Development of a Screening Tool for Roundabout Feasibility in Winnipeg

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ABSTRACT

As roundabouts become more prominent in Canada, it is increasingly important for decision-makers to have a defined procedure for evaluating when a roundabout is warranted. For the City of Winnipeg this is a present challenge as no such procedure currently exists. To address this, a screening tool was developed to aid engineers in efficiently evaluating when a roundabout is warranted in Winnipeg. The tool, designed to be used in retrofit situations, provides a clear step by step set of considerations when evaluating a potential roundabout location. The tool guides engineers to analyze context sensitive and qualitative factors that can be easily overlooked during initial analyses. Major evaluation objectives include safety, operations, traffic calming, spatial requirements, environmental and aesthetics. The data required to evaluate these objectives includes collision history, cost of collisions, road geometry, and speed limit, as well as mode interaction/split, traffic volume and turning movements. Surrounding land use is an additional consideration both with respect to acquisition cost as well as potential constructability issues. A review of jurisdictions with existing screening procedures was performed to develop an understanding of the requirements of an effective and comprehensive screening tool for roundabouts. These procedures were analyzed to aid in developing additional considerations for the screening tool to create a procedure that makes sense in Winnipeg's environment. In addition to a review of other jurisdictions' procedures, a literature review was conducted that focused on reports and recent conference papers that addressed considerations for evaluating roundabouts and roundabout design. This paper consolidates the information obtained from both the consultation with multiple jurisdictions as well as a review of relevant literature to provide a comprehensive source on roundabouts for a mid-sized urban area. The consolidated information combined with the screening tool serve to provide a foundation for the City of Winnipeg to evaluate roundabouts in future intersection retrofit situations and support future policy consideration.

INTRODUCTION

In 2011, the City of Winnipeg approved a new Transportation Master Plan, which required roundabouts be evaluated for all new intersection designs and retrofits [1]. Roundabouts have been becoming more prominent throughout Canada but are still relatively new to Winnipeg. Winnipeg currently has 23 roundabouts and had its first retrofit to a roundabout in 2009 [2]. With the introduction of the Transportation Master Plan and a resulting shift in how intersection control types are evaluated, a comprehensive and efficient way to evaluate the feasibility of a roundabout was required. To solve this issue, a screening tool was developed to be used by City of Winnipeg (COW) employees as a way to consistently identify significant benefits or critical issues associated with implementing a roundabout in a retrofit situation.

A screening tool allows for evaluators of an existing intersection to review major considerations efficiently, allowing for the identification of benefits and concerns related to the implementation of a roundabout at that specific location. The tool, organized as a checklist, requires specific design characteristics of both the existing location and the potential roundabout, as input criteria and then provides information on the effect those characteristics have on the feasibility of a roundabout at that location. After going through all considerations, a decision can be made on whether or not a roundabout would be a feasible design option; based on whether any major concerns become apparent, through the screening tool. The screening tool allows for specific concerns to be identified, allowing COW employees sound and consistent justification for roundabout feasibility and installation. Additionally, the screening tool provides a comprehensive source of major considerations that must be considered in evaluating a roundabout in a retrofit situation; which can prove useful to those whom have limited experience in designing roundabouts. The considerations are primarily qualitative and site specific and the checklist provides an assurance that these factors are considered during the evaluation process. Due to the limited presence of roundabouts in Winnipeg, this tool allows those evaluating intersection retrofit projects to be confident that their analysis is comprehensive.

Considerations for the screening tool were found primarily through two sources: current research and reports regarding roundabouts, and existing screening procedures from other jurisdictions in North America. The use of research papers and reports allowed for data on the performance of roundabouts as well as their benefits and disadvantages to be understood and incorporated into the tool, educating those that are using the tool. The existing procedures from other jurisdictions provided a foundation on which the tool was structured, by highlighting important areas to focus on during the screening process and critical factors to analyze that determine the feasibility of a roundabout. These two sources complemented each other, allowing for the development of a screening tool that provides a comprehensive source of considerations and potential benefits and disadvantages associated with the implementation of a roundabout.

