Monarch Corporation

STONEBRIDGE GOLF COMMUNITY - PHASES 10 TO 12

TRANSPORTATION IMPACT STUDY

AUGUST 2007

IBI GROUP

August 2, 2007

Ms. Amira Shehata, M.Eng., P.Eng.
Infrastructure Approvals Officer
Planning and Infrastructure Approvals
Planning, Transit and the Environment Department
City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

Dear Ms. Shehata:

Stonebridge Golf Community Phases 10 to 12 - Transportation Impact Study

We are pleased to submit for your review and approval, ten (10) copies of the Transportation Impact Study (TIS) report for Phases 10 to 12 of the Stonebridge Golf Community. The study has followed the City of Ottawa Transportation Impact Assessment Guidelines and has incorporated the parameters and assumptions that were discussed and agreed at the pre-consultation meeting held on July 6, 2007.

The site plan for Phases 10 to 12 of the proposed development has been modified since this study has been completed. The number of residential units has potentially increased between the plan included in the TIS report and the latest site plan, by approximately 15%. We have reviewed the changes to the proposed plan and have conducted additional traffic analyses based on the revised unit count. The results of these additional analyses indicate that the increase in the number of residential units does not result in a significant increase in the traffic impact related to Phases 10 to 12 on the adjacent road network, above what is reported in the attached report.

Based on the above, we have concluded that the changes to the site plan for Phases 10 to 12 of the Stonebridge Golf Community (ie.15% increase in the total number of residential units within these phases) do not produce significant changes to the analysis results of this TIS. The findings and conclusions of the report remain the same.

Should you have any questions or require clarification regarding the above, please do not hesitate to contact us.

Yours truly,

IBI Group

David Hatton, MSc., P.Eng.
Principal, Transportation Facilities Engineering

Justin Date, P.Eng.
Project Engineer, Transportation

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1. INTRODUCTION

This report presents the methodology, findings and conclusions of a Transportation Impact Study related to Phases 10 to 12 of the Stonebridge Golf Community, located in south Barrhaven.

The study has followed the City of Ottawa Transportation Impact Assessment Guidelines (October 2006). Prior to the commencement of the study, the study parameters and assumptions were discussed and confirmed with City of Ottawa staff. These included:

- Background traffic counts
- Traffic growth rate assumptions
- Road network assumptions
- Trip generation rates
- Traffic distribution assumptions
- Intersection capacity analysis methodology

Traffic data used in this study were obtained from traffic counts undertaken by the City of Ottawa and supplemented with additional counts conducted by Geospace Research Associates, on behalf of IBI Group.

Background traffic projections used in the current traffic analysis have been based on information contained in the following reports:

- Barrhaven South Community Design Plan (CDP) Transportation Master Plan (Revised Draft), Delcan Corporation, May 2006.
- Half Moon Bay Development – Phase 1 (Mattamy Homes Limited) Traffic Impact Study, IBI Group, January 2007.

Further details of the background traffic growth assumptions are provided in Section 4.1.

Successive sections of the report describe the proposed development, traffic analyses and findings and conclusions associated with the study. A series of appendices provide details of background traffic information, traffic generations factors and intersection capacity analyses related to the study.

2. PROPOSED DEVELOPMENT

2.1 Site Location

Phases 10 to 12 are the final phases of the Stonebridge Golf Community development and will be located on vacant parcels of land bounded on the west by Greenbank Road, on the east by Jockvale Road and Phases 6 to 9 of the development, and on the north by the future Half Moon Bay development by Taggart Investments.

EXHIBIT 1 – SITE LOCATION indicates the location of the proposed Phases 10 to 12 of the Stonebridge Golf Community.

2.2 Land Uses

TABLE 1 – PROPOSED LAND USES presents details of the land uses proposed in each of the phases of the development.

TABLE 1

PROPOSED LAND USES

Phase	Land Uses		
	Single-Family Detached (units)	**Townhouses (units)**	**Elementary School (students)**
10 North	104	199	-
10 South	-	-	Approx. 500
11	125	53	-
12	101	185	-
TOTAL	**330**	**437**	**Approx. 500**

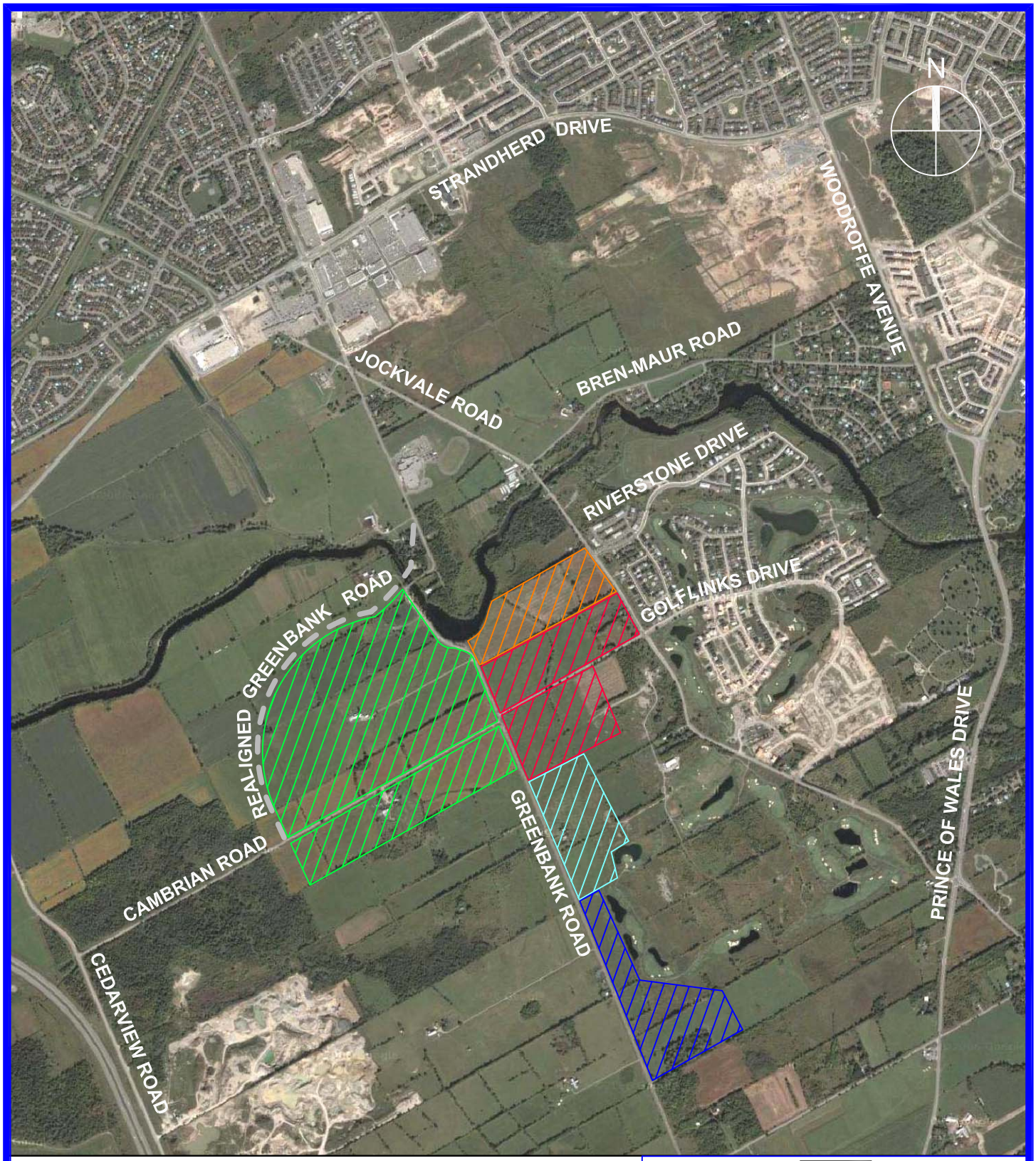
EXHIBIT 2 – PROPOSED DEVELOPMENT indicates the details of the internal layout of each of the phases of the development.

2.3 Site Access

Access to Phase 10 North will be provided to/ from Cambrian Road via Street No. 1, as indicated on Exhibit 2. The Street No. 1 approach to Cambrian Road will be located directly opposite Kilbirnie Drive, creating a four-way intersection. Access to Phase 10 North will also be possible indirectly via the Jockvale Road/ Riverstone intersection and the internal road network of the Half Moon Bay development to the north.

Phases 11 and 12 of the development will be accessed to/ from Greenbank Road, via Dundonald Drive and Kilbirnie Drive, as indicated on Exhibit 2. It is anticipated that these intersections wil be unsignalized with stop control on the side street approach. Indirect access to phases 11 and 12 to/from Cambrian Road and Jockvale Road will also be provided via Kilbirnie Drive and Blackleaf Drive respectively.

The site plan details of the elementary school proposed in Phase 10 South have not been confirmed at the time of this study. It is anticipated that access will be provided to/ from Greenbank Road and/or Cambrian Road.



LEGEND

- STONEBRIDGE (PHASE 10)
- STONEBRIDGE (PHASE 11)
- STONEBRIDGE (PHASE 12)
- MATTAMY HALF MOON BAY
- TAGGART HALF MOON BAY

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STONEBRIDGE PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

SITE LOCATION

DATE	SCALE	DWG. NO.
2007-06-21	N.T.S.	EXHIBIT 1

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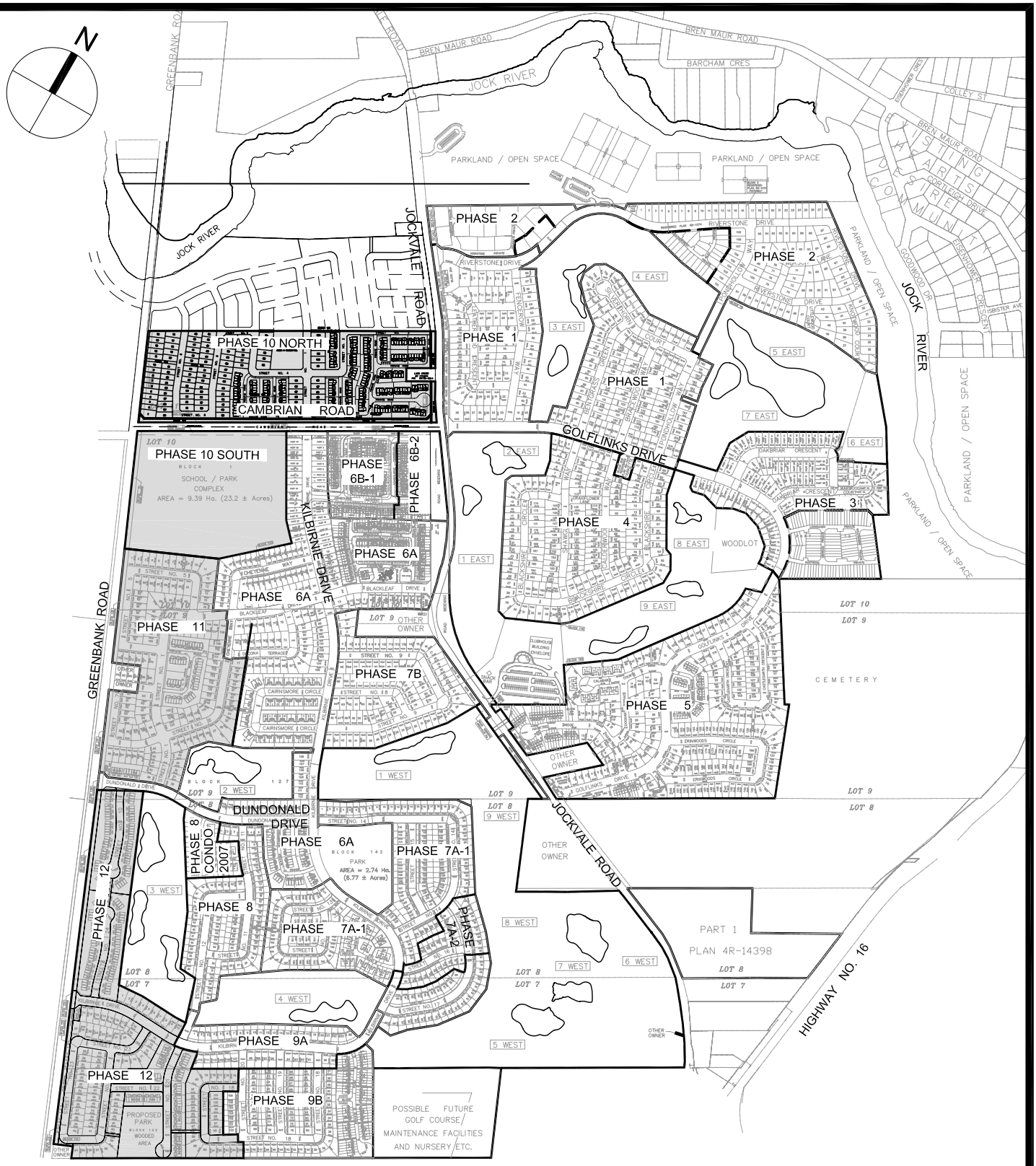

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STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

PROPOSED DEVELOPMENT

DATE	SCALE	DWG. NO.
23-07-2007	N.T.S.	EXHIBIT 2

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3. TRANSPORTATION NETWORK

3.1 Existing Road Network

3.1.1 JOCKVALE ROAD

Jockvale Road is a two-lane undivided rural arterial road under the jurisdiction of the City of Ottawa. The section of Jockvale Road to the south of the Jock River has a posted speed limit of 70 km/h.

Jockvale Road runs in a north-south direction between Prince of Wales Drive to the south and Greenbank Road to the north.

