BACKGROUND REPORT for the LACK OF A COLLECTOR ROAD CONNECTION TO WARDEN AVENUE

In support of the following applications for a new residential neighbourhood at 4134 16th. Avenue, City of Markham, Region of York:

- Official Plan Amendment file OP/ZA 16 179225
- Zoning By-Law Amendment file OP/ZA 16 179225
- Draft Plans of Subdivision
  files SU 16 179225 (001 and 002)

Submitted on behalf of: Sixteenth Land Holdings Inc.

Date: June 2017

Produced jointly by:

BEACON ENVIRONMENTAL

Gatzios Planning + Development Consultants Inc.

mbtw wai

Poulos Chung

Stantec

1. INTRODUCTION

Sixteenth Land Holdings Inc. submitted applications for an Official Plan Amendment, a Zoning by-law Amendment, and two Draft Plans of Subdivision to permit a new residential neighbourhood on its lands at 4134 16th Avenue, in the City of Markham (the "Subject Property").

The planning applications were deemed complete by the City of Markham on November 11, 2016, and circulated by the City for agency review. Various consultant reports submitted in support of the planning applications detailed and addressed the collector road network being proposed for this development, including the lack of a collector road being proposed to extend to the western edge of the Subject Property for a connection to Warden Avenue.

In reviewing the applications and the various reports submitted, the Region of York and the City of Markham have requested that the applicant produce an additional document, being a compiled summary report of all the various professional investigations and opinions leading to the applicant's conclusion that a collector road connection to Warden Avenue would not be included in the development plans.

As a result, this Background Report has been produced in response to this request, and has been prepared as a joint effort by the following firms, listed alphabetically:

- Beacon Environmental Ltd.
- Gatzios Planning + Development Consultants Inc.
- The MBTW Group
- Poulos + Chung
- Stantec

Also included as Appendix A is a Brief entitled "**Transportation Technical Analysis Comparison and Evaluation of Proposed Minor Collector Road Connection to Warden Avenue**", prepared by Poulos & Chung Limited dated May 2017.

2. DESCRIPTION OF THE APPLICANT'S PROPOSED ROAD NETWORK

The neighbourhood-structuring network of major and minor collector roads proposed for this new residential neighbourhood is illustrated on **Figure 1 – Structure Plan**. A composite of the two Draft Plans of Subdivision submitted is shown on **Figure 2 – Composite Draft Plans**.

The applicant's proposed neighbourhood structure does not include a collector road connection to Warden Avenue. The major and minor collector road network proposed is shown on **Figure 3A – Proposed OPA Schedule Map 10 Road Network City of Markham Official Plan 2014**, and on **Figure 3B – Proposed OPA Schedule Map 11 Minor Collector Road Network City of Markham Official Plan 2014**.

The proposed network of major and minor collector roads was determined in a collaborative multi-disciplinary consultant team approach, with the proposed road network reflecting the combination of transportation engineering, environmental network, civil engineering, planning and urban design goals and objectives. The overall goal of achieving as much connectivity and providing as much access to and through this new neighbourhood was considered as a starting point for this analysis,

and the resultant road network considered additional factors from that starting point to arrive at the recommended road network.

One major collector road crossing of the Bruce Creek valleyland system on the Subject Property is proposed, representing a westward extension of Bur Oak Avenue which is a major collector currently intersecting Kennedy Road in a signalized three-way intersection adjacent to the Subject Property's eastern edge. This major collector road is not proposed to continue west to also cross the Berczy Creek valleyland, and therefore does not intersect with Warden Avenue.

As a result, there is no proposed collector road crossing of the Berczy Creek valleyland or connection to Warden Avenue through the subject property's 26 m frontage located on the west edge of the West Plan of Subdivision. A potential collector road connection from the Subject Property through the Berczy Creek valleyland area to create a road connection to Warden Avenue was analyzed from the point of view of various disciplines, including environmental, planning, and engineering., The conclusion of the analysis deemed this collector road connection undesirable, when considering all of factors.

3. DESCRIPTION OF THE WARDEN AVENUE FRONTAGE OF THE SUBJECT PROPERTY

As illustrated on **Figure 4 – Warden Avenue Frontage Detail**, being a close-up of this portion of the West Draft Plan of Subdivision, the Subject Property has a western edge that narrows to 26.2 m of frontage onto the east side of Warden Avenue.

The 26 m narrow area of the Subject Property extends approximately 210 m westerly from the existing active golf course area of the Subject Property to Warden Avenue. The most western portion of the Subject Property adjacent to Warden Avenue is within the floodplain and valleylands associated with the Berczy Creek, and is proposed to be dedicated into public ownership as Block 4 Open Space on the proposed Draft Plan of Subdivision. Berczy Creek meanders in a southeasterly direction in this area adjacent to and eventually under Warden Avenue. The elevation through the 26m wide strip of land decreases in a west to east direction from Warden Avenue to Berczy Creek and then increases on the Subject Property to arrive at an elevation that is above Warden Avenue at the portion of the Subject Property which is the active golf course area.

The land uses surrounding this western portion of the Subject Property are illustrated on **Figure 5 – Warden Avenue Surrounding Land Uses**.

To the north, there are existing estate residential lots on Walnut Glen Place, with rear yards adjacent to the northern property line of the 26 m wide strip of land, as well as a parcel of land adjacent to the east edge of Warden Avenue owned by the City of Markham containing a portion of the Berczy Creek and its associated valleylands.

To the south, there is the existing Glenburn Forest executive townhouse development, which has rear yards ranging from 3.6 m to 6.1 m for the townhouses adjacent to the southern property line of the 26 m wide strip of the Subject Property. In addition, one of the private driveways within the Glenburn Forest executive townhouse development and two of the townhouse units face the southern property line of the 26 m wide strip of land. At the time of construction of the Glenburn Forest townhouse development, the developer received permission from York Downs Golf & Country Club (the previous owner of the Subject Property) to plant a series of mature conifer trees

along this portion of the Subject Property, in order to provide a visual barrier from the estate lots on Walnut Glen Place to the north.

Immediately east of the Glenburn Forest townhouse development and immediately south of the 26m wide strip of land, there are 2 residential lots, which are the remaining parcels of land after the Glenburn Forest executive townhouse development site was severed from a larger landholding that previously existed in this location. As well, in the area immediately west of the Glenburn Forest townhouse there is a single detached residential lot with frontage onto the east side of Warden Avenue, with a driveway onto Warden Avenue immediately south of the 26 m wide strip of the Subject Property. This residential unit has a side yard of 2.4 m adjacent to the southern property line of the 26 m wide strip of the Subject Property.

Also as shown on **Figure 5 – Warden Avenue Surrounding Land Uses**, south of the Glenburn Forest townhouses are the city-owned parcels of land containing the Berczy Creek valleylands, and existing estate lots in the Country Estates Drive area. These existing estate lots have no vehicular connection to Warden Avenue but rather Country Estates Drive is a cul de sac which intersects with 16th Avenue at a four way signalized intersection opposite Village Parkway to the south.

On the west side of Warden Avenue directly opposite the 26 m wide strip of the Subject Property are lands owned by the City of Markham containing the main branch of Berczy Creek, one of its tributaries and its associated valleylands. Further west of the valleylands is the residential development around Macrill Road. There is no road intersection on the west side of Warden Avenue between Calvert Drive and Cachet Parkway (just south of Major Mackenzie Drive East).

Calvert Road intersects with Warden Avenue approximately 300 metres south of the 26 m wide strip of the Subject Property, and is a minor collector road with its eastern terminus at a three way unsignalized intersection at Warden Avenue and its western terminus at a four way signalized intersection with Woodbine Avenue opposite Markland Street to the west.

Photographs taken of and in the immediate area of the 26 m wide strip of the Subject Property included below (PHOTOS 1 to 4) illustrate the property width in this location, the existing grade separation between the Subject Property and Warden Avenue, and the proximity of existing residential buildings and rear yard amenity areas to the north and to the south of the Subject Property.

As described above and illustrated in PHOTOS 1 to 4 below, a summary of the land uses surrounding the 26 m strip of the Subject Property at Warden Avenue is as follows:

a) existing estate single detached residential rear yards to the north
b) Berczy Creek and associated valleylands across the western portion of the Subject Lands, extending north and south adjacent to Warden Avenue
c) existing single detached residential side yards to the south
d) existing townhouse residential side and rear yards to the south
e) Berczy Creek and associated valleylands on the west side of Warden Avenue immediately opposite the Subject Property
f) Calvert Road, a minor collector road, intersecting with Warden Avenue and extending west from the three way intersection approximately 300 metres south of the Subject Property
g) no road intersection along the east side of Warden Avenue between the Subject Property and 16th. Avenue

PHOTO 1 – Facing west to Warden Avenue: the Subject Property south property line common with the Glenburn Forest executive townhouses is located south of the conifer trees.

PHOTO 2 – Facing south to adjacent Glenburn Forest Executive Townhouses: the Subject Property line is located roughly at the red-leafed tree.

PHOTO 3 – Facing north towards adjacent Walnut Glen Place estate lots: the Subject Property line common with the estate lots is the fence.

PHOTO 4 – Facing north on eastern shoulder of Warden Avenue: the Subject Property in the foreground sloping down from Warden Avenue.

4. DESCRIPTION OF THE POTENTIAL COLLECTOR ROAD CONNECTION TO WARDEN AVENUE

A 24.5 m Right-of-Way ("ROW") width was utilized for the analysis of a potential minor collector road to Warden Avenue. An illustration of the details of this potential road is found on **Figure 6 – Potential Collector Illustration Plan**.

A conceptual road grading design was prepared to connect the existing grades of Warden Avenue to the proposed grades within the future development, as illustrated on **Figure 7- Potential Collector Road Grading Plan & Profile** and on **Figure 8 – Potential Collector Road Intersection with Warden Avenue.**

This potential intersection would result in only a "T" intersection at Warden Avenue as there is no opportunity to extend the collector road westerly due to the location of the two branches of Berczy Creek and its associated valley lands located on the west side of Warden Avenue in this location.

An illustration of the grade change of the Subject Property in an east-west direction is included on **Figure 9 – Subject Property Grades for Potential Collector Road (Section B)**. As shown, the Subject Property slopes down as it extends east from Warden Avenue to the Berczy Creek watercourse level, and then rises again as it continues east into the balance of the Subject Property. **Figure 9** provides the details of Section B as found on **Figure 6**.

The potential collector road connection to Warden Avenue will mostly likely require signalization at the intersection as well as improvements along Warden Avenue as shown on **Figure 8**. The necessary improvements include exclusive right and left turning lanes and medians with appropriate tapers, which result in an expansion of the existing road surface along Warden Avenue for approximately a 320 m stretch.

The road expansion results in additional grading, tree and vegetation removal within Berczy Creek and its associated valley lands along the west side of Warden Avenue, as well as expansions to two existing Warden Avenue bridge structure crossings of Berczy Creek, one north and one south of this potential collector road intersection.

The proposed right turn lane along Warden Avenue into the 26 m wide strip would require the widening of the road surface and existing sidewalk / trail further to the east resulting in a conflict with the existing driveway of the single detached residential lot with frontage onto the east side of Warden Avenue, immediately south of the 26 m wide strip of the Subject Property.

The grading design requires retaining walls on both sides of the potential collector road to make up the existing significant grade differences between the north and south property limits ranging from 2 to 3 metres. As a result, it is expected that the full length of the 26 metre wide strip of land would be graded, resulting in the removal of all vegetation.

Noise attenuation fences would be required for both the north and south sides of the potential collector road given that it would abut existing residential outdoor amenity areas both to the north and to the south. **Figure 10 – Potential Collector Road Grading & Noise Attenuation (Section A)** illustrates the resultant grading and noise attenuation requirements for the potential collector road. As shown, and on advice from Jade Acoustics Inc. (the project acoustical consultant), a minimum 1.8 metre high acoustic fence is required along both street lines of the potential collector road. Where retaining walls are shown, the required acoustic fence would need to be installed on

top of the retaining walls. On the existing residential properties to the south, this total barrier height will be approximately 4.6 metres tall from the existing residential yard grade, situated approximately 4.5 m away from the rear face of the building as illustrated on **Figure 10.**

5. TRANSPORTATION NETWORK ANALYSIS OF A POTENTIAL COLLECTOR ROAD CONNECTION TO WARDEN AVENUE

Included as **Appendix A** is a Brief entitled "***Transportation Technical Analysis Comparison and Evaluation of Proposed Minor Collector Road Connection to Warden Avenue***", prepared by Poulos + Chung Limited dated May 2017.

This Brief compared and evaluated transit, active transportation, estimated vehicle flow demand, assessed intersection performance, and evaluated a preliminary functional design of a potential minor collector road connection to Warden Avenue in this location.

This Brief also identified the potential minor collector road connection cross-section and the potential functional design improvements on Warden Avenue that were used by the consultant team to examine this potential minor collector road connection to Warden Avenue and evaluate its impacts.

