

ROAD SAFETY AUDIT CERTIFICATE

We certify that the functional drawings for the proposed roundabout at the intersection of Jeanne d'Arc Boulevard North and Fortune Drive/Vineyard Drive, including a single-lane and a multi-lane option,¹ in the City of Ottawa, Ontario has been the subject of a Road Safety Audit.

The Road Safety Audit Team's report and table of findings are attached.

Signed: 

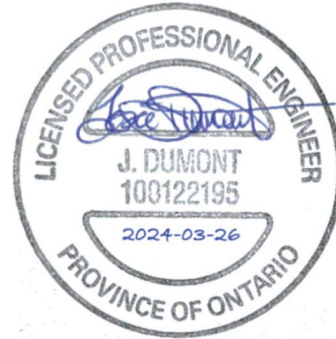
Road Safety Audit Team (Lead)

Name: Josée Dumont

Title: Partner, Transportation Safety Engineer

Date: March 26, 2024

Professional Registration Number: 100122195



We certify that the functional drawings for the proposed roundabout at the intersection of Jeanne d'Arc Boulevard North and Fortune Drive/Vineyard Drive, including a single-lane and a multi-lane option, in the City of Ottawa, Ontario has been the subject of a Road Safety Audit and that all observations and recommendations in the Road Safety Audit Team's report have been satisfactorily addressed and resolved.

Signed: 

Firm: Robinson Consultants Inc.

Name: Robert Cotnam, P. Eng.

Title: Practice Area Lead - Transportation Services

Date: March 28, 2024

Professional Registration Number: _____

Affix Professional Seal

¹ For the list of documents reviewed, refer to the Road Safety Audit Report dated February 5, 2024, Section 1.1.

Receipt of this Certificate is acknowledged.

Signed:  _____

City of Ottawa

Name: Sara Akkaoui, P. Eng.

Date: April 4, 2024 (recived via-email)



ROAD SAFETY AUDIT

**LOCATION: JEANNE D'ARC BOULEVARD NORTH AT FORTUNE
DRIVE/VINEYARD DRIVE – FUNCTIONAL DESIGN, OTTAWA,
ONTARIO**

February 2024



ROAD SAFETY AUDIT

Location: Jeanne d'Arc Boulevard North at Fortune Drive/Vineyard Drive –
Functional Design, Ottawa, Ontario

Prepared For: Robert Cotnam, P.Eng., Robinson Consultants Inc.

Prepared By:

Stefan Tsang, B.A.Sc., RSP₁, P.Eng.

Josée Dumont, M.A.Sc., RSP2IB, P.Eng.

Alexandre Nolet, M.Eng., RSP₁, P.Eng.

| Version | Date | Comments |
|---------|------------------|----------------|
| E01 | February 5, 2024 | Issued for use |
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| | | |
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Josée Dumont, M.A.Sc., RSP2IB, P.Eng.

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1.0 INTRODUCTION

1.1 Background

Robinson Consultants Inc. ('Robinson') has been retained by the City of Ottawa (the 'City') to complete a transportation analysis and functional design and assessment for a proposed roundabout at the intersection of Jeanne d'Arc Boulevard North and Fortune Drive/Vineyard Drive, to accommodate OC Transpo buses completing U-turn movements at the intersection and continue southbound to the Jeanne d'Arc O-Train station. As part of the design process, an independent Road Safety Audit (RSA) of the functional road design drawings was completed.

True North Safety Group (TNS) was retained by Robinson (the 'Design Team') to conduct the RSA to review transportation safety aspects of the proposed roundabout designs, including a single-lane and a multi-lane option.

The RSA was conducted in accordance with the Transportation Association of Canada Road Safety Audit Guide (the 'TAC Guide').

This report provides an overview of the RSA process, as well as the findings and recommendations for the design. For this safety review, the following documents were provided to TNS (the 'RSA Team'):

- ▶ Memorandum from Robert Cotnam to Sara Akkaoui, titled *Jeanne d'Arc Boulevard Transit Priority Measures – DRAFT*, dated August 16, 2023 (File Name: 23005 – Traffic Analysis.pdf).
- ▶ 8-hour turning movement counts dated January 8, 2020 (File Name: 5469210_-_JEANNE_D'ARC_BLVD @_FORTUNE_DR_VINEYARD_DR_-_JAN_08_2020_739820_01-08-2020.pdf).
- ▶ Jeanne d'Arc Boulevard Transit Priority Measures Geometry Plan, showing a multi-lane roundabout functional design, undated, provided on September 20, 2023 (File Name: Jeanne_d'Arc_Blvd-Geometry.pdf).
- ▶ Sketch of potential single stage crossing for pedestrians, undated, provided on December 20, 2023 (File Name: 23005-Geometry Single Stage.pdf).
- ▶ Jeanne d'Arc Boulevard Transit Priority Measures Geometry Plan, showing a single-lane roundabout functional design, undated, provided on December 21, 2023 (File Name: 23005-roll-plan.pdf).
- ▶ Bus swept path drawing, undated, provided on January 16, 2024 (File Name: 23009 - Bus U-Turn.pdf).

1.2 Study Area

The study area consists of the following:

- ▶ The intersection of Jeanne d'Arc Boulevard North and Fortune Drive/Vineyard Drive, including the functional roundabout area.
- ▶ Jeanne d'Arc Boulevard North, between the intersection with Fortune Drive/Vineyard Drive and the north side of the intersection with Ottawa Road 174 Eastbound On- and Off-ramps.

Figure 1 provides an aerial image of the study area.



Figure 1: Aerial image of the study area (GeoOttawa, 2024).

The project includes:

- ▶ Conversion of the intersection of Jeanne d'Arc Boulevard North and Fortune Drive/Vineyard Drive into a single- or multi-lane roundabout.
- ▶ Addition of multi-use paths on all approaches, within the functional limit of the roundabout.
- ▶ Addition of a multi-use path on the east side of Jeanne d'Arc Boulevard North, between the intersection with Fortune Drive/Vineyard Drive and the north side of the intersection with Ottawa Road 174 Eastbound On- and Off-ramps.
- ▶ Addition of bus bays and a driver rest station along the southbound lanes of Jeanne d'Arc Boulevard, between the intersection with Fortune Drive/Vineyard Drive and the north side of the intersection with Ottawa Road 174 Eastbound On- and Off-ramps.

1.3 RSA Team

The RSA Team consists of Mr. Stefan Tsang, Mr. Alexandre Nolet, and Ms. Josée Dumont, who are all transportation safety experts with a specialization in multi-modal road safety.

2.0 RSA PROCESS

2.1 RSA Phases

The primary objective of this design RSA is to evaluate the performance of the proposed design elements from a safety perspective. Safety performance considers the exposure to, probability of, and consequences associated with potential conflicts as a result of design issues. Typically, the review conducted at this stage focuses on the items listed below. The RSA is based solely on the information provided to the auditors.

