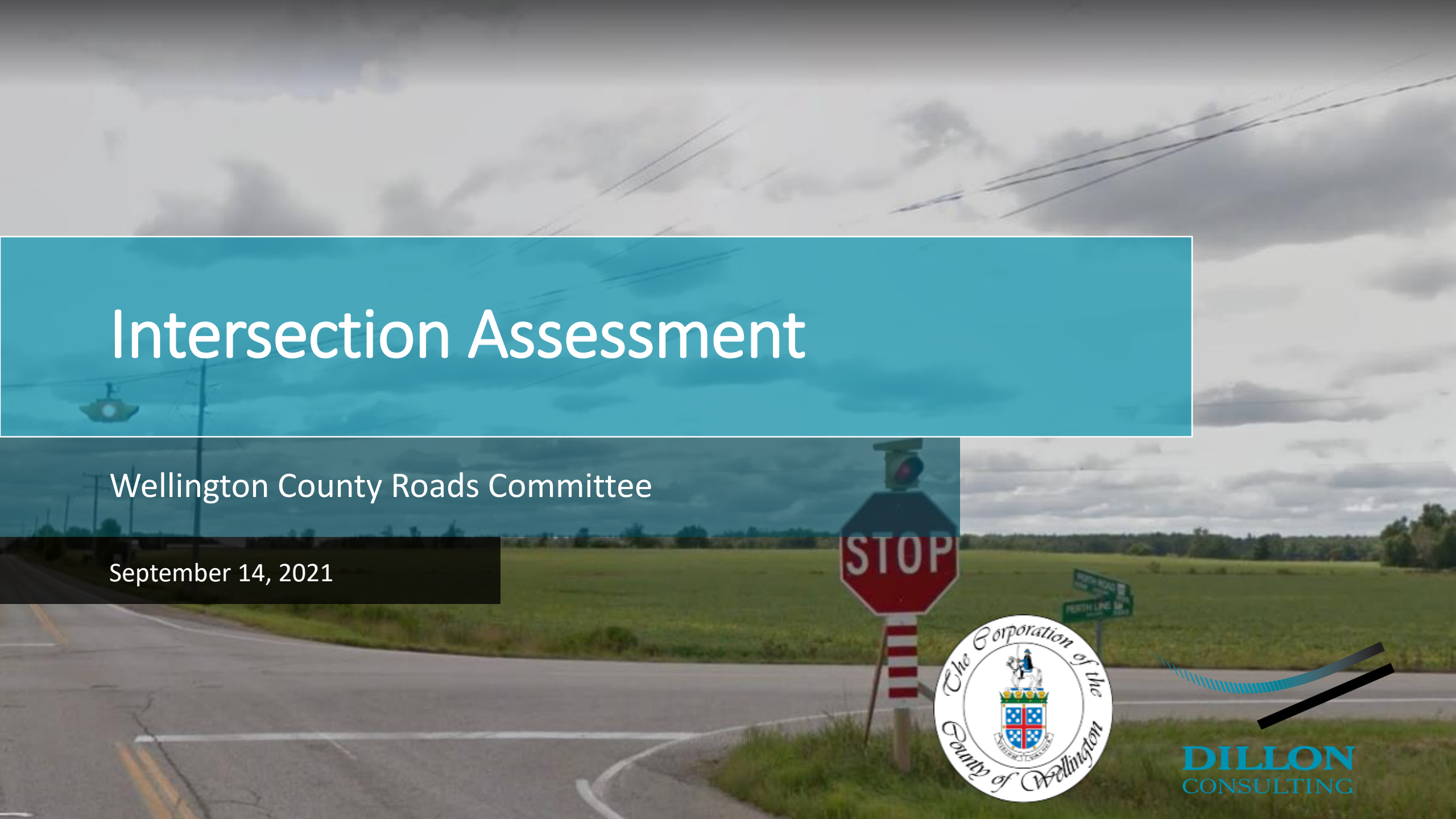
Intersection Assessment

Wellington County Roads Committee

September 14, 2021



Agenda

Overview

Approach and key recommendations

- Preliminary Alternatives Considered
- Detailed Intersection Evaluation Package
- Intersection Assessment Process
- Recommended Solutions
- Next Steps

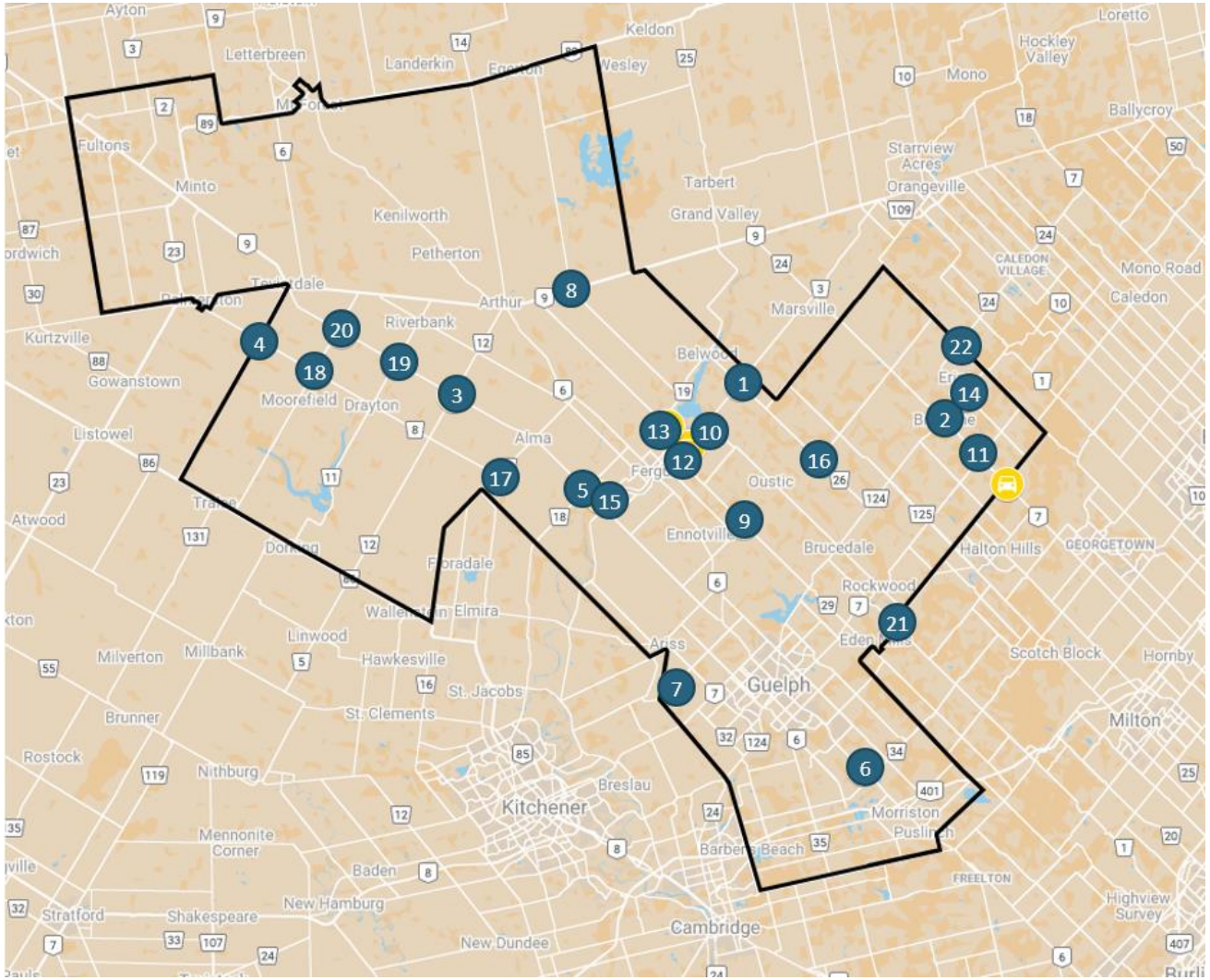
Discussion at the end of the Presentation

