257	170	116
LT Vol	24	9	7	26
Through Vol	96	224	115	73
RT Vol	26	24	48	17
Lane Flow Rate	146	257	170	116
Geometry Grp	1	1	1	1
Degree of Util (X)	0.202	0.336	0.222	0.163
Departure Headway (Hd)	4.98	4.709	4.706	5.053
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	714	758	757	703
Service Time	3.054	2.77	2.774	3.13
HCM Lane V/C Ratio	0.204	0.339	0.225	0.165
HCM Control Delay	9.3	10.2	9.1	9.1
HCM Lane LOS	A	B	A	A
HCM 95th-tile Q	0.8	1.5	0.8	0.6

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	16	164	27	16	242	40	27	87	24	24	98	11
Future Vol, veh/h	16	164	27	16	242	40	27	87	24	24	98	11
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	16	164	27	16	242	40	27	87	24	24	98	11
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10	11.1	9.7	9.7
HCM LOS	A	B	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	8%	5%	18%
Vol Thru, %	63%	79%	81%	74%
Vol Right, %	17%	13%	13%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	138	207	298	133
LT Vol	27	16	16	24
Through Vol	87	164	242	98
RT Vol	24	27	40	11
Lane Flow Rate	138	207	298	133
Geometry Grp	1	1	1	1
Degree of Util (X)	0.204	0.288	0.396	0.199
Departure Headway (Hd)	5.327	5.013	4.893	5.385
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	676	720	739	669
Service Time	3.343	3.013	2.893	3.401
HCM Lane V/C Ratio	0.204	0.287	0.403	0.199
HCM Control Delay	9.7	10	11.1	9.7
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	0.8	1.2	1.9	0.7

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	460	315	68	103	25
Future Vol, veh/h	22	460	315	68	103	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	460	315	68	103	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	383	0	-	0	819	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	504	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1175	-	-	-	345	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	607	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1175	-	-	-	338	725
Mov Cap-2 Maneuver	-	-	-	-	338	-
Stage 1	-	-	-	-	726	-
Stage 2	-	-	-	-	607	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	19.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1175	-	-	-	377
HCM Lane V/C Ratio	0.019	-	-	-	0.34
HCM Control Delay (s)	8.1	-	-	-	19.4
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.5

