R.V. Anderson Associates Limited
43 Church Street Suite 104
St. Catharines Ontario L2R 7E1 Canada
Tel 905 685 5049 Fax 855 833 4022
www.rvanderson.com

MEMORANDUM

TO: Matt Kernahan, Planner, Upper Canada Consultants **RVA:** 215652

FROM: Nick Palomba, Transportation Planner, R.V. Anderson Associates Ltd.

DATE: May 27, 2021

SUBJECT: Kunda Park / Forest Park Draft Plans – Subdivision Development
Transportation Review of Road Network Options and Active Transportation Facilities

BACKGROUND

As part of the ongoing development application process for the proposed Kunda Park and Forest Park residential subdivision developments in the Town of Pelham (Town), R.V. Anderson Associates Limited (RVA) has been retained to undertake a technical review and evaluation of three proposed road network options and their ability to meet the mobility needs of the area and provide a recommendation with justification for a preferred road network option. These options relate to how the two planned subdivisions can connect with the existing surrounding transportation network (road and trail) and provide connectivity for the various travel modes and other community services.

It is our understanding that initial iterations of the Kunda Park Draft Plan of Subdivision did not include any trail crossings over the Steve Bauer Trail. However, in consultation with Town staff, the provision of at least one trail crossing was considered necessary to maintain conformity with the East Fonthill Secondary Plan, as well as to address other planning considerations such as dispersing traffic, providing a connection between the Kunda Park Subdivision and East Fonthill, and optimize accessibility to the subdivision for emergency services. Upper Canada Consultants (UCC) submitted the Kunda Park Draft Plan of Subdivision application on behalf of Sterling Realty in May 2020, which included a proposed road network with two (2) proposed trail crossings, as per the request of Town staff. A motion passed by Council on January 11, 2021 prohibited the trail crossings, thus impelling UCC to investigate alternative road network layout options for the subject development and approaching RVA's traffic consultants for their assistance in developing a proposed plan to move forward.

This technical memorandum provides: a description of the proposed roadway network options; potential trail crossing or connection alternatives; an estimate of the anticipated traffic generation from the development; a comparative multi-criteria evaluation of the proposed road network options; and a summary of our findings from this review and our recommendation for the preferred road network connectivity option.

ROAD NETWORK OPTIONS

There are currently three (3) road network options being considered, shown in **Appendix A**, which provide various vehicular and active transportation connectivity options to both the internal and external transportation networks. The proposed Kunda Park residential subdivision is located on the west side of the Steve Bauer trail and will be an extension of the existing residential community connecting to both Stella Street and Kunda Park Boulevard. The proposed Forest Park residential subdivision is located to the east of the Steve Bauer Trail and is a new development with proposed connections to both Port Robinson Road via a Station Street southerly extension and to the future Saffron Meadows Phase 3 subdivision via several internal roadways. The Steve Bauer Trail intersects the overall development area in a north-south alignment with connection points at both Port Robinson Road and Merritt Road.

All three options considered include common transportation-related elements, most notably:

- Extension of Station Street south of Port Robinson Road east of the Steve Bauer Trail to the planned Walker Road;
- Planned future local road connections into the future Saffron Meadows Phase 3 residential development to the east; and
- A local road connection (Street A) to Stella Street to the west.

All of these proposed road connection points will provide vehicular and active transportation connections between the internal road network of the proposed development area and the existing surrounding road network.

Furthermore, the existing trail alignment between Port Robinson Road and Merritt Road is just over 1 kilometre in length with no intermediary access points. This long uninterrupted stretch of the trail system poses a safety concern with no accessible connections for trail users or emergency services personnel. All three of the proposed road network options

consist of a new access point along this segment of the trail system with varying degrees of functionality, accessibility, and safety, as described further below.

The primary distinguishing transportation-related elements of each option are as follows:

Option 1

- **Community Interconnection**: Interconnection of both subdivisions via an extension of William Street across the Steve Bauer Trail. The trail crossing is a proposed 8.5-metre-wide roadway with accommodation for all modes including boulevards, sidewalks, and street illumination.
- **PSW Impacts:** Kunda Park Boulevard is discontinuous at the Provincially Signification Wetland (PSW) located near the south end of the subdivision. No road extension is proposed through PSW areas.

Option 2

- **Community Interconnection**: Interconnection of both subdivisions does not exist for all modes. A paved 9-metre-wide emergency access connecting Station Street Road Extension to Street D in the Kunda Park Subdivision would be in place. The access would require paving of the trail at the crossing point for emergency vehicles. The emergency access would be gated at each end and would require emergency personnel to exit their vehicles and unlock the gate prior to proceeding. Pedestrians and cyclists could utilize the access for connectivity to the Steve Bauer Trail and the subdivisions. The access would be aligned with the proposed William Street and Station Street intersection and would not be illuminated.
- **PSW Impacts:** Kunda Park Boulevard is discontinuous at the PSW located near the south end of the subdivision. No road extension is proposed through PSW areas.

Option 3

- **Community Interconnection**: Interconnection of both subdivisions does not exist for all modes. A paved 3-metre-wide walkway connecting Station Street Road Extension to Street D in the Kunda Park Subdivision would be in place for use by pedestrians and cyclists. The walkway would be aligned with the proposed William Street and Station Street intersection and would not be illuminated.

- **PSW Impacts:** Kunda Park Boulevard would be extended southerly across the PSW area impacting the environment.

SUBDIVISON TRAFFIC GENERATION

The proposed overall residential development is planned to consist of:

Kunda Park

- 84 single-family detached dwelling units.

Forest Park

- 77 single-family detached dwelling units;
- 87 street townhome units; and
- 280 multi-family dwelling units.

Weekday a.m. and p.m. peak hour traffic generation from the proposed development was estimated utilizing the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 10th Edition.* The results of the traffic generation analysis are summarized in **Table 1**, with detailed traffic generation calculation sheets provided in **Appendix B**.

Table 1: Trip Generation Summary

Land Use	Unit Count	Weekday a.m. peak hour		Weekday p.m. peak hour	
		Total Trips	Trips In/Out	Total Trips	Trips In/Out
Kunda Park					
Single-Family Detached	84	64	16/48	86	54/32
Forest Park					
Single-Family Detached	77	59	14/45	79	50/29
Townhomes	87	42	10/32	52	33/19
Multi-Family	280	127	29/98	148	93/55
Forest Park Total	**-**	**228**	**53/175**	**279**	**176/103**
Site Total	-	292	69/223	365	230/135

As shown, the two subdivisions are estimated to generate a total of 69 inbound and 223 outbound additional trips during the a.m. peak hour, and 230 inbound and 135 outbound additional trips during the p.m. peak hour. Providing a direct connection to Port Robinson Road (via the Station Street extension) will be key in servicing the peak hour inbound and

outbound volumes and efficiently distributing these and future trips from the Saffron Meadows Phase 3 subdivision to the surrounding collector and arterial road network, avoiding out of way travel and minimize use of internal local roadways.

STATION STREET ALIGNMENT

As previously described, all three road network options include the proposed extension of Station Street south of Port Robinson Road, providing a road connection between the new residential communities and Port Robinson Road. There is a 20 metre road right-of-way to the east of the Steve Bauer Trail for this connection. If the entire roadway is maintained within this right-of-way the intersection at Port Robinson Road would result in an offset intersection configuration which is not desirable. The offset would not meet the intersection design guidelines from the industry-standard Transportation Association of Canada (TAC) Geometric Design Guide, requiring unconventional travel paths by vehicles travelling north-south along Station Street through the intersection, as well as operational concerns with left-turn movements at the intersection. Furthermore, from a safety standpoint, this configuration increases the likelihood of vehicle conflicts due to the conflicting travel paths, and also results in an unconventional crosswalk configuration with the potential for an increase in vehicle-pedestrian/cyclist conflicts.

Shifting the intersection of the proposed Station Street extension further east so as to result in a separate t-intersection independent of the existing Station Street t-intersection on Port Robinson Road has also been evaluated as an alternative option. As per the TAC Geometric Design Guide, the spacing between local-to-local intersections should be at least 40 metres to operate acceptably as successive t-intersections, with greater distances required along higher classification roadways as is the case here with Port Robinson Road being an arterial roadway. As per TAC, the typical minimum intersection spacing along arterial roadways is 200 metres, which is generally only applicable in areas of intense existing development or restrictive physical controls where feasible alternatives do not exist. Therefore, situating the Station Street extension further to east so as to result in two successive t-intersections would not meet the intersection design guidelines from the industry-standard TAC design guide, as achieving the recommended 200 metre separation between the two (2) t-intersections is not feasible.