ROUNDABOUT SAFETY BENEFITS

Roundabouts should be considered when an intersection has a high number of angle-, rear end- or loss of control collisions, long traffic delays, or a high percentage of left-hand turning traffic [3]. Modern roundabouts provide speed reduction geometry and a yield entry that eliminates the more severe right-angle intersection crashes and control traffic flow. Research shows that modern roundabouts can reduce injury crashes by up to 76% and fatal crashes by 90% [4].

The reduction in collisions, when comparing roundabouts to traditional signalized intersections, can be attributed to four factors: [5]

1. Low travel speeds,
2. No traffic signal
3. One flow direction
4. Fewer and less severe conflict points

Pedestrian safety and roundabouts has been studied extensively and is becoming an increasingly important issue for intersection design. According to the Insurance Institute of Highway Safety, roundabouts can reduce pedestrian crashes by 30 to 40% and cyclist collisions by approximately 10% [4]. Pedestrian collision rates, regardless of pedestrian volume, have been seen to be lower at roundabouts compared to signalized intersections while higher pedestrian volume intersections experienced lower overall collision rates than lower pedestrian volume intersections [6]. A reduction in collisions involving pedestrians has been attributed to lower operating speeds and pedestrians only being required to cross one direction of traffic at a time, provided a splitter island is installed [7].

Truck safety at roundabouts is another important consideration, trucks can have difficulty navigating roundabouts and it is important to understand the movements a truck may take through a roundabout and how that affects the safety of the intersection. Truck accommodation presents an added challenge as safety can be compromised by truck accommodation. Truck volumes should therefore be an important consideration when evaluating an intersection for retrofit [8].

EVALUATING ROUNDABOUTS

Numerous jurisdictions in North America have implemented policies whereby roundabouts must be considered as a design alternative to STOP controlled or signal controlled intersections. Roundabouts in Canada: A Primer for Decision Makers, included a jurisdictional survey conducted by the Canadian Institute of Transportation Engineers highlighting the current state of roundabouts in Canada, referencing “policy, implementation, operations, safety, and maintenance” [9]. The survey identified British Columbia and Alberta as “roundabouts first” jurisdictions, where roundabouts must be evaluated as a first alternative for both retrofit and new intersections. If a roundabout is not installed, documentation must be provided detailing the rationale for the decision.

The National Cooperative Highway Research Program (NCHRP) produced Roundabouts: An Informational Guide (Report 672) which addresses the planning, design, construction, maintenance and operation of roundabouts. Report 672 outlines the various advantages and disadvantages of roundabout installation and the following common considerations that need to be addressed at the planning stage:

- Is a roundabout appropriate for this location?
- How big should it be or how many lanes might be required?
- What sort of impact might be expected?
- What public education and outreach might be appropriate?

Additionally, the report highlights that "consideration must also be given to the potential trade-offs between safety, operations, and design when planning roundabouts. Particularly in the early stages of planning, these key aspects and their impacts on one another can help determine a roundabout's feasibility."

Report 672 compares the performance of a roundabout to traditional intersection control methods; two-way stop-control (TWSC), all-way stop-control (AWSC), and signal control.

First, compared to TWSC, roundabouts can offer significant safety benefits, and relieve congestion and queues caused by heavy left hand turn volumes. If a TWSC intersection is functioning without major delay, a roundabout would not necessarily significantly improve performance.

Second, comparing roundabouts to AWSC, roundabouts can offer superior operational performance and an inconsequential variance in safety performance. Report 672 recommends that, in this comparison, the primary considerations should be operational performance and life-cycle costs.

Third, when signal control is warranted, provided a roundabout is operating within its capacity, the roundabout can provide better operational performance than signal control. Additionally, roundabouts provide greater safety performance and reduce the number of potential conflicts, potentially in turn reducing the worst crash types (angle, head-on, and left-turn).

Report 672 develops a framework for roundabout feasibility, design, and construction throughout the project life cycle as well as outlines the following policy considerations for roundabout installation:

- Safety
- Vehicle delay and queue storage
- Delay of major movement
- Signal progression
- Environmental factors
- Operation and maintenance costs
- Traffic calming
- Aesthetics
- Design for older drivers
- Spatial requirements

The above policy considerations can be applied to three (3) distinct installation scenarios:

1. A new roadway system,
2. The first roundabout in the area, and
3. A retrofit in an area where roundabouts have previously been installed.

