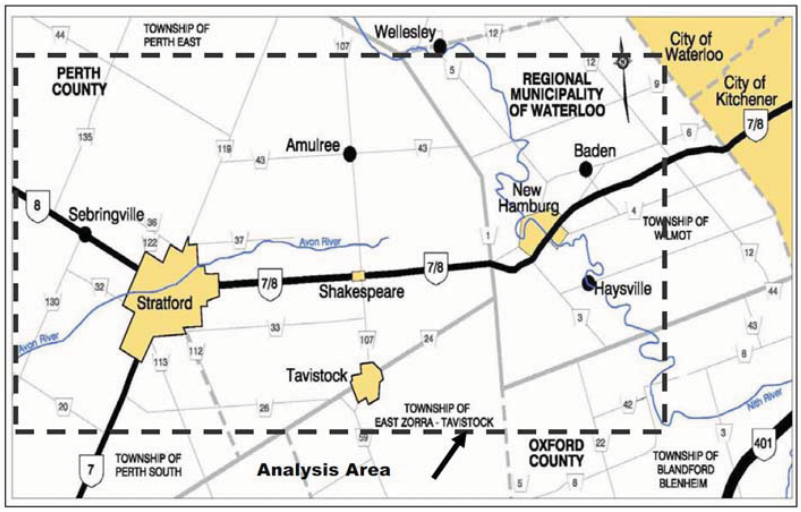
Ontario

Highway 7/8 Value Engineering Study

From Stratford to New Hamburg

December 2011

MTO Group Work Project #13-00-00



FINAL REPORT

HDR | iTRANS

Appendix A
VE Proposal Documentation

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-2
TITLE: Parclo A-2 at Nafziger Road	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

At grade signalized intersection at Natziger Road and Highway 7/8

ALTERNATIVE CONCEPT:

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Parclo A-2 (A-4) interchange at Natziger Road and Highway 7/8

ADVANTAGES:	DISADVANTAGES:
♦ Increased capacity ♦ Maintains through capacity on Hwy while eliminating the need to add more lanes ♦ More consistent design with eastern section of Highway 7/8 ♦ Serves future needs of area designated for development ♦ Don't need as wide a bridge as with a diamond	♦ More property requirements than diamond ♦ Potential impact on planned soccer field ♦ Full buildout to an A-4 (directional ramps) would impact patrol yard in NW quadrant ♦ Required a longer bridge that a diamond

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Parclo A-2 at Nafziger Road	**IDEA NO.**	**PAGE NO**
	NH-2	2 of 3

DISCUSSION / JUSTIFICATION:

- Serves section of New Hamburg that is designated for future growth and serves the new and expanding community/recreation complex.
- Least property constrained intersection in New Hamburg, mostly greenfields impacted

IMPLEMENTATION CONSIDERATIONS:

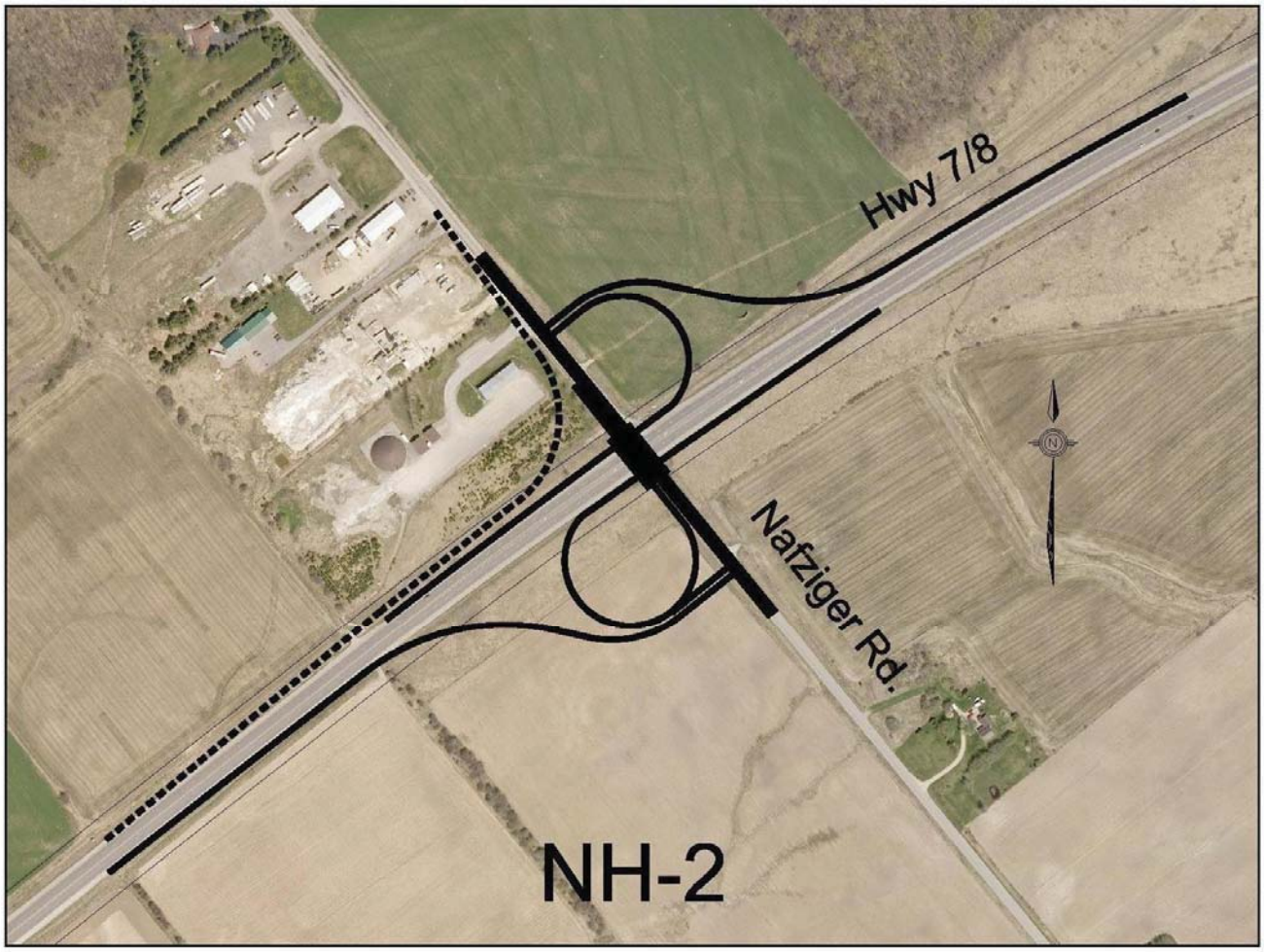
Property purchases needed

May need to build 4 lanes on structure to eliminate overlapping left turnS

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	Performance Compared to Present Design				
	-2	-1	0	+1	+2
Reduced Environmental Impact	x				
Enhanced Operational Performance					x
Reduced Construction Impacts			x		
Expedited Project Delivery			x		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-2
TITLE: Parclo A-2 at Nafziger Road	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-5
TITLE: Nafziger Road: Tight Diamond on North, Diamond or Loops on the South	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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At grade signalized intersection at Natziger Road and Highway 7/8

ALTERNATIVE CONCEPT: Tight diamond

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Nafziger Road: Tight Diamond on North side of Highway 7/8, Standard Diamond or Loops on the South Side of Highway 7/8

ADVANTAGES:	**DISADVANTAGES:**
♦ Increased capacity ♦ Maintains through capacity on Hwy while eliminating the need to add more lanes ♦ More consistent design with eastern section of highay 7/8 ♦ Serves future needs of area designated for development ♦ Least property requirements of any interchange design	♦ Additional property requirements ♦ Potential impact on planned soccer field

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Nafziger Road: Tight Diamond on North, Diamond or Loops on the South	**IDEA NO.**	**PAGE NO**
		NH-5	2 of 3

DISCUSSION / JUSTIFICATION:

- Serves section of New Hamburg that is designated for future growth and serves the new and expanding community/recreation complex.
- Least property constrained intersection in New Hamburg

IMPLEMENTATION CONSIDERATIONS:

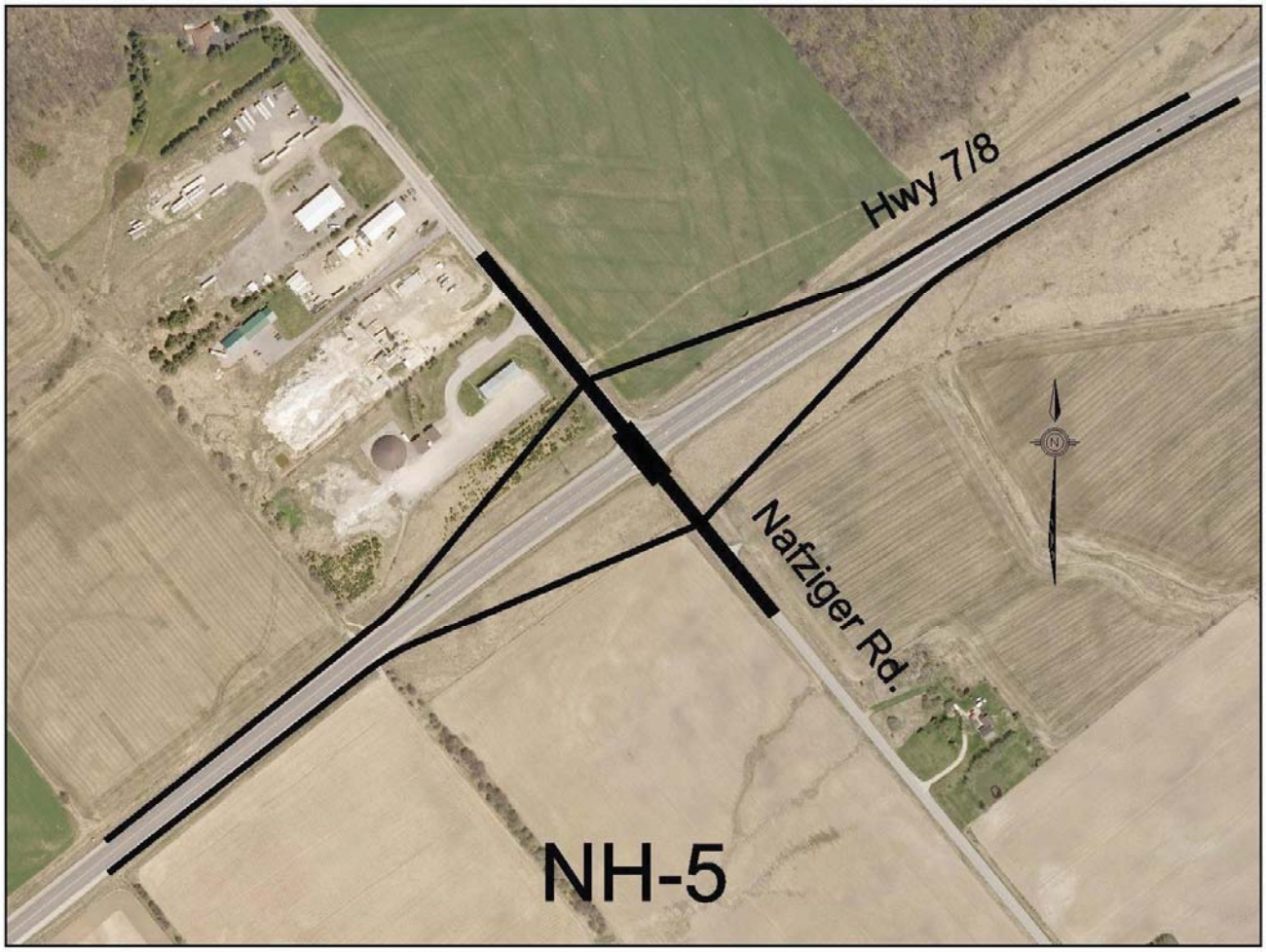
Property purchases needed

May need to build 4 lanes on structure to eliminate overlapping left turnS

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				x	
Reduced Construction Impacts			x		
Expedited Project Delivery			x		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-5
TITLE: Nafziger Road: Tight Diamond on North, Diamond or Loops on the South	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-27 & NH-36
TITLE: Bleams/Hamilton – Roundabout; Close Victoria Street	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

At-grade intersection and maintenance of access at Victoria

ALTERNATIVE CONCEPT:

2/3-lane roundabout with median and closure of Victoria with median (RiRo) or full closure

ICD = 80m

ADVANTAGES:	**DISADVANTAGES:**
• Improved safety • Side street operation • Reduced highway speed • No need for 6 lanes on highway • Facilitates reduced access at Victoria	• Possible proximity to Nafziger/Peel IC • Main highway throughput • Reduced highway speed • Property requirements • High percentage of commercial vehicles may affect roundabout capacity

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Bleams/Hamilton – Roundabout; Close Victoria Street	**IDEA NO.**	**PAGE NO**
	NH-27 & NH-36	2 of 3

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

Staging is difficult

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact				x	
Enhanced Operational Performance			x		
Reduced Construction Impacts		x			
Expedited Project Delivery			x		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-27 & NH-36
TITLE: Bleams/Hamilton – Roundabout; Close Victoria Street	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-34
TITLE: Upgrade to complete freeway with interchanges at Nafziger, Peel and Regional Rd 1	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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At grade signalized intersections at Nafziger, Peel and Regional Rd 1.

ALTERNATIVE CONCEPT:

Interchanges at Nafziger, Peel and Regional Road 1; Close Walker and Victoria Streets; Install fly-over at Hamilton Street.

ADVANTAGES:	DISADVANTAGES:
♦ Increased highway capacity ♦ Improved highway safety ♦ Reduced highway travel time ♦ eliminates the need to add more through lanes and turning ♦ More consistent design with eastern section of highway 7/8	♦ Increased cost ♦ Not context sensitive to community character ♦ Property impacts for interchanges (industrial, commercial, residential, retail, recreational agriculture) ♦ Reduced community connectivity due to reduced number of accesses ♦ May have out of way travel for community ♦ Abrupt transition to lower functioning section of Highway west of Regional Rd 1

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Upgrade to complete freeway with interchanges at Nafziger, Peel and Regional Rd 1	**IDEA NO.**	**PAGE NO**
		NH-34	2 of 3

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

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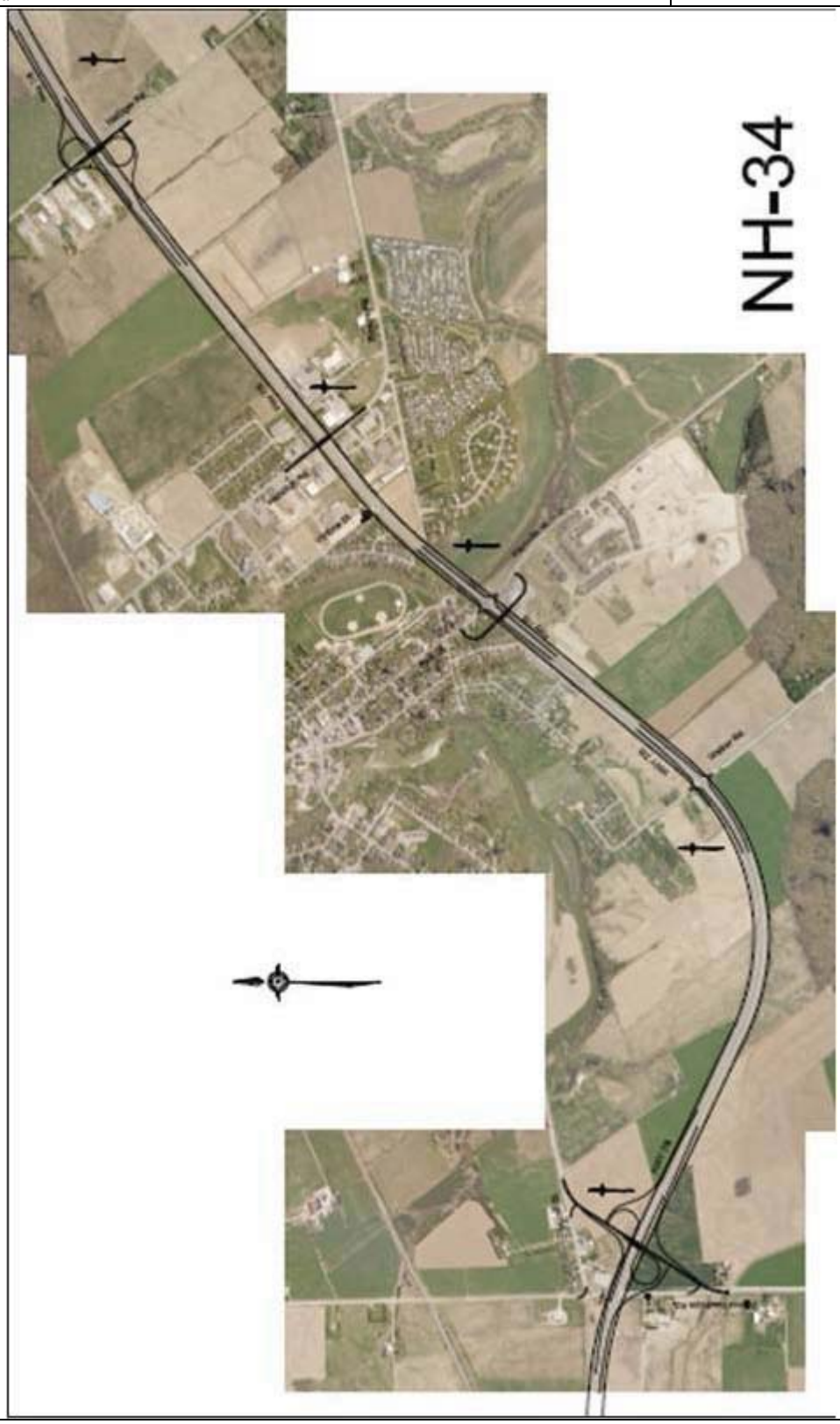
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	x				
Enhanced Operational Performance					x
Reduced Construction Impacts	x				
Expedited Project Delivery	x				

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-34
TITLE: Upgrade to complete freeway with interchanges at Nafziger, Peel and Regional Rd 1	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-42
TITLE: Grade Separated Roundabout at Peel	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

At-grade intersection

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ALTERNATIVE CONCEPT:

2/3-lane roundabout with median

ICD = 8m

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ADVANTAGES:	**DISADVANTAGES:**
♦ Improved safety ♦ Side street operation ♦ Reduced highway speed ♦ No need for 6 lanes on highway, retain existing bridge	♦ Main highway throughput ♦ Reduced highway speed ♦ Property requirements ♦ Potential grade issue at Nith River ♦ Pedestrians and cyclists to cross river at existing or new bridge ♦ High percentage of commercial vehicles may affect roundabout capacity

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Grade Separated Roundabout at Peel	**IDEA NO.**	**PAGE NO**
	NH-42	2 of 3

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

Staging is difficult

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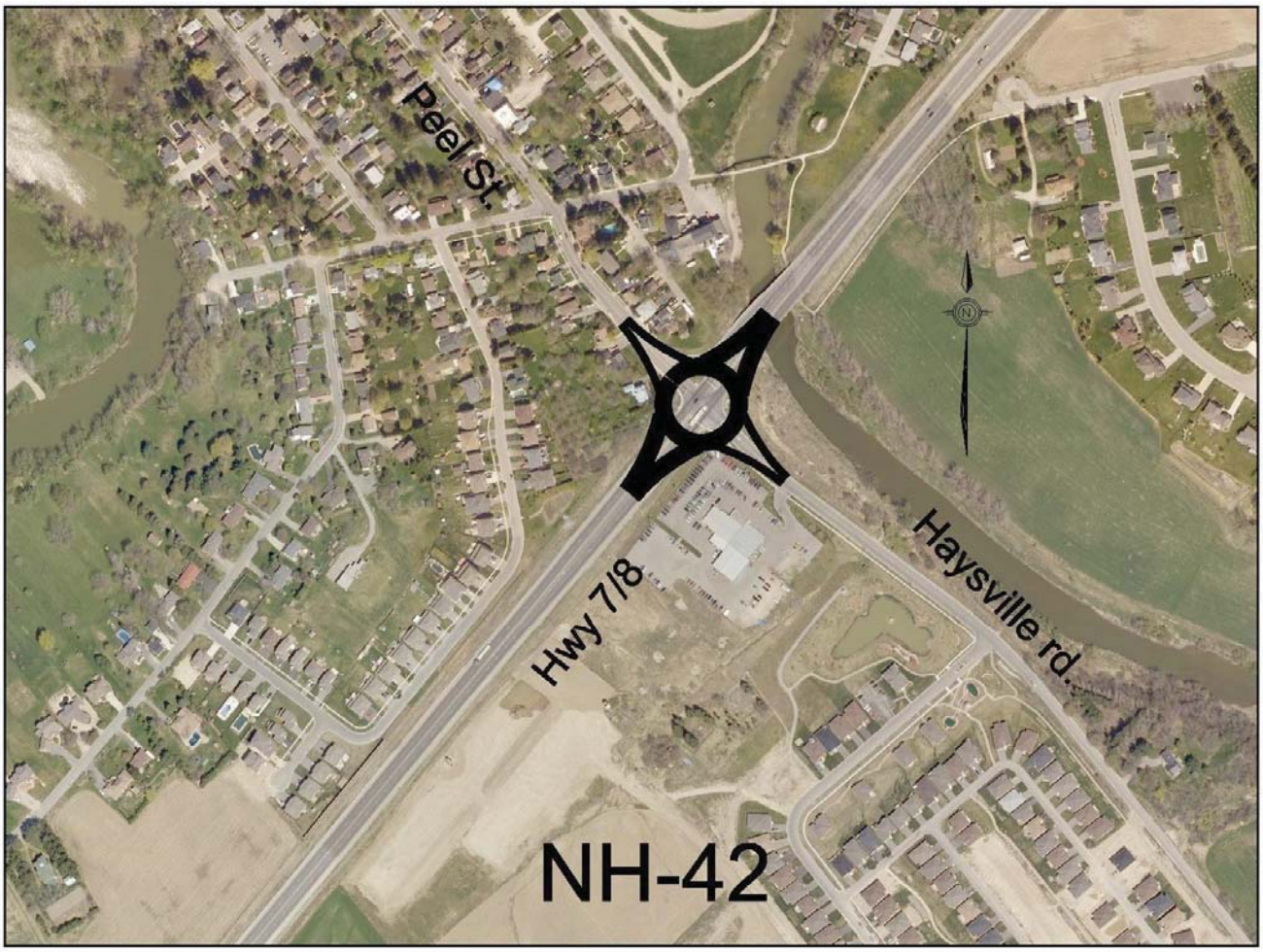
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact				x	
Enhanced Operational Performance			x		
Reduced Construction Impacts		x			
Expedited Project Delivery			x		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-42
TITLE: Grade Separated Roundabout at Peel	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-45
TITLE: Peel Street: Bucksaw IC with Flyover to West	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

At grade signalized intersection at Peel Street

ALTERNATIVE CONCEPT:

Bucksaw IC at Peel Street with the flyover structure to the West of Peel. Connections to Highway 7/8 are right in, right out only.

ADVANTAGES:	DISADVANTAGES:
• Increased highway capacity • Slightly increased highway safety • Eliminates the need to add more lanes • More consistent design with eastern section of highay 7/8 • Serves future needs of area designated for development • Least property requirements of any interchange design	• Speed change lanes require structure widening over the Nith River. • Unconventional, substandard design • Grades across overpass will be a concern • Property impacts, residential and commercial • Pedestrians and cyclist not well accommodated • Increased cost • Inconsistent intrusion physical and visual into heritage district • Noise impact with raised overpass

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Peel Street: Bucksaw IC with Flyover to West	**IDEA NO.**	**PAGE NO**
	NH-45	2 of 3

DISCUSSION / JUSTIFICATION:

As discussed inNH-38, alternative grade separated interchange, a Parclo-B: ramp would require removal of about 20 homes in north west quadrant. That fact helps justify use of the less standard bucksaw interchange.....

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IMPLEMENTATION CONSIDERATIONS:

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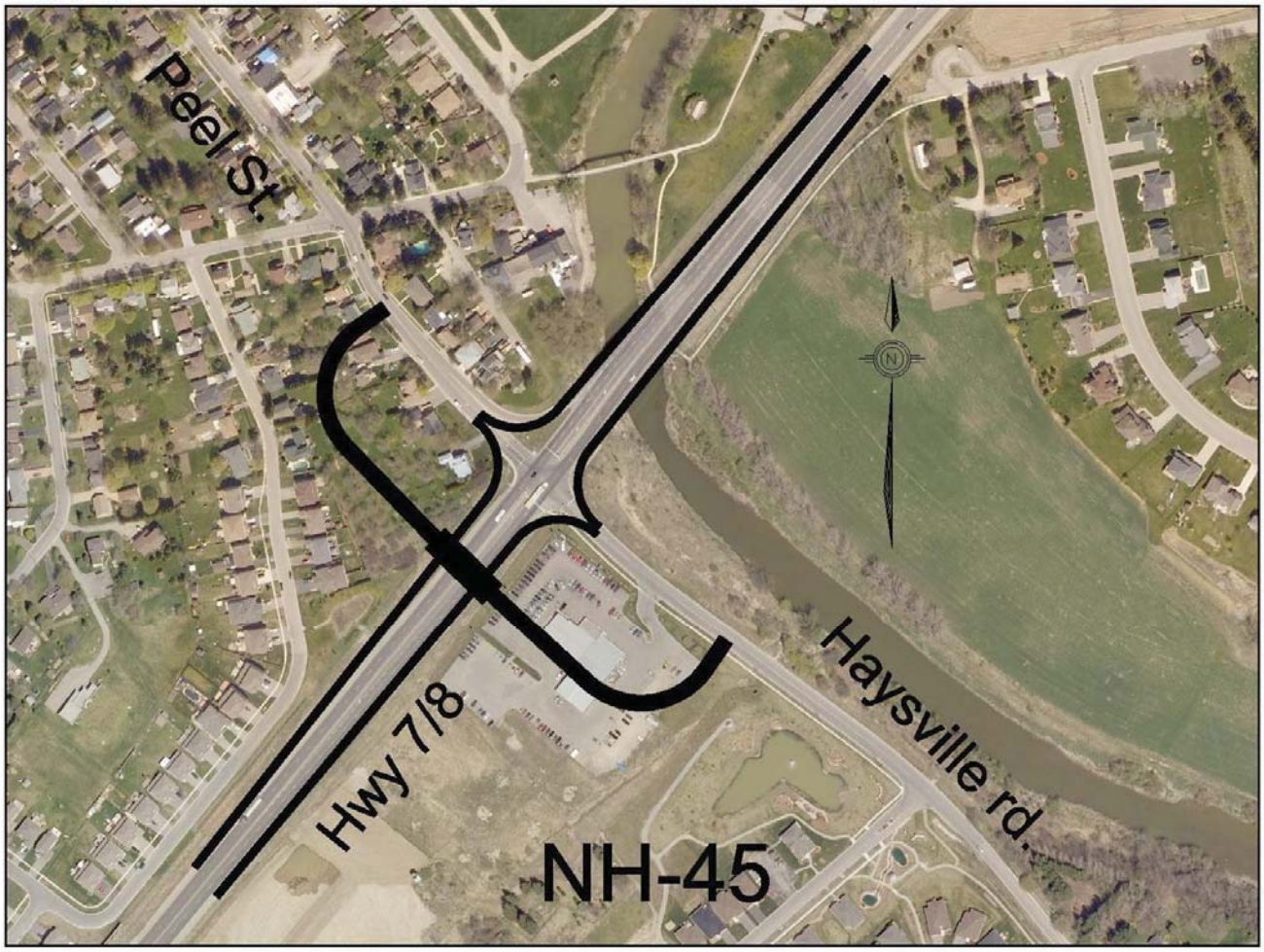
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	x				
Enhanced Operational Performance				x	
Reduced Construction Impacts	x				
Expedited Project Delivery	x				

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-45
TITLE: Peel Street: Bucksaw IC with Flyover to West	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-54
TITLE: Huron Street – Realign with Interchange at Highway 7/8	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

At grade signalized intersection at Huron Street and Highway 7/8.....

ALTERNATIVE CONCEPT:

Parclo A-2 (A-4).at realigned Huron Street and Highway 7/8

ADVANTAGES:	**DISADVANTAGES:**
♦ Increased capacity ♦ Maintains thru capacity on Hwy ♦ Increased safety	♦ Property requirements (agricultural) ♦ Increased cost ♦ Cost v.s. need? ♦ Not consistent with the 5-lane section to the west ♦ Unconventional road access close to ramp terminals. ♦ Extra turns and out-of-way travel for south-north travel.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Huron Street – Realign with Interchange at Highway 7/8	**IDEA NO.**	**PAGE NO**
	NH-54	2 of 3

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

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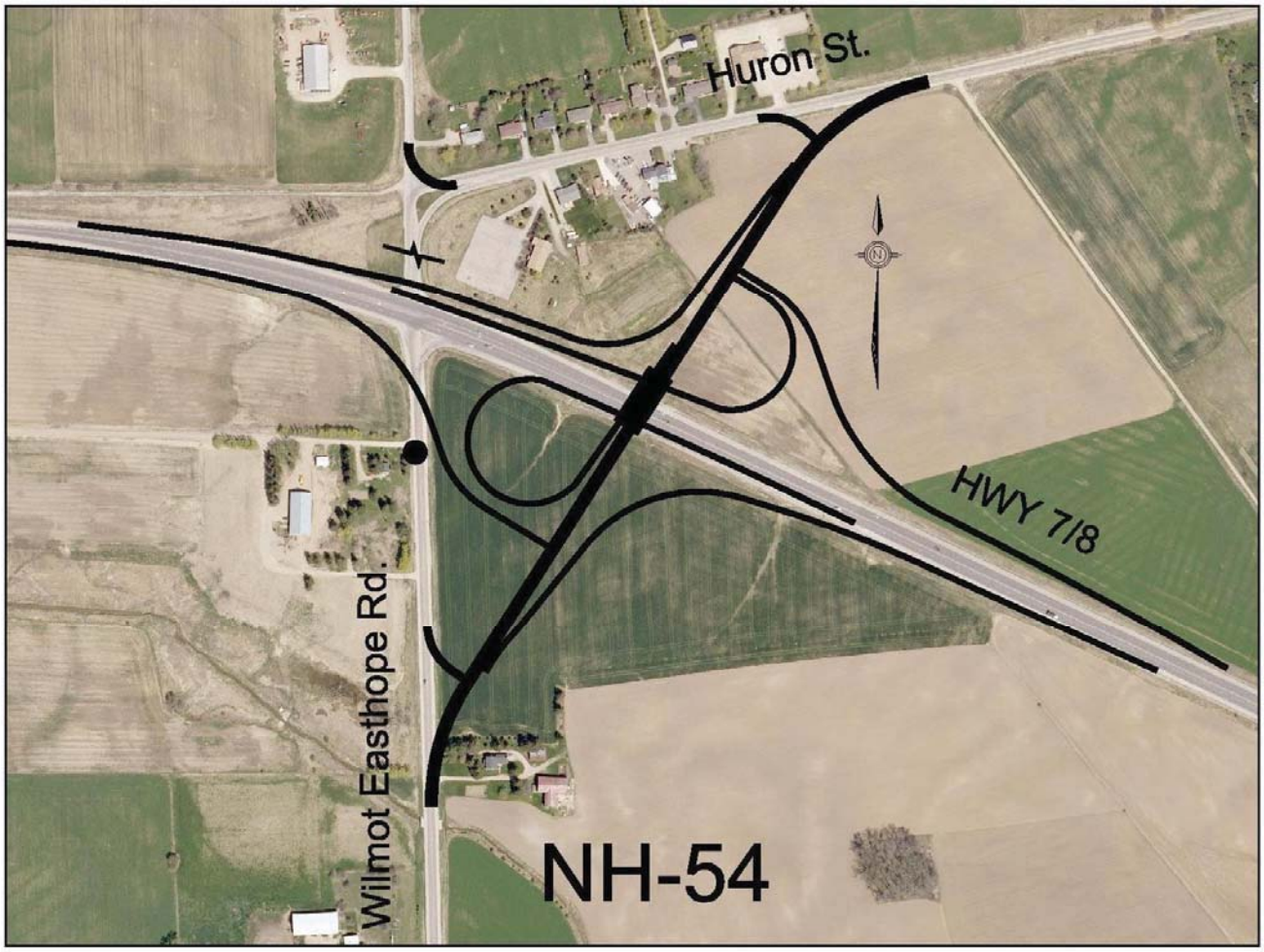
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	x				
Enhanced Operational Performance					x
Reduced Construction Impacts	x				
Expedited Project Delivery	x				

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-54
TITLE: Huron Street – Realign with Interchange at Highway 7/8	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-62
TITLE: Freeway/Arterial Combination	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

At grade signalized intersections and road accesses

ALTERNATIVE CONCEPT:

Parclo A-2 Interchange at Nafziger Road; At grade signalized intersection at Hamilton Street; Victoria Street closed, At grade signalized intersection at Peel; Right in, right out at Walker Road; At grade signalized intersection at Regional Road 1.

Median barrier throughout. Six lanes from Nafziger to Walker

ADVANTAGES:	**DISADVANTAGES:**
♦ Increased highway capacity ♦ Minor safety improvement ♦ Slightly reduced highway travel time ♦ Context sensitive - consistent with current characteristics 7/8 ♦ Transitions better to the western section ♦ Maintains most community accesses	♦ Slight increased cost ♦ Minor property impacts for interchanges (recreational agriculture) ♦ Bridge widening required over the Nith River ♦ Median barrier to signalized intersections require transition treatments

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Freeway/Arterial Combination	**IDEA NO.**	**PAGE NO**
	NH-62	2 of 3

DISCUSSION / JUSTIFICATION:

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Modification of this scenario with roundabouts added at Hamilton and Peel would have the advantage of not needing a widening to six lanes, no bridge widening required over the Nith River and improved safety. Performance scenario shown in table below (R).

Principle disadvantage is property impacts.....

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IMPLEMENTATION CONSIDERATIONS:

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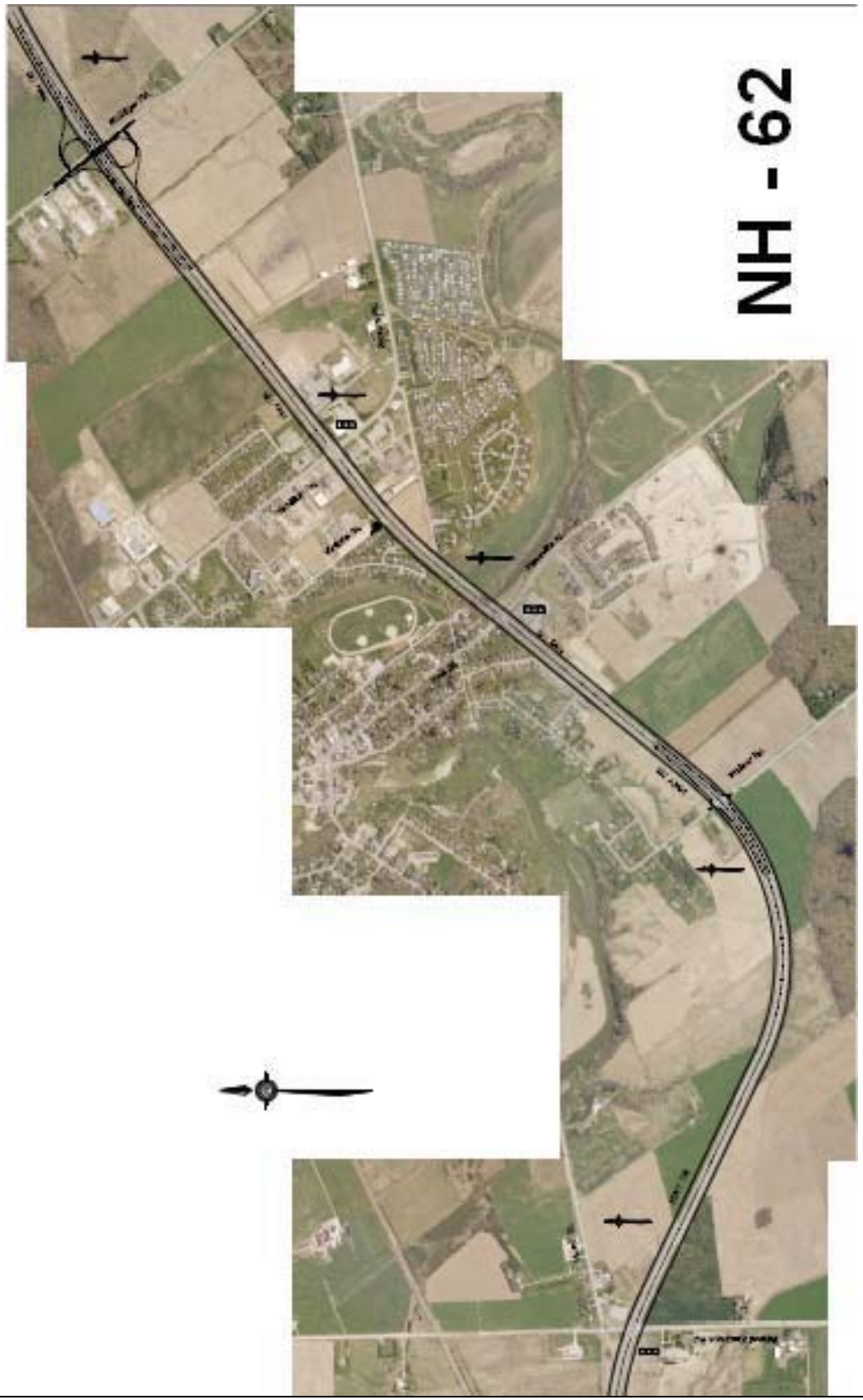
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-62
TITLE: Freeway/Arterial Combination	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-62A
TITLE: Freeway/Arterial Roundabout Combination	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

At grade signalized intersections and road accesses

ALTERNATIVE CONCEPT:

Parclo A-2 Interchange at Nafziger Road; Roundabout at Hamilton Street; Victoria Street closed, Roundabout at Peel; Right in, right out at Walker Road;Roundabout at Regional Road 1.

Median barrier throughout. Six lanes from Nafziger to Walker

ADVANTAGES:	**DISADVANTAGES:**
♦ Increased highway capacity ♦ Safety improvement ♦ Context sensitive - consistent with current characteristics 7/8 ♦ Transitions better to the western section ♦ Maintains most community accesses ♦ Widening to six lanes not required, ♦ No bridge widening required over the Nith River	♦ Larger footprint impacts property ♦ Slight increased cost ♦ Minor property impacts for interchanges (recreational agriculture) ♦ Median barrier to signalized intersections require transition treatments

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Freeway/Arterial Combination	**IDEA NO.**	**PAGE NO**
	NH-62A	2 of 3

DISCUSSION / JUSTIFICATION:

Please refer to NH-62.... .....

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IMPLEMENTATION CONSIDERATIONS:

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-62A
TITLE: Freeway/Arterial Combination	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: New Hamburg	**IDEA NO.** NH-63
TITLE: Roundabout at Wilmot and Easthope	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

At-grade signalized intersection

ALTERNATIVE CONCEPT:

2/3-lane roundabout interchange connecting Hwy 7/8 with Huron and Wilmot Easthope.

Could be combined with a realignment of Huron St. as the larger traffic move...

ADVANTAGES:	DISADVANTAGES:
♦ Improved safety ♦ Context sensitive - consistent with current characteristics 7/8 ♦ Transitions better to the rural section ♦ Huron can be realigned to provide better traffic flow for major move	♦ Property requirements ♦ High percentage of commercial vehicles may affect roundabout capacity

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Roundabout at Wilmot and Easthope	**IDEA NO.**	**PAGE NO**
	NH-63	2 of 3

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: New Hamburg	**IDEA NO.** NH-63
TITLE: Roundabout at Wilmot and Easthope	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-15
TITLE: Median directional intersections on existing Highway 7&8 at Perth Line 102, 104 and 106	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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Maintain 5-lane cross section with stop condition on sideroads. Center two-way left-turn lane throughout mainline and converts to a dedicated left-ton lane at intersection for both directions. .....

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ALTERNATIVE CONCEPT:

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Maintain 5-lane cross section on existing Highway 7&8 with a median directional intersection at sideroads (RA-15). Sideroad is stop condition. Median stop condition with a 30m separation between median stop bars (to be determined during preliminary design). .....

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ADVANTAGES:	**DISADVANTAGES:**
♦ Facilitates crossing movements of agricultural vehicles.	♦ Property impacts to all four quadrants of intersection ♦ Larger footprint impact ♦ Cost increase ♦ Additional winter maintenance needs.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Median directional intersections on existing Highway 7&8 at Perth Line 102, 104 and 106	**IDEA NO.**	**PAGE NO**
		RA-15	2 of 3

DISCUSSION / JUSTIFICATION:

Consultations with the agricultural community through the EA process raised safety concerns regarding crossing a multi-lane highway with slow moving equipment. Providing a wide center median would provide refuge for vehicles until an adequate gap was available.....

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IMPLEMENTATION CONSIDERATIONS:

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- Implemented with highway widening or,
- Base case, (5-lane cross section) could be upgraded to accommodate RA-15. Future safety issues could be address if property requirements were protected through the EA.. .....

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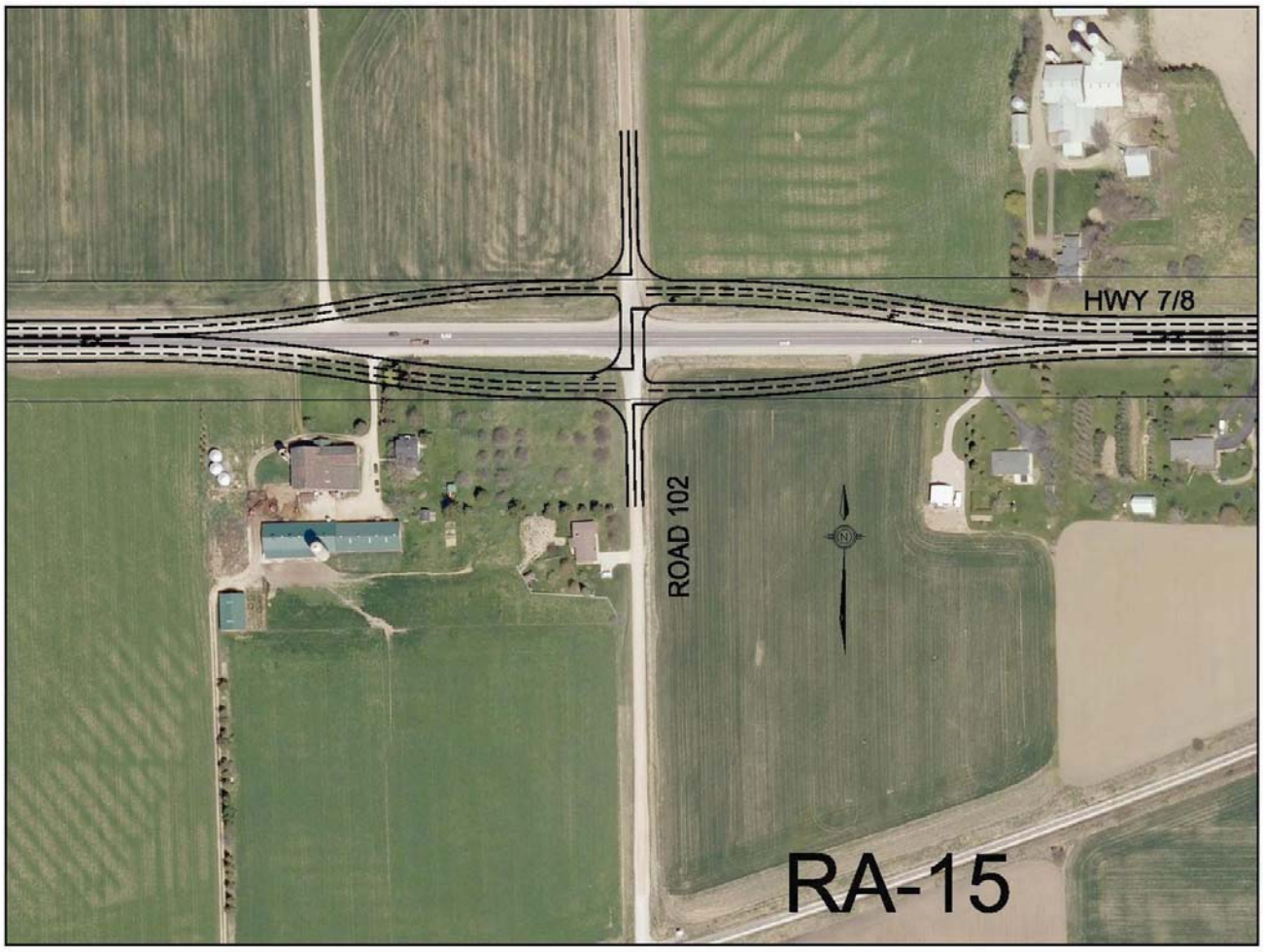
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance			X		
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** RA-15
TITLE: Median directional intersections on existing Highway 7&8 at Perth Line 102, 104 and 106	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-18
TITLE: Perth Line 108 to flyover new Highway 7/8 with no connections	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Maintain 4-lane cross section on Highway 7&8 at Perth Road 108 with stop control. No left turn lanes on Highway 7&8 mainline.

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ALTERNATIVE CONCEPT:

Maintain 4-lane cross section on new Highway 7&8 with Perth Line 108 as a flyover. No access to new Highway 7&8 from 108.

ADVANTAGES:	DISADVANTAGES:
• Avoids need for access to Highway 7&8 based on low volumes on Perth Line 108. ♦ Improves safety along mainline with absence of access. ♦ Provides crossing movement for agricultural vehicles	• Higher capital construction cost ♦ Larger footprint impact

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Perth Line 108 to flyover new Highway 7/8 with no connections	**IDEA NO.**	**PAGE NO**
	RA-18	2 of 3

DISCUSSION / JUSTIFICATION:

- RA-18: This alternative meets agricultural community needs. Improves safety along mainline. Avoids need for additional access to mainline for a low volume sideroad.
- Works very well in combination with RA-15, Median directional intersections on existing Highway 7&8 at Perth Line 102, 104 and 106.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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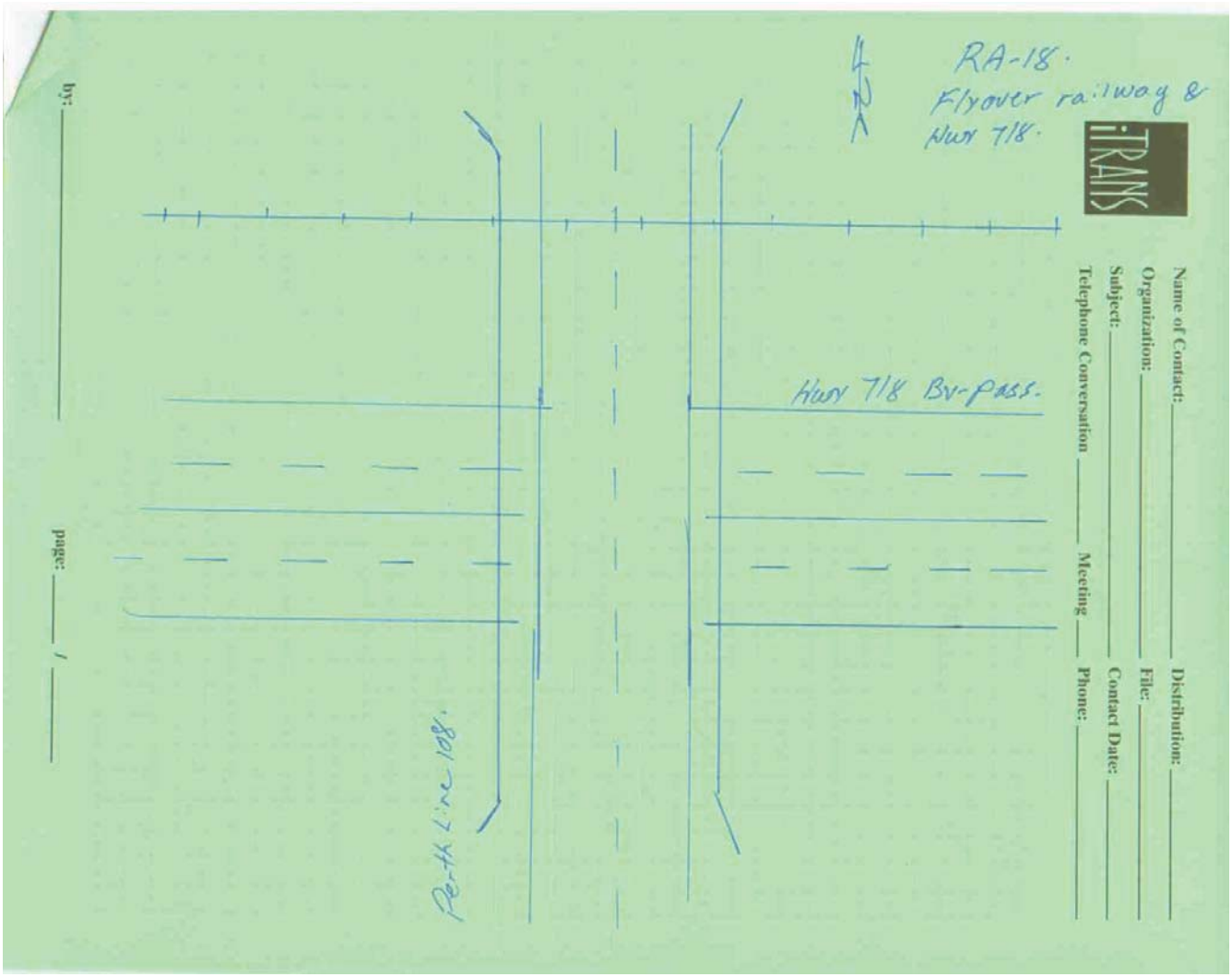
QUALITATIVE PERFORMANCE

Performance Criteria RA-18 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance					X
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** RA-18
TITLE: Perth Line 108 to flyover new Highway 7/8 with no connections	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-22B
TITLE: Median directional intersections on existing Highway 7&8 at Perth Line 108	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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Maintain 4-lane cross section with stop condition on sideroads. .....

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ALTERNATIVE CONCEPT:

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Maintain 4-lane cross section on new Highway 7&8 with a median directional intersection at sideroad. Sideroad is stop condition. Median stop condition with a 30m separation between median stop bars (to be determined during preliminary design). .....

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ADVANTAGES:	**DISADVANTAGES:**
♦ Facilitates crossing movements of agricultural vehicles.	♦ Property impacts to all four quadrants of intersection ♦ Larger footprint impact ♦ Cost increase ♦ Additional winter maintenance needs.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Median directional intersections on existing Highway 7&8 at Perth Line 108	**IDEA NO.**	**PAGE NO**
		RA-22B	2 of 3

DISCUSSION / JUSTIFICATION:

Consultations with the agricultural community through the EA process raised safety concerns regarding crossing a multi-lane highway with slow moving equipment. Providing a wide center median would provide refuge for vehicles until an adequate gap was available.....

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IMPLEMENTATION CONSIDERATIONS:

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- Base case, (4-lane cross section) could be upgraded to accommodate RA-22B. Future safety issues could be address if property requirements were protected through the EA.. .....

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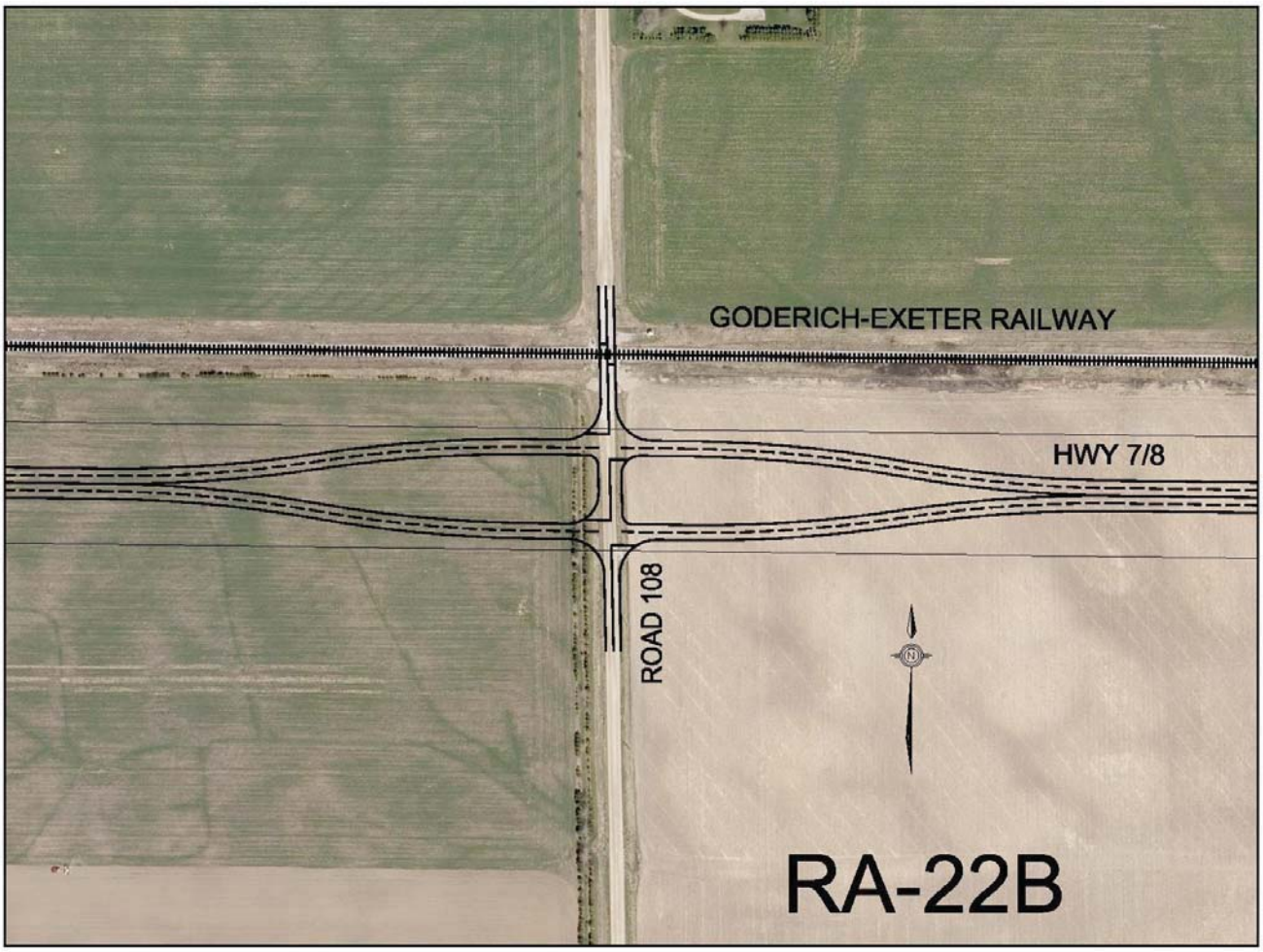
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance			X		
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** RA-22B
TITLE: Median directional intersections on existing Highway 7&8 at Perth Line 108	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	Shakespeare and rural areas	**IDEA NO.** RA-23D
TITLE:	WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Signalized Intersection; 110 continues NB as 4th leg of intersection.	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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Maintain 4-lane cross section on Highway 7&8 with T-intersection with Perth Line 33 with stop control. No left turn lane on Highway 7&8 mainline. No access connection for Perth Line 110 north (cul-de-sac). Access connection for Perth Line 110 south to Perth Line 33.

ALTERNATIVE CONCEPT:

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RA-30: Perth Line 110 under Highway 7&8. Perth Line 33 westbound under Highway 7&8. Eastbound directional ramp to Perth Line 33. Existing intersection of Perth Line 33 and Perth Line 110 maintained with stop control.

RA-23D: Connect Perth Line 110 north as 4th leg of intersection. Traffic Signals and turning lanes.

RA-23E: Roundabout intersection. Connect Perth Line 110 north as 4th leg of roundabout.

ADVANTAGES:	**DISADVANTAGES:**
RA-23D: • Provides access connection for Perth Road 110 north to south. ♦ Provides crossing movement for agricultural vehicles along Perth Line 110. ♦ Increased safety for all movements.	RA-23D: • Higher capital construction cost ♦ Larger footprint impact

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE **Highway 7/8 Stratford to New Hamburg**		**MTO**	
TITLE:	WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Signalized Intersection; 110 continues NB as 4th leg of intersection.	**IDEA NO.**	**PAGE NO**
		RA-23D	2 of 3

DISCUSSION / JUSTIFICATION:

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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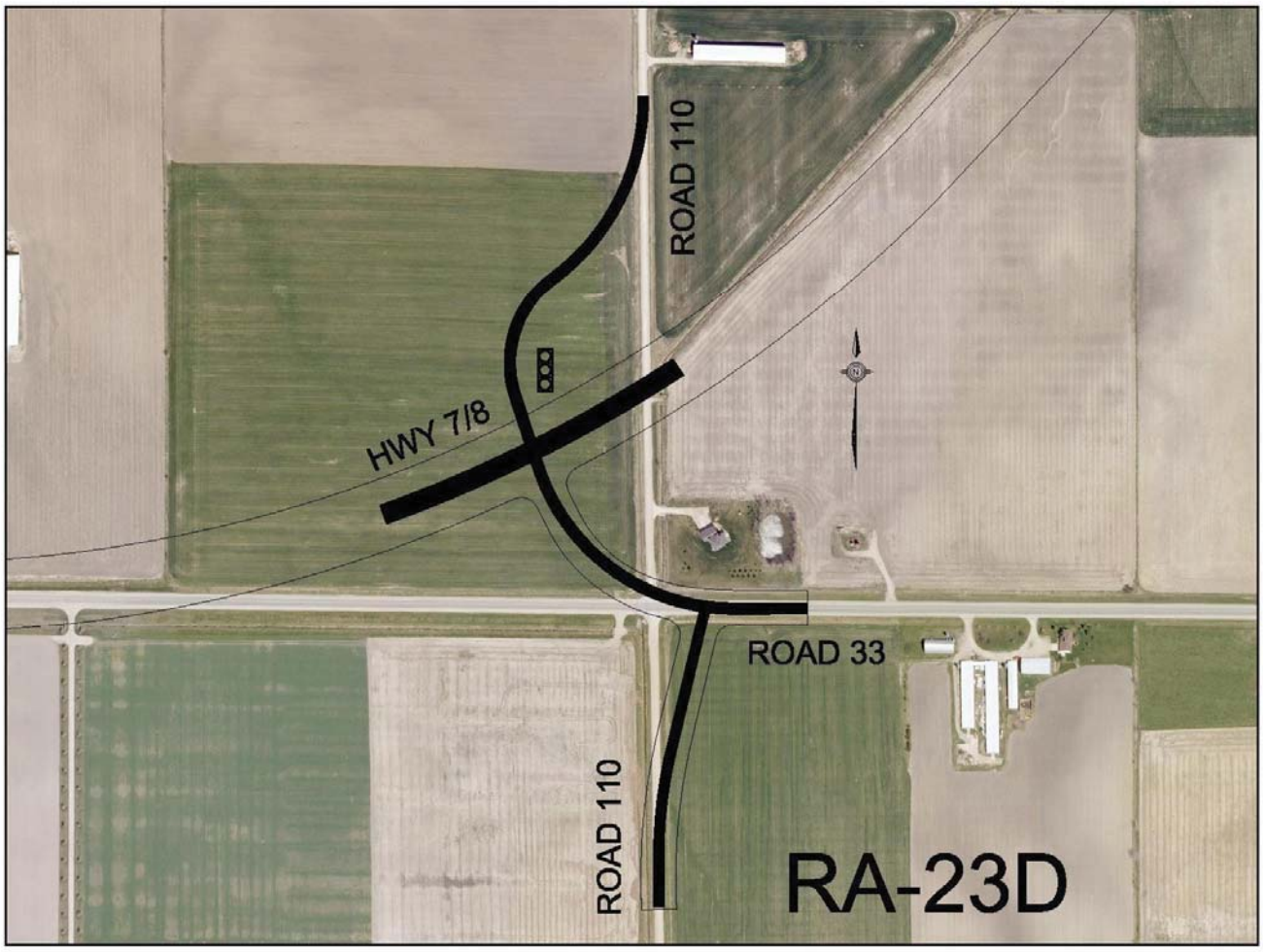
QUALITATIVE PERFORMANCE

Performance Criteria RA-23D (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** RA-23D
TITLE: WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Signalized Intersection; 110 continues NB as 4th leg of IS.	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-23E
TITLE: WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Roundabout; 110 continues NB as 4th leg of Roundabout.	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

Maintain 4-lane cross section on Highway 7&8 with T-intersection with Perth Line 33 with stop control. No left turn lane on Highway 7&8 mainline. No access connection for Perth Line 110 north (cul-de-sac). Access connection for Perth Line 110 south to Perth Line 33.

ALTERNATIVE CONCEPT:

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RA-23E: Roundabout intersection. Connect Perth Line 110 north as 4th leg of roundabout.

ADVANTAGES:	**DISADVANTAGES:**
RA-23E: • Provides access connection for Perth Road 110 north to south. ♦ Provides crossing movement for agricultural vehicles along Perth Line 110. ♦ Increased safety for all movements.	RA-23E: ♦ Higher capital construction cost ♦ Larger footprint impact ♦ Results in all mainline traffic to slow down to maneuver through roundabout

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE **Highway 7/8 Stratford to New Hamburg**		**MTO**	
TITLE:	WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Roundabout; 110 continues NB as 4th leg of Roundabout.	**IDEA NO.**	**PAGE NO**
		RA-23E	2 of 3

DISCUSSION / JUSTIFICATION:

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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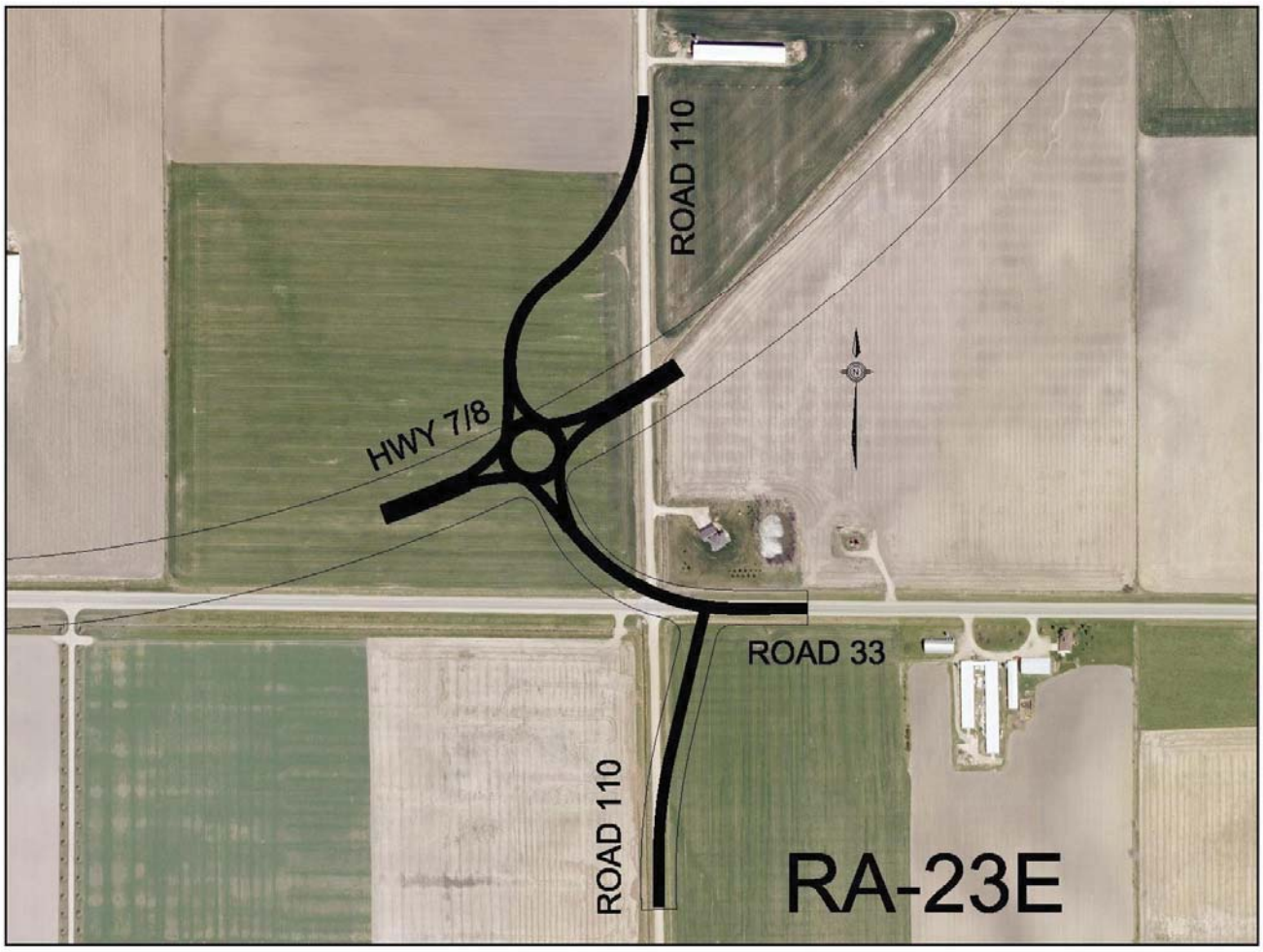
QUALITATIVE PERFORMANCE

Performance Criteria RA-23E (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** RA-23E
TITLE: WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Roundabout; 110 continues NB as 4th leg of Roundabout.	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	Shakespeare and rural areas	**IDEA NO.** RA-30
TITLE:	Perth Line110 under new 7/8; WB Perth Line 33 under new 7/8; EB directional ramp to 33; 33/110 IS stop control	**PAGE NO.** 1 of 2

ORIGINAL CONCEPT:

.

Maintain 4-lane cross section on Highway 7&8 with T-intersection with Perth Line 33 with stop control. No left turn lane on Highway 7&8 mainline. No access connection for Perth Line 110 north (cul-de-sac). Access connection for Perth Line 110 south to Perth Line 33.

ALTERNATIVE CONCEPT:

Perth Line 110 under Highway 7&8. Perth Line 33 westbound under Highway 7&8. Eastbound directional ramp to Perth Line 33. Existing intersection of Perth Line 33 and Perth Line 110 maintained with stop control.

ADVANTAGES:	**DISADVANTAGES:**
RA-30: ♦ Facilitates crossing movements of agricultural vehicles ♦ Uninterrupted flow for both the mainline and sideroad connections (Perth Line 33 and Perth Line 110) ♦ Low potential for collision conflict	RA-30: ♦ Doesn't provide for minor movements ♦ Larger footprint impact ♦ Cost increase ♦ 2 new structures.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Perth Line110 under new 7/8; WB Perth Line 33 under new 7/8; EB directional ramp to 33; 33/110 IS stop control	**IDEA NO.**	**PAGE NO**
		RA-30	2 of 3

DISCUSSION / JUSTIFICATION:

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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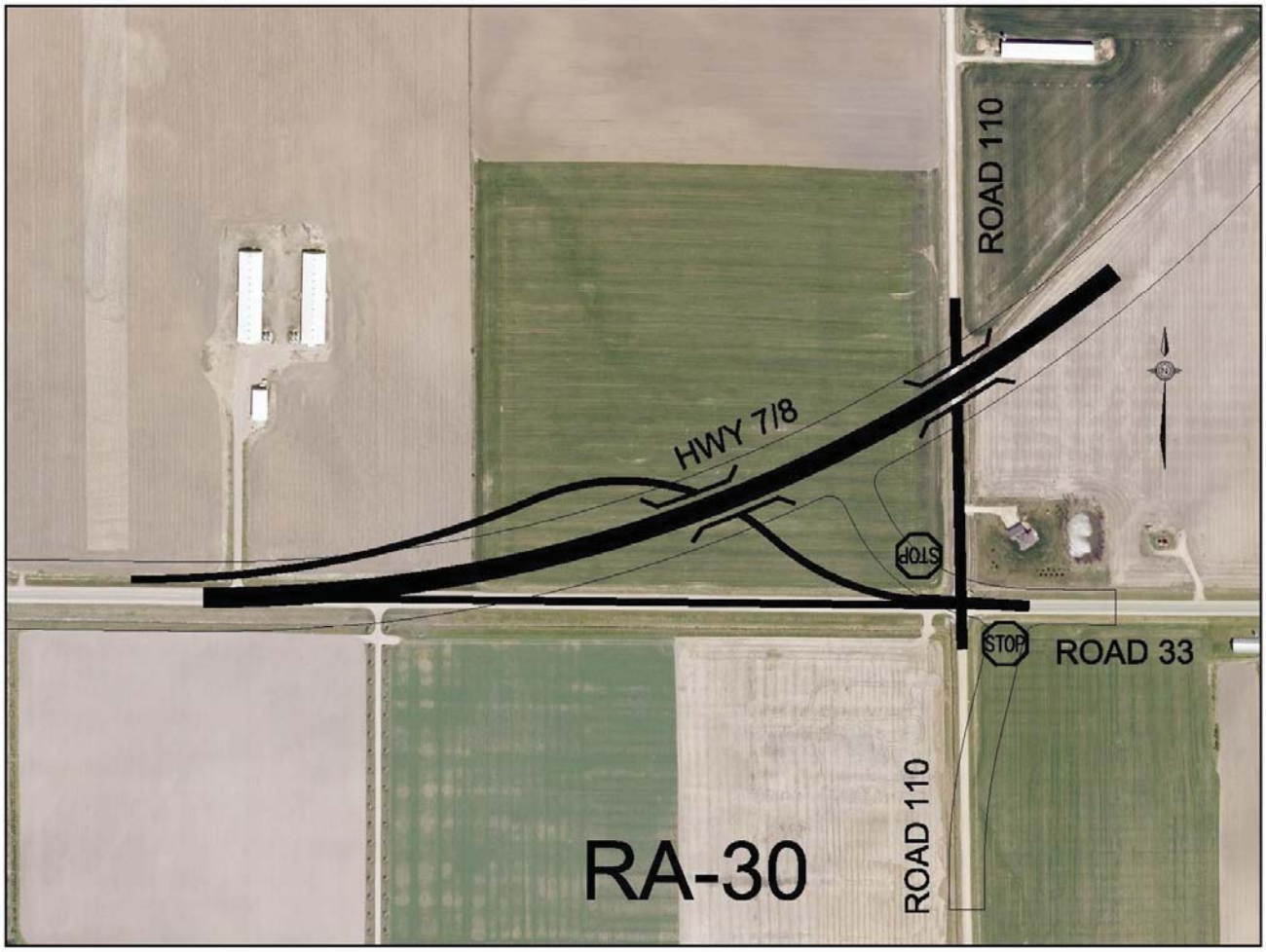
QUALITATIVE PERFORMANCE

Performance Criteria RA-30 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance					X
Reduced Construction Impacts	X				
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** RA-30
TITLE: Perth Line110 under new 7/8; WB Perth Line 33 under new 7/8; EB directional ramp to 33; 33/110 IS stop control	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-39
TITLE: Perth Line 111connects to New Highway 7/8 as Signalized Intersection	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

Maintain 4-lane cross section on Highway 7&8 at Perth Road 111 with stop control. No left turn lanes on Highway 7&8 mainline.

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ALTERNATIVE CONCEPT:

.

Perth Line 111connects to New Highway 7/8 at a signalized intersection with turning lanes.

ADVANTAGES:	**DISADVANTAGES:**
RA-39: ♦ Facilitates crossing movements of agricultural vehicles ♦ Increased safety for all movements.	RA-39: ♦ Minor footprint impact ♦ Cost increase

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Perth Line 111connects to New Highway 7/8 as Signalized Intersection	**IDEA NO.**	**PAGE NO**
		RA-39	2 of 3

DISCUSSION / JUSTIFICATION:

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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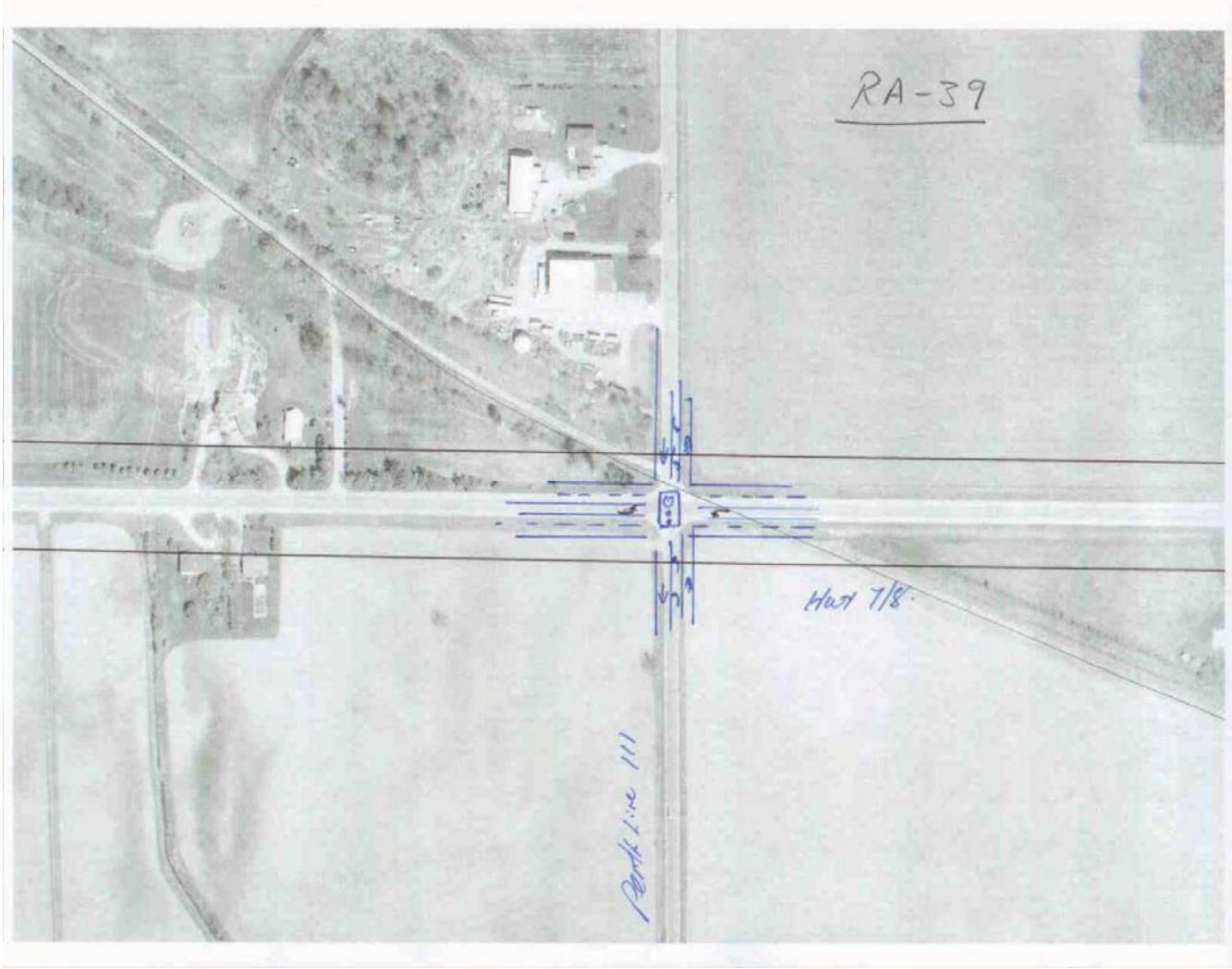
QUALITATIVE PERFORMANCE

Performance Criteria RA-39 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** RA-39
TITLE: Perth Line 111connects to New Highway 7/8 as Signalized Intersection	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-40
TITLE: Perth Line 111connects to New Highway 7/8 at a Roundabout	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

Maintain 4-lane cross section on Highway 7&8 at Perth Road 111 with stop control. No left turn lanes on Highway 7&8 mainline.

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ALTERNATIVE CONCEPT:

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Perth Line 111connects to New Highway 7/8 at a roundabout

ADVANTAGES:	**DISADVANTAGES:**
RA-40: ♦ Facilitates crossing movements of agricultural vehicles ♦ Increased safety for all movements. ♦ Gateway feature for entering Stratford ♦ Improves speed transition from rural to urban environment.	RA-40: • Minor footprint impact • Cost increase

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Perth Line 111connects to New Highway 7/8 at a Roundabout	**IDEA NO.**	**PAGE NO**
	RA-40	2 of 3

DISCUSSION / JUSTIFICATION:

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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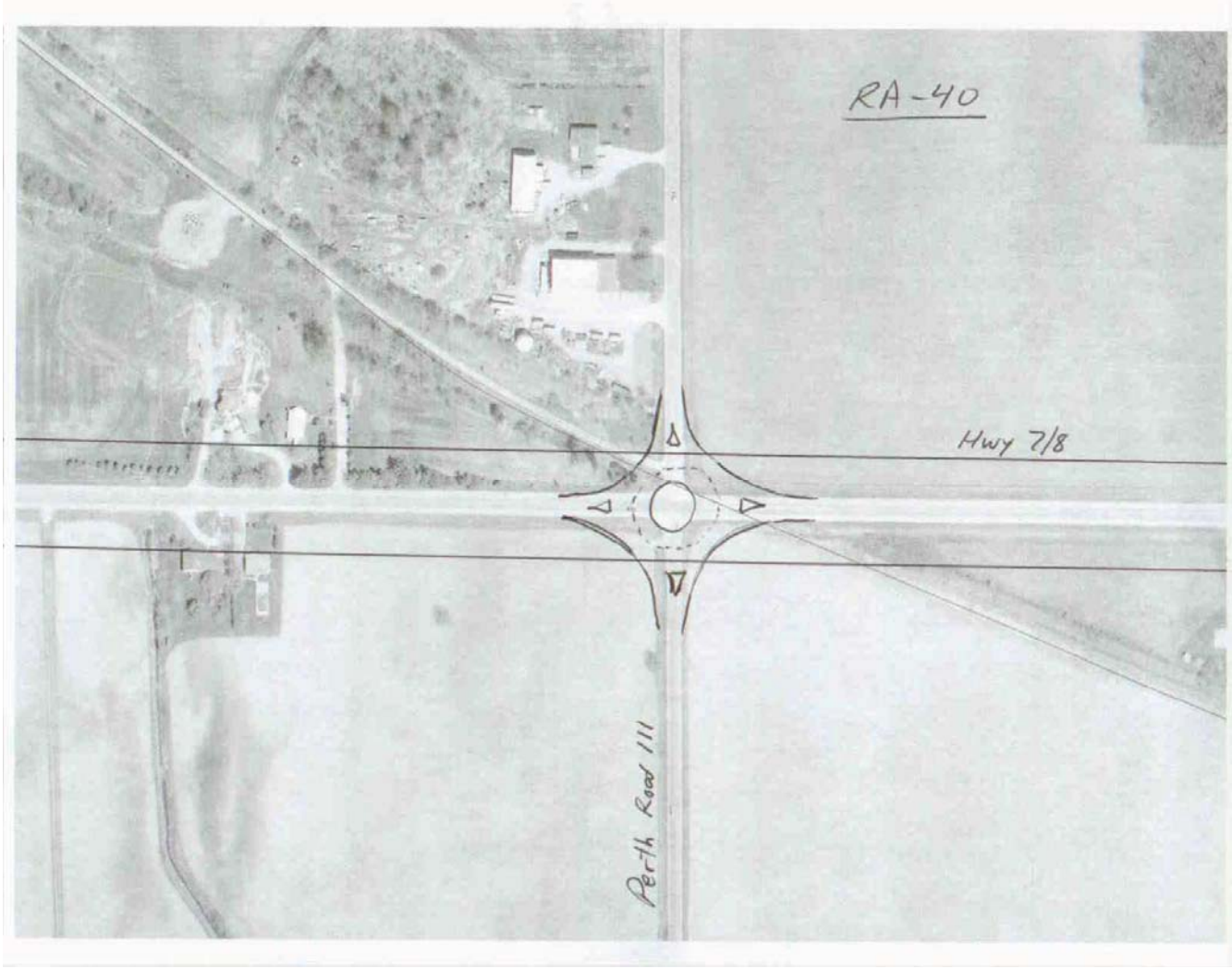
QUALITATIVE PERFORMANCE

Performance Criteria RA-40 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** RA-40
TITLE: Perth Line 111connects to New Highway 7/8 at a Roundabout	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** RA-43
TITLE: At-grade Perth Road 109 with railway and traffic signals on the preferred route. Interconnect with railway crossing signals.	**PAGE NO.** 1 of 2

ORIGINAL CONCEPT:

Maintain 4-lane cross section on Highway 7&8 at Perth Road 109 with stop control. No left turn lanes on Highway 7&8 mainline.

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ALTERNATIVE CONCEPT:

At-grade Perth Road 109 with railway and traffic signals on the preferred route. Interconnect with railway crossing signals.

Note: Improvements to existing Highway 7&8 at Perth Road 109 will be required. Preliminary Design to review need for traffic signals/turning lanes or roundabout.

ADVANTAGES:	DISADVANTAGES:
♦ Facilitates crossing movements of agricultural vehicles ♦ makes bypass more desirable for Stratford (westbound) and Kitchener (eastbound) traffic vs. having to go through Shakespeare ♦ provides for gateway access into Stratford	• Higher capital construction cost ♦ Larger footprint impact ♦ Requires interconnect signals with railway crossing signals

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	At-grade Perth Road 109 with railway and traffic signals on the preferred route. Interconnect with railway crossing signals.	**IDEA NO.**	**PAGE NO**
		RA-43	2 of 3

DISCUSSION / JUSTIFICATION:

- VE Team identified that Perth Road 109 was a critical access connection for traffic destined for Stratford's east end (commercial node), downtown and north side (residential). Also makes bypass more desirable for Stratford (westbound) and Kitchener (eastbound) traffic vs. having to go through Shakespeare.
- RA-43: This alternative would likely require a smaller footprint than a roundabout. Requires interconnection of traffic signals and railway signals.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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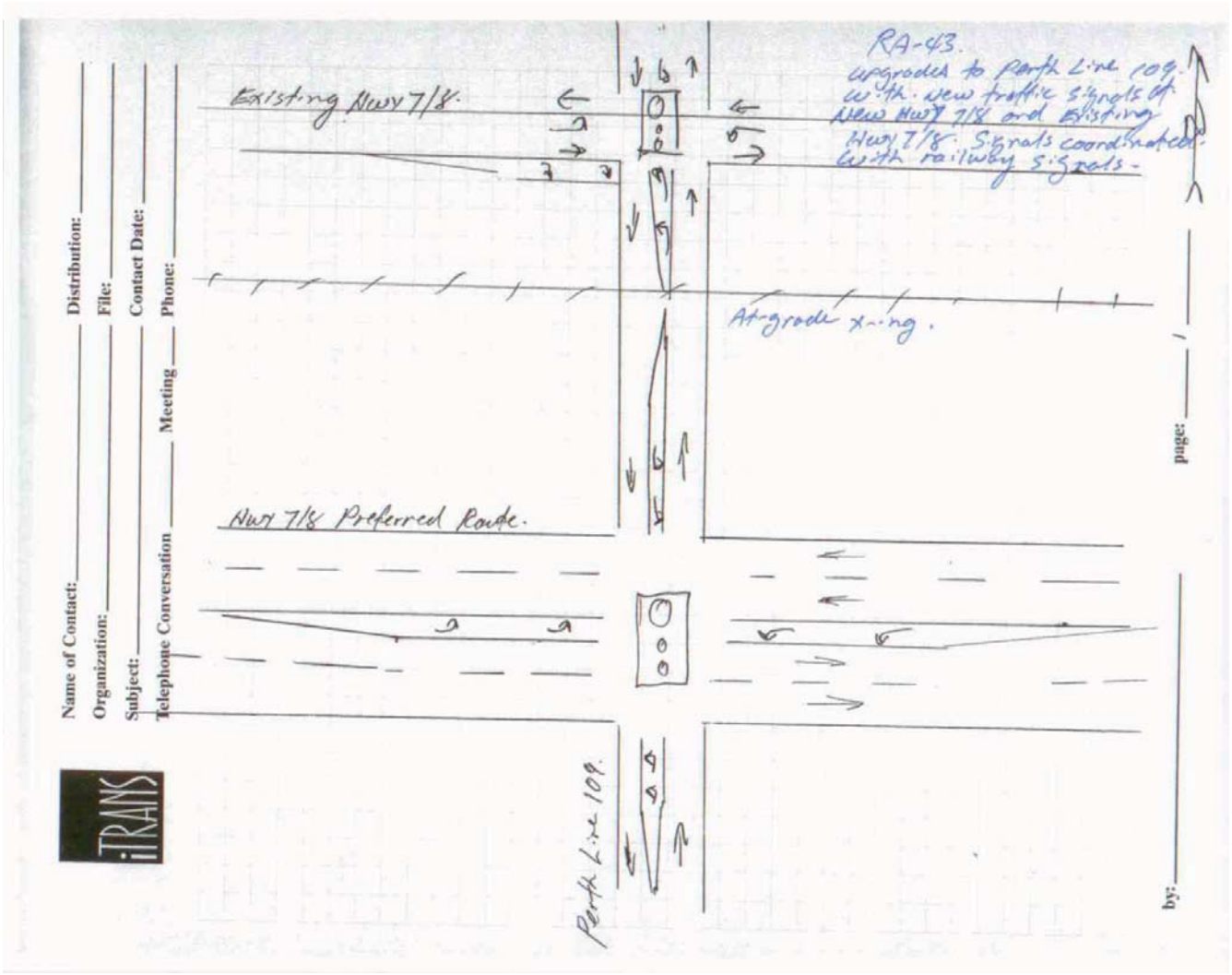
QUALITATIVE PERFORMANCE

Performance Criteria RA-43 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** RA-43
TITLE: At-grade Perth Road 109 with railway and traffic signals on the preferred route. Interconnect with railway crossing signals.	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** SH-5
TITLE: Shakespeare east – Westbound access only (Split off to right)	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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No connection to existing Highway 7&8. The 5-lane mainline diverts southerly onto new alignment.. .....

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ALTERNATIVE CONCEPT:

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New widened 5-lane cross section on existing Highway 7&8 transitions to a 4-lane on a new alignment south and provides a westerly directional ramp only.. ... .

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ADVANTAGES:	**DISADVANTAGES:**
♦ Provides community access to Shakespeare and Stratford for the westbound direction. ♦ Small capital cost to implement ♦ Uninterrupted flow for both the mainline and sideroad connection ♦ Low potential for collision conflicts	♦ Limited additional property required ♦ Minor cost increase ♦ Snow plows maintaining ramp would have to access by-pass via Perth Road 107

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Shakespeare east – Westbound access only (Split off to right)	**IDEA NO.**	**PAGE NO**
	SH-5	2 of 3

DISCUSSION / JUSTIFICATION:

- Shakespeare business community indicated a desire to have Stratford bound traffic have the ability to travel through the community
- Due to access management intersection spacing requirements a full movement access cannot be accommodated between Perth Line 106 and Perth Road 107(desirable 1600 m, minimum 800m).

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance			X		
Reduced Construction Impacts		X			
Expedited Project Delivery			X		

SKETCHES

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** SH-5
TITLE: Shakespeare east – Westbound access only (Split off to right)	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	Shakespeare and rural areas	**IDEA NO.** SH-12
TITLE:	Grade separate Perth Road 107 from Railway; Connect with roundabout on the preferred route.	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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At-grade connection to Highway 7&8 south by-pass at Perth Road 107 with traffic signals. At-grade railway crossing. Interconnection of traffic signals and railway signals.

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ALTERNATIVE CONCEPT:

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Grade separate Perth Road 107 with Railway and a new roundabout on the preferred route.

ADVANTAGES:	**DISADVANTAGES:**
• Avoids conflicts with railway • Reduces potential of serious collisions ♦ Lower maintenance cost over long-term ♦ Avoids need to interconnect signals with railway crossing signals	♦ Larger footprint impact ♦ Results in all mainline traffic to slow down to maneuver through roundabout ♦ Higher capital construction cost ♦ Requires new structure

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Grade separate Perth Road 107 from Railway; Connect with roundabout on the preferred route.	**IDEA NO.**	**PAGE NO**
		SH-12	2 of 3

DISCUSSION / JUSTIFICATION:

- This alternative would require southerly shift in the Highway 7&8 alignment and additional right-of-way width to accommodate the circular footprint of the roundabout. In addition, the highway approaches from the east and west require successive curves to reduce operating speeds for approaching traffic.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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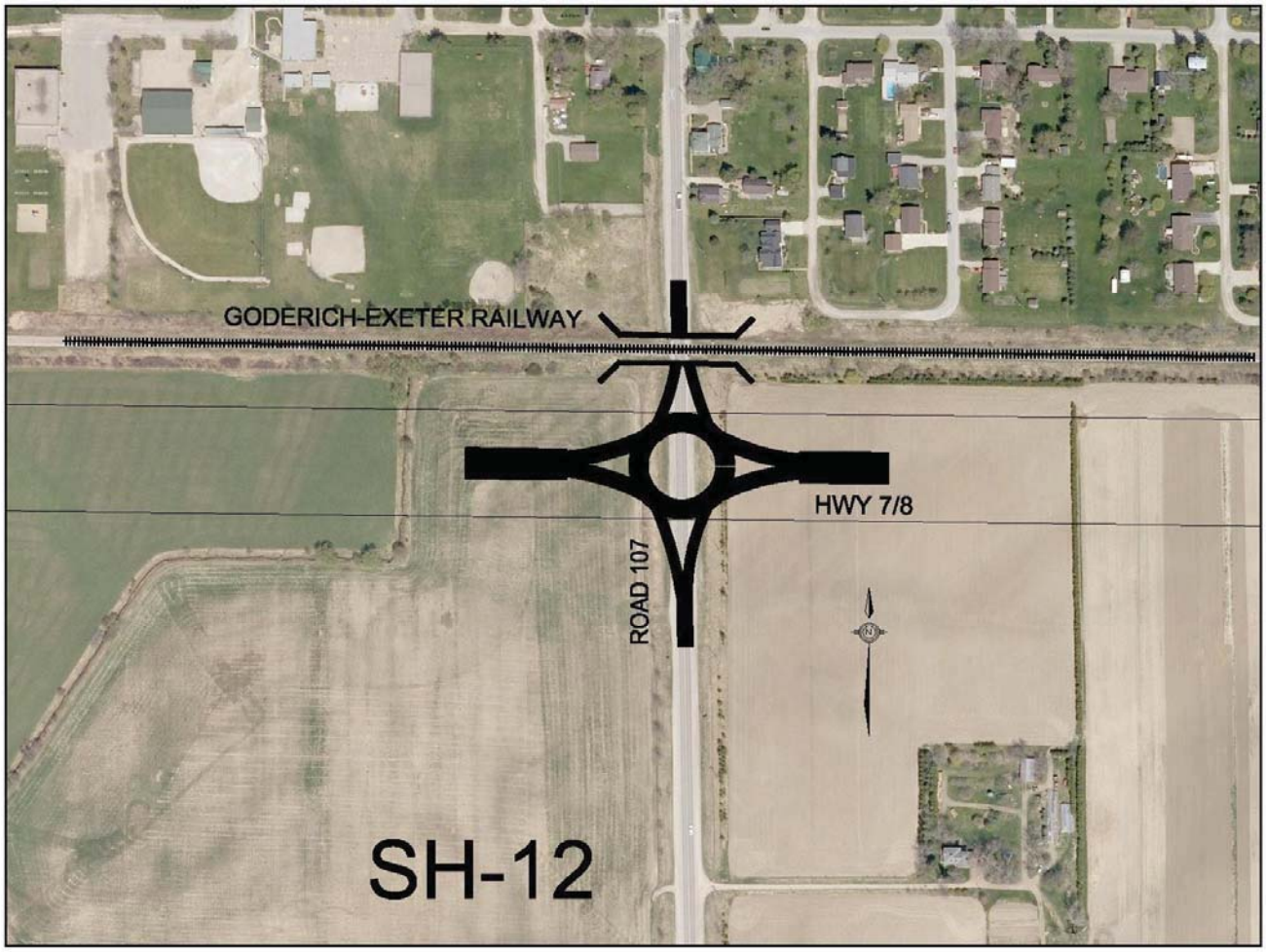
QUALITATIVE PERFORMANCE

Performance Criteria SH-12 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	X				
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** SH-12
TITLE: Grade separate Perth Road 107 from Railway; Connect with roundabout on the preferred route.	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** SH-13
TITLE: Grade separate Perth Road 107 from Railway and connect with signalized intersection on the preferred route	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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At-grade connection to Highway 7&8 south by-pass at Perth Road 107 with traffic signals. At-grade railway crossing. Interconnection of traffic signals and railway signals.

ALTERNATIVE CONCEPT:

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Grade separate Perth Road 107 from Railway and connect with signalized intersection on the preferred route.

ADVANTAGES:	DISADVANTAGES:
• Avoids conflicts with railway ♦ Avoids need to interconnect signals with railway crossing signals	• Higher capital construction cost ♦ Larger footprint impact • Requires new structure

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Grade separate Perth Road 107 from Railway and connect with signalized intersection on the preferred route	**IDEA NO.**	**PAGE NO**
		SH-13	2 of 3

DISCUSSION / JUSTIFICATION:

- This alternative would likely require a smaller footprint than a roundabout. An alignment shift may be required to provide adequate visibility to the traffic signal heads with respect to the railway subway structure.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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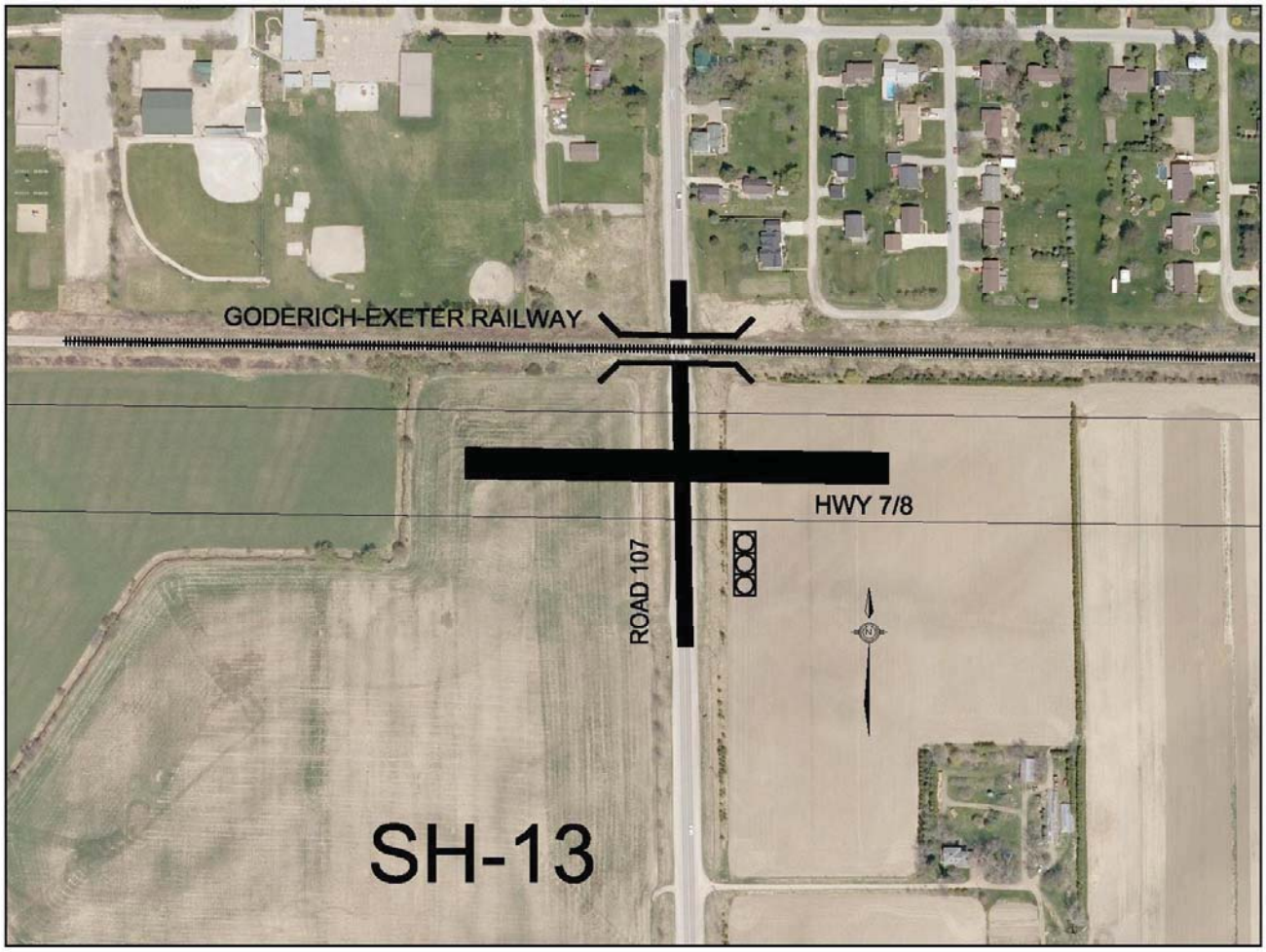
QUALITATIVE PERFORMANCE

Performance Criteria SH-13 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance					X
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SH-13
TITLE: Grade separate Perth Road 107 from Railway and connect with signalized intersection on the preferred route	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** SH-23
TITLE: Grade separate Perth Road 109 from Railway; Connect with roundabout on the preferred route.	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

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Maintain 4-lane cross section on Highway 7&8 at Perth Road 109 with stop control. No left turn lanes on Highway 7&8 mainline.

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ALTERNATIVE CONCEPT:

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Grade separate Perth Road 109 from Railway and a new roundabout on the preferred route.

. Note: Improvements to existing Highway 7&8 at Perth Road 109 will be required. Preliminary Design to review need for traffic signals/turning lanes or roundabout.

ADVANTAGES:	**DISADVANTAGES:**
♦ Avoids conflicts with railway ♦ Reduces potential of serious collisions ♦ Lower maintenance cost over long-term ♦ Avoids need to interconnect signals with railway crossing signals	♦ Larger footprint impact ♦ Results in all mainline traffic to slow down to maneuver through roundabout ♦ Higher capital construction cost ♦ Requires new structure

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Grade separate Perth Road 109 from Railway; Connect with roundabout on the preferred route.	**IDEA NO.**	**PAGE NO**
		SH-23	2 of 3

DISCUSSION / JUSTIFICATION:

- VE Team identified that Perth Road 109 was a critical access connection for traffic destined for Stratford's east end (commercial node), downtown and north side (residential). Also makes bypass more desirable for Stratford (westbound) and Kitchener (eastbound) traffic vs. having to go through Shakespeare.
- This alternative would require southerly shift in the Highway 7&8 alignment and additional right-of-way width to accommodate the circular footprint of the roundabout. In addition, the highway approaches from the east and west require successive curves to reduce operating speeds for approaching traffic.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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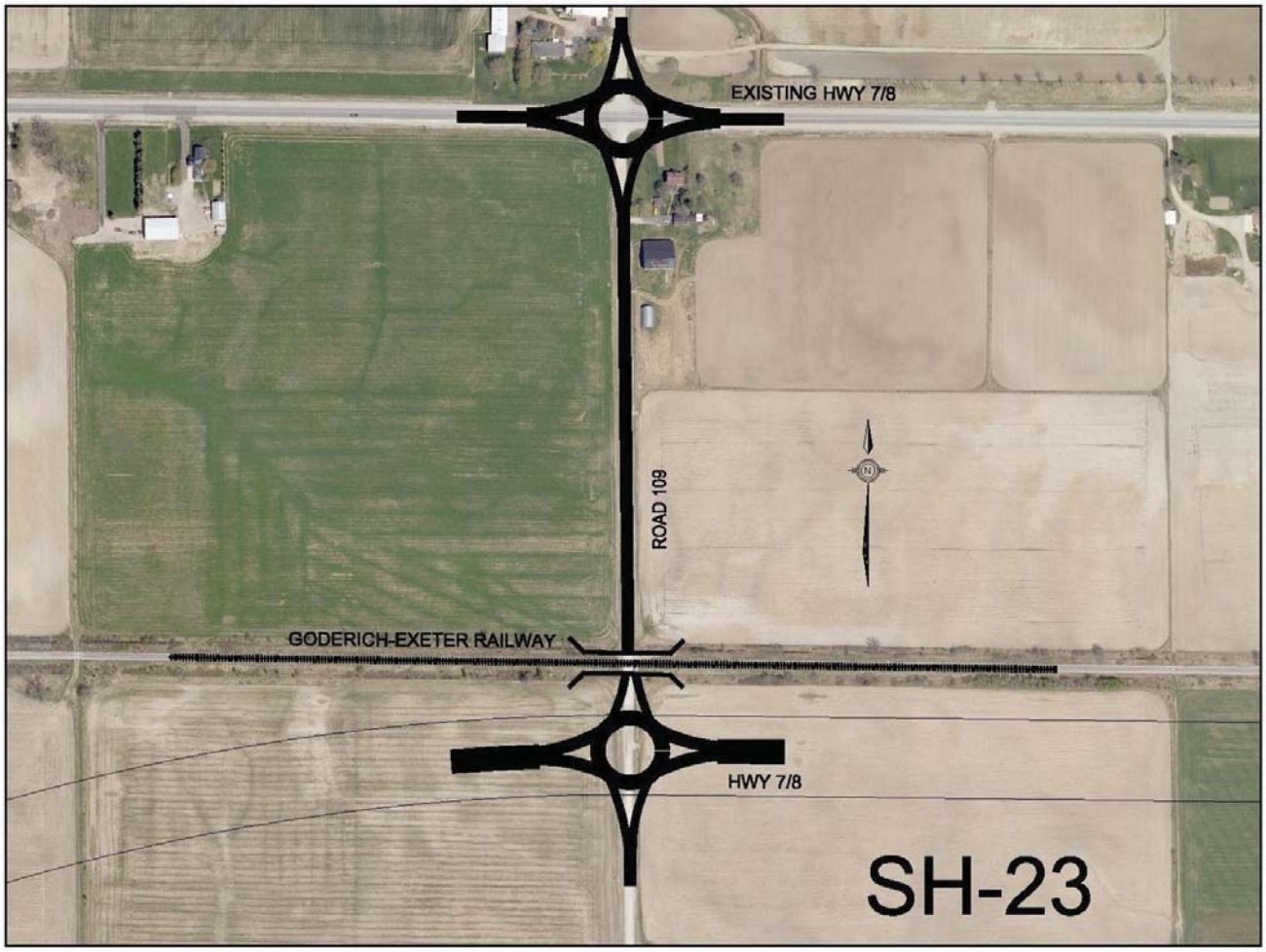
QUALITATIVE PERFORMANCE

Performance Criteria SH-23 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	X				
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Shakespeare and rural areas	**IDEA NO.** SH-23
TITLE: Grade separate Perth Road 109 from Railway; Connect with roundabout on the preferred route.	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Shakespeare and rural areas	**IDEA NO.** SH-24
TITLE: Grade separate Perth Road 109 from Railway and connect with signalized intersection on the preferred route	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

.

Maintain 4-lane cross section on Highway 7&8 at Perth Road 109 with stop control. No left turn lanes on Highway 7&8 mainline.

ALTERNATIVE CONCEPT:

.

Grade separate Perth Road 109 from Railway and connect with signalized intersection on the preferred route

Note: Improvements to existing Highway 7&8 at Perth Road 109 will be required. Preliminary Design to review need for traffic signals/turning lanes or roundabout.

ADVANTAGES:	DISADVANTAGES:
♦ Avoids conflicts with railway ♦ Avoids need to interconnect signals with railway crossing signals	♦ Higher capital construction cost ♦ Larger footprint impact ♦ Requires new structure

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Grade separate Perth Road 109 from Railway and connect with signalized intersection on the preferred route	**IDEA NO.**	**PAGE NO**
		SH-24	2 of 3

DISCUSSION / JUSTIFICATION:

- VE Team identified that Perth Road 109 was a critical access connection for traffic destined for Stratford's east end (commercial node), downtown and north side (residential). Also makes bypass more desirable for Stratford (westbound) and Kitchener (eastbound) traffic vs. having to go through Shakespeare.
- This alternative would likely require a smaller footprint than a roundabout. An alignment shift may be required to provide adequate visibility to the traffic signal heads with respect to the railway subway structure.

IMPLEMENTATION CONSIDERATIONS:

- Implemented with highway by-pass

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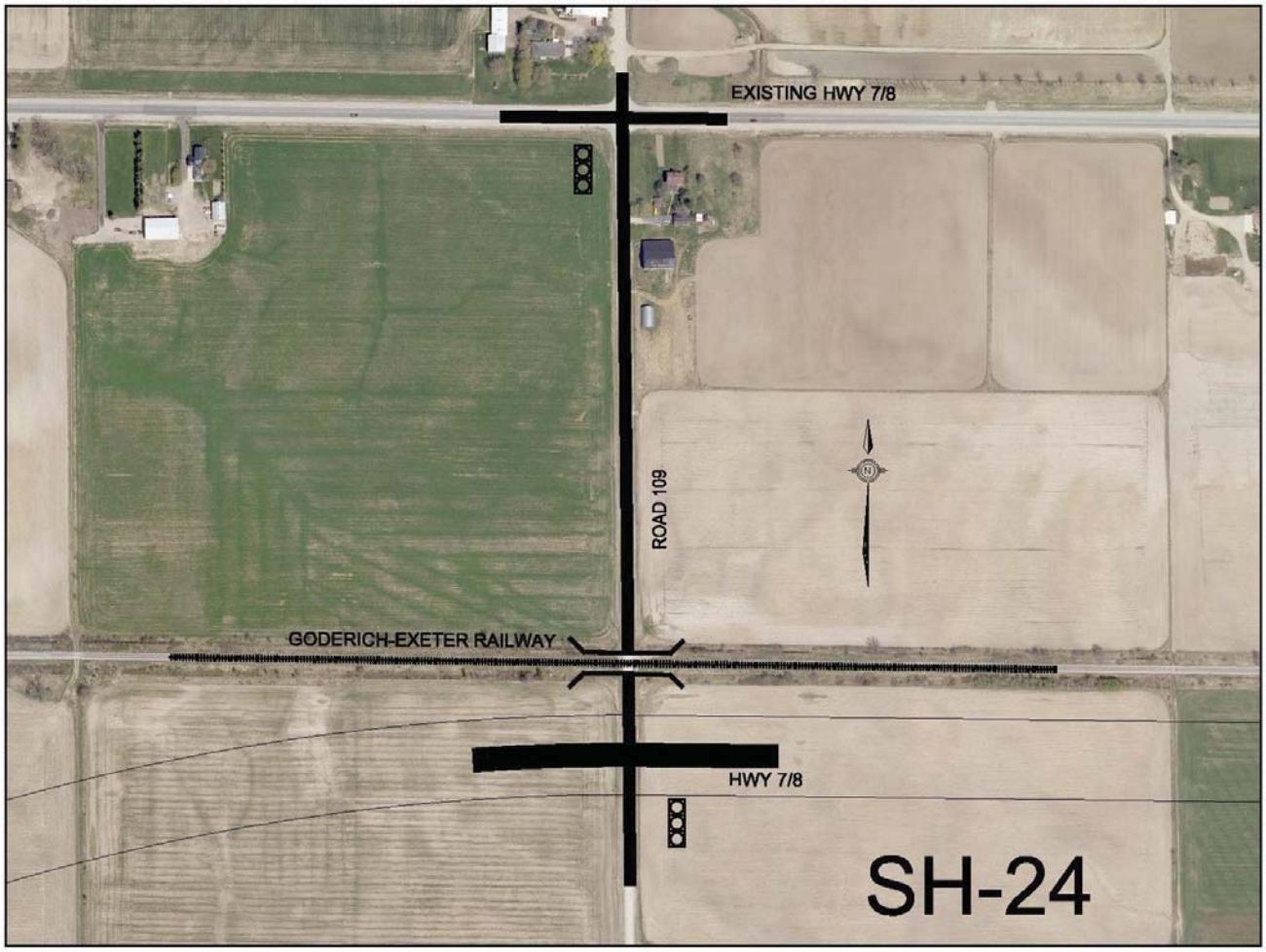
QUALITATIVE PERFORMANCE

Performance Criteria SH-24 (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance					X
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SH-24
TITLE: Grade separate Perth Road 109 from Railway and connect with signalized intersection on the preferred route	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	7/8 Stratford West of 111 to East of Erie Street	**IDEA NO.** SE-1
TITLE:	Alternative 2 - Modern Roundabouts at Romeo Street and Downie Street; possibly at Erie Street	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept (2031 base case) for Highway 7/8 along Lorne Avenue East from west of Road 111 to east of Erie Street (Highway 7 south) is to transition from a basic four-lane cross-section with rural attributes to a basic five-lane (two through lanes eastbound; two through lanes westbound; centre Two-Way Left Turn Lane – TWLTL) cross-section with urbanized attributes.

At major intersections (Romeo Street – tee to the north – Stop-control on north approach) and Downie Street (4-legged skewed intersection with traffic control signals), traffic signals are assumed to be included in the base case by 2031 at Downie Street only. A traffic signal (existing) at the 4-legged intersection of Highway 7/8 at Erie Street is also assumed.

ALTERNATIVE CONCEPT:

Note: The range of alternatives to be applied at Road 111 should be examined for consistency and road user expectations when assessing alternatives to the west identified in this write-up. These are assumed to be either traffic control signals (base case) or modern roundabout The alternative concept consists of four components, as follows:

1) Romeo Street will likely be extended to the south, to provide connection to a secondary roadway network serving planned industrial development. Accordingly, this intersection should be assumed to be 4-legged, and signalized, in 2031. This will be assumed in the evaluation of all subsequent alternatives involving traffic control signals. The base case cross-section will apply. A traffic control signal at Road 111 is assumed for consistency. A traffic control signal at Erie Street is also assumed.
2) **An alternative intersection treatment, in the form of modern roundabouts (SE-1), is to be explored at Romeo Street and Downie Street (base case modified by Alternative 1 is traffic control signals). The base case five-lane cross-section will apply. A complimentary modern roundabout at Road 111 is assumed for consistency. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout. These sub-alternatives do not impact this Alternative.**
3) A notional link in the southeast quadrant between Highway 7/8 and Erie Street is to be explored (SE13; SE-14. The two connections are to be explored as either traffic control signalized intersections or as roundabouts. If Road 111, Romeo Street, and Downie Street remain signalized, these connections will also be signalized. If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections will also be converted to roundabouts. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout.
4) An alternative cross-section (SE-1A), in the form of a basic four-lane (two through lanes eastbound; two through lanes westbound; centre raised median with barrier curbs) cross-section with urbanized attributes is to be explored over the segment west of Road 111 to Erie Street. This alternative requires Road 111, Romeo Street, Downie Street, and Erie Street to be roundabouts to permit U-turns at these locations. This alternative also requires an additional roundabout between Downie Street and Erie Street, to provide for U-turns at this location and limit out-of-the-way travel.
   If Alternative 3 above is implemented along with Alternative 4, the two connections between Highway 7/8 and Erie Street will be roundabouts. Erie Street may either be A) a traffic control signal (base case); or B) a roundabout. This is information only, and was not developed as a unique scenario.

This write-up deals with (2) above only – Romeo Street 4-legged and with modern roundabout, Downie Street with modern roundabout, Erie Street as either a signal or a modern roundabout, and the five-lane cross-section base case.

ADVANTAGES:	DISADVANTAGES:
• Continuous flow of Highway 7/8 traffic maintained (relative to base case traffic control signal at Downie Street and assumed traffic control signal at Romeo Street) • Greater flexibility to manage peak flow, changing conditions • Safer than traffic control signals for vehicular traffic • Reduced noise and greenhouse gases • Reduced pedestrian work load – crossing only one stream at a time • Less road user delay, frustration. • Less ongoing maintenance cost • Traffic calming effect; provides rural to urban speed transition at Romeo Street (Road 111 if it is also a roundabout); maintenance of consistent operating speeds through corridor • Eliminates need for auxiliary turn lanes; left-turn phases at intersections • Facilitates U-turns for all vehicle types on Highway 7/8 • May be combined with mid-block access management treatments • Aesthetics – roundabouts provide greater community appeal; blend better with community • Provides incentive to place utilities underground (less signals/illumination aerial clutter) • Flexibility to use existing Highway 7/8 alignment as primary route while new Highway 7/8 is upgraded	• Reduces mobility of Highway 7/8 traffic relative to the base case • Higher capital cost (land consumption) • Road user familiarity; yield to pedestrians on entry/exit (Note: roundabouts are present in Stratford; local road users have experience) • Issues for pedestrians with vision loss • Mode of failure in over-capacity situations – highway traffic will dominate/unacceptable sidestreet delay • Bigger footprint at intersection • Difficult to widen once constructed • Constructability issues when attempting to maintain traffic during construction (opportunities to use existing connecting link; close north and south approaches during construction) • Feasibility of roundabout at Erie Street • Pedestrian demand at Erie Street; level of service with signals versus roundabout

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Alternative 2 - Modern Roundabouts at Romeo Street and Downie Street; possibly at Erie Street	**IDEA NO.**	**PAGE NO**
		SE-1	3 of 4

DISCUSSION / JUSTIFICATION:

Key benefit of roundabouts is their ability to keep traffic moving; provide sidestreet access; control operating speeds; and allow all classes of vehicles to U-turn at these locations. By coupling two or more roundabouts, it may be possible to impose partial or full access management measures at minor street intersections and existing/remaining private accesses along the corridor. These access points could be constrained locally to right-in, right-out (porkchop islands) or by a continuous raised median. The combination of right-in, right-out access and appropriately-spaced roundabouts could provide full access with minimal out-of-the-way travel to execute U-turns.

Access control by means of a continuous median is not viewed as viable with signalized major intersections, even with permitted left-turn U-turns, as large commercial vehicles could not take advantage of this permissive condition.

IMPLEMENTATION CONSIDERATIONS:

Consistency and road user expectations suggest that the same intersection treatment be applied at Road 111; Romeo Street; Downie Street; and the notional connection between Highway 7/8 and Erie Street in the southeast quadrant of that intersection, if it is constructed.

At Erie Street, available land, and reduced traffic volumes if the aforementioned connection is established likely dictate that this recently-upgraded intersection remain traffic signal-controlled. This also addresses the major pedestrian movements at this location, and the close proximity of commercial entrances.

However, for evaluation purposes and to support development of other ideas, a roundabout option at Erie Street is to be explored under this Alternative.

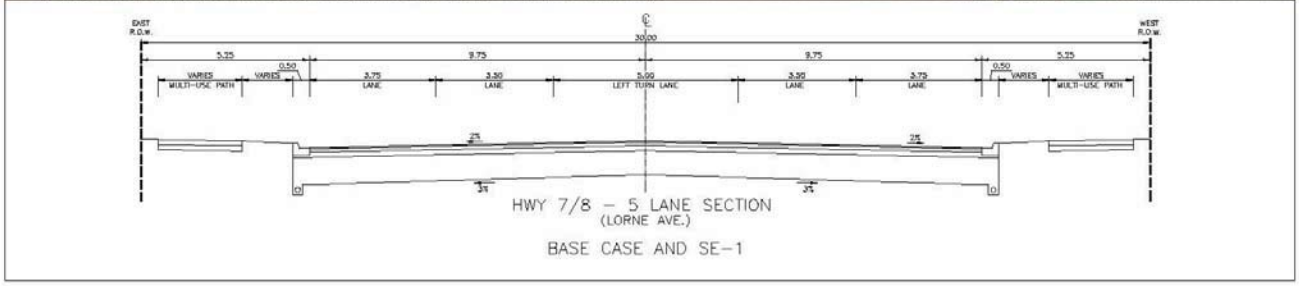
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact					X
Enhanced Operational Performance				X	
Reduced Construction Impacts			X		
Expedited Project Delivery				X	

SKETCHES

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA: 7/8 mobility	**IDEA NO.** SE-1
TITLE: Alternative 2 - Modern Roundabouts at Romeo Street and Downie Street; possibly at Erie Street	**PAGE NO.** 4 of 4



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: 7/8 Stratford West of 111 to East of Erie Street	**IDEA NO.** SE-1A
TITLE: Alternative 4 – Median from east of Road 111 to Erie Street	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept (2031 base case) for Highway 7/8 along Lorne Avenue East from west of Road 111 to east of Erie Street (Highway 7 south) is to transition from a basic four-lane cross-section with rural attributes to a basic five-lane (two through lanes eastbound; two through lanes westbound; centre Two-Way Left Turn Lane – TWLTL) cross-section with urbanized attributes.

At major intersections (Romeo Street – tee to the north – Stop-control on north approach) and Downie Street (4-legged skewed intersection with traffic control signals), traffic signals are assumed to be included in the base case by 2031 at Downie Street only. A traffic signal (existing) at the 4-legged intersection of Highway 7/8 at Erie Street is also assumed.

ALTERNATIVE CONCEPT:

Note: The range of alternatives to be applied at Road 111 should be examined for consistency and road user expectations when assessing alternatives to the west identified in this write-up. These are assumed to be either traffic control signals (base case) or modern roundabout The alternative concept consists of five components, as follows:

1) Romeo Street will likely be extended to the south, to provide connection to a secondary roadway network serving planned industrial development. Accordingly, this intersection should be assumed to be 4-legged, and signalized, in 2031. This will be assumed in the evaluation of all subsequent alternatives involving traffic control signals. The base case cross-section will apply. A traffic control signal at Road 111 is assumed for consistency. A traffic control signal at Erie Street is also assumed.

2) An alternative intersection treatment, in the form of modern roundabouts (SE-1), is to be explored at Romeo Street and Downie Street (base case modified by Alternative 1 is traffic control signals). The base case five-lane cross-section will apply. A complimentary modern roundabout at Road 111 is assumed for consistency. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout. These sub-alternatives do not impact this Alternative.

3) A notional link in the southeast quadrant between Highway 7/8 and Erie Street is to be explored (SE13; SE-14. The two connections are to be explored as either traffic control signalized intersections or as roundabouts. If Road 111, Romeo Street, and Downie Street remain signalized, these connections will also be signalized. If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections will also be converted to roundabouts. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout.

4) An alternative cross-section (SE-1A), in the form of a basic four-lane (two through lanes eastbound; two through lanes westbound; centre raised median with barrier curbs) cross-section with urbanized attributes is to be explored over the segment west of Road 111 to Erie Street. This alternative requires Road 111, Romeo Street, Downie Street, and Erie Street to be roundabouts to permit U-turns at these locations. This alternative also requires an additional roundabout between Downie Street and Erie Street, to provide for U-turns at this location and limit out-of-the-way travel.

If Alternative 3 above is implemented along with Alternative 4, the two connections between

Highway 7/8 and Erie Street will be roundabouts. Erie Street may either be A) a traffic control signal (base case); or B) a roundabout. This is information only, and was not developed as a unique scenario.

This write-up deals with (4) above only – a raised median from east of Road 111 to Erie Street, with Road 111, Romeo Street, Downie Street, and Erie Street to be roundabouts to permit U-turns at these locations, and an additional roundabout between Downie Street and Erie Street, to provide for U-turns at this location and limit out-of-the-way travel.

ADVANTAGES:	DISADVANTAGES:
♦ Converts minor roadway and private accesses between major intersection into right-in, right-out only ♦ Reduces potential of angle and left-turn opposing collisions mid-block ♦ Median provides pedestrian refuge mid-block ♦ Improves mid-block traffic flows on Highway 7/8 by reducing side-friction ♦ May permit narrower cross-section mid-block, reducing property requirements at tight locations ♦ May only be implemented with roundabout option at major intersections to facilitate U-turns by all classes of vehicles; enhances roundabout utility	♦ Requires roundabouts at Road 111, Romeo Street, Downie Street, and either Erie Street or at SE quadrant link intersection if this option included ♦ Increases out-of-the-way travel to access/egress minor roadways and driveways on opposite side of Highway 7/8 ♦ Requires additional roundabout midway between Downie Street and Erie Street to limit out-of-the-way travel ♦ May not be accepted by commercial operations along Highway 7/8 ♦ May limit flexibility regarding emergency services response ♦ Complicates winter maintenance

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Alternative 4 – Median from east of Road 111 to Erie Street	**IDEA NO.**	**PAGE NO**
	SE-1A	3 of 4

DISCUSSION / JUSTIFICATION:

Base case assumes TWLTL, allowing for unrestricted movements at mid-block locations

Median facilitates access management of minor roadways and driveways, improving operations within the corridor; benefits to through traffic at the expense of some inconvenience to local trips.

IMPLEMENTATION CONSIDERATIONS:

Requires adoption of roundabouts at major intersections within the corridor to facilitate U-turns.

Likely requires roundabout at Oak Street to address distance between Downie Street and Erie Street

Not as feasible without either roundabout at Erie Street or implementation of connection in SE quadrant and roundabout at north terminal of this connection.

With quadrant connection, may be implemented regardless of whether Highway 7/8 at Erie Street is retained as signal or converted to roundabout.

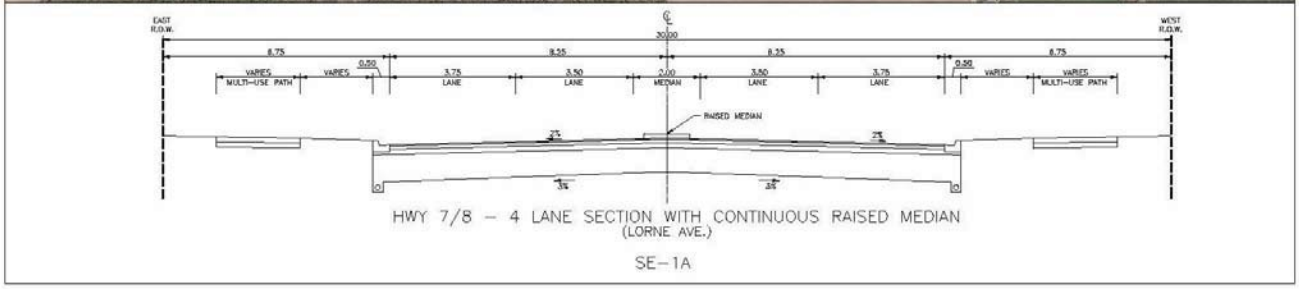
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact					X
Enhanced Operational Performance					X
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA: Manage minor street access to improve operations and safety	**IDEA NO.** SE-1A
TITLE: Alternative 4 – Median from east of Road 111 to Erie Street	**PAGE NO.** 4 of 4



HWY 7/8 – 4 LANE SECTION WITH CONTINUOUS RAISED MEDIAN
(LORNE AVE.)

SE–1A

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	7/8 Stratford West of 111 to East of Erie Street	**IDEA NO.** SE-13
TITLE:	Alternative 3B – Quadrant Link between Highway 7/8 and Erie Street - Roundabouts	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept (2031 base case) for Highway 7/8 along Lorne Avenue East from west of Road 111 to east of Erie Street (Highway 7 south) is to transition from a basic four-lane cross-section with rural attributes to a basic five-lane (two through lanes eastbound; two through lanes westbound; centre Two-Way Left Turn Lane – TWLTL) cross-section with urbanized attributes.

At major intersections (Romeo Street – tee to the north – Stop-control on north approach) and Downie Street (4-legged skewed intersection with traffic control signals), traffic signals are assumed to be included in the base case by 2031 at Downie Street only. A traffic signal (existing) at the 4-legged intersection of Highway 7/8 at Erie Street is also assumed.

ALTERNATIVE CONCEPT:

Note: The range of alternatives to be applied at Road 111 should be examined for consistency and road user expectations when assessing alternatives to the west identified in this write-up. These are assumed to be either traffic control signals (base case) or modern roundabout The alternative concept consists of four components, as follows:

1) Romeo Street will likely be extended to the south, to provide connection to a secondary roadway network serving planned industrial development. Accordingly, this intersection should be assumed to be 4-legged, and signalized, in 2031. This will be assumed in the evaluation of all subsequent alternatives involving traffic control signals. The base case cross-section will apply. A traffic control signal at Road 111 is assumed for consistency. A traffic control signal at Erie Street is also assumed.

2) An alternative intersection treatment, in the form of modern roundabouts (SE-1), is to be explored at Romeo Street and Downie Street (base case modified by Alternative 1 is traffic control signals). The base case five-lane cross-section will apply. A complimentary modern roundabout at Road 111 is assumed for consistency. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout. These sub-alternatives do not impact this Alternative.

3) A notional link in the southeast quadrant between Highway 7/8 and Erie Street is to be explored (SE13; SE-14. The two connections are to be explored as either traffic control signalized intersections or as roundabouts. If Road 111, Romeo Street, and Downie Street remain signalized, these connections will also be signalized. If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections will also be converted to roundabouts. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout.

4) An alternative cross-section (SE-1A), in the form of a basic four-lane (two through lanes eastbound; two through lanes westbound; centre raised median with barrier curbs) cross-section with urbanized attributes is to be explored over the segment west of Road 111 to Erie Street. This alternative requires Road 111, Romeo Street, Downie Street, and Erie Street to be roundabouts to permit U-turns at these locations. This alternative also requires an additional roundabout between Downie Street and Erie Street, to provide for U-turns at this location and limit out-of-the-way travel.

   If Alternative 3 above is implemented along with Alternative 4, the two connections between Highway 7/8 and Erie Street will be roundabouts. Erie Street may either be A) a traffic control signal (base case); or B) a roundabout. This is information only, and was not developed as a unique scenario.

This write-up deals with (3B) above only – a quadrant link between Highway 7/8 and Erie Street with two new intersections controlled by roundabouts. Highway 7/8 at Erie Street is assumed to remain as signalized.

ADVANTAGES:	DISADVANTAGES:
• Provides access for traffic to/from Highway 7 without pushing it through the Highway 7/8 at Erie Street • Reduces effects of capacity constraints at Highway 7/8 at Erie Street • Eliminates need for WB-SB left turn phase at Highway 7/8 at Erie Street intersection • Addresses truck turning issues (E-S, S-E) at the Highway 7/8 at Erie Street • Improves pedestrian safety at Highway 7/8 at Erie Street intersection (trucks offtracking in NB-EB right turn) • May improve operation of entrances immediately south of Highway 7/8 at Erie Street intersection • Provides additional pedestrian crossing opportunities (staged crossing with splitter island refuge) • Supports Alternatives that require roundabout at or prior to the Highway 7/8 at Erie Street intersection to facilitate U-turns. • Addresses potential future need to signalize Dufferin Street @ Highway 7/8	• Introduces additional full-moves roundabout on Highway 7/8, and Erie Street • Intersection/roundabout spacing may be problematic in terms of progression and queuing (if Highway 7/8 at Erie Street intersection remains signalized) • Land requirements may exist at both terminals • Loss of development lands • Impacts on existing/proposed businesses

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Alternative 3B – Quadrant Link between Highway 7/8 and Erie Street - Roundabouts	**IDEA NO.**	**PAGE NO**
		SE-13	3 of 4

DISCUSSION / JUSTIFICATION:

Highway 7/8 at Erie Street was recently reconstructed and geometry and signal operations were optimized within existing constraints. Development in all quadrants likely precludes widening without significant property and cost implications. Same issues apply to conversion to roundabout.

Retaining signal at Highway 7/8 at Erie Street may better serve pedestrians.

Link to be built in "Greenfield" environment; provides staging options during other works

Fast-food outlets and driveways in SE quadrant impacting/being impacted by overlap. Traffic volumes in this area would be reduced.

Alternative provides opportunity to move Highway 7 traffic out of Erie Street intersection, potentially improving movement to and from the west. Alternative is compatible with roundabouts at Road 111, Romeo Street, Downie Street, and continuous median for access control

IMPLEMENTATION CONSIDERATIONS:

Link on Highway 7/8 would likely be placed opposite existing Dufferin Street. Link on Erie Street would likely be a 3-legged roundabout as City currently proposing to stop up Crane Avenue, after creating tie-in at rear of existing industrial developments to Packham Road. Spacing between Highway 7/8 at Erie Street and Packham for new roundabout is therefore flexible. If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections should also be converted to roundabouts.

Two sub-alternatives for the Highway 7/8 @ Erie Street intersection exist, as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout.

Implementation of this Alternative may be considered separately from the decision of what to do at Highway 7/8 @ Erie Street. If quadrant link is implemented, pressure to do something at Highway 7/8 at Erie Street may be lessened.If a centre median is to be implemented between west of Road 111 and Erie Street in conjunction with this Alternative, 111, Romeo Street, Downie Street and these connections should also be converted to roundabouts, and an additional roundabout added between the connection on Highway 7/8 and Downie Street

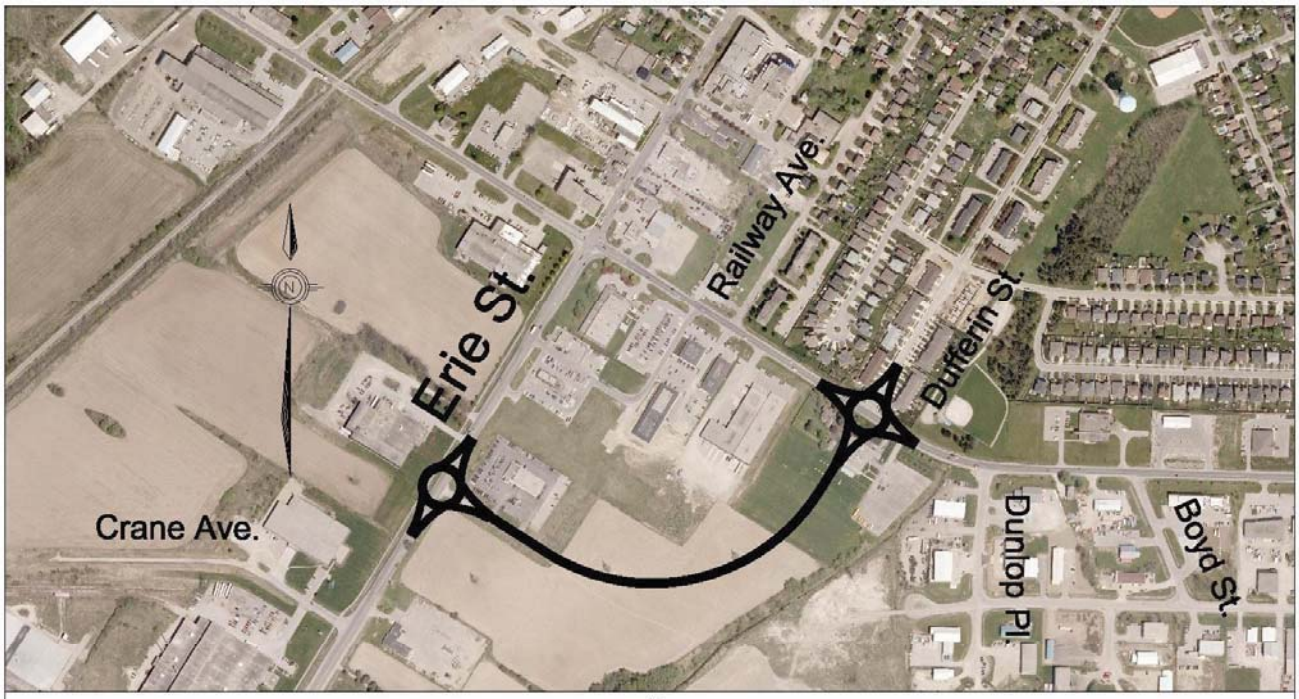
QUALITATIVE PERFORMANCE

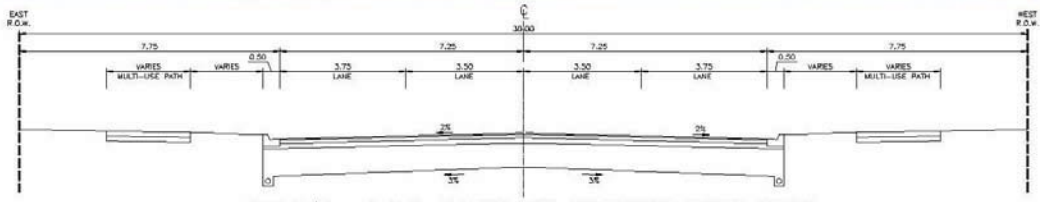
Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact				X	
Enhanced Operational Performance				X	
Reduced Construction Impacts					X
Expedited Project Delivery					X

SKETCHES

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA: Improve operations at Highway 7/8 and Erie Street intersection	**IDEA NO.** SE-13
TITLE: Alternative 3B – Quadrant Link between Highway 7/8 and Erie Street - Roundabouts	**PAGE NO.** 4 of 4





HWY 7/8 – 4 LANE SECTION WITH CONTINUOUS RAISED MEDIAN
(PROPOSED LINK)

SE–13

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	7/8 Stratford West of 111 to East of Erie Street	**IDEA NO.** SE-14
TITLE:	Alternative 3A – Quadrant Link between Highway 7/8 and Erie Street – Traffic Signals	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept (2031 base case) for Highway 7/8 along Lorne Avenue East from west of Road 111 to east of Erie Street (Highway 7 south) is to transition from a basic four-lane cross-section with rural attributes to a basic five-lane (two through lanes eastbound; two through lanes westbound; centre Two-Way Left Turn Lane – TWLTL) cross-section with urbanized attributes.

At major intersections (Romeo Street – tee to the north – Stop-control on north approach) and Downie Street (4-legged skewed intersection with traffic control signals), traffic signals are assumed to be included in the base case by 2031 at Downie Street only. A traffic signal (existing) at the 4-legged intersection of Highway 7/8 at Erie Street is also assumed.

ALTERNATIVE CONCEPT:

Note: The range of alternatives to be applied at Road 111 should be examined for consistency and road user expectations when assessing alternatives to the west identified in this write-up. These are assumed to be either traffic control signals (base case) or modern roundabout The alternative concept consists of four components, as follows:

1) Romeo Street will likely be extended to the south, to provide connection to a secondary roadway network serving planned industrial development. Accordingly, this intersection should be assumed to be 4-legged, and signalized, in 2031. This will be assumed in the evaluation of all subsequent alternatives involving traffic control signals. The base case cross-section will apply. A traffic control signal at Road 111 is assumed for consistency. A traffic control signal at Erie Street is also assumed.

2) An alternative intersection treatment, in the form of modern roundabouts (SE-1), is to be explored at Romeo Street and Downie Street (base case modified by Alternative 1 is traffic control signals). The base case five-lane cross-section will apply. A complimentary modern roundabout at Road 111 is assumed for consistency. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout. These sub-alternatives do not impact this Alternative.

3) A notional link in the southeast quadrant between Highway 7/8 and Erie Street is to be explored (SE13; SE-14. The two connections are to be explored as either traffic control signalized intersections or as roundabouts. If Road 111, Romeo Street, and Downie Street remain signalized, these connections will also be signalized. If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections will also be converted to roundabouts. Two sub-alternatives will be explored as follows: A) a traffic control signal at Erie Street (base case for this location); and B) conversion of Erie Street to a modern roundabout.

4) An alternative cross-section (SE-1A), in the form of a basic four-lane (two through lanes eastbound; two through lanes westbound; centre raised median with barrier curbs) cross-section with urbanized attributes is to be explored over the segment west of Road 111 to Erie Street. This alternative requires Road 111, Romeo Street, Downie Street, and Erie Street to be roundabouts to permit U-turns at these locations. This alternative also requires an additional roundabout between Downie Street and Erie Street, to provide for U-turns at this location and limit out-of-the-way travel.

   If Alternative 3 above is implemented along with Alternative 4, the two connections between Highway 7/8 and Erie Street will be roundabouts. Erie Street may either be A) a traffic control signal (base case); or B) a roundabout. This is information only, and was not developed as a unique scenario.

This write-up deals with (3A) above only – a quadrant link between Highway 7/8 and Erie Street with two new intersections controlled by traffic signals. Highway 7/8 at Erie Street is assumed to remain as signalized.

ADVANTAGES:	DISADVANTAGES:
• Provides access for traffic to/from Highway 7 without pushing it through the Highway 7/8 at Erie Street • Reduces effects of capacity constraints at Highway 7/8 at Erie Street • Eliminates need for WB-SB left turn phase at Highway 7/8 at Erie Street intersection • Addresses truck turning issues (E-S, S-E) at the Highway 7/8 at Erie Street • Improves pedestrian safety at Highway 7/8 at Erie Street intersection (trucks offtracking in NB-EB right turn) • May improve operation of entrances immediately south of Highway 7/8 at Erie Street intersection • Provides additional pedestrian crossing opportunities	• Introduces additional full-moves intersection on Highway 7/8, and Erie Street • Intersection spacing may be problematic in terms of progression and queuing • Land requirements may exist at both terminals • Loss of development lands • Impacts on existing/proposed businesses

DISCUSSION / JUSTIFICATION:

Highway 7/8 at Erie Street was recently reconstructed and geometry and signal operations were optimized within existing constraints.

Development in all quadrants likely precludes widening without significant property and cost implications.

Same issues apply to conversion to roundabout.

Retaining signal at Highway 7/8 at Erie Street may better serve pedestrians.

Opportunities for signal coordination.

Link to be built in "Greenfield" environment; provides staging options during other works

Fast-food outlets and driveways in SE quadrant impacting/being impacted by overlap. Traffic volumes in this area would be reduced.

Alternative provides opportunity to move Highway 7 traffic out of Erie Street intersection, potentially improving movement to and from the west.

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Alternative 3A – Quadrant Link between Highway 7/8 and Erie	**IDEA NO.**	**PAGE NO**

IMPLEMENTATION CONSIDERATIONS:

Link on Highway 7/8 would likely be placed opposite existing Dufferin Street to form 4-legged intersection.

Link on Erie Street would likely be a tee intersection as City currently proposing to stop up Crane Avenue, after creating tie-in at rear of existing industrial developments to Packham Road. Spacing between Highway 7/8 at Erie Street and Packham for new intersection is therefore flexible.

If Road 111, Romeo Street, and Downie Street remain signalized, these connections should also be signalized.

If 111, Romeo Street, and Downie Street are converted to roundabouts, these connections should also be converted to roundabouts.

Two sub-alternatives for the Highway 7/8 @ Erie Street intersection exist, as follows

A) a traffic control signal at Erie Street (base case for this location); and

B) conversion of Erie Street to a modern roundabout.

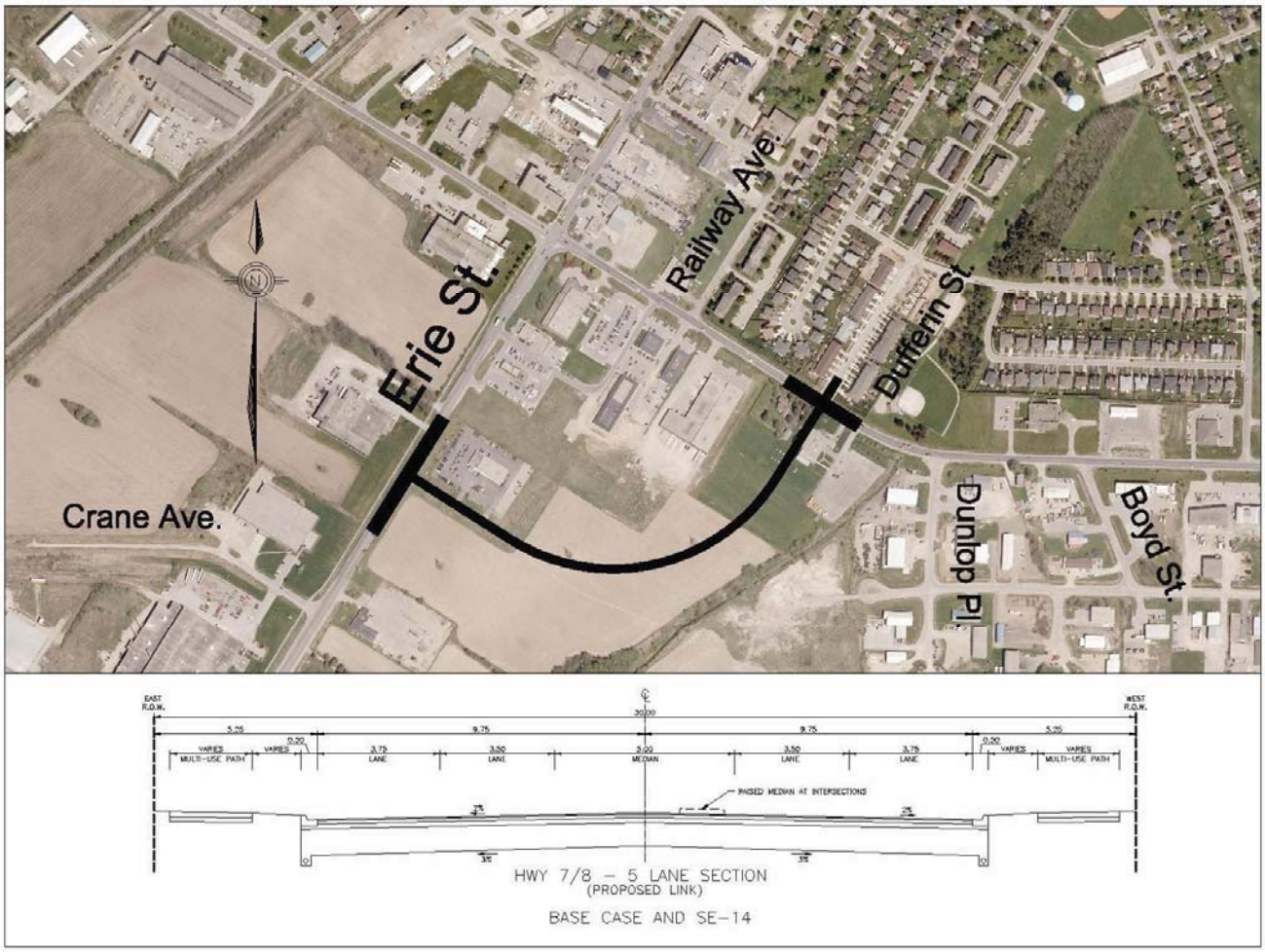
Implementation of this Alternative may be considered separately from the decision of what to do at Highway 7/8 @ Erie Street. If quadrant link is implemented, pressure to do something at Highway 7/8 at Erie Street may be lessened.

If a centre median is to be implemented between west of Road 111 and Erie Street in conjunction with this Alternative, 111, Romeo Street, Downie Street and these connections will should also be converted to roundabouts, and an additional roundabout added between the connection on Highway 7/8 and Downie Street

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance					X
Reduced Construction Impacts					X
Expedited Project Delivery					X

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Improve operations at Highway 7/8 and Erie Street intersection	**IDEA NO.** SE-14
TITLE: Alternative 3A – Quadrant Link between Highway 7/8 and Erie Street – Traffic Signals	**PAGE NO.** 4 of 4



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Highway 7 south of Highway 7/8 Stratford	**IDEA NO.** SE-15
TITLE: PackhamRoad/Embro Road – Roundabout	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Highway 7, south of Highway 7/8 will have a five-lane cross-section (two northbound through lanes; two southbound through lanes; centre Two-Way Left-Turn Lane-TWLTL) from Highway 7/8 to south of Road 29/Gibb Road

PackhamRoad/Embro Road is currently controlled by traffic control signals

ALTERNATIVE CONCEPT:

PackhamRoad/Embro Road - traffic control signals to be replaced with roundabout

ADVANTAGES:	**DISADVANTAGES:**
♦ PackhamRoad/Embro Road may require upgrade before 2031. Build-out to ultimate condition avoids throwaway ♦ Road 29/Gibb Road will likely reach warrant for signals before 2031. Build-out to ultimate condition avoids throwaway ♦ If Road 111, Romeo Street, Downie Street, Erie Street to be roundabouts under ultimate concept, roundabouts at these locations will maintain consistency of control along Highway 7 corridor	♦ Potential increase in delay to Highway 7 traffic over base case ♦ May "over-build" for interim condition ♦ Consistency in intersection control may not be achieved until the ultimate build-out.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: PackhamRoad/Embro Road – Roundabout	**IDEA NO.**	**PAGE NO**
	SE-15	2 of 3

DISCUSSION / JUSTIFICATION:

Avoids throwaway improvements between existing and desired, ultimate concept

IMPLEMENTATION CONSIDERATIONS:

Choice between signals and roundabouts should be based on consistency along Highway 7 corridor in ultimate condition

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact					X
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery					X

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Economy of implementation	**IDEA NO.** SE-15
TITLE: PackhamRoad/Embro Road – Roundabout	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: **Highway 7 south of Highway 7/8 Stratford**	**IDEA NO.** SE-23
TITLE: Road 29/Gibb Road – Roundabout	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Highway 7, south of Highway 7/8 will have a five-lane cross-section (two northbound through lanes; two southbound through lanes; centre Two-Way Left-Turn Lane-TWLTL) from Highway 7/8 to south of Road 29/Gibb Road

Road 29/Gibb Road is currently minor street STOP-controlled

ALTERNATIVE CONCEPT:

Road 29/Gibb Road - If warrant for signals met, additional lanes or other reconstruction necessary, built roundabout to MTO standards at that time.

ADVANTAGES:	**DISADVANTAGES:**
♦ PackhamRoad/Embro Road may require upgrade before 2031. Build-out to ultimate condition avoids throwaway ♦ Road 29/Gibb Road will likely reach warrant for signals before 2031. Build-out to ultimate condition avoids throwaway ♦ If Road 111, Romeo Street, Downie Street, Erie Street to be roundabouts under ultimate concept, roundabouts at these locations will maintain consistency of control along Highway 7 corridor	♦ Potential increase in delay to Highway 7 traffic over base case ♦ May "over-build" for interim condition ♦ Consistency in intersection control may not be achieved until the ultimate build-out.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Road 29/Gibb Road – Roundabout	**IDEA NO.**	**PAGE NO**
	SE-23	2 of 3

DISCUSSION / JUSTIFICATION:

Avoids throwaway improvements between existing and desired, ultimate concept

IMPLEMENTATION CONSIDERATIONS:

Choice between signals and roundabouts should be based on consistency along Highway 7 corridor in ultimate condition

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact					X
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery					X

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Highway 7 south of Highway 7/8 Stratford	**IDEA NO.** SE-23
TITLE: Road 29/Gibb Road – Roundabout	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: **Highway 7 south of Highway 7/8 Stratford**	**IDEA NO.** SE-24
TITLE: Road 29/Gibb Road – Traffic Signals	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Highway 7, south of Highway 7/8 will have a five-lane cross-section (two northbound through lanes; two southbound through lanes; centre Two-Way Left-Turn Lane-TWLTL) from Highway 7/8 to south of Road 29/Gibb Road.

Road 29/Gibb Road is currently minor street STOP-controlled.

ALTERNATIVE CONCEPT:

Road 29/Gibb Road – upgrade to traffic control signals (SE-24). If warrant for signals met, additional lanes or other reconstruction necessary, built ultimate cross-section and signals to MTO standards at that time.

ADVANTAGES:	**DISADVANTAGES:**
♦ Road 29/Gibb Road will likely reach warrant for signals before 2031. Build-out to ultimate condition avoids throwaway ♦ If Road 111, Romeo Street, Downie Street, Erie Street to be signalized under ultimate concept, signals at these locations will maintain consistency of control along Highway 7 corridor	♦ Potential increase in delay to Highway 7 traffic over base case ♦ May "over-build" for interim condition

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Greg Junnor	**Discipline**: Safety	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Road 29/Gibb Road – Traffic Signals	**IDEA NO.**	**PAGE NO**
	SE-24	2 of 3

DISCUSSION / JUSTIFICATION:

Avoids throwaway improvements between existing and desired, ultimate concept

IMPLEMENTATION CONSIDERATIONS:

Choice between signals and roundabouts should be based on consistency along Highway 7 corridor in ultimate condition

Consistency with treatment at Road 125; key intersections to the east (to Erie Street)

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance			X		
Reduced Construction Impacts				X	
Expedited Project Delivery					X

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Economy of implementation	**IDEA NO.** SE-24
TITLE: Road 29/Gibb Road – Traffic Signals	**PAGE NO.** 3 of 3

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford - West	**IDEA NO.** SW-1
TITLE: Reroute Monteith along upgraded Patterson	**PAGE NO.** 1 of 3

ORIGINAL CONCEPT:

Grade separation at railway crossing with road closure at Linton and Monteith. .....

.....

.....

ALTERNATIVE CONCEPT:

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Same as base case, but include a rerouting of Montieth to St. Vincent via Patterson Road, which requires an upgrade to Patterson Road to handle the industrial traffic along Montieth... .....

.....

.....

ADVANTAGES:	DISADVANTAGES:
♦ Provides a more direct connection between Monteith and Lorne Ave.	♦ Industrial traffic is redirected to a residential road. ♦ May be some geometric issues related to truck turning.

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Reroute Monteith along upgraded Patterson	**IDEA NO.**	**PAGE NO**

DISCUSSION / JUSTIFICATION:

Provides better connection rather than having industrial traffic migrate through random residential streets to St. Vincents.....

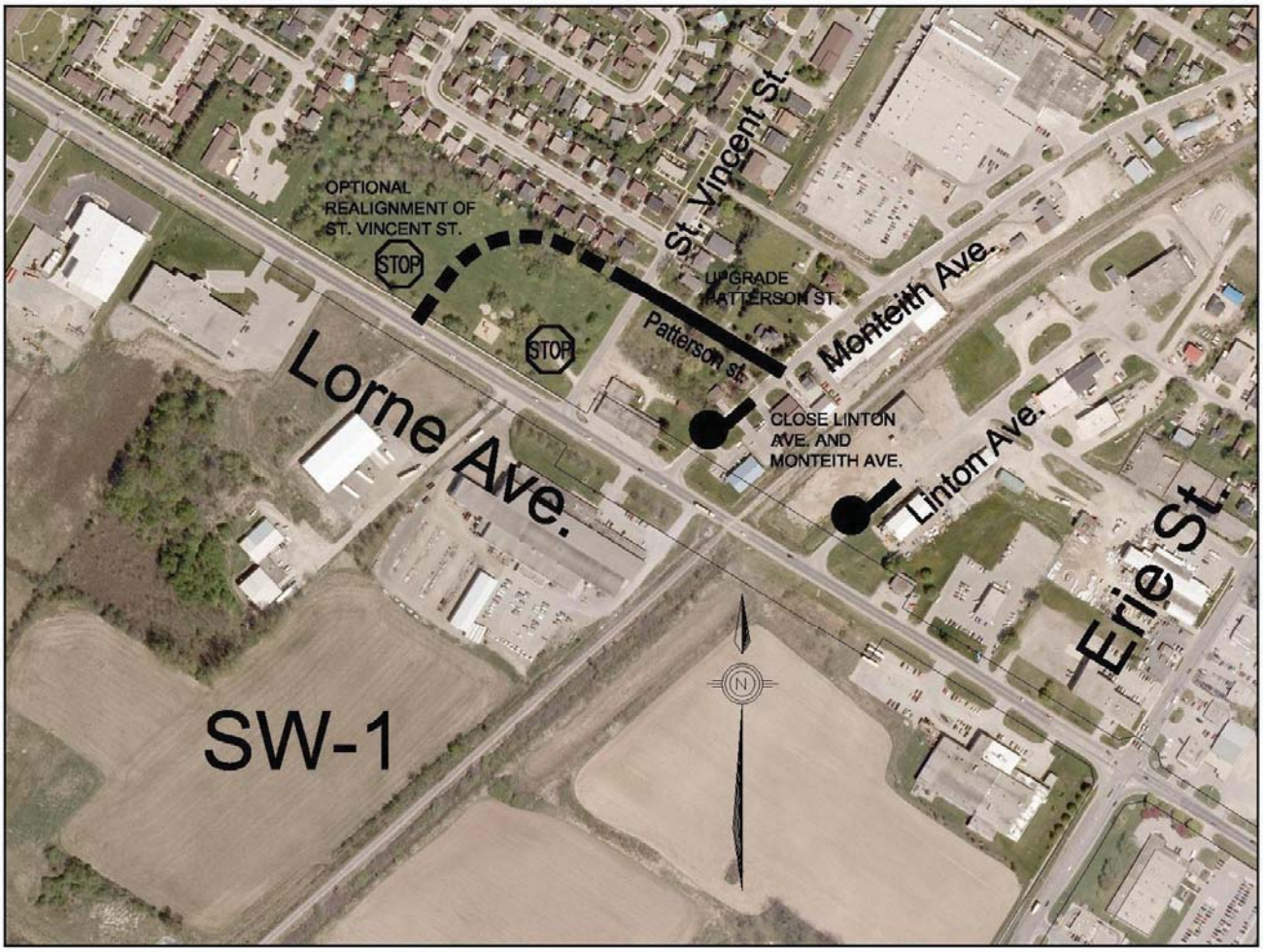
IMPLEMENTATION CONSIDERATIONS:

Costs are limited to reconstruction of the Patterson from Montieth to St.Vincents (approx. 150m).

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact				x	
Enhanced Operational Performance				x	
Reduced Construction Impacts		x			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-1
TITLE: Reroute Monteith along upgraded Patterson	**PAGE NO.** 3 of 3



VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford - West	**IDEA NO.** SW-5
TITLE: Roundabout at St.Vincent, re-align as required to the west	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Stop condition on sideroad at St. Vincent.

ALTERNATIVE CONCEPT:

Provide a roundabout at the Lorne / St.Vincent intersection (traffic volumes suggest a 2-lane roundabout) and re-align St.Vincent to the west through the park to provide appropriate distance to the grade separation.

ADVANTAGES:	**DISADVANTAGES:**
♦ Reduced severity for collisions. ♦ Improved LOS for St. Vincent.	♦ Reduced LOS for main line. ♦ Additional property requirement. ♦ Road user familiarity with roundabouts (noting that there is an existing roundabout within Stratford) ♦ Geometric challenges with roundabout approaches and proximity to the proposed rail grade separation (i.e. approach will likely exceed the maximum 4% grade). ♦ Impacts on the park – reduce land for recreation.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Roundabout at St. Vincent	**IDEA NO.**	**PAGE NO**
	SW-5	2 of 4

DISCUSSION / JUSTIFICATION:

Provides better connection to St.Vincent and the developed lands to the north of Lorne.....

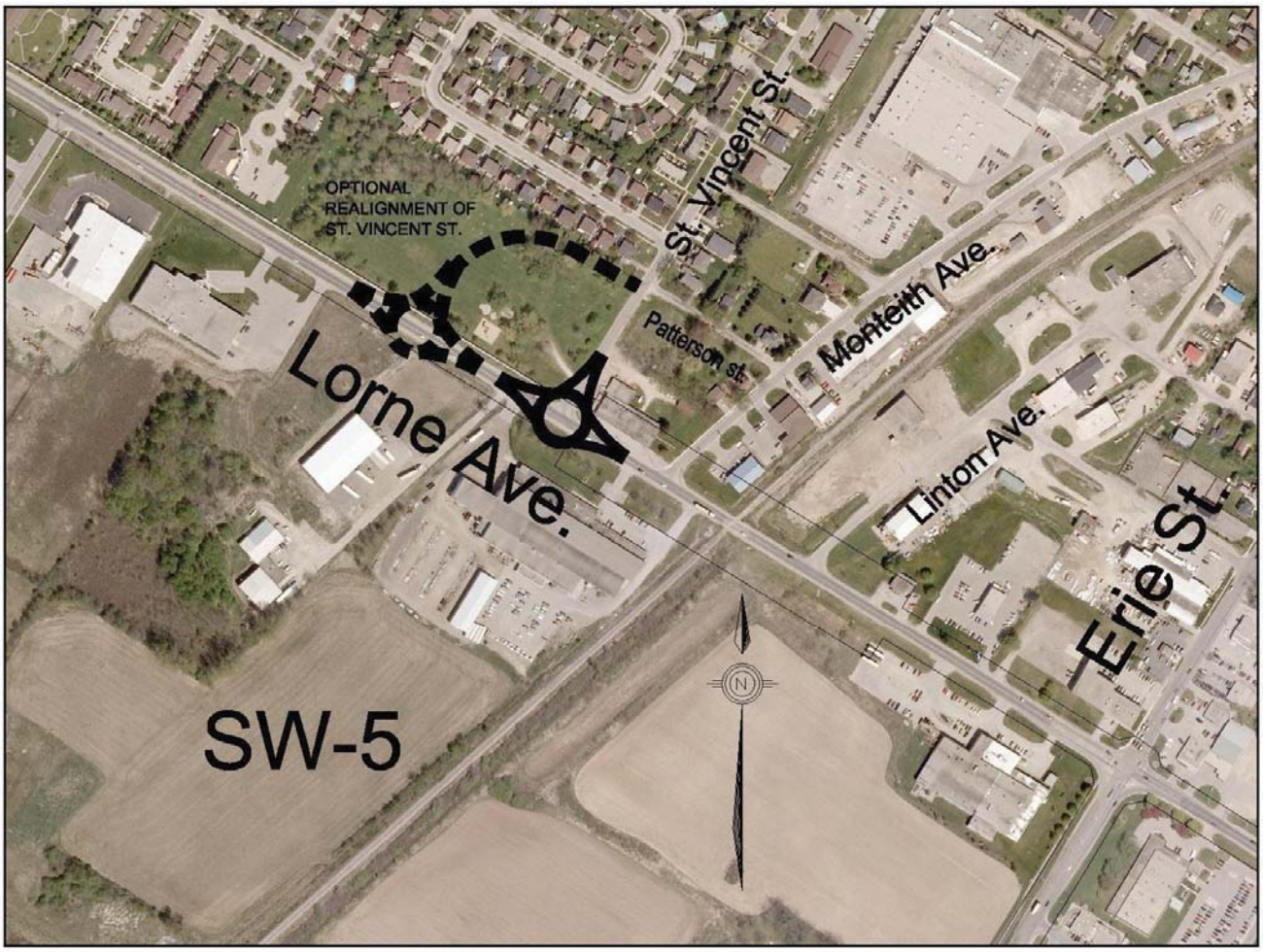
IMPLEMENTATION CONSIDERATIONS:

Need to consider the implications of the rail grade separation on the roundabout. The alternative provides for a realignment of St. Vincent through the park to allow for greater separation between the roundabout and the rail – road grade separation. ....

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		x			
Enhanced Operational Performance				x	
Reduced Construction Impacts	x				
Expedited Project Delivery		x			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-5
TITLE: Roundabout at St.Vincent, re-align as required to the west	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-5
TITLE: Roundabout at St.Vincent, re-align as required to the west	**PAGE NO.** 4 of 4

Costs include:

- **2 Lane Roundabout**
- **Potential realignment of St. Vincent**
- **Property to accommodate the roundabout footprint and the realignment of St. Vincent.**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford - West	**IDEA NO.** SW-6
TITLE: Signalized Intersection at St.Vincent, re-align as required to the west	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Stop condition on sideroad at St. Vincent.....

.....

.....

ALTERNATIVE CONCEPT:

Provide a traffic signal at the Lorne / St.Vincent intersection (T - intersection); re-align St.Vincent to the west through the park to provide appropriate distance to the grade separation..... .....

.....

.....

ADVANTAGES:	**DISADVANTAGES:**
♦ Improved LOS for St. Vincent.	♦ Reduced LOS for main line. ♦ Geometric challenges with intersection approaches and proximity to the proposed rail grade separation – may result in sight obstruction and require advanced flasher. ♦ Impacts on the park – reduce land for recreation.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Signalized Intersection at St. Vincent	**IDEA NO.**	**PAGE NO**
	SW-6	2 of 4

DISCUSSION / JUSTIFICATION:

Provides better connection to St.Vincent and the developed lands to the north of Lorne.....

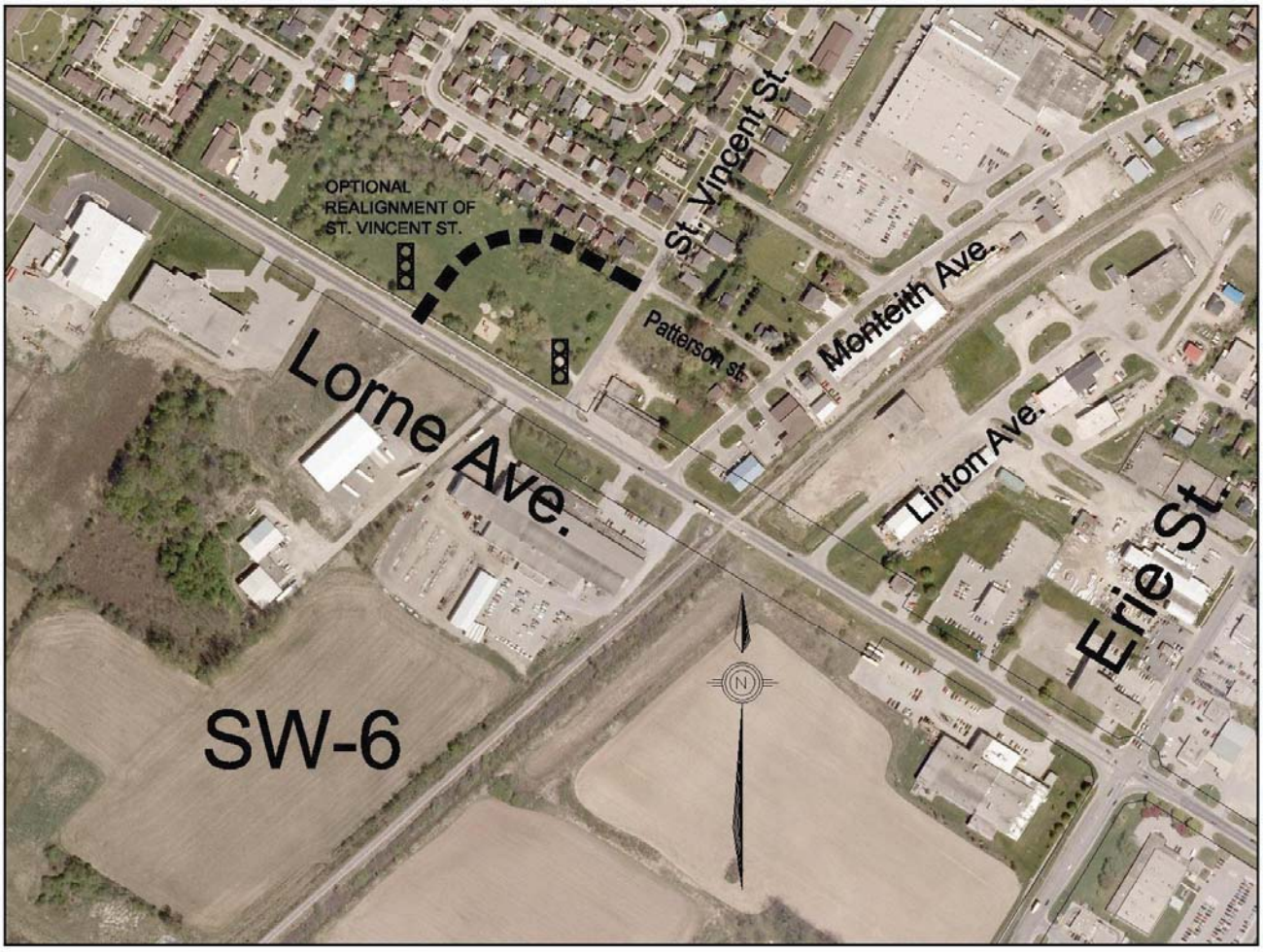
IMPLEMENTATION CONSIDERATIONS:

Need to consider the implications of the rail grade separation on the intersection. The alternative provides for a realignment of St. Vincent through the park to allow for greater separation between the T intersection and the rail – road grade separation.

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		x			
Enhanced Operational Performance				x	
Reduced Construction Impacts		x			
Expedited Project Delivery			x		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-6
TITLE: Signalized intersection at St.Vincent, re-align as required to the west	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA:	IDEA NO. SW-6
TITLE: Signalized Intersection at St.Vincent, re-align as required to the west	PAGE NO. 4 of 4

Costs include:

- **Traffic Signals (Tee Intersection)**
- **Widening through the intersection to accommodate turn lanes.**
- **Potential realignment of St. Vincent**
- **Property to accommodate the realignment.**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Lorne at Wright/Queensland/Freeland	**IDEA NO.** SW-12
TITLE: Oval Roundabout at Wright and Queensland	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Lorne is 3 Lanes with sideroad stop condition at Wright, Queensland and Freeland.....

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ALTERNATIVE CONCEPT:

Build an oval roundabout connecting both Wright and Queensland with Lorne (Hwy 8).... .....

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ADVANTAGES:	**DISADVANTAGES:**
♦ Consolidates two intersections into a single roundabout. ♦ Improved LOS for sideroads	♦ Additional property requirements for the roundabout ♦ Reduced LOS for mainline ♦ Not commonly used – rare application of roundabout technology.

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Oval Roundabout at Wright and Queensland	**IDEA NO.**	**PAGE NO**
	SW-12	2 of 4

DISCUSSION / JUSTIFICATION:

This idea will consolidate two existing tee intersections into a single roundabout and reduce conflicts.

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IMPLEMENTATION CONSIDERATIONS:

Consideration will need to be given to appropriate signing for the roundabout and also illumination. Also there is a need to for additional property to accommodate the oval roundabout. The expectation is that the intersections would meet signal warrant at the time that a roundabout is implemented.. ....

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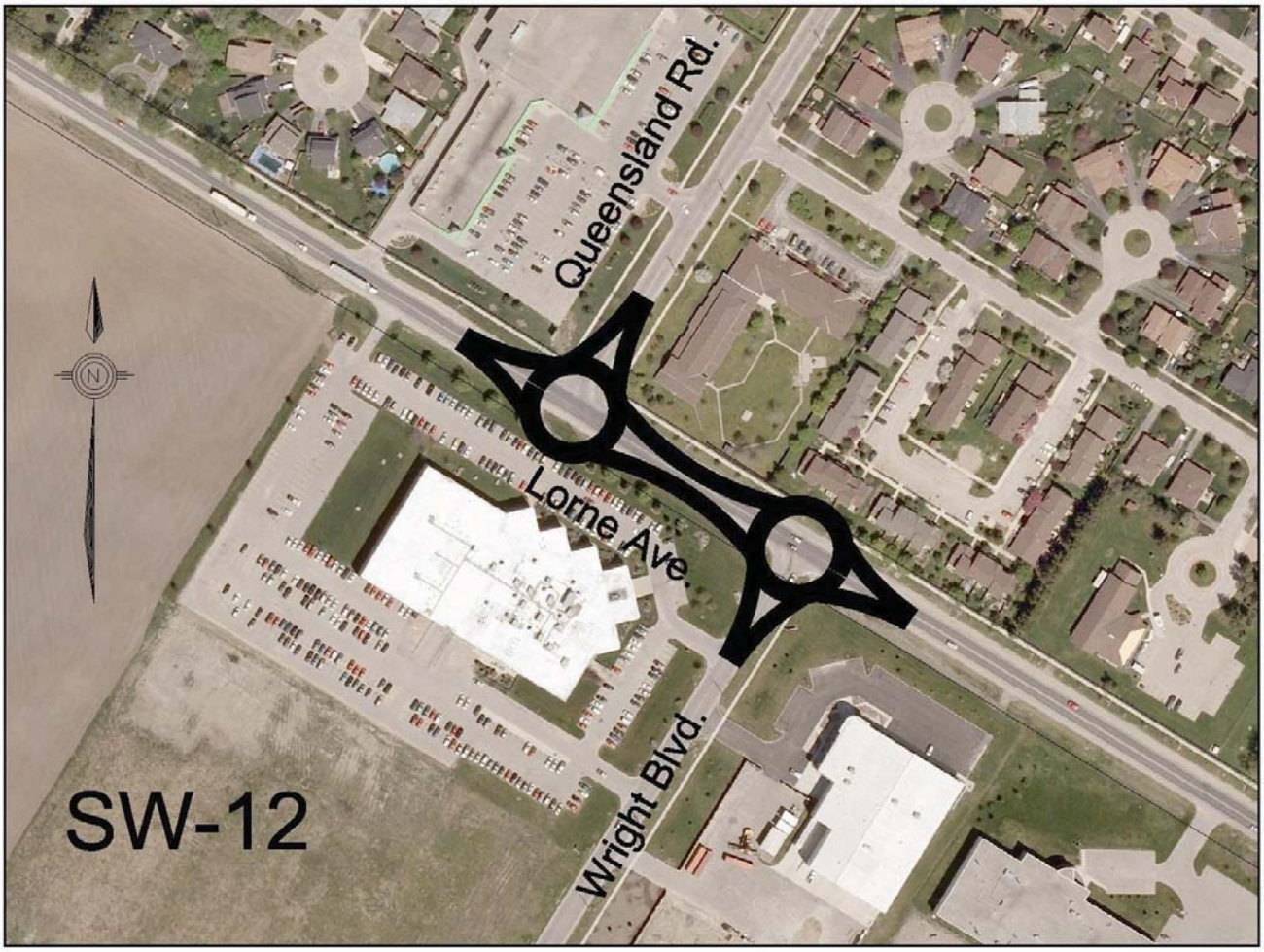
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			X		
Enhanced Operational Performance				X	
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-12
TITLE: Oval Roundabout at Wright and Queensland	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA:	IDEA NO. SW-12
TITLE: Oval Roundabout at Wright and Queensland	PAGE NO. 4 of 4

Cost Considerations include:

- **Oval Roundabout at Wright-Lorne-Queensland**
- **Property for the roundabout at new Wright-Lorne-Freeland**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Lorne at Wright/Queensland/Freeland	**IDEA NO.** SW-13
TITLE: Coordinated Split Phase Traffic Signal at Wright and Queensland	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Lorne is 3 Lanes with sideroad stop condition at Wright, Queensland and Freeland.....

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ALTERNATIVE CONCEPT:

Coordinated Split Phase Traffic Signal at Wright and Queensland.....

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ADVANTAGES:	DISADVANTAGES:
♦ Consolidates two intersections into a single traffic control. ♦ Safer operation for the sideroads	♦ Long cycle length ♦ Large percentage of green time to the sideroads ♦ Reduced LOS for mainline ♦ Not commonly used – rare application of traffic signals technology.

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Coordinated Split Phase Traffic Signal at Wright and Queensland	**IDEA NO.**	**PAGE NO**
	SW-13	2 of 4

DISCUSSION / JUSTIFICATION:

This idea will consolidate two existing tee intersections into a single traffic control and reduce conflicts.

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IMPLEMENTATION CONSIDERATIONS:

The traffic signals will work on three phases:

- Phase 1 - Wright protected left with ped crossing on the east side of Wright
- Phase 2 - Queensland protected left and ped crossing on west side of Queensland
- Phase 3 – Lorne (New Hwy 8) – all moves including peds along Lorne (New Hwy 8).

Traffic signal timing will require a longer cycle to accommodate the two protected lefts. ....

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact	x				
Enhanced Operational Performance		x			
Reduced Construction Impacts		X			
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-13
TITLE: Coordinated Split Phase Traffic Signal at Wright and Queensland	**PAGE NO.** 3 of 4

ASSUMPTIONS & CALCULATIONS

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA:	IDEA NO. SW-13
TITLE: Coordinated Split Phase Traffic Signal at Wright and Queensland	PAGE NO. 4 of 4

Cost Considerations include:

- **Traffic signals at Wright and at Queensland**
- **Lane widening to accommodate the turning needs at the Wright and Queensland intersections.**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford - West	**IDEA NO.** SW-20
TITLE: Realign Wright to Freeland with Traffic Signals, (assuming traffic signals at Queensland)	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Lorne is 3 Lanes with sideroad stop condition at Wright, Queensland and Freeland.....

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ALTERNATIVE CONCEPT:

Realign Wright to Freeland with traffic signals at the new Lorne / Wright-Freeland intersection, with signals at Queensland. Close existing Wright Blvd tee intersection.....

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ADVANTAGES:	DISADVANTAGES:
♦ Eliminates an intersection with Lorne ♦ Improved LOS for sideroad ♦ Reduces three existing tee intersections to one tee at Queensland and one cross at Wright/Freeland	♦ Additional property requirements for the Wright realignment ♦ Reduced LOS for mainline ♦ Some loss of business development land

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Realign Wright to Freeland with Traffic Signals, incl. traffic signals at Queensland	**IDEA NO.**	**PAGE NO**
		SW-20	2 of 4

DISCUSSION / JUSTIFICATION:

This idea will consolidate three existing tee intersections to two intersections along Lorne, thereby eliminating one conflict point on Hwy 8. Increased traffic contribution from Wright to Freeland at intersection will require more efficient intersection operation to minimize delays to Hwy 8 traffic flow. Roundabout at this location may now be warranted.....

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IMPLEMENTATION CONSIDERATIONS:

Acquisition of zoned industrial lands will be required for the realignment of Wright. The realignment of Wright must account for efficient use for the use of developable business par lands. New municipal road allowance is required to realign Wright Blvd. .....

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		x			
Enhanced Operational Performance				x	
Reduced Construction Impacts		x			
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Stratford - West	**IDEA NO.** SW-20
TITLE: Realign Wright to Freeland with Traffic Signals, incl. traffic signals at Queensland	**PAGE NO.** 3 of 4

ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-20
TITLE: Realign Wright to Freeland with Traffic Signals, incl. traffic signals at Queensland	**PAGE NO.** 4 of 4

Cost Considerations include:

- **Traffic signals at new Lorne / Wright-Freeland intersection**
- **Realignment of Wright (New 2-Lane Local Industrial Road)**
- **Property for the realignment of Wright**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford - West	**IDEA NO.** SW-20A
TITLE: Realign Wright to Freeland with Roundabout, (assuming a roundabout at Queensland)	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Lorne is 3 Lanes with sideroad stop condition at Wright, Queensland and Freeland.....

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ALTERNATIVE CONCEPT:

Realign Wright to Freeland with roundabout at the new Lorne / Wright-Freeland intersection, with a roundabout at Queensland. Close existing Wright Blvd tee intersection.....

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ADVANTAGES:	**DISADVANTAGES:**
♦ Eliminates an intersection with Lorne ♦ Improved LOS for sideroad ♦ Reduces three existing tee intersections to a roundabout at Wright/Freeland and a roundabout at Queensland	♦ Additional property requirements for the Wright realignment ♦ Reduced LOS for mainline ♦ Some loss of business development land ♦ Additional property for the roundabouts

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: Joseph Arcaro	**Discipline**:	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE **Highway 7/8 Stratford to New Hamburg**		**MTO**	
TITLE:	Realign Wright to Freeland with Roundabout, (assuming a roundabout at Queensland)	**IDEA NO.**	**PAGE NO**
		SW-20A	2 of 4

DISCUSSION / JUSTIFICATION:

This idea will consolidate three existing tee intersections to two intersections along Lorne, thereby eliminating one conflict point on Hwy 8. Increased traffic contribution from Wright to Freeland at intersection will require more efficient intersection operation to minimize delays to Hwy 8 traffic flow. Roundabout at this location may now be warranted.....

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IMPLEMENTATION CONSIDERATIONS:

Acquisition of zoned industrial lands will be required for the realignment of Wright. The realignment of Wright must account for efficient use for the use of developable business par lands. New municipal road allowance is required to realign Wright Blvd. .....

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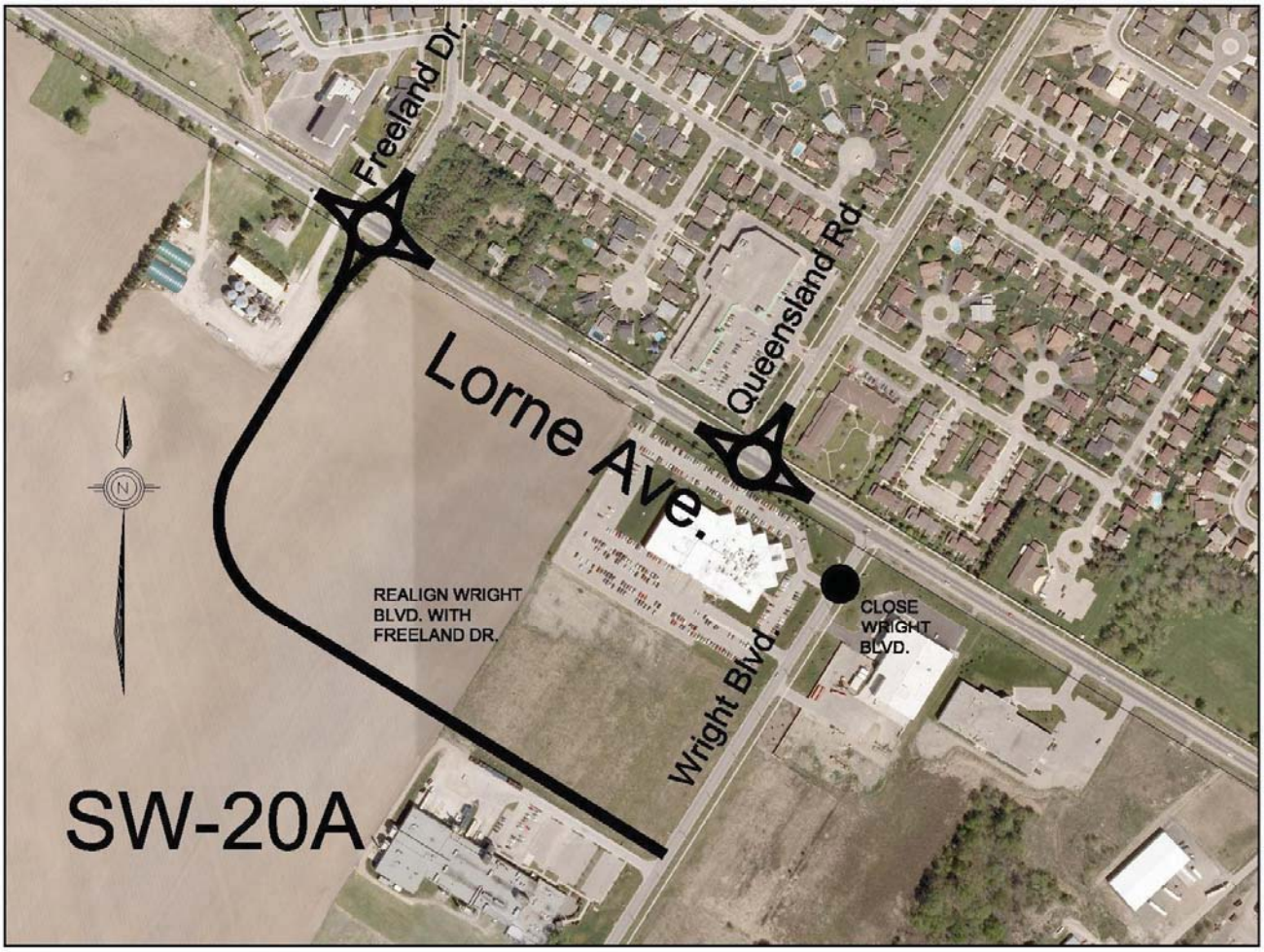
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact			x		
Enhanced Operational Performance				X	
Reduced Construction Impacts		x			
Expedited Project Delivery		x			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Stratford - West	**IDEA NO.** SW-20A
TITLE: Realign Wright to Freeland with Roundabout, (assuming a roundabout at Queensland)	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Stratford - West	**IDEA NO.** SW-20A
TITLE: Realign Wright to Freeland with Roundabout, (assuming a roundabout at Queensland)	**PAGE NO.** **4 of 4**

Cost Considerations include:

- **Roundabout at new Lorne / Wright-Freeland intersection**
- **Realignment of Wright (New 2-Lane Local Industrial Road)**
- **Property for the realignment of Wright**
- **Property for the roundabout at new Lorne / Wright-Freeland**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: **Highway 7 at Road 122**	**IDEA NO.** SW-22
TITLE: Highway 7 at Road 122 - roundabout	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

Three-lane cross-section from the east; median island on west approach to cut access to Bannerd Drive to right-in, right-out; eastbound left-turn lane; north-south left and right-turn lanes as required; traffic control signals.

ALTERNATIVE CONCEPT:

Modern roundabout

ADVANTAGES:	DISADVANTAGES:
♦ Reduced overall delay ♦ Improved relative safety (angle and left-turn opposing collisions) ♦ Reduced greenhouse gas emissions ♦ Eliminates need for left and right-turn lanes ♦ Gateway feature; rural-to-urban transition for eastbound traffic entering Stratford ♦ May better accommodate agricultural equipment transiting intersection ♦ Maintenance; electrical consumption reduction	♦ May require more land at intersection ♦ Single-lane roundabout may require truck apron ♦ Unbalanced flows E-W versus N-S may be more amenable to actuated traffic control signal ♦ Winter maintenance

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member:	Discipline:	PERFORMANCE:

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE: Highway 7 at Road 122 - roundabout	**IDEA NO.** SW-22	**PAGE NO** 1 of 4

DISCUSSION / JUSTIFICATION:

High-speed rural arterial intersection

Potential safety benefits with roundabout regarding angle and left-turn opposing collisions

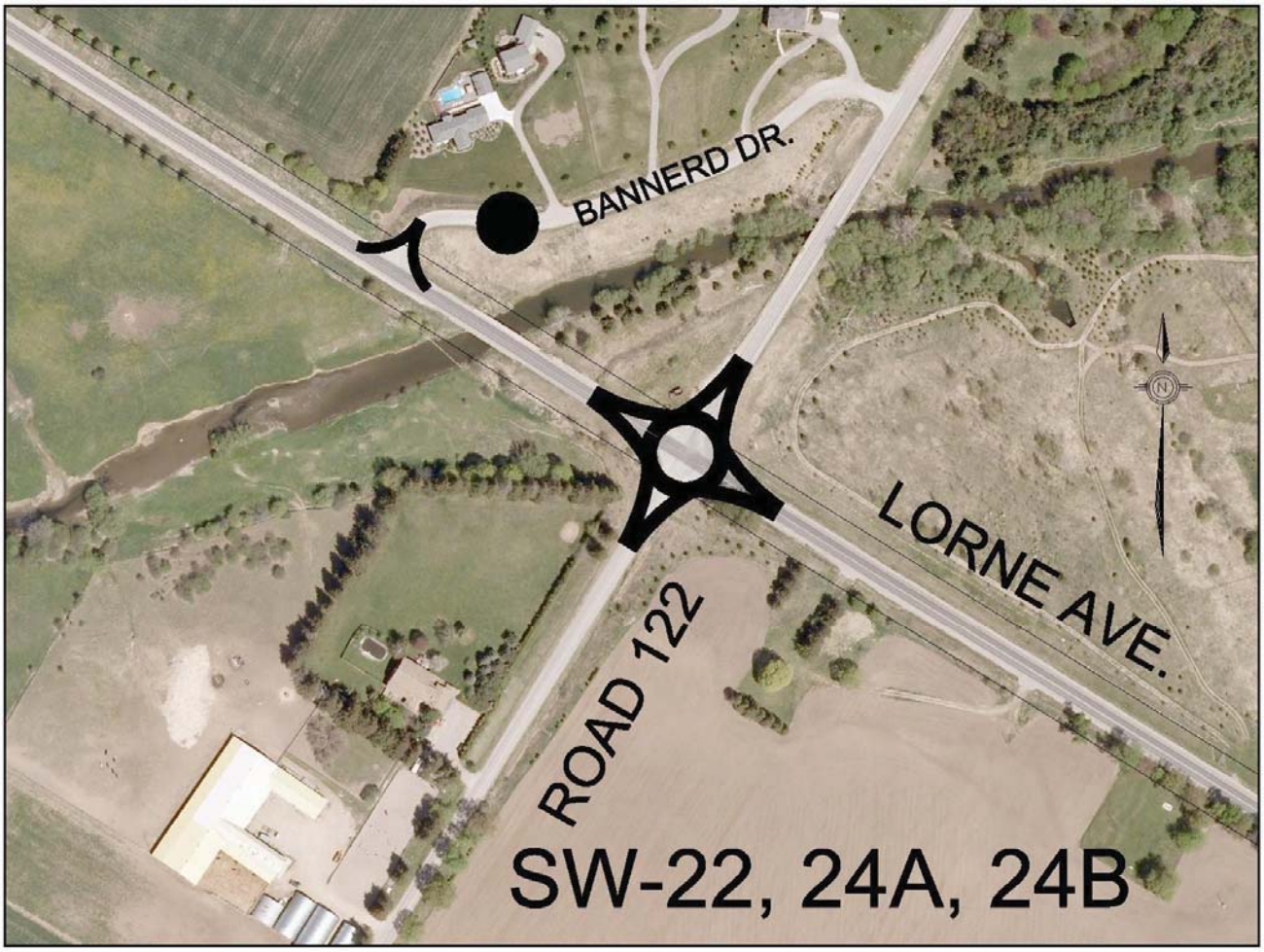
IMPLEMENTATION CONSIDERATIONS:

Consistency with treatment at Road 125; key intersections to the east (to Erie Street)

QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact				X	
Enhanced Operational Performance			X		
Reduced Construction Impacts			X		
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA: Intersection safety	**IDEA NO.** SW-22
TITLE: Highway 7 at Road 122 - roundabout	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA: Intersection safety	**IDEA NO.** SW-22
TITLE: Highway 7 at Road 122 - roundabout	**PAGE NO.** 4 of 4

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford west side – New Highway 8 at Perth Road 125	**IDEA NO.** SW-26 or SW-26A
TITLE: Roundabout, option for high-speed east to north right turn channelization	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

.

New Highway 8 alignment turns north on channelized right turn lane to existing Perth Line 125. Stop control provided on east-west approaches to provide priority for north to east movement along new Highway 8 alignment. .....

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ALTERNATIVE CONCEPT:

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SW-26: Single lane roundabout. .....

SW-26A: Single lane roundabout with high speed right turn channelization for east to north movement.....

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ADVANTAGES:	**DISADVANTAGES:**
SW-26 • Improved safety for all movements • Improved service for EB and WB traffic SW-26A • Improved safety for all movements • Improved service for EB and WB traffic • Increased capacity and speed for priority east to north movement along Highway 8	SW-26 • Increased footprint • Increased capital cost SW-26A • Increased footprint • Increased capital and maintenance costs • Reduced pedestrian safety

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: D. Cleghorn	**Discipline**: Traffic	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Roundabout, option for high-speed east to north right turn channelization	**IDEA NO.**	**PAGE NO**
		SW-26 or SW-26A	2 of 4

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

If SW-26 is selected, protecting property for SW-26A would improve future flexibility.....

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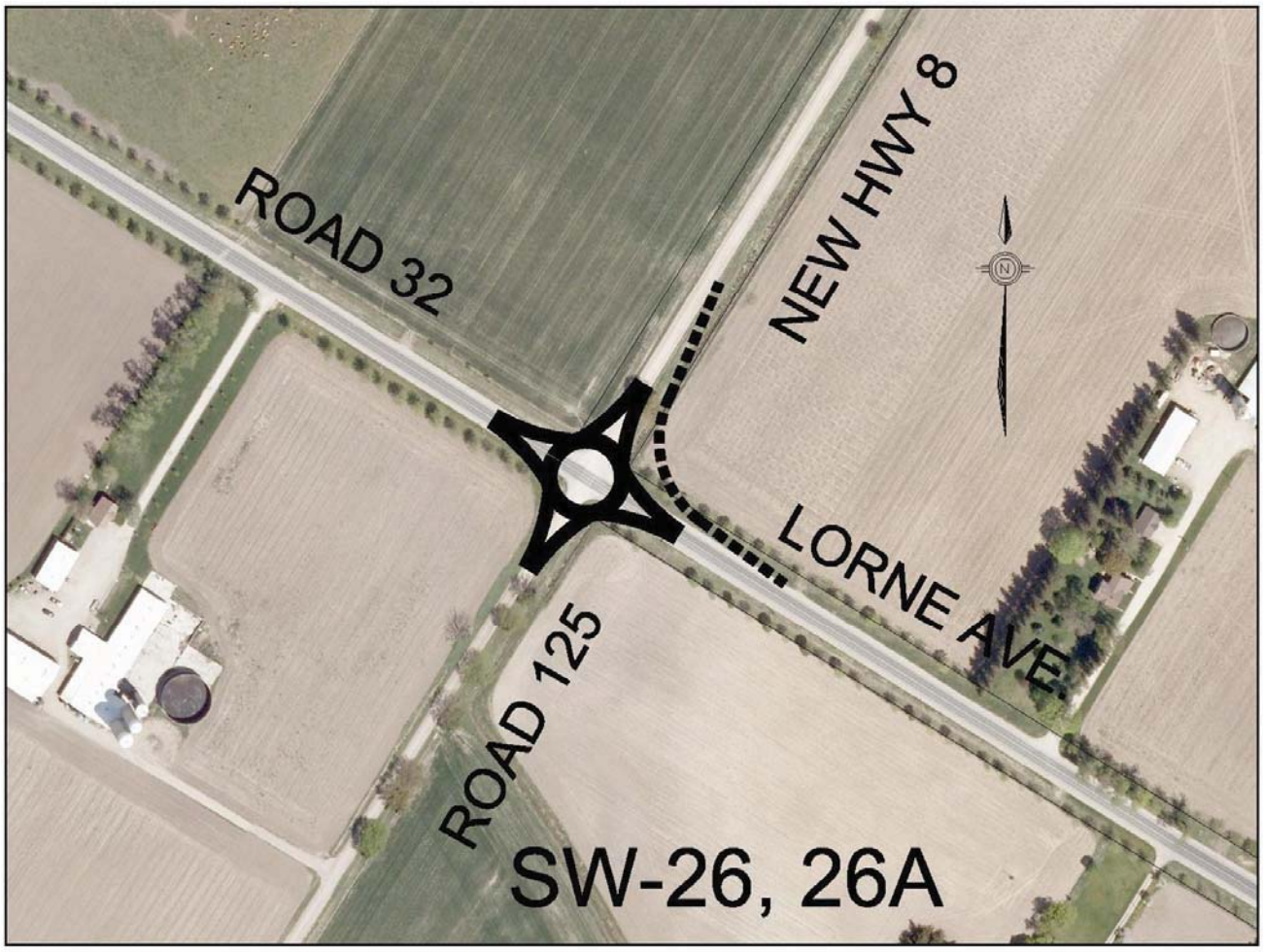
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery		X			

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-26 or SW-26A
TITLE: Roundabout, option for high-speed east to north right turn channelization	**PAGE NO.** 3 of 4



ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-26 or SW-26A
TITLE: Roundabout, option for high-speed east to north right turn channelization	**PAGE NO.** 4 of 4

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	Stratford west side – New Highway 8 at Perth Road 125	**IDEA NO.** SW-27 or SW-27A
TITLE:	Signalized intersection, option for high-speed east to north right turn channelization	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

.

New Highway 8 alignment turns north on channelized right turn lane to existing Perth Line 125. Stop control provided on east-west approaches to provide priority for north to east movement along new Highway 8 alignment. .....

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ALTERNATIVE CONCEPT:

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SW-27: Signalized intersection.....

SW-27A: Signalized intersection with high speed right turn channelization for east to north movement .....

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ADVANTAGES:	**DISADVANTAGES:**
SW-27 ♦ Improved safety for all movements ♦ Improved service for EB and WB traffic ♦ Potential for protected left turn phase for north to east turn along Highway 8 SW-27A ♦ Improved safety for all movements ♦ Improved service for EB and WB traffic ♦ Potential for protected left turn phase for north to east turn along Highway 8 ♦ Increased capacity and speed for priority east to north movement along Highway 8	SW-27 ♦ Increased footprint ♦ Increased capital and maintenance costs SW-27A ♦ Increased footprint ♦ Increased capital and maintenance costs ♦ Reduced pedestrian safety

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**

Savings	**$**	**$**	**$**	**$**
Team Member: D. Cleghorn		**Discipline**: Traffic	**PERFORMANCE:**	

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO	
TITLE:	**IDEA NO.**	**PAGE NO**
	SW-27 or SW-27A	

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

If SW-27 is selected, protecting property for SW-27A would improve future flexibility.....

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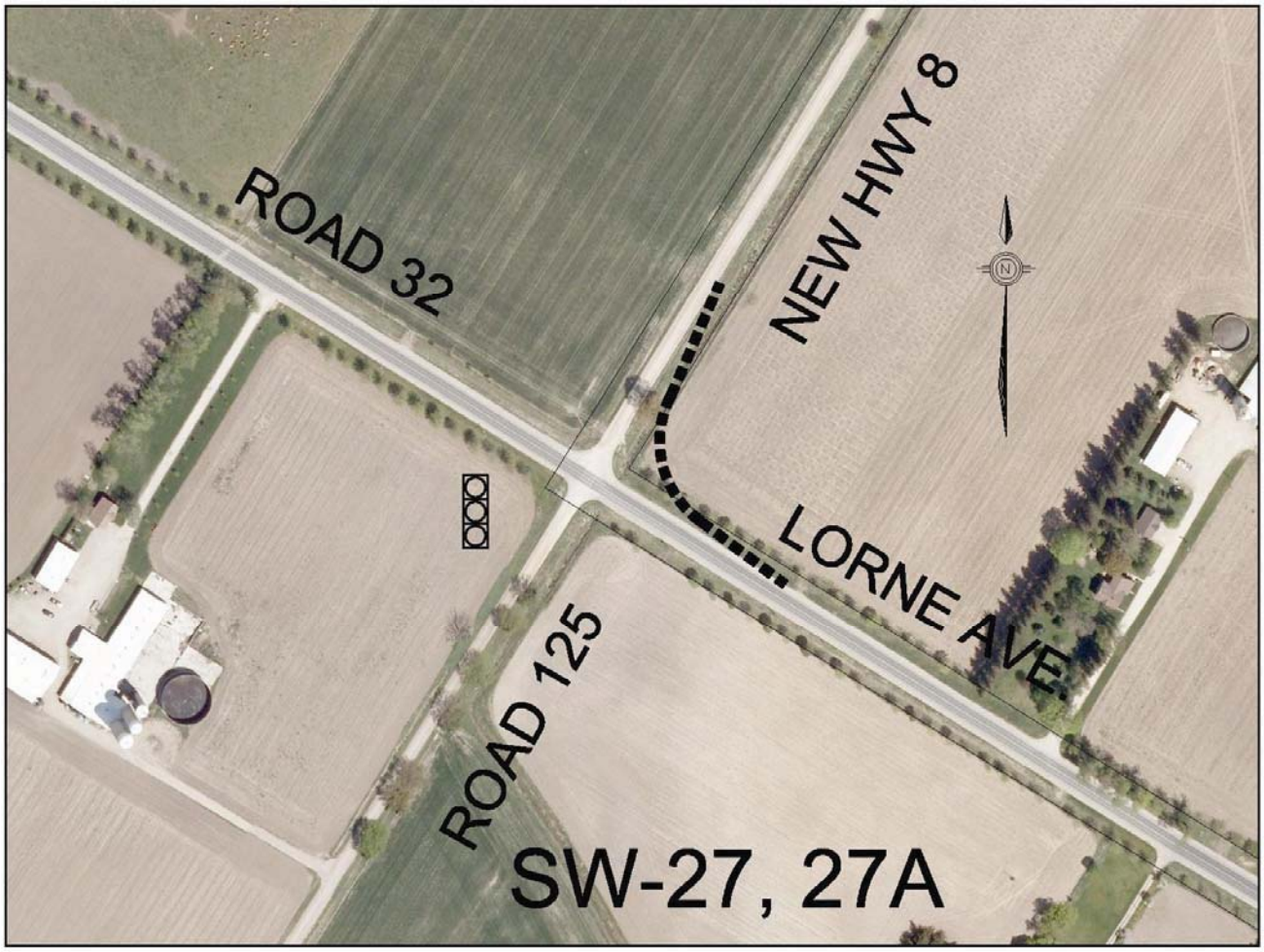
QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** N-x
TITLE:	**PAGE NO.**



ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** N-x
TITLE:	**PAGE NO.**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg	MTO
FUNCTION: Stratford west side – New Highway 8 at Perth Road 125	**IDEA NO.** SW-36
TITLE: Roundabout with high-speed west to south right turn channelization	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

.

Eastbound New Highway 8 alignment turns south on channelized right turn lane to existing Perth Line 125. Stop control provided on north-south approaches to provide service for larger east-west movement along existing Highway 8 alignment. .....

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ALTERNATIVE CONCEPT:

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SW-36: Single lane roundabout with high speed right turn channelization for west to south movement .....

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ADVANTAGES:	**DISADVANTAGES:**
SW-36 ♦ Improved safety for all movements ♦ Improved service for new Highway 8 alignment traffic ♦ Encourages diversion to the new Highway 8 alignment to reduce through traffic in Stratford	SW-36 ♦ Increased footprint ♦ Increased capital cost

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: D. Cleghorn	**Discipline**: Traffic	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Roundabout with high-speed west to south right turn channelization	**IDEA NO.**	**PAGE NO**
		SW-36	2 of 4

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

Potential issues with private entrances close to the intersection on the north side of existing Highway 8.... .....

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-36
TITLE: Roundabout with high-speed west to south right turn channelization	**PAGE NO.** 3 of 4

ASSUMPTIONS & CALCULATIONS

Highway 7/8 Stratford to New Hamburg

VALUE TARGET AREA:	IDEA NO. SW-36
TITLE: Roundabout with high-speed west to south right turn channelization	PAGE NO. 4 of 4

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO
FUNCTION:	Stratford west side – New Highway 8 at Old Highway 8	**IDEA NO.** SW-38
TITLE:	Signalized intersection with high-speed west to south right turn channelization	**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

.

Eastbound New Highway 8 alignment turns south on channelized right turn lane to existing Perth Line 125. Stop control provided on north-south approaches to provide service for larger east-west movement along existing Highway 8 alignment. .....

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ALTERNATIVE CONCEPT:

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SW-38: Signalized intersection with high speed right turn channelization for west to south movement.....

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ADVANTAGES:	**DISADVANTAGES:**
SW-38 ♦ Improved safety for all movements ♦ Improved service for new Highway 8 alignment traffic ♦ Encourages diversion to the new Highway 8 alignment to reduce through traffic in Stratford	SW-38 ♦ Increased footprint ♦ Increased capital cost

COST SUMMARY	**Initial Cost**	**Present Value Subsequent Cost**	**Present Value Highway User Cost**	**Net Present Value**
Original Concept	**$**	**$**	**$**	**$**
Alternative Concept	**$**	**$**	**$**	**$**
Savings	**$**	**$**	**$**	**$**

Team Member: D. Cleghorn	**Discipline**: Traffic	**PERFORMANCE:**

VALUE ENGINEERING ALTERNATIVE Highway 7/8 Stratford to New Hamburg		MTO	
TITLE:	Signalized intersection with high-speed west to south right turn channelization	**IDEA NO.**	**PAGE NO**
		SW-38	2 of 4

DISCUSSION / JUSTIFICATION:

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IMPLEMENTATION CONSIDERATIONS:

Potential issues with private entrances close to the intersection on the north side of existing Highway 8.... .....

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QUALITATIVE PERFORMANCE

Performance Criteria (insert X as appropriate)	**Performance Compared to Present Design**				
	-2	**-1**	**0**	**+1**	**+2**
Reduced Environmental Impact		X			
Enhanced Operational Performance				X	
Reduced Construction Impacts				X	
Expedited Project Delivery			X		

SKETCHES	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-38
TITLE: Signalized intersection with high-speed west to south right turn channelization	**PAGE NO.** 3 of 4

ASSUMPTIONS & CALCULATIONS	
Highway 7/8 Stratford to New Hamburg	
VALUE TARGET AREA:	**IDEA NO.** SW-38
TITLE: Signalized intersection with high-speed west to south right turn channelization	**PAGE NO.** 4 of 4

Appendix B
VE Evaluation

HIGHWAY 7/8 CORRIDOR

VALUE ENGINERING STUDY: EVALUATION

Ontario Ministry of Transportation

HDR | iTRANS FAITHFUL+GOULD

Highway 7/8 VA Study

New Hamburg Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR COMPLETE NEW HAMBURG SECTION OF CORRIDOR	Weight →	13	13	11	25	21	17			
Base Case - At grade signalized intersections	Rating 1-10	3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total	39	65	55	125	105	68	457	1.11	411.71
Alternative 1 - NH-34: Upgrade to complete freeway with interchanges at Nafziger, Peel and Regional Rd 1	Rating 1-10	4.8	4.7	4.5	2.7	7.0	9.0			
	Sub Total	62	61	50	68	147	153	541	1.16	465.95
Alternative 2 - NH-62A: Freeway/Arterial Combination with IC at Nafziger and Signalized Intersections at Hamilton and Peel	Rating 1-10	3.1	5.4	4.5	4.8	6.2	7.0			
	Sub Total	40	70	50	120	130	119	529	1.09	485.50
Alternative 3 - NH-62B: Freeway/Arterial Combination with IC at Nafziger and At-grade Roundabouts at Hamilton and Peel	Rating 1-10	2.7	6.0	5.0	4.5	7.0	9.0			
	Sub Total	35	78	55	113	147	153	581	1	580.60
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VA Study

Nafziger Road Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR NAFZIGER ROAD	Weight →		13	13	11	25	21	17			
Base Case - At grade signalized intersection	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1.00	474.00
Alternative 1 - NH-5: Tight Diamond on North, Diamond or Loops on the South	Rating 1-10		5.3	5.9	5.0	5.8	5.4	7.0			
	Sub Total		69	77	55	145	113	119	578	1.15	502.61
Alternative 2 - NH-2: Parclo A-2	Rating 1-10		5.8	5.9	5.0	5.7	7.0	8.0			
	Sub Total		75	77	55	143	147	136	633	1.16	545.34
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Peel Street Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR PEEL STREET	Weight →		13	13	11	25	21	17			
Base Case - At grade signalized intersection	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1.09	434.86
Alternative 1 - NH-42: Grade separated roundabout	Rating 1-10		2.8	5.2	4.5	5.0	6.2	9.0			
	Sub Total		36	68	50	125	130	153	562	1.00	561.70
Alternative 2 - NH-45: Bucksaw IC with Flyover to West	Rating 1-10		2.9	2.8	4.0	4.7	3.8	6.0			
	Sub Total		38	36	44	118	80	102	417	1.53	272.81
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Hamilton Street Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR HAMILTON STREET	Weight →	13	13	11	25	21	17			
Base Case - At grade signalized intersection	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.09	434.86
Alternative 1 - NH-27: Roundabout	Rating 1-10	2.8	5.0	5.0	4.3	6.2	9.0			
	Sub Total	36	65	55	108	130	153	547	1	547.10
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study
Huron Street Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	Performance Criteria - Performance Measure	Human Factors Assessment	Sustainability	Natural Environment	Community Impacts	Traffic Operations	Roadway User Safety	Total Performance (P)	Cost Index (C)	P/C
ALTERNATIVES FOR HURON STREET	Weight →	13	13	11	25	21	17			
Base Case - At grade signalized intersection	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1	474.00
Alternative 1 - NH-54: Realign Huron with Interchange at Highway 7/8	Rating 1-10	6.7	3.3	5.0	4.0	8.2	9.0			
	Sub Total	87	43	55	100	172	153	610	1.29	473.02
Alternative 1 - NH-63: Roundabout at Huron and Wilmot Easthope	Rating 1-10	2.7	5.8	5.0	4.5	7.0	9.0			
	Sub Total	35	75	55	113	147	153	578	1	577.57
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

East of Shakespeare Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR EAST OF SHAKESPEARE	Weight →	13	13	11	25	21	17			
Base Case - No Connection between New Highway 7/8 and Existing Highway 7/8	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1	474.00
Alternative 1 - SH-5: Westbound access only (Split off to right) to Old Highway 7/8	Rating 1-10	3.7	6.8	5.0	6.3	5.0	4.0			
	Sub Total	48	88	55	158	105	68	522	1	522.00
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Perth Line 102 104 106 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR PERTH LINE 102, 104, and 106	Weight →	13	13	11	25	21	17			
Base Case - At-grade Stop Control Intersections at Perth Line 102, 104 and 106	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.06	447.17
Alternative 1 - RA-15: Median directional intersections on existing Highway 7&8 at Perth Line 102, 104 and 106	Rating 1-10	3.7	6.5	5.0	5.7	5.4	7.0			
	Sub Total	48	85	55	143	113	119	563	1.00	562.50
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Perth Line 107 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR PERTH LINE 107 (COUNTY ROAD 59)	Weight →		13	13	11	25	21	17			
Base Case - At-grade Signalized Intersection	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1	474.00
Alternative 1 - SH-13: Grade separate Perth Road 107 from Railway and connect with signalized intersection on the preferred route	Rating 1-10		2.7	7.6	5.0	6.5	4.2	9.0			
	Sub Total		35	99	55	163	88	153	593	1	592.60
Alternative 2 - SH-12: Grade separate Perth Road 107 from Railway; Connect with roundabout on the preferred route.	Rating 1-10		2.7	7.4	4.5	6.7	3.0	7.0			
	Sub Total		35	96	50	168	63	119	530	1.12	473.48
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Perth Line 108 Evaluation

Page 1 of 1	EVALUATION MATRIX									
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	Performance Criteria - Performance Measure	Human Factors Assessment	Sustainability	Natural Environment	Community Impacts	Traffic Operations	Roadway User Safety	Total Performance (P)	Cost Index (C)	P/C
ALTERNATIVES FOR PERTH LINE 108	Weight →	13	13	11	25	21	17			
Base Case - At-grade Stop Control Intersection	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.13	419.47
Alternative 1 - RA-22B: Median directional intersections on New Highway 7/8 at Perth Line 108	Rating 1-10	3.7	6.5	5.0	5.3	5.4	9.0			
	Sub Total	48	85	55	133	113	153	587	1	586.50
Alternative 2 - RA-18: Perth Line 108 to flyover new Highway 7/8 with no connections	Rating 1-10	10.0	6.4	4.5	4.0	10.0	10.0			
	Sub Total	130	83	50	100	210	170	743	1	742.70
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Perth Line 109 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	Performance Criteria - Performance Measure	Human Factors Assessment	Sustainability	Natural Environment	Community Impacts	Traffic Operations	Roadway User Safety	Total Performance (P)	Cost Index (C)	P/C
ALTERNATIVES FOR PERTH LINE 109	Weight →	13	13	11	25	21	17			
Base Case - At-grade Stop Control Intersection	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.09	434.86
Alternative 1 - RA-43: At-grade Perth Road 109 with railway and traffic signals on the preferred route. Interconnect with railway crossing signals.	Rating 1-10	2.7	7.0	5.0	5.7	5.0	8.0			
	Sub Total	35	91	55	143	105	136	565	1	564.60
Alternative 2 - SH-24: Grade separate Perth Road 109 from Railway and connect with signalized intersection on the preferred route	Rating 1-10	2.7	7.4	5.0	5.0	4.2	9.0			
	Sub Total	35	96	55	125	88	153	553	1.09	506.88
Alternative 3 - SH-23: Grade separate Perth Road 109 from Railway; Connect with roundabout on the preferred route.	Rating 1-10	2.7	7.6	4.5	5.2	3.0	7.0			
	Sub Total	35	99	50	130	63	119	495	1.22	406.07
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Perth Lines 110 & 33 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR PERTH LINES 110 AND 33	Weight →	13	13	11	25	21	17			
Base Case - Perth Line 33 connects to Highway 7/8 at stop control tee (No left turn lane on Highway 7/8); Cul-de-sac Perth Line 110 from north; Connect Perth Line 110 south to Perth Line 33.	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.12	423.21
Alternative 1 - RA-23D: WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Signalized Intersection; 110 continues NB as 4th leg of intersection.	Rating 1-10	2.7	7.5	4.5	5.0	4.2	9.0			
	Sub Total	35	98	50	125	88	153	548	1	548.30
Alternative 2 - RA-23E: WB Perth 33 and NB Perth 110 merge and Tie into New Highway7/8 at Roundabout; 110 continues NB as 4th leg of Roundabout.	Rating 1-10	2.7	7.5	4.5	5.3	4.2	7.0			
	Sub Total	35	98	50	133	88	119	522	1.06	492.26
Alternative 3 - RA-30: Perth Line110 under new 7/8; WB Perth Line 33 under new 7/8; EB directional ramp to 33; 33/110 IS stop control	Rating 1-10	8.2	7.3	5.0	6.0	7.4	9.0			
	Sub Total	107	95	55	150	155	153	715	1.18	605.85
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Perth Line 111 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR PERTH LINE 111	Weight →		13	13	11	25	21	17			
Base Case - At-grade Stop Control Intersection	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1.12	423.21
Alternative 1 - RA-39: Perth Line 111connects to New Highway 7/8 at At-grade Signalized Intersection	Rating 1-10		2.7	8.8	5.0	5.2	5.0	9.0			
	Sub Total		35	114	55	130	105	153	593	1.00	592.50
Alternative 2 - RA-40: Perth Line 111connects to New Highway 7/8 at a Roundabout	Rating 1-10		2.7	8.6	4.5	5.5	3.8	7.0			
	Sub Total		35	112	50	138	80	119	533	1.06	502.55
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Romeo Downie Erie Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD EAST: ROMEO, DOWNIE, AND ERIE	Weight →	13	13	11	25	21	17			
Base Case - At-grade Stop Control Intersection at Romeo and eventual signalized intersections at Downie and Erie	Rating 1-10	3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total	39	65	55	125	105	85	474	1.2	395.00
Alternative 1 - SE-1 (Alt.2): Modern Roundabouts at Romeo Street and Downie Street; possibly at Erie Street	Rating 1-10	5.4	3.2	5.5	4.3	6.6	10.0			
	Sub Total	70	42	61	108	139	170	588	1	588.40
Alternative 2 - SE-1A (Alt.4): Modern Roundabouts at Romeo Street, Downie Street, TBD, and Erie Street with Raised Median from West of Road 111 to Erie Street	Rating 1-10	4.9	2.9	4.5	4.7	6.2	9.0			
	Sub Total	64	38	50	118	130	153	552	1.09	506.06
Alternative 3 - SE-13 (Alt.3A): SE-1 Plus Quadrant Link between Highway 7/8 and Erie Street – Traffic Signals	Rating 1-10	4.9	5.3	4.5	5.0	7.4	10.0			
	Sub Total	64	69	50	125	155	170	633	1.04	608.17
Alternative 4 - SE-14 (Alt.3B): SE-1 Plus Quadrant Link between Highway 7/8 and Erie Street – Roundabouts	Rating 1-10	3.0	5.7	4.5	4.8	6.2	5.0			
	Sub Total	39	74	50	120	130	85	498	1.26	395.08
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Packham Embro Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD EAST: PACKHAM/EMBRO	Weight →		13	13	11	25	21	17			
Base Case - At-grade Signalized Intersection at Packham/Embro	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1.28	370.31
Alternative 1 - SE-15: Modern Roundabouts at Packham/Embro and Highway 7	Rating 1-10		4.9	5.3	4.5	5.0	5.8	10.0			
	Sub Total		64	69	50	125	122	170	599	1.00	598.90
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Gibb 29 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD EAST: GIBB/29	Weight →		13	13	11	25	21	17			
Base Case - Stop Controlled Intersection at Gibb/29	Rating 1-10		3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total		39	65	55	125	105	68	457	1.29	354.26
Alternative 1 - SE-23: Modern Roundabout at Gibb/29 and Highway 7 when warranted	Rating 1-10		4.7	6.0	4.5	5.0	5.0	7.0			
	Sub Total		61	78	50	125	105	119	538	1.07	502.43
Alternative 2 - SE-24: Traffic Signals at Gibb/29 and Highway 7 when warranted	Rating 1-10		4.8	6.5	5.0	4.8	5.0	9.0			
	Sub Total		62	85	55	120	105	153	580	1.00	579.90
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

St. Vincent Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD WEST:ST.VINCENT	Weight →	13	13	11	25	21	17			
Base Case - Stop condition on sideroad at St. Vincent	Rating 1-10	3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total	39	65	55	125	105	68	457	1.23	371.54
Alternative 1 - SW-6: Signalized Intersection at St.Vincent, re-align as required to the west	Rating 1-10	4.8	3.9	4.5	4.8	5.0	9.0			
	Sub Total	62	51	50	120	105	153	541	1.00	541.00
Alternative 2 - SW-5: Roundabout at St.Vincent, re-align as required to the west	Rating 1-10	4.7	3.5	4.5	5.0	5.0	7.0			
	Sub Total	61	46	50	125	105	119	505	1.03	490.29
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Queensland Wright Freeland Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD WEST: QUEENSLAND, WRIGHT, AND FREELAND	Weight →	13	13	11	25	21	17			
Base Case - Stop conditions at Wright, Queensland and Freeland	Rating 1-10	3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total	39	65	55	125	105	68	457	1.23	371.54
Alternative 1 - SW-12: Oval roundabout connecting both Wright and Queensland with Lorne (Hwy 8)....	Rating 1-10	2.7	2.6	4.5	5.0	5.4	7.0			
	Sub Total	35	34	50	125	113	119	476	1.10	432.55
Alternative 2 - SW-13: Coordinated Split Phase Traffic Signal at Wright and Queensland	Rating 1-10	4.7	3.5	5.0	5.5	4.6	9.0			
	Sub Total	61	46	55	138	97	153	549	1.00	548.70
Alternative 3 - SW-20: Realign Wright to Freeland with Traffic Signals, (assuming traffic signals at Queensland)	Rating 1-10	4.8	3.3	4.5	4.2	3.8	9.0			
	Sub Total	62	43	50	105	80	153	493	1.00	492.60
Alternative 4 - SW-20A: Realign Wright to Freeland with Roundabout, (assuming a roundabout at Queensland)	Rating 1-10	4.9	2.9	4.0	4.7	4.2	7.0			
	Sub Total	64	38	44	118	88	119	470	1.10	427.36
SEEK THE BEST - NOT PERFECTION										

Highway 7/8 VE Study

Road 122 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD WEST: ROAD 122	Weight →		13	13	11	25	21	17			
Base Case - Signalized intersection with Bannerd roght in, right out with median	Rating 1-10		3.0	5.0	5.0	5.0	5.0	5.0			
	Sub Total		39	65	55	125	105	85	474	1.24	382.26
Alternative 1 - SW-22: Roundabout on Highway 7 at Road 122	Rating 1-10		4.9	3.2	4.5	5.2	5.8	9.0			
	Sub Total		64	42	50	130	122	153	560	1.00	559.60
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Road 125 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET. 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**		**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD WEST: ROAD 125	Weight →		13	13	11	25	21	17			
Base Case - New 8 (Lorne Ave) turns north on channelized right turn lane to Perth Line 125. Stop control on east-west approaches give priority to N-E movement on new Highway 8	Rating 1-10		3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total		39	65	55	125	105	68	457	1.25	365.60
Alternative 2 - SW-27A: Signalized Intersection at Highway 8 (Lorne Ave) and Road 125 with high speed right turn channelization for E-N movement	Rating 1-10		6.1	6.8	5.0	4.8	6.2	9.0			
	Sub Total		79	88	55	120	130	153	626	1.06	590.47
Alternative 4 - SW-26A: Single lane roundabout at Highway 8 (Lorne Ave) and Road 125 with high speed right turn channelization for E-N movement	Rating 1-10		5.8	6.3	4.5	4.8	6.6	8.0			
	Sub Total		75	82	50	120	139	136	601	1.07	562.06
SEEK THE BEST - NOT PERFECTION											

Highway 7/8 VE Study

Old 8 at New 8 Evaluation

Page 1 of 1	EVALUATION MATRIX										
1. HOW WELL DOES THE ALTERNATIVE SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST) FROM RESPECTIVE SCORING SHEET 2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL 3. SUM ACROSS AND RANK	**Performance Criteria - Performance Measure**	**Human Factors Assessment**	**Sustainability**	**Natural Environment**	**Community Impacts**	**Traffic Operations**	**Roadway User Safety**	**Total Performance (P)**	**Cost Index (C)**	**P/C**
ALTERNATIVES FOR STRATFORD WEST: NEW HIGHWAY 8 AT OLD HIGHWAY 8	Weight →	13	13	11	25	21	17			
Base Case - EB New Highway 8 turns south on channelized right turn lane to Perth Line 125. Stop control on north-south approaches favours larger E-W movement on existing Highway 8	Rating 1-10	3.0	5.0	5.0	5.0	5.0	4.0			
	Sub Total	39	65	55	125	105	68	457	1.23	371.54
Alternative 1 - SW-38: Signalized intersection with high speed right turn channelization for west to south movement	Rating 1-10	6.1	6.5	5.0	4.8	6.2	7.0			
	Sub Total	79	85	55	120	130	119	588	1.16	506.90
Alternative 2 - SW-36: Single lane roundabout with high speed right turn channelization for west to south movement	Rating 1-10	5.8	6.3	4.5	4.8	6.6	9.0			
	Sub Total	75	82	50	120	139	153	618	1.00	618.40
SEEK THE BEST - NOT PERFECTION										

Appendix C
VE Workshop Agenda

Highway 7/8 Corridor
From Greater Stratford to New Hamburg Area
Value Engineering Study

Agenda

Monday March 7, 2011

7:30 am –8:00 am	**Coffee, Continental Breakfast and Meet & Greet with Study Team (In Meeting Room)**
8:00 am – 8:15 am	**Welcome & Introductions** An Introduction to VE Workshop Agenda & Guidelines
8:15 am – 10:30 am	**Information Phase** Review MTO Goals & Objectives Constraints on VE Scope Status and Background of the EA/Key Issues Presentation (by AECOM) Presentation of Existing and Planned Land Uses (by Municipalities) Review of MTO Access Guidelines (by Ken Teasedale) Review Existing and Project Traffic Volumes/Destination (HDR) Review Safety Assessment Considerations (HDR) Present Costing Model (HDR) Questions & Answers
10:30 am –12:30 pm	**Site Visit**
12:30 pm – 1:00 pm	**Lunch**
1:00 pm –4:00 pm	**Information Phase (continued)** Identification of Project Risks Preparation of Project Risk Register Discuss and Finalize Performance Criteria and Measures Questions & Answers
4:00 pm – 5:00 pm	**Function Analysis Phase** Present Project " FAST" Diagram and FAST Guidelines Adjust FAST Diagram by Consensus Identify Value Target Functions / Areas
5:00 pm	**Adjourn**

Tuesday March 8, 2011

7:30 am –8:00 am	**Coffee and Continental Breakfast in Meeting Room**
8:00 am – 12:00 pm	**Creative Phase** Generate ideas according to Value Target Functions / Areas
12:00 pm – 12:45 pm	**Break for Lunch**
12:45 pm – 2:00 pm	**Continue Creative Phase**
2:00 pm – 5:00 pm	**Evaluation Phase** Weight Final Performance Criteria by Paired Comparison Weight Final Performance Criteria by 100% Allocation Method Determine Weights to Be Used by VE Team Consensus Score Creative Ideas by VE Team Consensus from 1 to 10 (best) Determine Cut-Off Score to Select Best Concepts for Development Assign Individuals/Sub-Teams for Development into VE Proposals
5:00 pm	**Adjourn**

Wednesday March 9, 2011

7:30 am –8:00 am	**Coffee and Continental Breakfast in Meeting Room**
8:00 am – 12:00 pm	**Development Phase** Prepare VE Proposal Concepts, Estimates, Calculations, etc. Document Advantages, Disadvantages, Added Factors, Benefits Document VE Proposals Performance against Relevant Criteria
12:00 pm – 12:45 pm	**Break for Lunch**
12:45 pm – 5:00 pm	**Development Phase (continued)** Complete VE Proposal Concepts, Estimates, Calculations, etc. Document Advantages, Disadvantages, Added Factors, Benefits Document VE Proposals Performance against Relevant Criteria
5:00 pm	**Adjourn**

Thursday March 10, 2011

7:30 am –8:00 am	**Coffee and Continental Breakfast in Meeting Room**
8:00 am – 12:00 pm	**Scenario Development Phase** Individuals/Sub-Teams Present VE Proposals to Entire VE Team VE Team Discuss Results, Recommend Modifications Create Scenarios from Development Results Prepare Scenario Concepts, Estimates, Calculations, etc. Document Advantages, Disadvantages, Added Factors, Benefits Document Scenario Scoring on Performance Criteria Measures Begin Preparation of PowerPoint Slides (Parallel Activity)
12:00 pm – 12:45 pm	**Break for Lunch**
12:45 pm – 5:00 pm	**Scenario Development Phase (continued)** Complete Scenario Concepts, Estimates, Calculations, etc. Document Advantages, Disadvantages, Added Factors, Benefits Document Scenario Scoring on Performance Criteria & Measures Prepare Evaluation Matrix Using Performance Criteria & Measures Document Evaluation Scoring and Discussions Finalize PowerPoint Slides (Parallel Activity)
5:00 pm	**Adjourn**

Friday March 11, 2011

7:30 am –8:00 am	**Coffee and Continental Breakfast in Meeting Room**
8:00 am – 12:00 pm	**Scenario Development Phase (continued)** Conduct Sensitivity Analysis of Evaluation Matrix Finalize Evaluation Matrix Using Performance Criteria & Measures Document Evaluation Adjustments and Discussions Complete Final Adjustments to PowerPoint Slides
12:00 pm – 12:45 pm	**Break for Lunch**
12:45 pm – 2:00 pm	**Presentation Phase** Review Final Adjustments to PowerPoint Slides Prepare Room for Presentation
2:00 pm – 3:30 pm	**Presentation Phase** Present PowerPoint Slides Questions & Answers, Discussion
3:30 pm	**Adjourn**

Appendix D
VE Workshop Attendance

VE Workshop Attendance

Participant	March 7, 2011	March 8, 2011	March 9, 2011	March 10, 2011	March 11, 2011
MTO and Consultant					
Charles Organ, VE Project Manager	√	√	√	√	√
Frank Hochstenbach, VE Coordinator (PT)	√	√	√		
James Corcoran, Environmental Specialist (PT)	√		√	√	√
Ken Teasdale, Corridor Management (PT)	√	√		√	
Roger Ward, Planning and Design	√	√	√	√	√
Brenda Jamieson, EA PM, (PT), AECOM	√				√
Fred Leech, EA Environmental Planner, (PT) AECOM	√				
Municipal Participants					
Geoff Vander Booren, Perth County (PT)	√	√			
Geoffrey Keyworth, Region of Waterloo	√	√	√	√	√
Wes Kuepfer, Twp. of Perth East (PT)	√				√
Larry McGreigor, Twp. of Perth South (PT)	√	√			√
Ray Nothdurft, Stratford	√	√	√	√	√
Harold O'Kafra, Twp. of Wilmot (PT)		√			
Dennis O'Neil, Twp. E. Zorra-Tavistock (PT)	√				
Darrell Reis, Twp. of Perth East (PT)			√		
Glenn Schwendinger, Twp. of Perth East (PT)	√	√			√
Grant Whittington, Twp. of Wilmot (PT)	√		√		√
HDR | iTRANS and Sub-Consultants					
Scot McClintock F+G, VE Team Leader	√	√	√	√	√
Joseph Arcaro, VE Project Manager	√	√	√	√	√
Mark Mis, VE Team Assistant	√	√	√	√	√
Greg Perry, Highway Design Specialist	√	√	√	√	√
Don Cleghorn, Traffic Specialist	√	√	√	√	√
Greg Junnor, Safety Specialist	√	√	√	√	√
Donald Moore, Structures, IBI	√	√	√	√	√