Recent modifications to Jockvale Road have included the construction of auxiliary turning lanes at the Jockvale Road/Riverstone Drive, Jockvale Road/Cambrian Road/Golf Links Drive (N) and Jockvale Road/ Golf Links Drive (S) intersections. As well, improvements to the vertical and horizontal alignment of Jockvale Road on the northbound and southbound approaches to the Jockvale Road/Cambrian Road/Golf Links Drive intersection were completed in 2006.

Traffic signals will be installed at the Jockvale Road/ Cambrian Road/ Golf Links Drive (N) intersection in summer 2007.

3.1.2 GREENBANK ROAD

Greenbank Road is a two-lane undivided rural arterial road under the jurisdiction of the City of Ottawa. The posted speed limit along Greenbank road, south of the Jock River, is 80 km/h. The posted speed limit is reduced to 20 km/h in the vicinity of the bridge crossing the Jock River.

Greenbank Road runs in a north-south direction and converges with Jockvale Road at an all-way stop controlled intersection, as indicated on Exhibit 1.

3.1.3 CAMBRIAN ROAD

Cambrian Road is a two-lane undivided rural arterial road under the jurisdiction of the City of Ottawa. Cambrian Road provides an east-west connection between Jockvale Road and Cedarview Road.

TABLE 2 – EXISTING INTERSECTION CONFIGURATIONS presents details of the lane configurations and traffic control at each of the existing intersections to be assessed as part of this study.

TABLE 2

EXISTING INTERSECTION CONFIGURATIONS

INTERSECTION	TRAFFIC CONTROL	LANE CONFIGURATION			
		EB	WB	NB	SB
Greenbank Road/ Jockvale Road	Unsignalized (all-way stop control with flashing red beacon)	LTR	LTR	LTR	LTR
Greenbank Road/ Cambrian Road	Unsignalized (stop-control on Cambrian approaches)	LTR	LTR	LTR	LTR
Cedarview Road/ Cambrian Road	Unsignalized (Stop-control on Cambrian approach)	-	LR	TR	TL
Jockvale Road/ Cambrian Road/Golf Links Drive	Unsignalized (Stop-control on EB and WB approaches)	L TR	L TR	L TR	L TR
Jockvale Road/ Riverstone Drive	Unsignalized (stop-control on WB approach)	-	L R	TR	L T
Jockvale Road/ Golf Links Drive (S)	Unsignalized (stop-control on WB approach)	-	L R	TR	L T
Jockvale Road/ Prince of Wales Drive	Signalized	LTR	TL R[2]	L T TR	L T TR

Notes:

1. *L – Left-turn lane; R – Right-turn lane; T – Through lane; TL – Shared Through/Left-turn lane; TR – Shared Through/Right-turn lane; LR – Shared left-turn/right-turn lane; LTR – Shared left turn/through/right-turn lane.*
2. *Channelized right-turn lane.*

3.2 Existing Bicycle and Pedestrian Network

There are no existing sidewalks along Greenbank Road and Cambrian Road adjacent to the site.

There are currently no specific facilities provided for bicycles on the sections of Greenbank Road and Cambrian Road adjacent to the site. Paved shoulders usable by cyclists and pedestrians are provided along the section of Jockvale Road adjacent to the Stonebridge development.

3.3 Existing Transit Service

Regular Route 186 operates on Jockvale Road, south of Strandherd Drive, to service the Stonebridge community. Route 186 is extended south to service the Town of Manotick during the weekday morning and afternoon peak periods.

APPENDIX 1 – OC TRANSPO MAPS, presents the latest transit route maps for the area, provided by OC Transpo.

3.4 Existing Traffic Volumes

The existing traffic volumes within the study area have been derived from weekday traffic counts undertaken at the following intersections:

- Greenbank Road/Jockvale Road (City of Ottawa, 2006)
- Jockvale Road/ Riverstone Drive (Geospace Research Associates, 2007)
- Jockvale Road/Cambrian Road/Golf Links Drive (N) (City of Ottawa, 2005)
- Jockvale Road/ Golf Links Drive (S) (Geospace Research Associates, 2007)
- Greenbank Road/Cambrian Road (Geospace Research Associates, 2006)
- Cambrian Road/Cedarview Road (Geospace Research Associates, 2006)

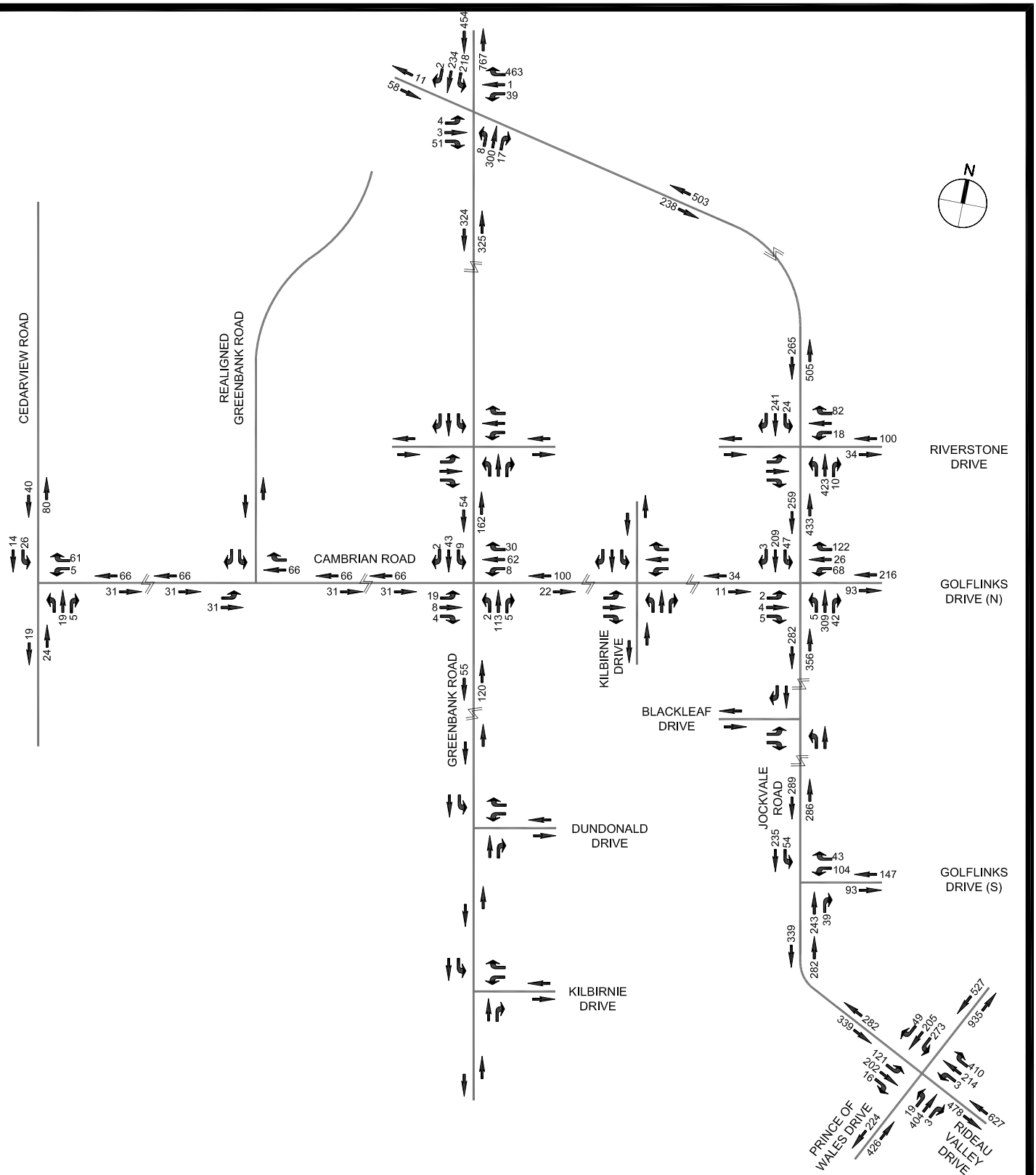
Details of the traffic data indicated above are included in APPENDIX 2 – TRAFFIC DATA.

Representative 2007 traffic volumes have been derived from traffic data in Appendix 2, by applying a 3% annual background traffic growth rate to the 2005 and 2006 arterial road traffic volumes. The 3% annual traffic growth rate was established in the Barrhaven South Community Design Plan (CDP) Transportation Master Plan (Revised Draft), prepared by Delcan Corporation in May 2006 and represents the traffic growth due to development outside of the study area that has occurred in the time between when the traffic data was recorded and the present.

EXHIBIT 3A – EXISTING (2007) TRAFFIC, AM PEAK HOUR and EXHIBIT 3B – EXISTING (2007) TRAFFIC, PM PEAK HOUR, present details of the 2007 representative traffic volumes for the intersections indicated above, during the weekday morning and weekday afternoon peak hours.

3.5 Collision Records

A review of the collision records for the past three years has been carried out for the study area. The City of Ottawa Transportation Impact Assessment Guidelines (October 2006) indicate that



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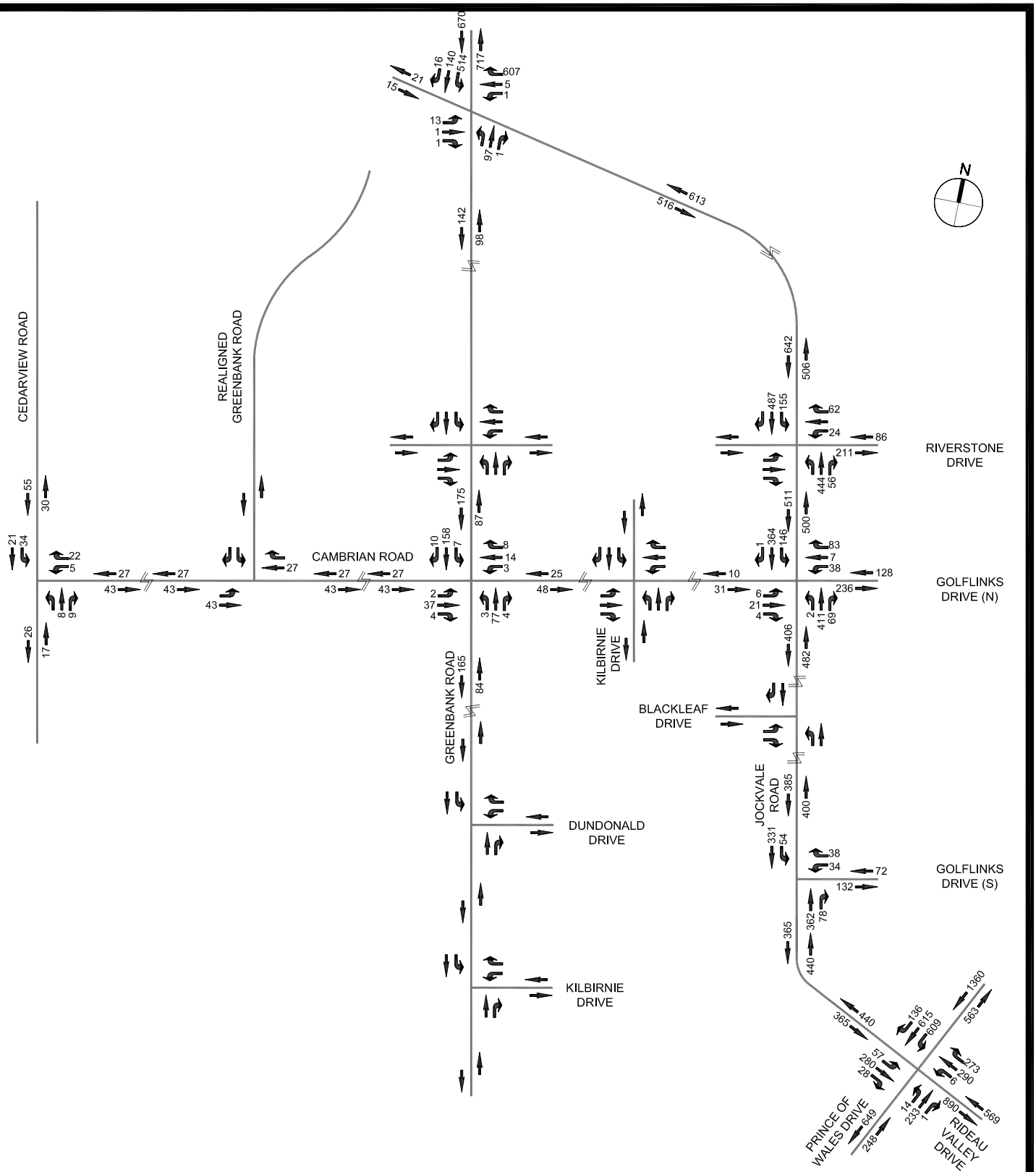
STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

EXISTING (2007) TRAFFIC
AM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	3A



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PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

EXISTING (2007) TRAFFIC
PM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	3B

further analysis may be warranted when there have been either 33 or more total collisions reported at a particular location or at least six collisions for any one movement, over a three year period.

TABLE 3 – REPORTED COLLISIONS WITHIN THE STUDY AREA presents a summary of the total collisions recorded at various locations in the study area during the period between January 1, 2004 and December 31, 2006.

TABLE 3

REPORTED COLLISIONS WITHIN THE STUDY AREA

Location	# of Reported Collisions (January 1, 2004 to December 31, 2006)
Jockvale Road/ Greenbank Road Intersection	7
Jockvale Road, between Greenbank Road and Riverstone Drive	12
Jockvale Road/ Cambrian Road/ Golf Links Drive (N) Intersection	9
Jockvale Road, between Golf Links Drive and Prince of Wales Drive	7
Jockvale Road/ Prince of Wales Drive Intersection	11

Based on the above, the locations investigated in this study fall well below the City's warrant for further analysis with respect to total reported collisions. As well, there were no discernible patterns apparent in the detailed records of the collisions.