The transportation network analysis undertaken in this Brief provides the following three conclusions:

1. A collector road connection to a bounding arterial road has merit, provides additional connectivity and options to serve directions of travel;
2. A collector road connection to a bounding arterial road which can extend beyond the connection point and connect to another arterial road can provide significant operational benefit to the entire arterial road network; and
3. A collector road such as this possible Warden Avenue connection, which simply connects to a bounding arterial road with no potential to ever be extended does not serve to improve or benefit the entire arterial road network, and only provides additional connectivity and options to serve directions of travel.

6. ANALYSIS OF THE IMPACTS OF A POTENTIAL COLLECTOR ROAD CONNECTION TO WARDEN AVENUE

In order to document and analyze the benefits and disadvantages of adding this potential collector road, an evaluation matrix was prepared, similar to many Environmental Assessment processes which serve to analyze and provide a decision-making strategy when various factors are involved, such as this current situation of considering this potential collector road.

Table 1 – Evaluation Matrix provides this analysis. The following discussion summarizes the findings in the Evaluation Matrix, and supports the conclusion that OPTION B: No Road to Warden Avenue, as per the Landowner's Applications, when considering all the various factors that are at play.

A. Socio-Economic Environment

The following evaluation criteria were included in this evaluation category:

1. Subject Property impacts
2. community area impacts
3. land use
4. property impact
5. urban design impact
6. residential amenity impact

Creating safe, vibrant, and positive streetscapes that promote walkability are important aspects of creating great communities. The evaluation criteria in this category address impacts / benefits upon the people of the future neighbourhood and the surrounding existing residents, and their collective social and urban environment.

As noted in the Evaluation Matrix, this potential collector road to Warden Avenue would introduce more vehicular trips through this new neighbourhood by creating a more permeable transportation network.

The introduction of a collector road in this location creates a negative and undesirable situation of rear lotting onto the new collector road for existing residential properties both north and south of the 26 m strip of land. Rear lotting of any sort is a design that is not promoted, designed or approved unless in very exceptional situations due to the negative impacts upon the rear yard amenity spaces. The Glenburn Forest townhouses to the south have very short rear yards which places the rear of the dwellings very close to the collector road, and, the estate lots to the north have rear yard amenity areas including swimming pools backing onto this portion of the Subject Property.

Noise attenuation walls would be required to the north and to the south, located on top of any retaining walls. The visual impact of the noise attenuation fences on top of the south retaining wall will create a significant visual barrier to the first and second floor of the existing residents of the Glenburn Forest executive townhouses, amplified by the proximity to the road itself. In some cases, this total barrier height will be as significant as 4.6 metres, situated approximately 4.5 m away from the rear face of the building as illustrated on **Figure 9.**

The introduction of a collector road in this location would create an undesirable and unsightly gateway to the community, as the road would sit within noise attenuation walls on both sides, and it would not have any built form or development frontage on it for approximately 200 metres.

In summary, the introduction of the collector road as OPTION A scores poorly in this category, with OPTION A scoring 1 out of 6 points.

B. Natural Environment

The following evaluation criteria were included in this evaluation category:

1. fisheries & aquatic habitat
2. wildlife
3. vegetation
4. groundwater, floodlines
5. stream morphology

Berczy Creek provides habitat for the provincially Endangered Redside Dace. In this regard, the Ministry of Natural Resources and Forestry (MNRF) will likely require a crossing that spans the meander belt at a minimum. This crossing size would still result in encroachment into the habitat of this species. Proposed intersection and lane improvements along Warden Avenue would require additional road surface, and existing bridge expansions which would cause even further encroachment.

Furthermore, the MNRF Best Management Practices (BMPs) for development activities within regulated Redside Dace habitat would need to be considered. One of these BMPs states that a maximum number of crossings of Redside Dace habitat to be one per kilometer. A structure at this location would not meet this BMP as there would be three crossings within a 300 m stretch of Berczy Creek. Without sufficient rationale the MNRF may not support this crossing given the potential impacts to this sensitive habitat. If they support the crossing, substantial permitting requirements under the provincial *Endangered Species Act* would still need to be undertaken.

Two lowland deciduous forest units, one dominated by Black Walnut and one dominated by Sugar Maple will be heavily impacted with a Warden Avenue connection. These impacts will result in vegetation loss as well as impairment to the connectivity of this sensitive system. This valley system currently provides a strong north-south linkage that would be weakened with the installation of a roadway.

The proposed open span crossing design would likely have some impact on the existing flood levels in the area, unless the crossing was also able to span the floodplain. A full analysis has not been undertaken at this stage.

TRCA's crossing guidelines would require a 55 m wide open span bridge crossing, as illustrated**,** and abutments would need to be situated outside of the 100 year erosion limits. The western abutment would be situated within the existing ROW for Warden Avenue, in a similar alignment to the existing vertical retaining wall situated just north of the 26 m wide strip.

In summary, the introduction of the collector road as OPTION A scores poorly in this category, with OPTION A scoring 0 out of 6 points.

C. Transportation

The following evaluation criteria were included in this evaluation category:

1. network compatibility: vehicular connectivity
2. network compatibility: transit connectivity
3. network compatibility: pedestrian & bicycle connectivity

Improving connectivity and active transportation opportunities within existing and planned communities are key urban development transportation objectives.

A summary of the transportation analysis is included as **Appendix A**, being a Brief entitled "***Transportation Technical Analysis Comparison and Evaluation of Proposed Minor Collector Road Connection to Warden Avenue***", prepared by Poulos + Chung Limited dated May 2017.

The transportation network analysis undertaken in this Brief provides the following three conclusions:

1. A collector road connection to a bounding arterial road has merit, provides additional connectivity and options to serve directions of travel;
2. A collector road connection to a bounding arterial road which can extend beyond the connection point and connect to another arterial road can provide significant operational benefit to the entire arterial road network; and
3. A collector road such as this possible Warden Avenue connection, which simply connects to a bounding arterial road with no potential to ever be extended does not serve to improve or benefit the entire arterial road network, and only provides additional connectivity and options to serve directions of travel.

In summary, the introduction of the collector road as OPTION A scores well in this category, with OPTION A scoring 3 out of 3 points.

D. Cost and Construction Staging

The following evaluation criteria were included in this evaluation category:

1. estimated construction cost
2. disruption to adjacent residents
3. construction staging

Significant grade differences exist within the 26m wide strip. As a result of existing grade differences and grading standards for roads, the majority of the 26 m wide strip would be regraded incorporating retaining walls throughout adjacent to rear yards of existing residents.

Construction challenges of building the potential collector road and intersection within a 26 m wide strip, adjacent to existing residential buildings and properties in close proximity include encroachment onto adjacent properties for the purposes of constructing retaining walls, noise attenuation fences, erosion sediment control measures, and the open span bridge as well as grading and disruption to amenity areas within the Glenburn Forest executive townhouses.

A partial and/or full closure of Warden Avenue would be required to complete the necessary improvements to Warden Avenue as well as the construction of the 55m open span crossing of Berczy Creek.

In summary, the introduction of the collector road as OPTION A scores poorly in this category, with OPTION A scoring 0 out of 3 points.

6. CONCLUSION

In conclusion, as detailed on the **Evaluation Matrix**, the consultant team concluded that the potential collector road connection to Warden Avenue should not be included in the development applications as the marginal transportation benefits did not outweigh the negative impacts, in some cases significant negative impacts, which appear in all of the other evaluation criteria categories.

TABLE 1

EVALUATION MATRIX FOR THE POTENTIAL COLLECTOR ROAD TO WARDEN AVENUE

EVALUATION CRITERIA			OPTION A: ROAD TO WARDEN AVE		OPTION B: NO ROAD TO WARDEN AVE (as per Landowner's Applications)	
			comment	ranking (1 = positive)	comment	ranking (1 = positive)
A. SOCIO-ECONOMIC ENVIRONMENT	1	Subject Property impacts	- more vehicular trips through the development	0	- less through traffic	1
	2	community area impacts	- more permeable network	1	- less permeable network	0
	3	land use	- undesirable land use arrangement	0	- acceptable land use arrangement	1
	4	property impact	- negative impact on adjacent residential uses	0	- no negative impacts	1
	5	urban design impact	- walled community entry road	0	- no negative impacts	1
	6	residential amenity impact	- noise and visual impact on adjacent	0	- no negative impacts	1
total points:	**6**			**1**		**5**
B. NATURAL ENVIRONMENT	1	fisheries & aquatic habitat	- impacts to high quality fish habitat including Endangered Redside Dace habitat	0	- no negative impacts	1
	2	wildlife	- impact habitat	0	- no negative impacts	1
	3	vegatation	- removal of vegetation including deciduous forest unit	0	- no negative impacts	1
	4	groundwater, floodlines	- impact to both	0	- no negative impacts	1
	5	stream morphology	- potential impacts due to realignment that is likely required	0	- no negative impacts	1
total points:	**5**			**0**		**5**
C. TRANSPORTATION	1	network compatibility: vehicular connectivity	- additional connection point	1	- no benefit	0
	2	network compatibility: transit connectivity	- additional connection point	1	- no benefit	0
	3	network compatibility: ped & bicycle connectivity	- additional connection point	1	- no benefit	0
total points:	**3**			**3**		**0**
D. COST AND CONSTRUCTION STAGING	1	estimated construction cost	- Warden Ave improvements, reconstruction of 2 existing bridges, new intersection construction, bridge crossing of Creek, noise attenuation for adj uses	0	- no cost	1
	2	disruption to adjacent residents	- disruption to outdoor amenity areas	0	- no disruption	1
	3	construction staging	- closure of Warden Ave	0	- no negative impacts	1
total points:	**3**			**0**		**3**
TOTAL RANKING POINTS	**17**			**4**		**13**
EVALUATION OUTCOME			**NOT PREFERRED**		**PREFERRED**	

Background Report for the Lack of a Collector Road Connection to Warden Avenue

4134 16th Avenue Community

Figure 1
Structure Plan

Background Report for the Lack of a Collector Road Connection to Warden Avenue

4134 16th Avenue Community

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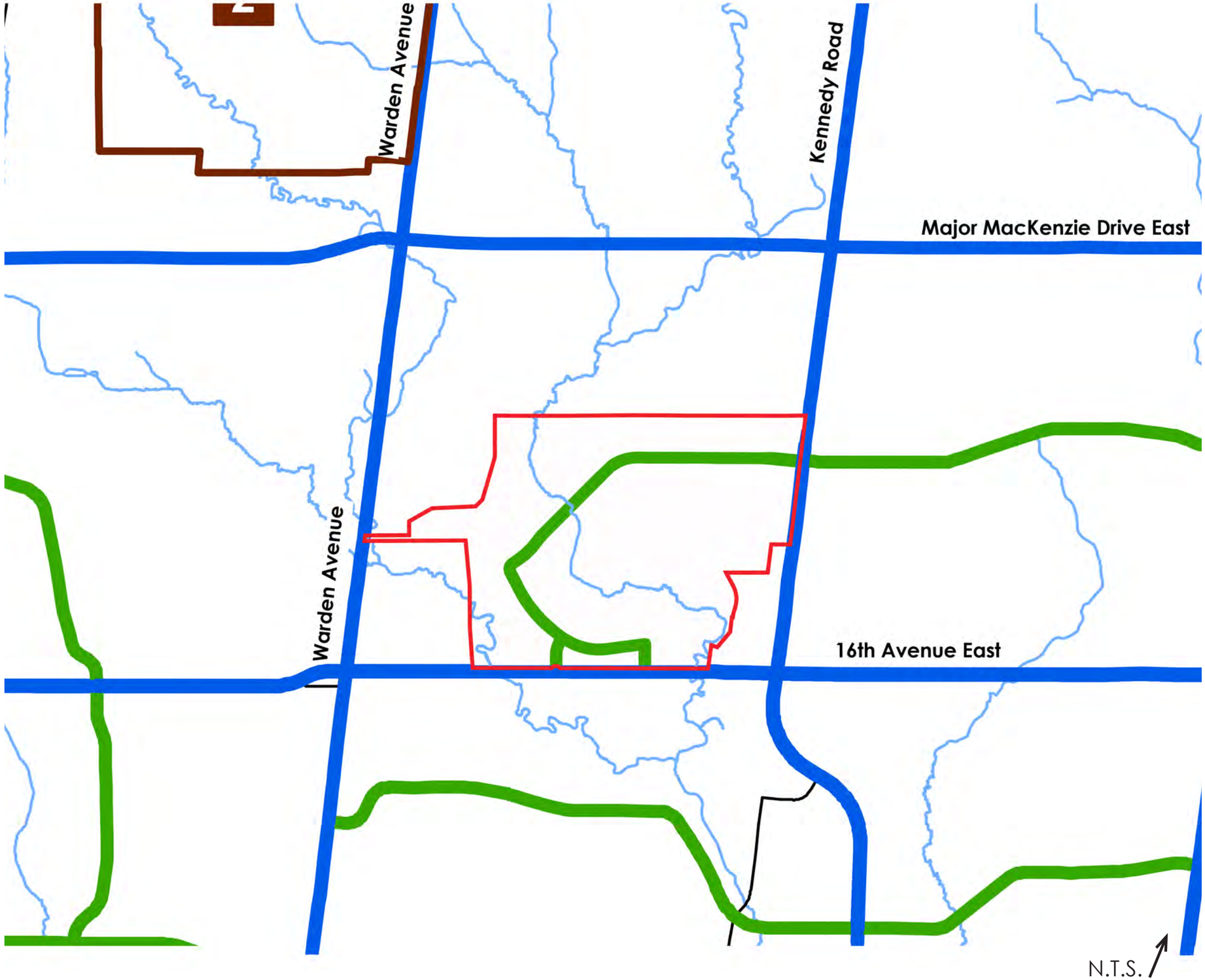
Figure 2