Depending on the installation scenarios, various planning considerations can be applied to warrant the installation of a roundabout or more traditional intersection control methods. Additionally, the warranting of a roundabout might be dependent on site specific considerations, which can influence the design and construction of the roundabout and require more detailed analysis prior to forming a decision for or against implementation. To better understand the variability of warranting procedures for roundabouts, five jurisdictions were contacted to identify existing roundabout screening procedures. Additionally, design guides and roundabout screening tools were obtained to aid in further shaping the developed screening tool.

BEST PRACTICES FOR ROUNDABOUT SCREENING

To develop an understanding of existing practices to evaluate roundabout feasibility five Canadian jurisdictions were contacted. Canadian jurisdictions including the Region of Waterloo, the City of Edmonton, Province of Nova Scotia, and the City of Winnipeg responded with information regarding the existence of a roundabout screening tool for that jurisdiction. Also consulted were members of the Transportation Research Board (TRB) Roundabout Committee and Transportation Association of Canada (TAC) Joint Roundabouts Subcommittee as well as consultants from MMM group.

The primary information that was obtained from the Canadian jurisdictions was whether or not a roundabout screening tool is currently in use as well as to the effectiveness of the tool. Both the province of Nova Scotia and the City of Edmonton stated that they currently do not have a roundabout screening tool, while the Region of Waterloo does have a roundabout screening tool.

In addition to those jurisdictions, several State Departments of Transportation roundabout screening tools and roundabout design guides were reviewed to obtain a comprehensive summary of existing procedures of evaluating roundabouts including screening tools and design guides from the Massachusetts DOT, Michigan DOT, Minnesota DOT, and Wisconsin DOT. The Michigan DOT and Wisconsin DOT do not have roundabout screening tools but instead provide a guidance document that does not function as a source of design standards but instead identifies key principles and considerations for roundabout design. The Massachusetts DOT and Minnesota DOT do have roundabout screening tools in addition to guidance documents that support the considerations outlined in their respective tools. A brief description of these roundabout screening tools as well as the roundabout screening tool developed by the Region of Waterloo is provided in the following paragraphs.

The Region of Waterloo utilizes an initial screening tool to evaluate roundabout feasibility. Key considerations for this tool include life cycle cost, roundabout size (number of lanes), collision frequency, as well as existing operational problems at the current intersection. Additionally, the tool examines future road improvements surrounding the intersection as well as the feasibility of traffic signals for the forecasted volume of the horizon year.

The Minnesota Department of Transportation (MDOT) created an "Intersection Control Evaluation (ICE)" procedure that evaluates roundabouts alongside other intersection alternatives such as two or all way stop control and traffic signals. The ICE procedure involves analyzing the feasibility of all intersection control types using procedures developed by the Minnesota DOT that considers cost, capacity, operation, and safety.

The Massachusetts Department of Transportation (MDOT) has developed a roundabout installation screening tool that implements the framework outlined in the Report 672 with the goal of providing, "consistent and systematic information regarding the issues, geometric characteristics, and traffic parameters related to a location under consideration for roundabout design". The tool was developed to help guide the decision to install a roundabout by evaluating the feasibility and impacts of the installation through the following five steps:

1. Description of existing problems
2. Project objectives
3. Type of roundabout and space requirements
4. Roundabout screen factors
5. Screening evaluation

The final step of the screening process is user driven, introducing potential bias and engineering judgement. Based on the previously outlined selection criteria, project objectives, and spatial requirements, the user determines if a roundabout is warranted.

The information obtained from existing roundabout screening tools, as well as information provided by contacted jurisdictions was used in the development of the roundabout screening tool, which is detailed in the following section.