APPENDIX 3 – COLLISION DATA presents the detailed collision records for the study area.

3.6 Future Road Network

3.6.1 JOCKVALE ROAD

Jockvale Road

The City of Ottawa has recently initiated an Environmental Assessment for the widening of Jockvale Road from 2 to 4 lanes between the Jock River and Prince of Wales Drive. In addition, the EA for the new roadway (Jockvale/Longfields Extension) between Strandherd Drive and Jockvale Road, north of the Jock River has been completed. The Ottawa 2020 Transportation Master Plan (TMP), published by the City of Ottawa in September 2003, indicates that both the Jockvale/ Longfields Link and Jockvale Road Widening projects are scheduled to be completed by 2013. The City of Ottawa Draft Budget Forecast for the period 2008 to 2016, indicates funds are to be allocated for construction of the Jockvale/ Longfields link in 2009. However, the timing of the Jockvale Road Widening project is uncertain as it has not been included in the list of required infrastructure projects for this period.

3.6.2 GREENBANK ROAD

An Environmental Assessment (EA) has been recently completed by the City of Ottawa for the proposed widening of Greenbank Road between Malvern Drive and Cambrian Road.

The EA has identified a preferred option for the future Greenbank Road that will consist of a four-lane divided cross-section with transit lanes in the median.

In addition, the section of Greenbank Road south of the existing Greenbank Road/Jockvale Road intersection will be realigned as indicated on Exhibit 1, to intersect with Cambrian Road at a location approximately 1 km to the west of the existing Greenbank Road/Cambrian Road intersection. This realignment will include a new bridge over the Jock River.

Upon completion of the future realigned Greenbank Road, the existing section of Greenbank Road north of Cambrian Road will be terminated at the Jock River and the existing bridge crossing will become a link in the proposed recreational pathway network in the area.

The Ottawa 2020 Transportation Master Plan (TMP), published by the City of Ottawa in September 2003, indicates that the future widening and realignment of Greenbank Road is scheduled to be completed by 2013. However, City staff have indicated that it is now unlikely that the future widening proposal will be completed by 2013 as forecasted in the TMP. Instead, the new Greenbank Road will be constructed as a two-lane undivided roadway initially, by 2013.

3.6.3 CAMBRIAN ROAD

The Barrhaven South CDP Transportation Master Plan indicates a future requirement for Cambrian Road to be widened from 2 to 4 lanes, between Jockvale Road and the new Greenbank Road, to facilitate the continued development of the Barrhaven South Community south of Cambrian Road. The timing of this project is unknown at this time. It has been assumed that Cambrian Road will remain as a two-lane undivided roadway within the time period assessed in this study.

3.7 Future Bicycle and Pedestrian Facilities

The Draft City of Ottawa Cycling Plan (March 2005) classifies Jockvale Road, Cedarview Road and Greenbank Road as “Spine or City-wide Cycling Routes” and they will function as the primary links between the Barrhaven South Community and other major nodes throughout the City.

Cycle lanes will be provided on the widened Jockvale Road and the new realigned section of Greenbank Road, in accordance with City of Ottawa policy.

Sidewalks will be provided on both sides of the adjacent arterial roads (New Greenbank Road , Jockvale Road and Cambrian Road) and the internal collector road system.

The TMP has identified the Jock River corridor as a location for a major recreational pathway network.

3.8 Future Transit Service

The City of Ottawa initiated the Southwest Rapid Transit Corrdor EA to address the extension of the southwest bus transitway from Berrigan Drive to the Urban Boundary. The EA recommended that the bus rapid transit corridor be located within the median of the realigned section of Greenbank

Road. This recommendation has been included in the preliminary design and EA of the Greenbank Road Widening.

4. TRAFFIC ANALYSES

4.1 Background Traffic Growth

In accordance with the City of Ottawa Transportation Impact Assessment Guidelines, the horizon year for the traffic analysis for Phases 10 to 12 of the Stonebridge Golf Community has been established to be 2018. The horizon year assumes a period of five years beyond the anticipated build-out year of the development.

Future background traffic volumes have been derived from the 2013 and 2018 traffic projections included in the Half Moon Bay – Phase 1 Traffic Impact Study, prepared by IBI Group in January 2007. The 2013 and 2018 total traffic projections in the Half Moon Bay study include future traffic generated by the following developments:

- Mattamy Half Moon Bay – Phase 1
- Taggart Half Moon Bay Subdivision
- Stonebridge Golf Community – Phases 6 to 12

The traffic generation estimates for phases 10 to 12 that were established at the time of the Mattamy study have been subtracted from the 2013 and 2018 traffic projections, in order to obtain representative background traffic volumes for use in this study.

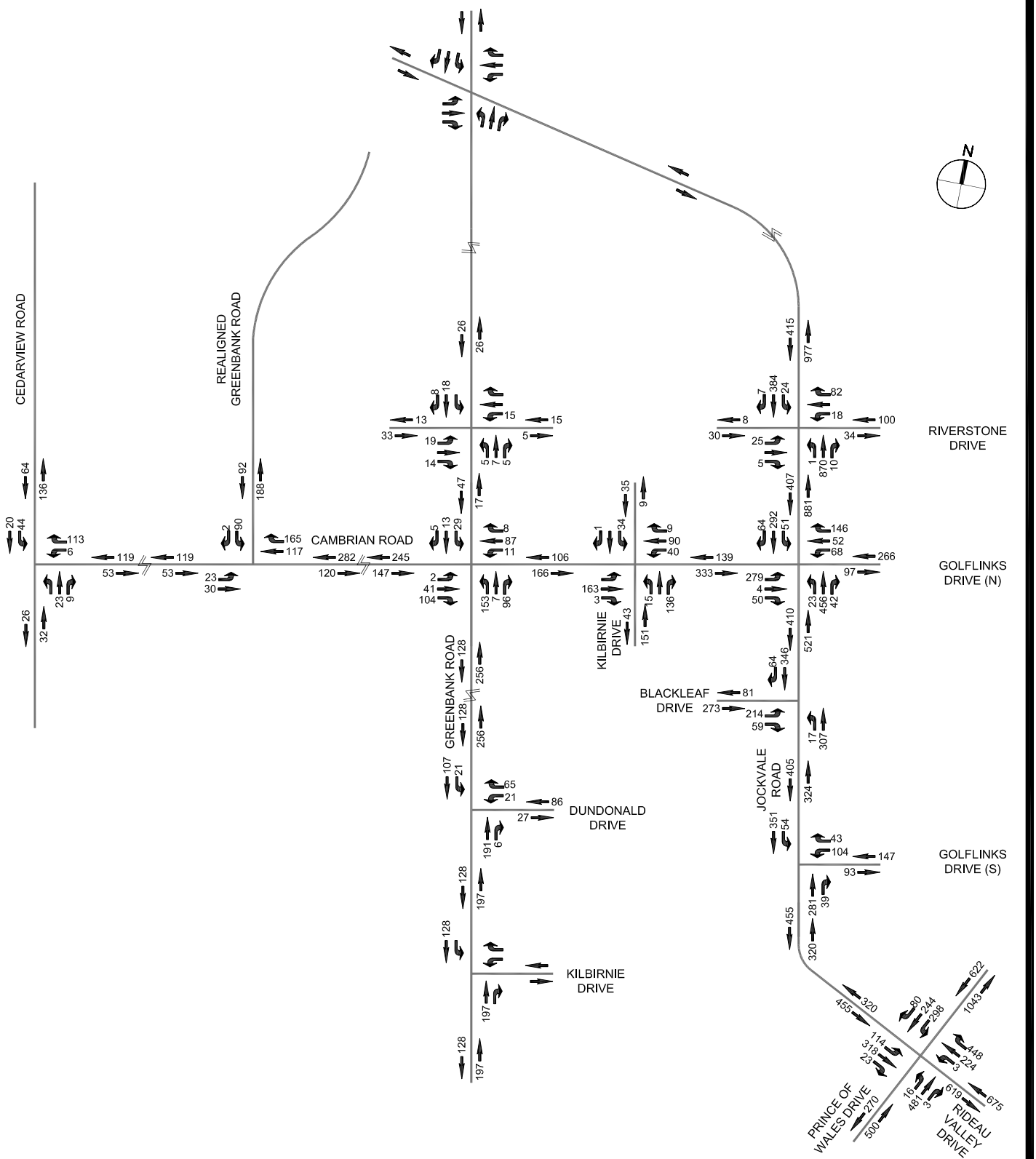
The approach to the determination of future background traffic volumes summarized above has been discussed and agreed with City of Ottawa staff prior to undertaking the traffic analysis in this study. Relevant extracts from the referenced studies are included in Appendix 2.

EXHIBIT 4A – FUTURE (2013) BACKGROUND TRAFFIC, AM PEAK HOUR and EXHIBIT 4B – FUTURE (2013) BACKGROUND TRAFFIC, PM PEAK HOUR, present details of the projected future background traffic volumes on the adjacent road network at the 2013 build-out year of the development, for the weekday morning and afternoon peak hours.

EXHIBIT 5A – FUTURE (2018) BACKGROUND TRAFFIC, AM PEAK HOUR and EXHIBIT 5B – FUTURE (2018) BACKGROUND TRAFFIC, PM PEAK HOUR, present details of the projected future background traffic volumes on the adjacent road network at the 2018 study horizon year, for the weekday morning and afternoon peak hours.

4.2 Trip Generation

Traffic generation associated with the Half Moon Bay development has been estimated based on data included in the ITE “Trip Generation” 7th Edition, 2003 publication. Traffic generation for the weekday morning and weekday afternoon peak hours has been derived for the land uses referenced above. APPENDIX 4 –TRIP GENERATION DATA, presents relevant extracts from the ITE publication.



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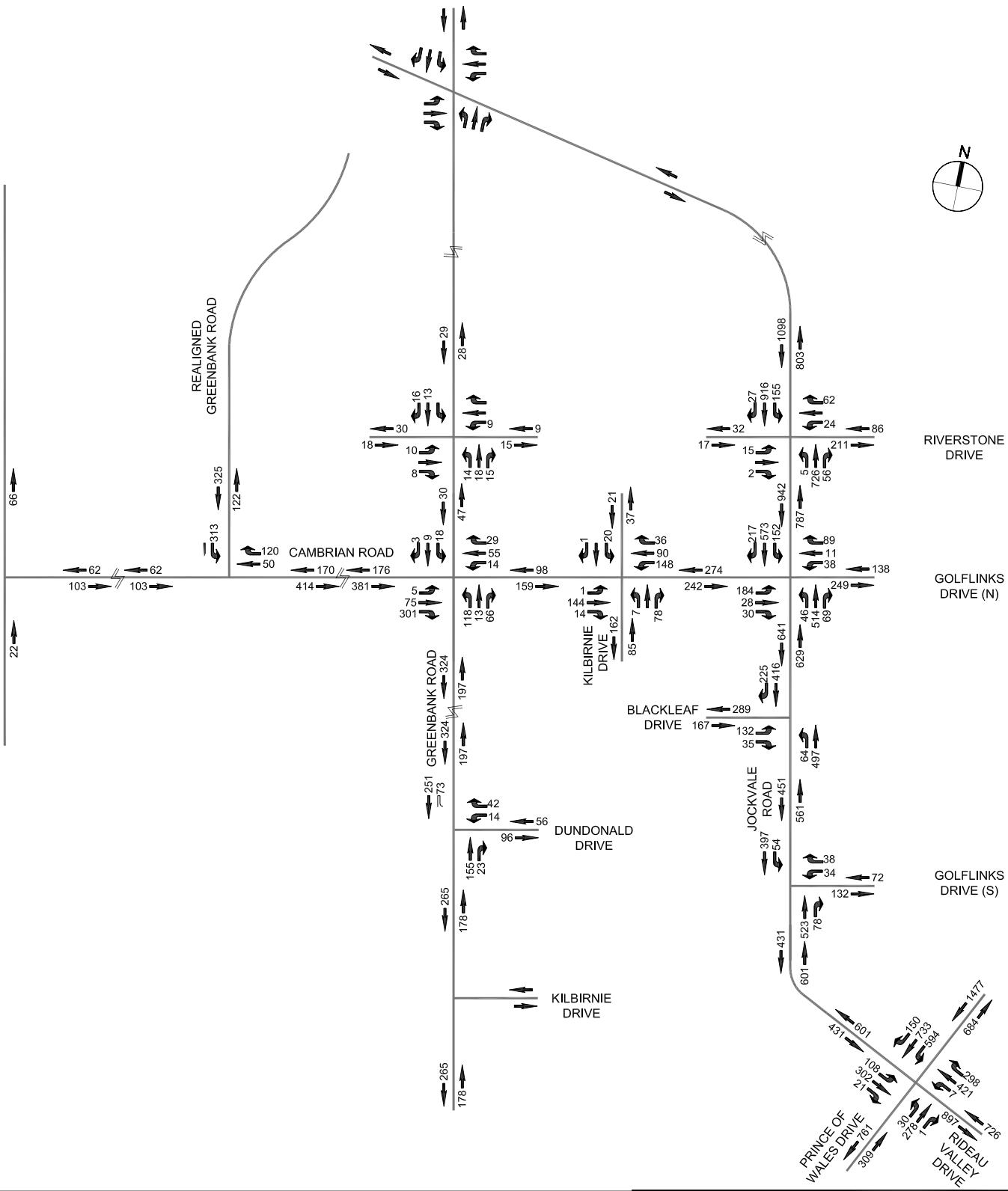
STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

FUTURE (2013) BACKGROUND TRAFFIC
AM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	4A