Overview

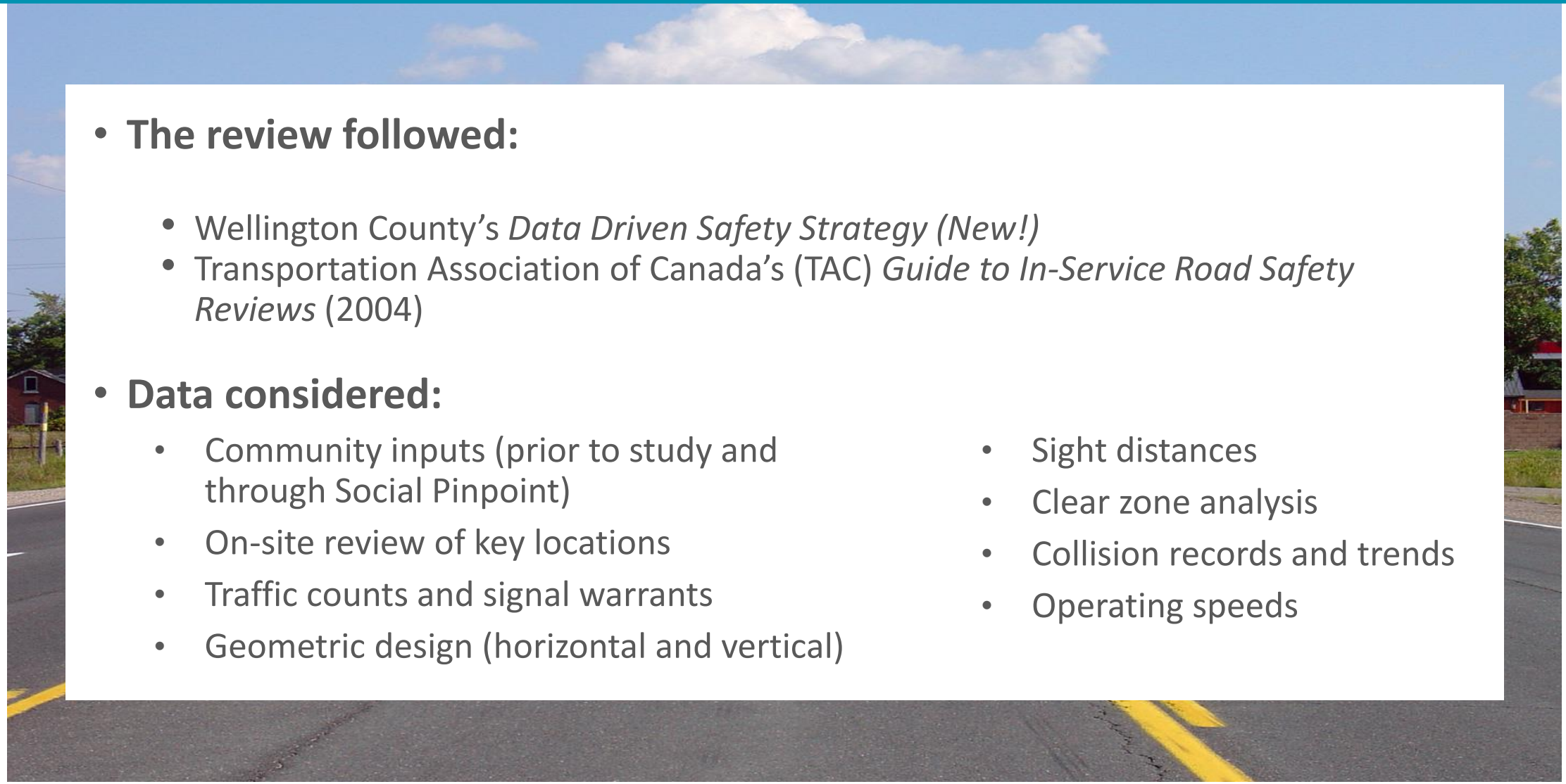
- Total of 22 intersections were selected for review based on input from County staff, councillors and through public consultation from the initial RMAP engagement exercise

- Locations were generally identified based on:
  - Collision trends
  - Speeding issues
  - Operational challenges
  - Geometric design
  - Community concerns

- Numerous locations along WR 18 and WR 7, though there are no common trends between sites on those corridors