Composite Draft Plans

Background Report for the Lack of a Collector Road Connection to Warden Avenue

4134 16th Avenue Community



Subject Property

PROVINCIAL HIGHWAYS
- Provincial 400 Series Highway
- Provincial Highway
- Potential Provincial 400 Series Highway Mid-Block Crossing
- Potential Provincial 400 Series Highway Interchange

ARTERIAL ROADS
- Region of York Arterial Road (right-of-way width on Map 12 - York Region Official Plan)
- Future Donald Cousens Parkway
- City of Toronto Arterial Road
- Markham Arterial Road (up to 32.5 metre right-of-way width)

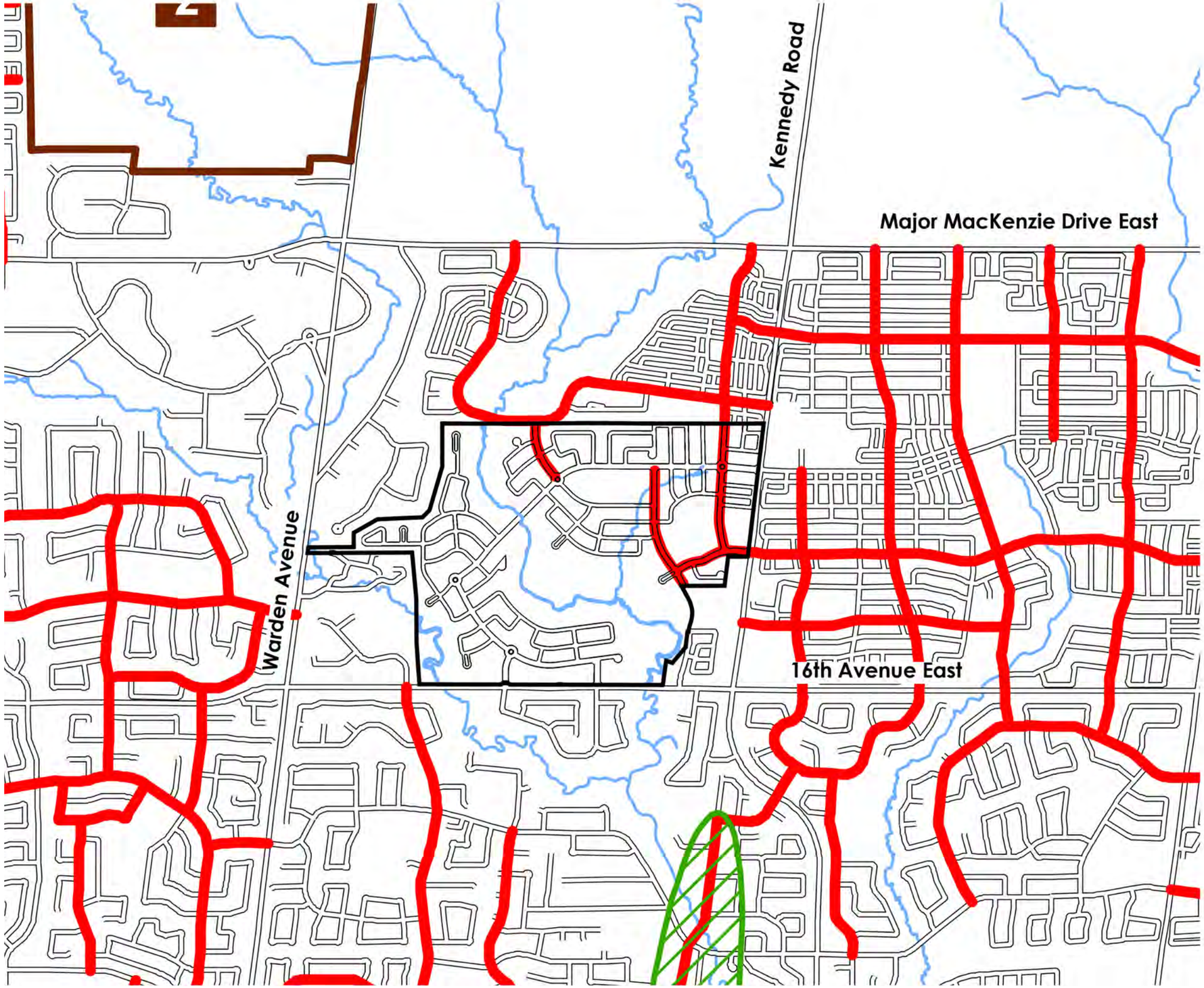
COLLECTOR ROADS
- Major Collector Road (up to 30.5 metre right-of-way width)
- Proposed Major Collector Road
- Special Transportation Study Area (road network improvments to be determined based on further studies with agencies having jurisdiction) or Environmental Assessment Study

Figure 3A

Proposed OPA Schedule
Map 10 Road Network
City of Markham
Official Plan 2014

Background Report
for the Lack of a
Collector Road
Connection to
Warden Avenue

4134 16th Avenue Community



Subject Property

COLLECTOR ROADS

Note: Major Collector Road (see Map 10 - Road Network)

Minor Collector Road (up to 24.5 metre right-of-way width)

See Section 10.8.1.4

✱ Special Transportation Study Area (road network improvements to be determined based on further studies with agencies having jurisdiction) or Environmental Assessment Study.

Figure 3B

Proposed OPA Schedule
Map 11 Minor Collector
Road Network
City of Markham
Official Plan 2014

Background Report for the Lack of a Collector Road Connection to Warden Avenue

4134 16th Avenue Community

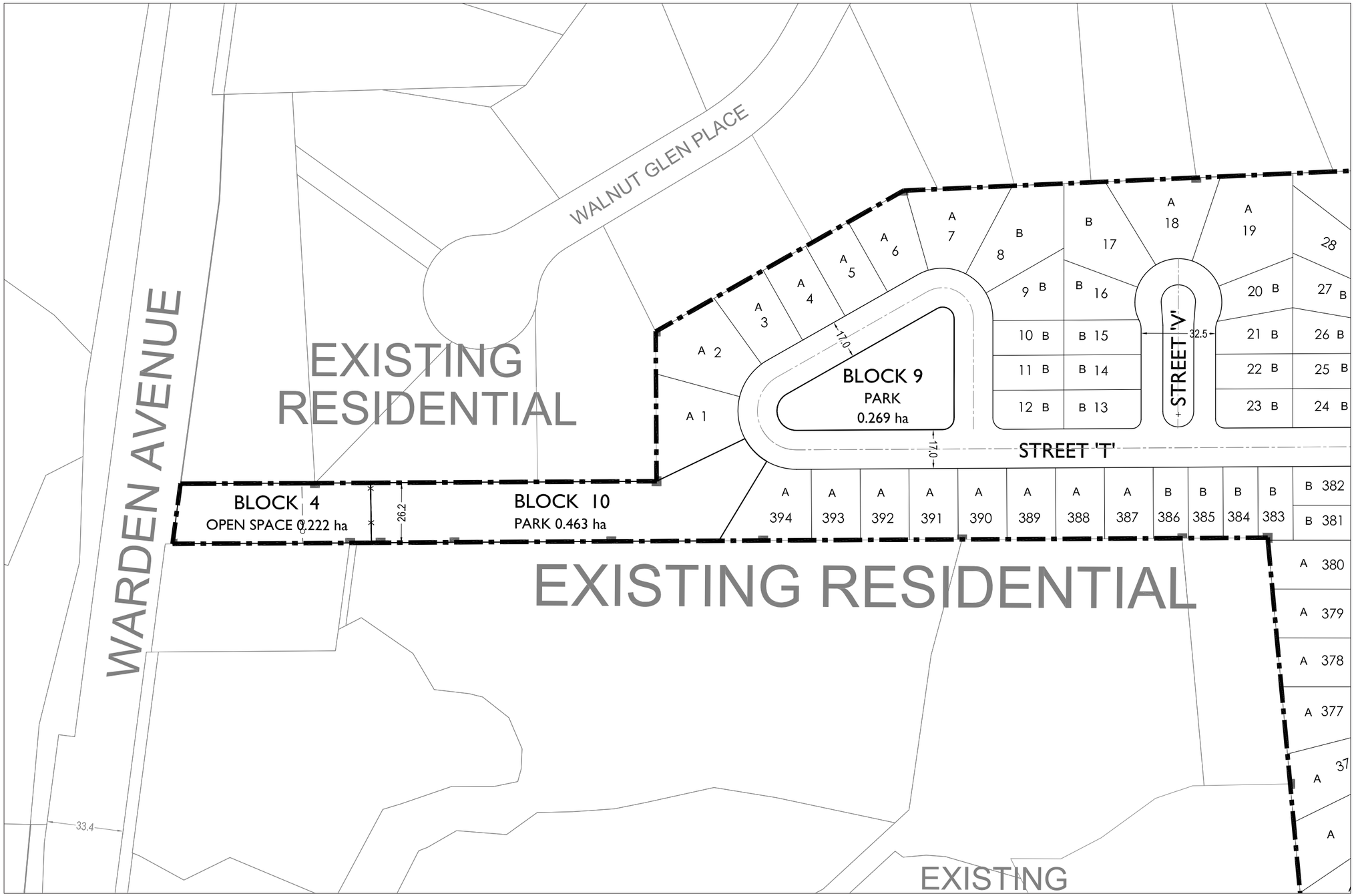
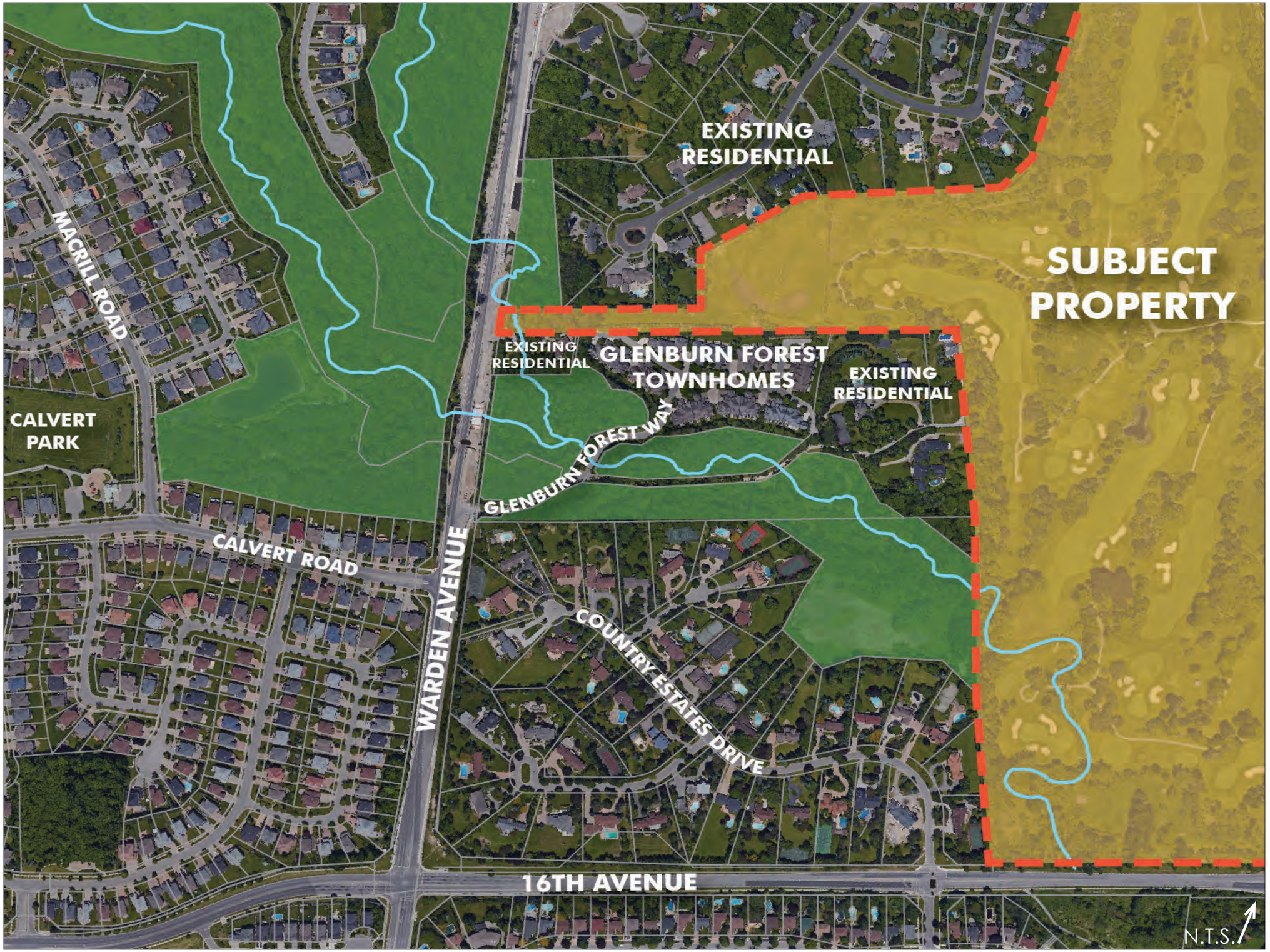