Intersection	
Int Delay, s/veh	2.4

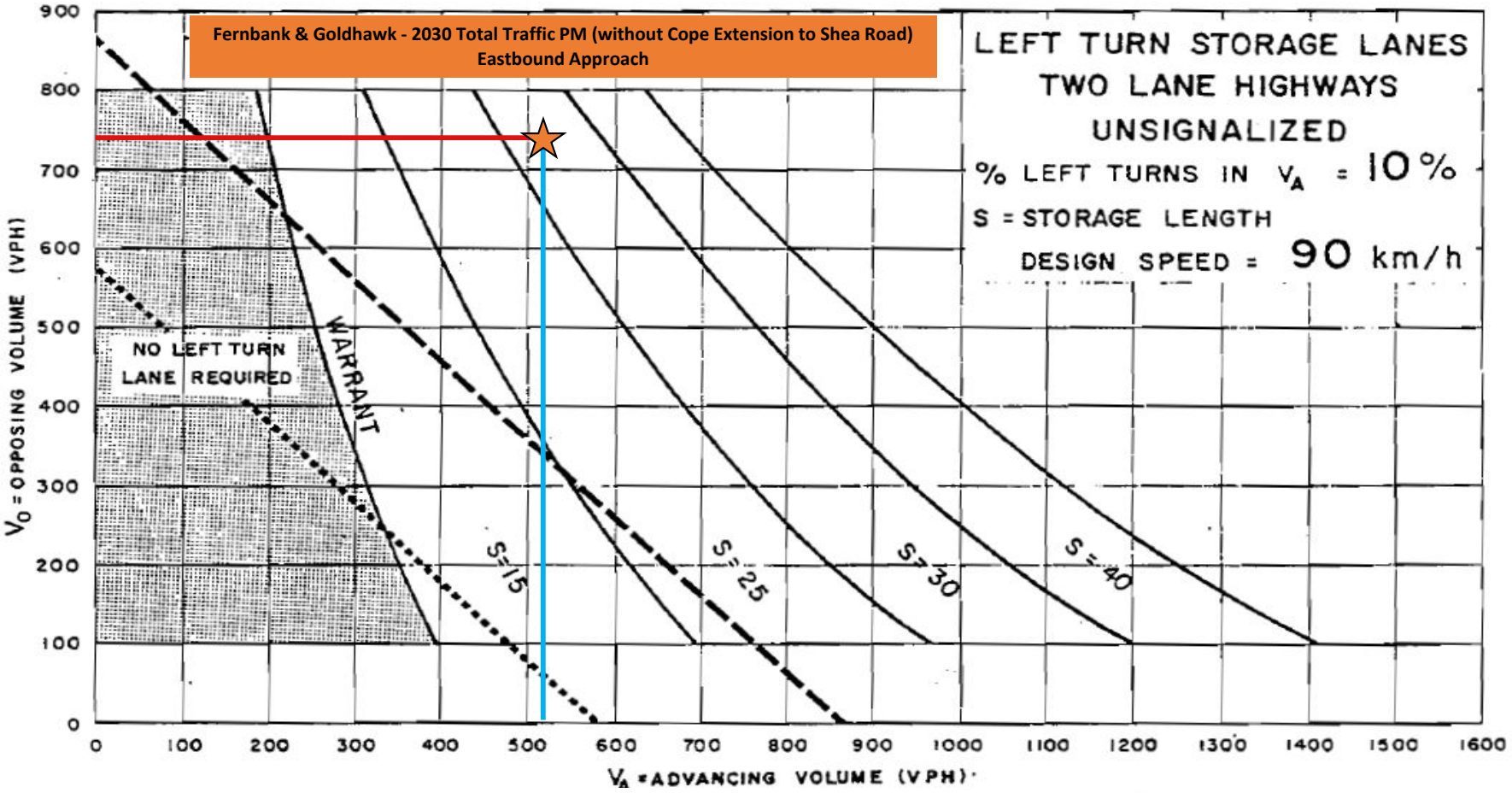
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	427	663	127	75	19
Future Vol, veh/h	38	427	663	127	75	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	250	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	427	663	127	75	19