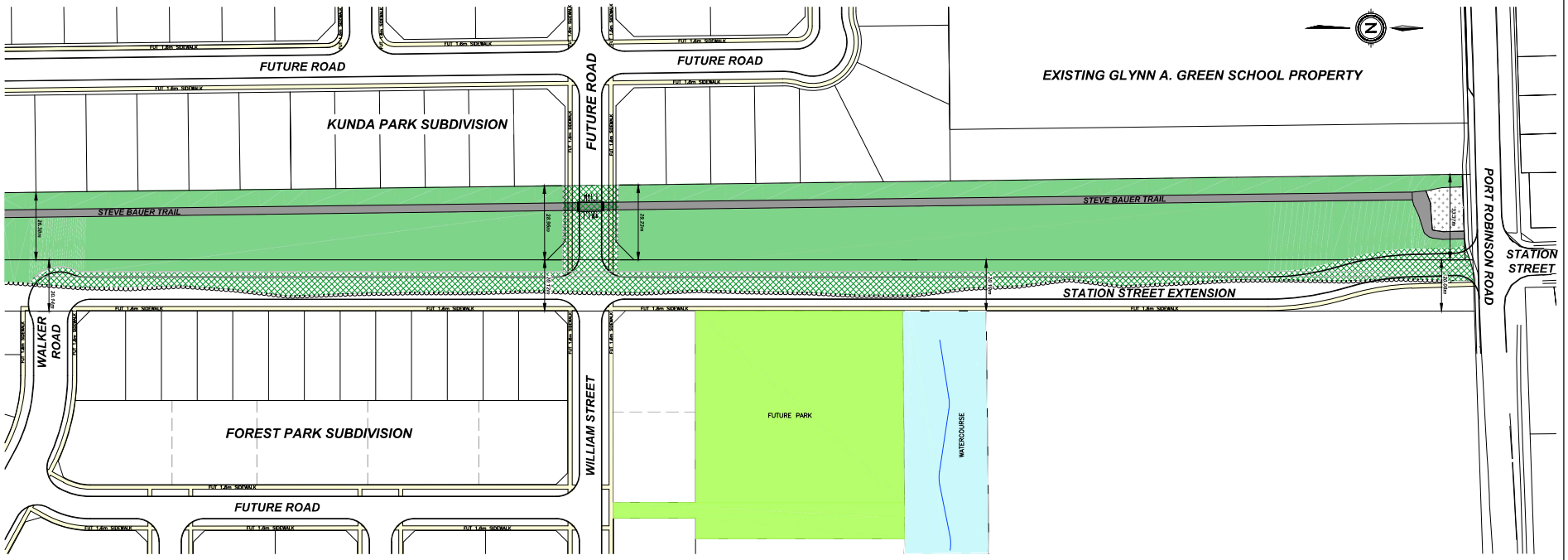
From a network connectivity standpoint, this road connection will serve as a key access point for vehicles accessing and egressing these future residential communities, with a substantial proportion of commuter traffic generated from these communities anticipated to be travelling to/from the north where higher-order transportation links are located (i.e.,

Highway 20). Therefore, requiring traffic volumes to make multiple turning movements between two (2) successive t-intersections along Port Robinson Road is not desirable from an operational standpoint for the intersections, or the Port Robinson corridor in general.

An alternate intersection configuration was developed in which the offset was eliminated by shifting the roadway to the west as it approaches Port Robinson Road using a centreline radius of 100 metres. The option aligns the south leg of the intersection with the north leg at Port Robinson Road. The resulting configuration creates a four-legged, all-way stop intersection, with painted crosswalks on all four approaches to accommodate pedestrians and cyclists including the trail users. This configuration, as illustrated in **Figure 1**, simplifies the intersection, and reduces the complexity of movements to be made by all modes. This proposed alignment and intersection location on Port Robinson Road is desirable from both operational and safety perspectives, for the reasons described below.

As described in this memorandum, there is notable estimated peak hour traffic generation related to these subdivisions with more to come online when the balance of the adjacent lands are developed, and with a substantial proportion of commuter traffic generated from these communities anticipated to be travelling to/from the north. Therefore, planning and maintaining an intersection configuration that operates efficiently at this location is critical to ensuring this “gateway” intersection, and the Port Robinson corridor in general, continue to operate efficiently and safely and can accommodate all travel modes.

As per the *Tree Loss Assessment* report prepared by Beacon Environmental, the proposed shift of the Station Street extension to the west (approximately 10 metres into the hedgerow) will not impact the wooded corridor associated with this section of the Steve Bauer Trail. Tree impacts at this location are limited to dead and dying Green Ash trees, twenty-three planted Spruce trees that are landscape cultivars, and one Manitoba Maple.



LEGEND

- AREA OF TREES TO BE REMOVED (2m BEHIND BACK OF CURB OR SIDEWALK)
- AREA OF TREES TO BE PRESERVED
- STEVE BAUER TRAIL
- FUTURE PARK (FOREST PARK SUBDIVISION)
- WATERCOURSE (FOREST PARK SUBDIVISION)
- FUTURE SIDEWALK

Figure 1: Proposed Station Street Alignment (Tree Loss Assessment, Beacon Environmental, 2021

Pelham NIAGARA

UNDER CANADA CONSULTANTS

FOREST PARK/KUNDA PARK
TOWN OF PELHAM

TREE PRESERVATION PLAN

CONSULTANT FILE No.	1995
DATE	2021-04-21
PRINTED	2021-04-21
SCALE	1:750 m
REF No.	
DWG No.	1995-TREE
REV	0

DRAWING FILE: P:\1995\Engineering\2021-NEW TRAIL CROSSING OPTIONS BASE\1995-FOREST KUNDA TRAIL PRESENTATION.dwg PLOTTED: Apr 21, 2021 - 3:48pm PLOTTED BY: TAllen

TRAIL CROSSING FACILITY DESIGN

The Option 1 roadway network includes a proposed trail crossing at the intersection of William Street and the Steve Bauer Trail. Based on trip generation calculations completed utilizing the ITE *Trip Generation Manual,* this future segment of William Street is estimated to service approximately up to 80 two-way vehicles during the weekday peak hour, which would occur during the afternoon. This section of William Street is planned to have a roadway width of approximately 8.5 metres, and an assumed maximum speed limit of 50 km/h.

As per the Ontario Traffic Manual (OTM) Book 15 (Pedestrian Crossing Treatments) Pedestrian Crossover Selection Matrix, based on the estimated peak volumes, 50 km/h posted speed limit, and roadway width (pedestrian crossing distance), this midblock crossing warrants a "Level 2 Type D" pedestrian crossover (PXO); a conceptual illustration of this PXO type from OTM Book 15 is shown in **Figure 2**. Key features of this crossing include side-mounted pedestrian cross-over signs, Ladder Crosswalk markings, Yield to Pedestrians line markings, and Advance Pedestrian Crossover Ahead signs and Lane Changing Prohibition signs in advance of the crossing. Based on project roadway volumes flashing beacons with pushbuttons are not warranted, however the Town may choose to add this feature for enhance visibility and clearer definition of who has right of way.

Figure 2: Level 2 Type D PXO (OTM Book 15)

As an added safety and speed control measure, there are several crossing treatments that can be considered at this location and it would be appropriate to discuss them with the Town of Pelham Engineering and Fire Department staff. These treatments consist of the use of a vertical deflection in the roadway, either at the PXO crossing or in advance of the PXO crossing. The options include the following:

1. A raised crosswalk or traffic table with a crosswalk, as illustrated in **Figure 3**. The crosswalk configuration of the pavement markings designates the accommodation of pedestrians and dismounted cyclists through the crossing facility. This raised traffic table feature will enhance active transportation safety by creating a traffic

calming feature through the vertical deflection of the roadway surface. It will also serve as an accessible design feature by raising the crossing surface, reducing the degree of vertical change for trail and other crossing users. The crossing design will be compliant with Accessibility for Ontarians with Disability Act (AODA) requirements (i.e., tactile walking surface indicators).

2. Speed humps or speed cushion in advance of the PXO. In these options the vertical deflection would occur in advance of the crossing locations to manage approaching vehicle speeds. These options have one key difference, the speed cushions would be designed to allow emergency vehicles to not be impacted by the vertical deflection, thus not affecting their response time to events. The spacing of these features along the short section of roadway will be discussed with the Town.

The typical geometric design of speed humps, speed cushions and speed tables is shown in **Appendix C**, taken from the TAC *Canadian Guide to Traffic Calming*.

Contained in each option would be advance signage along the trail to advise approaching trail users of the roadway crossing, to advise cyclists to dismount before crossing, and also the use of gate systems at each trail end to restrict unauthorized vehicles from entering the trail and also to further enforce the requirement for cyclists to dismount before entering the crossing. Also, the intersection of William Street and Street D and William Street and Station Street would be two-way stop controlled on William Street.

The location of the crossing will be aligned with the existing alignment of the Steve Bauer Trail, approximately 20 metres west of the Station Street extension intersection and approximately 43 metres east of the first local road intersection to the west. This mid-block crossing location is desirable from operational and safety standpoints, as it separates the crossing from the adjacent intersections so that vehicles turning out of those intersections (typically at low speeds) onto this segment of William Street will have clear visibility ahead to perceive, react, and yield to crossing pedestrians and dismounted cyclists.