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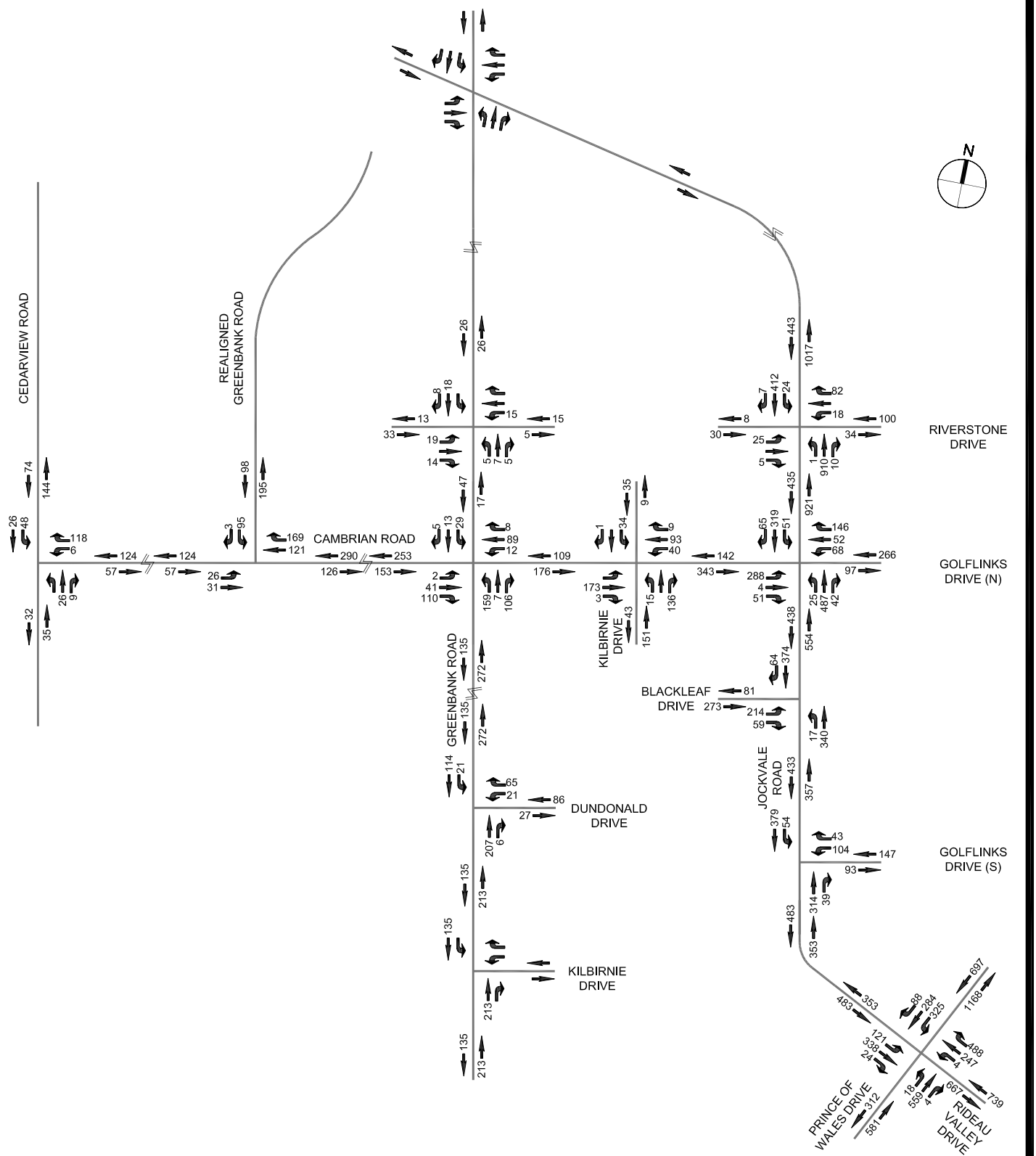
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

FUTURE (2013) BACKGROUND TRAFFIC
PM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	4B



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STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

FUTURE (2018) BACKGROUND TRAFFIC
AM PEAK HOUR

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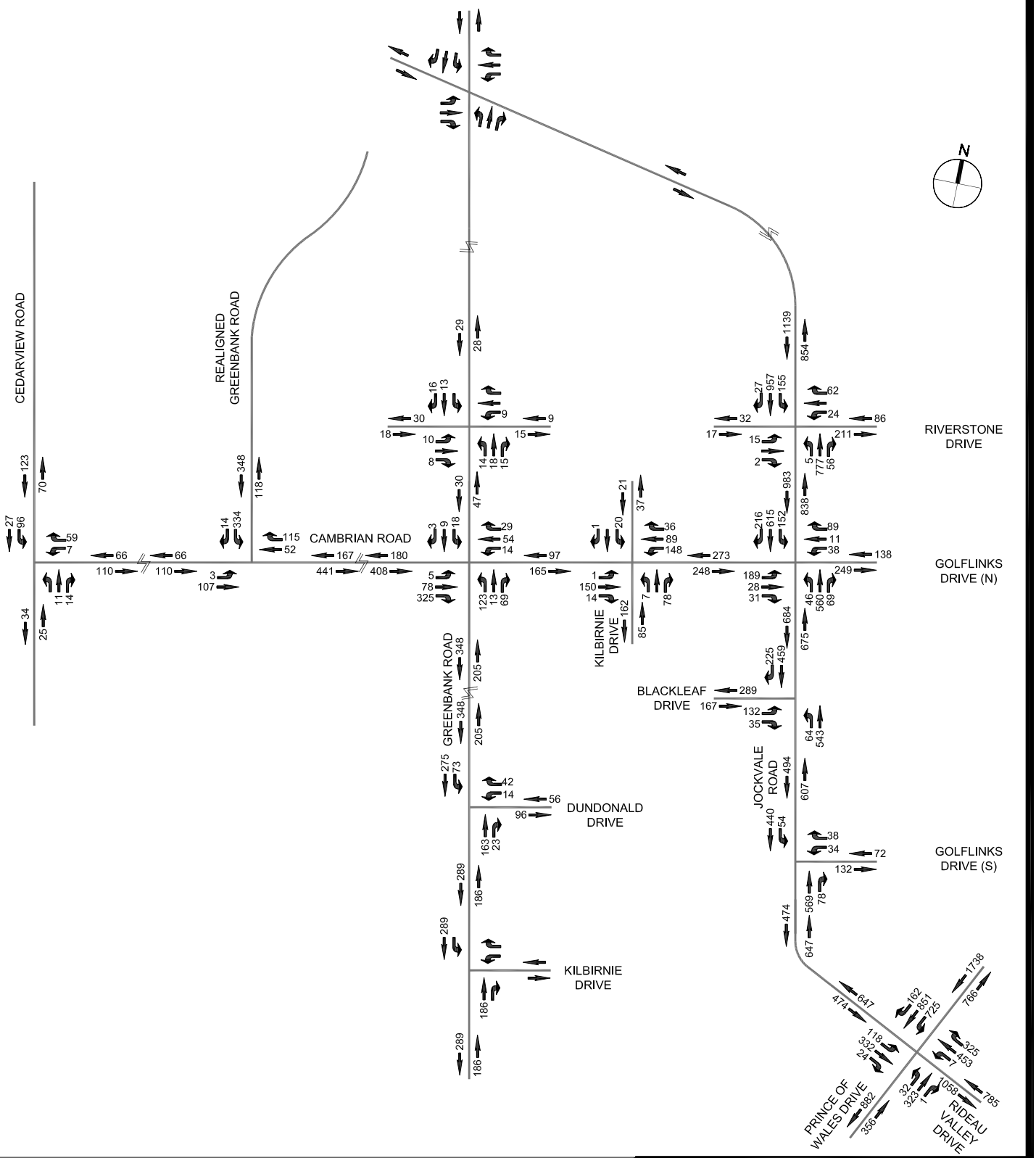
11-07-07	N.T.S.	5A



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PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

FUTURE (2018) BACKGROUND TRAFFIC
PM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	5B

4.2.1 SINGLE-FAMILY DETACHED

Land Use Code 210 “Single-Family Detached Housing” has been referenced from the ITE publication for trip generation data.

Based on the above, traffic generation associated with the single-family detached units in the Half Moon Bay development has been determined as follows:

- **Morning Peak Hour**

  Traffic generation = T, where

  T = 0.70(X) + 9.43, where

  X = number of residential units

  Directional Distribution = 25% Entering; 75 % Exiting

- **Afternoon Peak Hour**

  Traffic Generation = T, where

  Ln (T) = 0.90 Ln (X) + 0.53, where

  X = number of residential units

  Directional Distribution = 63% entering; 37% exiting

4.2.2 TOWNHOUSES/CONDOMINIUMS

Land Use Code 230 “Residential Condominium/Townhouse”, has been referenced for trip generation data.

- **Morning Peak Hour**

  Traffic Generation = T, where

  Ln (T) = 0.80 Ln (X) + 0.26, where

  X = number of residential units

  Directional Distribution = 17% entering; 83% exiting

- **Afternoon Peak Hour**

  Traffic Generation = T, where

  Ln (T) = 0.82 Ln (X) + 0.32, where

  X = number of residential units

  Directional Distribution = 67% entering; 33% exiting

4.2.3 ELEMENTARY SCHOOL

Land Use Code 520 “Elementary School”, has been referenced from the ITE publication for trip generation data.

- **Morning Peak Hour**

  Traffic Generation = T, where

  Ln (T) = 1.11 Ln (X) - 1.73, where

  X = approximate number of students

  Directional Distribution = 55% entering; 45% exiting

- **Afternoon Peak Hour**

  The data from the ITE publication used to calculate the afternoon peak hour traffic generated by the elementary school does not coincide with the afternoon peak hour for the adjacent road network. In order to obtain a more representative traffic volume from the elementary school during the afternoon peak hour for analysis, a reduction factor of 0.3 has been applied in the trip generation calculation. This factor has been used in other similar traffic impact studies approved by the City of Ottawa.

  Traffic Generation = T, where

  (Ln (T) = 1.08 Ln (X) - 1.90) x 0.30, where

  X = approximate number of students

  Directional Distribution = 45% entering; 55% exiting

  Details of the reduction factor derivation are included in Appendix 4.

4.2.4 TRAFFIC GENERATION SUMMARY

TABLE 4 – TRAFFIC GENERATION SUMMARY, presents a summary of the traffic generation estimated for each of the proposed land uses within the Richardson Ridge Subdivision, during the weekday morning and afternoon peak hours.

TABLE 4 -

TRAFFIC GENERATION SUMMARY

Phase	Trip Generation (veh/h)			
	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Phase 10 N	36	136	141	76
Phase 10 S	97	79	17	20

Phase 11	30	98	106	60
Phase 12	34	130	135	73
Total	**197**	**443**	**399**	**229**

4.3 Traffic Distribution

4.3.1 RESIDENTIAL

Primary traffic distribution factors for the residential component of the development have been assumed based on the distribution factors established in the Stonebridge Golf Community – Phases 6 to 9 Traffic Impact Study, prepared by CCL/ IBI in March 2005, as follows:

- To/ from the north 80%
- To/ from the south 20%

Site generated trips from Phases 10 to 12 of the Stonebridge development have been assigned to the internal and external road network using the most convenient and shortest route.

4.3.2 ELEMENTARY SCHOOL

Traffic generated by the proposed elementary school in Phase 10 South, has been assumed to originate primarily from the Stonebridge Golf Community (Phases 1 to 12) and has been distributed to/from each of the phases within the development according to their relative proportions.

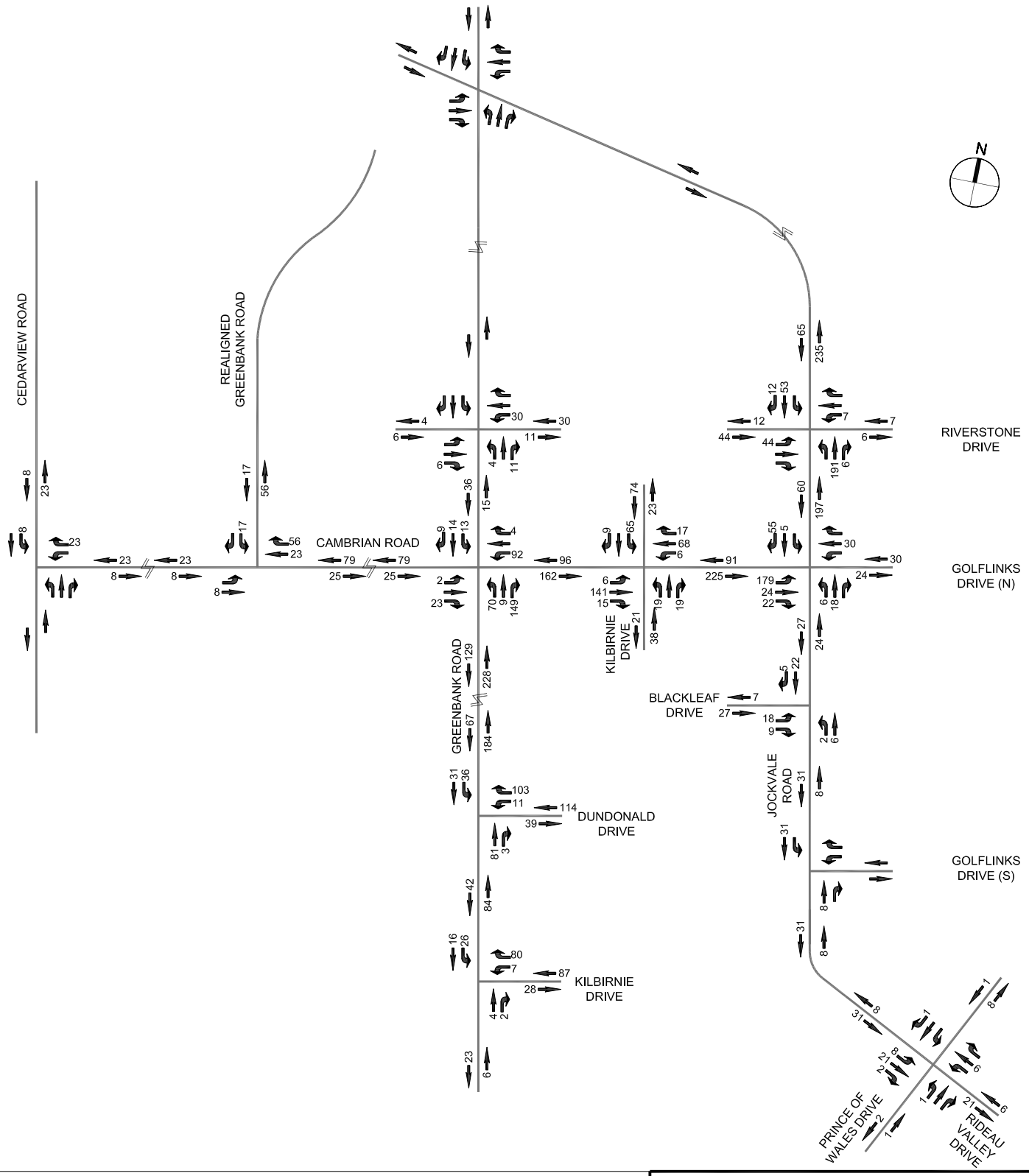
EXHIBIT 6A – SITE GENERATED TRAFFIC, AM PEAK HOUR and EXHIBIT 6B – SITE GENERATED TRAFFIC, PM PEAK HOUR, present the distribution and assignment of the traffic generated by Phases 10 to 12 of the Stonebridge Golf Community, for the weekday morning and afternoon peak hours.