- ▶ Horizontal and Vertical Alignment
- ▶ Visibility and Sight Distance
- ▶ Traffic Control Devices
- ▶ Vulnerable Road User Planning
- ▶ Driver Expectancy
- ▶ Road User Interaction
- ▶ Shoulders and Clear Zones

The documentation was provided by the Design Team to the RSA Team between September 20, 2023 and January 16, 2024. A meeting was held between the RSA Team, the Design Team, and the City's Project Manager on January 15, 2024, to allow the Design Team to provide an overview of the site context and design considerations. The RSA Team attended the site on January 22, 2024, and completed its review of the functional road design drawings on January 23, 2024. The findings and recommendations were summarized in tabular format. The RSA Team is expected to receive responses from the Design Team on the design's recommended mitigations before submitting the drawings to the City.

More details about how the RSA findings are summarized, a summary of additional safety analysis on single- and multi-lane roundabouts, and how the responses to the identified mitigation measures expected from the Design Team are provided in Sections 2.2 to 2.4 of this report.

2.2 RSA Findings and Suggestions

The RSA findings are provided in a tabular format. The table includes the following information:

- ▶ Issue No. (Sheet): Identifies the issue number and specifies the sheet on which the issue was identified.
- ▶ Issue Description: Describes the potential safety issue identified.
- ▶ Critical/Non-Critical: While the Owner/Design Team should consider addressing all identified safety issues, this attribute identifies which safety issues are to be given higher priority.
- ▶ Suggested Mitigation: The measures suggested to address the identified safety issues.
- ▶ Owner/Designer Response: Actions that will be taken by the Owner/Design Team in response to each safety concern. Note that it is the responsibility of the Owner/Design Team to complete this column when responding to the RSA findings.

- ▶ Status (Y/N/P): The Owner/Design Team is to indicate the action taken or not to be taken regarding the suggested mitigation measures. The Yes/No/Partial (Y/N/P) option indicates whether a recommendation was accepted, rejected, or partially accepted.
- ▶ RSA Team Comments on Designer Response: Based on the Owner/Designer response, the RSA Team will provide additional comments or will indicate that the issue has been resolved.

2.3 Transportation Safety at Roundabout

2.3.1 General Findings

The City and design team are currently considering both a single-lane and a multi-lane options for this intersection. From a vehicle safety perspective, roundabouts are recognized to be safer than stop-controlled or signalized intersections, as they reduce the number of conflict points, generally lower vehicle operating speeds, and decrease the angle of impact for vehicle-vehicle collisions.

Safety impacts for active transportation users are not as clear as those for motorists; however:

- ▶ Single-lane roundabouts are found to be a safer option, as they generally lower motor vehicle speeds and provide two-stage crossings, where active transportation users can cross one lane at a time, with one-way motorized traffic for each stage.
- ▶ Multi-lane roundabouts are found to be more difficult to cross than single-lane roundabouts as:
 - Crossing distances are longer, with more than one lane to cross at a time.
 - Vehicle speeds are generally higher, due to the geometry of the roundabout.
 - Visibility between active transportation users and motorists in the far lane may be obstructed by vehicles in the near lane.
 - Motorists fail to yield to pedestrians much more frequently at multi-lane roundabouts compared to single-lane roundabouts.

Published literature clearly shows that single-lane roundabouts are safer for active transportation users than multi-lane roundabouts. When deciding on single- or multi-lane roundabouts, recommendations include:

- ▶ *“Pedestrians and cyclists should not use multi-lane roundabouts. At-grade crossings of two lane entries and especially two lane exits should be avoided.”¹*
- ▶ *“[M]ultilane roundabouts should not be used where they are not needed for capacity purposes in the short term, as single-lane roundabouts are much safer for bicyclists.”²*
- ▶ *“Further consideration to enhance pedestrian safety include: [...] Minimizing the number of travel lanes on the approaches and departures to reduce crossing distances.”³*

¹ Netherlands Ministry of Transport, Public Works and Water management. *Roundabouts – Application and design: A practical manual*. June 2009.

² National Cooperative Highway Research Program Report 672. *Roundabouts: An Informational Guide*. Second Edition. Transportation Research Board, Washington, D.C., 2010.

³ Transportation Association of Canada. *Canadian Roundabout Design Guide*. 2017.

- ▶ *“Multi-lane roundabouts do not have as strong a safety record as single-lane roundabouts, and present additional risks to pedestrians and cyclists.”⁴*
- ▶ *“Where multi-lane roundabouts are necessary for capacity reasons, it is preferable to provide multiple lanes only on the approaches where necessary. In particular, the use of multi-lane exits should be limited as much as possible.”⁵*

Further, where multi-lane roundabouts are the selected option, the recommendations include:

- ▶ *“Pedestrians and cyclists should be provided routes that bypass the roundabout, or given a grade separated crossing, via either a bridge or a tunnel.”⁶*
- ▶ *“Where high volumes of pedestrians and cyclists are anticipated, alternative treatments should be considered, such as: Grade-separated pedestrian and cyclist facilities [or] signalized mid-block crossings on roundabout approaches.”⁷*
- ▶ *“Due to the higher entry and exit speeds at a multi-lane roundabout, the use of raised pedestrian and cycling crossings is recommended at all multi-lane entries and exits. However, raised crossings may not be appropriate on transit routes.”⁸*
- ▶ *“Roundabout implementation should also be carefully considered at locations with heavy pedestrian and bicycle traffic, or concentrations of vulnerable road users such as children, the elderly or persons with disabilities or other accessibility challenges. Although pedestrian crosswalks can be installed on the approaches, additional traffic control devices may be required to provide protected crossings if alternative means of accommodating non-motorized users, such as grade separation, are not possible.”⁹*

2.3.2 Jeanne d’Arc Boulevard North and Fortune Drive/Vineyard Drive

Given the surrounding land use, which is primarily residential and includes an elementary school adjacent to the intersection, and the construction of the Jeanne d’Arc O-Train station, pedestrians and cyclists, including young children, are expected to be present at the subject intersection. In their August 16, 2023, memorandum, the design team has concluded that:

In light of the results of this analysis, the City may consider the application of a single lane roundabout at this location as an interim facility as the transportation analysis indicates it would be expected to operate effectively in the near term and potentially long term. We note there would be considerable benefits to the use of a single lane roundabout as interim facility, namely the enhanced pedestrian crossing accommodations for the adjacent elementary school and the traffic calming benefits associated with a single lane roundabout. Given the proximity of the intersection to the school, it is expected that pedestrian safety will be a paramount

⁴ Ministry of Transportation of Ontario. *Ontario Traffic Manual Book 18: Cycling Facilities*. Queen’s Printer for Ontario, 2021.