THE DEVELOPED SCREENING TOOL

The roundabout screening tool developed in this research aids in identifying if a roundabout is a feasible design option for an existing intersection due to be retrofitted. The tool was developed as a step by step guide for use by engineers working with intersection retrofits and with knowledge of roundabouts and their benefits and disadvantages. The tool is comprised of sections that focus on road safety, operational performance, traffic calming, as well as spatial and environmental considerations. The developed tool is structured to guide the evaluator through the site assessment by first collecting site characteristics and background information, followed by evaluating issues pertaining to safety and operations, as well as traffic calming, spatial, and environmental considerations. Using the tool, the evaluator works through eight steps to evaluate the feasibility of a roundabout at an existing intersection. These steps are shown in Figure 1 and are described on the following page.

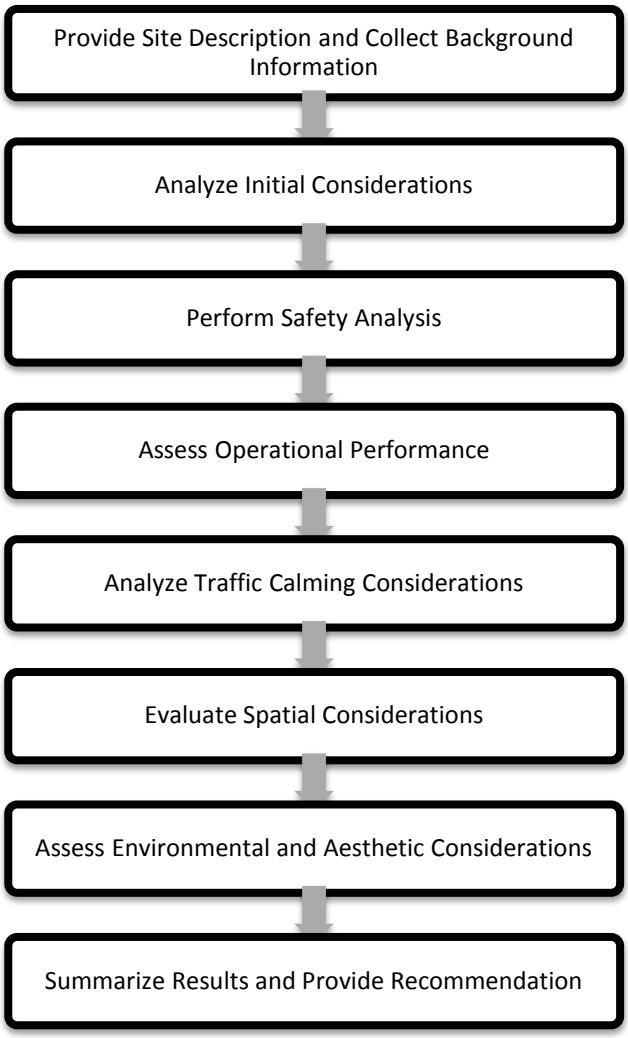

Figure 1 - Screening Tool Flow Chart

1. **Site Description and Background Information:** Prior to the analysis of the intersection, the evaluator should collect general location information on both the intersection and the approaches. This includes information concerning the geographical location of the intersection, the date, existing control type, and the name, AADT, and speed limit of the major and minor approaches. The background information involves obtaining information that aids in the characterization and evaluation of the existing intersection including turning movement data, speed data, vehicle classification data and vehicle volumes. Additional information includes the surrounding land use, roads and active transportation pathways and presence of vulnerable road users. Figure 2 shows the location information and the list of required data as it appears in the screening tool.

Location Information	
Location:	Major Street:
	Minor Street:
City:	Existing Control Type:
Evaluator:	Number of Legs:
Reviewer:	AADT on Major Road:
Phone:	AADT on Minor Road:
Email:	Speed Limit on Major Road:
Date:	Speed Limit on Minor Road:
Required Data Checklist	
1. Traffic Count Data (AADT on Major and Minor Roads)	9. Forecast Demand / Major Trip Generators & Attractors
2. Intersection Turning Movement Counts	10. Presence of High Risk Users (Seniors, Children, Persons with a Disability)
3. Vehicle Classification Data (% Trucks, Busses)	11. Surrounding Active Transportation / Pedestrian Facilities
4. Pedestrian and Bicycle Volumes	12. Surrounding Road Network
5. Speed Data	13. Construction Staging Requirements (If Applicable)
6. Existing Geometry / Approach Geometry	14. Existing Intersection Characteristics (Grade, Delay, Control)
7. Peak Hour Volumes	15. Truck Route / Bus Route
8. Surrounding Land Use	16. Collision Data (min 3 years) including Vulnerable Road User Collisions

Figure 2 - Location Information and Required Data

2. **Initial Considerations:** The evaluator first analyses the existing location to determine if a roundabout is feasible at the intersection. This involves analyzing forecast traffic volumes, identifying potential construction staging issues, and determining the availability of additional land for roundabout construction. Issues pertaining to these considerations would prevent a roundabout from being feasible and no further analysis would be required.