The projected site generated traffic volumes above have then been applied to the future (2013) background traffic volumes, indicated in Exhibits 4A and 4B above, to obtain total traffic volumes at the anticipated build-out year of the development.

EXHIBIT 7A – FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC, AM PEAK HOUR and EXHIBIT 7B – FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC, PM PEAK HOUR, present the total traffic volumes projected for the adjacent road network at the 2013 build-out year of the Stonebridge Golf Community.

The projected site generated traffic volumes referenced above have then been applied to the future (2018) background traffic volumes, indicated in Exhibits 5A and 5B above, to obtain total traffic volumes at the study horizon year.

EXHIBIT 8A – FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC, AM PEAK HOUR and EXHIBIT 8B – FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC, PM PEAK HOUR, present the total traffic volumes projected for the adjacent road network at the 2018 study horizon year.



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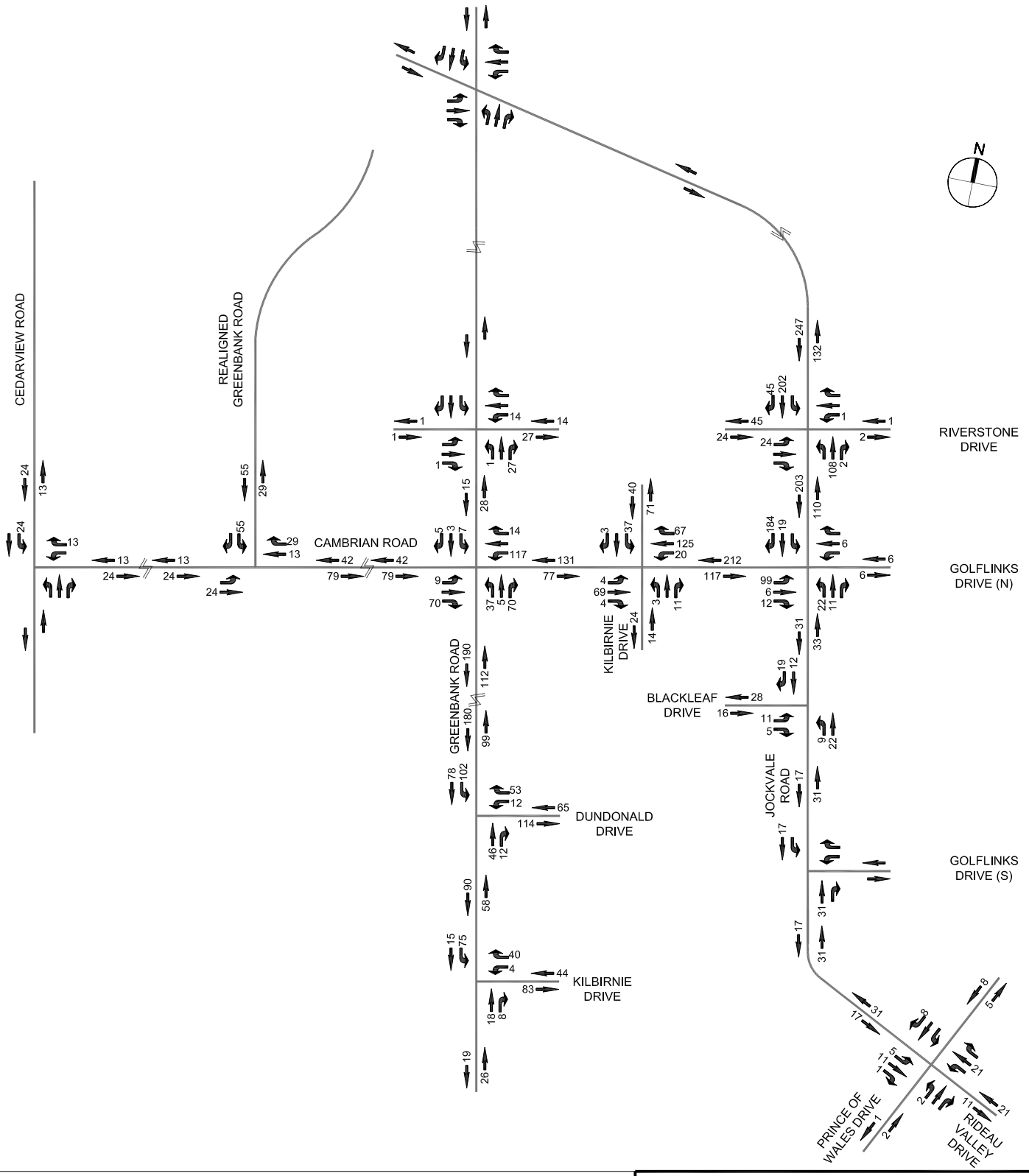
STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

SITE GENERATED TRAFFIC
AM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	6A



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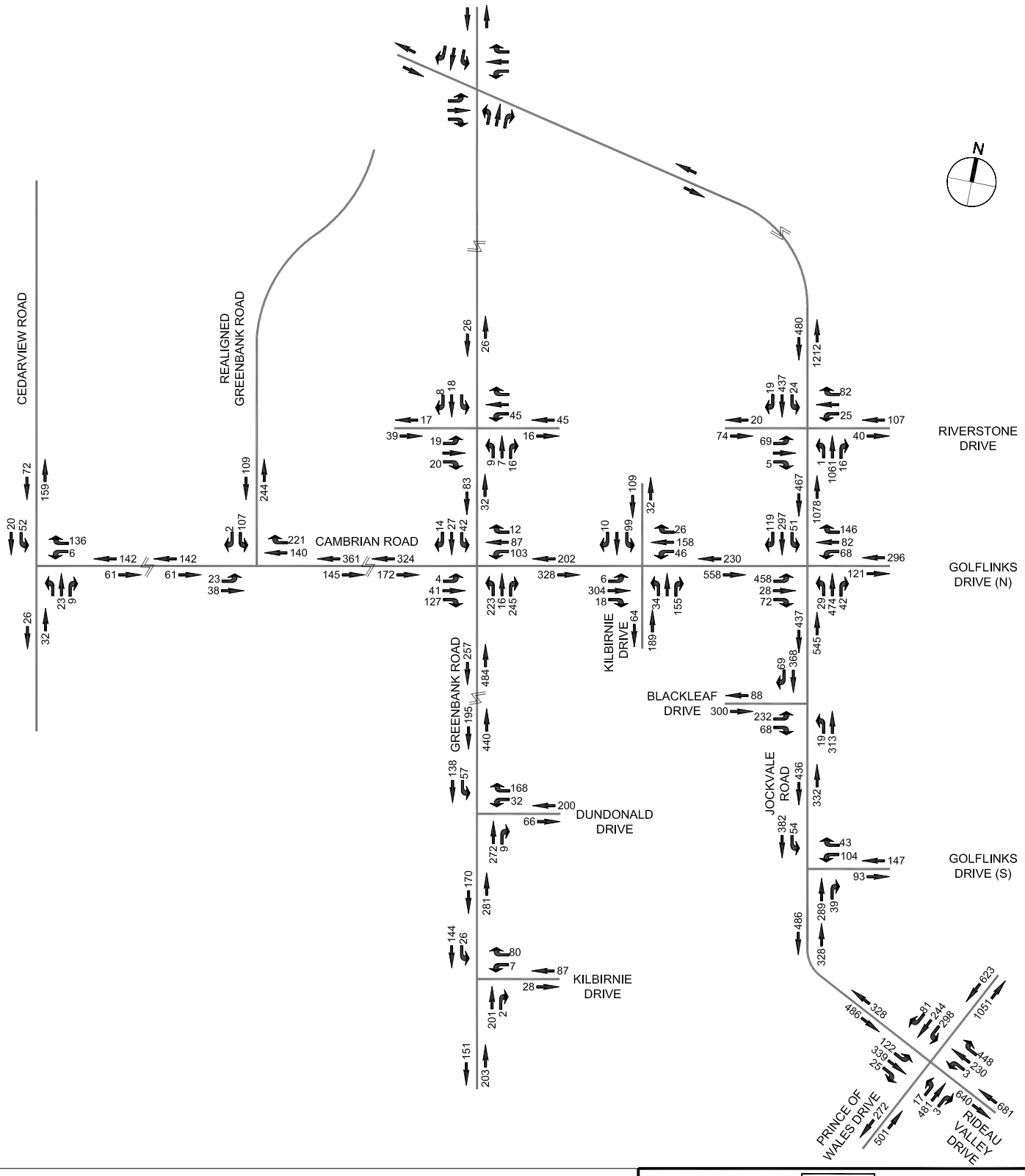
IBI GROUP

STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY

SITE GENERATED TRAFFIC
PM PEAK HOUR

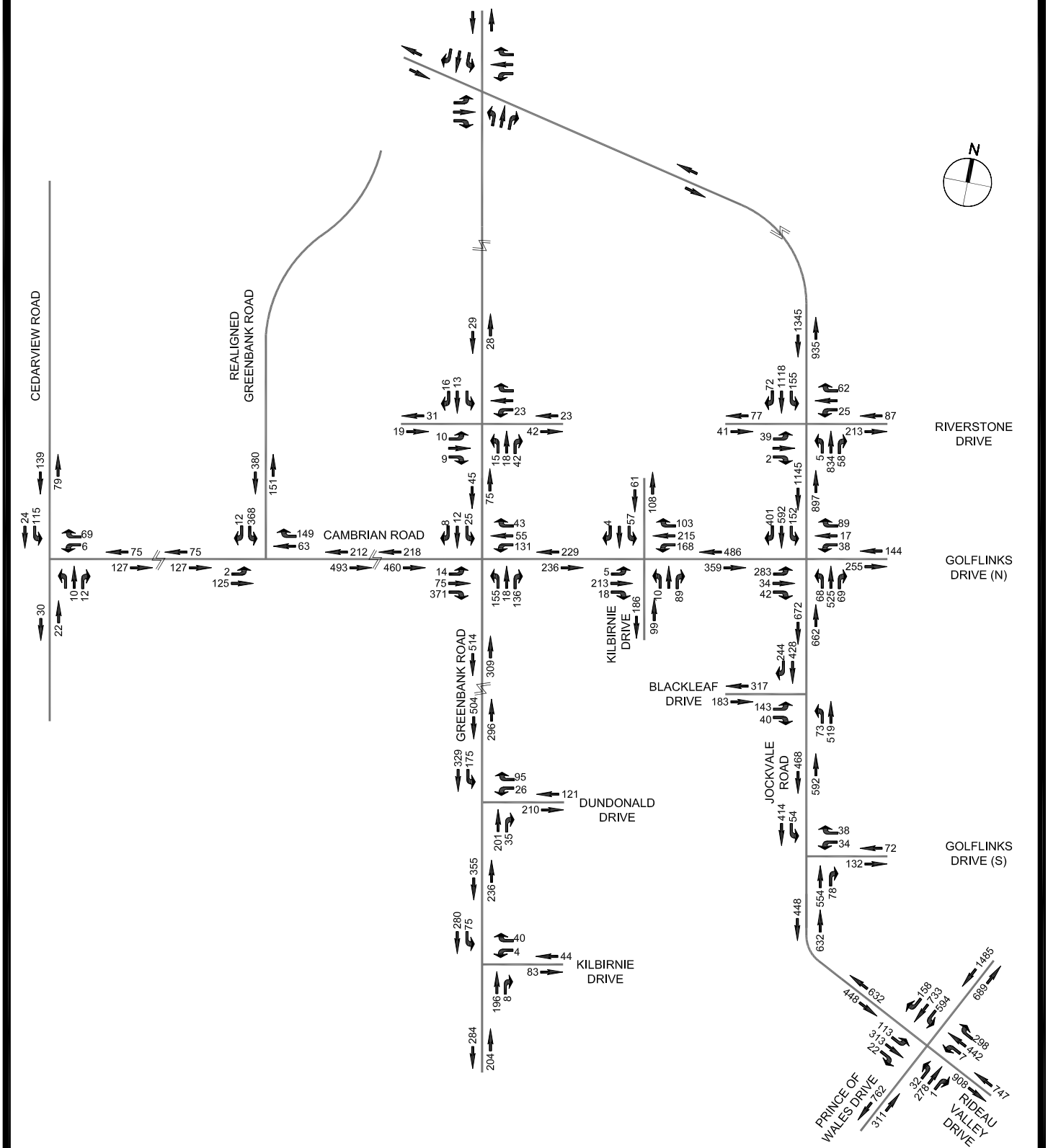
DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	6B