⁵ Idem.

⁶ Netherlands Ministry of Transport, Public Works and Water management. *Roundabouts – Application and design: A practical manual*. June 2009.

⁷ Ministry of Transportation of Ontario. *Ontario Traffic Manual Book 18: Cycling Facilities*. Queen’s Printer for Ontario, 2021.

⁸ Idem.

⁹ Transportation Association of Canada. *Canadian Roundabout Design Guide*. 2017.

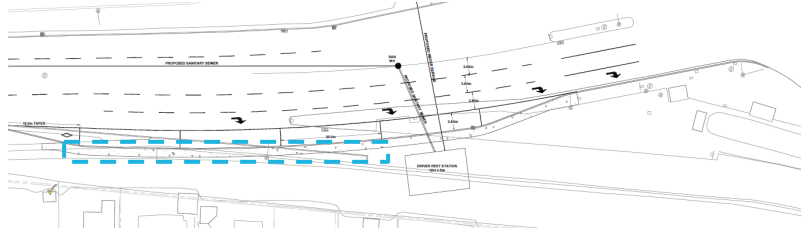
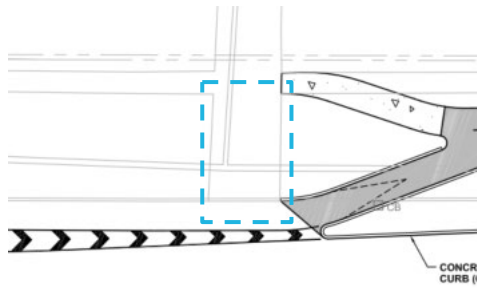
concern for the community, and the reduced crossing distances and reduced speeds of a single lane facility would be expected to less of a concern for vulnerable pedestrians.

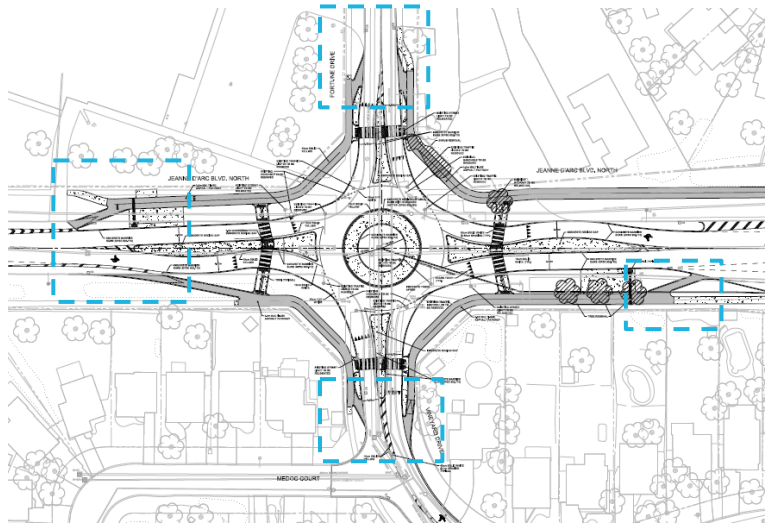
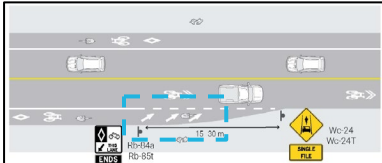
Multi-lane roundabouts are typically implemented on arterial roadways to accommodate high vehicular volumes. However, the implementation of a multi-lane roundabout at the subject location does not seem to align well with the primarily residential surrounding land use, especially considering the anticipated increase in pedestrian traffic. TNS agrees with the design team's findings, and strongly supports the single-lane roundabout option. Nonetheless, findings and suggestions are provided for both options in the RSA table.

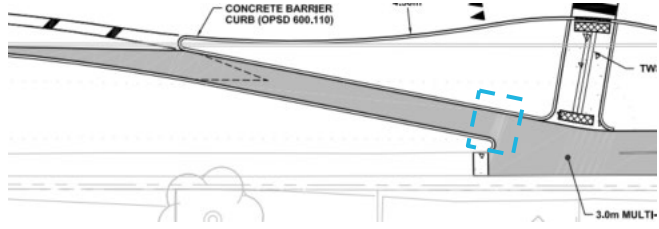
2.4 Response to RSA Findings and Suggestions

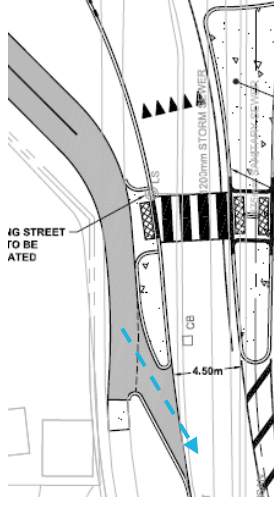
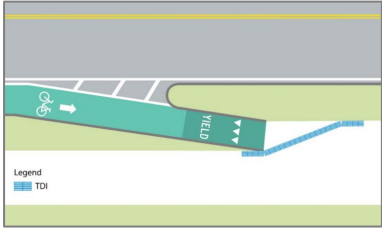
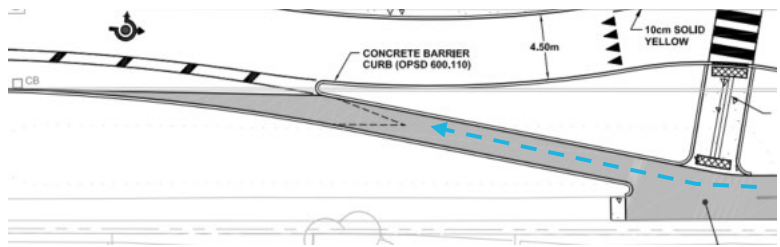
The Design Team is under no obligation to accept or implement any of the suggestions proposed by the RSA Team. It is expected that responses will be provided to each recommendation stating whether the suggestion is accepted, rejected, or partially accepted and the reason(s) for the decisions. Once a response from the Design Team has been provided to the RSA Team for each identified safety issue, a Road Safety Audit Certificate will be provided to the Design Team.

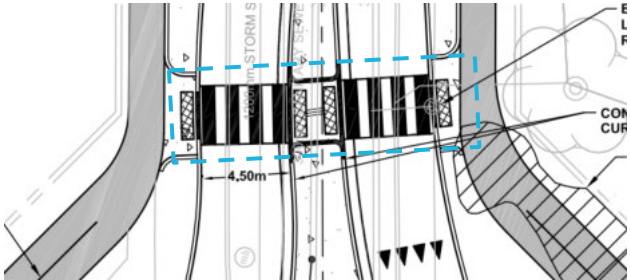
Note that the suggestions outlined in the RSA table are safety-focused and do not necessarily consider unforeseen parameters and limitations such as design constraints, property acquisition issues, life-cycle cost, etc. Actions taken in response to the issues and suggestions of the RSA report shall be the responsibility of the Design Team in consideration of all potential factors and constraints.