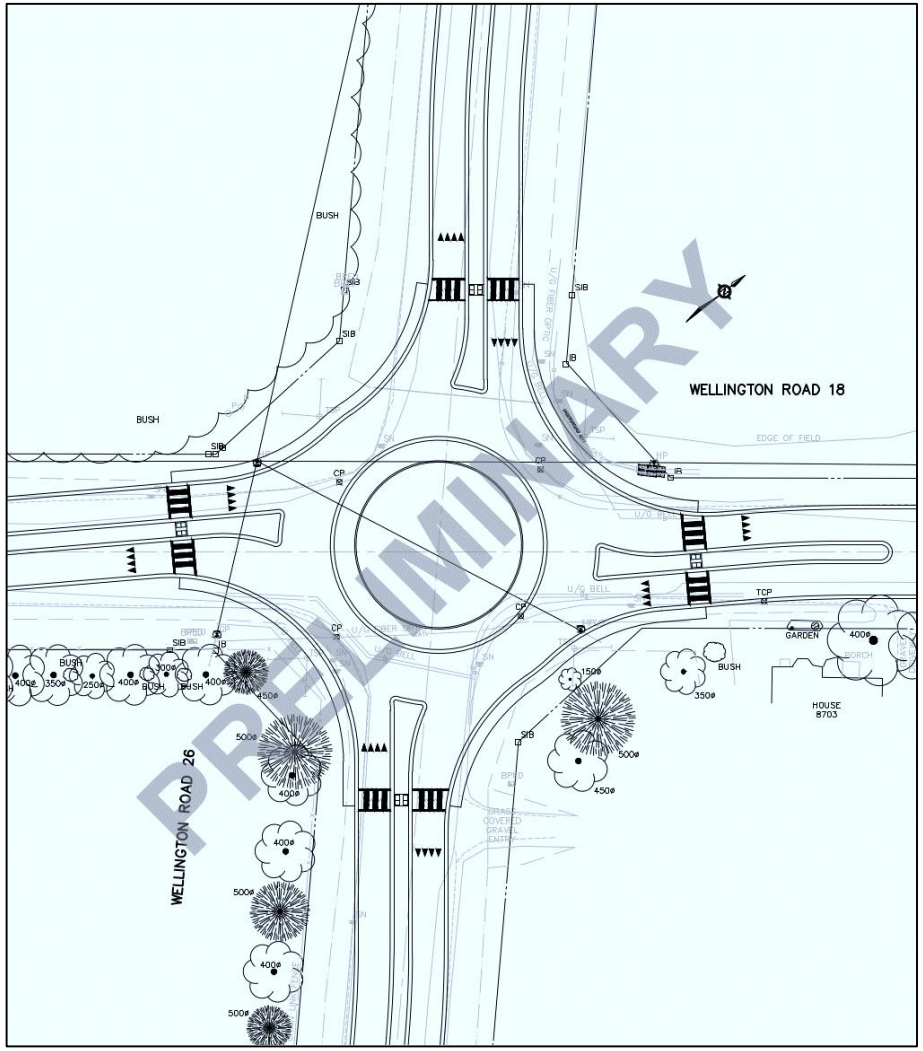
Overview



- **The review followed:**
  - Wellington County's *Data Driven Safety Strategy (New!)*
  - Transportation Association of Canada's (TAC) *Guide to In-Service Road Safety Reviews* (2004)
- **Data considered:**
  - Community inputs (prior to study and through Social Pinpoint)
  - On-site review of key locations
  - Traffic counts and signal warrants
  - Geometric design (horizontal and vertical)
  - Sight distances
  - Clear zone analysis
  - Collision records and trends
  - Operating speeds

Preliminary Alternatives Considered

Primary Alternatives Considered

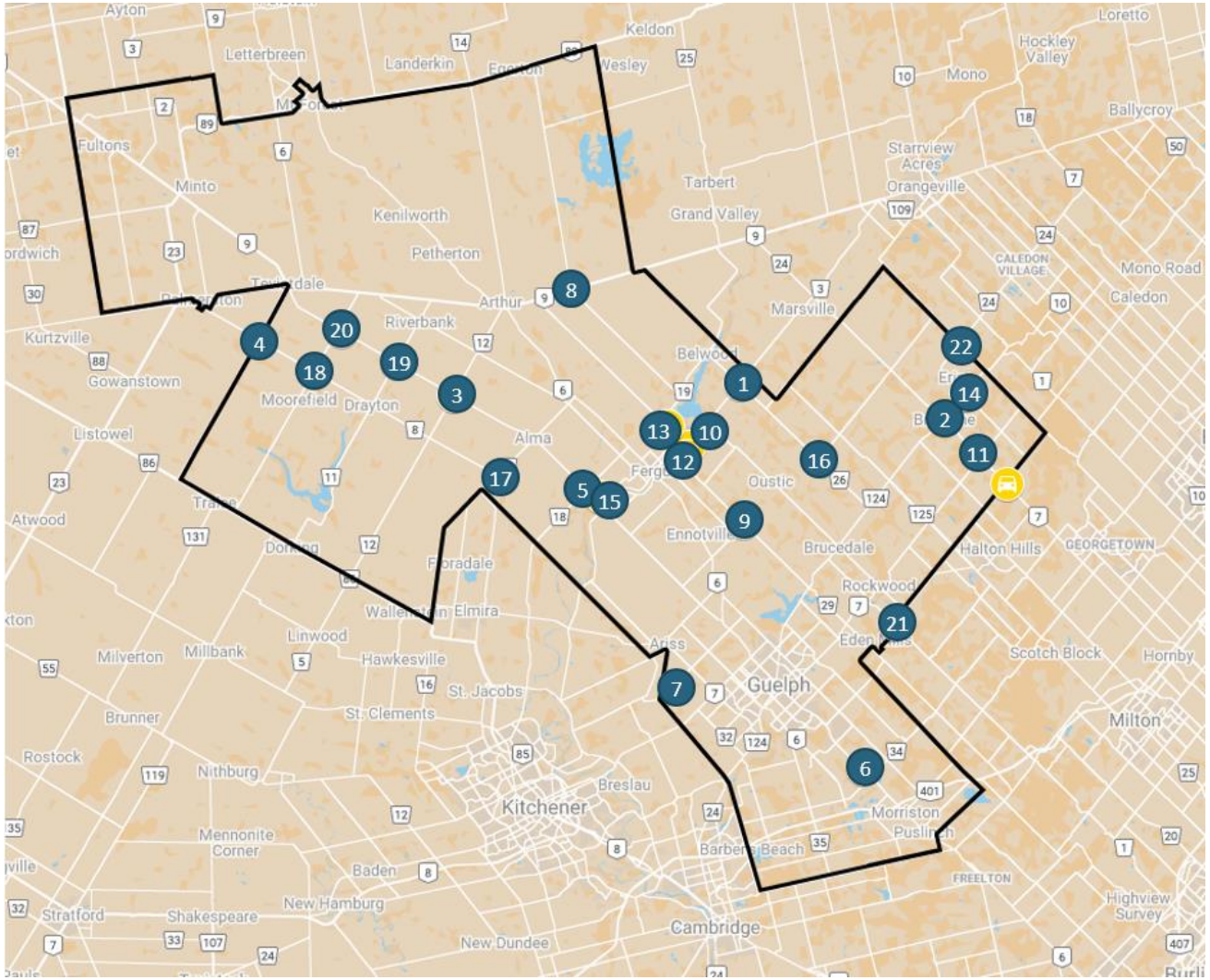


- Additional traffic control to address operational issues:
  - All-way stop control
  - Traffic signals
  - Roundabouts
- Addition or removal of dedicated turning lanes
- Modification to the road alignments (horizontal and vertical profiles)
- Regrading and/or addition of guiderail
- Speed control:
  - Roundabouts
  - Urbanization
  - Modification of posted speeds