Figure 4

Warden Avenue Frontage Detail

Background Report for the Lack of a Collector Road Connection to Warden Avenue

4134 16th Avenue Community



Subject Property

City of Markham Open Space Ownership

Figure 5

Warden Avenue
Surrounding Land Uses

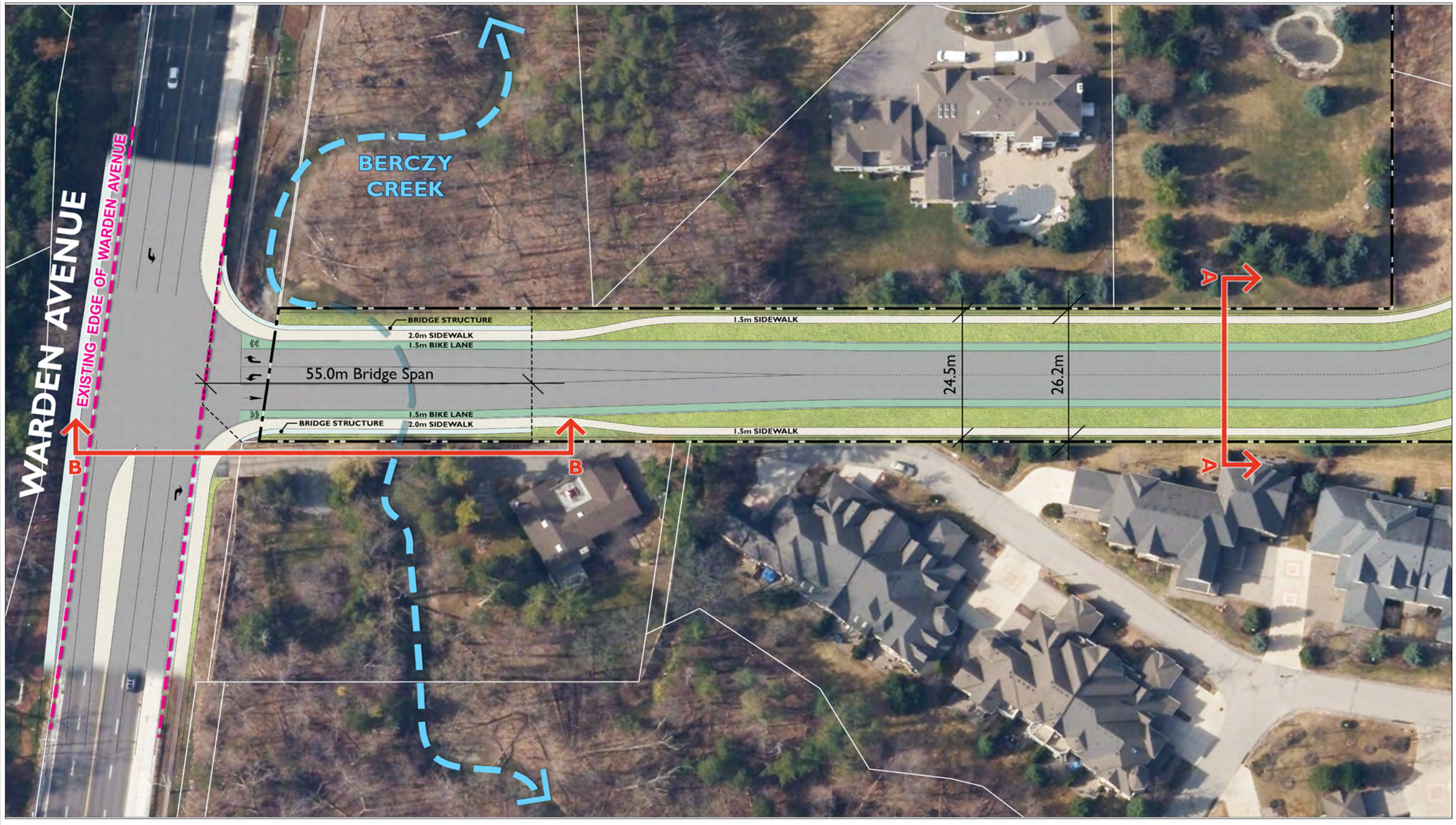


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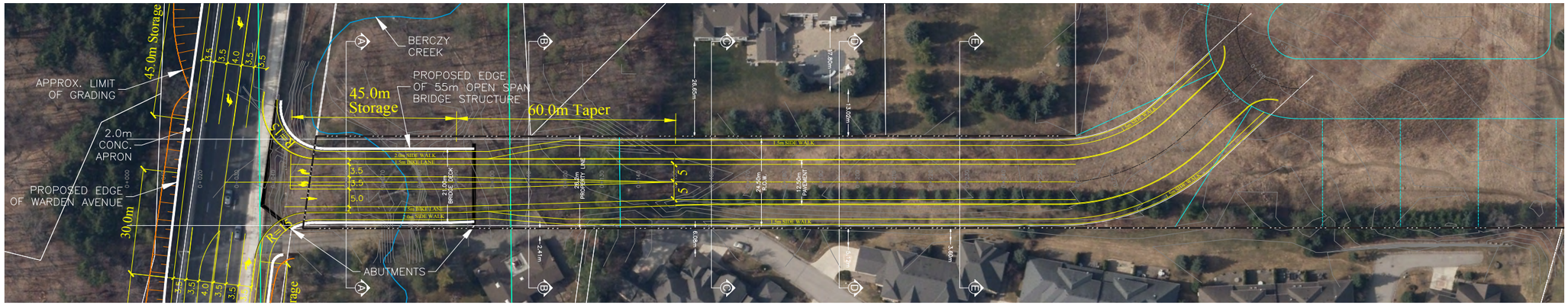
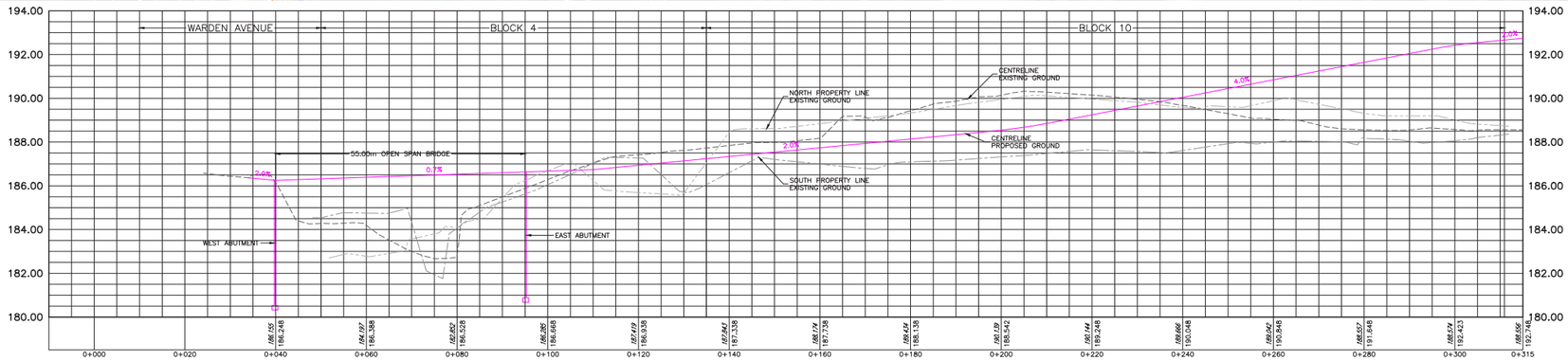
Figure 6

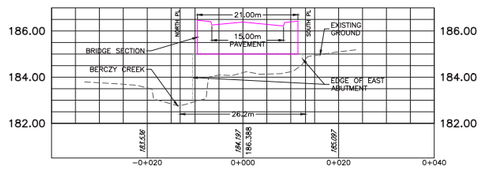
Potential Collector Road
Illustration Plan

Background Report for the Lack of a Collector Road Connection to Warden Avenue

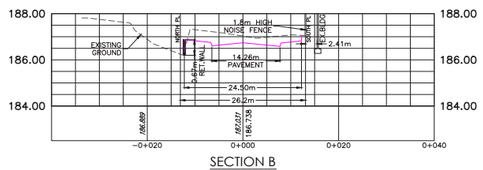
4134 16th Avenue Community







SECTION A
(STA 0+060)



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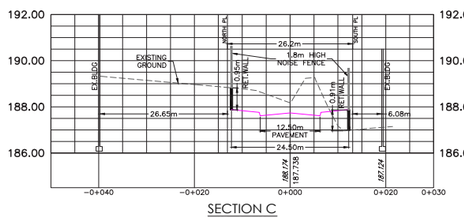

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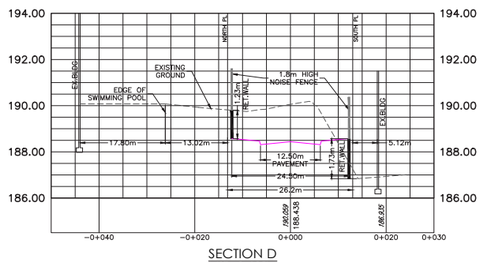

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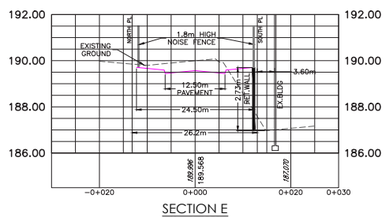

SECTION E
(STA 0+228)

N.T.S.