3. **Safety Analysis:** The safety analysis involves analyzing how the benefits and disadvantages of a roundabout align with the desired safety improvement for the existing intersection. Safety is measured by analyzing collision frequency as well as the types of collisions that occur at the intersection. Additionally, the presence of vulnerable road users and their interaction with vehicles should be examined. Once the safety considerations have been analyzed, a summary section, highlighted in yellow provides a summary of the severity of the issues pertaining to safety that is also included at the end of the tool. Figure 3 shows the safety analysis component of the screening tool and how each section is summarized.

SECTION 2 - SAFETY CONSIDERATIONS					
Question	**Are there safety issues regarding…?**	**Yes**	**No**	**Comment**	
2.1	the type of roundabout chosen by Q1.1				
2.2	number of legs of the intersection or unconventional geometry				
2.3	crashes at high speeds				
2.4	a high proportion of angled collisions				
2.5	collisions resulting in injury or fatality				
2.6	young children or seniors with visual / mobility impairments in the area				
2.7	high pedestrian or cyclist volumes				
2.8	any alterations of pedestrian crossing location interfering with desire lines				
2.9	irremovable objects within the clear zone				
Summary	Based on the above responses, how severe are the safety issues?	**Critical**	**Minor**	**None**	**Comments:**

Figure 3 - Safety Considerations

4. **Operational Performance:** This section involves the evaluator analyzing how the presence of certain factors and traffic movements may affect the performance of a roundabout in terms of both capacity and level of service. These factors include nearby schools, transit stops, railroad crossings, pedestrian crossings, and signalized intersections and the potential queuing into the roundabout associated with each factor. Additionally, traffic characteristics such as a higher percentage of left turns and U-turns, high peak volumes, and truck percentages are analyzed for their effect on the delay occurring at the existing intersection and the influence a roundabout may have.

5. **Traffic Calming Considerations:** Traffic calming considerations include issues surrounding the speed of vehicles and if a need to reduce speed and volume of vehicles has been identified through complaints or a future change in land use. This section addresses any potential need for the traffic calming that can be associated with the presence of a roundabout.

6. **Spatial Considerations:** Spatial constraints associated with the existing intersection are analyzed specifically in regards to the presence of existing pedestrian and bike infrastructure that would interfere with the construction or required space associated with a roundabout.

7. **Environmental and Aesthetics Considerations:** The final section before the summary guides the evaluator to assess environmental and aesthetic implications such as the presence of excessive noise and emissions from delay. Additionally, the aesthetic appeal of a roundabout is included as a consideration.

8. **Summary and Recommendation:** This section of the tool summarizes the results of the analyses from the previous six sections to provide an overall summary of the analysis of the intersection. Using the summary of the analysis as a reference, a decision between three possible options is made that determines the feasibility of a roundabout, or that a higher level analysis is required. Due to the qualitative nature of the analysis a second evaluator is required to review the conclusions of the first evaluator. Figure 4 displays the summary table and decision component of the screening tool.

SECTION 7 - SUMMARY AND RECOMMENDATION				
Section	Severity of Issues	Comments		
1				
2				
3				
4				
5				
6				
Overall Recommendation: (Circle one)		Pursue Roundabout Design	Further Investigation Required	Reject Roundabout Option

Figure 4 - Summary and Recommendation

The complete screening tool is presented on the following four pages.