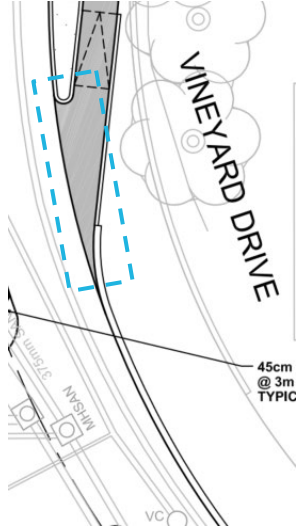
| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|--------------------------------|---|--------------------------|-------------------------------------|---|--|----------------|-------------------|
| Issues present in both designs | | | | | | | |
| 1 | <p><u>Pedestrian comfort</u>: The sidewalk along west side of Jeanne d’Arc Boulevard, north of the intersection with Highway 174 ramps, is adjacent to roadway. This may result in challenges with snow storage and may reduce pedestrian comfort.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Consider providing a boulevard area between the roadway/bus bays and the sidewalk to provide:</p> <ul style="list-style-type: none"> ▶ Space for snow storage between the road and sidewalk, so snow is not plowed onto the sidewalk. ▶ A buffer area between pedestrians and motorists, resulting in a more comfortable experience for pedestrians. | <p>RCI: Design to be modified to maintain newly constructed curb and sidewalk through this section. No change</p> <p>City: No comment</p> | N | No response |
| 2 | <p><u>Existing walkway connection</u>: the existing walkway connecting Convent Glen Catholic School to Jeanne d’Arc Boulevard is still shown across the boulevard. This may result in motorists blocking the bike lane to load/unload, or pedestrians crossing at midblock locations.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Remove the existing walkway connection located on the boulevard.</p> | <p>RCI: To be removed/reconfigured as part of detail design development</p> <p>City: The existing walkway connection has a depressed curb along Jeanne D’Arc Blvd. Consult with EMS and the school to ensure that this paved</p> | Y | No response |

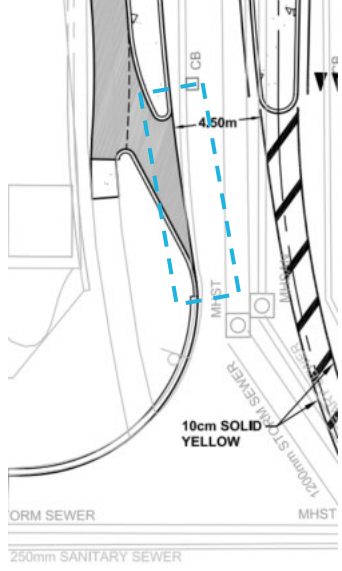
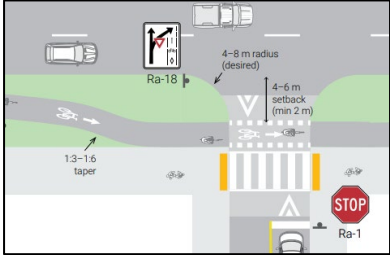
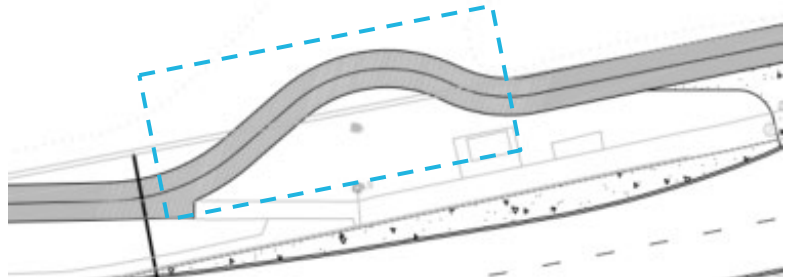
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|-----------|---|----------|--------------|---|---|----------------|-------------------|
| | | | | | connection is not required for emergency and/or maintenance vehicle access. | | |
| 3 | <p><u>Discontinuous cycling facilities</u>: the designated cycling facilities terminate outside the extent of the roundabout, where cyclists will mix with general traffic. Visual cues are needed to provide guidance to road users that the designated cycling facilities are terminating, and cyclists will be entering mixed traffic.</p> <p>OTM Book 18 – Cycling Facilities encourages continuity of bicycle facility types, to create better predictability for users. It mentions that a mixed traffic bicycle route is only recommended when the street is low-speed and low-volume.</p>  | ☒ | ☐ | <p>Consider extending the MUP on all approaches to the roundabout to provide a continuous network for cyclists.</p> <p>If the MUP is not extended, provide signage visible to cyclists and motorists clearly indicating start (Wb-10 TAC, Rb-84a, Rb-84t) and the end (Rb-84a, Rb-85t) of the designated cycling facilities.</p> <p>Consider providing arrow pavement markings to indicate where bicycle lanes merge with general traffic lanes, similar to what is shown in MTO Book 18 Figure 6.62:</p>  | <p>RCI: Design to be updated to reflect OTM Boom 18 and City of Ottawa design standards</p> <p>City: Agree. The need for cyclists and drivers to merge traffic should be clearly indicated (e.g., sharrows on the road at the point where cyclists are merging with general traffic).</p> | Y | No response |

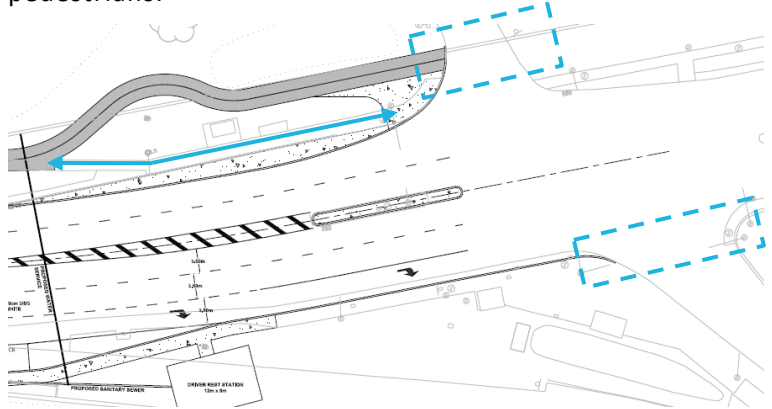
| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|-----------|--|----------|--------------|---|--|----------------|-------------------|
| 4 | <p><u>Cycle track to MUP transitions</u>: on all cycle track transitions from the roadway to the MUP, there is potential for conflicts between cyclists accessing the MUP and pedestrians.</p>  | ☒ | ☐ | <p>Install “Bicycles Yield to Pedestrians” signage for cyclists heading from the roadway to the MUP, along with cyclist yield markings.</p> | <p>RCI: Signage to be reviewed/refined with City of Ottawa during detail design process.</p> <p>CITY: Signage could also be provided for pedestrians (and cyclists) entering the MUP from the road crossing to look both ways for cross traffic.</p> | Y | No response |
| 5 | <p><u>MUP/cycle tracks transitions – pedestrians</u>: on all cycle tracks transitions between the MUP and the roadway, there is potential for pedestrians travelling on the MUP to follow the cycle track and end up on the roadway.</p> | ☐ | ☒ | <p>Provide arrows and bike stencils on the cycle track to indicate the intended use by cyclists only.</p> <p>Consider providing arrows and pedestrian stencils on the portion of the cycle track connecting to the sidewalk.</p> <p>Install attention TWSIs within the ramp to advise pedestrians that they are leaving the sidewalk.</p> <p>Install directional TWSIs at the edge of the MUP to advise pedestrians of the correct direction of travel.</p> | <p>RCI: Cycle ramp transitions and TWSI layouts to be developed during detail design refinement in accordance with City of Ottawa standards</p> <p>CITY: No comment</p> | Y | No response |