IBI GROUP

STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY
FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC
AM PEAK HOUR

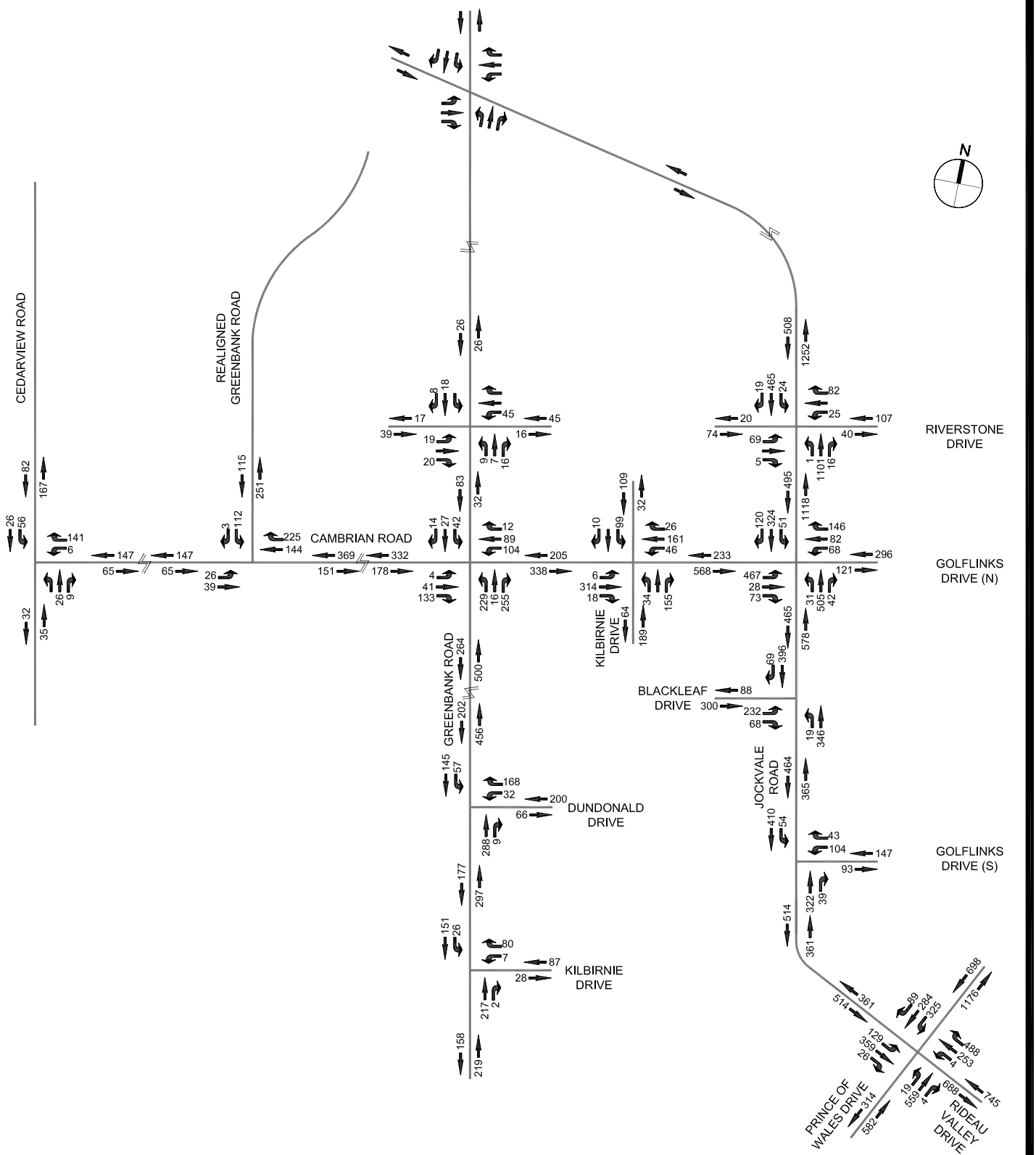
DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	7A



IBI GROUP

STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY
FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC PM PEAK HOUR

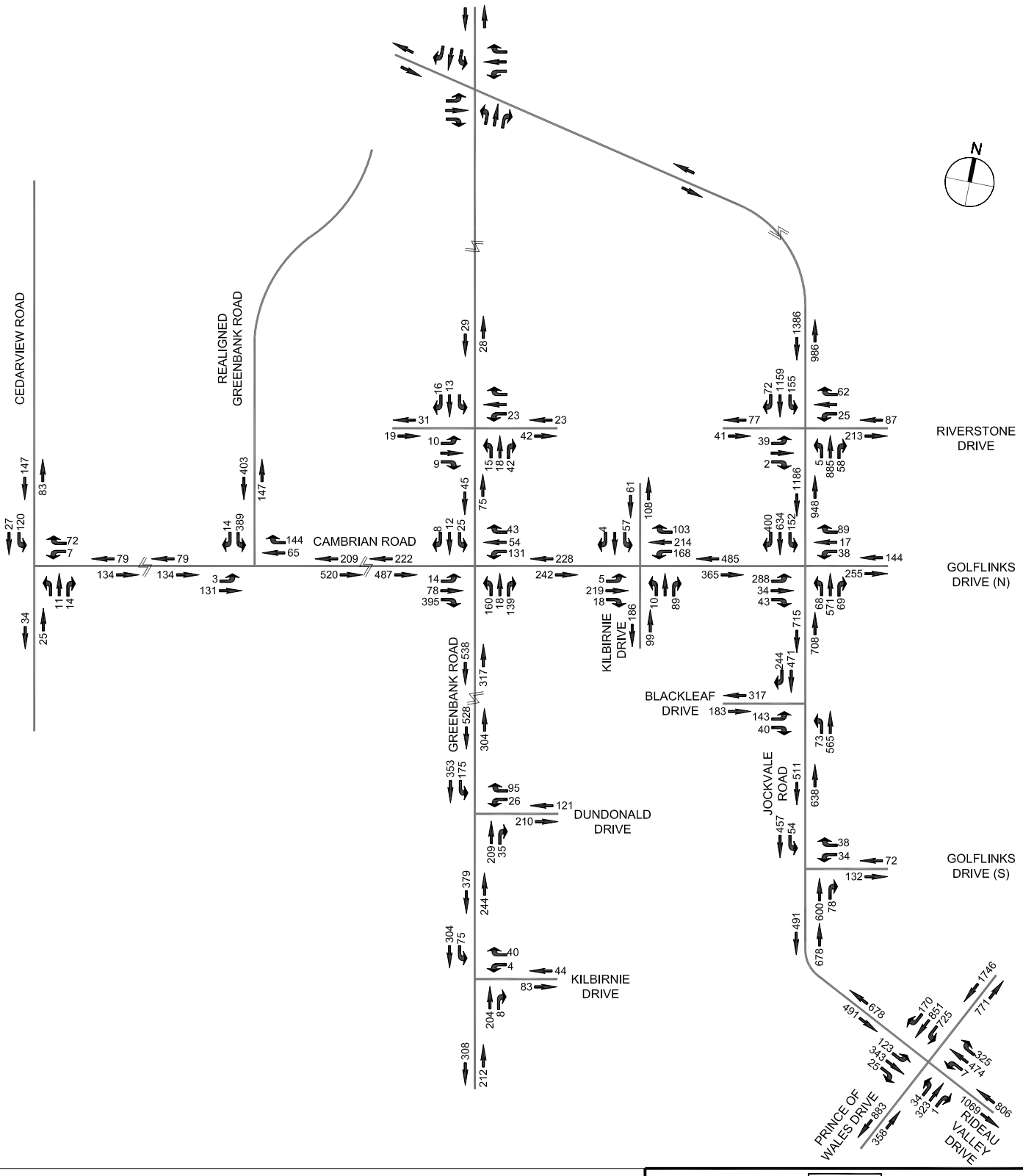
DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	7B



IBI GROUP

STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY
FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC AM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	8A



IBI GROUP

STONEBRIDGE GOLF COMMUNITY
PHASES 10 TO 12
TRANSPORTATION IMPACT STUDY
FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC
PM PEAK HOUR

DATE	SCALE	DWG. NO.
11-07-07	N.T.S.	8B

4.4 Intersection Capacity Analyses

Intersection capacity analyses have been carried out for the intersections indicated in Table 2 above, under the following weekday morning and weekday afternoon peak hour traffic conditions:

- Existing (2007) Traffic
- Future (2013) Background Traffic
- Future (2018) Background Traffic
- Future (2013) Background plus Site Generated Traffic
- Future (2018) Background plus Site Generated Traffic

The intersection capacity of a **traffic signal controlled** intersection, is commonly expressed by the manner in which an intersection functions in terms of the "Level of Service" it provides.

In qualitative terms, the Level of Service defines operational conditions within a traffic stream and their perception by motorists. A level-of-service definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. Level of Service can also be related to the ratio of the volume: capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above.

Levels of Service are given letter designations from A to F. Level of Service "A" represents the best operating conditions and Level of Service "E" represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can, practicably, be accommodated. Level of Service F indicates that the intersection is operating beyond its theoretical capacity.

The City of Ottawa has developed criteria as part of the Transportation Impact Assessment Guidelines, which directly relate the volume to capacity (v/c) ratio of a signalized intersection to a Level of Service designation. These criteria are as follows:

LEVEL OF SERVICE CRITERIA – SIGNALIZED INTERSECTIONS

Level of Service	Volume to Capacity (v/c) Ratio
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	> 1.00

The intersection capacity analysis technique provides an indication of the Level of Service for each movement at the intersection under consideration and for the intersection as a whole. The overall v/c ratio for an intersection is defined as the sum of equivalent volumes for all critical movements at the intersection divided by the sum of capacities for all critical movements.

The capacity of an **unsignalized** intersection can also be expressed in terms of the "Level of Service" 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 unsignalized intersection, is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2000 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for unsignalized intersections, related to average movement delays at the intersection.

LEVEL OF SERVICE CRITERIA - UNSIGNALIZED INTERSECTIONS

Level of Service	Delay Range (sec/veh)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

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 conditions, 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 in Ottawa's Urban Core – the downtown and its vicinity). Level of Service "F" indicates that the movement is operating beyond its design capacity.

4.4.1 EXISTING (2007) TRAFFIC

Intersection capacity analyses have been undertaken for the intersections referenced above under existing (2007) traffic conditions, during the weekday morning and afternoon peak hours, utilizing traffic volumes presented in Exhibits 3A and 3B respectively.

The intersection capacity analyses carried out for the signalized intersections in the study area have incorporated existing signal timing plans provided by the Traffic and Parking Operations Branch of the City of Ottawa.

The results of the intersection capacity analyses under existing (2007) traffic conditions are presented in Tables 5 - 6 below:

TABLE 5 – INTERSECTION CAPACITY ANALYSIS, EXISTING (2007) TRAFFIC, AM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday morning peak hour.

TABLE 5

INTERSECTION CAPACITY ANALYSIS

EXISTING (2007) TRAFFIC

AM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale / Greenbank[2]	**E (0.87)[3]**	B (0.15)			E (0.87)			C (0.66)			E (0.87)		
Jockvale/ Riverstone[2]	**B (0.25)[3]**	-			B (0.05)	-	B (0.13)	-	A (0.25)		A (0.02)	A (0.14)	-
Jockvale/ Cambrian/ Golf Links[2]	**C (0.24)[3]**	C (0.01)	B (0.02)		C (0.19)	B (0.24)		A (0.00)	A (0.21)		A (0.04)	A (0.12)	
Jockvale/ Golf Links[2]	**C (0.24)[3]**	-			C (0.24)	-	A (0.06)	-	A (0.17)		A (0.04)	A (0.14)	-
Jockvale/ Prince-of Wales	**B (0.61)**	C (0.77)[1]			A (0.37)		A (0.53)	A (0.05)	A (0.33)		A (0.49)[1]	A (0.13)	
Greenbank/ Cambrian[2]	**B (0.16)[3]**	A (0.01)			A (0.00)			B (0.16)			B (0.07)		
Cambrian/ Cedarview[2]	**A (0.06)[3]**	-			A (0.06)			-	A (0.01)		A (0.02)		-

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*

TABLE 6 – INTERSECTION CAPACITY ANALYSIS, EXISTING (2007) TRAFFIC, PM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday afternoon peak hour.

TABLE 6

INTERSECTION CAPACITY ANALYSIS

EXISTING (2007) TRAFFIC

PM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale / Greenbank[2]	**F (1.16)[3]**	B (0.03)			F (0.95)			B (0.20)			F (1.16)		
Jockvale/ Riverstone[2]	**D (0.29)[3]**	-			D (0.15)	-	B (0.10)	-	A (0.29)		A (0.15)	A (0.29)	-
Jockvale/ Cambrian/ Golf Links[2]	**E (0.28)[3]**	D (0.05)	D (0.13)		E (0.26)	B (0.17)		A (0.00)	A (0.28)		A (0.13)	A (0.21)	
Jockvale/ Golf Links[2]	**C (0.26)[3]**	-			C (0.11)	-	B (0.06)	-	A (0.26)		A (0.05)	A (0.19)	-
Jockvale/ Prince-of Wales	**A (0.48)**	C (0.67)			A (0.47)		A (0.38)	A (0.07)	A (0.21)[1]		E (0.93)[1]	A (0.41)	
Greenbank/ Cambrian[2]	**B (0.21)[3]**	A (0.00)			A (0.00)			A (0.10)			B (0.21)		
Cambrian/ Cedarview[2]	**A (0.03)[3]**	-			A (0.03)			-	A (0.01)		A (0.02)		-

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*

4.4.2 FUTURE (2013) BACKGROUND TRAFFIC

Intersection capacity analyses have been undertaken for the intersections referenced above under future (2013) background traffic conditions, during the weekday morning and afternoon peak hours, utilizing traffic volumes presented in Exhibits 4A and 4B respectively.

The results of the intersection capacity analyses under future (2013) background traffic conditions are presented in Tables 7 - 8 below:

TABLE 7 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2013) BACKGROUND TRAFFIC, AM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday morning peak hour.

TABLE 7

INTERSECTION CAPACITY ANALYSIS

FUTURE (2013) BACKGROUND TRAFFIC

AM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[2]	**F (0.52)[3]**	F (0.28)	B (0.01)		E (0.14)	C (0.24)		A (0.00)	A (0.52)		A (0.03)	A (0.23)	
Jockvale/ Riverstone[4]	**A (0.48)**	A (0.24)	A (0.01)		A (0.16)	A (0.26)		A (0.00)	A (0.57)[1]		A (0.07)[1]	A (0.25)	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.48)**	C (0.74)[1]	A (0.10)		A (0.16)	A (0.32)[1]		A (0.05)	A (0.56)		A (0.18)	A (0.40)	
Jockvale/ Golf Links (S)[2]	**C (0.29)[3]**	-			C (0.29)	-	B (0.06)	-	A (0.19)		A (0.04)	A (0.21)	-
Jockvale/ Prince-of Wales	**C (0.75)**	D (0.83)[1]			A (0.34)		A (0.52)	A (0.05)	A (0.43)		B (0.66)[1]	A (0.18)	
Greenbank/ Cambrian[2]	**B (0.32)[3]**	A (0.00)			A (0.01)			B (0.32)			B (0.08)		
Cambrian/ Cedarview[2]	**A (0.12)[3]**	-			A (0.12)			-	A (0.02)		A (0.03)		-
Greenbank/ Dundonald[2]	**B (0.12)[3]**	-			B (0.11)			-	A (0.12)		A (0.02)		-
Jockvale/ Blackleaf[2]	**C (0.53)[3]**	C (0.53)	-	B (0.08)	-			A (0.01)	A (0.18)	-	-	A (0.20)	A (0.04)
Cambrian/ Kilbirnie[2]	**B (0.18)[3]**	A (0.00)			A (0.03)			B (0.18)			B (0.08)		

Realigned Greenbank/ Cambrian[2]	**B (0.17)[3]**	A (0.02)	A (0.17)	-	B (0.13)

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*

TABLE 8 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2013) BACKGROUND TRAFFIC, PM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday afternoon peak hour.

TABLE 8

INTERSECTION CAPACITY ANALYSIS

FUTURE (2013) BACKGROUND TRAFFIC

PM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[2]	**F (0.63)[3]**	F (0.49)	C (0.01)		F (0.63)	C (0.15)		A (0.01)	A (0.46)		B (0.19)	B (0.55)	
Jockvale/ Riverstone[4]	**A (0.54)**	A (0.12)	A (0.01)		A (0.18)	A (0.16)		A (0.02)[1]	A (0.53)		A (0.41)	B (0.63)[1]	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.43)**	C (0.71)[1]	A (0.16)		A (0.14)	A (0.25)[1]		A (0.16)	A (0.48)		A (0.35)	B (0.66)	
Jockvale/ Golf Links (S)[2]	**C (0.35)[3]**	-			C (0.15)	-	B (0.07)	-	A (0.35)		A (0.06)	A (0.23)	-
Jockvale/ Prince-of Wales	**E (0.95)**	F (0.97)[1]			A (0.56)		A (0.36)	A (0.29)	A (0.46)		E (0.94)[1]	B (0.53)	
Greenbank/ Cambrian[2]	**B (0.30)[3]**	A (0.00)			A (0.01)			B (0.30)			B (0.06)		
Cambrian/ Cedarview[2]	**A (0.06)[3]**	-			A (0.06)			-	A (0.01)		A (0.06)		-

Greenbank/ Dundonald[2]	**B (0.10)[3]**	-			B (0.08)	-	B (0.10)		A (0.05)			-
Jockvale/ Blackleaf[2]	**E (0.56)[3]**	E (0.56)	-	B (0.05)	-	A (0.07)	A (0.29)	-	-	A (0.24)		A (0.13)
Cambrian/ Kilbirnie[2]	**C (0.10)[3]**	A (0.00)			A (0.10)	A (0.10)			C (0.06)			
Realigned Greenbank/ Cambrian[2]	**B (0.42)[3]**	A (0.00)			A (0.10)	-			B (0.42)			

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*

4.4.3 FUTURE (2018) BACKGROUND TRAFFIC

Intersection capacity analyses have been undertaken for the intersections referenced above under future (2018) background traffic conditions, during the weekday morning and afternoon peak hours, utilizing traffic volumes presented in Exhibits 5A and 5B respectively.

The results of the intersection capacity analyses under future (2018) background traffic conditions are presented in Tables 9 - 10 below:

TABLE 9 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2018) BACKGROUND TRAFFIC, AM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday morning peak hour.

TABLE 9

INTERSECTION CAPACITY ANALYSIS

FUTURE (2018) BACKGROUND TRAFFIC

AM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[4]	**A (0.51)**	A (0.24)	A (0.01)		A (0.16)	A (0.27)		A (0.00)	A (0.60)[1]		A (0.08)[1]	A (0.27)	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.48)**	C (0.76)[1]	A (0.10)		A (0.16)	A (0.31)[1]		A (0.06)	A (0.59)		A (0.19)	A (0.43)	
Jockvale/ Golf Links (S)[2]	**C (0.32)[3]**	-			C (0.32)	-	B (0.06)	-	A (0.21)		A (0.04)	A (0.22)	-
Jockvale/ Prince-of Wales	**D (0.82)**	D (0.87)[1]			A (0.35)		A (0.54)	A (0.06)	A (0.55)		C (0.76)[1]	A (0.21)	
Greenbank/ Cambrian[2]	**B (0.35)[3]**	A (0.00)			A (0.01)			B (0.35)			B (0.08)		
Cambrian/ Cedarview[2]	**A (0.12)[3]**	-			A (0.12)			-	A (0.02)		A (0.03)		-
Greenbank/ Dundonald[2]	**B (0.13)[3]**	-			B (0.11)			-	A (0.13)		A (0.02)		-
Jockvale/ Blackleaf[2]	**D (0.57)[3]**	D (0.57)	-	B (0.09)	-			A (0.02)	A (0.20)	-	-	A (0.22)	A (0.04)
Cambrian/ Kilbirnie[2]	**B (0.18)[3]**	A (0.00)			A (0.03)			B (0.18)			B (0.09)		
Realigned Greenbank/ Cambrian[2]	**B (0.17)[3]**	A (0.02)			A (0.17)			-			B (0.14)		

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*

2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*

TABLE 10 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2018) BACKGROUND TRAFFIC, PM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday afternoon peak hour.

TABLE 10

INTERSECTION CAPACITY ANALYSIS

FUTURE (2018) BACKGROUND TRAFFIC

PM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[4]	**A (0.56)**	A (0.13)	A (0.01)		A (0.20)	A (0.17)		A (0.02)[1]	A (0.55)		A (0.42)	B (0.65)[1]	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.44)**	C (0.73)[1]	A (0.16)		A (0.14)	A (0.25)[1]		A (0.17)	A (0.51)		A (0.37)	B (0.68)	
Jockvale/ Golf Links (S)[2]	**D (0.38)[3]**	-			D (0.17)	-	B (0.08)	-	A (0.38)		A (0.06)	A (0.26)	
Jockvale/ Prince-of Wales	**F (1.18)**	F (1.22)[1]			B (0.61)		A (0.39)	A (0.34)	A (0.52)		F (1.16)[1]	A (0.60)	
Jockvale/ Prince-of-Wales[5]	**E (0.94)**	E (0.95)[1]			A (0.55)		A (0.37)	A (0.56)	A (0.51)		E (0.93)[1]	C (0.72)	
Greenbank/ Cambrian[2]	**B (0.32)[3]**	A (0.00)			A (0.01)			B (0.32)			B (0.06)		
Cambrian/ Cedarview[2]	**A (0.07)[3]**	-			A (0.07)			-	A (0.01)		A (0.06)		-
Greenbank/ Dundonald[2]	**B (0.11)[3]**	-			B (0.08)			-	A (0.11)		A (0.05)		
Jockvale/ Blackleaf[2]	**F (0.63)[3]**	F (0.63)	-	B (0.06)	-			A (0.07)	A (0.32)	-	-	A (0.27)	A (0.13)

Jockvale/ Blackleaf[4]	**A (0.43)**	A (0.41)[1]	-	A (0.11)	-	A (0.13)	A (0.43)[1]	-	-	A (0.36)	A (0.20)
Cambrian/ Kilbirnie[2]	**C (0.11)[3]**	A (0.00)			A (0.10)	A (0.11)			C (0.06)		
Realigned Greenbank/ Cambrian[2]	**B (0.45)[3]**	A (0.00)			A (0.10)	-			B (0.45)		

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*
5. *Double left-turn lanes introduced on Prince-of-Wales – southbound approach*

4.4.4 FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC

Intersection capacity analyses have been undertaken for the intersections referenced above under future (2013) background plus site generated traffic conditions, during the weekday morning and afternoon peak hours, utilizing traffic volumes presented in Exhibits 7A and 7B respectively.

The results of the intersection capacity analyses under future (2013) background plus site generated traffic conditions are presented in Tables 11 - 12 below:

TABLE 11 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC, AM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday morning peak hour.

TABLE 11

INTERSECTION CAPACITY ANALYSIS

FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC

AM PEAK HOUR

Intersection	**Overall Intersection Level of Service (v/c ratio)**	**Level of Service (v/c Ratio)**											
		EB			**WB**			**NB**			**SB**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Jockvale/ Riverstone[4]	**B (0.63)**	A (0.50)	A (0.01)		A (0.17)	A (0.26)		A (0.00)	C (0.72)[1]		A (0.10)[1]	A (0.30)	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.52)**	D (0.91)[1]	A (0.13)		A (0.12)	A (0.28)[1]		A (0.12)	A (0.74)		A (0.31)	A (0.60)	

Jockvale/ Golf Links (S)[2]	**C (0.31)[3]**	-		C (0.31)	-	B (0.06)	-	A (0.19)		A (0.04)	A (0.22)	-
Jockvale/ Prince-of Wales	**C (0.78)**	D (0.85)[1]		A (0.33)		A (0.51)	A (0.06)	A (0.46)		B (0.68)[1]	A (0.19)	
Greenbank/ Cambrian[2]	**D (0.77)[3]**	A (0.00)		A (0.07)			D (0.77)			C (0.24)		
Cambrian/ Cedarview[2]	**A (0.14)[3]**	-		A (0.14)			-	A (0.02)		A (0.03)		-
Greenbank/ Dundonald[2]	**B (0.29)[3]**	-		B (0.29)			-	A (0.17)		A (0.04)		-
Jockvale/ Blackleaf[2]	**D (0.60)[3]**	D (0.60)	-	B (0.10)	-		A (0.02)	A (0.18)	-	-	A (0.22)	A (0.04)
Cambrian/ Kilbirnie[2]	**D (0.40)[3]**	A (0.00)		A (0.04)			B (0.30)			D (0.40)		
Greenbank/ Kilbirnie[2]	**A (0.12)**	-		A (0.11)			-	A (0.12)		A (0.02)		-
Realigned Greenbank/ Cambrian[2]	**B (0.21)[3]**	A (0.02)		A (0.21)			-			B (0.17)		

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*

TABLE 12 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC, PM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday afternoon peak hour.

TABLE 12

INTERSECTION CAPACITY ANALYSIS

FUTURE (2013) BACKGROUND PLUS SITE GENERATED TRAFFIC

PM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[4]	**C (0.75)**	A (0.30)	A (0.01)		A (0.18)	A (0.17)		A (0.05)[1]	A (0.60)		A (0.48)	C (0.80)[1]	
Jockvale/ Cambrian/ Golf Links (N)[4]	**C (0.71)**	D (0.90)[1]	A (0.17)		A (0.12)	A (0.23)[1]		A (0.49)[1]	A (0.51)		A (0.37)	D (0.88)[1]	
Jockvale/ Golf Links (S)[2]	**C (0.37)[3]**	-			C (0.16)	-	B (0.08)	-	A (0.37)		A (0.06)	A (0.24)	
Jockvale/ Prince-of Wales	**E (0.99)**	F (1.02)[1]			A (0.57)		A (0.36)	A (0.31)	A (0.45)		E (0.97)[1]	A (0.54)	
Jockvale/ Prince-of-Wales[5]	**D (0.83)**	D (0.87)[1]			A (0.56)		A (0.36)	A (0.32)	A (0.38)		C (0.77)[1]	B (0.61)	
Greenbank/ Cambrian[2]	**D (0.69)[3]**	A (0.01)			A (0.12)			D (0.69)			C (0.16)		
Cambrian/ Cedarview[2]	**A (0.07)[3]**	-			A (0.07)			-	A (0.01)		A (0.07)		-
Greenbank/ Dundonald[2]	**B (0.21)[3]**	-			B (0.21)			-	A (0.14)		A (0.13)		-
Jockvale/ Blackleaf[2]	**F (0.66)[3]**	F (0.66)	-	B (0.06)	-			A (0.08)	A (0.31)	-	-	A (0.25)	A (0.14)
Jockvale/ Blackleaf[4]	**A (0.36)**	A (0.43)[1]	-	A (0.12)	-			A (0.14)	A (0.41)	-	-	A (0.34)[1]	A (0.21)

Cambrian/ Kilbirnie[2]	**D (0.29)[3]**	A (0.00)		A (0.13)		A (0.15)			D (0.29)		
Greenbank/ Kilbirnie[2]	**A (0.12)**	-		A (0.06)		-	A (0.12)		A (0.05)		-
Realigned Greenbank/ Cambrian[2]	**C (0.52)[3]**	A (0.00)		A (0.12)		-			C (0.52)		

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*
5. *Double left-turn lanes introduced on Prince-of-Wales – southbound approach*

4.4.5 FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC

Intersection capacity analyses have been undertaken for the intersections referenced above under future (2018) background plus site generated traffic conditions, during the weekday morning and afternoon peak hours, utilizing traffic volumes presented in Exhibits 8A and 8B respectively.

