Document 1 Evaluation of Alternative Solutions and Corridors

1.0 EVALUATION OF ALTERNATIVE SOLUTIONS

Based on the overview of existing conditions, planning policy directions for growth as well as a documented deficiency in the urban and rural major road network in the Study Area, a general need and opportunity to plan to extend Earl Armstrong Road from Albion Road to Hawthorne Road is supported. Influential documents and plans include:

- City of Ottawa Official Plan (OP) (2003, as amended);
- City of Ottawa Transportation Master Plan (TMP) (2013);
- Leitrim Community Design Plan (CDP) (2005);
- Riverside South CDP (2005/2016);
- Limebank Road Environmental Assessment (EA) (which included the Earl Armstrong extension and widening and tie-in to Albion Road) (2003);
- Bank Street Widening EA (2014);
- Airport Master Plan 2008 and "YOW 2038" (2018) update (unreleased but executive summary available);
- Current City of Ottawa Zoning By-Law; and
- Potential/proposed area development plans.

1.1 Planning Objectives

Based on the outcome of the needs and opportunities assessment, there is a transportation need to provide additional connectivity and capacity for all modes within the Study Area. Specific planning objectives are outlined below:

1. Reinforce east-west connectivity with the north-south major road network.
2. Provide a continuous travel route of regional importance.
3. Contribute to a multi-modal connection to the Earl Armstrong/Bowesville LRT Station and Park and Ride.
4. Provide connections to existing and future adjacent land uses.
5. Contribute to connecting Leitrim and Riverside South communities by all modes as a complete street.
6. Provide an opportunity for new bus transit service.
7. Provide a potential corridor to accommodate infrastructure/municipal services.
8. Provide an opportunity to interact and appreciate the natural heritage character.

1.2 Description of Alternative Solutions

A list of alternative solutions that have some potential to address the planning objectives was developed. These are described in Table 1-1.

Table 1-1 List of Alternative Solutions

Alternative		Description
1	Do nothing in the Study Area.	Provide no new transportation infrastructure in the Study Area and do not extend Earl Armstrong Road. Rely on other transportation infrastructure investments outlined in the TMP for transportation capacity for all modes.
2	Construct new pedestrian/cycling facilities only.	Do not construct a new roadway in the Study Area. Construct contemporary pedestrian and cycling facilities in a dedicated corridor.
3	Improve transit service within the Study Area connecting to Leitrim and Earl Armstrong/Bowesville Stations on the Trillium Line Extension, including a new park and ride facility.	Improve bus transit service through increased route options and number of trips offered. Construct a new park and ride facility in the Study Area to provide access to improved transit service.
4	Extend a new road from Albion Road to Hawthorne Road.	Construct a new road from Albion Road to Hawthorne Road accommodating all modes (walking, cycling, transit, automobiles and trucks).
5	Upgrade existing east-west Rideau Road.	Upgrade Rideau Road (Albion Road to Hawthorne Road) to serve east-west travel demand and include active transportation facilities.

Note: The TMP investments outside the corridor within the planning horizon are included in all alternative solutions considered, including the Do-Nothing solution, and include:

- *Trillium Line Extension;*
- *New or expanded Park and Ride Facilities associated with Trillium Line;*
- *Widening Bank Street as per the Bank Street Widening EA (2014);*
- *Widening and extending Earl Armstrong Road to Albion Road (to the west of the Study Area) as per the Limebank Road EA (2003);*
- *Widening other Arterial Roads as proposed in the TMP, including Leitrim Road;*
- *Constructing new Collector and Major Collector Roads associated with area developments;*
- *Cycling and pedestrian facilities and multi-use pathways as proposed in the TMP and associated with area development;*
- *Intersection improvements as part of the City's intersection modification program; and*
- *City-wide Transportation Demand Management initiatives.*

This long list of alternative solutions was subject to a two-step screening/evaluation process. The first step involved screening the ability of each alternative to sufficiently meet the planning objectives. If the alternative passed that screening, it was then carried forward for a more holistic evaluation considering all aspects of the environment at a high-level and in consideration of the existing conditions previously documented.

1.3 Screening of Long List of Alternative Solutions

As noted, the first step in the evaluation process is screening alternative solutions based on their ability to sufficiently achieve the identified planning objectives as outlined in Section 1.1. The results are shown in Table 1-2. Those cells highlighted in green identify the solutions that were carried forward

whereas cells highlighted in red represent those solutions that do not sufficiently satisfy the planning objectives and were therefore screened out. Cells that are highlighted in yellow partially satisfy the planning objectives and are also carried forward for further analysis.