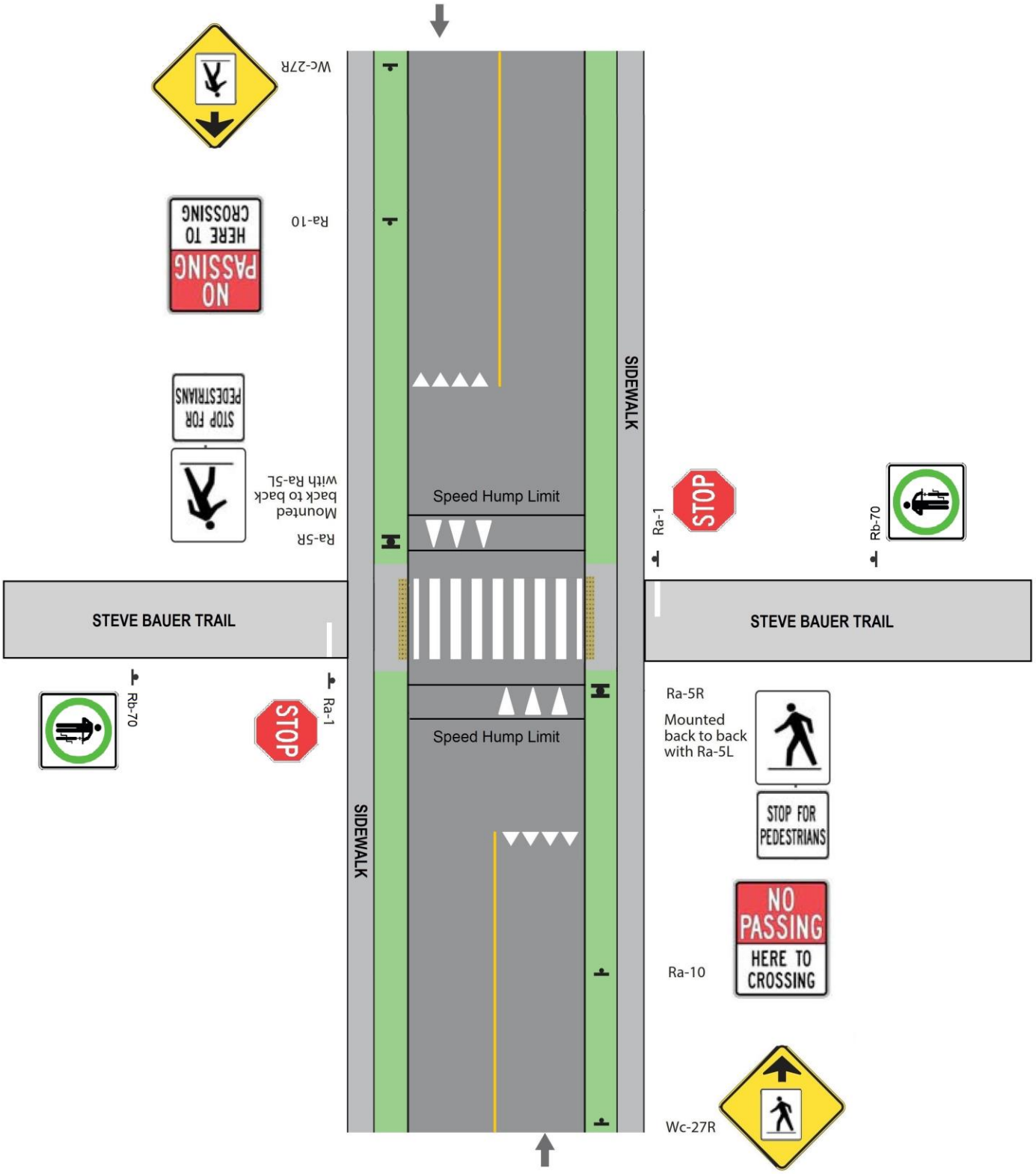


Figure 3: "Level 2 Type D" PXO with Raised Traffic Table

Note:
Additional signage and pavement marking on trail approaches can be considered.
PXO could be upgraded to include rapid flashing beacons with pushbuttons.

MULTI-CRITERIA EVALUATION

Utilizing transportation-related criteria, RVA has undertaken a multi-criteria evaluation to comparatively evaluate the road network options; the general evaluation criteria used in evaluating the road network options are outlined in **Table 2**.

Table 2: Evaluation Criteria

CRITERIA	DESCRIPTION
Traffic Operations	
Neighbourhood Connectivity	Number and accessibility of road network connections provided between the site and the external road network.
Emergency Medical Services (EMS) Access	Degree of accessibility for emergency vehicles to access the site from the external road network
Intersection Operations	Anticipated traffic operational impacts of the site generated traffic on surrounding intersections
Trail Operations and Safety	
Road/Trail Crossings	Number of road-trail crossing proposed
Trail Access	Degree of accessibility for trail users accessing the trail
Illumination	Level of additional trail illumination proposed
Natural Environment Impacts	
Vegetation Impacts	Variation in vegetation impacts (i.e., tree removals) between the options
PSW Impacts	Variation in PSW impacts between the options

The project team comparatively ranked each road network option, for each of the described criteria, to determine the preferred option; **Figure 4** demonstrates the rating scale used in the evaluation.

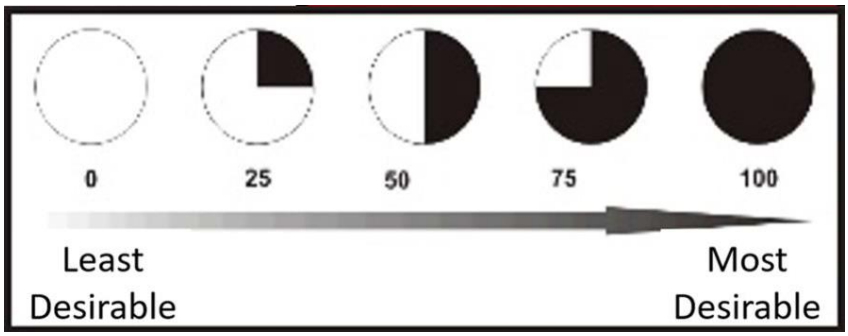


Figure 4: Alternative Solutions Ranking System

The completed multi-criteria evaluation table, with brief explanations justifying the assigned scores, is provided in **Appendix D**.

As shown in the evaluation table, **Option 1 is the preferred road network option**, for the following key distinguishing factors:

- **Traffic Operations:** This option maximizes road network connectivity and EMS accessibility with multiple road connection options provided and offers the best dispersion of traffic to the surrounding collector and arterial road network with the least anticipated impacts to intersection operations for all modes and services.
- **Trail Operations and Safety:** This option proposes a road-trail crossing that provides an additional access point for trail users via William Street, with additional illumination proposed at the subject crossing; and
- **Natural Environment:** The level of vegetation impacts associated with the proposed trail crossing is generally nominal as per the Beacon Environmental Tree Loss Assessment report, with no measurable difference in tree loss if an EMS access to the trail was proposed instead of the William Street crossing, and furthermore no PSW impacts are proposed.

SUMMARY OF FINDINGS

The findings of this transportation review are summarized as follows:

- Three (3) road network options are proposed, providing various vehicular and active transportation access points and internal road network layouts for the proposed Kunda Park and Forest Park communities;
- The overall site is estimated to generate a total of 69 inbound and 223 outbound additional trips during the a.m. peak hour, and 230 inbound and 135 outbound additional trips during the p.m. peak hour;
- Providing a direct connection to Port Robinson Road (via the Station Street extension), with a typically aligned intersection configuration at Port Robinson Road, will be key in servicing the peak hour inbound and outbound volumes while maintaining an acceptable level of service and safety for all modes;
- An alignment of the Station Street Extension offset from the existing Station Street north approach at Port Robinson Road does not meet TAC Design Guidelines,

would result in vehicle path conflicts, and increases the likelihood of vehicle-pedestrian/cyclist conflicts;

- The proposed trail crossing on William Street warrants a “Level 2 Type D” crossing as per the OTM Pedestrian Crossover Selection Matrix; and
- Based on a multi-criteria evaluation of the proposed road network options, Option 1 is the preferred option based on traffic operations, trail operations and safety, and natural environment impacts.

RECOMMENDATIONS

Based on the findings as detailed in this Transportation Review, the Option 1 road network layout is recommended for implementation, and the proposed trail crossing at William Street is recommended to be signed and marked as a “Level 2 Type D” crossing per OTM guidelines, with the crossing configured either as an at-grade PXO with speed humps in advance, or the PXO situated on a raised platform (speed table/crosswalk) to manage vehicular approach speeds. These should be discussed with Town Staff and Emergency Services staff to determine the preferred treatment.

CLOSING

Thank you for providing us with the opportunity to undertake this study. If there is any query related to this memorandum, please feel free to contact Nick Palomba at 905-685-5049 ext. 4204 or by email at NPalomba@rvanderson.com.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