Figure 7

Potential Collector Road Grading Plan & Profile

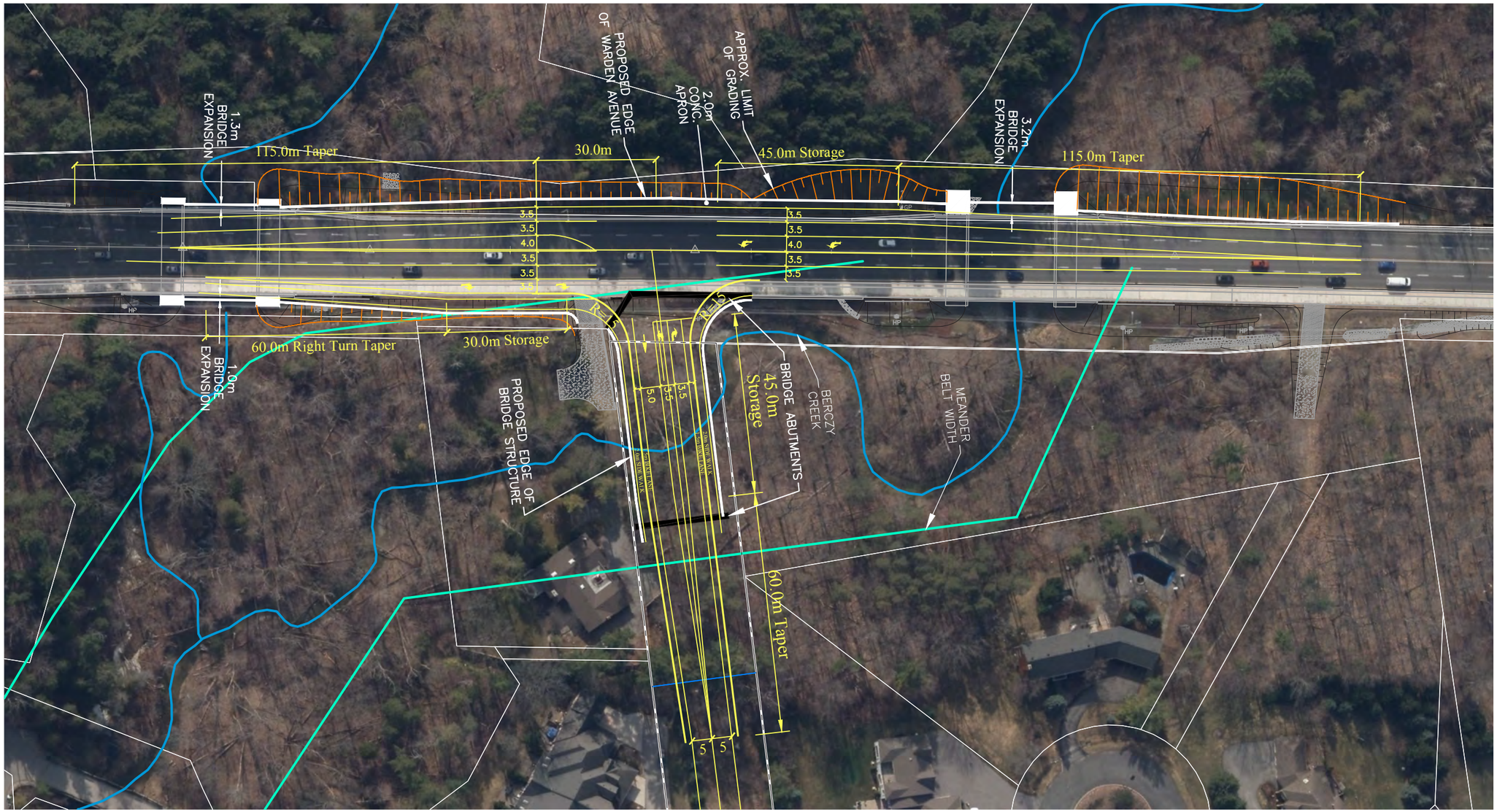

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Figure 8

Potential Collector Road Intersection with Warden Avenue

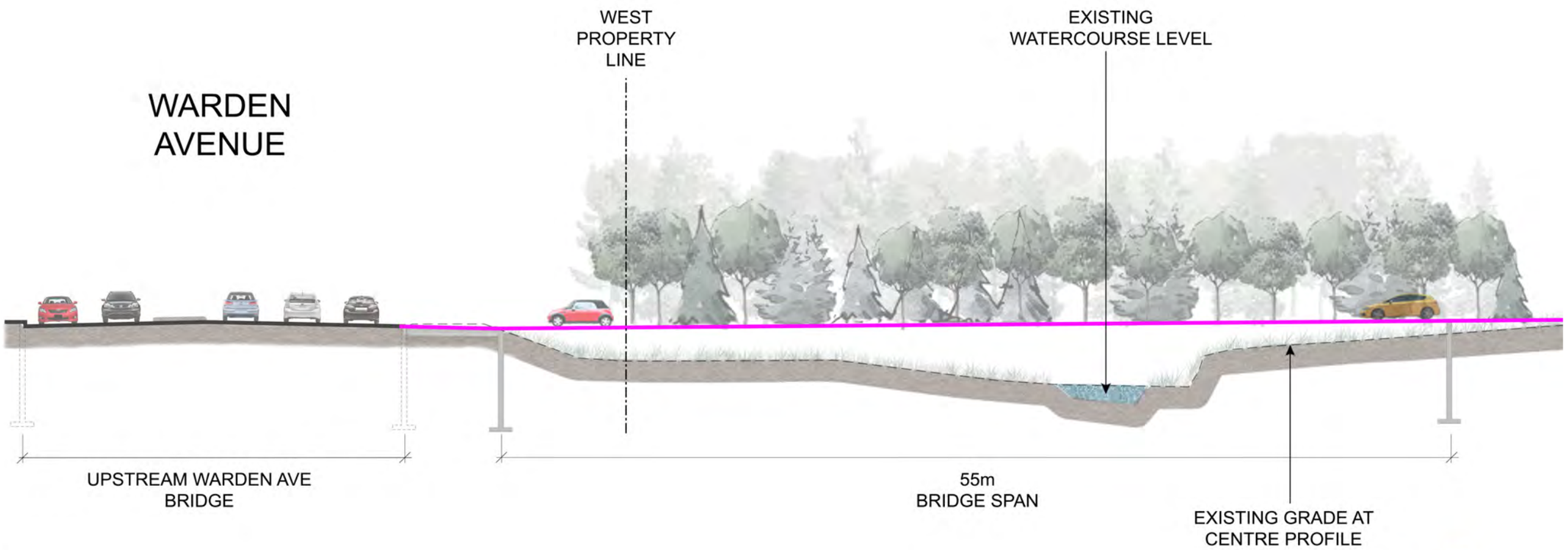

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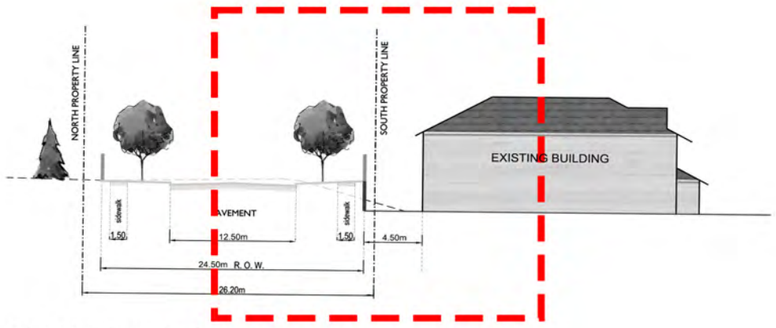
Figure 9

Subject Property Grades for
Potential Collector Road
(Section B)



SECTION A-A
Key Plan

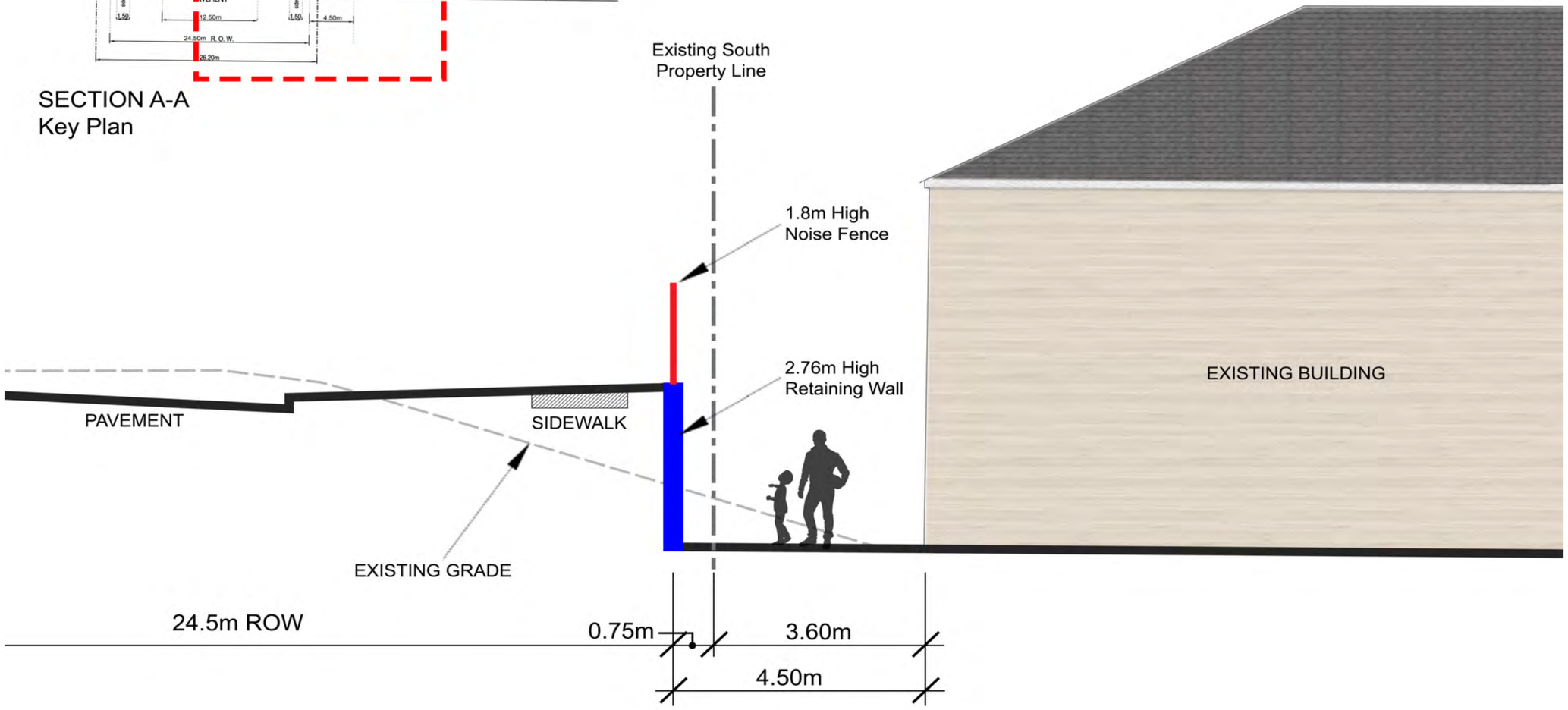


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Figure 10
Potential Collector Road
Grading & Noise Attenuation
(Section A)

Appendix A

"Transportation Technical Analysis Comparison and Evaluation of Proposed Minor Collector Road Connection to Warden Avenue"

Sixteenth Land Holdings Inc.
4134 16th Avenue Lands
City of Markham

Transportation Technical Analysis
Comparison and Evaluation
Of A
Proposed Minor Collector Road Connection to Warden Avenue

May 2017

Prepared By: Poulos & Chung Limited

Sixteenth Land Holdings Inc.
4134 16th Avenue Lands
City of Markham
Transportation Technical Analysis
Comparison and Evaluation of
Proposed Minor Collector Road Connection to Warden Avenue

Table of Contents

Sixteenth Land Holdings Inc.
4134 16th Avenue Lands
City of Markham
Transportation Technical Analysis
Comparison and Evaluation of
Proposed Minor Collector Road Connection to Warden Avenue

1. Introduction

Sixteenth Land Holdings Inc. has filed a complete application in support of an Official Plan Amendment, Zoning By – Law Amendment and Draft Plans of Subdivision for the subject property.

The City of Markham upon reviewing the Transportation Assessment Report in support of the Official Plan Amendment has requested additional information and clarification.

In particular the formation of the internal roadway network has brought forth a question as to whether or not a minor collector roadway connection is appropriate to Warden Avenue.

To respond to this request the entire Project Team has worked together to prepare a comprehensive response.

This technical analysis report documents the transportation technical analysis including comparison and evaluation that was undertaken. It respects not only roadway operating conditions, roadway geometric results but also policy directions which encourage connectivity.

The option to connect or not to connect to Warden Avenue is illustrated in Figure 1.

2. Transit Comparison and Evaluation

Including a connection to Warden Avenue provides transit with another option to introduce a transit route structure to serve the subject property.

This capability is evaluated in Figure 2.

The following presumptions are made:

- The subject property will have transit services (Proposed Transit Route) operating on its internal roadway network;

- The introduction of the Warden Avenue connection provides transit with another route option to enter and leave the subject property. The route option by itself does not materially increase or decrease the propensity for residents of the subject property to use transit;

- Assuming this equal propensity of transit usage within the subject property the real comparison of transit occurs outside of the subject property boundary.

Figure 2 identifies the available development adjacent to alternate transit route patterns. It is the magnitude of development in close proximity that allows a transit route to attract riders.