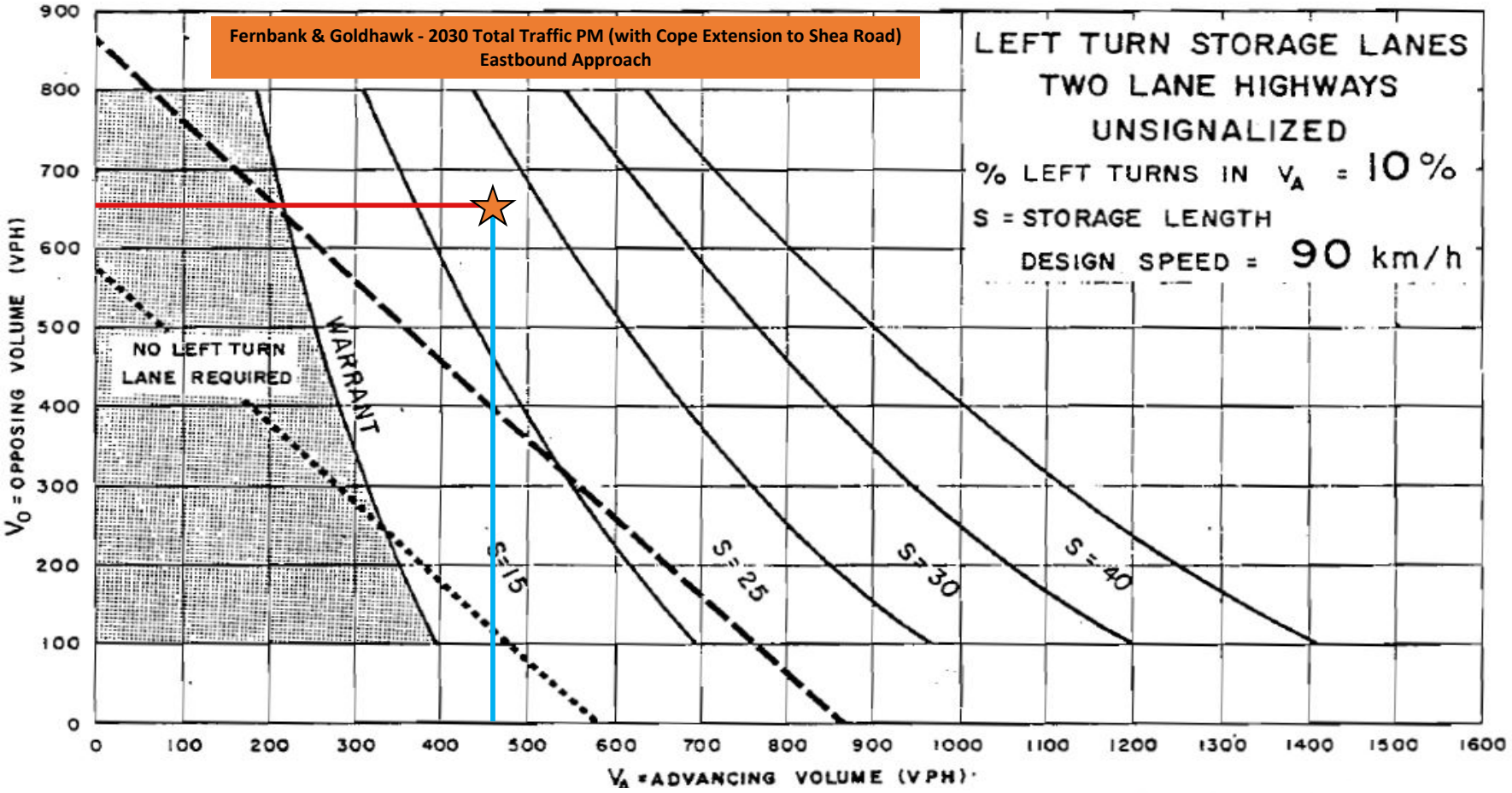
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	790	0	-	0	1166	663
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	503	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	839	-	-	-	216	465
Stage 1	-	-	-	-	516	-
Stage 2	-	-	-	-	612	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	839	-	-	-	206	465
Mov Cap-2 Maneuver	-	-	-	-	206	-
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	612	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	30.7
HCM LOS			D