Nick Palomba, P.Eng.
Vice-President
Manager of Transportation Planning

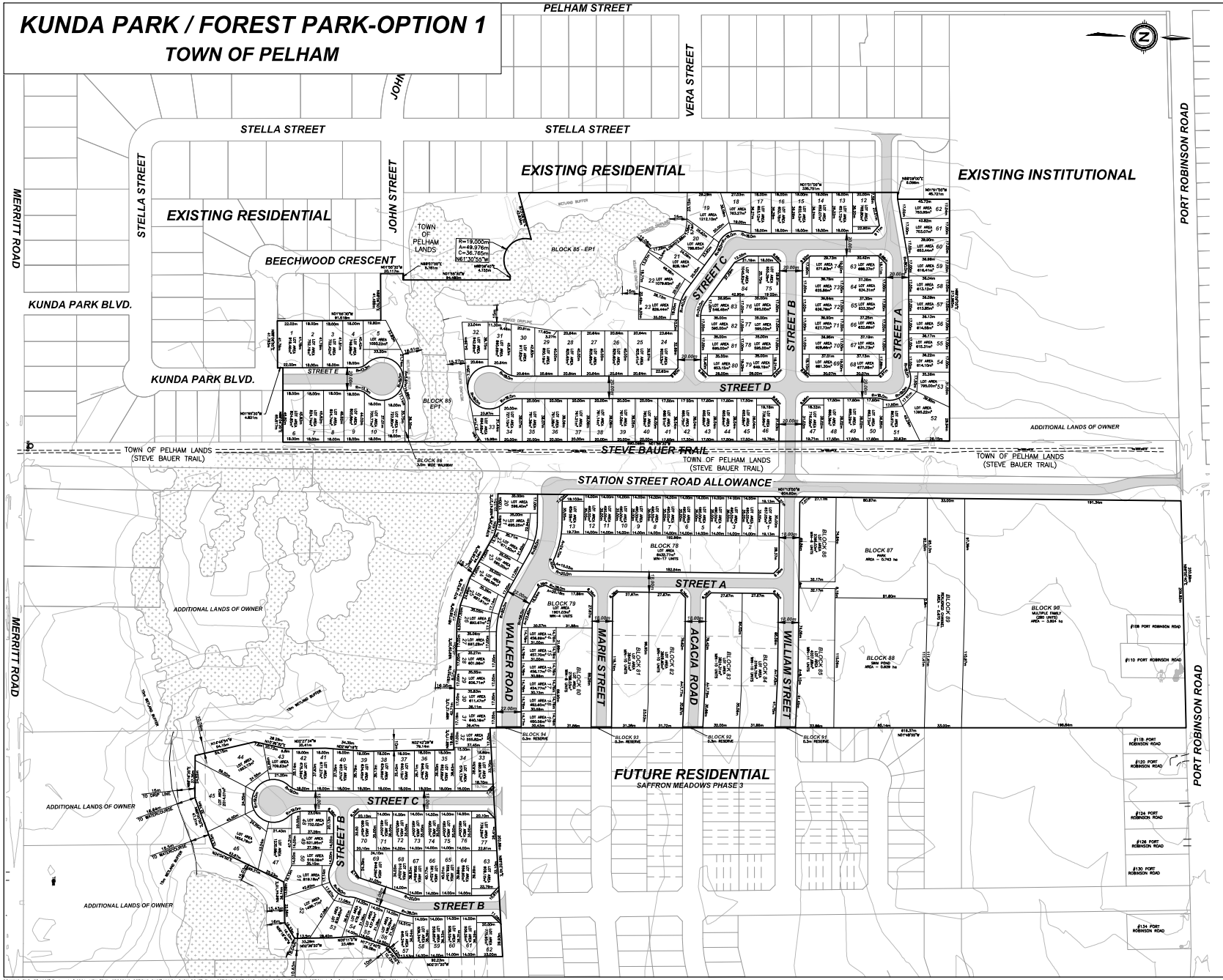
Adam Mildenberger, B.A., C.E.T.
Transportation Planner

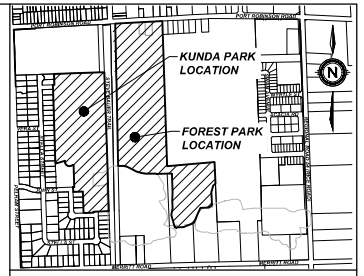
APPENDIX A

ROAD NETWORK OPTIONS

KUNDA PARK / FOREST PARK-OPTION 1

TOWN OF PELHAM





KEY PLAN
N.T.S.

DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION

PART OF LOT 172 & LOT 173
GEOGRAPHIC TOWNSHIP OF THOROLD
NOW IN THE TOWN OF PELHAM
REGIONAL MUNICIPALITY OF NIAGARA

OWNER'S CERTIFICATE

BEING THE REGISTERED OWNER, I HEREBY AUTHORIZE UPPER CANADA CONSULTANTS TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE TOWN OF PELHAM FOR APPROVAL.

JOHN DELISLE, STERLING REALTY (NIAGARA) INC. — JANUARY 6, 2020 DATE

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ARE CORRECTLY SHOWN.

KIRKUP-MASCOE-URE SURVEYING LTD. — FEBRUARY 18, 2020 DATE

REQUIREMENTS OF SECTION 51(17) OF THE PLANNING ACT

a) SEE PLAN	e) SEE PLAN	i) SILTY SAND
b) SEE PLAN	f) SEE PLAN	j) SEE PLAN
c) SEE PLAN	g) SEE PLAN	k) FULL SERVICE
d) SEE PLAN	h) MUNICIPAL WATER	l) SEE PLAN

LAND USE SCHEDULE - KUNDA PARK

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	1–84	84	6.216	55.98
ENVIRONMENTAL PROTECTION	BLOCK 85		2.629	23.68
3.0m WIDE WALKWAY	BLOCK 86		0.015	0.14
ROADWAY			2.244	20.21
TOTAL	86	84	11.104	100.00

DEVELOPABLE AREA = 8.475 ha
DEVELOPABLE DENSITY = 9.91 units/ha

LAND USE SCHEDULE

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	LOTS 1–77	77	4.764	27.97
STREET TOWN RESIDENTIAL	BLOCK 78–86	87	3.522	20.68
MULTIPLE FAMILY RESIDENTIAL	BLOCK 90	280	3.924	23.04
PARK	BLOCK 87		0.743	4.36
SWM POND	BLOCK 88		0.929	5.45
WATERCOURSE	BLOCK 89		0.670	3.93
0.3m RESERVE	BLOCK 91–94		0.002	0.01
ROADWAY			2.478	14.55
TOTAL	94	444	17.032	100.00

DEVELOPABLE AREA = 16.362ha (EXCLUDES WATERCOURSE)
DEVELOPABLE DENSITY = 27.14 units/ha

#	REVISION	DATE	INIT
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0	ISSUED FOR REVIEW	2021-02-23	MK

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

DRAWING TITLE	KUNDA PARK / FOREST PARK OVERALL DRAFT PLAN OF SUBDIVISION (OPTION 1)
DRAFTING	TA/MK
DATE	JANUARY 18, 2021
PRINTED	FEBRUARY 23, 2021
SCALE	1:1500
DWG No.	1995-OP1
REV	0

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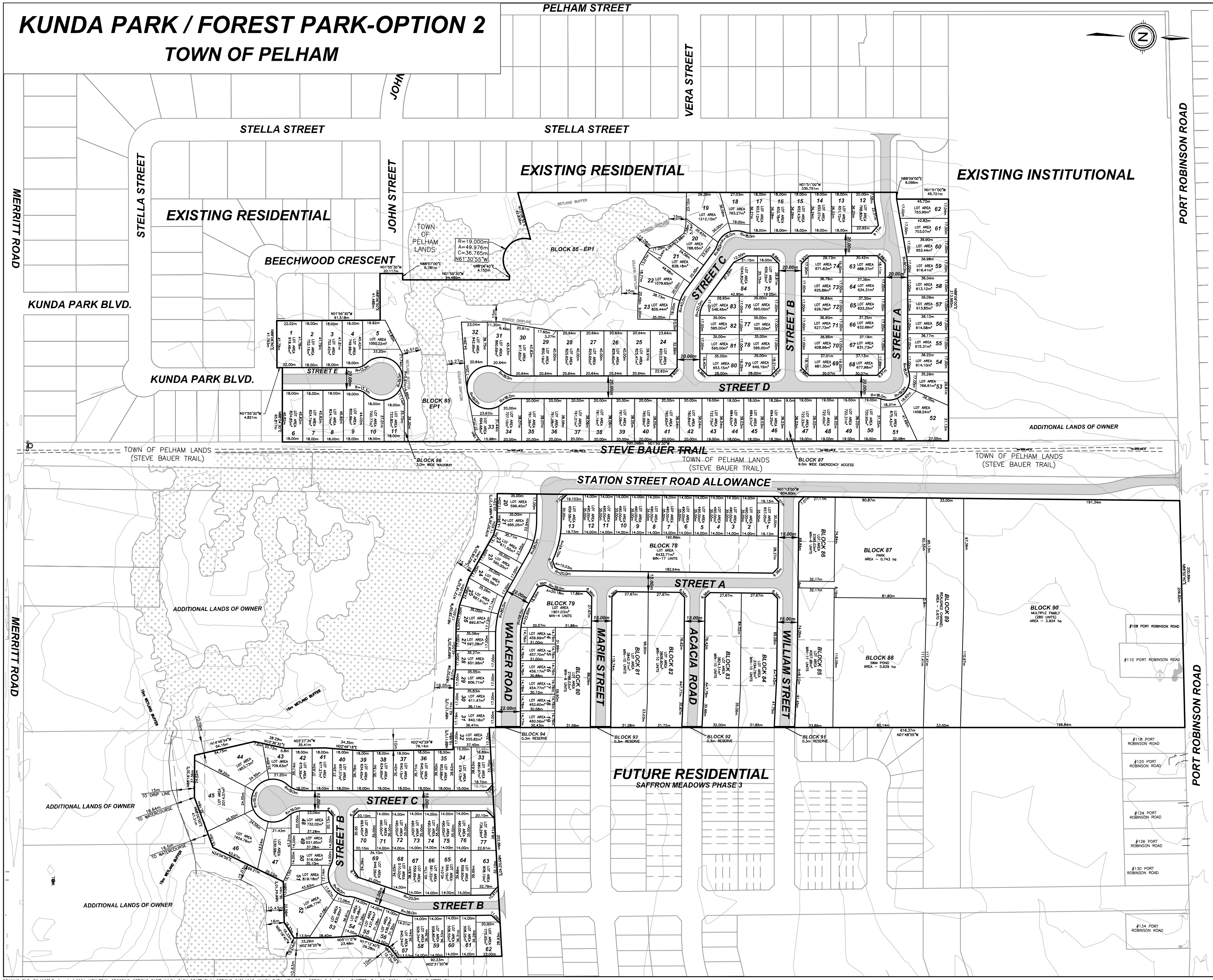
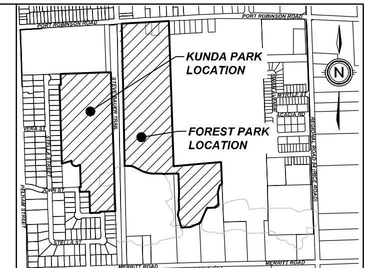
KUNDA PARK / FOREST PARK-OPTION 2

TOWN OF PELHAM





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9.0m WIDE EMERGENCY ACCESS	BLOCK 87		0.034	0.30
ROADWAY			2.163	19.48
TOTAL	87	84	11.104	100.00

DEVELOPABLE AREA = 8.475 ha
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ENGINEERS / PLANNERS

DRAWING TITLE	
KUNDA PARK / FOREST PARK OVERALL DRAFT PLAN OF SUBDIVISION (OPTION 2)	DRAFTING TA/MK
	DATE JANUARY 18, 2021
	PRINTED FEBRUARY 23, 2021
	SCALE 1:1500
	DWG No. 1995-OP2 — REV 0

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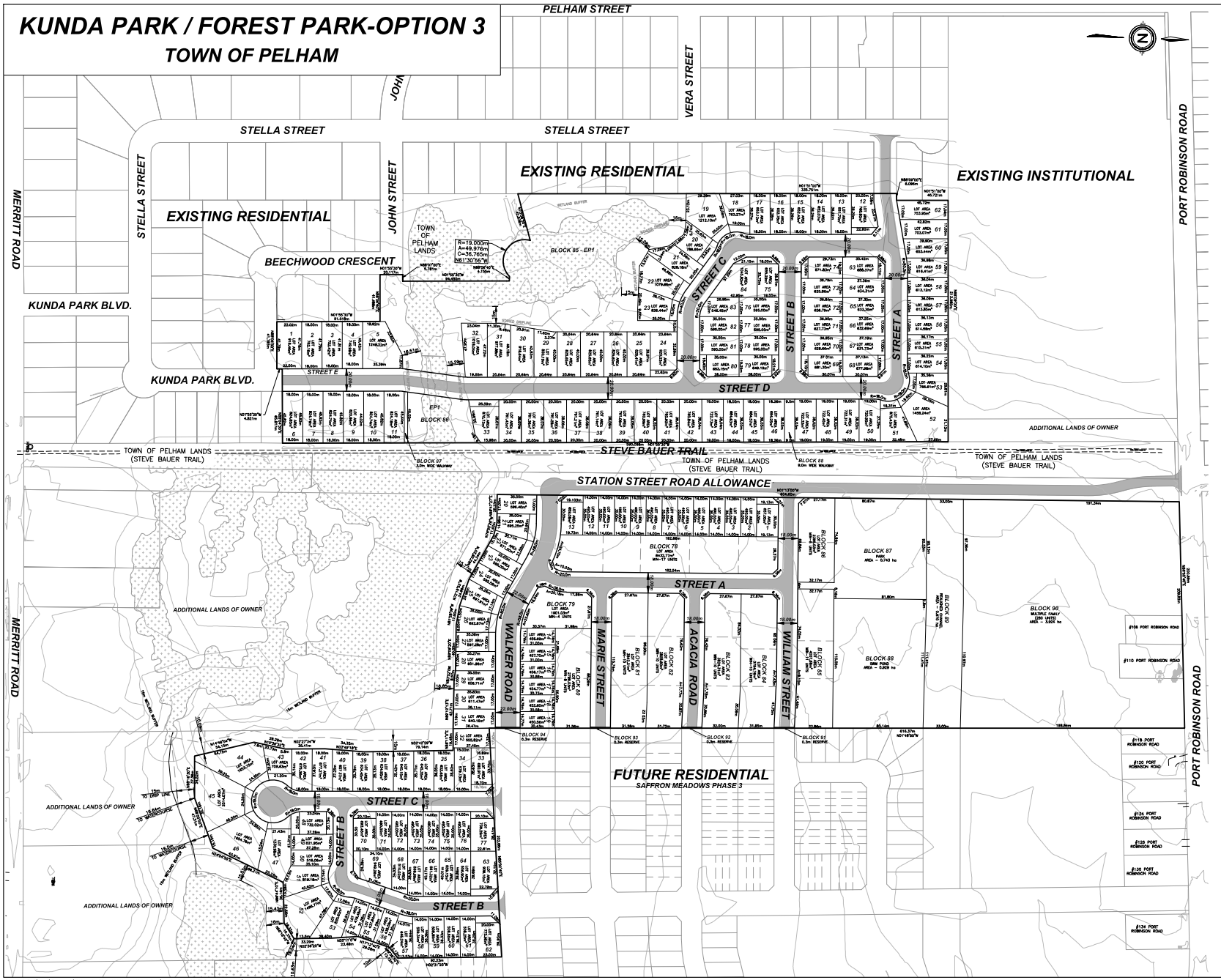
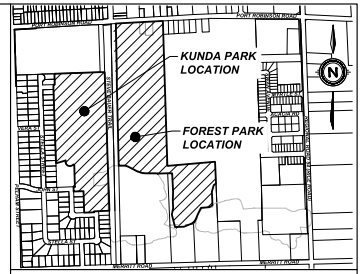
KUNDA PARK / FOREST PARK-OPTION 3

TOWN OF PELHAM





KEY PLAN
N.T.S.

DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION

PART OF LOT 172 & LOT 173
GEOGRAPHIC TOWNSHIP OF THOROLD
NOW IN THE TOWN OF PELHAM
REGIONAL MUNICIPALITY OF NIAGARA

OWNER'S CERTIFICATE

BEING THE REGISTERED OWNER, I HEREBY AUTHORIZE UPPER CANADA CONSULTANTS TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE TOWN OF PELHAM FOR APPROVAL.

JOHN CELSO, STERLING REALTY (NIAGARA) INC. — JANUARY 6, 2020 — DATE

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ARE CORRECTLY SHOWN.

William E. Heikoop — FEBRUARY 18, 2020 — DATE
KIRKUP-MASCOE-URE SURVEYING LTD.

REQUIREMENTS OF SECTION 51(17) OF THE PLANNING ACT

a) SEE PLAN	e) SEE PLAN	i) SILTY SAND
b) SEE PLAN	f) SEE PLAN	j) SEE PLAN
c) SEE PLAN	g) SEE PLAN	k) FULL SERVICE
d) SEE PLAN	h) MUNICIPAL WATER	l) SEE PLAN

LAND USE SCHEDULE - KUNDA PARK

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	1–84	84	6.349	57.18
ENVIRONMENTAL PROTECTION	BLOCK 85–86		2.512	22.62
3.0m WIDE WALKWAY	BLOCK 87		0.015	0.14
9.0m WIDE EMERGENCY ACCESS	BLOCK 88		0.034	0.30
ROADWAY			2.194	19.76
TOTAL	88	84	11.104	100.00

DEVELOPABLE AREA = 8.592ha
DEVELOPABLE DENSITY = 9.78 units/ha

LAND USE SCHEDULE

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
SINGLE FAMILY RESIDENTIAL	LOTS 1–77	77	4.764	27.97
STREET TOWN RESIDENTIAL	BLOCK 78–86	87	3.522	20.68
MULTIPLE FAMILY RESIDENTIAL	BLOCK 90	280	3.924	23.04
PARK	BLOCK 87		0.743	4.36
SWM POND	BLOCK 88		0.929	5.45
WATERCOURSE	BLOCK 89		0.670	3.93
0.3m RESERVE	BLOCK 91–94		0.002	0.01
ROADWAY			2.478	14.55
TOTAL	94	444	17.032	100.00

DEVELOPABLE AREA = 16.362ha (EXCLUDES WATERCOURSE)
DEVELOPABLE DENSITY = 27.14 units/ha

#	REVISION	DATE	INIT
.	.	.	.
.	.	.	.
0	ISSUED FOR REVIEW	2021-02-23	MK

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

DRAWING TITLE	KUNDA PARK / FOREST PARK OVERALL DRAFT PLAN OF SUBDIVISION (OPTION 3)
DRAFTING	TA/MK
DATE	JANUARY 18, 2021
PRINTED	APRIL 1, 2021
SCALE	1:1500
DWG No.	1995-OP3
REV	0

DRAWING FILE: P:\1995\Engineering\2021-NEW TRAIL CROSSING OPTIONS BASE\KUNDA PARK DRAFT PLAN OPTIONS CAD\1995-KUNDA PARK NEW DP - OPTION 3 (new).dwg PLOTTED: Apr 01, 2021 - 10:58am PLOTTED BY: mark

APPENDIX B

TRAFFIC GENERATION CALCULATION SHEETS

OPTION 1

Kunda Park (Top Side) Cul-De-Sac

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	11	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	13	12	3/10	7/5

Kunda Park (Top Side) Right Side

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	73	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	57	75	14/43	47/28

Forest Park (Bottom Side)

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	77	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	59	79	14/45	50/29
Multifamily Housing (Low Rise) LUC (220)	87	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	42	52	10/32	33/19
Multifamily Housing (Low Rise) (Block 90) LUC (220)	280	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	127	148	29/98	93/55
Total (Bottom Side)				**228**	**279**	**53/175**	**176/103**

OPTION 2

Kunda Park (Top Side) Cul-De-Sac

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	11	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	13	12	3/10	7/5

Kunda Park (Top Side) Right Side

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	73	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	57	75	14/43	47/28

Forest Park (Bottom Side)

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	77	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	59	79	14/45	50/29
Multifamily Housing (Low Rise) LUC (220)	87	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	42	52	10/32	33/19
Multifamily Housing (Low Rise) (Block 90) LUC (220)	280	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	127	148	29/98	93/55
Total (Bottom Side)				**228**	**279**	**53/175**	**176/103**

OPTION 3

Kunda Park (Top Side)

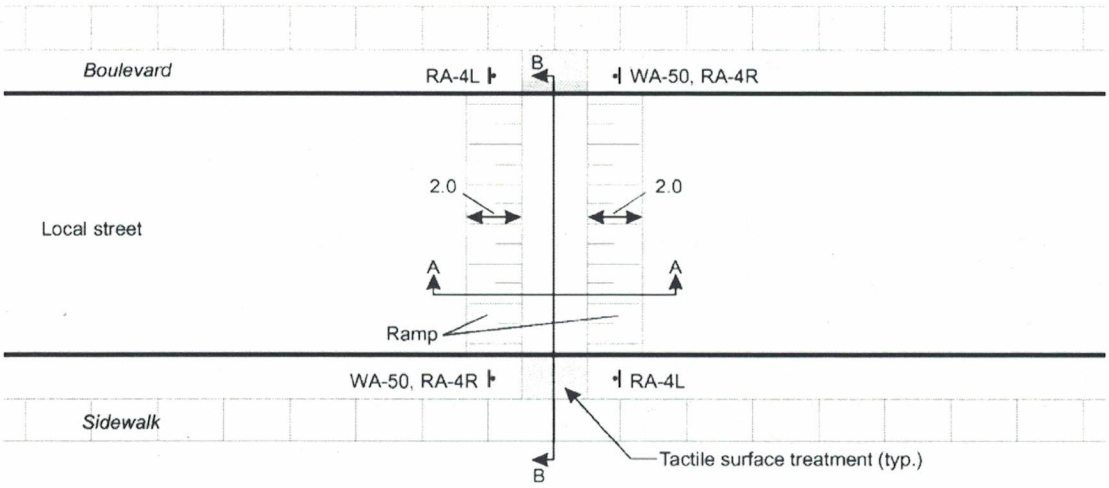
Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	84	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	64	86	16/48	54/32

Forest Park (Bottom Side)

Land Use	Unit Count	Equation		Total Trips		Inbound/Outbound	
		AM	PM	AM	PM	AM	PM
Single Family Detached LUC (210)	77	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	59	79	14/45	50/29
Multifamily Housing (Low Rise) LUC (220)	87	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	42	52	10/32	33/19
Multifamily Housing (Low Rise) (Block 90) LUC (220)	280	T = 0.71(X) + 4.80	Ln(T) = 0.96 Ln(X) + 0.20	127	148	29/98	93/55
Total (Bottom Side)				**228**	**279**	**53/175**	**176/103**

APPENDIX C

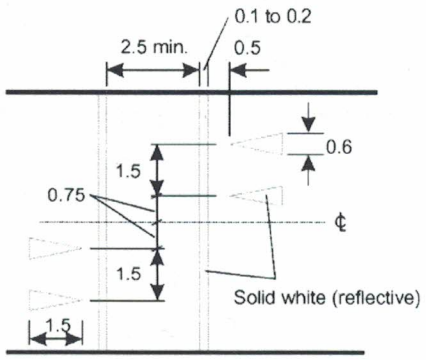
TRANSPORTATION ASSOCIATION OF CANADA MANUAL EXCERPTS



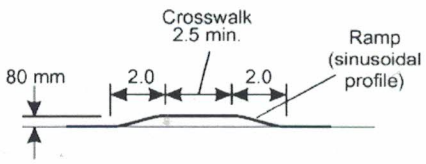
Sign Descriptions:

RA-4 Pedestrian Crosswalk
WA-50 Speed Hump

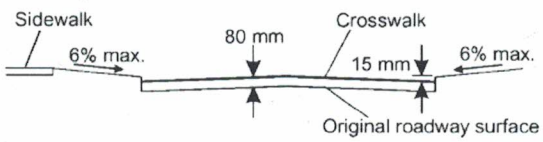
- Catch basins are required on the uphill side of a raised crosswalk.
- To satisfy the recommended curb-face height of 15 mm may require sidewalk reconstruction adjacent to the curb.



Pavement Markings
(two-way street)



Section A-A



Section B-B

Ramp Height Development

Crosswalk profile parallel to roadway surface.

Distance (m)	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500	1.625	1.750	1.875	2.000
Finished Height (mm)	0	1	3	7	12	18	25	32	40	48	55	62	68	73	77	79	80

All dimensions are in metres unless otherwise noted.

NOT TO SCALE

FIGURE 4.1 – MIDBLOCK RAISED CROSSWALK

4.2.4 SPEED HUMP / TABLE

A speed hump/table is intended to produce sufficient discomfort to limit travel speeds yet allow the driver to maintain vehicle control. Its design is intended to limit effects on emergency, maintenance and transit vehicles while allowing cyclists to comfortably cross the speed hump.

A. Geometric Requirements

Speed humps and speed tables described in Section 3.2.4 have similar configurations except that the latter has a flat top section 3.0 m long by 80 mm high between the two halves of the local street hump which is more suitable for roadways with higher design speeds. This difference recognizes the likelihood of transit and emergency routes being located on the collector streets. Section A-A in Figure 4.6 shows this difference. Note that motor vehicles may try use bicycle lanes to reduce deflection. Consideration should be given for maintaining the speed hump/table across the width of the bicycle lane or a physical separation (median, delineator posts) could be provided to 'protect' the bicycle lane from motorists trying to avoid the hump.

The vertical transition required at each end of a retrofit speed hump should be keyed into the existing pavement. This will produce a structure which is more securely bonded to the existing pavement than a "feather edged" installation. Such an installation should minimize damage to, and by, snow plowing equipment.

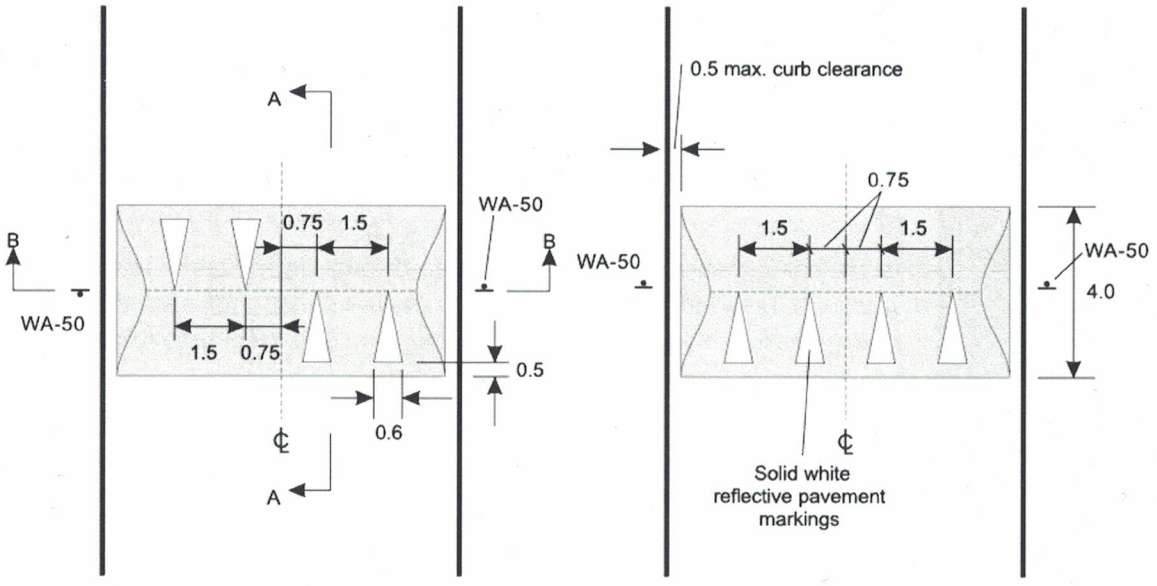
The dimensions and profile (sinusoidal) of the ramp as shown, are the most compatible with roadway maintenance, emergency vehicle travel and general driveability requirements. It is recognized that while current construction techniques may make achievement of this profile difficult, best attempts should be made to build within a typically acceptable construction variation tolerance of ± 3 mm.

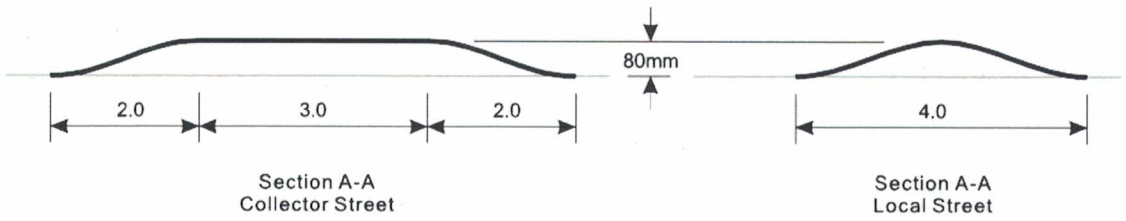
In order to retain slower vehicle speeds over longer distance, a series of speed humps/tables is required. A spacing of 80 m to 150 m is recommended to maintain an 85th percentile operating speed between 40 and 48 km/h.