As in evident in Figure 2:

- Warden Avenue connection route:

    - A 400 meter walking distance to Warden Avenue results in 100 dwelling units (50 dwelling units south of the connection to 16th Avenue and 50 dwelling units north to Major Mackenzie Drive) are available as a rider catchment number;

- A Major Mackenzie Drive connection route;

    - A 400 meter walking distance through the Angus Glen West Village results in 300 dwelling units are available as a rider catchment area;

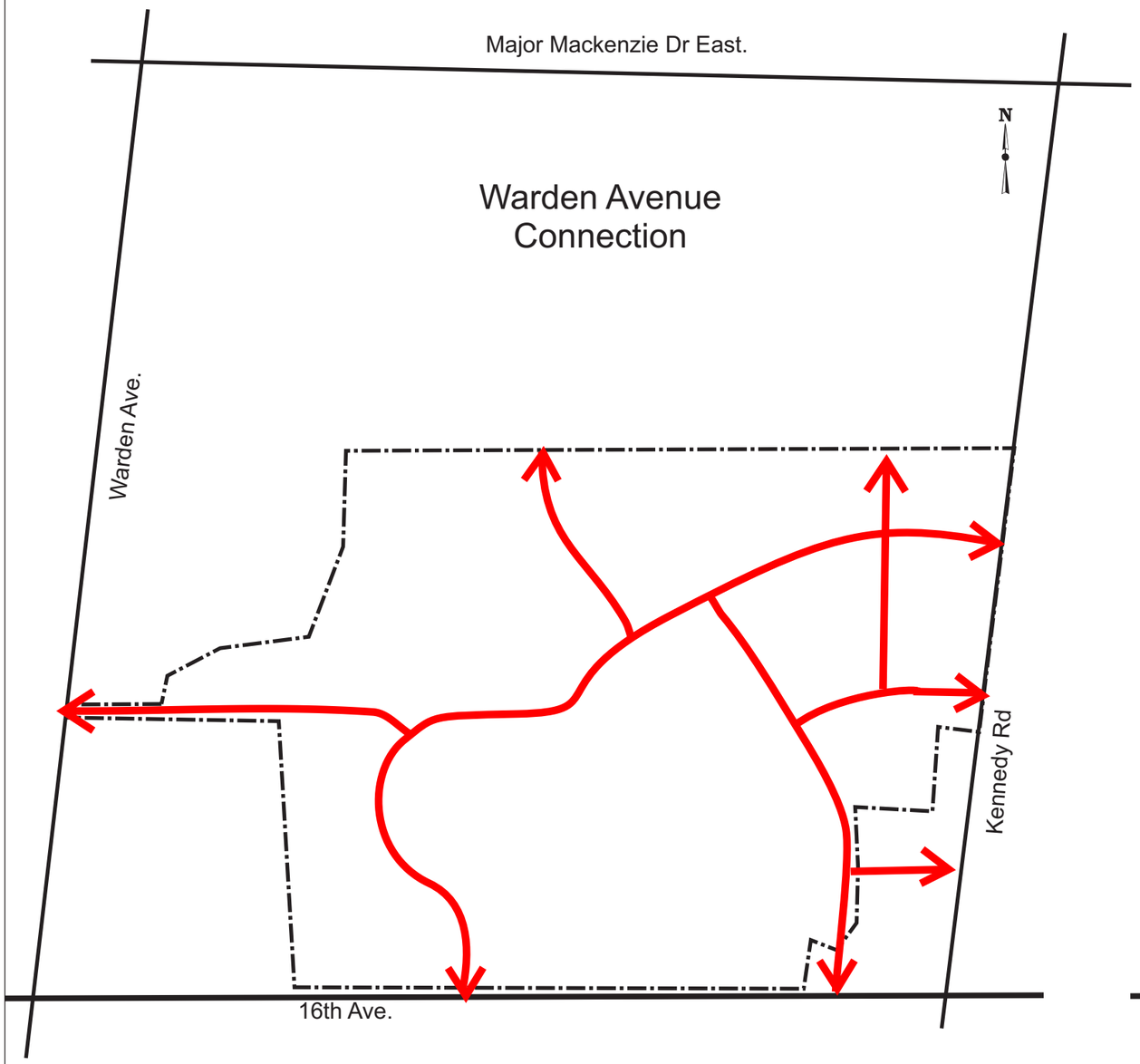
    - Direct access to the Angus Glen Community Centre;

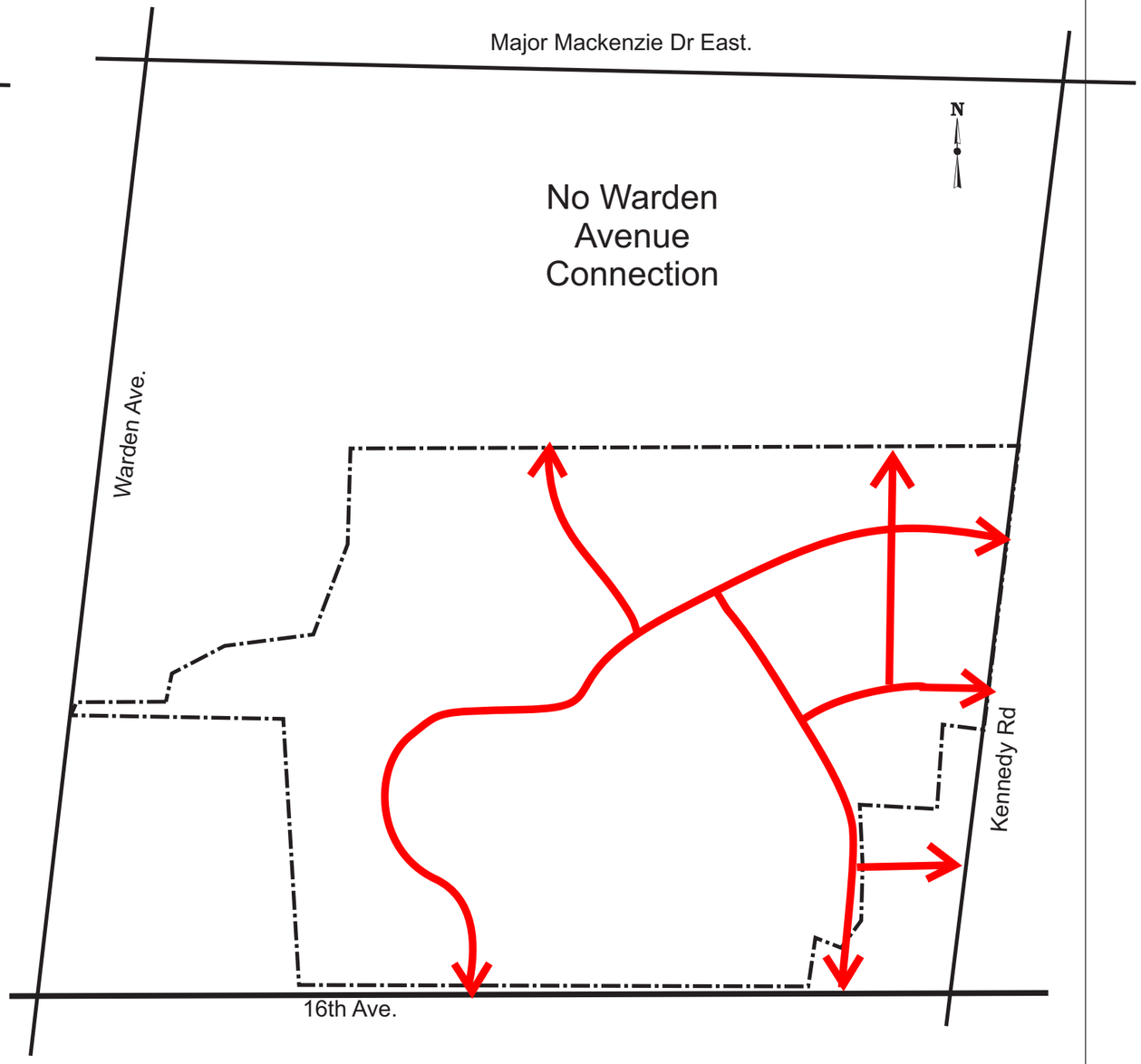
- A 16th Avenue connection route:

    - A 400 meter walking distance to 16th Avenue results in 150 dwelling units are available as a rider catchment number.

It can be concluded that a transit route utilizing a possible Warden Avenue connection does not materially attract new transit rider potential.

As a matter of fact existing transit routes on Warden Avenue and 16th Avenue provide services to the described catchment number that a Warden Avenue connection would.





Subject Property Boundary

Collector Road Network

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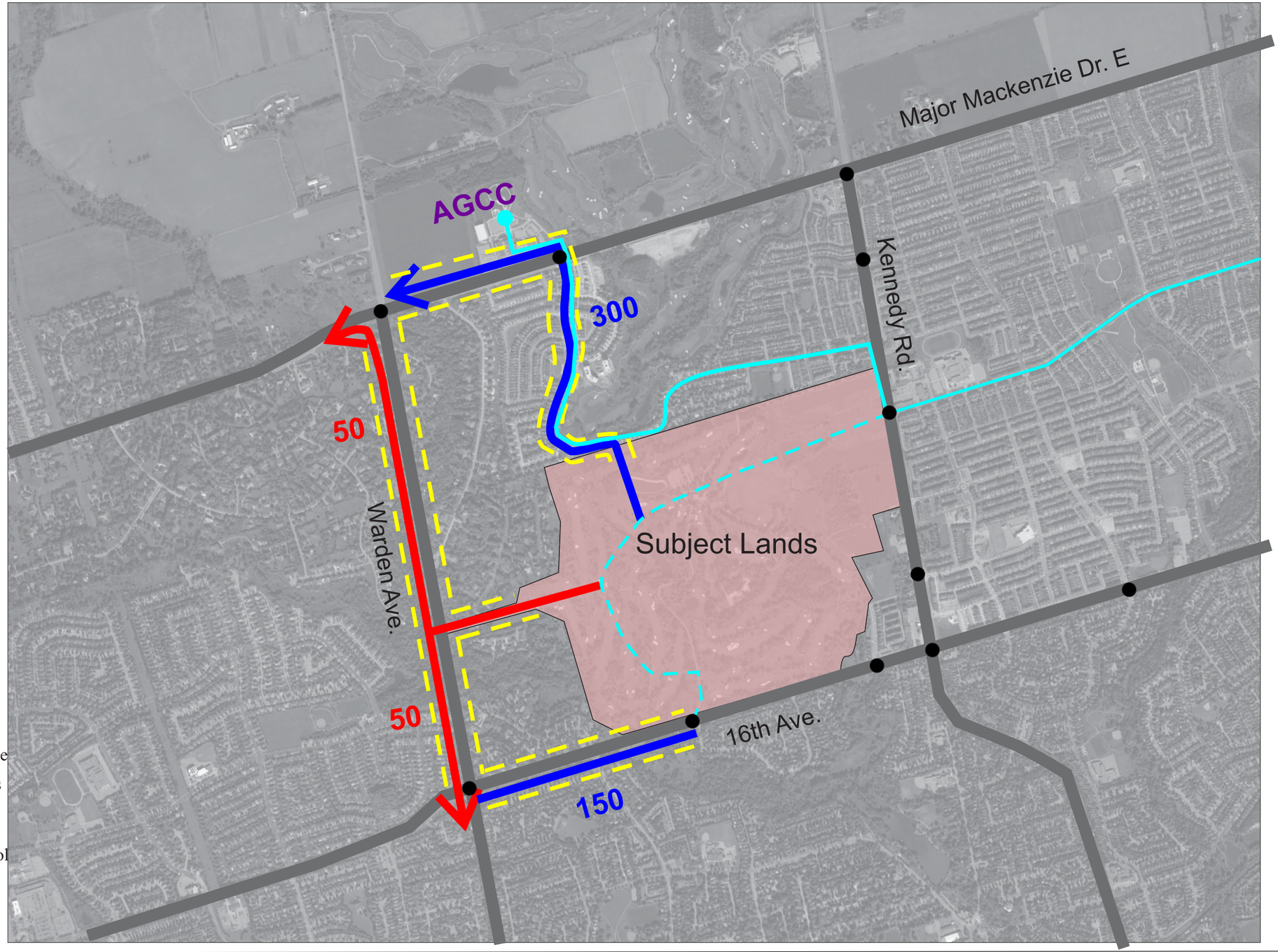
Collector Road Network
Figure 1



Legend:

- Existing Transit on Regional Roads
- Existing Transit on Municipal Road
- Proposed Transit In Plan of Subdivision
- Potential Warden Avenue Transit
- Potential Continuation of Existing Transit
- 400m Band Around Proposed Transit Service
- XXX - Number of Dwelling Units Within 400m Walking Distance to Transit
- Existing Traffic Signal Control
- Subject Lands

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Not To Scale

Transit On Potential Warden Avenue Connection
(Comparing Existing Density Within a 400 Meter Walking Distance)
Figure 2

3. Active Transportation Comparison and Evaluation

The 4134 16th Avenue proposed development will have significant infrastructure to support and encourage walking and bicycling modes of transportation.