The results of the intersection capacity analyses under future (2018) background plus site generated traffic conditions are presented in Tables 13 - 14 below:

TABLE 13 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC, AM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday morning peak hour.

TABLE 13

INTERSECTION CAPACITY ANALYSIS

FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC

AM PEAK HOUR

Intersection	**Overall Intersection Level of Service (v/c ratio)**	**Level of Service (v/c Ratio)**											
		EB			**WB**			**NB**			**SB**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Jockvale/ Riverstone[4]	**B (0.65)**	A (0.53)	A (0.01)		A (0.17)	A (0.26)		A (0.00)	C (0.74)[1]		A (0.10)[1]	A (0.32)	
Jockvale/ Cambrian/ Golf Links (N)[4]	**A (0.51)**	E (0.92)[1]	A (0.13)		A (0.12)	A (0.27)[1]		A (0.14)	C (0.77)		A (0.36)	B (0.63)	

Jockvale/ Golf Links (S)[2]	**C (0.33)[3]**	-		C (0.33)	-	B (0.06)	-	A (0.21)		A (0.05)	A (0.24)	-
Jockvale/ Prince-of Wales	**D (0.84)**	D (0.88)[1]		A (0.34)		A (0.53)	A (0.07)	A (0.59)		C (0.79)[1]	A (0.22)	
Greenbank/ Cambrian[2]	**D (0.80)[3]**	A (0.00)		A (0.07)			D (0.80)			C (0.25)		
Cambrian/ Cedarview[2]	**A (0.14)[3]**	-		A (0.14)			-	A (0.02)		A (0.04)		-
Greenbank/ Dundonald[2]	**B (0.29)[3]**	-		B (0.29)			-	A (0.17)		A (0.05)		-
Jockvale/ Blackleaf[2]	**D (0.65)[3]**	D (0.65)	-	B (0.10)	-		A (0.02)	A (0.20)	-	-	A (0.23)	A (0.04)
Cambrian/ Kilbirnie[2]	**D (0.41)[3]**	A (0.00)		A (0.04)			B (0.30)			D (0.41)		
Greenbank/ Kilbirnie[2]	**B (0.13)[3]**	-		B (0.11)			-	A (0.13)		A (0.02)		-
Re-aligned Greenbank/ Cambrian[2]	**B (0.22)[3]**	A (0.02)		A (0.22)			-			B (0.18)		

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*

TABLE 14 – INTERSECTION CAPACITY ANALYSIS, FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC, PM PEAK HOUR, presents the results of the intersection capacity analyses for the weekday afternoon peak hour.

TABLE 14

INTERSECTION CAPACITY ANALYSIS

FUTURE (2018) BACKGROUND PLUS SITE GENERATED TRAFFIC

PM PEAK HOUR

Intersection	Overall Intersection Level of Service (v/c ratio)	Level of Service (v/c Ratio)											
		EB			WB			NB			SB		
		L	T	R	L	T	R	L	T	R	L	T	R
Jockvale/ Riverstone[4]	**C (0.78)**	A (0.30)	A (0.01)		A (0.18)	A (0.18)		A (0.05)[1]	B (0.63)		A (0.55)	D (0.83)[1]	
Jockvale/ Cambrian/ Golf Links (N)[4]	**C (0.74)**	E (0.91)[1]	A (0.17)		A (0.12)	A (0.23)[1]		B (0.61)[1]	A (0.56)		A (0.40)	E (0.92)[1]	
Jockvale/ Golf Links (S)[2]	**D (0.40)[3]**	-			D (0.18)	-	B (0.08)	-	A (0.40)		A (0.06)	A (0.27)	-
Jockvale/ Prince-of Wales	**F (1.22)**	F (1.18)[1]			A (0.60)		A (0.38)	A (0.37)	A (0.52)		F (1.25)[1]	B (0.63)	
Jockvale/ Prince-of-Wales[5]	**E (0.97)**	E (0.98)[1]			A (0.55)		A (0.36)	B (0.61)	A (0.53)		E (0.96)[1]	C (0.79)	
Greenbank/ Cambrian[2]	**D (0.72)[3]**	A (0.01)			A (0.12)			D (0.72)			C (0.17)		
Cambrian/ Cedarview[2]	**A (0.08)[3]**	-			A (0.08)			-	A (0.01)		A (0.08)		-
Greenbank/ Dundonald[2]	**B (0.22)[3]**	-			B (0.22)			-	A (0.14)		A (0.13)		
Jockvale/ Blackleaf[2]	**F (0.74)[3]**	F (0.74)	-	B (0.07)	-			A (0.08)	A (0.33)	-	-	A (0.28)	A (0.14)
Jockvale/ Blackleaf[4]	**A (0.45)**	A (0.43)	-	A (0.12)	-			A (0.15)	A (0.45)[1]	-	-	A (0.38)	A (0.21)

Cambrian/ Kilbirnie[2]	**D (0.29)[3]**	A (0.00)	A (0.13)	B (0.15)		D (0.29)	
Greenbank/ Kilbirnie[2]	**B (0.12)**	-	B (0.06)	-	A (0.12)	A (0.06)	-
Realigned Greenbank/ Cambrian[2]	**C (0.56)[3]**	A (0.00)	A (0.12)	-		C (0.56)	

Notes:

1. *Critical movements used to calculate overall intersection v/c ratio.*
2. *Unsignalized intersection.*
3. *Maximum v/c ratio stated.*
4. *Signalized intersection.*
5. *Double left-turn lanes introduced on Prince-of-Wales – southbound approach*

4.4.6 INTERSECTION CAPACITY ANALYSES SUMMARY

The results of intersection capacity analyses indicate that the following intersections will continue to operate at acceptable Levels of Service during the weekday morning and afternoon peak hours under future (2018) background plus site generated traffic conditions:

- Jockvale Road/ Cambrian Road/ Golf Links Drive (N)
- Jockvale Road/ Golf Links Drive (S)
- Greenbank Road/ Dundonald Drive
- Greenbank Road/ Kilbirnie Drive
- Greenbank Road/ Cambrian Road
- Cambrian Road/ Kilbirnie Drive
- Cambrian Road/ Realigned Greenbank Road
- Cambrian Road/ Cedarview Road

Jockvale Road/ Riverstone Drive

The results of the intersection capacity analyses indicate that the intersection will operate above its theoretical capacity as an unsignalized intersection during the weekday morning and weekday afternoon peak hours, under future (2013) background traffic conditions. Further analysis indicates that the intersection will operate at acceptable Levels of Service (LOS “B” and “C” respectively) during the weekday morning and afternoon peak hours, under future (2018) background plus site generated traffic conditions, with the introduction of traffic signals.

Jockvale Road/ Blackleaf Drive

The results of the intersection capacity analyses indicate that the intersection will operate above its theoretical capacity (LOS “F”) during the afternoon peak hour under future (2013) background plus

site generated traffic conditions. Further analysis indicates that the intersection will operate at acceptable Levels of Service as a signalized intersection, under future (2018) backgrounds plus site generated traffic conditions.

Jockvale Road/ Prince-of Wales Drive

The results of the intersection capacity analyses indicate that the intersection will operate above its theoretical capacity (LOS "F") during the weekday afternoon peak hour, under future (2018) background traffic conditions. Further analysis indicates that the overall operating condition can be improved to a Level of Service "E" designation with the introduction of double left-turn lanes on the south-west approach to the intersection.

APPENDIX 5 – INTERSECTION CAPACITY ANALYSES presents the details of the intersection capacity analyses summarized above.

4.5 Traffic Signal Warrants Analyses

Traffic control signal warrants analyses have been carried out for the Jockvale Road/ Riverstone Drive and Jockvale Road/ Blackleaf Drive intersections under future (2013) background traffic conditions.

The analyses have followed the established procedures outlined in the "Ontario Traffic Manual, Book 12", published by the Ontario Ministry of Transportation (MTO). The results of the analyses indicate that both intersections meet the minimum warrants for traffic signal control under future (2013) background traffic conditions.

Details of the signal warrants analyses described above are included in APPENDIX 6 – TRAFFIC SIGNAL WARRANTS ANALYSES.

4.6 Auxiliary Lane Analyses

Analyses of auxiliary lane requirements have been carried out for the following intersections under 2013 and 2018 projected traffic volumes:

- Greenbank Road/ Dundonald Drive
- Greenbank Road/ Kilbirnie Drive
- Cambrian Road/ Kilbirnie Drive

The analyses have been conducted using the procedure defined in "Geometric Design Standards for Ontario Highways", published by the Ontario Ministry of Transportation (MTO). The MTO procedure is used to estimate the minimum storage requirements for auxiliary left-turn lanes at unsignalized intersections along two-lane roadways.

The results of the analyses indicate that auxiliary left-turn lanes will be required on the southbound approaches to each of the intersections. The minimum storage length requirements are as follows:

- Greenbank Road/ Dundonald Drive – auxiliary left turn lane is required on the southbound approach – minimum storage length = 30m. This auxiliary lane is required under future (2013) background traffic conditions as a result of traffic generated by

Phases 6 to 9 of the Stonebridge Golf Community and should be constructed by the time these phases are fully built-out, in 2009.

- Greenbank Road/ Kilbirnie Drive – auxiliary left-turn lane is required on the southbound approach – minimum storage length = 15m. This auxiliary lane is required under future (2018) background plus site generated traffic conditions and should be constructed by the 2018 study horizon year.

- Cambrian Road/ Kilbirnie Drive – auxiliary left-turn lane is required on the westbound approach – minimum storage length = 25m. This auxiliary lane is required is required under future (2013) background plus site generated traffic and should be constructed by the 2013 full build-out year of phases 10 to 12 of the Stonebridge Golf Community.

The minimum approach taper requirements for the auxiliary left-turn lanes referenced above have been derived using information provided in the Geometric Design Guide for Canadian Roads, 1999 Edition, published by the Transportation Association of Canada (TAC).

Assuming a design speed of 90km/h, the auxiliary left-turn lanes along Greenbank Road will each require a minimum approach taper length of 95m.

Assuming a design speed of 60km/h, the auxiliary left-turn lane on the westbound approach to the Cambrian Road/ Kilbirnie Drive intersection will require a minimum approach taper length of 55m.

Details of the auxiliary lane analyses described above are included in APPENDIX 7 – AUXILIARY LANE ANALYSES.

5. FINDINGS AND CONCLUSIONS

Based on the traffic analyses undertaken in this Transportation impact Study, the main findings, conclusions and recommendations are as follows:

- The following intersections will operate at acceptable Levels of Service during the weekday morning and afternoon peak hours of traffic at the 2018 study horizon year:
  - Jockvale Road/ Cambrian Road/ Golf Links Drive (N)
  - Jockvale Road/ Golf Links Drive (S)
  - Greenbank Road/ Dundonald Drive
  - Greenbank Road/ Kilbirnie Drive
  - Greenbank Road/ Cambrian Road
  - Cambrian Road/ Kilbirnie Drive
  - Cambrian Road/ Realigned Greenbank Road
  - Cambrian Road/ Cedarview Road

- By 2018 there may be a need to introduce double left-turn lanes on the southbound approach to the Jockvale Road/ Prince-of-Wales Drive intersection. This requirement is not as a direct consequence of traffic generated by the Stonebridge Golf Community and should be addressed at the initiative of the City of Ottawa. The future lane requirements at this intersection will be investigated in more detail during the Environmental Assessments for the Jockvale Road and Prince-of-Wales Drive widenings.

- The results of the intersection capacity analyses indicate that by 2013, traffic signals will be required at the Jockvale Road/ Riverstone Drive intersection. As well, the intersection meets the minimum warrants for traffic signal control under future (2013) background traffic conditions. This requirement is due to traffic generated by both the Stonebridge Golf Community and the adjacent Taggart Half Moon Bay Subdivision.

- The results of the intersection capacity analyses indicate that by 2013, traffic signals will be required at the Jockvale Road/ Blackleaf Drive intersection. As well, the intersection meets the minimum warrants for traffic signal control under future (2013) background traffic conditions. This requirement is due to traffic generated by the Stonebridge Golf Community.

- An auxiliary left-turn lane (minimum storage length = 30m; minimum approach taper length = 95m) will be required on the southbound approach to the Greenbank Road/ Dundonald Drive intersection. This auxiliary left-turn lane should be in place by 2009 and is required due to traffic generated by the Stonebridge Golf Community.

- An auxiliary left-turn lane (minimum storage length = 15m; minimum approach taper length = 95m) will be required on the southbound approach to the Greenbank Road/ Kilbirnie Drive intersection. This auxiliary left-turn lane should be in place by 2018 and is required due to traffic generated by the Stonebridge Golf Community.

- An auxiliary left-turn lane (minimum storage length = 25m; minimum approach taper length = 55m) will be required on the westbound approach to the Cambrian Road/ Kilbirnie Drive intersection. This auxiliary left-turn lane should be in place by 2013 and is required due to traffic generated by the Stonebridge Golf Community.

In summary, the overall conclusion of this Transportation Impact Study is that the future traffic generated by Phases 10 to 12 of the Stonebridge Golf Community can be safely accommodated on the adjacent road network, provided the roadway modifications described above are constructed.