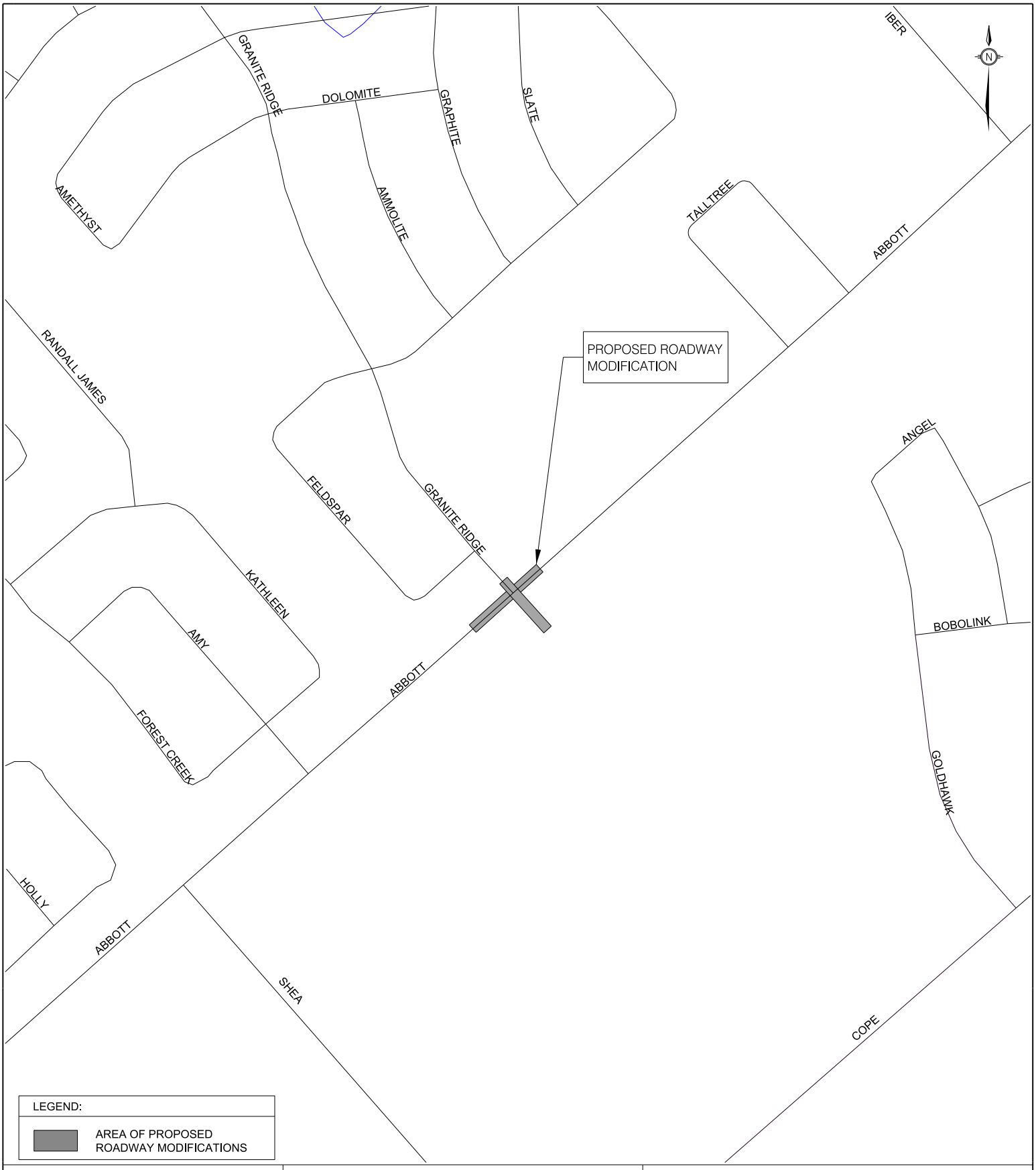
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	839	-	-	-	232
HCM Lane V/C Ratio	0.045	-	-	-	0.405
HCM Control Delay (s)	9.5	-	-	-	30.7
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.8

Appendix K – Auxiliary Lane Analyses


Fernbank & Goldhawk - 2030 Total Traffic PM (without Cope Extension to Shea Road)
Eastbound Approach
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10 %
S = STORAGE LENGTH
DESIGN SPEED = 90 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume


Fernbank & Goldhawk - 2030 Total Traffic PM (with Cope Extension to Shea Road)
Eastbound Approach
LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 10 %
S = STORAGE LENGTH
DESIGN SPEED = 90 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S=15
S=25
S=30
S=40
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS
Opposing Volume
Advancing Volume