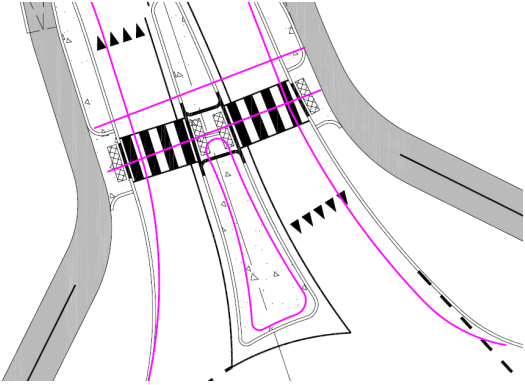
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|-----------|--|----------|--------------|---|---|----------------|-------------------|
| |  | | | <p>Example:</p>  <p>Where no sidewalk is provided beyond the MUP, provide signage advising pedestrians that the sidewalk and MUP end, and they should cross to the other side.</p> | | | |
| 6 | <p><u>MUP/cycle track transitions – cyclists:</u> on cycle track transitions between the MUP and the roadway which are intended for cyclists travelling towards the roundabout, there is potential for cyclists and travelling on the multi-use path away from the roundabout to follow the one-way cycling ramp in the wrong direction and end up on the roadway in the direction opposite to vehicular traffic.</p>  | ☒ | ☐ | <p>Install “wrong way” signage for cyclists heading into the roadway.</p> <p>Provide arrows and bike stencils to indicate the intended direction of travel.</p> | <p>RCI: Signage to be reviewed/refined with City of Ottawa during detail design process</p> <p>CITY: No comment</p> | Y | No response |

| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|-----------|--|--------------------------|-------------------------------------|---|---|----------------|--|
| 7 | <p><u>Bicycle crossing facilities</u>: designated crossing facilities are not provided for cyclists crossing the roundabout. This may lead to conflicts between pedestrians, cyclists, and vehicles in crosswalks.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Provide signage instructing cyclists to dismount before crossing. | <p>RCI: Signage to be reviewed/refined with City of Ottawa during detail design process</p> <p>CITY: Cyclists may not heed the signs though</p> | Y | At this time, there is no mechanism in Ontario to provide right-of-way to cyclists crossing a roundabout approach. Since an uncontrolled bicycle crossing is not compatible with a PXO, and given the presence of a nearby elementary school, preference is given to a PXO at this location. |
| 8 | <p><u>Rodway to cycle track transition</u>: the eastbound cycle track access on Vineyard Drive is on the inside of the horizontal curve. The access may not be visible to cyclists. In addition, the relatively short length and narrow width of taper would require cyclists to access the bicycle facility on a shallow angle.</p> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Provide advance signage advising cyclists and motorists of the start of the cycling facility. | RCI: Cycle transitions and signage to be reviewed/refined with City of Ottawa during detail design process | Y | No response |

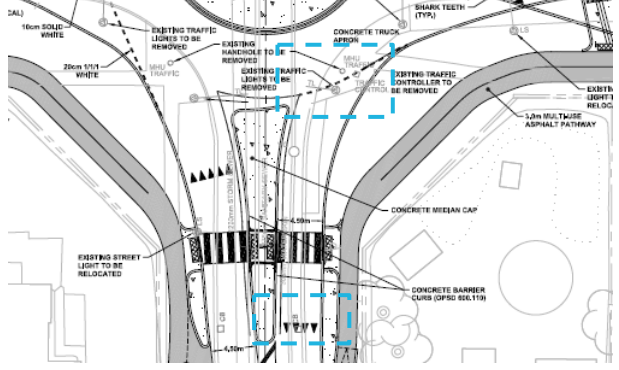
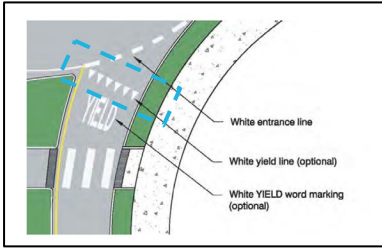


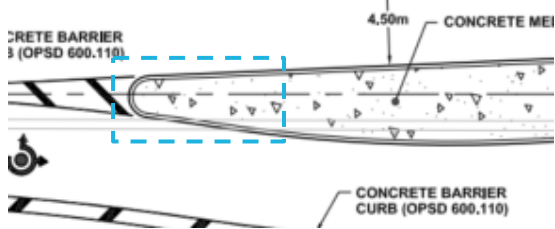
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|-----------|--|----------|--------------|--|---|----------------|--------------------|
| |  | | | <p>Ensure that a level surface is provided to minimize the risk of cyclists losing control when accessing the cycle track.</p> <p>Consider lengthening the on-road horizontal transition to provide a better opportunity for cyclists to safely access the cycle track.</p> | <p>CITY: No comment</p> | | |
| 9 | <p><u>Cycle track to roadway transition on Vineyard Drive</u>: cyclists travelling westbound on Vineyard Drive transition to the roadway just prior to Medoc Court. This may lead to conflicts with motorists turning to and from Medoc Court.</p> | ☒ | ☐ | <p>Consider extending MUP along Vineyard Drive to provide a more connected cycling network.</p> <p>If not possible, extend MUP past Medoc Court. At the intersection, consider providing crosswalk and crossroad markings, and signage for westbound right-turning motorists to yield to through cyclists. There may be an opportunity to provide a setback crossing at the intersection, similar to the</p> | <p>RCI: Cycle transitions and signage to be reviewed/refined with City of Ottawa during detail design process</p> <p>CITY: No comment</p> | Y | <p>No response</p> |

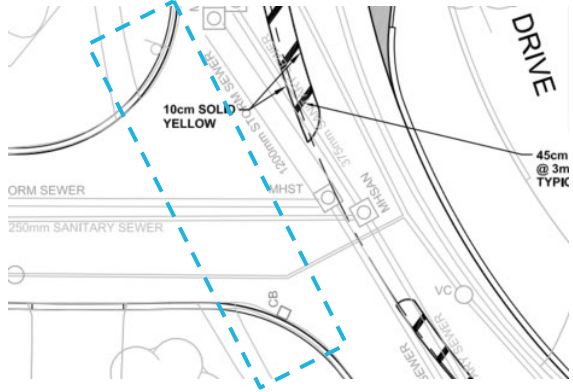
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|-----------|--|--------------------------|-------------------------------------|--|--|----------------|-------------------|
| |  | | | <p>configuration shown in OTM Book 18 Figure 6.30:</p>  | | | |
| 10 | <p><u>Horizontal curve in the MUP</u>: there are horizontal curves with short radii on the MUP located on the east side of Jeanne d'Arc Boulevard, north of the intersection with Highway 174 ramps. This may result in cyclists having difficulties navigating the curves.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Consider increasing the curve radii of the MUP to provide greater comfort for cyclists.</p> | <p>RCI: MUP designed and built by others. No changes to be made under this project</p> <p>CITY: No comment</p> | N | No response |

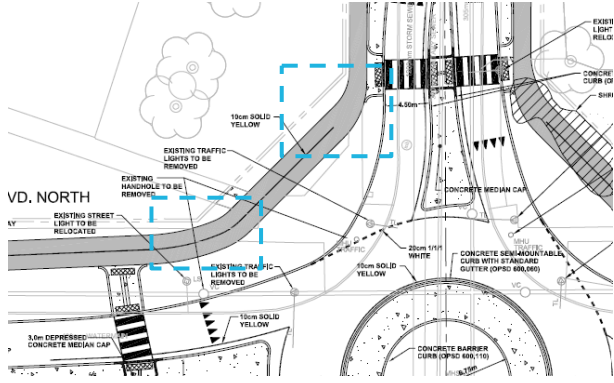
| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|-----------|--|-------------------------------------|-------------------------------------|---|---|----------------|-------------------|
| 11 | <p><u>Connection to facilities south of study area:</u> pedestrians and cyclists travelling on the sidewalk or MUP to/from locations south of the study area need to cross highway ramps. There is potential for conflicts between motorists and active transportation users.</p> <p>On the east side of Jeanne d’Arc, there is a sidewalk branching away from the MUP to serve the existing bus stop, which is planned to be removed. This may cause confusion as to the intended path for pedestrians.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Ensure MUP on the east side and sidewalk on the west side of Jeanne d’Arc boulevard provide connectivity to areas south of the study area, including to the O-Train station.</p> <p>Provide appropriate crossing facilities, including crosswalks and crossrides at intersections south of the study area.</p> <p>On the east side of Jeanne d’Arc, consider removing the existing sidewalk alignment to provide only the MUP. Pedestrian access could be provided to the existing bus stop from the MUP.</p> <p>Ensure a RSA is completed on the design for the portion south of this study area.</p> | <p>RCI: Outside limits of this project. To be design/built by others. No changes to be made under this project</p> <p>CITY: No comment</p> | N | No response |
| 12 | <p><u>Single-stage crossing:</u> providing a single-stage crossing for the crosswalk at Fortune Drive would require pedestrians to cross both the entry and exit lanes of the roundabout at the same time. This considerably increases the crossing distance and requires pedestrians to cross two directions of traffic at once.</p> <p>While a PXO Type C crossing is proposed to provide additional pedestrian right of way, motorists may not be anticipating the need to stop, especially those in the exit lane. This could result in conflicts</p> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <p>A single-stage crossing is not recommended at a roundabout, especially near an elementary school. Splitter islands serve different roles at roundabouts, including providing refuge for pedestrians and allowing them to cross each direction of</p> | <p>RCI: Noted. Per discussion with City of Ottawa, 2 stage crossings to be maintained.</p> <p>CITY: The design already proposes a 2-stage crossing;</p> | Y | No response |

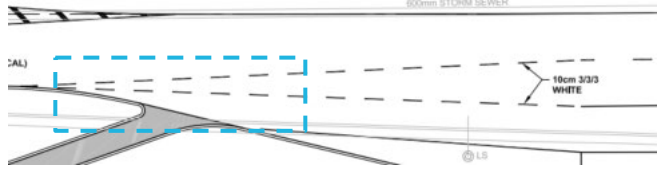
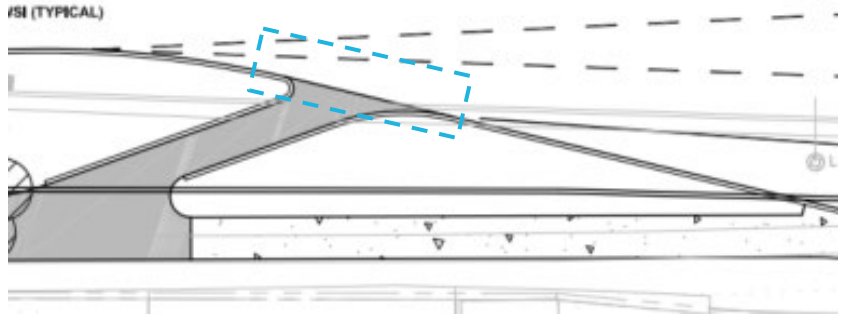
| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|-----------|---|--------------------------|-------------------------------------|---|--|----------------|-------------------|
| | <p>between pedestrians and motorists. This issue is compounded by the fact that an elementary school is located on the northeast corner of the intersection.</p>  | | | <p>traffic separately, making it easier to find a gap in traffic and concentrate on detecting vehicles arriving from one direction.</p> | <p>therefore, the suggested mitigation is not required.</p> | | |
| 13 | <p><u>Roundabout yield markings</u>: While entering a roundabout, motorists face yield conditions in two locations that are several metres apart: before the crosswalk, and again before entering the roundabout. Although both locations are at conflict points and require the motorist to yield, pavement markings in these two locations are different.</p> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Although optional, consider providing a second yield line on all entry lanes, at the edge of the circulating lane to provide markings consistency for motorists.¹</p> <p>Example:</p> | <p>RCI: City of Ottawa pavement marking standards do not include perpendicular yield lines (shark's teeth) at roundabout entry.</p> <p>CITY: Pavement markings should be consistent with</p> | N | No response |

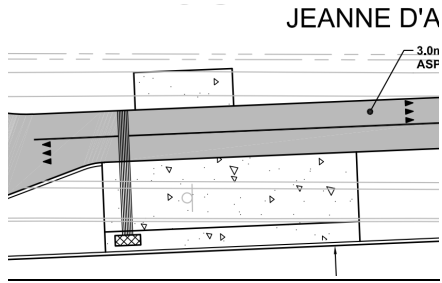
¹ National Cooperative Highway Research Program (NCHRP). *Report 672 – Roundabouts: An Informational Guide*. Second Edition. Washington, D.C., 2010. Exhibit 7-5 and Section 7.3.1.6.