Table 1-2 Results of Screening of the Long List of Alternative Solutions

Alternative		Description	Recommendation
1	Do nothing in the Study Area.	Does not sufficiently address the planning objectives	Carried forward for comparison purposes
2	Construct new pedestrian/cycling facilities only.	Does not sufficiently address the planning objectives	Screened out
3	Improve transit service within the Study Area connecting to Leitrim and Earl Armstrong/Bowesville Stations on the Trillium Line Extension, including a new park and ride facility.	Does not sufficiently address the planning objectives	Screened out
4	Extend a new road from Albion Road to Hawthorne Road.	Satisfies the planning objectives	Carried forward for further evaluation
5	Upgrade existing east-west Rideau Road.	Partially Satisfies the Planning Objectives	Carried forward for further evaluation

The Do Nothing alternative does not address the planning objectives but is carried forward as an alternative solution for comparison purposes. Further, alternative solutions that partially address the planning objectives were also carried forward for further evaluation. Transportation Demand Management measures do not on their own address the need and planning objectives and are therefore not included as an independent alternative solution. They are however an important component and are considered part of all solutions. Similarly, new pedestrian and cycling infrastructure will be provided in any preferred solution, in keeping with the corridor's Official Plan and TMP designations and other council policies, but on their own do not satisfy the transportation demand. Providing only improved transit and new park and ride services does not satisfy the overall east-west travel demand objectives in the Study Area and the Trillium Line and associated park and ride lots are only one destination within the Study Area and southeast sector of the city.

1.4 Evaluation of the Remaining Short List of Alternative Solutions

The results of the screening identified two (2) solutions that have some potential to sufficiently address the planning objectives. These were carried forward for further evaluation. Together with the Do Nothing solution, they were subject to a high-level environmental impact assessment based on transportation need, social, biological, physical and economic criteria:

1. **The ability of the alternative to fully address the transportation need for the project.** Preferred solutions must provide transportation capacity and meet the planning objectives for all modes in the Study Area during the planning horizon.

2. **Adherence to policies, regulations, and local standards of practice.** Preferred solutions should comply with provincial/federal policies or municipal regulations or policies.
3. **Consideration of environmental impacts.** Preferred solutions should minimize their impacts on the various environmental conditions or result in impacts that have a likelihood of being able to be managed and/or mitigated through design, or have a positive effect. The ability to avoid/reduce/minimize impacts was also considered.

The evaluation results are provided in Table 1-3.

Table 1-3: Results of the Evaluation of Short List of Alternative Solutions

Criteria		Alternative 1: Do Nothing in the Study Area (for comparison purposes)	Alternative 4: Extend Earl Armstrong Road from Albion Road to Hawthorne Road	Alternative 5: Upgrade existing east-west Rideau Road
1a	Ability to provide transportation capacity in the Study Area	Does not address. No additional transportation capacity would be provided beyond other TMP commitments.	Fully addressed. Provides additional transportation capacity within the Study Area for all modes.	Fully addressed. Provides additional transportation capacity within the Study Area for all modes.
1b	Provide an efficient and continuous east-west link to the north-south major road network	Does not provide opportunity.	Fully addressed. Earl Armstrong west of Albion is an existing or planned arterial road that provides a continuous east-west link connecting across the Rideau River and to Highway 416 through the community of Barrhaven. An extension would provide a continuous link to the major north-south roadways in the Study Area such as Albion Road, Bank Street and Hawthorne Road.	Partially addressed. Rideau Road is an existing east-west collector road that is limited in continuity. Currently, it connects River Road in the west to an eventual connection to Highway 417 at Boundary Road. Rideau Road does not cross the Rideau River.
1c	Reinforces/provides resiliency in the arterial road network in the Study Area	Does not provide opportunity.	Fully addressed. Provides resiliency in the east-west arterial road network and an additional travel route option within the Study Area. Extends	Partially addressed. This alternative leaves only one arterial road (Leitrim Road) connection between the growing communities of Riverside South and Leitrim. This is insufficient and will not alone meet the transportation requirement. Would provide resiliency in

Criteria		Alternative 1: Do Nothing in the Study Area (for comparison purposes)	Alternative 4: Extend Earl Armstrong Road from Albion Road to Hawthorne Road	Alternative 5: Upgrade existing east-west Rideau Road
			eastward an arterial road that connects across the Rideau River via the Strandherd Bridge (Vimy Memorial Bridge).	the east-west road network, but its location would be relatively close to Mitch Owens Road that provides a better connection from Highway 417 at Boundary Road across the Rideau River and beyond. Further, Rideau Road is a collector road, and to upgrade it would also potentially require re-designation of all of Rideau Road to an arterial, changing the planned function of that roadway. Also, terminating Earl Armstrong at Albion Road and not extending it easterly across the north side of the Rideau Carleton Raceway site towards Bank Street would result in east-west travel being focused on Albion Road to gain north-south connectivity. The Albion Road corridor has not been planned for that result.
1d	Provide a corridor for transit operations	Does not provide opportunity.	Fully addressed. Provides a new corridor for transit operation located in close proximity to surrounding growth communities of Leitrim and Riverside South. Provides a direct connection to the Trillium Line LRT service.	Partially addressed. Provides capacity for transit operations however, does not respond to the long-term multi-modal transportation requirement for east-west travel between Riverside South and Leitrim Communities. Does not provide efficient connection to the Trillium Line LRT service from transit supporting uses, and does not serve the growing communities well.
1e	Provide a corridor for active transportation	Does not provide opportunity.	Fully addressed. Provides a corridor for active transportation	Partially addressed. Provides a corridor for active transportation

Criteria		Alternative 1: Do Nothing in the Study Area (for comparison purposes)	Alternative 4: Extend Earl Armstrong Road from Albion Road to Hawthorne Road	Alternative 5: Upgrade existing east-west Rideau Road
	facilities		facilities to the surrounding community.	facilities however does not connect growing communities.
1f	Provide a Truck Route	Does not provide opportunity.	Fully addressed. Provides a truck route within the Study Area that provides more direct access to regional highway networks.	Partially addressed. There are restrictions throughout Rideau Road and it does not provide continuity west across the Rideau River. It is located close to Mitch Owens Road which already provides more direct access to regional highway networks, has no restrictions and has continuity across the Rideau River.
2a	Supports planned function to accommodate growth and policies and/or standards of municipal, provincial, and federal authorities	Does not address the planned function to accommodate growth.	Fully Addressed. Provides opportunity for connections from planned growth areas in the Study Area. Project would be planned in accordance with municipal, provincial and federal guidance where applicable.	Partially addressed. Does not provide an efficient connection from planned growth areas in the Study Area as it is located well south of the growing communities of Leitrim and Riverside South. Project would be planned in accordance with municipal, provincial and federal guidance where applicable.
2b	Minimizes impact on existing and planned communities and development lands	No physical impacts. Congestion impacts to motorists and businesses. May add additional traffic on other major roadways in the Study Area.	Minimal physical impacts anticipated. Impacts can likely be minimized through design and in consultation with adjacent communities and landowners. Limited number of land owners affected.	Widening the existing corridor would impact numerous land owners. Located 1.4km south of the very south limit of the growth communities notably Leitrim and too far north to be utilized by Greely residents.
3a	Minimizes or avoids impact on mineral aggregate resources	No physical impacts.	No physical impacts to active aggregate resource extraction anticipated.	Will result in impacts to licensed aggregate resource areas due to widening of the corridor.
3b	Minimizes or avoids impact on natural heritage features	No physical impacts. Increased	Some physical impacts are anticipated. There are opportunities to	Minimal physical impacts anticipated due to widening of an existing road corridor

Criteria		Alternative 1: Do Nothing in the Study Area (for comparison purposes)	Alternative 4: Extend Earl Armstrong Road from Albion Road to Hawthorne Road	Alternative 5: Upgrade existing east-west Rideau Road
	including designated Significant Wetlands, known habitats for Species at Risk, surface water features and aquatic habitats	congestion could result in greater emissions.	align the roadway to avoid physical impacts to the extent feasible. Implications for provincially significant wetlands, hydrology and unevaluated wetlands requiring additional consideration and mitigation where required.	that can likely be reduced with mitigation where required.
3c	Minimizes or avoids impact on cultural heritage resources	No physical impacts.	Physical constraints within the Study Area include the cemetery on Albion Road at High Road.	Physical constraints within the Study Area includes a cemetery at the southeast corner of Albion Road and Rideau Road.
3d	Minimizes capital construction cost as well as land acquisition costs	No capital cost.	Higher anticipated capital cost for land acquisition and mitigation measures required of a new road corridor.	Moderate capital cost for land acquisition and mitigation measures required of a new road corridor.
	Conclusion	Removed from further evaluation	**Recommended Solution**	Removed from further evaluation

As shown in Table 1-3, Alternative 1: Do Nothing, does not address planning objectives and evaluation criteria. Doing nothing has the potential to introduce or intensify traffic congestion in the area and to surrounding communities with associated negative impacts. Also, it would not result in any improvements to pedestrian, cycling and transit systems.

Alternative 5: Upgrade existing east-west Rideau Road only partially addressed some planning objectives and evaluation criteria. Rideau Road does not respond to the long-term multi-modal transportation requirement for east-west travel between the large growing communities of Riverside South and Leitrim. It is important to recognize that Leitrim has a planned build out of 23,000 residents and 3,800 jobs, and Riverside South has a planned build out of 57,000 residents and 17,000 jobs. The alternative of upgrading Rideau Road would leave these two communities only connected by one arterial road, namely Leitrim Road, which is at the very north limit of the Leitrim community. This single major road would be insufficient to meet the travel demand in the area. Rideau Road is located 1.4km south of the very south limit of the Leitrim community, and it alone would perform poorly in providing a multi-modal transportation service to the growing communities. Further, it is also important to note that the Trillium Line LRT service is planned with a station and a park and ride lot located at Earl Armstrong Road and Bowesville Road. This alternative does not provide a direct connection to this transit service

and does not support the uptake in transit that is anticipated to be in high demand. Furthermore, this alternative solution would leave Earl Armstrong Road terminated at Albion Road and would result in east-west travel being focused on Albion Road to gain north-south connectivity. The Albion Road corridor has not been planned for that result. Overall, this solution does not sufficiently meet the planning objectives.

Alternative 4: Extend Earl Armstrong Road from Albion Road to Hawthorne Road fully addresses the planning objectives and sufficiently addresses the evaluation criteria. It provides opportunities to enhance the network of major roads in the Study Area and the broader city context by increasing resiliency and providing a continuous corridor for active modes, a transit route and a truck route. It is a solution that will meet the existing and future transportation demand and help advance the City's strategic directions for growth and development in this sector. Additional considerations to minimize impacts to all aspects of the environment are considered manageable.

1.5 Preliminary Preferred Solution

In consideration of the planning objectives for the Study Area, the Preliminary Preferred Solution is an easterly extension of Earl Armstrong Road east of Albion Road, connecting to Bank Street and further east to Hawthorne Road, as a continuous major road that adds transportation capacity, mobility choices, and resiliency to the Riverside South, Leitrim and adjoining rural area transportation network. On the basis of the needs assessment documented in this Environmental Assessment study, the solution will provide for a four-lane roadway with active transportation and transit accommodation. The facility will be designed in a manner to enable the possibility of phasing as an interim two-lane roadway with active transportation and transit features.

The evaluation of Alternative Designs (corridors) is the next key phase of the Environmental Assessment Process. For the Earl Armstrong Road Extension EA study, the alternative designs focus on the various alternative corridors (alignments), and their varied opportunities, constraints, and environmental effects. Once the Preliminary Preferred Corridor is confirmed, the geometric design choices for infrastructure including intersection choices and built-in mitigation choices, will be evaluated as part of a subsequent analysis.

1.6 Preferred Solution

The preliminary preferred solution was presented to stakeholders along with alternative corridors in a series of consultation events including the study's three consultation groups (Agency, Business, and Public) in November 2018 as well as the first Public Open House in January 2019. Comments received during consultation, that relate to the alternative solutions, included expressed interest in why upgrading Rideau Road was not determined to be the preferred solution.

Upon further analysis, upgrading Rideau Road was reconfirmed to not be the preferred solution on the basis that it is located too far south to respond to the long-term multi-modal transportation requirements for east-west travel between the large growing communities of Riverside South and Leitrim, and for the additional reasons discussed in the evaluation.

Other comments included: support for the solution which will provide additional capacity in the study area and beyond, support for the solution that will enable efficient transit and connectivity to the Trillium Line, the need to minimize property impacts and natural environment impacts, and the need to clarify the road's role in the truck route network. In consideration of the comments received and the ability to

address them as part of alternative corridors and designs and related mitigation measures, the preferred solution was confirmed to be the easterly extension of Earl Armstrong Road from Albion Road to Hawthorne Road.

2.0 EVALUATION OF ALTERNATIVE CORRIDORS

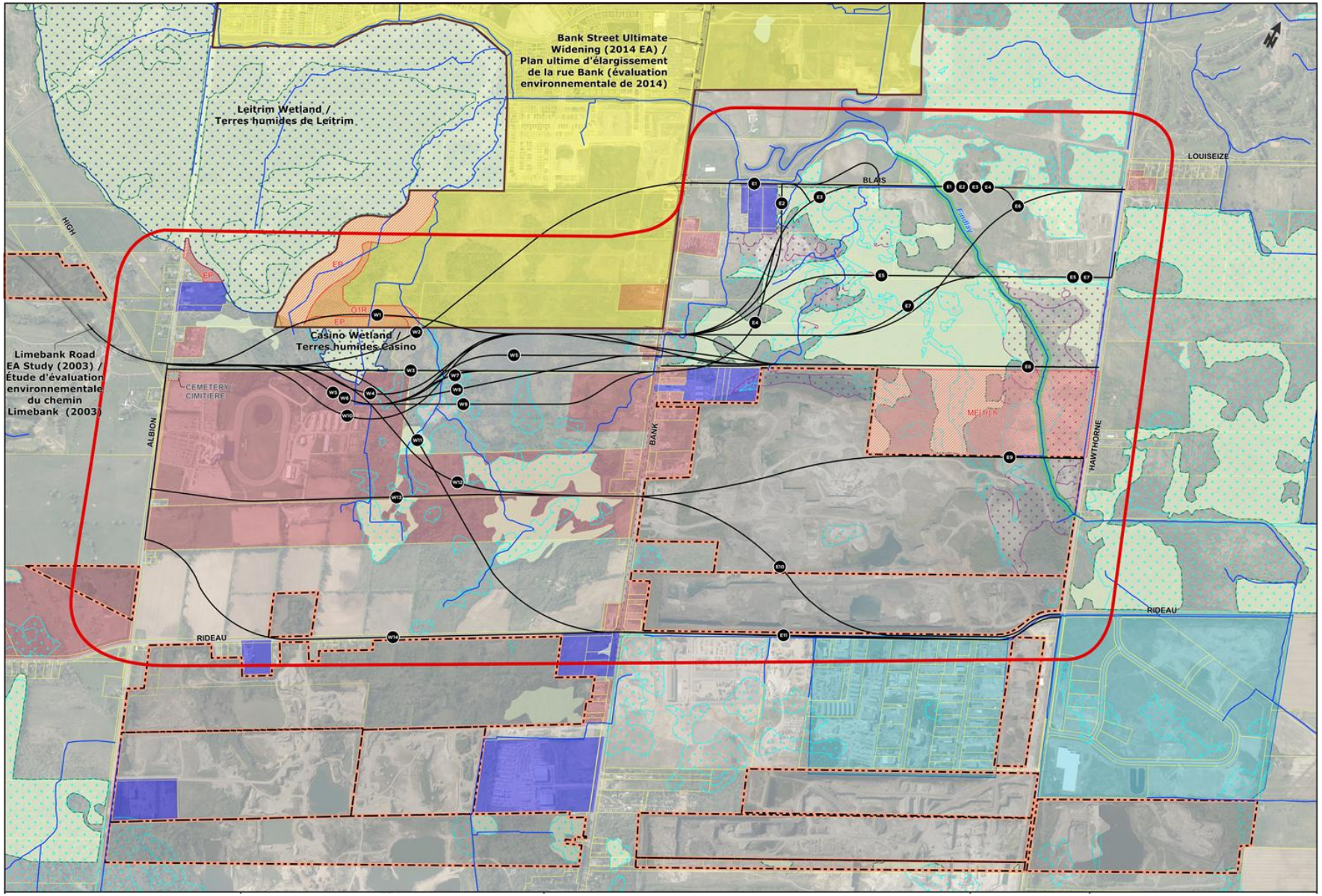
The evaluation of alternative corridors is a key phase of the Environmental Assessment Process for the Earl Armstrong Road Extension EA study. The evaluation of alternative corridors focused on their varied opportunities, constraints, and environmental effects.

Once the Preliminary Preferred Corridor is confirmed, the geometric design choices for infrastructure will be evaluated on a subsequent analysis.

2.1 Screening of the Long List of Alternative Corridors

Through consultation with various stakeholders and technical experts on the study team, a long list of alternative corridors was prepared. These are presented in Figure 2-1**.** The long list of alternative corridors was first subject to a screening against the criteria shown in Table 2-1. The Study Area was divided into two sections, west (Albion Road to Bank Street) and east (Bank Street to Hawthorne Road), because the transportation need for each section is different.

Figure 2-1 Long List of Alternative Corridors



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Alternative corridors were screened out from further evaluation if they were not consistent with the planning objectives for the study and/or if they were not consistent with provincial and/or City policy. The preliminary screening evaluation results are provided in Table 2-1**.**

Table 2-1 Results of Screening of the Long List of Alternative Corridors

Number	Criteria	Corridors Screened Out Based on Criteria
1	Corridors that do not provide an efficient corridor to meet transportation demand as defined by the planning objectives for the study.	W2, W11, W12, W13, W14, E2, E9, E10, E11
2	Corridors that are located through approved residential development including draft plans of subdivision/site plans.	W1, W2, E1
3	Corridors that are located through properties with mineral extraction licenses.	E9, E10
4	Corridors that are located through designated Provincially Significant Wetland (PSW) and/or Environmental Protection Zone.	W1, W2, W3, W11
5	Corridors that are located through core natural heritage system features.	E5, E6, E7
6	Corridors that result in significant property fragmentation.	W1, W2, W5, W10, W11, E5, E6, E7, E9, E10

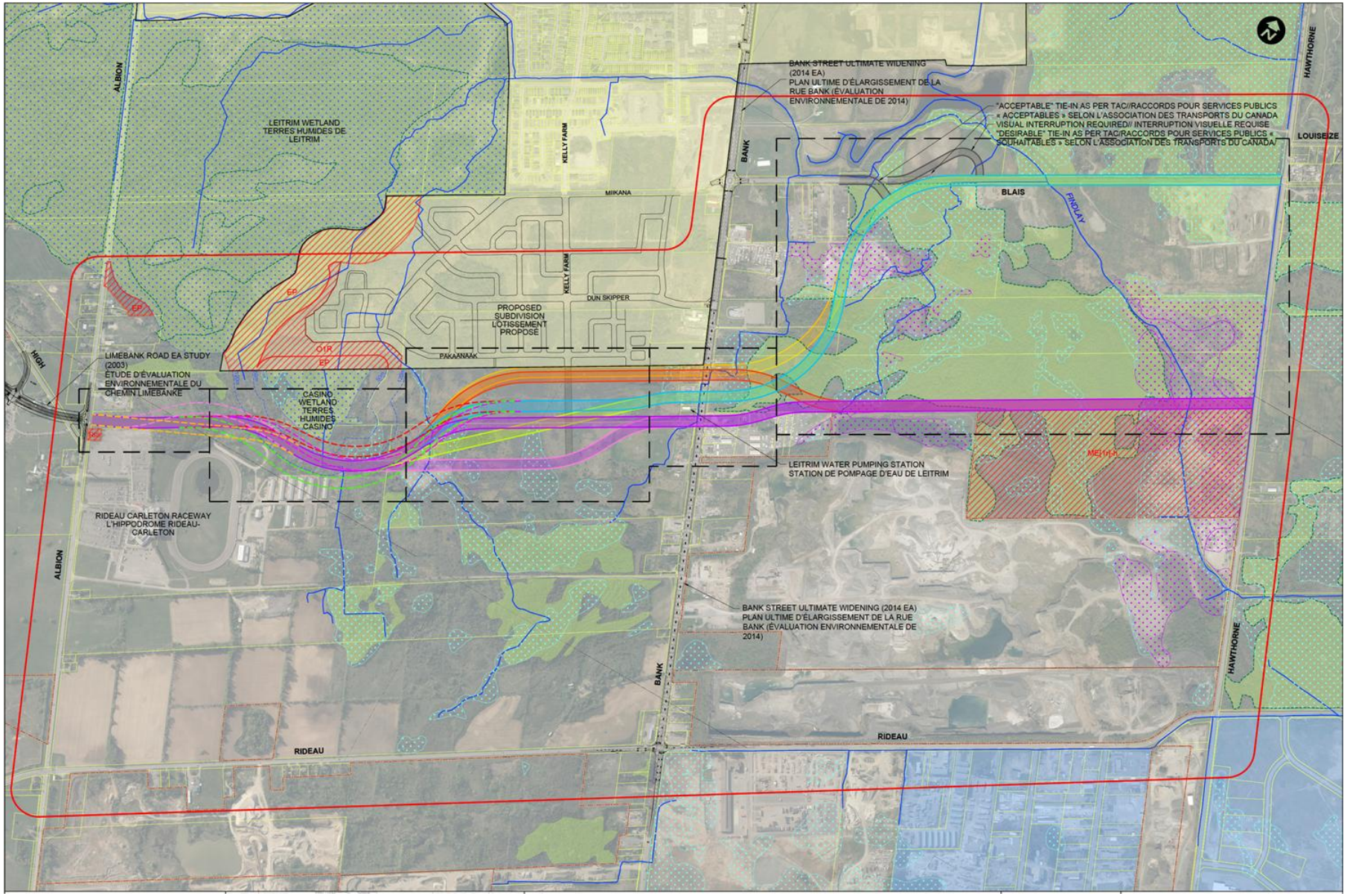
The long-list of alternative corridors screened out all the alternatives that passed through existing development lands in Findlay Creek as well as those alternatives that would continue further south towards Rideau Road or directly through licenced aggregate resources east of Bank Street. Similarly, the high-level screening also eliminated alternatives that bisected the City's natural heritage system and significant woodlands.

Based on the outcome of the screening, W4, W5, W6, W7, W8 and W9 remain for the west section and E3, E4 and E8 remain for the east section. These alternative corridors form the short list and were carried forward for the next step of focused evaluation.

2.2 Focused Evaluations

The short-listed alternative corridors were evaluated using differentiating criteria, derived from a long list of possible criteria, which have regard for all aspects of the environment (natural, physical, social, cultural, economic). The Study Area was divided into five separate focused evaluations based on the differing contexts each geographic area presents. The short list of preferred corridors and the locations for each focused evaluation are illustrated on Figure 2-2. A description of the evaluation criteria and methodology employed for each focused evaluation is described in the next section.

Figure 2-2 Short List of Alternative Corridors



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2.3 Evaluation Criteria and Methodology

An evaluation method reveals the rationale or reasons for decisions but does not necessarily make the decision. As such, evaluation methods are designed as decision-making tools. Using a formal evaluation method has the following advantages:

1. It provides a better basis for decision-making that may not otherwise exist;
2. It provides reasons for decisions that on examination can be traced, explained, and defended; and
3. It provides a means to demonstrate how the many aspects of the environment have been considered, in a holistic and multi-disciplinary manner.

Several evaluation methods are available for environmental assessment studies. An Evaluation Matrix was selected as the methodology for this study as it provides a method of objectivity evaluating several alternatives against several criteria that can be tailored to the varying Study Area contexts. The evaluation methodology included the following tasks:

Task 1: Criteria Development

Task 2: Identification of Alternative Corridors

Task 3: Identification of Focused Evaluation Sections and Differentiating Criteria Selection

Task 4: Criteria-based Evaluation of Alternative Corridors

Task 5: Synthesis of Findings and Recommendation of Preliminary Preferred Corridor

The context-sensitive criteria that were developed specifically for this study by the core study team, that include subject matter experts for all aspects of the environment, are presented in Table 2-2 with the evaluation scale shown in Table 2-3. The criteria are grouped into five (5) broad categories covering all aspects of the environment as defined in the EA Act including:

- Transportation System Sustainability;
- Ecological and Physical Sustainability;
- Land Use and Community Sustainability;
- Climate Change Mitigation and Adaptation; and
- Economic Sustainability.

For each of the focused evaluations, all listed criteria were considered to aid in evaluation, however, only criteria particularly relevant and differentiating were selected to assist with each of the five focused evaluations.

Table 2-2 Evaluation Criteria and Indicators

Criteria		Indicators
Transportation System Sustainability		
1	Accessibility and Inclusion	a) Consistent with Federal, Provincial and Municipal laws, standards and best practices. b) Provides accessible routes for persons of all abilities along the corridor, and at crossings and transit stops.
2	Active Transportation	a) Provides the opportunity to connect to existing pedestrian and cycling facilities within the Study Area

Criteria		Indicators
		c) Provides a direct and efficient pedestrian and cycling travel route through the Study Area
3	Transit Network	a) Maximizes opportunity for convenient and accessible bus stops b) Provides an efficient route and direct connection to Bowesville/Earl Armstrong LRT Station b) Provides an opportunity to create/increase transit ridership
4	Arterial Road Network	a) Provides east-west vehicular connectivity to the north-south road network within the Study Area b) Provides vehicular access to planned communities and development lands c) Provides an efficient and continuous east-west travel route through the Study Area d) Provides/reinforces resiliency in the road network in the Study Area e) Provides additional capacity in the road network in the Study Area
Ecological and Physical Sustainability		
5	Protection of Existing Vegetation	a) Optimizes the incorporation of existing valued natural/vegetated areas
6	Surface Water, Hydrology and Aquatic Habitat	a) Results in the least amount of stormwater management requirement b) Minimizes impact on or loss of existing aquatic habitat c) Provides opportunity to maintain hydrologic flow
7	Natural Heritage Features	a) Minimizes or avoids impacts on designated features of the City's natural heritage system b) Minimizes or avoids impacts on significant woodlands
8	Wildlife	a) Minimizes disruption to wildlife connection and movements
9	Wetlands	a) Minimizes impacts to the PSW within the Study Area b) Minimizes impacts to non-PSWs within the Study Area
10	Mineral Aggregate Resources	a) Minimizes disruption to existing and planned mineral aggregate resources
11	Physical Environment	a) Minimizes risk to human health on areas of known contaminated soils and/or groundwater
Land Use and Community Sustainability		
12	Community Planning & Design	a) Consistent with area plans for the Leitrim community development b) Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses c) Minimizes impacts to existing land uses d) Provides the opportunity to create a corridor for trunk municipal services and utilities e) Minimizes or avoids disruption to essential municipal services (potable water and sanitary services)
13	Cultural Heritage Resources	a) Avoids or minimizes impact on existing archaeological resources or areas with potential b) Avoids or minimizes impact on designated or potential built heritage resources c) Avoids or minimizes impact on designated or potential cultural heritage landscapes
14	Noise & Vibration	a) Maximizes separation between the roadway (a potential noise and vibration source) and sensitive receivers b) Minimizes the need for noise mitigation.

Criteria		Indicators
15	Air Quality	a) Maximizes fuel efficient driving behavior b) Minimizes travel distance and associated infrastructure
Climate Change Mitigation and Adaptation		
16	Climate Change Mitigation (Effect of Project on Climate Change)	a) Minimizes potential effects on climate resulting from driving behaviour b) Promotes a reduction in vehicle kilometres travelled c) Promotes a modal shift towards active transportation (walking, cycling) d) Promotes a modal shift towards transit use e) Potential for protecting and/or enhancing carbon sinks f) Maximizes the potential of ecological system to respond successfully to climate change g) Minimizes effects on climate change from the amount of materials used in construction h) Minimizes the life cycle maintenance and operation requirements i) Maximizes the possibility of electricity production by the project j) Minimizes the propensity for creation of heat island effect
17	Climate Change Adaption (Effect of Climate Change on Project)	a) Minimizes risk of extreme cold temperatures on the project b) Minimizes risk of extreme hot temperatures on the project c) Minimizes risk of extreme rainfall events on the project d) Minimizes risk of flooding on the project e) Minimizes risk of extreme snow and snow drifting events on the project f) Minimizes the risk of freezing rain events on the project g) Minimizes risk of extreme wind on the project h) Minimizes risk of drought on the project i) Minimizes risk of wildfire on the project j) Maximizes the safety and comfort of corridor users exposed to the environment k) Minimizes the risk of fog on the project
Economic Sustainability		
18	Phasing and Implementation	a) Maximizes the ability to phase and incrementally implement the project b) Minimizes the propensity for traffic diversion during construction
19	Life Cycle Cost	a) Minimizes the capital infrastructure cost including minimizing the need to alter or abandon existing infrastructure b) Minimizes infrastructure design and construction costs c) Minimizes maintenance and operation costs d) Minimizes property acquisition cost

EVALUATION SCALE

To assist in understanding how the evaluation was conducted, Table 2-3 details the evaluation scale used. Each alternative was evaluated based on how it performs in meeting each individual indicator ranging from performing very well to failure assuming best management practices and standard mitigation measures would be applied. A colour-coded format is used. Green indicates the best performing alternative, whereas red indicates failure.

Table 2-3 Evaluation Scale and Definitions

Assessment	Definition
Performs Very Well	The alternative is evaluated by subject matter experts to have a highly favorable result in regards to fulfillment of the indicator. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and, in policy and guidelines, with the performance often exceeding benchmarks.
Performs Well	The alternative is evaluated by subject matter experts to have a favorable result in regards to fulfillment of the indicator. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by the stakeholders and in policy and guidelines.
Performs Adequately	The alternative is evaluated by subject matter experts to have an acceptable result in regards to fulfillment of the indicator. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines, with the performance just meeting or approaching benchmarks.
Performs Poorly	The alternative is evaluated by subject matter experts to have an undesirable result in regards to fulfillment of the indicator. There is a risk that the design may fall short of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines.
Fails	The alternative is evaluated by subject matter experts to have an unacceptable result in regards to fulfillment of the indicator. The design is expected to fall short of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines with the performance often below benchmarks.

2-4 Focused Evaluation of Section 1: Albion Road to the Casino Wetland (Leitrim PSW) Alternatives

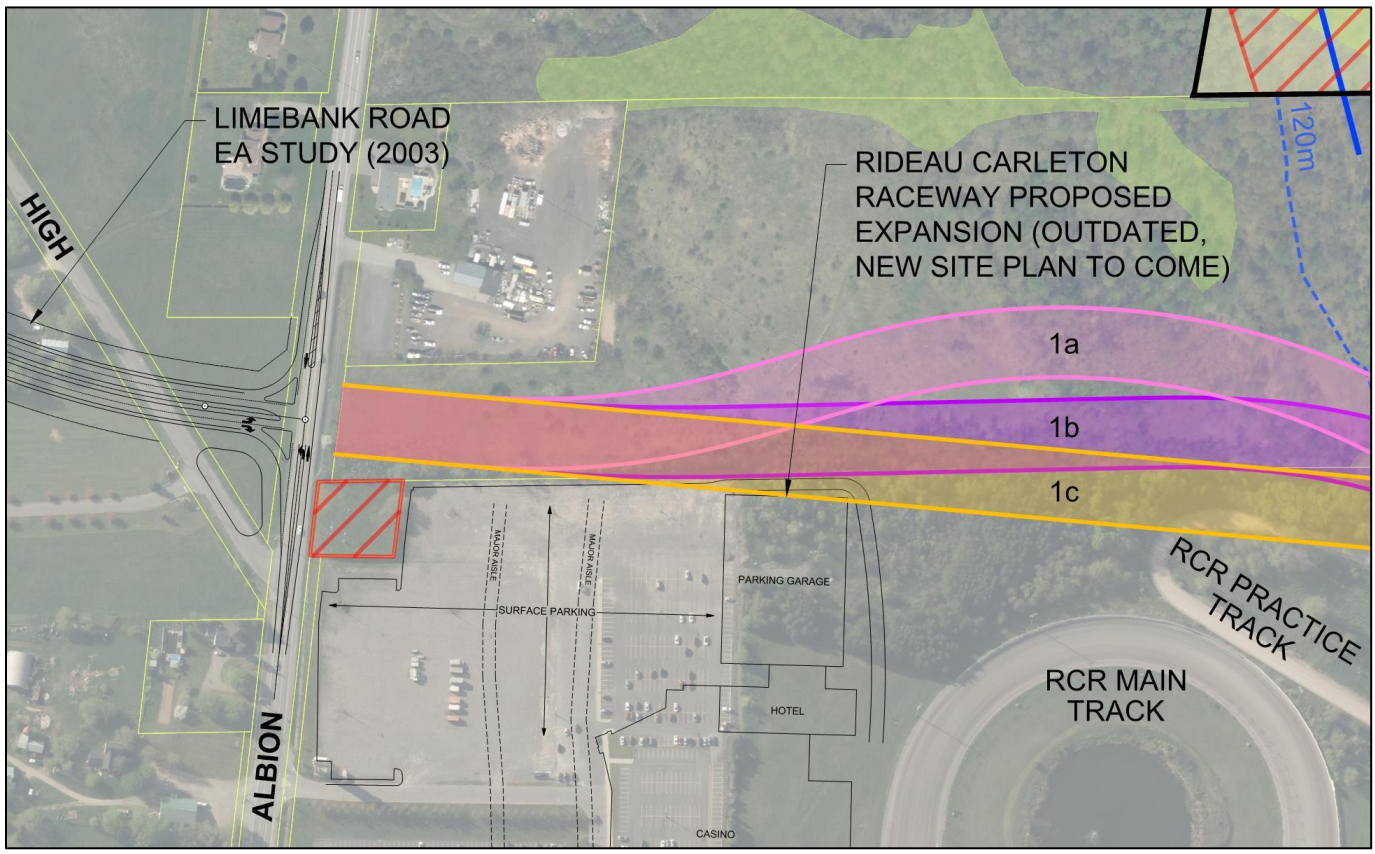
The primary objective for the corridor alignment in this section is to connect to the approved alignment for Earl Armstrong Road west of Albion Road as determined in the Environmental Assessment entitled, *Limebank Road EA Study* (2003). That EA has established the corridor for widening of Earl Armstrong Road from Spratt Road to Albion Road, including its extension to Albion Road which would replace the existing High Road and its intersection at Albion Road with a new intersection located to the north. That alignment had regard for the existing cemetery and the proposed intersection location has been specifically planned to avoid direct impacts on it. On this basis, the alignment of the current project at Albion Road is more or less fixed, and the alignment choices are based on whether the roadway follows the north lot line of the pioneer cemetery and the Rideau Carleton Raceway (RCR) property, or whether the roadway curves to the south, or north, from that point. