

ERINDALE / ARBOR CREEK

2017 NEIGHBOURHOOD TRAFFIC REVIEWS



City of Saskatoon
January 8, 2018

Erindale / Arbor Creek Neighbourhood Traffic Review

January 8, 2018

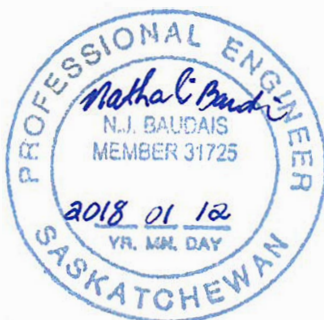
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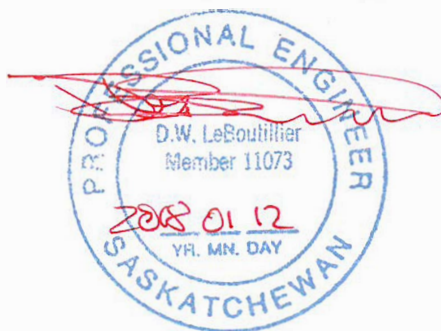


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- Erindale & Arbor Creek Community Association
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- Saskatoon Fire Department
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EXECUTIVE SUMMARY

The objective of the Neighbourhood Traffic Management Program is to address traffic concerns within neighbourhoods such as speeding, shortcutting, and pedestrian safety. The program was revised in August 2013 to address traffic concerns on a neighbourhood-wide basis. The program involves additional community and stakeholder consultation that provides the opportunity for residents and City staff to work together in developing solutions that address traffic concerns within their neighbourhood. The process is outlined in the *Traffic Calming Guidelines and Tools*, City of Saskatoon, 2016.

A public meeting was held in April 2017 to identify traffic concerns and potential solutions within the Erindale and Arbor Creek neighbourhoods. As a result of the meeting, a number of traffic assessments were completed to confirm and quantify the concerns raised by the residents. Based on the residents' input and the completed traffic assessments, a Traffic Plan was developed and presented to the community at a follow-up meeting held in September 2017.

A summary of recommended improvements for the Erindale and Arbor Creek neighbourhoods are included in **Table ES-1**. The summary identifies the locations, the recommended improvement, and a schedule for implementation. The schedule to implement the Traffic Plan can vary depending on the complexity of the proposed improvement. According to the *Traffic Calming Guidelines and Tools* document, the time frame may range from short-term (1 to 2 year); medium-term (3 to 5 years) and long-term (5 years plus). Accordingly, the specific time frame to implement the improvements ranges from 1 to 5 years.

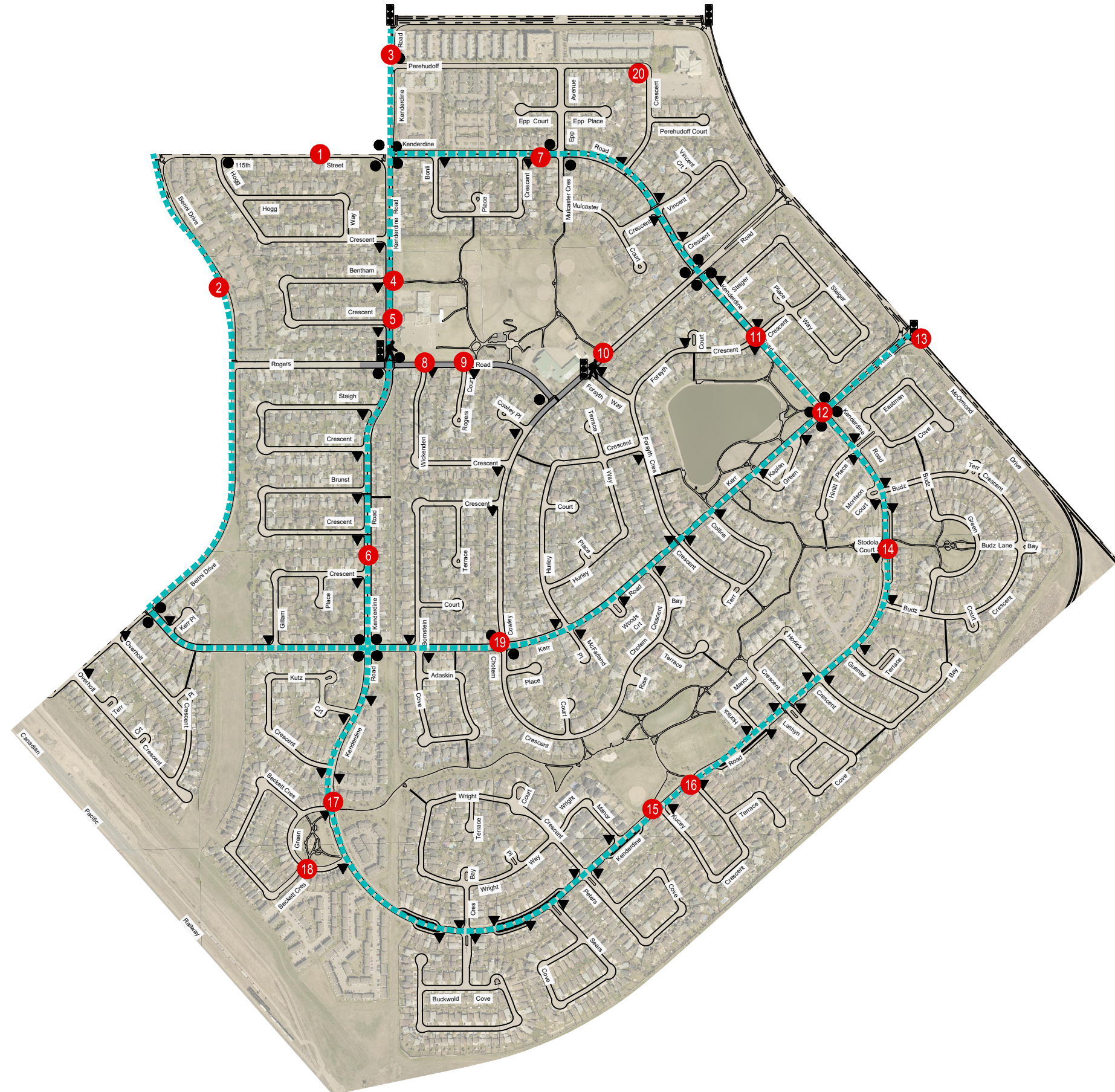
The Erindale and Arbor Creek Traffic Plan is illustrated in **Exhibit ES-1**.

Table ES-1: Erindale and Arbor Creek Neighbourhood Recommended Improvements

Item	Location	Recommendation	Reason
1	115 th Street between Berini Drive & Kenderdine Road	Speed Display Board facing westbound traffic	Reduce speed
2	North side of intersection of Berini Drive & Rogers Road	Speed Display Board facing southbound traffic	Reduce speed
3	Kenderdine Road & Perehudoff Crescent (west)	Pedestrian Ahead, Do Not Block Intersection, and pedestrian crosswalk signs	Improve pedestrian safety
4	Bentham Crescent (north) & Kenderdine Road	Zebra crosswalk	Improve pedestrian safety near school
5	Bentham Crescent (south) & Kenderdine Road	Curb extension	Reduce speed & improve pedestrian safety
6	Kenderdine Road between Brunst Crescent & Gillam Crescent	Speed Display Board facing northbound traffic	Reduce speed
7	30 m west of Kenderdine Road & Epp Avenue/Mulcaster Crescent	Speed Display Board facing eastbound traffic	Reduce speed
8	Wickenden Crescent & Rogers Road	Make temporary curb extension permanent	Improve sightline & improve pedestrian safety
9	Rogers Court & Rogers Road	Median island on east side	Reduce speed & improve pedestrian safety
10	Forsyth Way & Cowley Road	Modify the existing temporary curb extension	Improve the turning radius
11	Steiger Crescent/Forsyth Crescent & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
12	Kenderdine Road & Kerr Road (east)	Right Lane Must Turn Right sign, right turn arrow pavement marking (short-term) and temporary roundabout (mid-term)	Improve intersection operations and safety
13	McOrmond Drive & Kerr Road	Paint yellow guiding line for the westbound left turn	Improve intersection safety
14	Stodola Court & Kenderdine Road	Median island on north side	Reduce speed
15	Kucey Crescent (west) & Kenderdine Road	Median island on west side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
16	Kucey Crescent (east) & Kenderdine Road	Median island on east side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
17	Beckett Green (north) & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
18	Beckett Crescent (south) & Beckett Green	Curb extension on southwest corner and yield sign	Reduce speed & improve pedestrian safety
19	Cowley Road & Kerr Road	Make temporary curb extension permanent	Reduce speed & improve pedestrian safety
20	319 Perehudoff Crescent	No Parking signs and Checkerboard signs	Improve sightline and safety

Table ES-I Continued

Item	Location	Recommendation	Reason
21	Kenderdine Road (South of Kerr Road); Berini Drive; Kerr Road; 115 th Street; Perehudoff Crescent	Provide speed data to Saskatoon Police Service for enforcement	Reduce speed



- LEGEND**
- EXISTING STOP SIGN
 - ▼ EXISTING YIELD SIGN
 - BUS ROUTE
 - ▒ SCHOOL ZONE
 - Ⓜ EXISTING TRAFFIC SIGNAL
 - 🚶 PEDESTRIAN ACTUATED SIGNAL LOCATION
 - 10 RECOMMENDATION #

ARBOR CREEK/ERINDALE TRAFFIC PLAN

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I INTRODUCTION

As the City of Saskatoon continues to grow, many neighbourhoods face issues such as pedestrian safety, cut-through traffic, and increased speeds. In August 2013, City Council adopted the *City of Saskatoon Traffic Guidelines and Tools* that outlines a procedure for completing traffic reviews on a neighbourhood-wide basis. Prior to this, neighbourhood traffic issues were dealt with on a case-by-case basis with mixed results. Since 2013, the formal process has proven to be very successful in providing recommendations that improve neighbourhood traffic conditions and pedestrian safety. Recommendations are developed by the Administration and residents in a collaborative fashion. Accordingly, this report provides the Traffic Plan for the Erindale and Arbor Creek neighbourhood.

The Erindale and Arbor Creek neighbourhoods are located on the east portion of Saskatoon and are bound by College Drive to the south, McOrmond Drive to the east, Berini Drive to the west and Attridge Drive to the north. The land use is mostly residential, with schools on Kenderdine Road (Dr. John G. Egnatoff School) and Rogers Road (Father Robinson School).

The neighbourhood traffic review includes four stages:

- **Stage 1** - Identify issues, concerns and possible solutions through the initial neighbourhood consultation and the Shaping Saskatoon online discussion.
- **Stage 2** - Develop a draft traffic plan based on resident's input and traffic assessments.
- **Stage 3** - Present the draft traffic plan to the neighbourhood at a follow-up meeting; circulate the plan to other civic divisions for feedback; make adjustments as needed; and present the plan to City Council for approval.
- **Stage 4** - Implement the proposed measures in specific time frame, short-term (1 to 2 years), medium-term (3 to 5 years) or long-term (5 years plus).

This report presents the study findings and recommendations.

2 STAGE 1: IDENTIFYING ISSUES, CONCERNS, AND POSSIBLE SOLUTIONS

A public meeting was held in April 2017 to identify traffic concerns within the Erindale and Arbor Creek neighbourhoods. At the meeting, residents were given the opportunity to express their concerns and suggest possible solutions. The meeting minutes are provided in **Appendix A**.

The following pages summarize the concerns and suggested solutions identified during the initial consultation (including all correspondence and Shaping Saskatoon discussion comments received prior to the follow-up meeting) with the residents.

2.1 Concern 1 – Speeding and Shortcutting

Shortcutting occurs when non-local traffic passes through the neighbourhood on streets that are designed and intended for low volumes of traffic (i.e. local streets). As speeding often accompanies shortcutting, these concerns have been grouped into one category.

Concerns for speeding and shortcutting were identified at the following locations:

- School zone on Rogers Road - many vehicles are speeding
- 115th Street between Berini Drive & Kenderdine Road - speeding during night and weekend
- Berini Drive, Rogers Road, Kenderdine Road and Kerr Road - speeding
- Budz Crescent - speeding around the curve
- Perehudoff Crescent - speeding
- Kenderdine Road & Kerr Road - westbound speeding and operational issues with lane drop

Proposed solutions identified by residents:

- School zone on Rogers Road - playground zones all year long from 8 am – 5 pm with increased enforcement
- Hogg Crescent & 115th Street - install median island to narrow roadway and reduce speed
- Kenderdine Road - install curb extension, slow down signs and playground signs

2.2 Concern 2 – Pedestrian Safety

It is important to address pedestrian safety concerns to support active transportation. Walking to nearby amenities, as opposed to driving, reduces traffic volumes.

Pedestrian crosswalks need to adhere to the City of Saskatoon Council Policy C07-018 *Traffic Control at Pedestrian Crossings*, November 15, 2004 which states the following:

“The installation of appropriate traffic controls at pedestrian crossings shall be based on warrants listed in the document entitled *Traffic Control at Pedestrian Crossings – 2004* approved by City Council in 2004.”

Concerns regarding pedestrian safety were raised at the following locations:

- Kenderdine Road & Kerr Road (east) - motorists are passing the intersection by using the wrong lane on westbound and it is dangerous for pedestrians
- Kenderdine Road between Attridge Drive & Perehudoff Crescent - difficult to cross street; crosswalks are not well marked and drivers don't yield
- Kenderdine Road between Kucey Crescent - visibility issues (sun glare) around the crosswalk

2.3 Concern 3 – Traffic Control

Traffic control signs are used in order to assign the right-of-way. City of Saskatoon Council Policy C07-007 *Traffic Control – Use of Stop and Yield Signs*, April 26, 2009 states that stop and yield signs are not to be used:

- As speed control devices;
- to stop priority traffic over minor traffic;
- on the same approach to an intersection where traffic signals are operational; or
- as a pedestrian crossing device.

An all-way stop must meet the conditions for traffic volumes, collision history, and must have a balanced volume from each leg to operate sufficiently.

Concerns regarding traffic controls were raised at the following locations:

- Kerr Road & Berini Drive - stop signs are not aligned
- Rogers Road & Kenderdine Road - poor visibility

Proposed solutions identified by residents:

- Rogers Road & Kenderdine Road - a traffic signal is suggested
- Epp Avenue & Kenderdine Road - change the stop sign to yield sign

2.4 Concern 4 – Parking

Parking is allowed on all city streets unless signage is posted. According to City of Saskatoon Bylaw 7200, *The Traffic Bylaw*, December 16, 2013, vehicles are restricted from parking within 10 metres of an intersection and one metre of a driveway or back lane.

Concerns regarding parking were at the following locations:

- School zone - vehicles park in crosswalk day and night
- Perehudoff Crescent - parking issues with garbage bins along Perehudoff Crescent

Proposed solutions identified by residents:

- Perehudoff Crescent - remove parking on one side of street
- General - increase parking enforcement for parking in driveways

2.5 Concern 5 – Maintenance

Maintenance is requested throughout the consultation process that reflects the work of other civic departments. These include the condition of the street signs (i.e. knocked over, damaged, obstructed by trees), trees obstructing driver's view, or roadway maintenance (i.e. snow clearing, potholes, sanding).

Concerns regarding maintenance were identified at the following locations:

- Forsyth Crescent & Cowley Crescent - curb extension get torn out by snow plow
- Kenderdine Road south of Kerr Road - centreline pavement marking is required as people always drive on the wrong side

2.6 Concern 6 – Major Intersections & Corridors

Major intersections include roadways with higher traffic volumes (i.e. arterials, collectors) or intersections with an existing traffic signal.

Concerns regarding major intersections were identified at the following locations:

- Berini Drive & Attridge Drive - northbound left turn queue is too long
- Kerr Road & McOrmond Drive - westbound left turning traffic always turn into the outside lane creating conflicts with eastbound right turning vehicles
- Cowley Road & McOrmond Drive - eastbound right turn needs acceleration lane on McOrmond Drive

- Attridge Drive - synchronization of traffic signals is required
- McOrmond Drive & College Drive - northbound left turn is too congested
- General - countdown timers are great for motorists to know when to stop

Proposed solutions identified by residents:

- Berini Drive & Attridge Drive - northbound traffic needs protected left turn arrow

3 STAGE 2: DEVELOPMENT OF DRAFT TRAFFIC PLAN

3.1 Methodology

Stage 2 of the neighbourhood traffic review included the development of a draft Traffic Plan. This was completed through the following actions:

- Create a detailed list of all the issues provided by the residents.
- Collect historical traffic studies and information the City has on file for the neighbourhood.
- Prepare a data collection program that will provide the appropriate information needed to undertake the assessments.
- Complete the data collection, which may include:
 - Daily and weekly traffic counts
 - Speed measurements
 - Intersection turning movement counts
 - Pedestrian counts
 - Site observations
 - Collision analysis
- Assess the issues by using the information in reference with City policies, bylaws, and guidelines, transportation engineering design guidelines and technical documents, and professional engineering judgment.

The following sections provide details on the data collected for traffic volume and speed assessments, traffic control assessments, pedestrian crossing assessments, traffic signal assessments and collision analysis. A map of the traffic data collection is shown in **Appendix B**.

3.2 Traffic Volume and Speed Assessments

Traffic volumes and travel speeds were measured to assist in determining the need for traffic calming devices. In Saskatoon the neighbourhood streets are classified typically as either local or collector streets. Traffic volumes (referred to as Average Daily Traffic) on these streets should meet the City of Saskatoon guidelines shown in **Table 3-1**.

Table 3-1: City of Saskatoon Street Classifications and Characteristics

Characteristics	Classifications					
	Back Lanes		Locals		Collectors	
	Residential	Commercial	Residential	Commercial	Residential	Commercial
Traffic function	Access function only (traffic movement not a consideration)		Access primary function (traffic movement secondary consideration)		Traffic movement and land access of equal importance	
Average Daily Traffic (vehicles per day)	<500	<1,000	<1,000	<5,000	<5,000	8,000-10,000
Typical Speed Limits (kph)	20		50		50	
Transit Service	Not permitted		Generally avoided		Permitted	
Cyclist	No restrictions or special facilities		No restrictions or special facilities		No restrictions or special facilities	
Pedestrians	Permitted, no special facilities		Sidewalks on one or both sides	Sidewalks provided where required	Typically sidewalks provided both sides	Sidewalks provided where required
Parking	Some restrictions		No restrictions or restriction on one side only		Few restrictions other than peak hour	

Travel speeds were measured to determine the 85th percentile speed, which is the speed at which 85 percent of vehicles are travelling at or below. The speed limit in the Erindale and Arbor Creek neighbourhood is 50 kph, except for school zones where the speed limit is reduced to 30 kph from September and June, Monday to Friday, 8:00 am to 5:00 pm.

The speed studies and Average Daily Traffic (ADT) on streets where speeding was identified as a concern by residents are summarized in **Table 3-2**.

Table 3-2: Speed Studies and Average Daily Traffic Counts (2017)

Street	Between	Class	Average Daily Traffic (vehicles per day)	Speed (kph)
Beckett Green	Beckett Crescent & Beckett Crescent	local	195	34
Kenderdine Road	Kutz Crescent & Kutz Crescent	collector	2,980	60
Kenderdine Road	Kucey Crescent & Horlick Manor		2,320	65
Kenderdine Road	Budz Crescent & Budz Crescent		4,790	62
Kerr Road	McFarland Place & Wood Court		3,180	55
Kenderdine Road	Steiger Crescent & Steiger Crescent		2,750	55
Kenderdine Road	Staigh Crescent & Brunst Crescent		4,390	56
Rogers Road	Kenderdine Road & Cowley Road		820	regular = 42 school = 38
Kenderdine Road	Bonli Crescent & Bonli Crescent		3,820	57
115 th Street	Hogg Crescent & Kenderdine Road		5,820	55
Berini Drive	115 th Street & Rogers Road		minor arterial	2,960

3.3 Pedestrian Assessments

Pedestrian assessments are conducted to determine the need for pedestrian actuated signalized crosswalks which are in adherence to the City of Saskatoon Council Policy C07-018 *Traffic Control at Pedestrian Crossings*, November 15, 2004. Devices include the pedestrian corridor (flashing yellow lights) or pedestrian-actuated signals. A warrant system assigns points for a variety of conditions including:

- Number of traffic lanes to be crossed;
- presence of a physical median;
- posted speed limit of the street;
- distance the crossing point is to the nearest protected crosswalk point; and
- number of pedestrian and vehicles at the location.

Pedestrian and traffic data is collected during the five peak hours of: 8:00 am to 9:00 am, 11:30 am to 1:30 pm, and 3:00 pm to 5:00 pm.

A standard pedestrian crosswalk or a zebra crosswalk (i.e. striped) may be considered when a signalized crosswalk is not warranted. A summary of the pedestrian studies are provided in Table 3-3.

Table 3-3: Pedestrian Assessments

Location	Number of Pedestrians Crossing During Peak Hours	Results
Kenderdine Road & Perehudoff Crescent (west)	5	Pedestrian Device Not Warranted

Details of the pedestrian actuated signal and active pedestrian corridor assessments are provided in **Appendix C**.

3.4 Traffic Signal Assessments

Assessments are conducted to determine the need for traffic signals, in adherence to the Traffic Signal and Pedestrian Signal Head Warrant Handbook. A warrant system assigns points for a variety of conditions including:

- Number of traffic lanes;
- posted speed limit of the street;
- distance to the nearest traffic signal; and
- number of pedestrians and vehicles at the location.

Pedestrian and traffic data is collected during the five peak hours of: 8:00 am to 9:00 am, 11:30 am to 1:30 pm, and 4:00 pm to 6:00 pm.

If a traffic signal is not warranted, additional measures to improve safety (i.e. parking restrictions, oversized stop signs) may be considered. A summary of the traffic signal assessments is provided in **Table 3-4**.

Table 3-4: Traffic Signal Assessments

Location	Traffic Signal Warrant Points	Results
Kerr Road (east) & Kenderdine Road	62	Traffic Signal Not Warranted
Rogers Road & Kenderdine Road	22	

Details of the traffic signal assessments are provided in **Appendix D**.

3.5 Collision Analysis

The most recently available five year collision data (2011 to 2015) was provided by SGI. High-collision locations, typically noted as the locations with an average of two or more collisions per year, were reviewed in more depth to identify trends and possible improvements. Locations with two or more collisions per year include:

- Kenderdine Road & Kerr Road (east)
- Cowley Road & McOrmond Drive
- 115th Street & Kenderdine Road
- 115th Street & Berini Drive

Details of the collision analysis are provided in **Appendix E**.

3.6 Intersection of Kenderdine Road and Kerr Road Traffic Analysis

Detailed traffic analysis of the intersection of Kenderdine Road and Kerr Road is provided in **Appendix F**.

4 STAGE 3: PRESENTATION OF TRAFFIC PLAN

4.1 Methodology

Stage 3 of the neighbourhood traffic review included finalizing the recommended plan. This was achieved by completing the following steps:

- Based on the assessments, prepared a plan that illustrates the appropriate recommended improvement
- Presented the draft plan to the residents at a follow-up public meeting
- Circulated the draft plan to the civic divisions for comment
- Revised the draft plan based on feedback from the stakeholders
- Prepared a technical document summarizing the recommended plan and project process

The tables in the following sections provide the details of the recommended traffic management plan, including the location, recommended improvement and the justification of the recommended improvement.

4.2 Speeding and Shortcutting

As stated in Council Policy C07-007 *Traffic Control – Use of Stop and Yield Signs*, January 26, 2009, “stop signs are not to be used as speed control devices.”

The recommended improvements to address speeding and shortcutting are detailed in **Table 4-1**.

Table 4-1: Recommended Improvements – Speeding and Shortcutting

Location	Recommended Improvement	Justification
115 th Street between Berini Drive & Kenderdine Road	Speed Display Board facing westbound traffic	Reduce speed
North side of intersection of Berini Drive & Rogers Road	Speed Display Board facing southbound traffic	Reduce speed
Bentham Crescent (south) & Kenderdine Road	Curb extension	Reduce speed & improve pedestrian safety
Kenderdine Road between Brunst Crescent & Gillam Crescent	Speed Display Board facing northbound traffic	Reduce speed
30m west of Kenderdine Road & Epp Avenue/Mulcaster Crescent	Speed Display Board facing eastbound traffic	Reduce speed
Rogers Court & Rogers Road	Median island on east side	Reduce speed & improve pedestrian safety
Steiger Crescent / Forsyth Crescent & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
Stodola Court & Kenderdine Road	Median island on north side	Reduce speed
Kucey Crescent (west) & Kenderdine Road	Median island on west side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
Kucey Crescent (east) & Kenderdine Road	Median island on east side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
Beckett Green (north) & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
Beckett Crescent (south) & Beckett Green	Curb extension on southwest corner and yield sign	Reduce speed & improve pedestrian safety
Cowley Road & Kerr Road	Make temporary curb extension permanent	Reduce speed & improve pedestrian safety
Kenderdine Road (South of Kerr Road); Berini Drive; Kerr Road; 115 th Street; Perehudoff Crescent	Provide speed data to Saskatoon Police Service for enforcement	Reduce speed

4.3 Pedestrian Safety

The recommended improvements to increase pedestrian safety are detailed in **Table 4-2**.

Table 4-2: Recommended Improvements - Pedestrian Safety

Location	Recommended Improvement	Justification
Kenderdine Road & Perehudoff Crescent (west)	Pedestrian Ahead, Do Not Block Intersection, and pedestrian crosswalk signs	Improve pedestrian safety
Bentham Crescent (north) & Kenderdine Road	Zebra crosswalk	Improve pedestrian safety near school
Wickenden Crescent & Rogers Road	Make temporary curb extension permanent	Improve sightline & pedestrian safety

4.4 Intersection Safety

The recommended improvements to intersections that will improve the level of safety by clearly identifying the right-of-way through traffic controls are provided in **Table 4-3**.

Table 4-3: Recommended Improvements – Intersection Safety

Location	Recommended Improvement	Justification
Forsyth Way & Cowley Road	Modify the existing temporary curb extension	Improve the turning radius
Kenderdine Road & Kerr Road (east)	Right Lane Must Turn Right sign, right turn arrow pavement marking (short-term) and temporary roundabout (mid-term)	Improve intersection operations and safety
McMormond Drive & Kerr Road	Paint yellow guiding line for the westbound left turn	Improve intersection safety

4.5 Parking

The recommended improvements to parking that will improve the level of safety are provided in **Table 4-4**.

Table 4-4: Recommended Improvements – Parking

Location	Recommended Improvement	Justification
319 Perehudoff Crescent	No Parking signs and Checkerboard signs	Improve driver sightline and safety

4.6 Follow Up Consultation – Presentation of Traffic Management Plan

The recommended improvements were presented to residents and stakeholders at a follow-up public meeting in September 19, 2017. Meeting minutes are provided in **Appendix G**. Recommended improvements that were not supported were eliminated or altered accordingly.

A decision matrix detailing the list of recommended improvements presented at the follow-up meeting are included in **Appendix H**. Additional issues raised during the follow-up meeting are outlined in **Appendix I**. Recommendations were added to the list of improvements, if necessary.

The revised list of recommendations was then circulated to the civic divisions (including Saskatoon Police Service, Saskatoon Light & Power, Saskatoon Fire Department, Environmental Services, Parking Services, Roadways & Operations and Transit) to gather comments and concerns. General support for the recommendations was received.

5 STAGE 4: IMPLEMENTATION

Stage 4, the final stage of the neighbourhood traffic review, is to install the recommended improvements within the specified time frame. The time frame depends upon the complexity and cost of the solution. A short-term time frame is defined by implementing the improvements within 1 to 2 years; medium-term is 3 to 5 years; and long-term is 5 years plus.

The placement of signs, pavement markings and temporary traffic calming will be completed short-term (1 to 2 years). Most often the installations take place in spring / summer of the following year. Therefore, installations for Erindale and Arbor Creek are likely to take place in spring / summer 2018.

The estimated costs of the improvements included in the Neighbourhood Traffic Management Plan are outlined in the following tables:

- **Table 5-1:** Signs, Pavement Markings & Temporary Traffic Calming Cost Estimate
- **Table 5-2:** Temporary Roundabout
- **Table 5-3:** Speed Enforcement & Speed Display Boards Cost Estimate
- **Table 5-4:** Permanent Traffic Calming Cost Estimate
- **Table 5-5:** Permanent Roundabout
- **Table 5-6:** Total Cost Estimate

Table 5-1: Signs, Pavement Markings & Temporary Traffic Calming Cost Estimate

Location	Device (# of Devices)	Cost Estimate	Time Frame
Bentham Crescent (south) & Kenderdine Road	Curb extension (2)	\$1000	1 to 5 years (traffic calming devices will be installed temporarily until proven effective)
Rogers Court & Rogers Road	Median island (1)	\$500	
Steiger Crescent & Kenderdine Road	Median island (1)	\$500	
Stodola Court & Kenderdine Road	Median island (1)	\$500	
Kucey Crescent (west) & Kenderdine Road	Median island (1) Standard crosswalk (1)	\$500 \$250	
Kucey Crescent (east) & Kenderdine Road	Median island (1) Standard crosswalk (1)	\$500 \$250	
Beckett Green (north) & Kenderdine Road	Median island (1)	\$500	
Beckett Crescent (south) & Beckett Green	Curb extension (1) Yield sign (1)	\$500 \$250	
Kenderdine Road & Kerr Road (east)	Right Lane Must Turn Right sign (1) Right turn arrow pavement marking (1)	\$250 \$250	
Kenderdine Road & Pehudoff Crescent (west)	Pedestrian Ahead (2) Do Not Block Intersection (2) Pedestrian crosswalk signs (2)	\$500 \$500 \$500	
Bentham Crescent (north) & Kenderdine Road	Zebra crosswalk (1)	\$250	
McMormond Drive & Kerr Road	Yellow guiding line (1)	\$250	
319 Pehudoff Crescent	No Parking signs (2)	\$500	
	Checkerboard sign (1)	\$250	
Total		8,500	

Table 5-2: Temporary Roundabout

Location	Device	Cost Estimate	Time Frame
Kenderdine Road & Kerr Road (east)	Temporary roundabout	\$13,000	3 to 5 years

Table 5-3: Speed Enforcement & Speed Display Boards Cost Estimate

Location	Device	Cost Estimate	Time Frame
115 th Street between Berini Drive & Kenderdine Road	Speed Display Board	\$0 (funded through Speed Program)	1 to 2 years
North side of intersection of Berini Drive & Rogers Road	Speed Display Board	\$0 (funded through Speed Program)	
Kenderdine Road between Brunst Crescent & Gillam Crescent	Speed Display Board	\$0 (funded through Speed Program)	
30 m west of Kenderdine Road & Epp Avenue/Mulcaster Crescent	Speed Display Board	\$0 (funded through Speed Program)	
Kenderdine Road (South of Kerr Road); Bernie Drive; Kerr Road; 115 th Street; Perehudoff Crescent	Speed Enforcement	\$0 (provided by Saskatoon Police Service)	
	Total	\$0	

Table 5-4: Permanent Traffic Calming Cost Estimate

Location	Device (# of Devices)	Cost Estimate	Time Frame
Wickenden Crescent & Rogers Road	Curb extension (1)	\$45,000	3 to 5 years
Cowley Road & Kerr Road	Curb extension (2)	\$90,000	
Bentham Crescent (south) & Kenderdine Road	Curb extension (2)	\$90,000	
Rogers Court & Rogers Road	Median island (1)	\$5,000	
Steiger Crescent & Kenderdine Road	Median island (1)	\$5,000	
Stodola Court & Kenderdine Road	Median island (1)	\$5,000	
Kucey Crescent (west) & Kenderdine Road	Median island (1)	\$5,000	
Kucey Crescent (east) & Kenderdine Road	Median island (1)	\$5,000	
Beckett Green (north) & Kenderdine Road	Median island (1)	\$5,000	
Beckett Crescent (south) & Beckett Green	Curb extension (1)	\$45,000	
Cowley Road & Forsyth Way	Curb extension (2)	\$90,000	
Total		\$390,000	

Table 5-5: Permanent Roundabout

Location	Device (# of Devices)	Cost Estimate	Time Frame
Kenderdine Road & Kerr Road (east)	Permanent roundabout (1)	\$440,000	More than 5 years

Table 5-6: Total Cost Estimate

Category	Time Frame		Long-Term (more than 5 years)
	Short-Term (1 to 2 years)	Medium-Term (3 to 5 years)	
Signs, Pavement Markings & Temporary Traffic Calming	\$8,500	NA	NA
Speed Enforcement & Speed Display Boards	\$0	NA	NA
Temporary Roundabout	NA	\$13,000	NA
Permanent Traffic Calming	NA	\$390,000	NA
Permanent Roundabout	NA	NA	\$440,000
Total	\$8,500	\$403,000	\$440,000

The total cost estimate for short-term improvements (signs, pavement markings, temporary traffic calming and roundabout) is **\$8,500**. The total cost estimate for medium & long-term improvements (permanent traffic calming and roundabout) is **\$843,000**.

The list of recommended improvements resulting from the neighbourhood traffic review, including the location and justification, is summarized in **Table 5-7**.

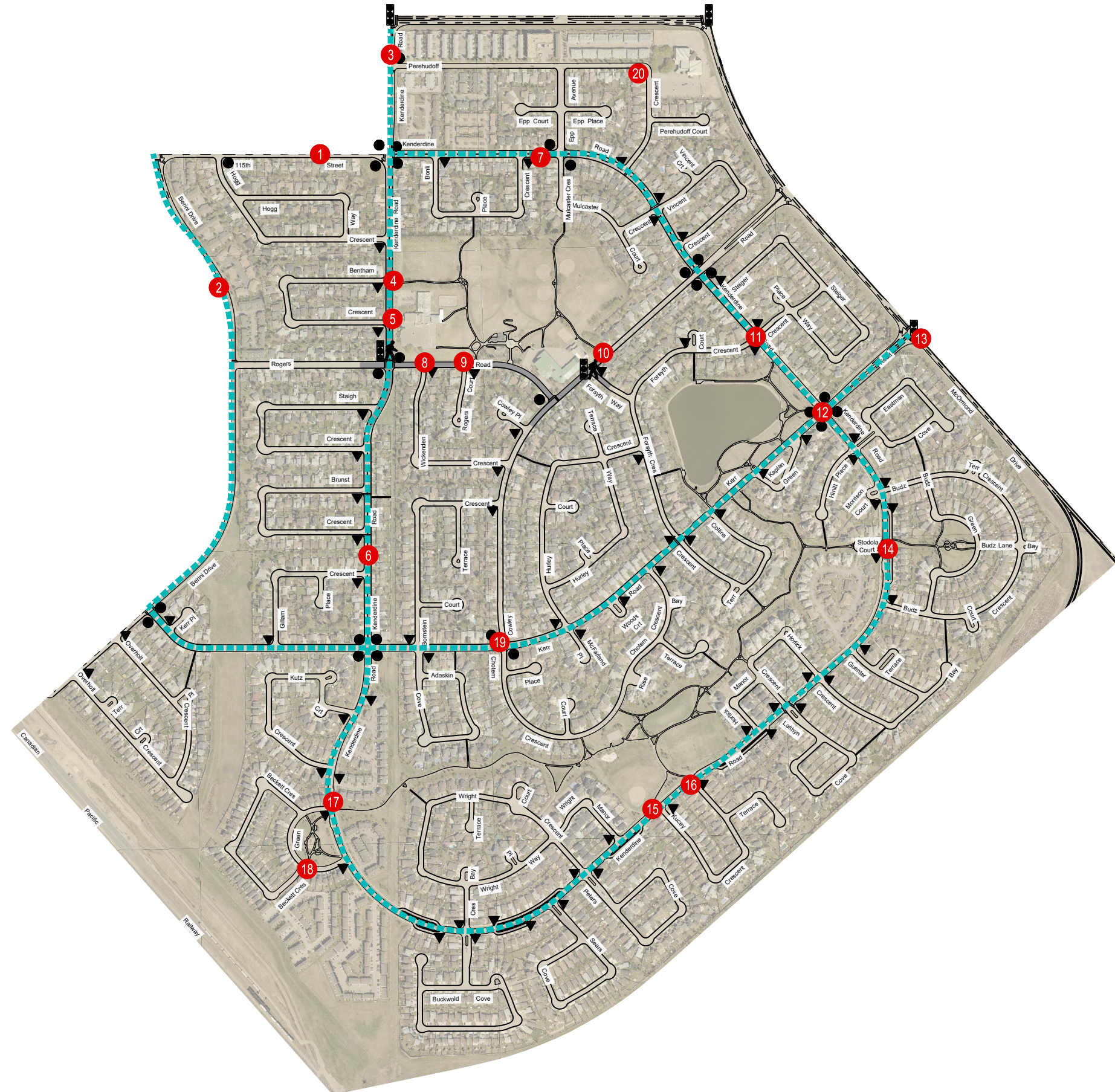
The recommended Erindale and Arbor Creek Neighbourhood Traffic Management Plan is illustrated in **Exhibit 5-1**.

Table 5-7: Erindale and Arbor Creek Neighbourhood Recommended Improvements

Item	Location	Recommendation	Reason
1	115 th Street between Berini Drive & Kenderdine Road	Speed Display Board facing traffic	Reduce speed
2	North side of intersection of Berini Drive & Rogers Road	Speed Display Board facing southbound traffic	Reduce speed
3	Kenderdine Road & Pehudoff Crescent (west)	Pedestrian Ahead, Do Not Block Intersection, and pedestrian crosswalk signs	Improve pedestrian safety
4	Bentham Crescent (north) & Kenderdine Road	Zebra crosswalk	Improve pedestrian safety near school
5	Bentham Crescent (south) & Kenderdine Road	Curb extension	Reduce speed & improve pedestrian safety
6	Kenderdine Road between Brunst Crescent & Gillam Crescent	Speed Display Board facing northbound traffic	Reduce speed
7	30 m west of Kenderdine Road & Epp Avenue/Mulcaster Crescent	Speed Display Board facing eastbound traffic	Reduce speed
8	Wickenden Crescent & Rogers Road	Make temporary curb extension permanent	Improve sightline & improve pedestrian safety
9	Rogers Court & Rogers Road	Median island on east side	Reduce speed & improve pedestrian safety
10	Forsyth Way & Cowley Road	Modify the existing temporary curb extension	Improve the turning radius
11	Steiger Crescent & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
12	Kenderdine Road & Kerr Road (East)	Right Lane Must Turn Right sign, right turn arrow pavement marking (short-term) and temporary roundabout (mid-term)	Improve intersection operations and safety
13	McMormond Drive & Kerr Road	Paint yellow guiding line for the westbound left turn	Improve intersection safety
14	Stodola Court & Kenderdine Road	Median island on north side	Reduce speed
15	Kucey Crescent (west) & Kenderdine Road	Median island on west side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
16	Kucey Crescent (east) & Kenderdine Road	Median island on east side and standard crosswalk on east side	Reduce speed & improve pedestrian safety
17	Beckett Green (north) & Kenderdine Road	Median island on south side	Reduce speed & improve pedestrian safety
18	Beckett Crescent (south) & Beckett Green	Curb extension on southwest corner and yield sign	Reduce speed & improve pedestrian safety
19	Cowley Road & Kerr Road	Make temporary curb extension permanent	Reduce speed & improve pedestrian safety
20	319 Pehudoff Crescent	No Parking signs and Checkerboard signs	Improve sightline and safety

Table 5-7 Continued

Item	Location	Recommendation	Reason
21	Kenderdine Road (South of Kerr Road); Berini Drive; Kerr Road; 115 th Street; Perehudoff Crescent	Provide speed data to Saskatoon Police Service for enforcement	Reduce speed



- LEGEND**
- EXISTING STOP SIGN
 - ▼ EXISTING YIELD SIGN
 - ▬▬▬▬ BUS ROUTE
 - ▬▬▬▬ SCHOOL ZONE
 - ⬮ EXISTING TRAFFIC SIGNAL
 - ⬮ PEDESTRIAN ACTUATED SIGNAL LOCATION
 - ⑩ RECOMMENDATION #

ARBOR CREEK/ERINDALE TRAFFIC PLAN

APPENDIX A: PUBLIC MEETING #1 – APRIL 4, 2017 MINUTES

Erindale / Arbok Creek Neighbourhood Traffic Review
Tuesday, April 4, 2017, 7:00 PM – 9:00 PM
Erindale Alliance Church

Agenda

1. Welcome & Introductions
2. Presentation from Transportation Division
3. Small Group Discussions & Report Back to Large Group
4. Next Steps
5. Large Group Discussion – Questions & Answers

1. Welcome & Introductions

(Presented by Mitch Riabko and Kathy Dahl, Facilitators)

2. Presentation from Transportation Division – Erindale / Arbok Creek Neighbourhood Traffic Review

(Presented by Lanre Akindipe, P.Eng, Transportation Engineer)

Presentation Outline

- Neighbourhood Traffic Review Process
- Erindale / Arbok Creek Review Schedule
- Sources of Information
- Past Concerns Received
- Description of Traffic Calming & Pedestrian Safety Devices
- Corridor Reviews & Major Intersection Reviews

Neighbourhood Traffic Review Process

- August 2013 – New process was adopted
- Mandate – Reduce and calm traffic, and improve safety within neighbourhoods
- 2014 – Reviewed 11 neighbourhoods
- 2015 – Reviewed 8 neighbourhoods
- 2016 – Reviewed 8 neighbourhoods
- 2017 – Dundonald, Erindale / Arbok Creek, Wildwood, Silverwood Heights, Richmond Heights / North Park, Pleasant Hill, Buena Vista / Exhibition / Queen Elizabeth.

Erindale / Arbok Creek Review Schedule

- Stage 1 – Identify issues & possible solutions through community consultation (April to Fall 2017)
- Stage 2 – Develop a draft traffic plan
- Stage 3 – Present draft traffic plan to community for feedback (Fall 2017)
- Stage 4 – Implement changes over time (Beginning Spring 2018)

Sources of Information

- Past studies
- Emails, Phone calls

- Feedback from public consultation
- Traffic Counts & Assessments
- Collision Analysis

Past Concerns Received

- Speeding and Pedestrian Safety – Kenderdine Road, Beckett Crescent, Perehudoff Crescent, Rogers Road, 115th Street, Kerr Road.
- Safety & Visibility Concerns – Kenderdine Road, Kerr & Chotem (west), Brunst Crescent
- Parking – too close to crosswalks
- School Safety Concerns – Excessive U turns in front of schools
- Traffic delays – Kenderdine Road & Kerr Road

Traffic Calming Devices

- Speed Display Board
- Curb Extension
- Raised Median Island
- Roundabout
- Diverter
- Right-In/Right-Out Island
- Directional Closure
- Raised Median Through Intersection
- Full Closure
- Pedestrian Devices
- Standard Crosswalk
- Zebra Crosswalk
- Active Pedestrian Corridor
- Pedestrian Actuated Signal

Corridor Reviews & Major Intersection Reviews

- Created to address issues at intersections along arterial streets as Neighbourhood Traffic Reviews addresses local and collector streets within neighbourhoods
- Recommendations will be identified and projects will be prioritized for funding approval
- Report will be presented to City Council

McOrmond Drive & College Drive Interchange

- Work to begin April 2017 with traffic impacts expected to begin in June 2017.
- The McOrmond and College Drive interchange is estimated to be completed in the fall of 2018.
- Information session on the Project:
th
Tuesday, April 11 2017 (6p.m – 8:30p.m) at St. Joseph High School – 115 Nelson Road
- More information on the project available on City's website

3. Small Group Discussions

Residents were divided into small groups to discuss traffic concerns in Arbok Creek and Erindale neighbourhoods and potential solutions

Group 1: Mariniel Flores (City Facilitator)

- School Zone on Rogers Road – Many vehicles are speeding. Suggesting playground zones all year long from 8am – 5pm with increased enforcement.
- Rogers Road & Kenderdine Drive – Poor visibility for southbound left turns. Needs a traffic signal.
- Parking around schools – parking in crosswalks day and night – Increased enforcement suggested.
- Speeding on transit routes especially on 115th Street (Berini Drive to Kenderdine) – Weekends, night and during school peak hours - suggesting speed bumps.
- Speeding on Berini Drive, Rogers Road, Kenderdine Road and Kerr Road.
- Hogg Crescent and 115th Street – suggesting Median Island to narrow roadway to reduce speed.
- McOrmond Drive and College Drive: Northbound left turn is too congested.
- The open land west of Gillam Crescent is where the community gathers. We do not want road to be constructed. A playground may be constructed there.
- At Father Robinson School – curb extension impede visibility and pedestrian lights too close to roadway on curb extension. The curb extension get torn out by snow plows.
- Kerr Road and Kenderdine Road – curb extension, narrow lane not good
- Weight restrictions for vehicles on North commuter parkway.
- Traffic backed up at Kenderdine & Kerr – lots of people turning left and backs up through traffic. Re-designate lanes (shared through / right lane). This occurs at rush hours (am + pm peak hours).
- Rogers Road has two lanes & parking on each side. In the evenings, it becomes a drag strip.
- Berini Drive and Kenderdine Road needs a speed study.
- Credit Union (Lowe + Ludlow) – an all way stop or traffic signal is required.
- Perehudoff & Kenderdine – unsafe intersection. Difficult to make left turns.
- Positive note: we like the wide roadways and no protected bike lanes.
- Kenderdine and Epp Avenue / Mulcaster – remove rubber curb extension
- U turns in school zones – more education needed.
- Want photo radar in school zones.
- Increased parking and enforcement for parking in driveways.

Group 2: Chelsea Lanning (City Facilitator)

- At Berini Drive, the straight through lane is long – Northbound left turn to Attridge backs up. Suggests a double arrow.
- Epp Avenue and Kenderdine has a stop sign rather than a yield sign. Why? Can it be a yield sign?
- Stop signs at Kerr & Berini are not evenly lined up (median & corner)
- Kenderdine & Kerr lane assignment – people are passing in the parking lane at the 4-way stop. Dangerous for pedestrians. Either use a twin lane or curb extensions. Same at Kenderdine & Kenderdine, no lines are painted to help either.

- Kerr & McOrmond – Willowgrove residents turning into the far lanes rather than the closest lane. There should be a turn into your lane campaign.
- Look at cycling routes more closely and include routes on the map.
- Crossing Kerr Road is difficult especially at Chotem. Please look at where bus stops are.

Group 3: Marina Melchiorre (City Facilitator)

- Cowley to McOrmond – wants acceleration lane / pass by lanes on McOrmond. Jersey barriers for Southbound right turn so they don't have to yield.
- Kenderdine & Kerr – Westbound speeding – dangerous with lane drop. Also delays in westbound direction.
- Forsyth & Cowley – Northbound right turn is difficult. It throws vehicles into the oncoming traffic. Curb extensions are too narrow.
- Kenderdine: Attridge to Perehudoff – pedestrian crossing is difficult, Southbound left turns is difficult, congestion.
- School Zone – passing on the right approaching Hogg crescent, speeding – southbound
- Kerr & Collins – Southbound multiuse pathway crosses Kerr but then connects to multiuse pathway mid-block. Suggestion - Midblock crossing / connector?

Group 4: Justine Marcoux (City Facilitator)

- Speeding along Kenderdine Road (from Manor to Horlick). Some solutions include installing temporary pop ups, slowdown signs during events (crossing guard), playground speed sign zone reduced
- Visibility issues around the crosswalks on Kenderdine (between Kucey Crescent), sunglare?
- Speeding around the curve along Budz crescent, dangerous for pedestrians crossing (kids)
- At Kenderdine Road and Kerr Road, Bus stop are narrow. Stops should be built into the boulevard. Also, rubber curbs makes road too narrow (single lane). Backs up traffic down Kenderdine due to the 4 way stop and curbs.
- There is a bar / piece of metal along Kenderdine Road (between Kerr Road and Forsyth Crescent) that needs to be maintained or removed.
- At Perehudoff Crescent and Kenderdine Road, the crosswalks are not well marked and drivers don't stop. The signs should be doubled up (two per direction instead of one). Also, backed up traffic blocks drivers from getting out on Perehudoff Crescent.
- There are parking issues with garbage bins along Perehudoff Crescent. It narrows the road to one lane. Solution – take out parking on one side.
- Speeding concerns along Perehudoff Crescent
- Speeding going through curve into oncoming lane. Solution: no parking signs (between utility box to curve). Road is narrow with parking on the sides. Saskatoon Police service should be out on weekends and evenings.

4. Next Steps

(Presented by Lanre Akindipe, Transportation Engineer)

1. Continue monitoring traffic issues in your neighbourhood
2. Mail-in or email comments no later than May 4, 2017
3. Additional public input via City on-line Community Engagement webpage no later than May 4, 2017 at <http://shapingsaskatoon.ca/discussions/erindale-arbor-creek-neighbourhood-traffic-review>
4. Traffic & pedestrian data collection, analysis
5. Develop recommendations and prepare draft Traffic Plan
6. Follow-up public input meeting to provide input on draft Traffic Plan
7. Determine revisions and finalize Traffic Plan
8. Present Traffic Plan to Transportation Committee
9. Present Traffic Plan to City Council for approval

5. Large Group Discussion – Questions & Answers

Question/Comment 1:

- **Resident:** We only have 3 ways out of the neighbourhood. It will get worse without additional accesses just like evergreen.

City's response: North Bridge will help to improve traffic flow and we will continue to do our best to improve traffic and pedestrian flow through the neighbourhood.

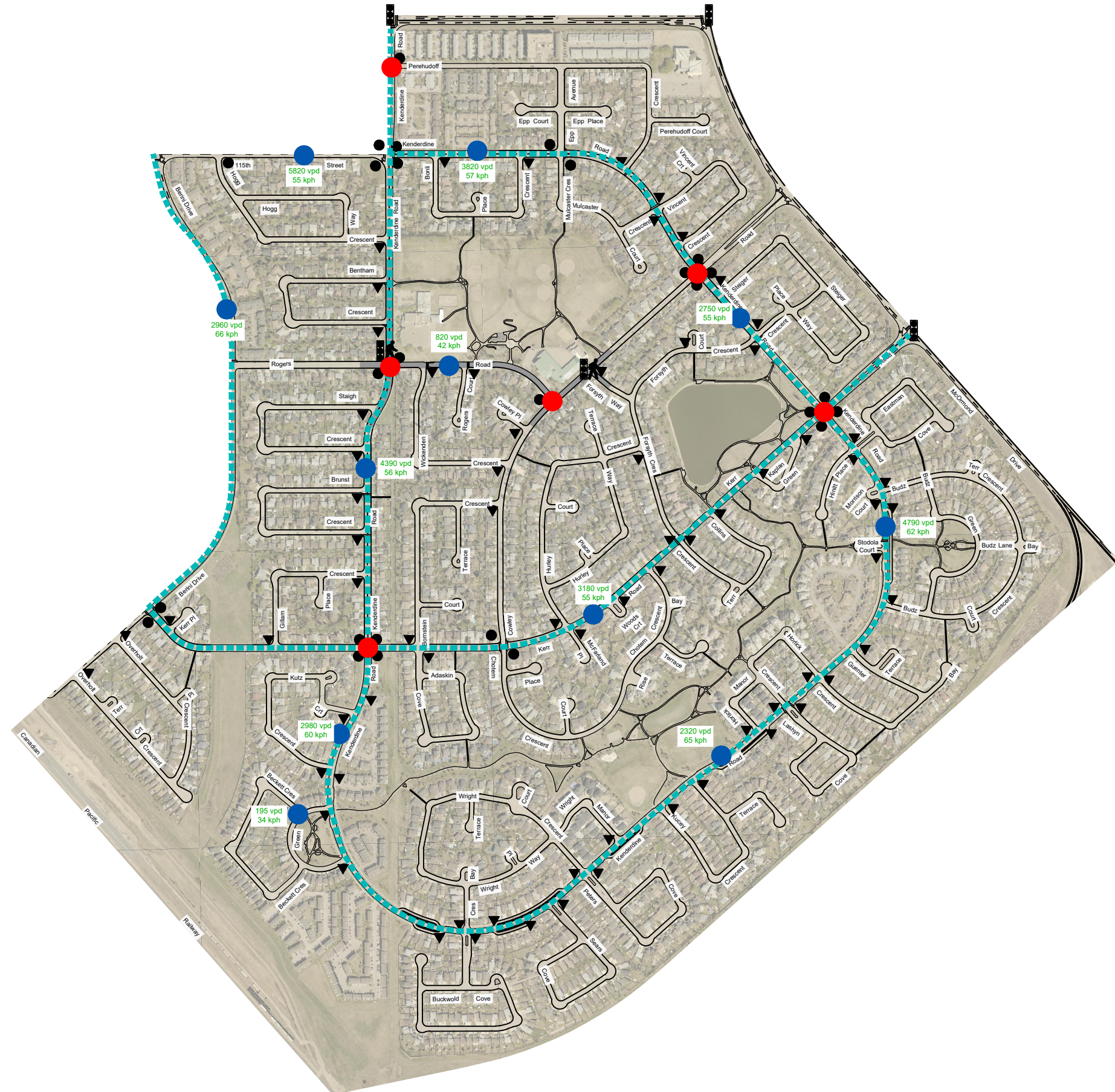
- **Resident:** Any progress on the synchronization of traffic signals in the City? Going along Attridge Drive is a good example
- **Councillor Jeffries:** The City is implementing a new wireless central system and lights. It will help to link all the signals together. Also, there will be a new traffic management system that can be adjusted remotely if there is congestion. Our traffic signals will be linked to the central system and there will be significant changes in the overall operation of the traffic signals.
- **Resident:** Can the Police please give us the indication of the crime rate in this neighbourhood?
- **Police Officer:** There is a webpage on the City of Saskatoon Police website where you can view the crime mapping in your neighbourhood using the filters.
- **Resident:** Are there going to be countdown timers at signalized intersections? At McOrmond and 115th Street, there was a countdown timer there before but it is no more there. The timers are great for motorists to know when to stop.
- **City's Response:** The countdown timers are really designed for pedestrians not motorists. It may lead to some confusion for motorists if the countdown timers runs down to zero and the light is still on green. We typically install them where we have lots of pedestrian activities like the downtown area.

- **Resident:** why do we have it at Central and Attridge even with a low pedestrian activity there?
- **City's Response:** There are quite a bit of pedestrian using this very busy intersection and it makes it safer for them.
- **Resident:** It will be a big benefit to drivers and it will be good if more research can be done with regards to that.

List of Representatives

- Mitch Riabko, Kathy Dahl – Great Works Consulting, Facilitators
- Lanre Akindipe – City of Saskatoon, Transportation & Utilities, Transportation Engineer
- Mariniel Flores – City of Saskatoon, Transportation & Utilities, Transportation Engineer
- Chelsea Lanning – City of Saskatoon, Transportation & Utilities, Transportation Engineer
- Justin Marcoux – City of Saskatoon, Transportation & Utilities, Transportation Engineer
- Marina Melchiorre – City of Saskatoon, Transportation & Utilities, Senior Transportation Engineer

APPENDIX B: TRAFFIC DATA COLLECTION



LEGEND

- EXISTING STOP SIGN
- ▼ EXISTING YIELD SIGN
- BUS ROUTE
- ▬ SCHOOL ZONE
- ⚡ EXISTING TRAFFIC SIGNAL
- 🚶 PEDESTRIAN ACTUATED SIGNAL LOCATION
- TRAFFIC + PEDESTRIAN COUNT MOVEMENT COUNT (INTERSECTION)
- SPEED + TRAFFIC VOLUME STUDY (MIDBLOCK)
- 786 vpd — NUMBER OF VEHICLES PER DAY
- 47.2 kph — 85th PERCENTILE SPEED

ARBOR CREEK/ERINDALE TRAFFIC DATA COLLECTION MAP



APPENDIX C: PEDESTRIAN DEVICE ASSESSMENTS

Pedestrian Actuated Signal Warrants

Kenderdine Rd & Perehudoff Cres

Prepared By: Yang Li Date: Wednesday, July 26, 2017

Location and Roadway Classification: Collector & Local

Date of Count: Day of wk: Monday Mth, Day, Yr: 6,5,2017

Weather: _____

Traffic Control Devices: _____

Current Pedestrian Control: Standard crosswalk

Other Notes: _____

Number of travel lanes passing through the crosswalk(s) 2 lanes

Is there a physical median in this crosswalk(s)? n (y or n)

Speed limit (or 85th percentile speed) 50 km/h

85th percentile (check one)

Posted Limit

Distance to nearest protected crosswalk 90 m

Location: Attridge Dr

Type: Signalized

Is the orientation of this crosswalk(s) N-S? n (y or n)

Duration of pedestrian count 6 hrs

Elementary: _____ Total Warranted PC Points: _____ or _____ / period

High School: 5 Highest PC point value: 229 at

Adult: _____ Active Ped Corridor Points: _____

Senior: _____ Pedestrian Actuated Signal Points: 13

Vehicles passing through crosswalk(s): 1,457

ACTIVE PEDESTRIAN CORRIDOR NOT WARRANTED
PEDESTRIAN ACTUATED SIGNAL NOT WARRANTED

****Install device at the South Crosswalk ****

(Note: Standard and Zebra crosswalks can be installed on both sides if pedestrian volumes are approximately equal.)

Time (15 minute intervals)	Vehicle Counts				Pedestrian Counts										
	SB	WB	NB	EB	North Crosswalk				South Crosswalk						
					Child	Teen	Adult	Senior / Impaired	Senior / Impaired	Adult	Teen	Child			
7:00															
7:15														1	
7:30															
7:45															
8:00	30	1	43												
8:15	40	3	87												
8:30	37	2	52											1	
8:45	31	2	36												
9:00															
9:15															
9:30															
9:45															
AM Totals	138	8	218											2	
11:30	15	1	20												
11:45	25		24												
12:00	23		21												
12:15	26	2	32												
12:30	36	1	27												
12:45	31	4	45												
13:00	27	2	33												
13:15	17		32												
Noon Totals	200	10	234												
14:00															
14:15															
14:30															
14:45															
15:00	34	3	40											2	
15:15	53	1	40												
15:30	50	2	36												
15:45	44	4	40											1	
16:00	40	2	38												
16:15	36		26												
16:30	42	4	31												
16:45	41	3	39												
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20:00															
20:15															
20:30															
20:45															
PM Totals	340	19	290											3	
Totals	678	37	742											5	
North Crosswalk =											South Crosswalk =				5

APPENDIX D: TRAFFIC SIGNALS ASSESSMENTS

City of Saskatoon Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Kerr Rd	Direction (EW or NS)	EW
Side Street (name)	Kenderdine Rd	Direction (EW or NS)	NS
Quadrant / Int #		Comments	YL
<small>CHECK SHEET</small>			

for Warrant Calculation Results, please hit 'Page Down'

Road Authority:	City of Saskatoon
City:	Saskatoon
Analysis Date:	2017 August 1, Tues
Count Date:	2017 June 05, Tues
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Kerr Rd	WB		1				1	245	1
Kerr Rd	EB		1			1		1,340	2
Kenderdine Rd	NB				1				
Kenderdine Rd	SB				1				

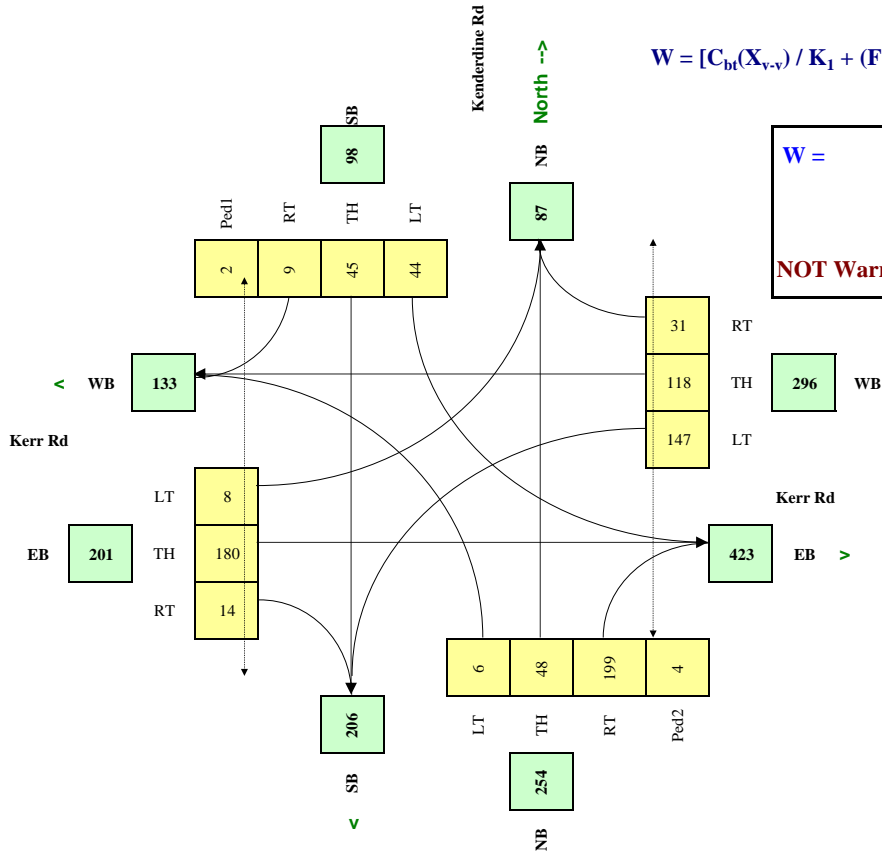
Are the Kenderdine Rd NB right turns significantly impeded by through movements? (y/n) n
 Are the Kenderdine Rd SB right turns significantly impeded by through movements? (y/n) n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	265,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Kerr Rd	EW	50	3.0%	y	0.0
Kenderdine Rd	NS		3.0%	y	

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	2	38	302	44	13	1	46	48	8	3	262	3	0	8	2	0
8:00 - 9:00	9	89	287	58	32	7	78	64	22	7	224	20	4	2	1	2
11:30 - 12:30	3	47	105	29	35	4	119	111	21	9	115	8	0	3	9	0
12:30 - 13:30	7	44	151	33	34	13	115	99	27	12	123	7	2	1	2	0
16:00 - 17:00	7	31	171	43	68	13	238	198	47	7	179	26	2	3	6	0
17:00 - 18:00	9	41	180	57	87	14	287	187	61	7	175	18	1	5	4	3
Total (6-hour peak)	37	290	1,196	264	269	52	883	707	186	45	1,078	82	9	22	24	5
Average (6-hour peak)	6	48	199	44	45	9	147	118	31	8	180	14	2	4	4	1

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p})L) / K_2] \times C_i$$

W =	62	59	3
	Veh	Ped	
NOT Warranted			

RESET SHEET

CITY OF SASKATOON Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Kenderdin Rd	Direction (EW or NS)	NS
Side Street (name)	Rogers Rd	Direction (EW or NS)	EW
Quadrant / Int #		Comments	YL
CHECK SHEET			

for Warrant Calculation Results, please hit 'Page Down'

Road Authority:	CITY OF SASKATOON
City:	SASKATOON
Analysis Date:	2017 Jul 26, Wed
Count Date:	2017 May 29, Mon
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Kenderdin Rd	NB				1			692	1
Kenderdin Rd	SB				1			1,000	1
Rogers Rd	WB								
Rogers Rd	EB				1				

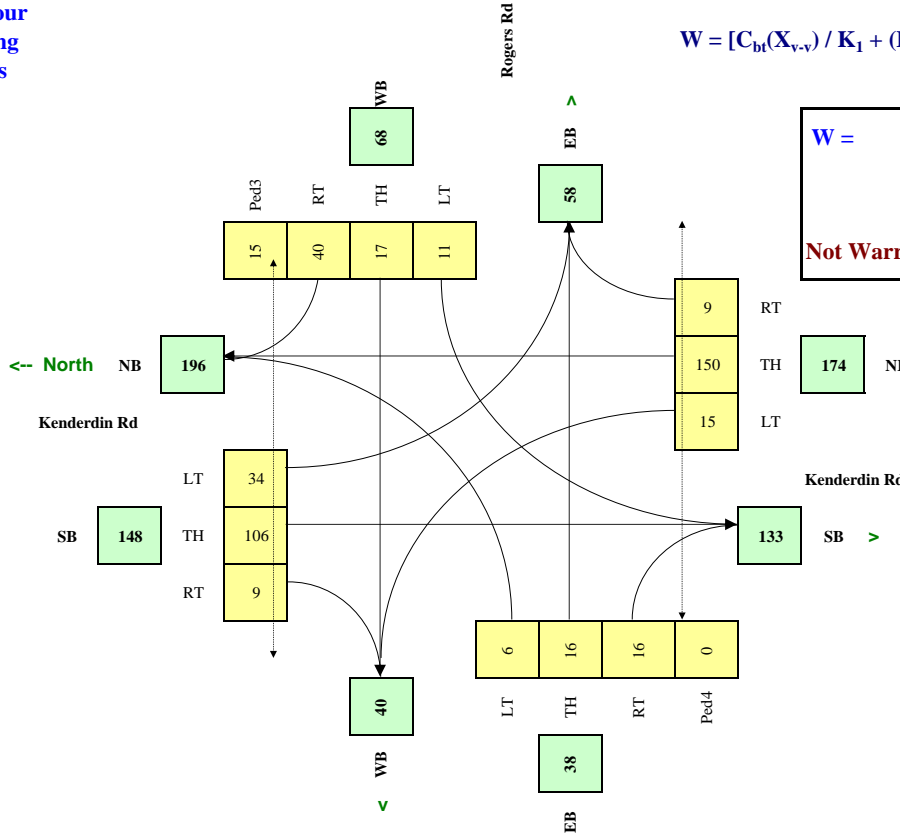
Are the Rogers Rd WB right turns significantly impeded by through movements? (y/n) n
 Are the Rogers Rd EB right turns significantly impeded by through movements? (y/n) n

Demographics		
Elem. School/Mobility Challenged	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	230,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Kenderdin Rd	NS	50	2.0%	y	
Rogers Rd	EW			n	

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00	15	168	3	11	34	4	8	40	37	0	7	5	1	8	8	
8:00 - 9:00	28	196	21	32	75	13	19	26	74	6	10	11	20	56	32	
11:30 - 12:30	7	97	8	36	96	12	16	9	37	7	9	21	12	4	11	
12:30 - 13:30	15	118	3	20	85	7	9	7	20	2	11	10	3	2	10	
16:00 - 17:00	11	137	9	43	151	8	9	7	31	8	28	24	13	9	28	1
17:00 - 18:00	13	183	10	60	195	7	3	10	43	11	28	27	4	6	0	1
Total (6-hour peak)	89	899	54	202	636	51	64	99	242	34	93	98	53	85	89	2
Average (6-hour peak)	15	150	9	34	106	9	11	17	40	6	16	16	9	14	15	0

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p})L) / K_2] \times C_i$$

W =	22	15	7
		Veh	Ped
Not Warranted - Vs < 75			

RESET SHEET

APPENDIX E: COLLISION ANALYSIS

Street 1	Street 2	UGRID	2012	2013	2014	2015	2016	Total Number of Collisions (2012 - 2016)	Total Number of Collisions (2016)	Right Angle, Left Turn & Right Turn Collisions Only (2012 - 2016)	Right Angle, Left Turn & Right Turn Collisions Only (2016)	Average Number of Collisions (2012 - 2016)
KENDERDINE RD	BUDZ CR	SKQ7-3	2	2	0	1	0	5	0	2	0	1
KENDERDINE RD	BECKETT GR N	SKO7-18	3	1	0	1	1	6	1	1	0	1
KENDERDINE RD	COWLEY RD	SKP6-1	1	1	0	1	1	4	1	3	1	1
KENDERDINE RD	BUCKWOLD COVE	SKP7-31	0	1	1	2	0	4	0	1	0	1
KENDERDINE RD	GUENTHER CR N LEG	SKQ7-8	0	0	0	1	0	1	0	0	0	0
KENDERDINE RD	HOGG CR	SKO6-35	0	0	0	0	1	1	1	0	0	0
KENDERDINE RD	EASTMAN COVE / HINITT PL	SKQ6-18	1	1	0	2	0	4	0	0	0	1
KENDERDINE RD	BONLI CR W	SKP5-19	0	0	0	0	1	1	1	0	0	0
KENDERDINE RD	GILLAM CR	SKO7-22	0	0	0	1	0	1	0	0	0	0
KENDERDINE RD	GUENTHER S / HORLICK CR	SKQ7-9	0	1	0	0	0	1	0	0	0	0
KERR RD	BERINI DR	SKO7-7	1	1	1	0	1	4	1	1	1	1
KERR RD	COLLINS CR W / FORSYTH CR	SKP6-49	1	1	3	0	0	5	0	3	0	1
KERR RD	BORNSTEIN CR	SKP7-14	0	0	1	1	0	2	0	1	0	0
KERR RD	CHOTEM CR W / COWLEY RD	SKP7-6	1	0	0	1	1	3	1	4	1	1
KERR RD	GILLAM CR	SKO7-4	0	0	0	0	1	1	1	0	0	0
KERR RD	HURLEY CR	SKP7-15	0	1	0	0	1	2	1	1	1	0
ROGERS RD	BERINI DR	SKO6-37	2	0	0	1	1	4	1	1	0	1
ROGERS RD	KENDERDINE RD	SKO6-38	1	0	0	2	1	4	1	1	0	1
ROGERS RD	COWLEY RD	SKP6-3	0	0	0	0	1	1	1	0	0	0
COWLEY RD	MCORMOND RD	SKQ6-5	1	1	1	3	2	8	2	1	0	2
COWLEY RD	WICKENDEN S	SKP6-7	0	0	0	0	1	1	1	0	0	0
115TH ST	KENDERDINE / KENDERDINE RD	SKP5-5	1	2	6	0	3	12	3	4	0	2
115TH ST	BERINI DR	SKO5-8	2	5	1	4	5	17	5	9	3	3
115TH ST	HOGG CR / KEEVIL WAY	SKO5-12	0	0	1	0	0	1	0	0	0	0
FORSYTH CR	HURLEY CR	SKP6-32	0	1	0	1	0	2	0	1	0	0
EPP AVE	KENDERDINE RD / MULCASTER	SKP5-3	1	1	0	0	1	3	1	1	0	1
MCORMOND RD	KERR RD / STENSURD RD	SKQ6-10	17	27	19	20	14	97	14	27	4	19
KENDERDINE RD	KERR RD	SKQ6-11	3	2	1	4	2	12	2	4	1	2

APPENDIX F: INTERSECTION OF KENDERDRINE ROAD AND KERR ROAD TRAFFIC
ANALYSIS

INTERSECTION OF KENDERDINE ROAD AND KERR ROAD TRAFFIC ANALYSIS

January 2018



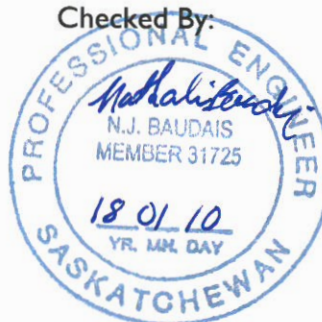
Authorization

Prepared By:

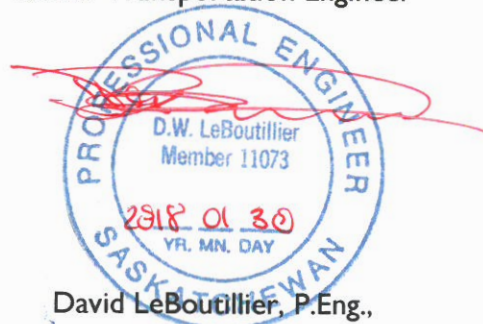


Yang Li, Engineer-in-Training
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EXHIBITS

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Exhibit C – Alternatives Intersection Capacity Analysis

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I INTRODUCTION

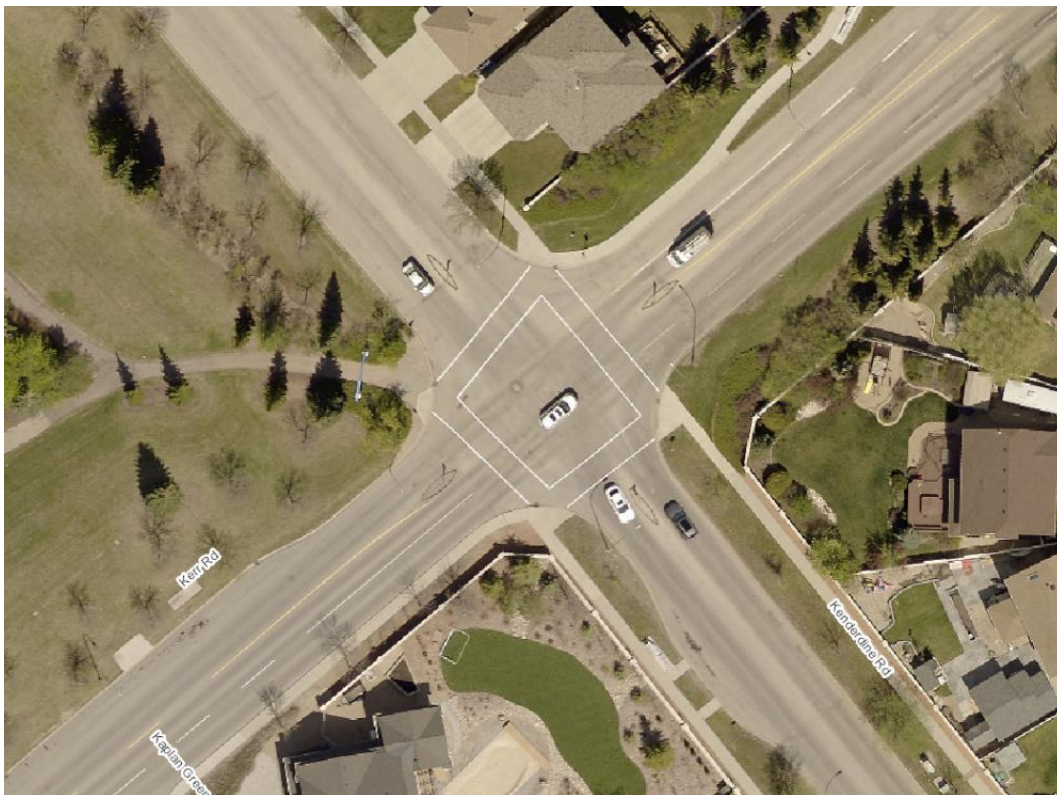
I.1 Background

In 2017, Erindale and Arbor Creek residents participated in a neighbourhood traffic review. As part of the neighbourhood traffic review process, a meeting was held in the spring to provide residents with the opportunity to identify traffic concerns in their neighbourhood. Concerns about the intersection of Kenderdine Road and Kerr Road were raised at the meeting.

Most of the concerns received about this intersection focussed on traffic delays experienced by westbound traffic during the afternoon peak period. Residents complained that the queue length in the westbound direction sometimes extends to the intersection of McOrmond Drive and Kerr Road. The westbound approach is currently signed as a shared through and left and right turn only. Some motorists use the right turn only lane as a through lane.

The Kenderdine Road and Kerr Road intersection is in the Erindale and Arbor Creek neighbourhoods (**Figure I-1**). The intersection is currently configured as a four way stop. Temporary median islands have been installed on all four legs of the intersection.

Figure I-1: Intersection of Kenderdine Road and Kerr Road (East), Saskatoon, SK



Based on the concerns expressed, the City conducted a detailed traffic analysis for the intersection.

1.2 Study Scope

The objective of the traffic study was to assess and analyze the existing and future traffic conditions, identify potential operational or safety issues, develop potential alternative solutions, evaluate alternative solutions and identify the preferred solution.

1.3 Methodology

To achieve the objective outlined above, the methodology included the following tasks:

- Collect traffic and pedestrian data at the intersection;
- Review the collision history at the intersection over the past five years (2012 to 2016);
- Review signage, bus stops and driveways;
- Undertake field observations during peak periods;
- Complete traffic signal warrant analysis in accordance with *The Traffic Signal and Pedestrian Signal Head Warrant Handbook, Transportation Association of Canada, 2014*;
- Analyze the intersection considering two separate measures of performance:
 - The volume to capacity ratio, and
 - The level of service (LOS) for each turning movement, based on the average control delay per vehicle.
- Identify operational and safety issues for existing conditions;
- Develop alternative solutions to address operational and safety issues;
- Evaluate alternative solutions using multiple criteria (including traffic operations, property impacts, costs, etc.); and
- Identify preferred solution.

2 EXISTING CONDITIONS

Kenderdine Road is aligned northwest to southeast and is classified as a collector roadway with a posted speed of 50 kph. Kenderdine Road is a two lane roadway with one parking lane in each direction between Kerr Road and Cowley Road and one parking lane only in southbound direction between Kerr Road and Budz Crescent. Kenderdine Road is a transit route with a bus stop south of the intersection.

Kerr Road aligns northeast to southwest and is classified as a collector roadway with a posted speed of 50 kph. Kerr Road four lane (2 lanes either direction) roadway with no parking on either side between Kenderdine Road and McOrmond Drive and one parking lane in each direction between Kenderdine Road and Forsyth Crescent. Kerr Road is a transit route with bus stops on the east and west legs of the intersection.

The existing traffic control device at the intersection of Kenderdine Road and Kerr Road is a four-way stop sign.

2.1 Past Studies

No previous studies were identified for this intersection.

2.2 Collision Analysis

The most recent available five year collision data from Saskatchewan Government Insurance (SGI) is from 2012 to 2016. This data was reviewed for collision configuration at the intersection of Kenderdine Road and Kerr Road. This data is presented in **Table 2-1**.

Table 2-1: Collision History for Kenderdine Road and Kerr Road intersection (East)

Year	Number of Collisions	Type of Collision			
		Left Turn	Right Angle	Rear End	Other
2012	3	0	2	0	1
2013	2	0	0	2	0
2014	1	0	0	1	0
2015	4	0	1	1	2
2016	2	0	1	1	0
Total	12	0	4	5	3

The following was noted based on the collision table above:

- Approximately 42% of the collisions at this intersection are rear end collisions.
- Approximately 33% of the collisions at this intersection are right angle collisions. These right angle collisions indicate that neither vehicle was attempting a turn.
- No known fatalities have occurred.
- The majority of collisions (75%) resulted in property damage only. Three collisions resulted in personal injury. Two of the collisions resulting in personal injury were the right angle collision type.
- The majority of collisions (92%) occurred during daylight hours. One collision occurred during dark hours; however, street lighting was on at the time of the collision.
- Six of the collisions occurred with dry road conditions, four of the collisions occurred on packed snow or ice road conditions and the road surface conditions for the other two collisions was not recorded.
- The “Other” collision types include: 1 fixed / movable object collision, 1 lost control – right ditch and 1 side swipe / same direction.

2.3 Field Observations

The following activities were observed during the field visit:

- Some westbound motorists use the right turn only lane approaching the intersection as a through lane in an attempt to bypass left turning vehicles.
- Westbound queues occasionally extend to the intersection of McOrmond Drive and Kerr Road during the PM peak periods.

- Non-compliance with lane designation is contributing to excessive queues and poor operation in the afternoon peak period.
- Westbound drivers attempting a through movement in the right turn lane are causing delays by waiting for an opportunity to proceed.

2.4 Existing Traffic Volumes

Traffic and pedestrian counts were collected at this intersection in June 2017 during the weekday peak hours (7:00 a.m to 9:00 a.m; 11:30 a.m to 1:30 p.m; 3:00 p.m to 6:00 p.m). The counts were used to complete the warrants for traffic signals and capacity analysis of alternative solutions.

The existing weekday AM and PM peak hour traffic volumes are illustrated in **Figure 2-1**.

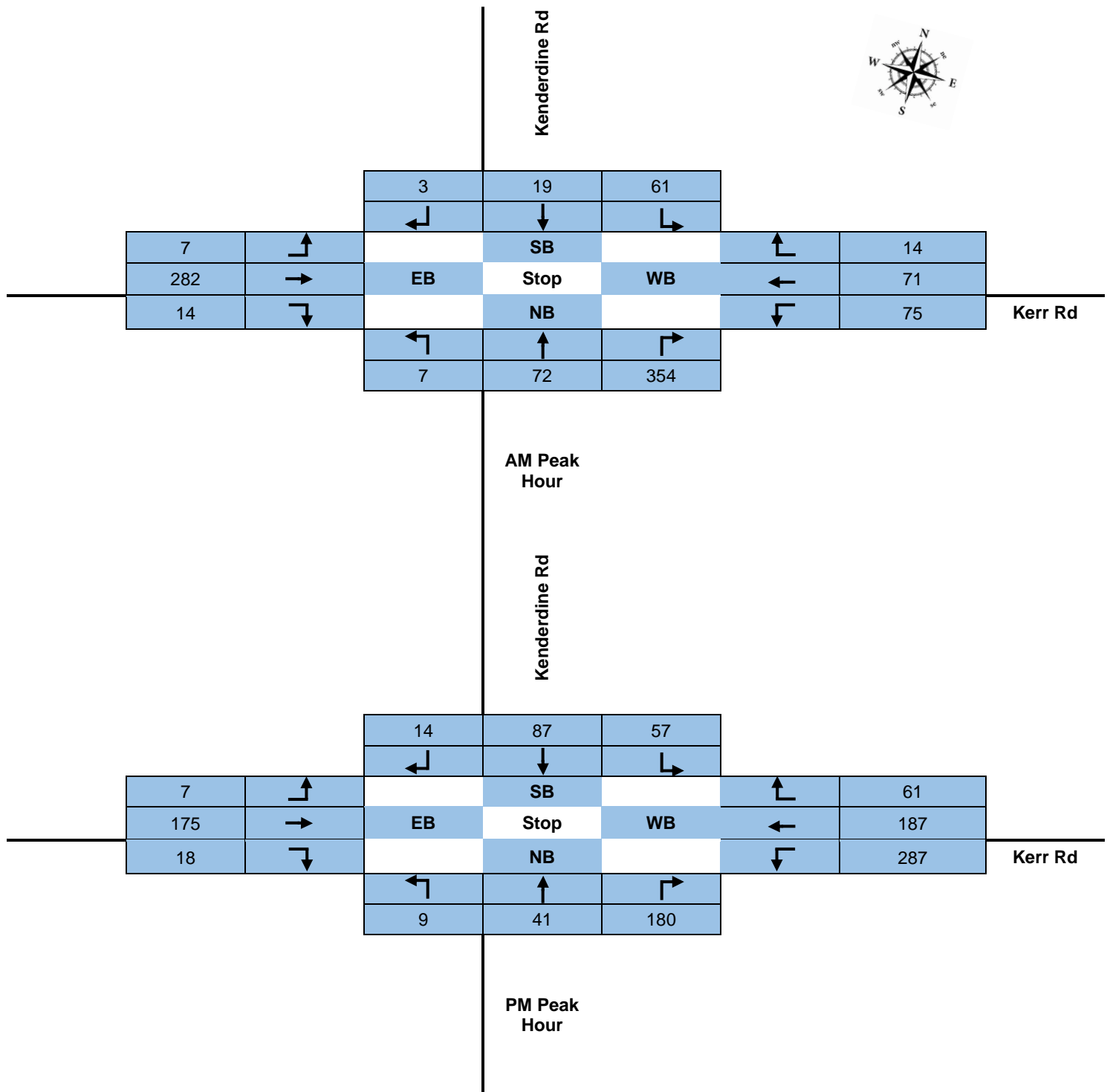


Figure 2-1: Existing Peak Hour Traffic Volumes

2.5 Intersection Capacity Analysis

Intersection capacity analysis was undertaken for the study intersection by using Synchro 9.0, a traffic analysis software package based on the methods outlined in the Highway Capacity Manual (HCM) 2000. This model uses standard transportation engineering procedures to determine the Volume to Capacity Ratio (v/c) and the corresponding delay-based traffic Level of Service (LOS) for movements at each intersection in the study network.

In general terms, for design purposes, the City of Saskatoon generally accepts a LOS D or better for all movements. If the LOS is worse than D, then mitigation measures may have to be recommended; however, individual approaches and/or turning movements experiencing LOS E may be considered acceptable depending on their respective v/c ratios, queue lengths and overall intersection LOS.

For unsignalized intersections, the LOS methodology considers intersection geometry, traffic volumes, speed limit, and type of intersection control. For signalized intersections, the LOS methodology considers intersection geometry, traffic volumes, speed limit, and signal timing plan. Delays range from LOS 'A' conditions with minimal delay to LOS 'F' representing longer delay. The LOS criteria for unsignalized and signalized intersections are summarized in **Table 2-2**:

Table 2-2. HCM Level of Service Summary

Level of Service (LOS)	Average Delay for Unsignalized Intersection (seconds per vehicle)	Average Delay for Signalized Intersection (seconds per vehicle)
A	0 - 10	0 - 10
B	> 10 - 15	> 10 - 20
C	> 15 - 25	> 20 - 35
D	> 25 - 35	> 35 - 55
E	> 35 - 50	> 55 - 80
F	> 50	> 80

The v/c ratio provides a quantitative value as to how much of the intersection's capacity is used to move traffic under the given traffic condition. If the ratio is greater than one, the available capacity has been exceeded and traffic conditions begin to break down. Typically, a v/c ratio of 0.90 or lower for all intersection movements is accepted in urban areas.

The results of the existing intersection capacity analysis for Kenderdine Road and Kerr Road are summarized in **Table 2-3**:

Table 2-3: Existing Operating Conditions

Intersection	Movement		AM Peak Hour				PM Peak Hour			
			Measure of Effectiveness							
			v/c Ratio	Delays (s)	LOS	Queue 95th (m)	v/c Ratio	Delays (s)	LOS	Queue 95th (m)
Kenderdine Road and Kerr Road	EB	LT	0.28	10.6	B	-	0.19	10.4	B	-
		TH	0.29	10.6	B	-	0.21	10.4	B	-
		RT	0.29	10.6	B	-	0.21	10.4	B	-
	WB	LT	0.29	11.4	B	-	0.91	44.4	E	-
		TH	0.29	11.4	B	-	0.91	44.4	E	-
		RT	0.02	7.8	A	-	0.1	8	A	-
	NB	LT	0.63	16.1	C	-	0.41	13.3	B	-
		TH	0.63	16.1	C	-	0.41	13.3	B	-
		RT	0.63	16.1	C	-	0.41	13.3	B	-
	SB	LT	0.15	10.3	B	-	0.31	12.9	B	-
		TH	0.15	10.3	B	-	0.31	12.9	B	-
		RT	0.15	10.3	B	-	0.31	12.9	B	-
Intersection Summary			0.63 (max)	13.1	B	-	0.91 (max)	25.6	D	-

The following was noted based on the Synchro analysis for existing conditions at this intersection:

- The intersection is currently a four way stop.
- The westbound left and through movements are experiencing significant delays during the PM peak period. These movements operate at a level of service E.
- During the PM peak period, traffic queues occasionally extend to the intersection of McOrmond Drive and Kerr Road. This operation was confirmed during field observations.
- All other approaches operate at an acceptable level of service.

2.6 Operational and Safety Issues

The intersection of Kenderdine Road and Kerr Road (East) is experiencing the following operational and safety issues:

- Westbound traffic delays during the PM peak hour; and
- Occasional lack of compliance with guide signs and/or stop control.

3 ALTERNATIVE SOLUTIONS

A number of alternatives were developed and analyzed for improvements at this intersection. These options are illustrated in **Exhibit A** and include:

1. Do nothing, maintain existing all-way stop and median islands;
2. Two lane roadway, roadway widening to provide additional westbound lane, west of the intersection;
3. Two-way stop control, change all-way stop to two-way stop for Kenderdine Road;
4. Traffic Signal; and
5. Roundabout.

Although a traffic signal alternative was developed for the intersection, a traffic signal is not warranted at this location. The signal warrant analysis is included in **Exhibit B**.

3.1 Evaluation of Alternatives

The alternatives were evaluated according to the following evaluation criteria:

- Property Impact;
- Traffic Operations;
- Pedestrian & Cyclist Accommodation;
- Traffic Safety;
- Driveway;
- Environmental; and
- Costs

The relative evaluation of the alternatives can be found in **Table 3-1**. The scale for the evaluation is:





Poor	Fair	Good	Excellent
			

Table 3-1: Evaluation Matrix

Criteria	Measures	Alternatives				
		Do Nothing	Two Lane Roadway	Two-Way Stop	Traffic Signal	Roundabout
Property Impact	Amount of property acquisition required	None	None	None	None	None
Traffic Operations	LOS, Average delay per vehicle (seconds) and v/c ratio for AM and PM peak hours.	AM: LOS: B Delay: 13.1 v/c: 0.63 PM: LOS: D Delay: 25.6 v/c: 0.91	AM: LOS: B Delay: 12.8 v/c: 0.63 PM: LOS: C Delay: 15.7 v/c: 0.73	AM: LOS: B Delay: 14.4 v/c: 0.66 PM: LOS: E Delay: 39.7 v/c: 1.26	AM: LOS: A Delay: 7.4 v/c: 0.57 PM: LOS: B Delay: 17 v/c: 0.86	AM: LOS: A Delay: 6.2 PM: LOS: A Delay: 6.9
Pedestrian & Cyclist Accommodation	Rating of the impact on cyclists and pedestrians, and how well the alternative will accommodate cyclists and pedestrians	No change	Increases pedestrian crossing distance on Kerr Road	May increase pedestrian delay crossing Kerr Road since vehicles are not required to stop on Kerr Road	Protects pedestrian movements by restricting traffic movements during the pedestrian signal phase; but, may increase pedestrian delay	Provides refuge for pedestrian to cross one direction of traffic at a time; but, may increase pedestrian delay since vehicles are not required to stop
Traffic Safety	Crash severity and rate; number of conflict points; speed reduction	May increase crashes due to driver frustration or lead motorists to increase their speed to regain time spent at the stop	May reduce certain collision types (i.e. as side swipe)	Higher anticipated crash rate and severity than do nothing; may encourage speeding	Reduces the frequency of certain types of crashes (i.e. right-angle); lower crash rate than do nothing due to signal and lighting improvements	Lower crash rate than signalized intersection due to fewer vehicle crossing conflict points; lower anticipated crash severity due to speed reduction
Driveways	Rating of how the alternative will accommodate existing driveways	No impact	No impact	No impact	Minor impact	Minor impact
Environmental	Impact to vegetation and air quality	No change	May reduce greenhouse gas emissions due to less delay	May reduce greenhouse gas emissions due to less delay	May reduce greenhouse gas emissions due to less delay	May reduce greenhouse gas emissions due to less delay
Costs	Construction cost	No cost	Moderate cost	Minimal cost	Moderate cost	Significant cost
Total Relative Score:		4.25	4.5	4.75	5	5.75

This Evaluation Matrix illustrates a ranking of “Preferred” for the roundabout. The roundabout is the technically preferred alternative based on the following rationale:

- The ability to improve the intersection operations and safety while decreasing overall vehicle delay. The detailed results of the intersection capacity analysis for proposed roundabout are summarized in **Exhibit C**.
- The ability to reduce crash frequency and severity;
- The ability to accommodate both pedestrians and cyclists; and
- The ability to reduce greenhouse gas emissions and improve air quality.

4 CONCLUSION AND RECOMMENDATIONS

Based on the traffic and pedestrian data, past studies, collision histories, field reviews, traffic assessments and analysis at the intersection of Kenderdine Road and Kerr Road, the installation of a roundabout is recommended. A roundabout would provide a more efficient and safer movement of vehicles and pedestrians at this intersection.

The proposed roundabout will have crosswalks on all four approaches to enhance pedestrian safety and provide shorter crossings at the roundabout.

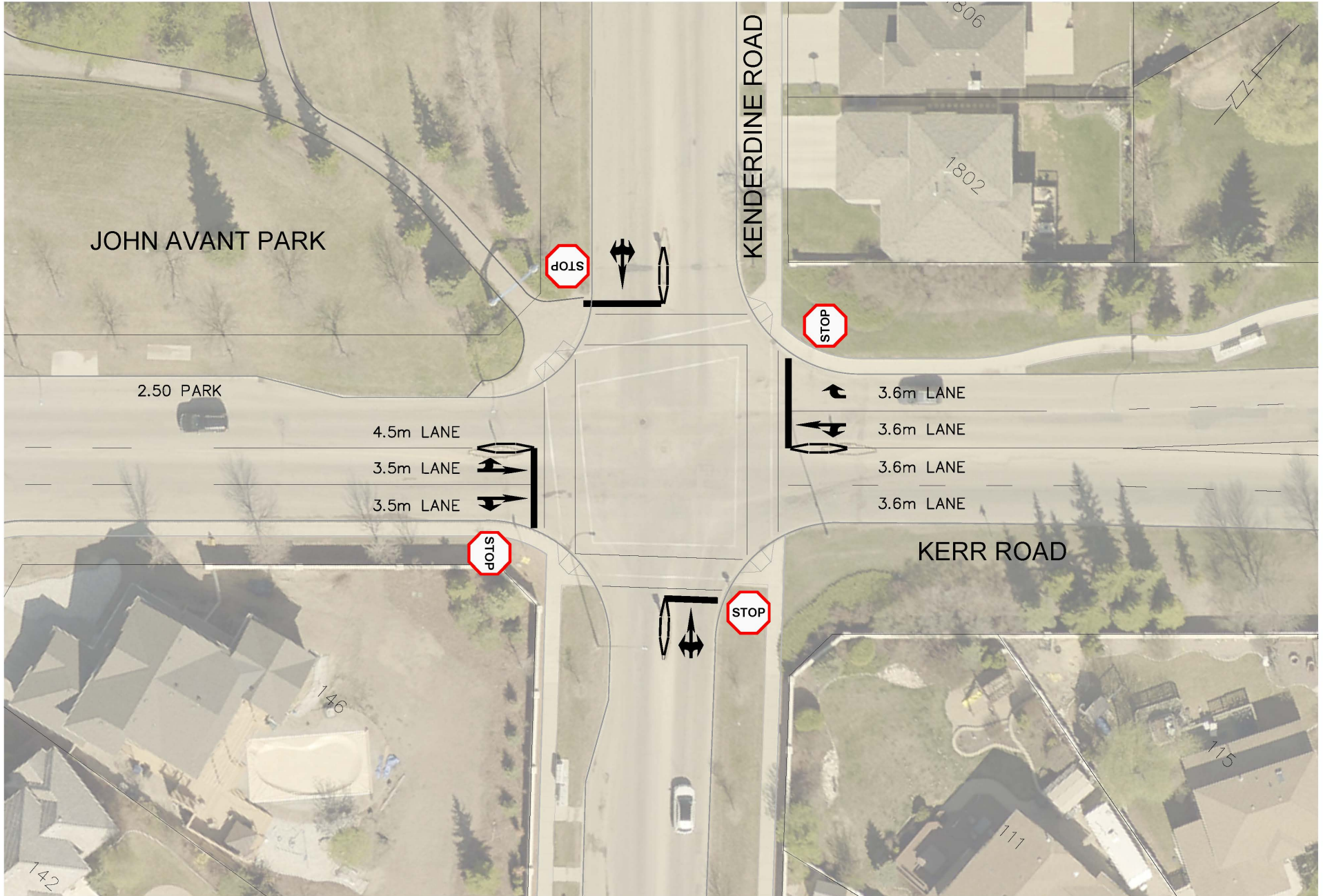
The installation of a temporary roundabout is recommended as a mid-term solution. Examples of temporary roundabouts are shown in **Exhibit D**. Tuff curb is suggested for the temporary roundabout at Kenderdine Road and Kerr Road. These tuff curbs are similar to the ones used for delineation for eastbound traffic on 22nd Street at Confederation Drive, shown in **Exhibit E**.

It is recommended that a new traffic count be completed after the opening of the McOrmond Drive interchange and the North Commuter Bridge; this comparison of alternatives and evaluation should be updated at that time to confirm the appropriate traffic control for this intersection. The proposed roundabout at this intersection is shown in **Exhibit A**.

This temporary roundabout should be reviewed and evaluated after a year or two to ascertain its effectiveness. If proven effective, a permanent roundabout should be installed at this intersection.

EXHIBIT A

ALTERNATIVE SOLUTIONS

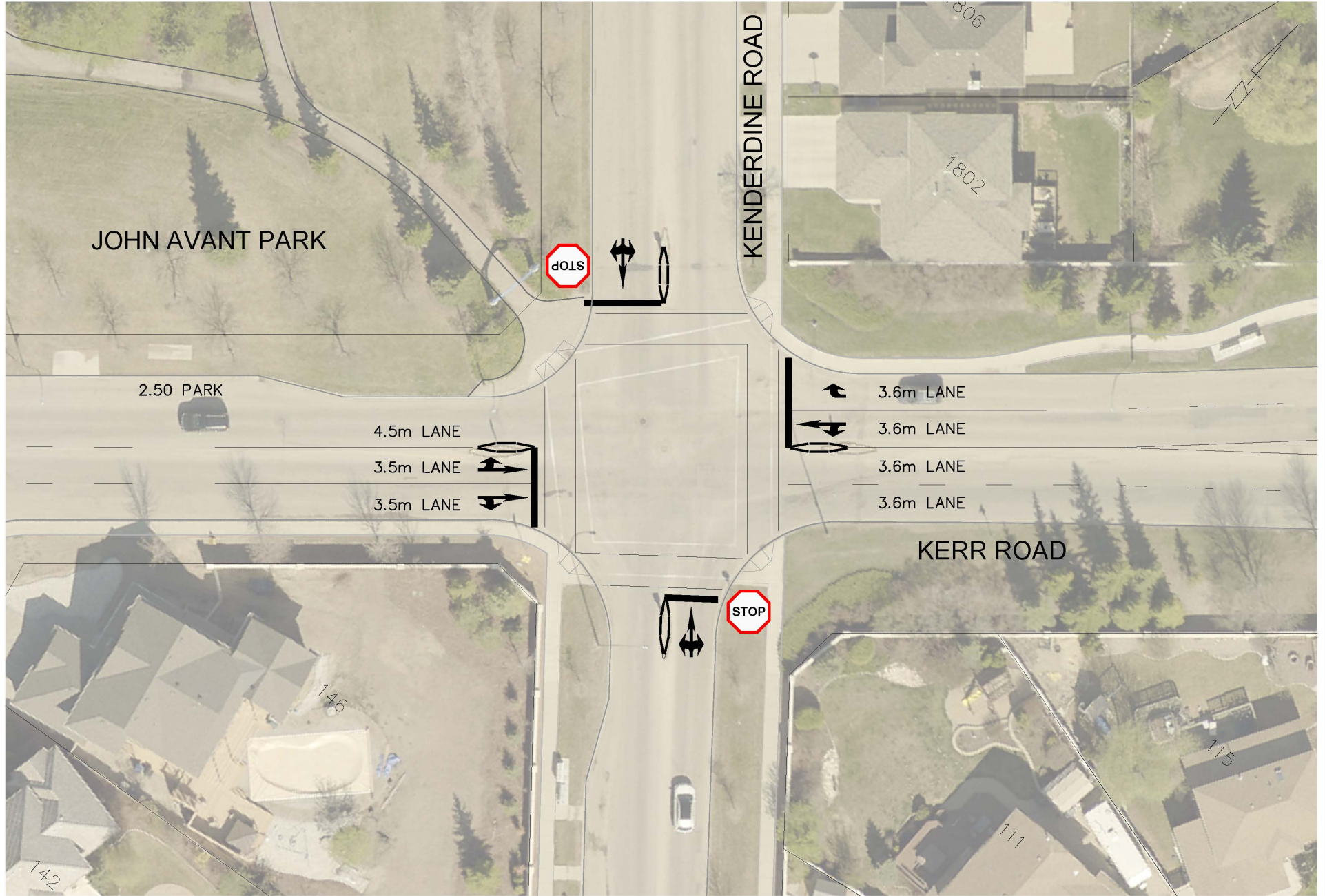


DO NOTHING

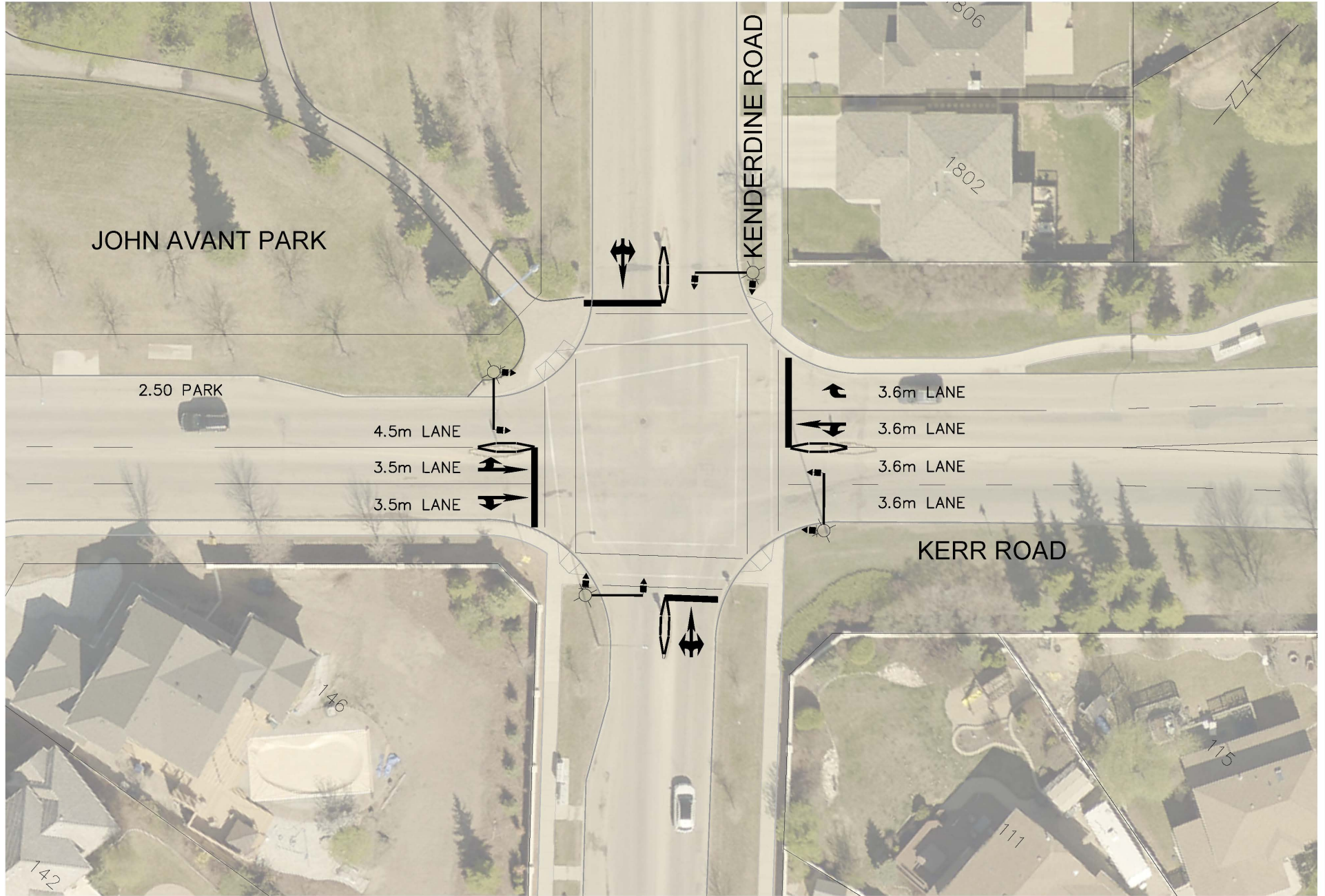


**City of
Saskatoon**

Transportation & Utilities Department



TWO-WAY STOP CONTROL

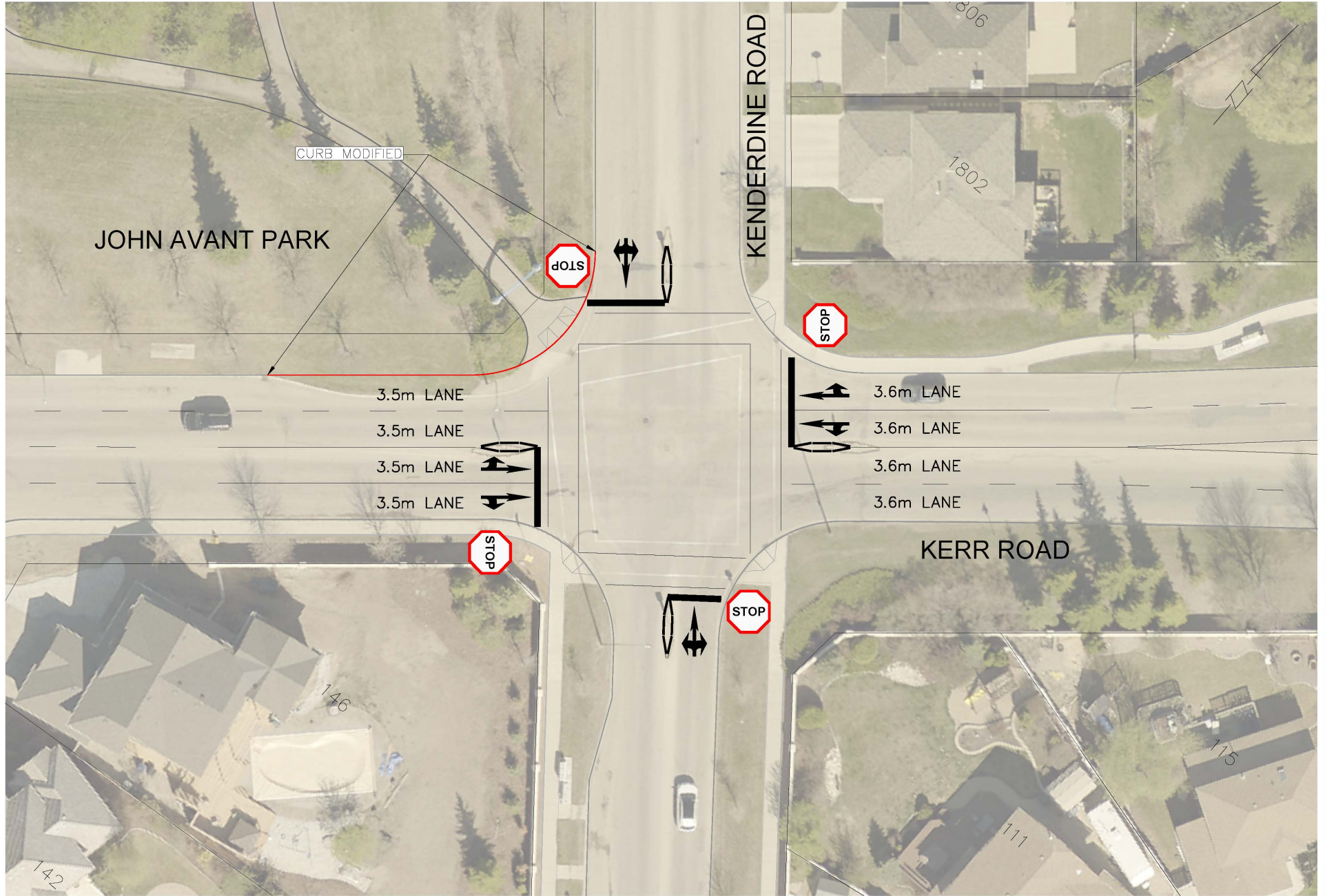


TRAFFIC SIGNALS

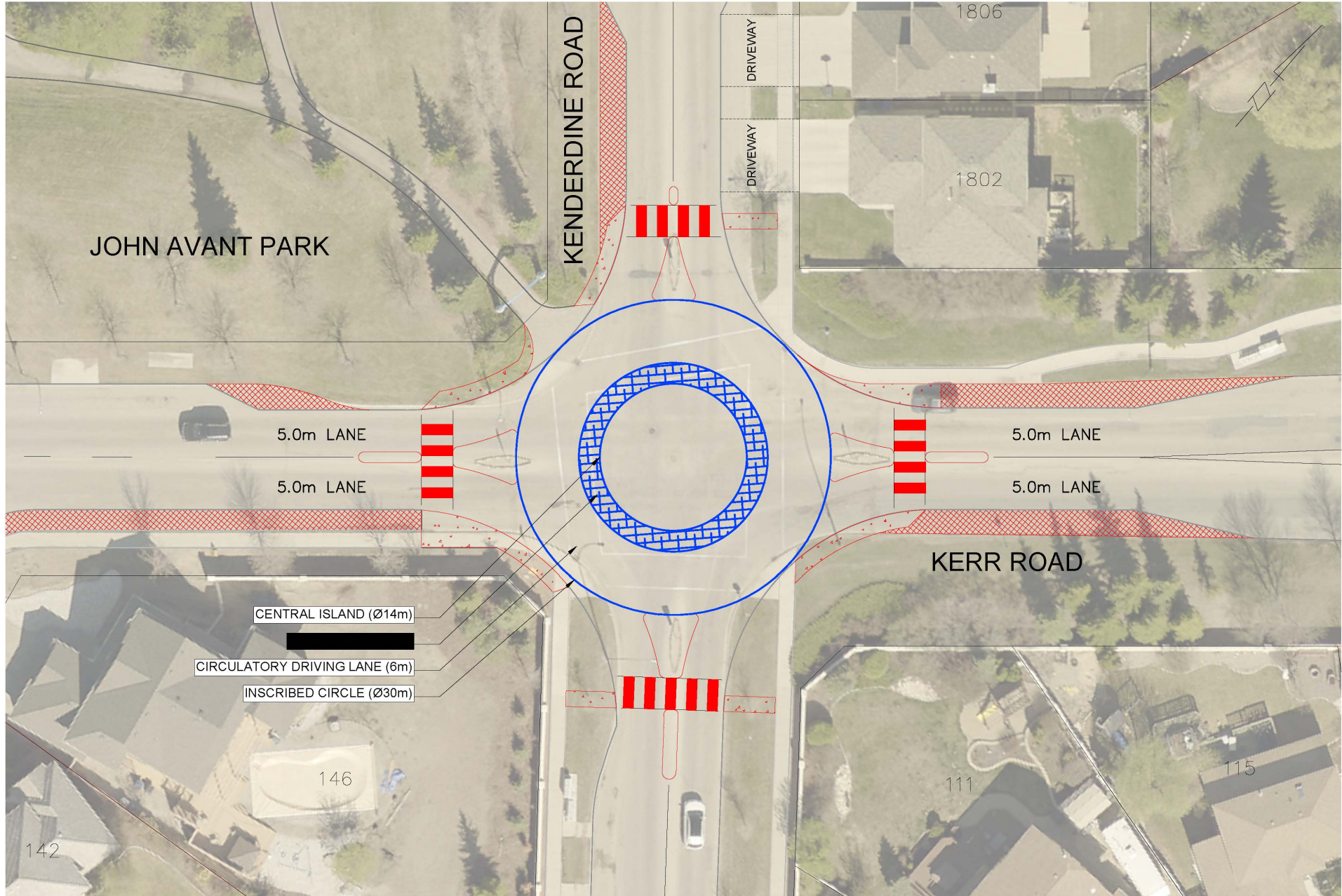


**City of
Saskatoon**

Transportation & Utilities Department



TWO LANE ROADWAY (WIDENING)



-  REMOVAL & LANDSCAPING
-  CONCRETE
-  ZEBRA CROSSWALK

ROUNDAABOUT

EXHIBIT B

TRAFFIC SIGNAL WARRANT ANALYSIS

Traffic signal warrant – Kenderdine Road and Kerr Road (2017 traffic counts)

Assessments are conducted to determine the need for traffic signals, in adherence to the Traffic Signal and Pedestrian Signal Head Warrant Handbook. According to the warrant analysis, traffic signal is not warranted at the intersection of Kenderdine Road and Kerr Road.

City of Saskatoon Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Kerr Rd		Direction (EW or NS)	EW	Road Authority:	City of Saskatoon	
Side Street (name)	Kenderdine Rd		Direction (EW or NS)	NS	City:	Saskatoon	
Quadrant / Int #			Comments	YL	Analysis Date:	2017 August 1, Tues	
For Warrant Calculation Results, please hit 'Page Down'					Count Date:	2017 June 05, Tues	
					Date Entry Format:	(yyyy-mm-dd)	

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	W of Thru Lanes	Stream Signal (m)
Kerr Rd	WB		1				1		245
Kerr Rd	EB		1			1			1,140
Kenderdine Rd	NB				1				
Kenderdine Rd	SB				1				

Are the Kenderdine Rd NB right turns significantly impeded by through movements? (y/n)	n
Are the Kenderdine Rd SB right turns significantly impeded by through movements? (y/n)	n

Other input	Speed (Km/h)	Truck %	Bus Rt. (y/n)	Median (m)
Kerr Rd	EW 50	3.0%	y	0.0
Kenderdine Rd	NS	3.0%	y	

Traffic Input	NB			SB			WB			EB			Ped1 NS		Ped2 NS		Ped3 EW		Ped4 EW	
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side				
7:00 - 8:00	2	38	202	44	13	1	46	48	8	3	262	3	0	8	2	0				
8:00 - 9:00	9	89	287	54	32	7	78	64	22	7	224	20	4	2	1	2				
9:30 - 12:30	3	47	105	29	35	4	119	111	21	9	115	8	0	3	9	0				
12:30 - 13:59	7	44	151	33	34	13	115	99	27	12	323	7	2	1	2	0				
16:00 - 17:00	7	31	171	43	68	13	234	198	47	7	170	26	2	3	6	0				
17:00 - 18:00	9	41	180	57	87	14	287	187	61	7	175	18	1	5	4	3				
Total (6-hour peak)	37	290	1,196	264	269	52	883	707	186	45	1,078	82	9	22	24	5				
Average (6-hour peak)	6	48	199	44	45	9	147	118	31	8	180	14	2	4	4	1				

Average 6-hour Peak Turning Movements

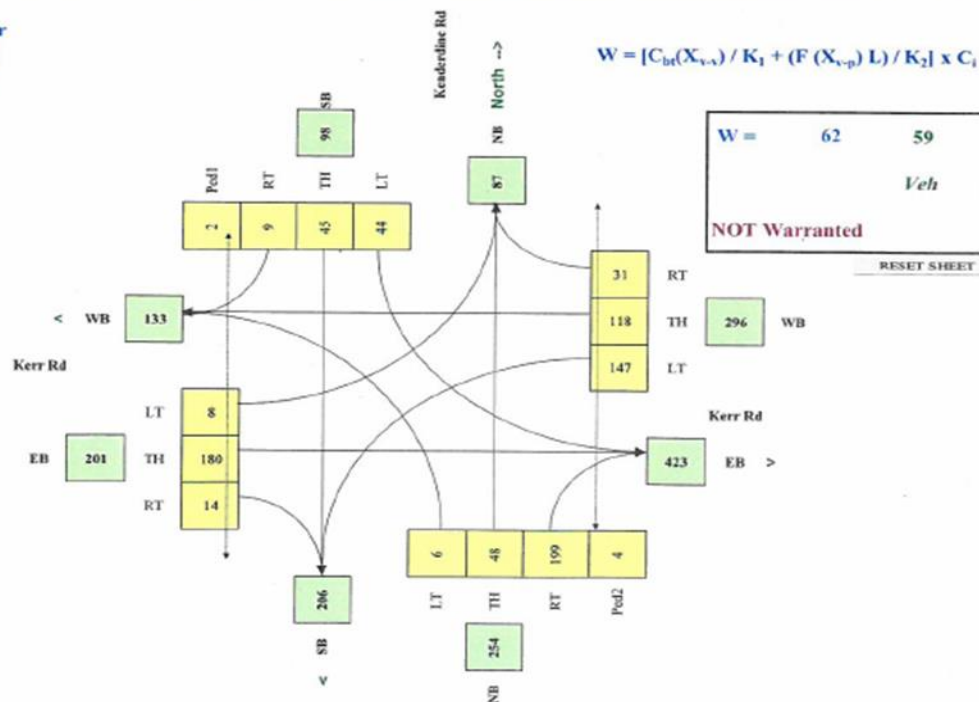


EXHIBIT C

ALTERNATIVES INTERSECTION CAPACITY ANALYSIS

Two lane Roadway

Intersection	Movement	AM Peak Hour				PM Peak Hour				
		Measure of Effectiveness								
		v/c Ratio	Delays (s)	LOS	Queue 95th (m)	v/c Ratio	Delays (s)	LOS	Queue 95th (m)	
Kenderdine Road and Kerr Road	EB	LT	0.27	10.5	B	-	0.19	10.1	B	-
		TH	0.28	10.5	B	-	0.2	10.1	B	-
		RT	0.28	10.5	B	-	0.2	10.1	B	-
	WB	LT	0.22	10.7	B	-	0.73	24.2	C	-
		TH	0.22	9.7	A	-	0.73	17.1	C	-
		RT	0.09	8.8	A	-	0.27	9.9	A	-
	NB	LT	0.63	16	C	-	0.39	12.6	B	-
		TH	0.63	16	C	-	0.39	12.6	B	-
		RT	0.63	16	C	-	0.39	12.6	B	-
	SB	LT	0.15	10.3	B	-	0.3	12.3	B	-
		TH	0.15	10.3	B	-	0.3	12.3	B	-
		RT	0.15	10.3	B	-	0.3	12.3	B	-
Intersection Summary		0.63 (max)	12.8	B	-	0.73	15.7	C	-	

The intersection capacity analysis at this intersection indicates that all approaches are expected to operate at an acceptable level of service during the AM and PM peak periods.

Two-way Stop Control

Intersection	Movement		AM Peak Hour				PM Peak Hour			
			Measure of Effectiveness							
			v/c Ratio	Delays (s)	LOS	Queue 95th (m)	v/c Ratio	Delays (s)	LOS	Queue 95th (m)
Kenderdine Road and Kerr Road	EB	LT	0	0	A	0.1	0.01	0	A	0.1
		TH	0.1	0.2	A	0.1	0.07	0.3	A	0.1
		RT	0.1	0	A	0	0.07	0	A	0
	WB	LT	0.06	0.5	A	1.6	0.22	2.1	A	6.5
		TH	0.06	4.4	A	1.6	0.22	5.9	A	6.5
		RT	0.1	0	A	0	0.04	0	A	0
	NB	LT	0.66	19.5	C	37.4	0.57	24.6	C	26.6
		TH	0.66	19.5	C	37.4	0.57	24.6	C	26.6
		RT	0.66	19.5	C	37.4	0.57	24.6	C	26.6
	SB	LT	0.59	60	F	23.4	1.26	227.4	F	78.6
		TH	0.59	60	F	23.4	1.26	227.4	F	78.6
		RT	0.59	60	F	23.4	1.26	227.4	F	78.6
Intersection Summary			0.66 (max)	14.4	B	-	1.26 (max)	39.7	E	-

The intersection capacity analysis at this intersection indicates that all movements are expected to operate at an acceptable level of service during the AM and PM peak periods except the southbound left/through/right movements.

Traffic Signal

Intersection	Movement		AM Peak Hour				PM Peak Hour			
			Measure of Effectiveness							
			v/c Ratio	Delays (s)	LOS	Queue 95th (m)	v/c Ratio	Delays (s)	LOS	Queue 95th (m)
Kenderdine Road and Kerr Road	EB	LT/TH/RT	0.32	8.4	A	14.1	0.14	6.7	A	9
	WB	LT/TH	0.41	11.9	B	17.9	0.86	28.4	C	88.8
		RT	0.03	2.1	A	1.4	0.09	2.5	A	4.1
	NB	LT/TH/RT	0.57	5.1	A	15.6	0.36	6.6	A	17.8
SB	LT/TH/RT	0.2	8	A	9.1	0.33	16.5	B	27.3	
Intersection Summary			0.57 (max)	7.4	A	-	0.86 (max)	17	B	-

The intersection capacity analysis at this intersection indicates that all approaches are expected to operate at an acceptable level of service during the AM and PM peak periods.

Roundabout

The intersection capacity analysis for proposed roundabout is completed by using Sidra Intersection. Sidra Intersection is a software package used for intersection (junction) and network capacity, level of service and performance analysis.

Intersection	Movement		AM Peak Hour			PM Peak Hour		
			Measure of Effectiveness					
			Delays (s)	LOS	Critical Gap	Delays (s)	LOS	Critical Gap
Kenderdine Road and Kerr Road	EB	LT	9.1	A	5.6	9	A	5.17
		TH	4.7	A	5.6	4.6	A	5.17
		RT	4.5	A	5.6	4.4	A	5.17
	WB	LT	9.7	A	5.47	11.7	B	5.17
		TH	5.3	A	5.47	7.3	A	5.17
		RT	5.1	A	5.47	7.1	A	5.17
	NB	LT	9.5	A	5.62	12	B	5.09
		TH	5.1	A	5.62	7.6	A	5.09
		RT	4.9	A	5.62	7.4	A	5.09
	SB	LT	10.4	B	5.28	8.9	A	5.47
		TH	6.1	A	5.28	4.6	A	5.47
		RT	6.1	A	5.28	4.7	A	5.47
Intersection Summary			6.2	A	-	6.9	A	-

The roundabout analysis at this intersection indicates that all approaches are expected to operate at an acceptable level of service during the AM and PM peak periods.

EXHIBIT D

TEMPORARY ROUNDABOUT EXAMPLES

Chantilly, Virginia, USA



City of San Luis, California, USA



Mckinney, TX, United States



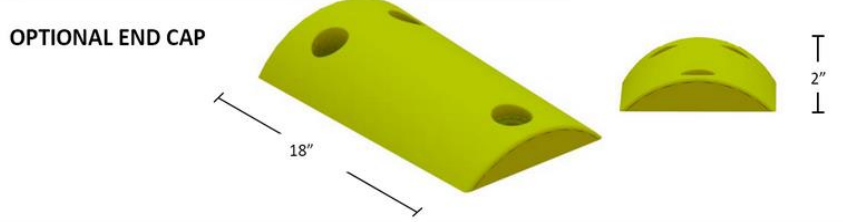
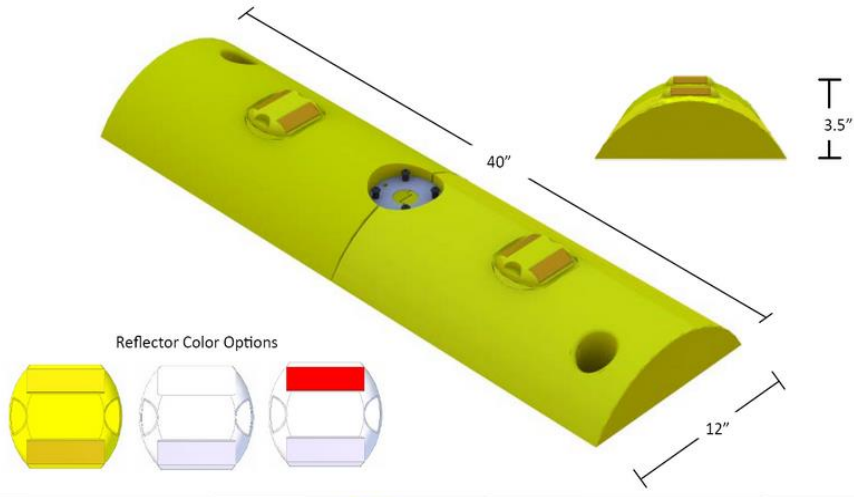
EXHIBIT E

EXAMPLE PRODUCTS - TUFF CURB AND FLEX CURB

APPENDIX F

Tuff Curb®

Turf Curb that will be used for the temporary roundabout



Flex Curb



APPENDIX G: PUBLIC MEETING #2 - NOVEMBER 23, 2016 MINUTES

Erindale / Arbor Creek Neighbourhood Traffic Review: Table Group Discussions

Item #	Location	Recommendation	Reason	Group 1: Lanre Akindipe	Group 2: Marina Melchiorre	Group 3: Nathalie Baudais	Group 4: Mariniel Flores	Group 5: Yang Li
1	115th St between Berni Dr & Kenderdine Rd	Install Speed Display Board facing westbound	Reduce speed			Supportive	In favour	In favour
2	North side of intersection of Berini Dr & Rogers Rd	Install Speed Display Board facing southbound direction	Reduce speed			Supportive	In favour	In favour
3	Kenderdine Rd & Pehudoff Cres (West)	Install 'Pedestrian Ahead', 'Do Not Block Intersection', and pedestrian crosswalk sign	Enhance pedestrian safety	Maybe the crossing should be removed		Supportive, potential for push button?	Problem there where drivers travel SB and switch lane, lane marking needed to prevent confusion, with lanes (2 or 1 lane?) Potential conflict? Ped light?	In favour
4	Bentham Cres (north) & Kenderdine Rd	Upgrade the standard crosswalk to zebra crosswalk	Enhance pedestrian safety	In favour. Parking is too close to the intersection.		Raised crosswalk possible? Ped light?	In favour	In favour
5	Bentham Cres (south) & Kenderdine Rd	Install curb extension on south side	Reduce speed & enhance pedestrian safety			need enough room for 2 buses wide, not as wide as existing examples. Put peds into traffic, pull them out, create hazard	In favour, snow clearing must not be interrupted	In favour
6	Kenderdine Rd between Brunst Cres and Gillam Cres	Install Speed Display Board facing northbound	Reduce speed & enhance pedestrian safety			Supportive	In favour, is this NB traffic?	In favour
7	30m west of Kenderdine Rd & Epp Ave/Mulcaster Cres	Install Speed Display Board facing eastbound direction	Reduce speed			road is rough there, pothole keeps speed down, corner of Kenderdine & Epp curb extension	In favour	In favour
8	Wickenden Cres & Rogers Rd	Make temporary curb extension to permanent	Improve sightline & enhance pedestrian safety			leave temporary for now? Speeding throughout year, no parking on site for school, teachers parking on street	In favour	In favour
9	Rogers Ct & Rogers Rd	Install median Island on east side	Reduce speed & enhance pedestrian safety			not a fan of obstructions in middle of roadway, curb extension one side	75 % in favour	In favour
10	Forsyth Way & Cowley Rd	Remove the temporary curb extension	Improve westbound turning radius			Supportive - needs to be removed, parking in front of mailbox all day	In favour	Keep the curb extension and redesign the northeast corner
11	Steiger Cres & Kenderdine Rd	Install median island on south side	Reduce speed & enhance pedestrian safety			no sidewalk along park side, concerns about RV parking, speed display board instead, hasn't noticed much speeding here	In favour	In favour
12	Kenderdine Rd & Kerr Rd (East)	Install 'Right Turn Only Lane' sign (short-term) and temporary roundabout (mid-term)	Improve intersection operations and safety		delay NB, roundabout intersections are a must!, planters must be raised so people cannot drive over	it would be anarchy, would improve operations? used to have 2 lanes NB, would help, remove median, easy fix, can't wait 2 years for solutions	(Right turn only sign Yes: 20%, No: 40%, Neutral: 40%). Roundabout slow it down, two or one lane? 40% support and 30% is neutral and 30% not support. Need more education for using of roundabout	In favour
13	McMormond Dr & Kerr Rd	Paint yellow guiding line for the westbound left turn	Improve intersection safety			not working, it has improved a lot, extend the line 50 ft further south	Neutral	In favour
14	Stodola Ct & Kenderdine Rd	Install median island on north side	Reduce speed			horrible ped crossing, cars don't stop, vegetation needs trimming	In favour	In favour
15	Kucey Cres (west) & Kenderdine Rd	Install median Island on west side and paint standard crosswalk on east side	Reduce speed & enhance pedestrian safety			Supportive	In favour	In favour
16	Kucey Cres (east) & Kenderdine Rd	Install median Island on east side and paint standard crosswalk on east side	Reduce speed & enhance pedestrian safety			Try it and monitor	In favour	In favour
17	Beckett Green (north) & Kenderdine Rd	Install median island on south side	Reduce speed & enhance pedestrian safety		Signs- No parking to corner, difficult to pass south of Beckett Green when parking on both sides	Try it and monitor	In favour	In favour
18	Beckett Cres (south) & Beckett Green	Install curb extension on southwest corner and yield sign	Reduce speed & improve intersection safety				In favour	In favour
19	Cowley Rd & Kerr Rd	Make temporary curb extension to permanent	Reduce speed & enhance pedestrian safety			Supportive	In favour, Parking too close on Kerr Rd to Cowley Rd, block visibility	In favour
20	Kenderdine Rd (South of Kerr Rd); Berni Dr; Kerr Rd; 115th St; Pehudoff Cres	Increase police enforcement	Reduce speed					In favour

Other Comments				
Group 1: Lanre Akindipe	Group 2: Marina Melchiorre	Group 3: Nathalie Baudais	Group 4: Mariniel Flores	Group 5: Yang Li
Speeding on Pehudoff Cres	Speeding on Kerr Rd	Snow removed in school zones, removing snow banks	Attridge & Berini intersection, NBLF delay is too long when school start and end, would like a protected left turn arrow	Review the intersection of 115th St & Kenderdine Rd, the delay is very long during peak hours, traffic increased due to the interchange and Central Ave & Attridge Ave
Pehudoff & Epp need traffic calming	Schematic of roundabout would be helpful	College D & Circle Dr - turning left to go south, suggests curb so cars can't jump out		Attridge & Berini intersection, NBLF delay is too long when school start and end
Pehudoff parking issue close the church, it is too narrow				Bins on the street should have reflective strip to increase visibility

APPENDIX H: DECISION MATRIX

Item #	Location	Recommendation	Reason	Group 1: Lanre Akindipe	Group 2: Marina Melchiorre	Group 3: Nathalie Baudais	Group 4: Mariniel Flores	Group 5: Yang Li	Decision
1	115th St between Berni Dr & Kenderdine Rd	Install Speed Display Board facing westbound	Reduce speed			Supportive	In favour	In favour	Carried
2	North side of intersection of Berini Dr & Rogers Rd	Install Speed Display Board facing southbound direction	Reduce speed			Supportive	In favour	In favour	Carried
3	Kenderdine Rd & Perehudoff Cres (West)	Install 'Pedestrian Ahead', 'Do Not Block Intersection', and pedestrian crosswalk sign	Enhance pedestrian safety	Maybe the crossing should be removed		Supportive, potential for push button?	Problem there where drivers travel SB and switch lane, lane marking needed to prevent confusion, with lanes (2 or 1 lane?) Potential conflict? Ped light?	In favour	Carried
4	Bentham Cres (north) & Kenderdine Rd	Upgrade the standard crosswalk to zebra crosswalk	Enhance pedestrian safety	In favour. Parking is too close to the intersection.		Raised crosswalk possible? Ped light?	In favour	In favour	Carried
5	Bentham Cres (south) & Kenderdine Rd	Install curb extension on south side	Reduce speed & enhance pedestrian safety			need enough room for 2 buses wide, not as wide as existing examples. Put peds into traffic, pull them out, create hazard	In favour, snow clearing must not be interrupted	In favour	Carried
6	Kenderdine Rd between Brunst Cres and Gillam Cres	Install Speed Display Board facing northbound	Reduce speed & enhance pedestrian safety			Supportive	In favour, is this NB traffic?	In favour	Carried
7	30m west of Kenderdine Rd & Epp Ave/Mulcaster Cres	Install Speed Display Board facing eastbound direction	Reduce speed			road is rough there, pothole keeps speed down, corner of Kenderdine & Epp curb extension	In favour	In favour	Carried
8	Wickenden Cres & Rogers Rd	Make temporary curb extension to permanent	Improve sightline & enhance pedestrian safety			leave temporary for now? Speeding throughout year, no parking on site for school, teachers parking on street	In favour	In favour	Carried
9	Rogers Ct & Rogers Rd	Install median Island on east side	Reduce speed & enhance pedestrian safety			not a fan of obstructions in middle of roadway, curb extension one side	75 % in favour	In favour	Carried
10	Forsyth Way & Cowley Rd	Remove the temporary curb extension	Improve westbound turning radius			Supportive - needs to be removed, parking in front of mailbox all day	In favour	Keep the curb extension and redesign the northeast corner	Modify the existing temporary curb extension
11	Steiger Cres & Kenderdine Rd	Install median island on south side	Reduce speed & enhance pedestrian safety			no sidewalk along park side, concerns about RV parking, speed display board instead, hasn't noticed much speeding here	In favour	In favour	Carried
12	Kenderdine Rd & Kerr Rd (East)	Install 'Right Turn Only Lane' sign (short-term) and temporary roundabout (mid-term)	Improve intersection operations and safety		delay NB, roundabout intersections are a must!, planters must be raised so people cannot drive over	it would be anarchy, would if improve operations, used to have 2 lanes NB, would help, remove median, easy fix, can't wait 2 years for solutions	(Right turn only sign Yes: 20%, No: 40%, Neutral: 40%). Roundabout slow it down, two or one lane? 40% support and 30% is neutral and 30% not support. Need more education for using of roundabout	In favour	Carried
13	McMormond Dr & Kerr Rd	Paint yellow guiding line for the westbound left turn	Improve intersection safety			not working, it has improved a lot, extend the line 50 ft further south	Neutral	In favour	Carried
14	Stodola Ct & Kenderdine Rd	Install median island on north side	Reduce speed			horrible ped crossing , cars don't stop, vegetation needs trimming	In favour	In favour	Carried
15	Kucey Cres (west) & Kenderdine Rd	Install median Island on west side and paint standard crosswalk on east side	Reduce speed & enhance pedestrian safety			Supportive	In favour	In favour	Carried
16	Kucey Cres (east) & Kenderdine Rd	Install median Island on east side and paint standard crosswalk on east side	Reduce speed & enhance pedestrian safety			Try it and see	In favour	In favour	Carried
17	Beckett Green (north) & Kenderdine Rd	Install median island on south side	Reduce speed & enhance pedestrian safety		Signs- No parking to corner, difficult to pass south of Beckett Green when parking on both sides	Try it and see	In favour	In favour	Carried
18	Beckett Cres (south) & Beckett Green	Install curb extension on southwest corner and yield sign	Reduce speed & improve intersection safety				In favour	In favour	Carried
19	Cowley Rd & Kerr Rd	Make temporary curb extension to permanent	Reduce speed & enhance pedestrian safety			Supportive	In favour, Parking too close on Kerr Rd to Cowley Rd, block visibility	In favour	Carried
20	Kenderdine Rd (South of Kerr Rd); Bernie Dr; Kerr Rd; 115th St; Perehudoff Cres	Increase police enforcement	Reduce speed					In favour	Carried

APPENDIX I: ADDITIONAL CONCERNS RECEIVED AFTER PRESENTATION OF DRAFT
PLAN

Item	Location	Comment
1	Bus stops on Berini Drive (south of Attridge Drive)	Move further north closer to Attridge
2	Kenderdine Rd & Kerr Rd	Roundabout is not safe for pedestrian, people have to yield and merge, any impact to adjacent properties?