This supporting infrastructure includes:

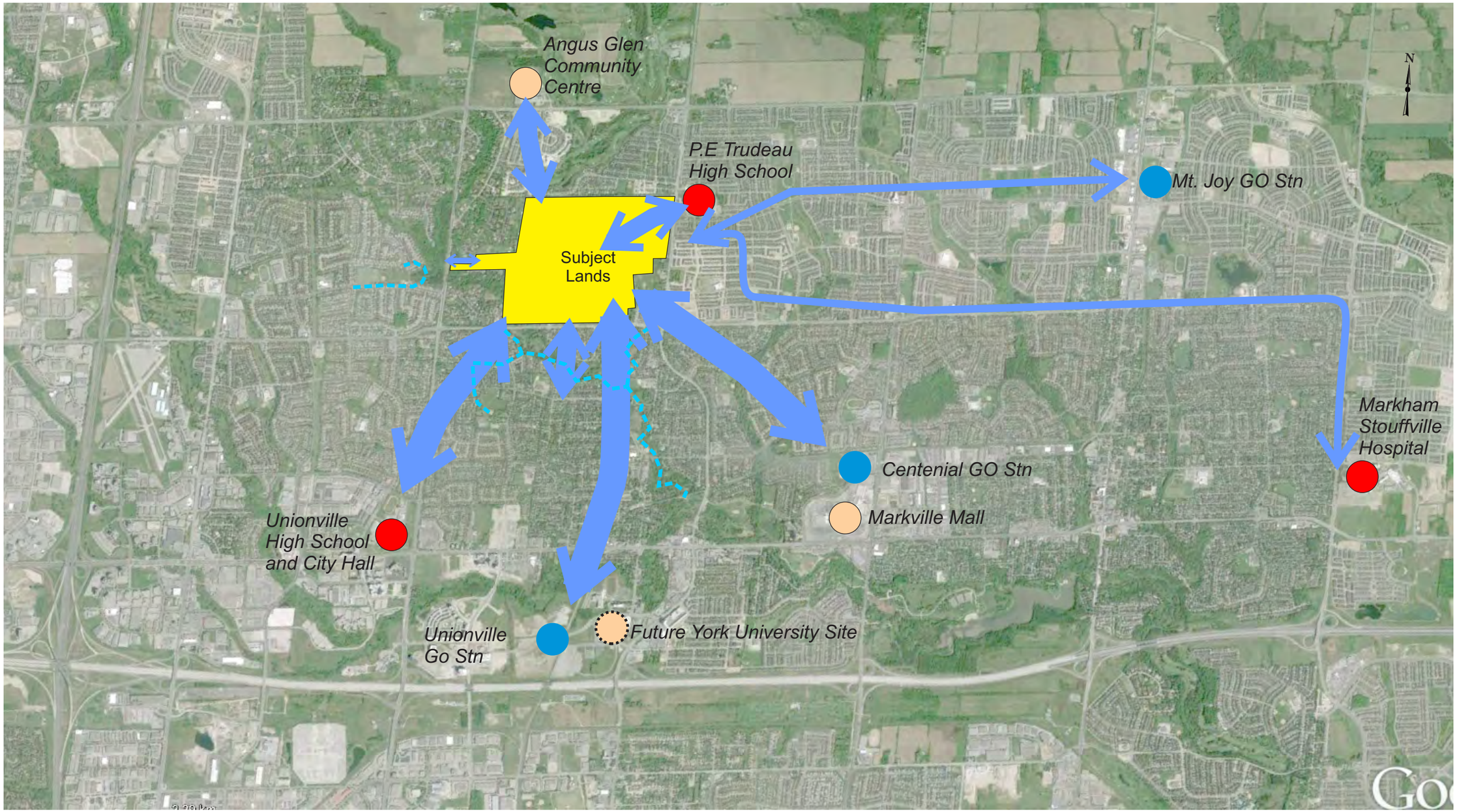
- Exclusive bike lanes on the primary internal collector roads;
- Sidewalks on both sides of the primary collector roads and local roads. The sidewalks provide direct connections to Kennedy Road, 16th Avenue and the community to the north;
- Connecting trail / path network within the valley lands;
- The introduction of traffic lights at the intersections of 16th Avenue with Normandale Road East and West. These two new traffic lights can assist pedestrians and bicyclists to cross 16th Avenue in a controlled manner. Using the sidewalk on the south side of 16th Avenue pedestrians and bicyclist can access the existing trail system. On the north side of 16th Avenue the proposed sidewalk, exclusive bike lane and trail network can directly connect to all attractors and generators. The new traffic signals effectively eliminate a major barrier to these modes of transportation.

Figure 3 identifies the major attractors and generators in the vicinity of 4134 16th Avenue. These attractors and generators range from schools to shopping and institutional locations as well as major employment areas.

The major travel desire patterns are illustrated.

It is evident that the travel desire directly to the west is fairly low.

The examination of topographical and environmental characteristics will determine if a physical connection can be made to the west (of Warden Avenue). It should be noted that any further extension of a trail / pedestrian / bicycle connection west of Warden Avenue is dependent upon securing access through an environmentally sensitive area. Otherwise a connection to Warden Avenue to just go north or south is no different than using the available arterial road east – west connectivity.



Legend:
- Travel Desire
- Existing Trails
- Subject Lands

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Active Transportation Primary Directions of Travel

Figure 3

4. Estimated Vehicle Flow Demand

The typical weekday AM Peak Hour Peak Direction of travel was examined in order to estimate the vehicle flows that could use a Warden Avenue connection.

The information sources used included:

- Examining York Region EMME II transportation model forecasts which did and did not include the Warden Avenue connection;
- Existing traffic flow patterns;
- Vehicle trip generation and distribution characteristics of the proposed 4134 16th Avenue land uses.

Figure 4 summarizes the traffic flows in the AM Peak Hour Peak Direction of travel.

Upon examining these traffic flows it is evident that:

- 150 vehicles would be diverted from the East and West Villages of Angus Glen;
- 200 vehicles would be diverted from southbound Kennedy Road and westbound Bur Oak Avenue;
- 300 vehicles (approximately 20% of the total traffic generated by the 4143 16th Avenue land uses in the AM Peak Hour) would be attracted to a Warden Avenue connection.

A Warden Avenue connection would consist of the following traffic flows in the AM Peak Hour Peak Direction of travel:

- Approximately 54% of the total traffic flow will have origins outside of the 4143 16th Avenue lands;
- Approximately 46% of the total traffic flow will originate within the 4143 16th Avenue lands.

From

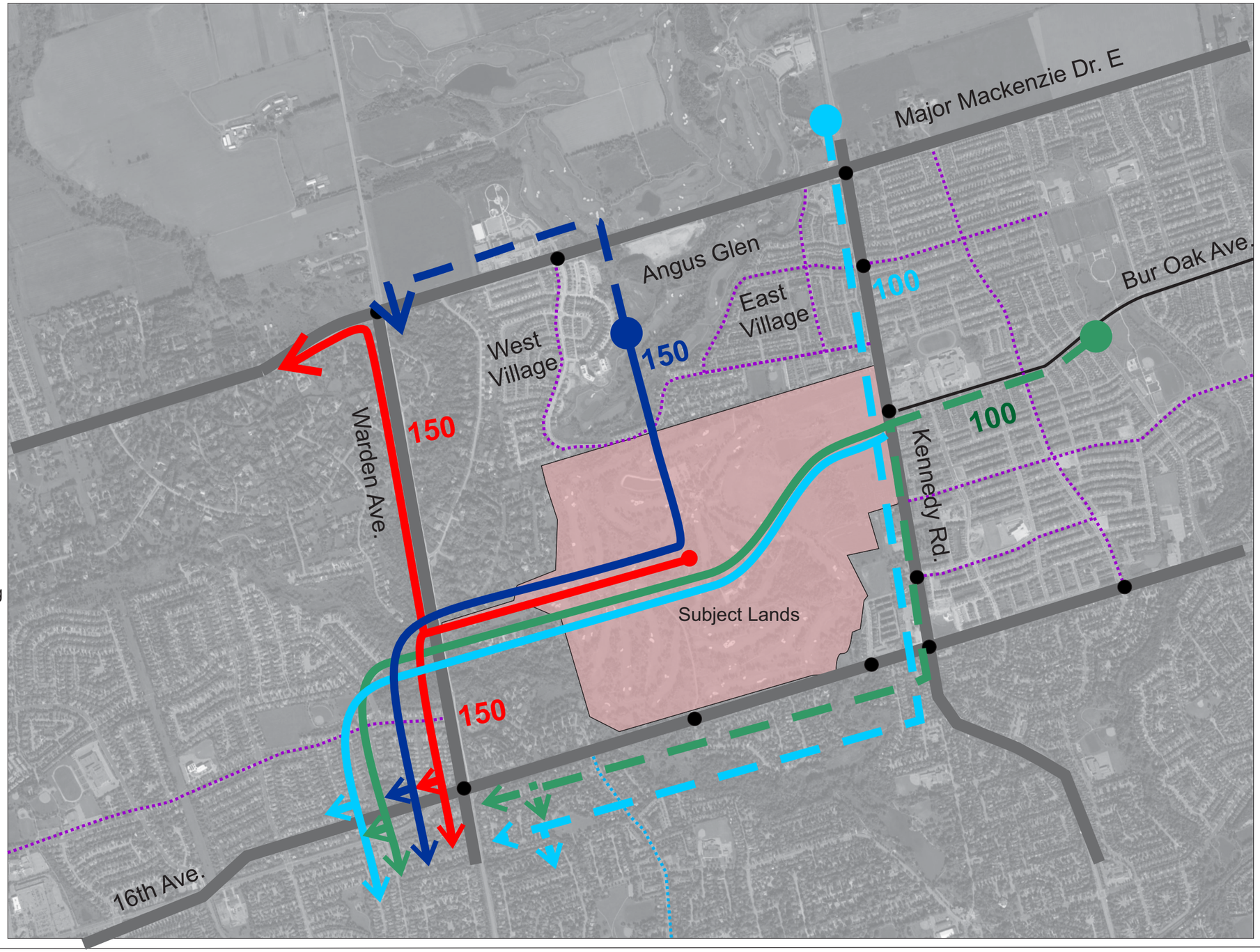
To

Regional Roads - 4 lanes
of traffic with exclusive turning
lanes at intersections

City Roads - 4 lanes
of traffic (Major Collector)

City Roads - 2 lanes
of traffic (Major Collector)

Exiting Traffic Signal Control



XXX Am Peak Hour
Peak Direction
Traffic Flow

Estimated Vehicle Flows
Attracted to Warden Avenue Connection
Figure 4

5. Intersection Performance Comparison and Evaluation

The two critical intersections were analysed in detail. The assessment was completed using the Synchro Software program. An optimized signal timing condition was used. The intersections compared and evaluated included:

- 16th Avenue and Warden Avenue:
- Warden Avenue and Major Mackenzie Drive.

The typical weekday roadway AM and PM peak hours were examined for horizon year 2021 assuming complete build out of the 4134 16th Avenue lands.

The analysis examined and compared the intersection operating performance of these two critical intersections with and without the Warden Avenue connection.

The intersection performance comparison and evaluation is based upon examining key intersection performance measures.

To compare the intersection performance with and without the Warden Avenue connection the change (increased delay or congestion) was noted. The key performance measures examined included;

- Overall intersection delay;
- Overall intersection capacity;
- Capacity change by key individual lane movement.

Figure 5 presents the summary results.

Upon examining the intersection performance characteristics the following can be concluded.

In the AM peak hour:

- At the Warden Avenue and 16th Avenue intersection:
    - Without the Warden Avenue connection the overall intersection vehicle delay increases by approximately 13 seconds and the westbound through and southbound left turn vehicle movements experience increased congestion and delay. This is not unexpected because 4134 16th Avenue traffic flows have to use this intersection to complete directions of travel;
    - With the Warden Avenue intersection the southbound through vehicle flows and eastbound left turns experience increased vehicle delay and congestion. This in not unexpected because the Warden Avenue connection traffic flows increase the demands on these lane movements;

- At the Warden Avenue and Major Mackenzie Drive intersection:

    - With the Warden Avenue connection the overall intersection delay increases by approximately 33 seconds and the westbound through, westbound left, southbound through and northbound left experience increased delay and congestion. This is not unexpected because the Warden Avenue traffic flow is attracted to this intersection to complete vehicle turning movements.

It is concluded in the AM Peak Hour that a Warden Avenue connection:

- Benefits 16th Avenue traffic flows in the westbound direction of travel while providing a degraded operation to opposing traffic flows especially southbound traffic flows on Warden Avenue, in addition;

- No benefits are accrued to the Warden Avenue and Major Mackenzie Drive intersection where several movements, especially the northbound left urns are adversely affected.

In the PM peak hour:

- At the Warden Avenue and 16th Avenue intersection;

    - Without the Warden Avenue connection the overall intersection delay increases by approximately 7.0 seconds and the westbound left and eastbound through vehicle flows experience increased delay and congestion. This is not unexpected because 4134 16th Avenue traffic flows are using this intersection to complete directions of travel;

    - With the Warden Avenue connection the eastbound left turn experiences a significant increase in delay and congestion. This is not unexpected because returning vehicles are using this left turn to access the Warden Avenue connection;

- At the Warden Avenue and Major Mackenzie Drive intersection;

    - Without the Warden Avenue connection the overall intersection delay increases by approximately 30 seconds with the westbound left and southbound left experiencing increased delay and congestion. This is not unexpected because of the increased flows in both directions of travel on Major Mackenzie Drive;

    - With the Warden Avenue connection the northbound through and in particular the northbound left experience significant increase in delay and congestion. This is not unexpected and results from the increase Warden Avenue connection traffic flows.

It is concluded in the PM Peak Hour that a Warden Avenue connection:

- Benefits 16th Avenue traffic flows in both the eastbound and westbound directions of travel but at the penalty of degrading significantly the eastbound left turn, and;

- Benefits the Major Mackenzie traffic flows in the eastbound and westbound directions of travel but at the penalty of significantly degrading the northbound left and through vehicle movements.