Detailed Evaluation Package

Detailed Intersection Evaluation Package

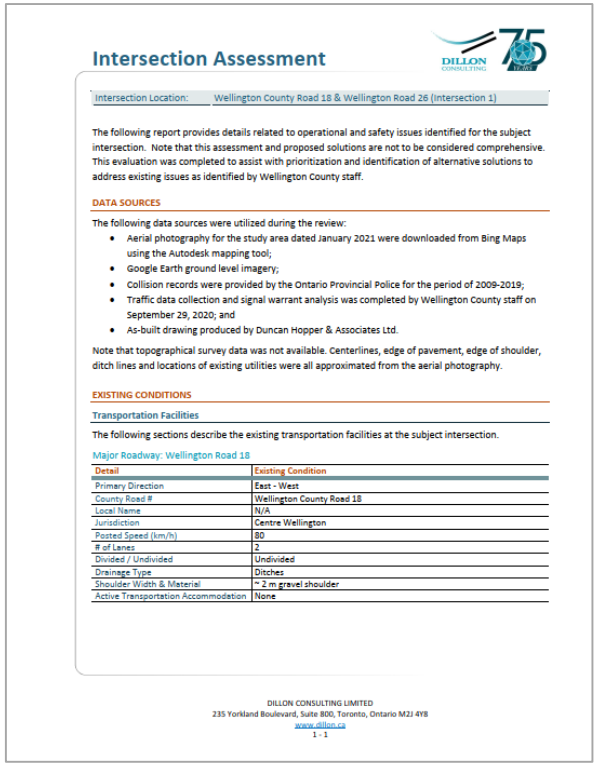
- Existing Conditions
  - transportation facilities
  - intersection design
- Operational and Safety Review
  - traffic signal warrant
  - geometric design
  - sight distances
  - roadside safety (clear zone, identified hazards)
  - collision records
  - operating speeds
- Public Concerns
- Alternative Solutions
- Recommended Solutions



Intersection Assessment Process

Intersection Assessment Process

Assessment of each intersection included the following details:



Intersection Assessment

Intersection Location: Wellington County Road 18 & Wellington Road 26 (Intersection 1)

The following report provides details related to operational and safety issues identified for the subject intersection. Note that this assessment and proposed solutions are not to be considered comprehensive. This evaluation was completed to assist with prioritization and identification of alternative solutions to address existing issues as identified by Wellington County staff.

DATA SOURCES

The following data sources were utilized during the review:

- Aerial photography for the study area dated January 2021 were downloaded from Bing Maps using the Autodesk mapping tool;
- Google Earth ground level imagery;
- Collision records were provided by the Ontario Provincial Police for the period of 2009-2019;
- Traffic data collection and signal warrant analysis was completed by Wellington County staff on September 29, 2020; and
- As-built drawing produced by Duncan Hopper & Associates Ltd.

Note that topographical survey data was not available. Centerlines, edge of pavement, edge of shoulder, ditch lines and locations of existing utilities were all approximated from the aerial photography.

EXISTING CONDITIONS

Transportation Facilities

The following sections describe the existing transportation facilities at the subject intersection.

Major Roadway: Wellington Road 18

Detail	Existing Condition
Primary Direction	East - West
County Road #	Wellington County Road 18
Local Name	N/A
Jurisdiction	Centre Wellington
Posted Speed (km/h)	80
# of Lanes	2
Divided / Undivided	Undivided
Drainage Type	Ditches
Shoulder Width & Material	~ 2 m gravel shoulder
Active Transportation Accommodation	None

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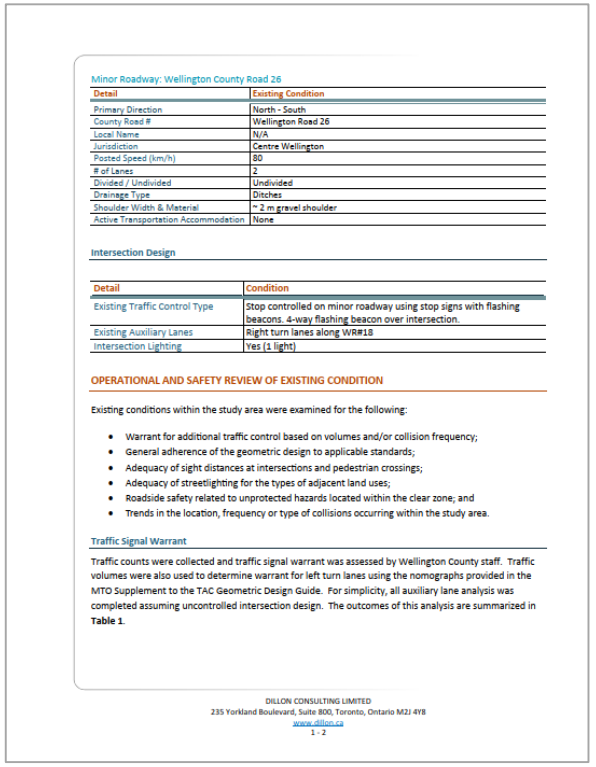

Minor Roadway: Wellington County Road 26

Detail	Existing Condition
Primary Direction	North - South
County Road #	Wellington Road 26
Local Name	N/A
Jurisdiction	Centre Wellington
Posted Speed (km/h)	80
# of Lanes	2
Divided / Undivided	Undivided
Drainage Type	Ditches
Shoulder Width & Material	~ 2 m gravel shoulder
Active Transportation Accommodation	None

Intersection Design

Detail	Condition
Existing Traffic Control Type	Stop controlled on minor roadway using stop signs with flashing beacons. 4-way flashing beacon over intersection.
Existing Auxiliary Lanes	Right turn lanes along WR#18
Intersection Lighting	Yes (1 light)

OPERATIONAL AND SAFETY REVIEW OF EXISTING CONDITION

Existing conditions within the study area were examined for the following:

- Warrant for additional traffic control based on volumes and/or collision frequency;
- General adherence of the geometric design to applicable standards;
- Adequacy of sight distances at intersections and pedestrian crossings;
- Adequacy of streetlighting for the types of adjacent land uses;
- Roadside safety related to unprotected hazards located within the clear zone; and
- Trends in the location, frequency or type of collisions occurring within the study area.

Traffic Signal Warrant

Traffic counts were collected and traffic signal warrant was assessed by Wellington County staff. Traffic volumes were also used to determine warrant for left turn lanes using the nomographs provided in the MTO Supplement to the TAC Geometric Design Guide. For simplicity, all auxiliary lane analysis was completed assuming uncontrolled intersection design. The outcomes of this analysis are summarized in **Table 1**.

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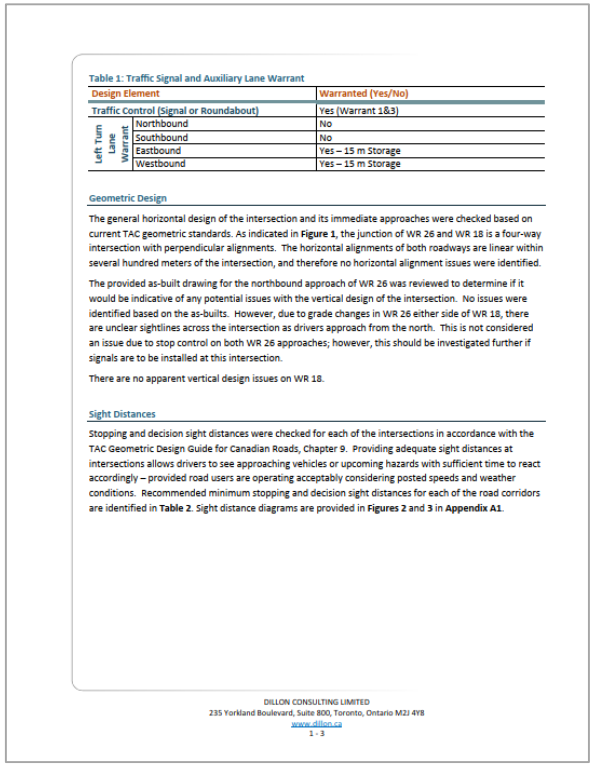

Table 1: Traffic Signal and Auxiliary Lane Warrant

Design Element		Warranted (Yes/No)
Traffic Control (Signal or Roundabout)		Yes (Warrant 1&3)
Left Turn Lane Warrant	Northbound	No
	Southbound	No
	Eastbound	Yes – 15 m Storage
	Westbound	Yes – 15 m Storage

Geometric Design

The general horizontal design of the intersection and its immediate approaches were checked based on current TAC geometric standards. As indicated in **Figure 1**, the junction of WR 26 and WR 18 is a four-way intersection with perpendicular alignments. The horizontal alignments of both roadways are linear within several hundred meters of the intersection, and therefore no horizontal alignment issues were identified.

The provided as-built drawing for the northbound approach of WR 26 was reviewed to determine if it would be indicative of any potential issues with the vertical design of the intersection. No issues were identified based on the as-builts. However, due to grade changes in WR 26 either side of WR 18, there are unclear sightlines across the intersection as drivers approach from the north. This is not considered an issue due to stop control on both WR 26 approaches; however, this should be investigated further if signals are to be installed at this intersection.

There are no apparent vertical design issues on WR 18.

Sight Distances

Stopping and decision sight distances were checked for each of the intersections in accordance with the TAC Geometric Design Guide for Canadian Roads, Chapter 9. Providing adequate sight distances at intersections allows drivers to see approaching vehicles or upcoming hazards with sufficient time to react accordingly – provided road users are operating acceptably considering posted speeds and weather conditions. Recommended minimum stopping and decision sight distances for each of the road corridors are identified in **Table 2**. Sight distance diagrams are provided in **Figures 2** and **3** in **Appendix A1**.

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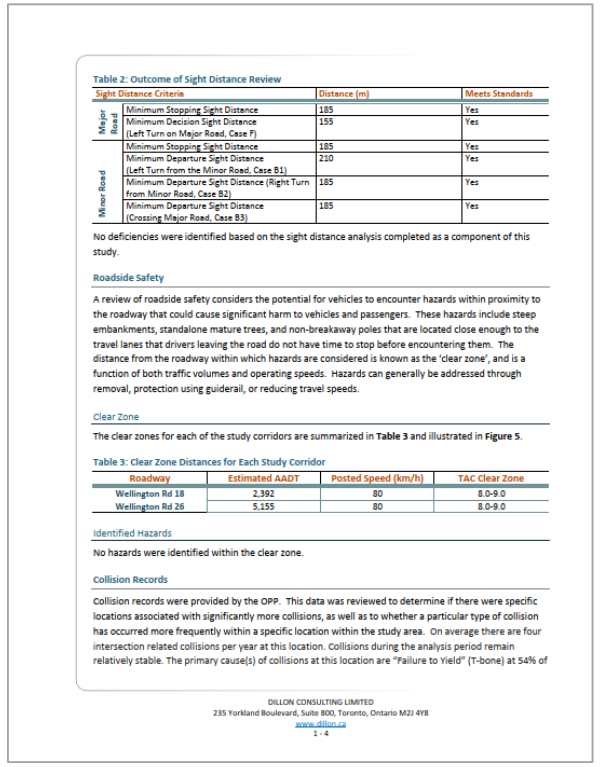

Table 2: Outcome of Sight Distance Review

Sight Distance Criteria		Distance (m)	Meets Standards
Major Road	Minimum Stopping Sight Distance	185	Yes
	Minimum Decision Sight Distance (Left Turn on Major Road, Case F)	155	Yes
Minor Road	Minimum Stopping Sight Distance	185	Yes
	Minimum Departure Sight Distance (Left Turn from the Minor Road, Case B1)	210	Yes
	Minimum Departure Sight Distance (Right Turn from Minor Road, Case B2)	185	Yes
	Minimum Departure Sight Distance (Crossing Major Road, Case B3)	185	Yes

No deficiencies were identified based on the sight distance analysis completed as a component of this study.

Roadside Safety

A review of roadside safety considers the potential for vehicles to encounter hazards within proximity to the roadway that could cause significant harm to vehicles and passengers. These hazards include steep embankments, standalone mature trees, and non-breakaway poles that are located close enough to the travel lanes that drivers leaving the road do not have time to stop before encountering them. The distance from the roadway within which hazards are considered is known as the 'clear zone', and is a function of both traffic volumes and operating speeds. Hazards can generally be addressed through removal, protection using guiderail, or reducing travel speeds.

Clear Zone

The clear zones for each of the study corridors are summarized in **Table 3** and illustrated in **Figure 5**.

Table 3: Clear Zone Distances for Each Study Corridor

Roadway	Estimated AADT	Posted Speed (km/h)	TAC Clear Zone
Wellington Rd 18	2,392	80	8.0-9.0
Wellington Rd 26	5,155	80	8.0-9.0

Identified Hazards

No hazards were identified within the clear zone.

Collision Records

Collision records were provided by the OPP. This data was reviewed to determine if there were specific locations associated with significantly more collisions, as well as to whether a particular type of collision has occurred more frequently within a specific location within the study area. On average there are four intersection related collisions per year at this location. Collisions during the analysis period remain relatively stable. The primary cause(s) of collisions at this location are "Failure to Yield" (T-bone) at 54% of

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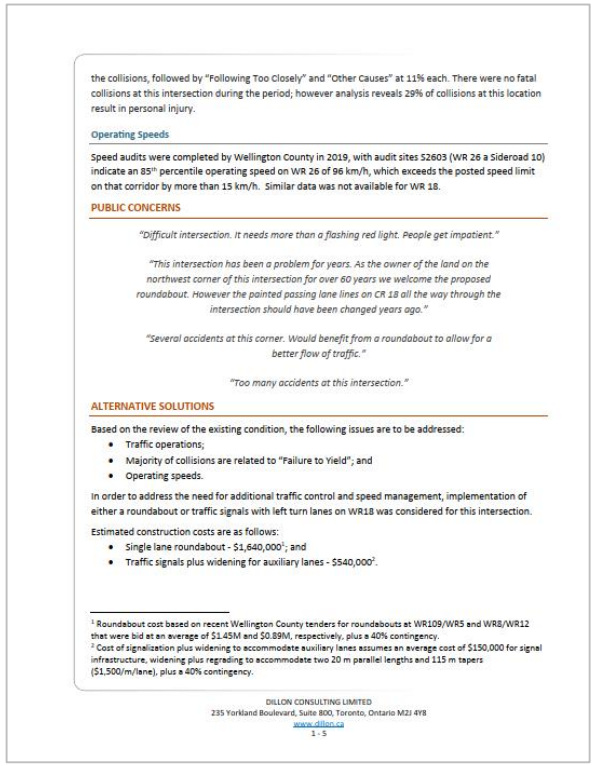
Description of Existing Condition → Review of Operational Issues and Traffic Signal Warrant → Review of the Horizontal and Vertical Design Details → Review of Adequacy of Stopping and Decision Sight Distances → Review of Clear Zones and Identification of Potential Hazards → Review of Available Collision Records

Intersection Assessment Process

Assessment of each intersection included the following details:



the collisions, followed by "Following Too Closely" and "Other Causes" at 11% each. There were no fatal collisions at this intersection during the period; however analysis reveals 29% of collisions at this location result in personal injury.

Operating Speeds

Speed audits were completed by Wellington County in 2019, with audit sites 52603 (WR 26 a Sideroad 10) indicate an 85th percentile operating speed on WR 26 of 96 km/h, which exceeds the posted speed limit on that corridor by more than 15 km/h. Similar data was not available for WR 18.

PUBLIC CONCERNS

"Difficult intersection. It needs more than a flashing red light. People get impatient."

"This intersection has been a problem for years. As the owner of the land on the northwest corner of this intersection for over 60 years we welcome the proposed roundabout. However the painted passing lane lines on CR 18 all the way through the intersection should have been changed years ago."

"Several accidents at this corner. Would benefit from a roundabout to allow for a better flow of traffic."

"Too many accidents at this intersection."

ALTERNATIVE SOLUTIONS

Based on the review of the existing condition, the following issues are to be addressed:

- Traffic operations;
- Majority of collisions are related to "Failure to Yield"; and
- Operating speeds.

In order to address the need for additional traffic control and speed management, implementation of either a roundabout or traffic signals with left turn lanes on WR18 was considered for this intersection.

Estimated construction costs are as follows:

- Single lane roundabout - $1,640,000[1]; and
- Traffic signals plus widening for auxiliary lanes - $540,000[2].

[1] Roundabout cost based on recent Wellington County tenders for roundabouts at WR109/WR5 and WR8/WR12 that were bid at an average of $1.45M and $0.89M, respectively, plus a 40% contingency.
[2] Cost of signalization plus widening to accommodate auxiliary lanes assumes an average cost of $150,000 for signal infrastructure, widening plus regrading to accommodate two 20 m parallel lengths and 115 m tapers ($1,500/m/lane), plus a 40% contingency.

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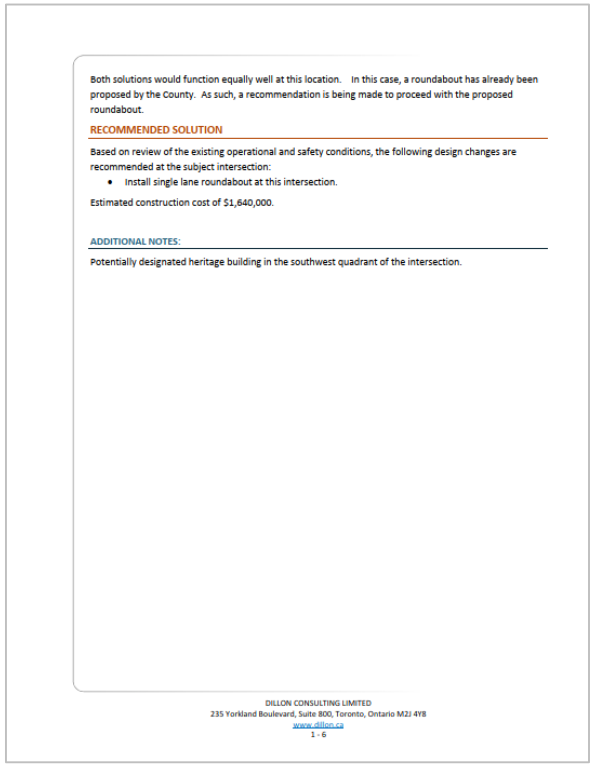

Both solutions would function equally well at this location. In this case, a roundabout has already been proposed by the County. As such, a recommendation is being made to proceed with the proposed roundabout.

RECOMMENDED SOLUTION

Based on review of the existing operational and safety conditions, the following design changes are recommended at the subject intersection:

- Install single lane roundabout at this intersection.

Estimated construction cost of $1,640,000.

ADDITIONAL NOTES:

Potentially designated heritage building in the southwest quadrant of the intersection.

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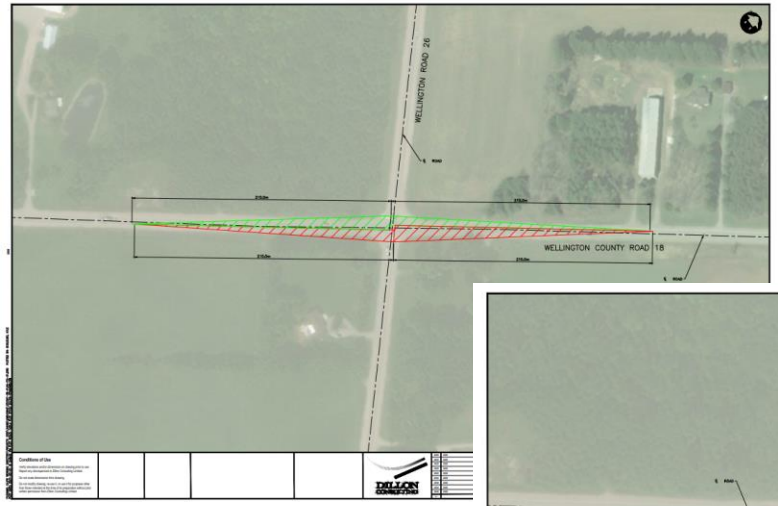
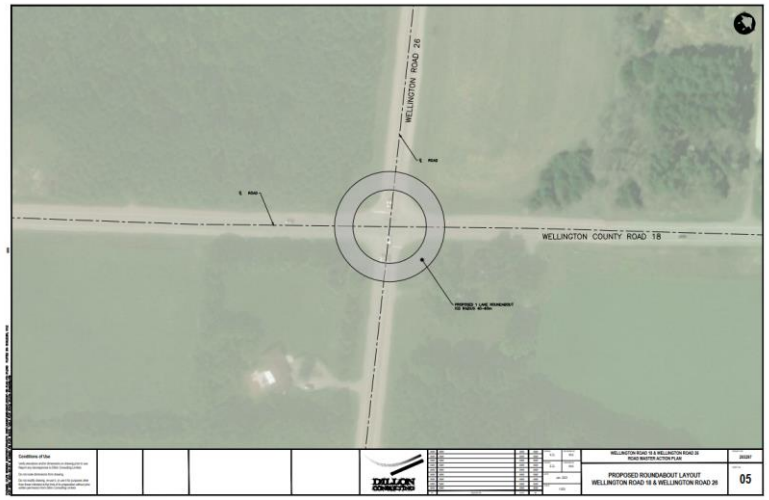




Review of Available Speed Data

Consideration of Public Concerns

Summary of Identified Issues Based on Completed Reviews and Available Data

Identification of Potential Alternative Solutions

Identification and High-Level Costing of a Recommended Solution

Associated Drawing Packages

Recommended Solutions

Overview of Recommended Solutions

Recommended Solutions	
Roundabouts	7
Intersection Signalizations with/without auxiliary lanes	5
Vertical and/or Horizontal realignment Projects	3
Recommended New All-way Stops	3
Turning lanes without changes to the traffic control	2
Other (signal timing, movement study, pavement markings, signage, do nothing)	2

Overview of Recommended Solutions

WR 18 and David Street

- Majority of recommended solutions require significant capital funding and time to design and construct
- Recommend that Staff use intersection assessment to inform future capital road budgets
- Potential short-term intersection change:
  - **Location: WR 18 (Geddes Street) and David Street,** Township of Centre Wellington
  - **Recommendation:** Implement a permanent all-way stop
  - **Context:** Requires a bylaw change to turn the temporary all-way stop to a permanent all-way stop
  - To be approved at an upcoming Roads Committee meeting

Overview of Recommended Solutions

Location Description			Identified Concerns					Solutions Considered					Recommended Solution	Rationale for Recommendations
#	Major Road	Minor Road	Traffic Ops	Upward Trend in Collisions	Speed	Geo-metry	Sight Distance	All-Way Stop Control	Traffic Signals	Round -about	Realign -ment	Other		
1	WR18	WR26	X		X				X	X			•Install single lane roundabout •Estimated value of $1,640,000 + property acquisition	•A roundabout has already been proposed by the County
2	WR124	WR24		X	X		X					X	•Conduct movement study •Adjust traffic signal timing •Review snow clearing operations	•Adjusting signal timing could potentially improve traffic operations (queues observed)
3	WR7	WR12	X	X					X	X			•Install single lane roundabout •Estimated value of $1,640,000 + property acquisition	•A roundabout has already been proposed by the County
4	WR8	WR9		X		X				X	X		•Install single lane roundabout •Estimated value of $1,640,000 + property acquisition	•The cost associated with the alternative solutions (realignment of approximately 500 m of WR8) was significantly higher than installing a roundabout
5	WR7	WR18	X						X	X			•Install single lane roundabout •Estimated value of $1,640,000 + property acquisition	•A roundabout has already been proposed by the County
6	WR46	Fox Run Bridle Path							X	X		X	•No data to warrant improvements	•N/A

Overview of Recommended Solutions

Location Description			Identified Concerns					Solutions Considered					Recommended Solution	Rationale for Recommendations
#	Major Road	Minor Road	Traffic Ops	Upward Trend in Collisions	Speed	Geo-metry	Sight Distance	All-Way Stop Control	Traffic Signals	Round -about	Realign -ment	Other		
7	WR30	Township Road 3		X	X	X		X		X			•Install single lane roundabout •Installation of guiderail to also be considered •Estimated value of $1,640,000	•Roundabout would address visibility, speeding and left turn capacity issues
8	WR16	WR109		X	X	X		X		X	X		•Realign approximately 400 m of WR16 in proximity to the intersection •Estimated value of $1,680,000 + property acquisition	•In the absence of more detailed traffic modelling, imbalanced traffic volumes at the intersection have been assumed to make a roundabout an infeasible solution for this location •As such, realignment has been recommended
9	WR22	WR29		X	X	X	X	X		X	X		•Adjust vertical profile WR22 or realign WR29 •Estimated value of $1,680,000 In the interim, install all-way stop control and advanced signage to address sight distance issues •Interim measures estimated at $8,000, ultimate solution estimated value of $1,680,000 + property acquisition	•Recommended solution will address sight distance issues •Due to close proximity of adjacent buildings, a roundabout was not considered to be a feasible solution
10	WR18	WR29	X				X		X	X			•Install traffic signals •Add left turn lane along WR18 •Install guiderail •Estimated value of $385,000	•Due to physical constraints imposed by the proximity of the Eramosa River, installation of a roundabout is not considered a feasible solution

Overview of Recommended Solutions

Location Description			Identified Concerns					Solutions Considered					Recommended Solution	Rationale for Recommendations
#	Major Road	Minor Road	Traffic Ops	Upward Trend in Collisions	Speed	Geo-metry	Sight Distance	All-Way Stop Control	Traffic Signals	Round -about	Realign -ment	Other		
11	WR24	WR42	X				X		X	X			•Install traffic signals •Add left turn lanes along WR24 •Estimated value of $540,000	•Installation of traffic signals and left turn lanes would address traffic operations and sight distances issues •Installation of roundabout is not feasible due to heritage property adjacent to the intersection
12	WR18	2 Line		X		X	X	X	X	X	X		•Install single lane roundabout •Estimated value of $1,640,000 + property acquisition	•Installation of roundabout would address operating speeds and sight distances issues •Realignment is not feasible due to close proximity of residential properties
13	WR19	2 Line		X			X	X		X			•Install single lane roundabout •Installation of guiderail to also be considered •Estimated value of $1,640,000 + property acquisition	•A roundabout could be used to address the alignment issue •Realignment is not feasible due to close proximity of residential properties
14	WR52	Ninth Line				X	X	X					•Remove right turn channel and painted island •Convert to all-way stop control •Estimated value of $40,000	•Current right turn channel design allows vehicles to approach adjacent intersections with limited visibility
15	WR18 (Geddes Street)	David Street		X			X	X					•Convert intersection to all-way stop control •Estimated value of $5,000	•All-way stop control could address the sight distances issue associated with existing vegetation without impacting the character of the area