B. Signing and Pavement Marking Requirements

A Speed Hump sign (WA-50) should be installed facing traffic and immediately adjacent to the speed hump. If a speed hump is installed on a one-way street, Speed Hump signs should be installed on both sides of the street facing traffic. The recommended design for pavement markings is shown on Figure 4.6. Advance pavement markings may also be provided to improve conspicuity of the speed hump/table, as illustrated in Figure 4.7. If required due to sign visibility, speed hump/table visibility or other factors, Speed Hump warning signs with distance tabs may be considered for placement in advance of the speed hump/table. The specific design of the triangular pavement markings should be noted, as these may appear to be similar to the Advance Yield to Pedestrians Line[18] used in advance of pedestrian crossings, but have different size, spacing and triangle orientation.

[18] Transportation Association of Canada, *Pedestrian Crossing Control Guide*, 2012, p. S2-43



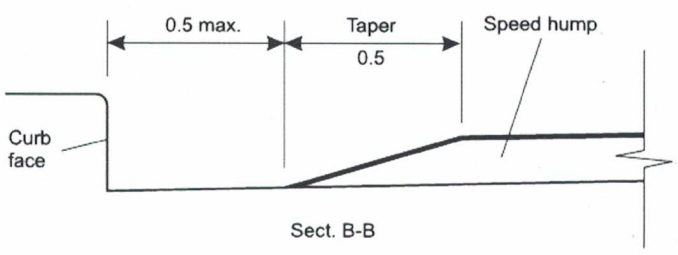


Sinusoidal Speed Hump Development

Distance (m)	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500	1.625	1.750	1.875	2.000
Finished Height (mm)	0	1	3	7	12	18	25	32	40	48	55	62	68	73	77	79	80

Sign Descriptions:

WA-50 Speed Hump



All dimensions are in metres unless otherwise noted.

NOT TO SCALE

FIGURE 4.6 – SPEED HUMP

4.2.3 SPEED CUSHION

Speed cushions are intended to produce sufficient discomfort to limit passenger vehicle travel speeds yet allow the driver to maintain vehicle control, while allowing larger vehicles such as transit vehicles and emergency vehicles to pass without difficulty, by straddling the raised elements of the speed cushion.

A. Geometric Requirements

All sides of the cushions shall be ramped to allow drainage. All edges of the ramps should be formed and keyed into the existing asphalt to provide adequate drainage and a continuous road surface.

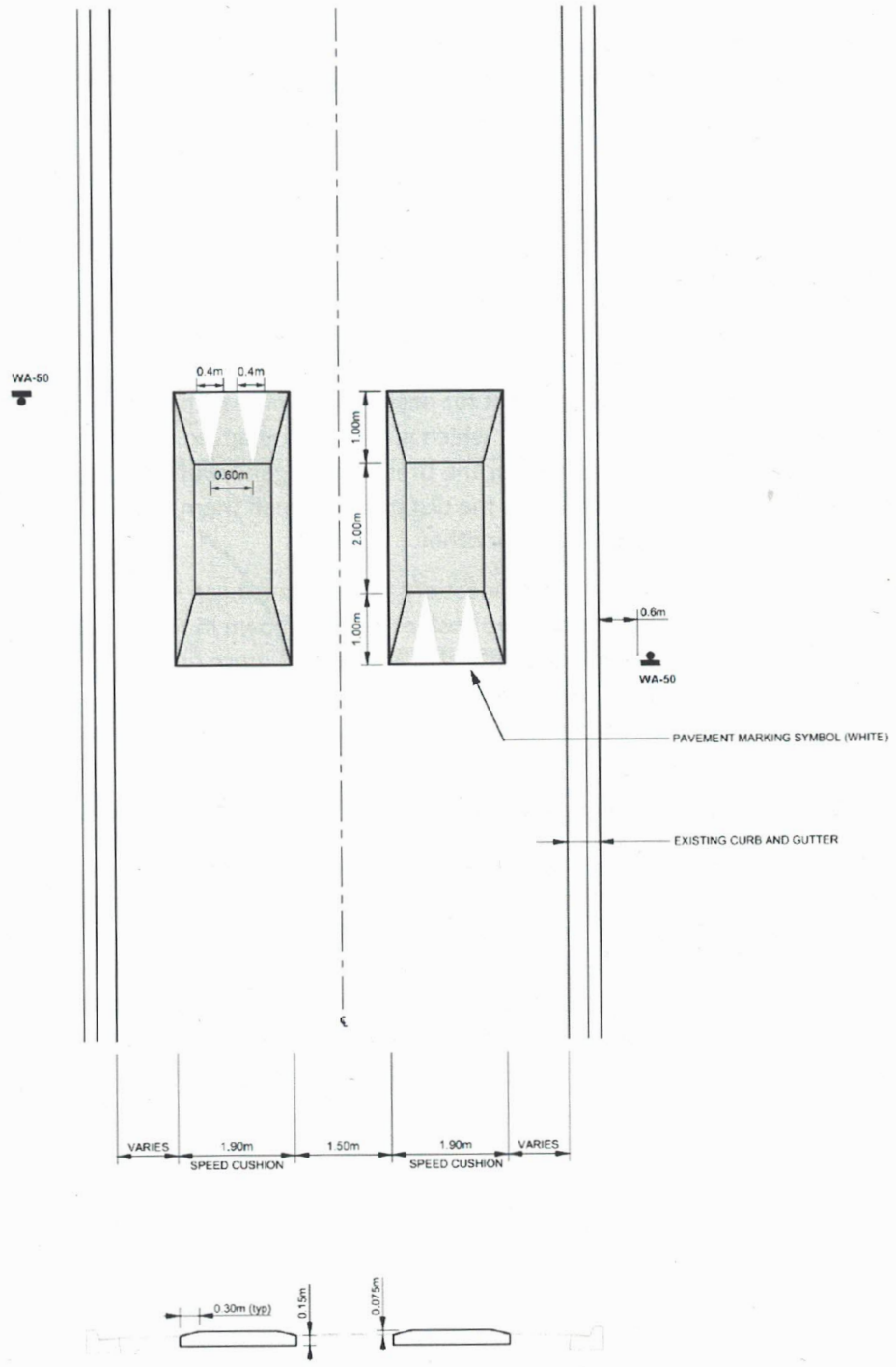
Typically one speed cushion is installed per travelled lane. The optimal width for speed cushions is approximately 1.8 m, which is narrow enough to allow emergency vehicles to pass unaffected but wide enough to maintain the desired slowing effect for passenger vehicles. The space between the cushions and the curb should be approximately 0.6 m, which is narrow enough so that drivers cannot avoid the cushions but wide enough for bicycles and for the tires of emergency vehicles to pass. If only two cushions are installed, one in each direction, the distance between them must be at least 1.50 m so that heavy vehicles do not pass too close to one another.

For streets that are not transit routes, or for locations where transit can safety and legally drive over the centre line for short periods of time, the three cushion design shown in Figure 4.5, may be an option. The advantage is that it forces passenger cars and light trucks to more typically drive over the cushions with both sets of tires, while drivers may be able to avoid the cushions with one side of the vehicle in the standard design. The three hump design requires transit and emergency vehicles to cross the centre line, so the specific site conditions, such as visibility, as well as rules of the road should be considered.

B. Signing and Pavement Marking Requirements

A Speed Hump sign (WA-50) should be installed facing traffic and immediately adjacent to the speed cushion. If required due to sign visibility, speed cushion visibility or other factors, Speed Hump warning signs with distance tabs may be considered for placement in advance of the speed cushion. If a speed cushion is installed on a one-way street, Speed Hump signs should be installed on both sides of the street facing traffic. The recommended design for pavement markings is shown on Figures 4.4 and 4.5. The specific design of the triangular pavement markings should be noted, as these may appear to be similar to the Advance Yield to Pedestrians Line[17] used in advance of pedestrian crossings, but have different size, spacing and triangle orientation.

[17] Transportation Association of Canada, *Pedestrian Crossing Control Guide*, 2012, p. S2-43



All dimensions are in metres unless otherwise noted.

NOT TO SCALE

FIGURE 4.4 – SPEED CUSHION

APPENDIX D

MULTI-CRITERIA EVALUATION TABLES

MULTI-CRITERIA EVALUATION TABLE
Kunda Park / Forest Park Draft Plans - Subdivision Development
Transportation Review of Road Network Options and Active Transportation Facilities