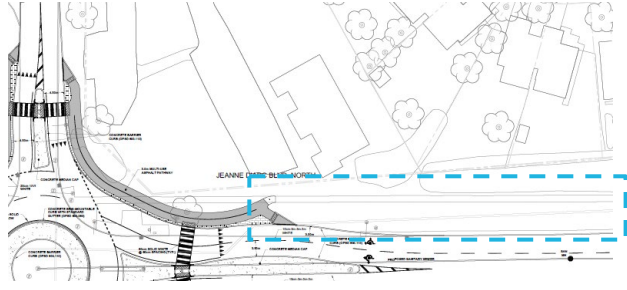
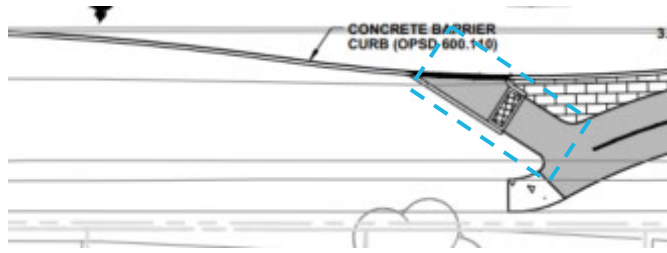
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| |  | | |  | <p>pavement markings at other roundabouts within the City of Ottawa for driver expectancy. Consider yield symbol pavement markings.</p>   | | |
| 14 | <p><u>Concrete medians</u>: the concrete median on each intersection approach presents a hazard for motorists entering the roundabout.</p>  | □ | ☒ | <p>Provide “keep right” and “object marker” signs on the median to advise motorists of the roadway hazards for all roundabout approaches.</p> | <p>RCI: Object markers and Keep right signage to be provided. Signage to be refined as part of detail design process.</p> <p>CITY: No comment</p> | Y | No response |

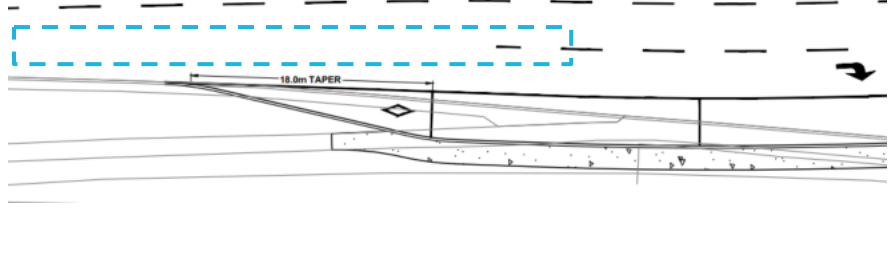
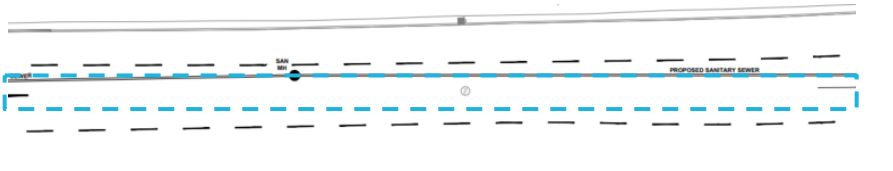
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| 15 | <p><u>Roadway identification signs</u>: motorists at roundabouts are entering a more complex operating environment compared to a traditional intersection. They may not be aware of which exit to take, which could result in harsh braking or conflicts with other road users.</p> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Provide directional signage ahead of the roundabout showing the intersection legs.</p> <p>Provide road name signs on the splitter islands.</p> | <p>RCI: Roundabout advanced notice and directional signage to be provided, Signage to be refined as part of detail design process</p> <p>CITY: No comment</p> | Y | No response |
| 16 | <p><u>Medoc Court intersection configuration</u>: the wide intersection width and large curb radius at Vineyard Drive and Medoc Court can result in high vehicle turn speeds and longer pedestrian crossing distance. In addition, the current configuration is not fully perpendicular to Vineyard Drive, which can impact sightlines for turning motorists.</p>  <p>The diagram shows a plan view of the intersection between Medoc Court and Vineyard Drive. A dashed blue line indicates the proposed curb radius reduction. Labels include '10cm SOLID YELLOW' for the curb, '45cm @ 3m TYPK' for the curb radius, 'ORM SEWER', '250mm SANITARY SEWER', 'MHST', 'VC', and 'DRIVE'.</p> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Reduce curb radius at the intersection using curb extensions. The smallest possible corner radius should be provided to reduce vehicle turn speeds as much as possible. Given the land uses on Medoc Court, the intersection corner radius could be reduced considerably.</p> <p>Use the curb radius reduction to align motorists more perpendicular to Fortune Drive to improve sightlines.</p> <p>Provide ladder crosswalk markings to improve visibility of the crosswalk.</p> | <p>RCI: Curb radii to be reviewed with City of Ottawa during detail design process</p> <p>CITY: No comment</p> | Y | No response |