Appendix L – RMA Materials



PLANNING AND GROWTH MANAGEMENT

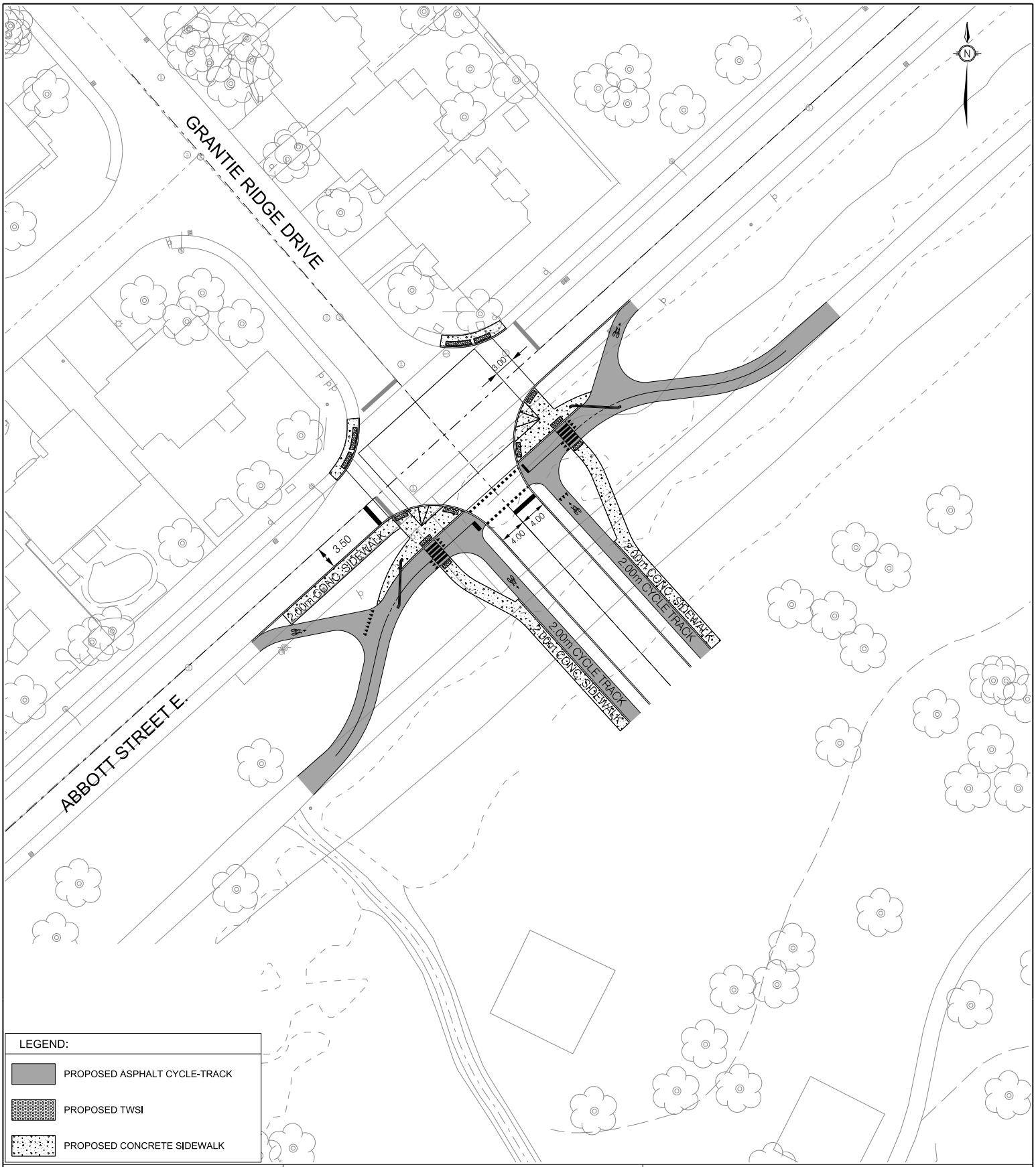
KEY PLAN

ABOTT STREET EAST AND GRANTIE RIDGE DRIVE

PROPOSED TRAFFIC-CALMING MEASURE

Transportation Engineering Services

Approved By: ----	Drawing No.: RMA-2022-TPD-XXXA
Completed By: IBI GROUP	
Scale: N.T.S.	Date: MARCH 2022



PLANNING AND GROWTH MANAGEMENT

KEY PLAN

ABOTT STREET EAST AND GRANTIE RIDGE DRIVE

PROPOSED TRAFFIC-CALMING MEASURE

Transportation Engineering Services

Approved By: ----	Drawing No.: RMA-2021-TPD-011B
Completed By: IBI GROUP	
Scale: N.T.S.	Date: MARCH 2022

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Abbott / Granite Ridge / Bobolink Protected Intersection
Functional Design Cost Estimate

DESCRIPTION		ESTIMATED COST	
Section A - General		**$**	**20,400.00**
Section B - Road		**$**	**428,985.00**
Section C - Streetlighting		**$**	**26,330.00**
Section D - Labour and Equipment		**$**	**10,005.60**
	Construction Subtotal	$	485,720.60
	Inflation 10%	$	48,572.06
City of Ottawa Design Fees		**$**	**5,000.00**
Street Lighting	$ 5,000.00		
	Subtotal	$	539,292.66
	Contingency 20%	$	107,858.53
	GRAND TOTAL	**$**	**647,151.19**

Note:
1. Cost for utility relocation / protection is not included.
2. Prices do not includes HST.
3. Tree compensation planting is not included.