EVALUATION CRITERIA	Option 1 (1 Road Connection to Station Street, with Road Crossing Trail; No Road Extension Through PSW)		Option 2 (No Road Connection to Station Street, EMS Access Crossing Trail; No Road Extension Through PSW)		Option 3 (No Road Connection to Station Street, with Walkway Crossing Trail; Road Extension Through PSW)	
MOBILITY	●	Maximizes road network connectivity and EMS accessibility with local road connection across Steve Bauer Trail, connecting Kunda and Forest Park neighbourhoods. Offers the best dispersion of traffic to surrounding intersections with maximum available access points between the neighbourhood and the external road network.	◑	Steve Bauer Trail divides the neighbourhood, with no direct auto connection between the Kunda and Forest neighbourhoods. Pedestrian and cyclists connectivity to be maintained through EMS dedicated access. EMS response time to be reduced due to required stopping/unlocking of access gates, as well as efficiency of other transportation-related services (i.e., waste collection, school buses, etc.) between the neighbourhoods.	◑	Steve Bauer Trail divides the neighbourhood, with no direct auto connection between the Kunda and Forest neighbourhoods. Pedestrian and cyclists connectivity to be maintained through walkway. EMS response time to be reduced due to no direct connection between Kunda and Forest Park neighbourhoods, as well as efficiency of other transportation-related services (i.e., waste collection, school buses, etc.) between the neighbourhoods. Proposed road connection through the PSW to the south of the Kunda Park neighbourhood to provide limited improvement to overall traffic operations.
Neighbourhood Connectivity	4	• Road connection provided across Steve Bauer Trail, connecting the Kunda and Forest Park neighbourhoods. • Road connections provided to Port Robinson Road to the north via Station Street, to the east through adjacent future residential development, and to the west to Pelham Street. • No direct road connection through the PSW to the south to Merritt Road, requiring use of Stella Street to divert around the PSW. • Sidewalk provided on all proposed local roads for pedestrians, and cyclists to utilize roadway with auto traffic. • Optimal connectivity and access for school buses, future transit/uber, waste collection, snow plow operations, and other transportation-based services.	2	• Road connection **not** provided across Steve Bauer Trail, with no direct road connection between the Kunda and Forest Park neighbourhoods. • Pedestrian/cyclist accommodation between the Kunda and Forest Park neighbourhoods provided across Steve Bauer Trail via gated emergency access. • Road connections for Forest Park provided to Port Robinson Road to the north via Station Street, and to the east through adjacent future residential development, with no direct connection to the south to Merritt Road. • Road connections for Kunda Park provided to the west to Pelham Street through existing local streets, with no direct connection to the north to Port Robinson Road. • No direct road connection through the PSW to the south to Merritt Road from Kunda Park, requiring use of Stella Street to divert around the PSW. • Sidewalk provided on all proposed local roads for pedestrians, and cyclists to utilize roadway with auto traffic. • Discontinuous access for school buses, future transit/uber, waste collection, snow plow operations, and other transportation-based services between residential communities.	2	• Road connection **not** provided through Steve Bauer Trail, with no direct road connection between the Kunda and Forest Park neighbourhoods. • Pedestrian/cyclist accommodation between the Kunda and Forest Park neighbourhoods provided across Steve Bauer Trail via walkway. • Road connections for Forest Park provided to Port Robinson Road to the north via Station Street, and to the east through adjacent future residential development. • Road connections for Kunda Park provided to the west to Pelham Street through existing local streets, and to the south to Merritt Road through new crossing of the PSW, with no direct connection to the north to Port Robinson Road. • Sidewalk provided on all proposed local roads for pedestrians, and cyclists to utilize roadway with auto traffic. • Discontinuous access and access for school buses, future transit/uber, waste collection, snow plow operations, and other transportation-based services between residential communities.
Emergency Medical Services (EMS) Access	4	• Optimal network connectivity and accessibility for EMS vehicles. • Local road connection across the Steve Bauer Trail between the Kunda and Forest Park neighbourhoods, minimizing EMS response times. • No dedicated EMS (Gated) accesses required.	2	• Gated EMS dedicated access proposed across Steve Bauer Trail, providing an EMS dedicated connection between the Kunda and Forest Parking neighbourhoods. • EMS access requires reconstruction of trail surface for heavy vehicle usage at crossing location. • Negative impact to EMS response times due to required stopping and unlocking of access gates by EMS personnel.	3	• Connection through PSW to the south provides additional access point for Kunda park Subdivision for EMS vehicles. • No EMS connection provided between Kunda and Forest Park neighbourhoods.
Intersection Operations	3	• The connectivity between Kunda and Forest Park neighbourhoods and with the external road network results in reduced out of way travel and the greatest level of connectivity with surrounding intersections. • Local road connection across Steve Bauer Trail (William Street) will include stop controls at its intersections both east and west of the trail crossing.	2	• With no road connection between the Kunda and Forest Park neighbourhoods, there will be an increase in out of way travel and greater reliance (traffic volumes) on the intersection of Vera Street at Pelham Street for vehicles accessing/egressing the Kunda Park neighbourhood. • No road connection for Kunda Park to Station Street.	2	• With no road connection between the Kunda and Forest Park neighbourhoods, there will be an increase in out of way travel and greater reliance (traffic volumes) on the intersection of Vera Street at Pelham Street for vehicles accessing/egressing the Kunda Park neighbourhood. • No road connection for Kunda Park to Station Street.
Category Score	**92%**		**50%**		**58%**	

MULTI-CRITERIA EVALUATION TABLE
Kunda Park / Forest Park Draft Plans - Subdivision Development
Transportation Review of Road Network Options and Active Transportation Facilities

EVALUATION CRITERIA	Option 1 (1 Road Connection to Station Street, with Road Crossing Trail; No Road Extension Through PSW)		Option 2 (No Road Connection to Station Street, EMS Access Crossing Trail; No Road Extension Through PSW)		Option 3 (No Road Connection to Station Street, with Walkway Crossing Trail; Road Extension Through PSW)	
TRAIL OPERATIONS AND SAFETY		One (1) new road-trail crossing proposed resulting in a new conflict location, but with improved trail accessibility and illumination with proposed design features for the crossing to maintain an acceptable level of safety at the crossing and ensure AODA compliance.		Proposed EMS dedicated access across the trail to reduce conflict points and provide an additional access point to the trail, but without winter maintenance (not fully AODA compliant) and illumination, and not benefiting from the personal safety and security enhancements associated with a road-trail crossing.		Proposed walkway across the trail to reduce conflict points and provide an additional access point to the trail, but without winter maintenance (not fully AODA compliant) and illumination, and not benefiting from the personal safety and security enhancements associated with a road-trail crossing.
Road/Trail Crossings	2	• One (1) proposed local road crossing (William Street) of the Steve Bauer Trail. • Crossing introduces new point of interaction between vehicles, pedestrians, and cyclists. • Crossing to include raised speed table and curb extensions for speed control, with supporting Pedestrian Crossover (PXO) signage and pavement markings per applicable Ontario Traffic Manual (OTM) guidelines and in accordance with Highway Traffic Act (HTA). • Trail approaches at crossing to include gates and supporting signage to facilitate safe crossing practices by cyclists.	3	• No local road crossing at the Steve Bauer Trail proposed. • New interaction point between trail users and emergency vehicles. • Crossing of trail by EMS vehicles will be infrequent and unexpected by trail users. • Trail crossing area for EMS dedicated access to be supported by reconstruction surface, with warning signage and gates to inform trail users of potential EMS vehicle crossing.	4	• No local road crossing at the Steve Bauer Trail proposed, with proposed walkway connection accommodating only pedestrians and cyclists.
Trail Access	4	• Road-trail crossing provides an additional trail user access point via sidewalks on both sides of William Street from each subdivision. • Winter maintenance of road/sidewalks will be provided by Town. • Trail crossing design to be AODA compliant (Accessibility for Ontarians with Disabilities Act)	2	• EMS dedicated access provides an additional trail user access point. • Trail will be reconstructed at crossing to accommodate heavy vehicles, with supporting warning signage, gates, etc. to inform trail users of potential EMS vehicle crossing. • Winter maintenance is not regularly provided for the gated EMS access. This will limit its use and AODA compliance.	3	• Proposed walkway provides an additional trail user access point for both pedestrians and cyclists. • Winter maintenance is not regularly provided for the gated EMS access. This will limit its use and AODA compliance.
Illumination	4	• Illumination to be provided along William Street to RP-8 standards including at road-trail crossing. • Crossing location provides an opening (break) in the trail network , the access will be illuminated and not isolated improving personal safety and security.	1	• There is no planned illumination of the EMS dedicated access across the trail. The access is adjacent to private homes and illumination along the access would result in light intrusion into private backyards.	1	• There is no planned illumination of the walkway across the trail. The walkway is adjacent to private homes and illumination along the walkway would result in light intrusion into private backyards.
ROW SCORE (Average)	**83%**		**50%**		**67%**	
NATURAL ENVIRONMENT		Limited vegetation impacts at the proposed local road crossing at the Steve Bauer Trail, and at the Station Street extension south of Port Robinson Road, with no PSW impacts.		Limited vegetation impacts at the proposed EMS dedicated access across the Steve Bauer Trail, and at the Station Street extension south of Port Robinson Road, with no PSW impacts.		Limited vegetation impacts at the proposed walkway across the Steve Bauer Trail, and at the Station Street extension south of Port Robinson Road, but with proposed local road extension through PSW lands to the south.
Vegetation Impacts	3	• Vegetation impacts at the location of the proposed local road crossing at the Steve Bauer Trail results in the removal of approximately 34 trees. • Vegetation impacts at the location of the proposed extension of Station Street south of Port Robinson Road are considered limited and will not impact the natural wooded corridor associated with the Steve Bauer Trail.	3	• Vegetation impacts at the location of the proposed EMS dedicated access across the Steve Bauer Trail results in the removal of approximately 34 trees. • Vegetation impacts at the location of the proposed extension of Station Street south of Port Robinson Road are considered limited and will not impact the natural wooded corridor associated with the Steve Bauer Trail.	3	• Vegetation impacts at the location of the proposed walkway across the Steve Bauer Trail results in the removal of approximately 34 trees. • Vegetation impacts at the location of the proposed extension of Station Street south of Port Robinson Road are considered limited and will not impact the natural wooded corridor associated with the Steve Bauer Trail.
PSW Impacts	4	• No PSW impacts.	4	• No PSW impacts.	1	• Proposed local road connection across the PSW will generate new impacts and require mitigation measures.
ROW SCORE (Average)	**88%**		**88%**		**50%**	
OVERALL SCORE	**88%**		**63%**		**58%**	
EVALUATION SUMMARY	**Recommended**		**Not Recommended**		**Not Recommended**	

Ranking System