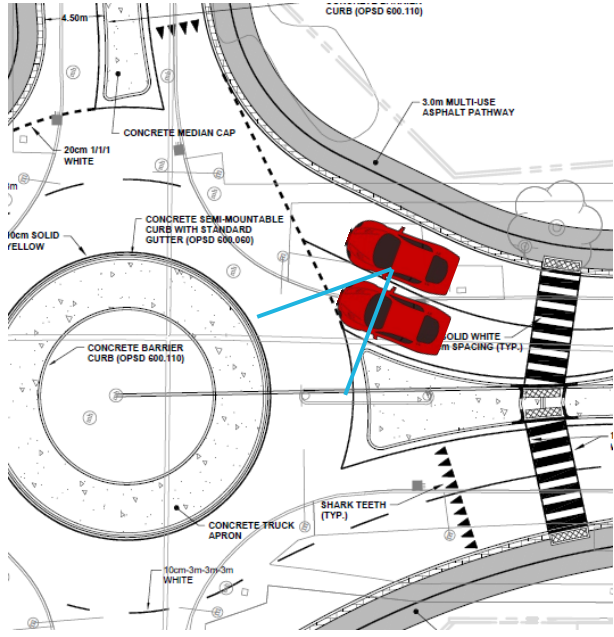

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| | | | | Add a crossride, as indicated in Issue 9. | | | |
| 17 | <u>Intersection illumination</u> : there is potential for collisions occurring during low light periods between motorists, pedestrians, and other road users. In addition, dark lighting conditions may result in difficulties for motorists to identify the path to their intended destination. | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Ensure illumination guidance is followed as per TAC Roadway Lighting Guide to provide sufficient illuminance for users. | RCI: Streetlighting design to be carried out by City of Ottawa forces, in accordance with City standards. CITY: No comment | Y | No response |
| Issues present in single lane configuration | | | | | | | |
| SL1 | <u>MUP alignment</u> : horizontal curves along the MUP at the intersection corners have a combination of two short radii and a tangent section, which may result in difficulties for cyclists to navigate.  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Redesign alignment of the MUP to provide a more gradual taper. The alignment could consist of a larger MUP radius instead of a small radius, tangent, and small radius. | RCI: MUP configuration at roundabout per comments received during functional design development to maximize MUP set back from roundabout facility. CITY: No comment | N | No response |
| SL2 | <u>Southbound lane expansion</u> : the southbound lane configuration abruptly expands from one lane to three lanes. This may lead to confusion for motorists and haphazard lane changes. | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Provide a more gradual transition from one to three | RCI: Lane arrangement to be | Y | No response |

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| |  | | | lanes and bus bays. A potential configuration could consist of: <ul style="list-style-type: none"> ▶ One lane. ▶ Addition of right-turn lane to the right. ▶ Addition of a through lane to the left of the existing through lane. ▶ Addition of bus bay on the right of the right-turn lane. | redesigned as part of detail design process. CITY: No comment | | |
| SL3 | <p><u>Southbound cycling facility transition</u>: southbound cyclists transition to the roadway at the beginning of the southbound lane expansion. This could lead to conflicts with motorists that are changing lanes approaching the highway ramps. There are no pavement markings or designated on-road facilities for cyclists.</p>  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Instead of transitioning southbound cyclists to on-street facilities, direct them to the east side bidirectional MUP to continue south. Provide only a sidewalk on the west side, past the south pedestrian crossing at the roundabout. Provide directional signage instructing southbound cyclists to cross to the east side of Jeanne d’Arc Boulevard. | RCI: Lane arrangement and cycle connection to be redesigned as part of detail design process. CITY: No comment | Y | No response |
| SL4 | <p><u>Location of bus shelter</u>: the shelter is located behind the MUP. For people who are blind, bus shelters and furniture are key landmarks</p> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Move the bus shelter and furniture on the platform to | RCI: Bus shelters to be relocated and design | Y | No response |

| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
|--|--|-------------------------------------|--------------------------|--|--|----------------|-------------------|
| | <p>for finding a bus stop. When these are absent or placed off the platform, users can sometimes be misled.</p>  | | | facilitate access to people who are blind. | <p>in accordance with OC Transpo requirements</p> <p>CITY: Relocate bus shelter to the platform adjacent to the curb/road so people do not have to cross cyclist traffic to board the bus.</p> | | |
| Issues present in multi-lane configuration | | | | | | | |
| ML1 | <p>Compared to a single lane roundabout, a multi-lane roundabout results in more conflict potential, especially for active transportation users, who face longer crossing distance, potential crosswalk visibility challenges.</p> <p>Additional concerns result from the presence of an elementary school.</p> <p>Refer to Section 2.3 of the design report for an additional discussion on transportation safety at roundabouts.</p> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <p>Consider selecting the single-lane roundabout option.</p> <p>If the multi-lane roundabout option is selected, implement the suggested mitigation measures below.</p> | <p>RCI: Single lane roundabout proposed</p> <p>CITY: No comment</p> | Y | No response |
| ML2 | <p><u>MUP facilities</u>: the multi-lane roundabout drawings provided do not show the MUP along the east side of Jeanne d’Arc Boulevard, south of the roundabout. Based on discussions with the design team, it is assumed that this MUP will be provided, similar to the single lane design.</p> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <p>Ensure MUP facility on the east side of Jeanne d’Arc Boulevard, south of the roundabout is provided and the design is the same as included in the single-lane roundabout drawings provided.</p> | <p>RCI: MUP Connection to be provided. MUP designed and constructed by others</p> <p>CITY: No comment</p> | Y | No response |

| Issue No. | Issue Description | Critical | Non-Critical | Suggested Mitigation | Owner / Designer Response | Status (Y/N/P) | RSA Team Comments |
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| |  | | | <p>If the design is different, ensure an RSA is completed at the detailed design stage, at least for the MUP.</p> | | | |
| ML3 | <p><u>Cycling facility transitions:</u> the tapers at the transitions between the roadway and the cycle tracks are not as gradual as the alignments in the single lane configuration. This may result in more difficulties for cyclists to navigate.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Provide more gradual tapers for the transition between the roadways and the cycle tracks, consistent with the single lane configuration.</p> | <p>RCI: Cycle transitions to be reviewed/refined with City of Ottawa during detail design process</p> <p>CITY: No comment</p> | Y | No response |

| | | | | | | | |
|------------|--|-------------------------------------|-------------------------------------|--|--|----------|--------------------|
| <p>ML4</p> | <p><u>Lane markings</u>: lane markings are not provided for the southbound right-turn lane south of the roundabout. The appearance of a wide lane may lead to motorists attempting to pass while others may occupy the entire lane, leading to sideswipe or rear-end conflicts.</p>  | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>Provide lane markings at the start of the taper to better define lane boundaries.</p> <p>Provide a more gradual transition from two to three lanes and bus bays. The right-turn lane and the bus bay should be added consecutively.</p> | <p>RCI: Lane arrangement to be redesigned as part of detail design process.</p> <p>CITY: No comment</p> | <p>Y</p> | <p>No response</p> |
| <p>ML5</p> | <p><u>Centre line markings</u>: the road segment of Jeanne d’Arc Boulevard south of Fortune Drive is missing centre line pavement markings.</p>  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <p>Add centre line pavement markings.</p> | <p>RCI: To be provided. Pavement marking to be developed as part of detail design development.</p> <p>CITY: No comment</p> | <p>Y</p> | <p>No response</p> |

| | | | | | | | |
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| <p>ML6</p> | <p><u>Roundabout yield markings on multi-lane entries:</u> While entering a roundabout on a multi-lane entry, vehicles in the left lane may reduce visibility for motorists in the right lane if the motorists do not position themselves in a staggered position.</p>  | <p>□</p> | <p>☒</p> | <p>On multi-lane entries, install staggered yield lines to prevent motorists in the left lane blocking sight distances for motorists in the right lane.</p> <p>Example:</p>  | <p>RCI: N/A – Single lane proposed. City of Ottawa pavement marking standards do not include perpendicular yield lines (shark's teeth) at roundabout entry.</p> <p>CITY: No comment</p> | <p>N</p> | <p>No response</p> |
|------------|---|----------|----------|---|---|----------|--------------------|