Overview of Recommended Solutions

Location Description			Identified Concerns					Solutions Considered					Recommended Solution	Rationale for Recommendations
#	Major Road	Minor Road	Traffic Ops	Upward Trend in Collisions	Speed	Geo-metry	Sight Distance	All-Way Stop Control	Traffic Signals	Round -about	Realign -ment	Other		
16	WR22 (East)	WR26		X	X			X		X		X	•Add northbound right and southbound left auxiliary lanes •Estimated value of $330,000 + property acquisition	•Auxiliary lane installation to address the collision trend is less than the cost of installing a roundabout
17	WR8	WR17	**X**	X	X		X		X	X	X		•Install traffic signals •Add an eastbound left turn lane and westbound right turn lane along WR8 •Estimated value of $700,000	•Installation of traffic signals and turn lanes would provide additional traffic control and speed management •A roundabout was not considered due to the steep profile of the intersection
18	WR8	WR10		X		X	X	X			X		•In the interim, convert intersection to all-way stop control with advanced signage and an overhead beacon •Ultimate correction of vertical profile •Interim measures estimated at $8,000, ultimate solution estimated value of $1,268,000	•All-way stop control will alleviate issues associated with sight distances until budget is available to correct the profile
19	WR7	WR11	**X**	X	X	X			X	X			•Install traffic signals •Estimated cost of $210,000 (not including auxiliary lanes)	•Installation of traffic signals would address the need for additional traffic control and speed management •A roundabout was not considered due to the impacts on adjacent residential properties

Overview of Recommended Solutions

Location Description			Identified Concerns					Solutions Considered					Recommended Solution	Rationale for Recommendations
#	Major Road	Minor Road	Traffic Ops	Upward Trend in Collisions	Speed	Geo-metry	Sight Distance	All-Way Stop Control	Traffic Signals	Round -about	Realign -ment	Other		
20	WR7	WR10				X	X	X				X	•Convert intersection to all-way stop control with advanced signage •Increase curb radii and replace pedestrian pads in each quadrant •Estimated value of $20,000	•All-way stop control is considered an acceptable solution to address the lack of adequate sight distances in this low speed environment and is significantly cheaper than road realignment
21	WR44	Eramosa-Milton Townline		X			X			X		X	•Add enhanced pavement markings and signage on approach to the intersection. •Add left turn lanes •Install guiderail •Estimated value of $280,000	•Installation of left turn lanes would address lane warrant and partially mitigate collision trends •A roundabout is not recommended due to the proximity of existing residential properties
22	WR25	WR124	X		X				X	X			•Install traffic signals •Add left turn lanes along WR124 •Regrade ditches •Estimated value of $540,000	•Installation of traffic signals and left turn lanes would provide additional traffic control •A roundabout is not recommended due adjacent natural heritage constraints.

Capital Cost of Recommended Solutions

Wellington Road 52 at Ninth Line. Recommended solution includes removal of right turn channel and conversion to all-way stop control.

- Roundabouts - $11,500,000
- Intersection Signalization with/without auxiliary lanes - $2,400,000
- Addition of Auxiliary Lanes Only - $610,000
- Horizontal/Vertical Realignment Projects - $4,600,000
- Recommended New All-way Stops - $25,000
- Interim measures – $16,000
- Other - $40,000

- **Total Estimated Capital Budget of: $19,200,000**

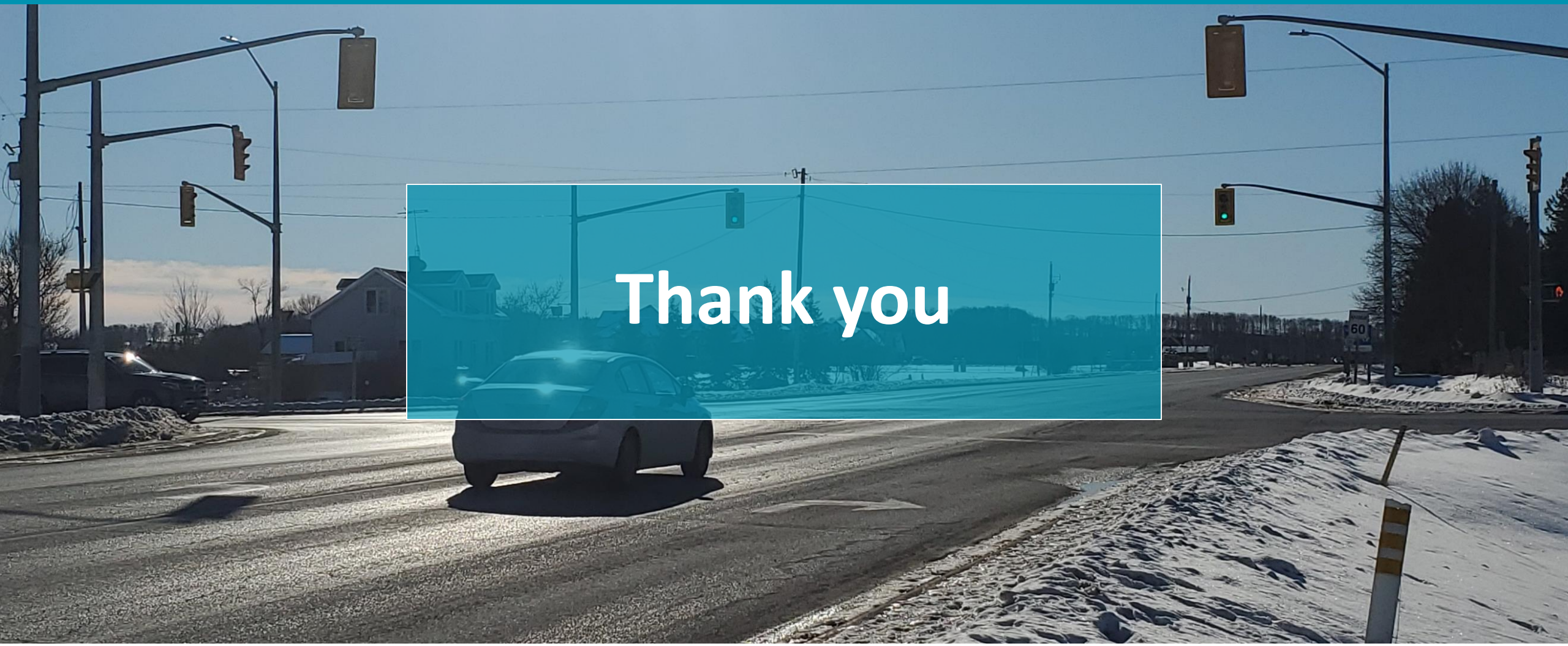
Next Steps

Next Steps

Wellington Road 24 at Wellington Road 124. Traffic signal optimization study to be completed.

- Prioritize projects
- Develop capital budgets
- Recommend an implementation schedule

Discussion



Thank you