City of Winnipeg Roundabout Feasibility Screening Tool

Location Information	
Location:	Major Street:
	Minor Street:
City:	Existing Control Type:
Evaluator:	Number of Legs:
Reviewer:	AADT on Major Road:
Phone:	AADT on Minor Road:
Email:	Speed Limit on Major Road:
Date:	Speed Limit on Minor Road:

Required Data Checklist	
1. Traffic Count Data (AADT on Major and Minor Roads)	9. Forecast Demand / Major Trip Generators & Attractors
2. Intersection Turning Movement Counts	10. Presence of High Risk Users (Seniors, Children, Persons with a Disability)
3. Vehicle Classification Data (% Trucks, Busses, Emergency)	11. Surrounding Active Transportation / Pedestrian Facilities
4. Pedestrian and Bicycle Volumes	12. Surrounding Road Network
5. Speed Data	13. Construction Staging Requirements (If Applicable)
6. Existing Geometry / Approach Geometry	14. Existing Intersection Characteristics (Grade, Delay, Control)
7. Peak Hour Volumes	15. Truck Route / Bus Route
8. Surrounding Land Use	16. Collision Data (min 3 years) including Vulnerable Road User Collisions

Reason for Potential Retrofit / Current Intersection Issues

Key Areas to Address (Priorities for Retrofit)

		Main		**Optional**		
Section	**Objective**	**Yes**	**No**	**Yes**	**No**	**Comments**
1	Initial Considerations					
2	Safety Improvement					
3	Operational Improvement					
4	Traffic Calming Improvement					
5	Spatial Improvement					
6	Environmental Impact and Aesthetics					

Note: References for each consideration attached separately

City of Winnipeg Roundabout Feasibility Screening Tool

SECTION 1 - INITIAL CONSIDERATIONS					
Question	**Is a roundabout feasible?**	**Yes**	**No**	**Comment**	
1.1	Based on capacity: Now & Future?				
1.2	Type of Roundabout: Single/Multi lane				
1.3	Can land be acquired if necessary?				
1.4	Would issues arise from the constructability of a roundabout?				
Summary	Based on the above responses, how severe are the initial issues?	**Critical**	**Minor**	**None**	**Comments:**

SECTION 2 - SAFETY CONSIDERATIONS					
Question	**Are there safety issues regarding…?**	**Yes**	**No**	**Comment**	
2.1	the type of roundabout chosen by Q1.1				
2.2	number of legs of the intersection or unconventional geometry				
2.3	crashes at high speeds				
2.4	a high proportion of angled collisions				
2.5	collisions resulting in injury or fatality				
2.6	young children or seniors with visual / mobility impairments in the area				
2.7	high pedestrian or cyclist volumes				
2.8	any alterations of pedestrian crossing location interfering with desire lines				
2.9	irremovable objects within the clear zone				
Summary	Based on the above responses, how severe are the safety issues?	**Critical**	**Minor**	**None**	**Comments:**

SECTION 3 - OPERATIONAL CONSIDERATIONS				
Question	**Operational Issues regarding…?**	**Yes**	**No**	**Comment**
3.1	additional turn lanes to accommodate increased demand			
3.2	high pedestrian or cyclist volumes			
3.3	nearby school or transit stop (queuing)			
3.4	nearby signalized intersection (queuing)			
3.5	high peak hour/low off peak hour volumes			
3.6	A high percentage of U-turns and left turns performed to enter access points on the opposite side of the road			

City of Winnipeg Roundabout Feasibility Screening Tool

Question	Operational Issues regarding…?	Yes	No	Comment	
3.7	nearby railroad grade crossing (queuing)				
3.8	a pedestrian crossing causing vehicle queuing to spill into the roundabout				
3.9	frequent emergency vehicle access/use				
3.10	nearby coordinated signal system where a roundabout could hinder traffic flow				
3.11	The intersection being along a truck route				
3.12	a high volume of left turns or U-turns				
3.13	limited left turn storage				
3.14	traffic heavily weighted in one direction				
Summary	Based on the above responses, how severe are the operational issues?	**Critical**	**Minor**	**None**	**Comments:**