Overall it can be concluded between the two critical intersections that in both typical weekday roadway peak hours a Warden Avenue connection secures operating benefits for certain directions of travel at the expense of other directions of travel. Not having a Warden Avenue connection increases the overall intersection vehicle delays and also contributes to the degradation of certain intersection directions of travel.

The intersection performance and evaluation summary demonstrates the futility of trying to balance arterial intersection operations without a continuous mid – block collector road component. That is if a continuous mid – block collector (Warden Avenue connection to Woodbine Avenue) was feasible then the benefits of such a connection would be immediately evident at these two arterial road intersections. Without such an opportunity it becomes very difficult to rationalize benefits and disbenefits.

Intersection Performance Difference
With Warden Avenue Connection Versus No Warden Avenue Connection
Measurements Include Overall Intersection Delay and Volume To capacity Ratio
And Individual Lane Movements
(Ratio can also be considered to be a Percent Change)

Location	AM Peak Hour With Warden Avenue Connection	AM Peak Hour Without Warden Avenue Connection	PM Peak Hour With Warden Avenue Connection	PM Peak Hour Without Warden Avenue Connection
Intersection – Warden Avenue and 16th Avenue				
Overall Vehicle Delay		+13.0 Seconds		+7.0 Seconds
Overall Intersection Capacity		+0.07		+0.07
By Lane Movement				
Westbound Through		+0.05	-	-
Westbound Left		+0.16		+0.06
Eastbound Through		+0.04		+0.08
Eastbound Left	+0.07		+0.31	
Southbound Through	+0.05		-	-
Southbound Left	-	-	-	-
Northbound Through	-	-	+0.03	
Northbound Left	-	-	-	-

Location	AM Peak Hour With Warden Avenue Connection	AM Peak Hour Without Warden Avenue Connection	PM Peak Hour With Warden Avenue Connection	PM Peak Hour Without Warden Avenue Connection
Intersection – Warden Avenue and Major Mackenzie Drive				
Overall Vehicle Delay	+33 Seconds			+32 Seconds
Overall Intersection Capacity	+0.04			+0.33
By Lane Movement				
Westbound Through	+0.10		-	-
Westbound Left	+ 0.05		-	-
Eastbound Through	-	-		+0.22
Eastbound Left	-	-	-	-
Southbound Through	0.10		-	-
Southbound Left	-	-		+0.18
Northbound Through	-	-	+0.17	
Northbound Left	+0.28		+0.42	

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	± XX

Difference

-	-

No Measurable Difference

Comparing Intersection Performance

Figure 5

6. Preliminary Warden Avenue Functional Design Evaluation

Poulos & Chung Limited recognizes that a Warden Avenue connection requires the implementation of City of Markham and York Region design standards. It is recognized that such a connection will require (based upon forecast design volumes):

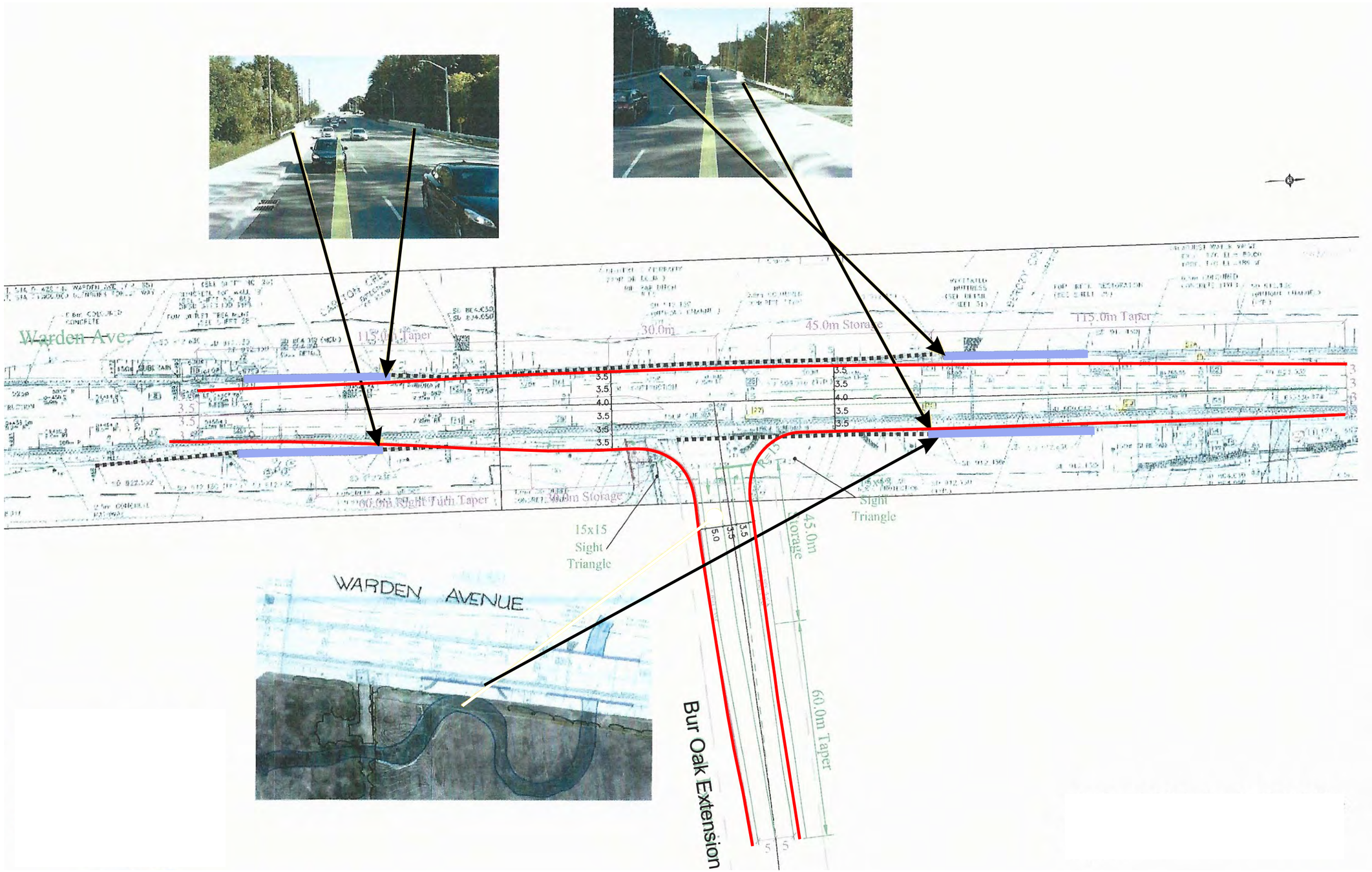
- An appropriate Warden Avenue connection cross –section which includes one lane of travel in each direction of travel, exclusive bicycle lanes in each direction of travel, sidewalks on both sides and an exclusive west to south left turn lane.

- On Warden Avenue the introduction of a Warden Avenue connection will require the installation of an exclusive northbound right turn lane and an exclusive southbound left turn lane.

Poulos & Chung Limited has prepared initial functional design sketch plans to assist the project team in conducting further detailed evaluations and assessments.

Figure 6 presents Option 1 examined by Poulos & Chung Limited to create the Warden Avenue connection intersection. Upon completing this functional design sketch plan it was quickly realized that assuming a widening on both sides of Warden Avenue has severe implications on existing curbs, guard rails and existing Warden Avenue bridge structures on both sides of Warden Avenue.

Since Warden Avenue was recently constructed as a four lane road an alternate geometric implementation plan was investigated. As a result Figure 7 was prepared. This Figure shows Option 2 and assumes that the east side curb would essentially remain untouched while the widening to permit the exclusive turning lanes would occur on the west side. Although this functional design sketch illustrates impacts to the curbs, guardrails and bridges on the west side of Warden Avenue the impacts of the introduction of necessary exclusive turning lanes has been kept to a minimum on the east side.

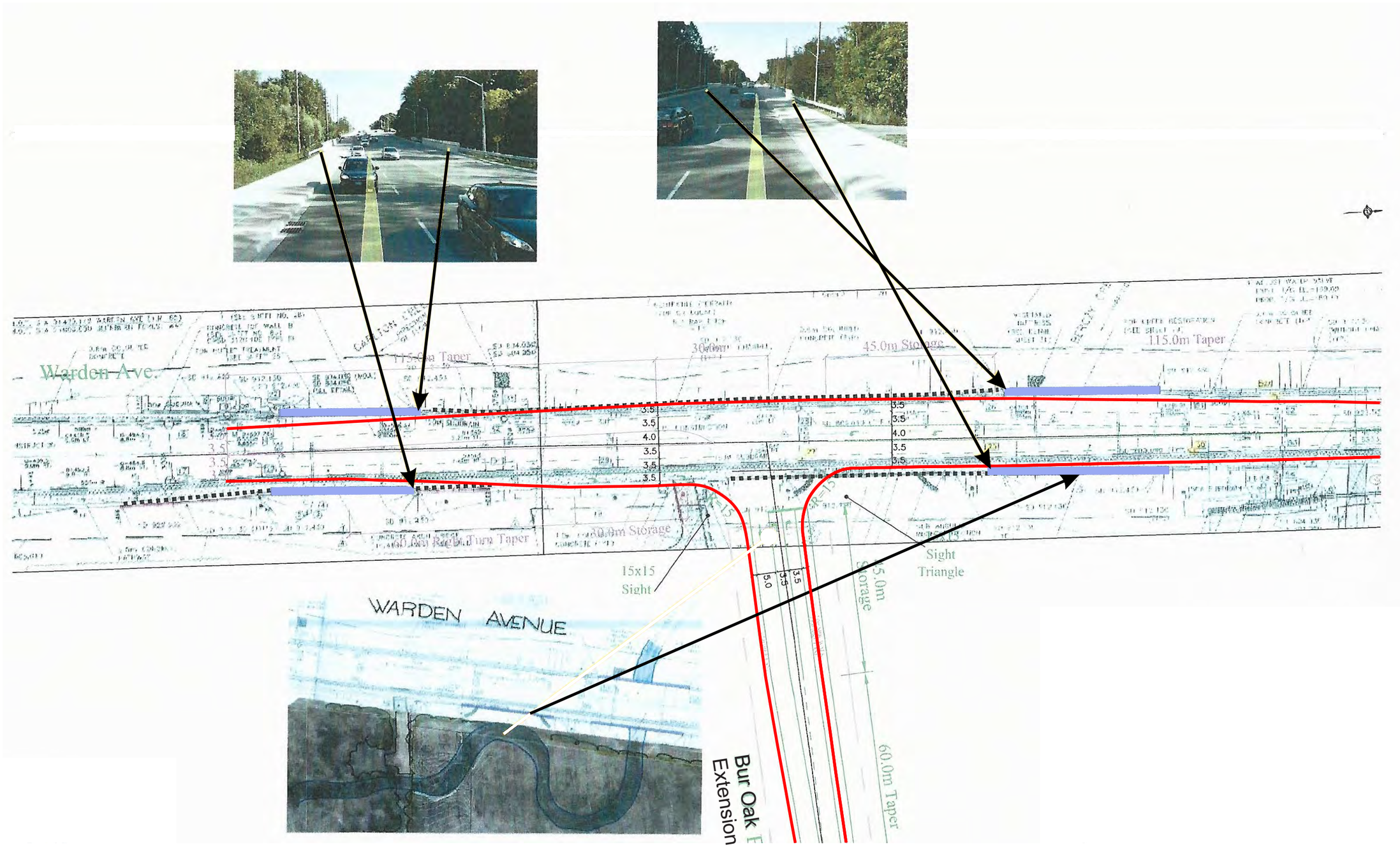


Legend:

- Bridge
- Guard Rail
- Proposed Curb Location

Option 1 - Widening On Both Sides of Warden Avenue

Figure 6



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Legend:

- Bridge
- Guard Rail
- Proposed Curb Location

Option 2 - Widening On West Sides of Warden Avenue

Figure 7

7. Conclusions

Poulos & Chung Limited has evaluated and compared the transportation aspects of a possible Warden Avenue connection. This technical analysis:

- Evaluated policies and guidelines which encourage maximum connectivity by assessing;
    - Transit route structure;
    - Active transportation desire lines.
- Evaluated vehicle flows by assessing:
    - Vehicle flow origins and direction of travel;
    - Intersection performance and;
    - Implications to critical directions of travel.

Reflecting upon the evaluations presented in this technical analysis, a series of conclusions stand out:

- A collector road connection to a bounding arterial road has merit, provides additional connectivity and options to serve directions of travel;
- A collector road connection to a bounding arterial road which can extend beyond the connection point (Warden Avenue) and connect to another arterial road (Woodbine Avenue) can provide significant operational benefit to the entire arterial road network;
- A collector road which simply connects to a bounding arterial road (Warden Avenue) with no potential to ever be extended provides additional connectivity and options to serve directions of travel but does not serve to improve or benefit the entire arterial road network.