SECTION 4 - TRAFFIC CALMING CONSIDERATIONS					
Question	**Traffic Calming Issues regarding…?**	**Yes**	**No**	**Comment**	
4.1	AADT of any leg exceeding existing capacity				
4.2	high speed transitions through intersection				
4.3	speeding at this intersection				
4.4	speed complaints been made by residents				
4.5	changes in surrounding land use that require traffic calming				
4.6	Pedestrians and cyclists utilizing the intersection				
Summary	Based on the above responses, how severe are the traffic calming issues?	**Critical**	**Minor**	**None**	**Comments:**

SECTION 5 - SPATIAL CONSIDERATIONS					
Question	**Spatial Issues regarding…?**	**Yes**	**No**	**Comment**	
5.1	sufficient space for roundabout (Q1.2)				
5.2	Nearby active transportation pathways that handle the majority of AT volumes				
5.3	intersection grade exceeding 6%				
5.4	A pedestrian crossing located away from the roundabout into the sidewalk network				
5.5	existing bike lanes at the location				
Summary	Based on the above responses, how severe are the spatial issues?	**Critical**	**Minor**	**None**	**Comments:**

City of Winnipeg Roundabout Feasibility Screening Tool

SECTION 6 - ENVIRONMENTAL & AESTHETIC CONSIDERATIONS					
Question	**Environmental Issues regarding…?**	**Yes**	**No**	**Comment**	
6.1	environmental impact of intersection				
6.2	existing noise at intersection				
Question	**Aesthetic Considerations**	**Yes**	**No**	**Comment**	
6.3	Could a roundabout be a part of a community enhancement program				
Summary	Based on the above responses, how severe are the environmental & aesthetic issues?	**Critical**	**Minor**	**None**	**Comments:**

SECTION 7 - SUMMARY AND RECOMMENDATION		
Section	**Severity of Issues**	**Comments**
1		
2		
3		
4		
5		
6		

Overall Recommendation: (Circle one)	**Pursue Roundabout Design**	**Further Investigation Required**	**Reject Roundabout Option**

Justification:

Evaluator's Name

Reviewer's Name

Signature

Signature

SCREENING TOOL SUMMARY

The roundabout screening tool was developed as a synthesis of the information obtained through a comprehensive review of roundabout literature and the analysis of existing roundabout screening tools from other jurisdictions across North America. The roundabout screening tool can be used to qualitatively evaluate the feasibility of a roundabout at existing intersections and identify critical issues associated with the installation of a roundabout. The tool is an easy to use guide that provides a reference to key factors that determine the feasibility of a roundabout at a retrofit location and consists of eight components to complete the analysis of an existing intersection:

1. Site description and background information
2. Initial considerations
3. Safety analysis
4. Operational performance
5. Traffic calming considerations
6. Spatial considerations
7. Environmental and aesthetic considerations
8. Summary and recommendation

Summarized results are used to determine if critical issues arise that prevent a roundabout from being feasible at the intersection being analyzed. As many of the components of the tool are qualitative, the requirement of a second evaluator allows for subjectivity to be accounted for. The use of this tool will allow for a quicker and more comprehensive assessment of intersections to be retrofitted and the feasibility of installing a roundabout at that location. Future research could develop this screening tool further by pursuing adding a weighting method to each objective that could then be used to provide an overall feasibility score in an effort to quantify the results obtained through the use of this tool.

CONCLUSION

This paper discusses the development of a screening tool to determine the feasibility of installing a roundabout as a retrofit. The screening tool guides an evaluator through the process of assessing the existing intersection while determining the feasibility of a roundabout. Summarized results from the analysis are then used to formulate a recommendation to pursue the design of a roundabout, investigate a roundabout design further, or remove a roundabout as a design option. This decision is based on a qualitative analysis and therefore requires a second evaluator to account for any subjectivity associated with the primary evaluator. The screening tool combines the information gained from a review of relevant literature and the research of existing screening tools to provide a comprehensive basis for analyzing roundabout feasibility at an intersection in Winnipeg. With limited data requirements and a comprehensive list of considerations, City of Winnipeg employees can quickly evaluate an intersection for a potential roundabout and have a strong research based conclusion on the feasibility of a roundabout. While the tool has yet to be applied in practice, it is expected that the tool contains enough guidance to be an asset to engineers in evaluating the feasibility of a roundabout.

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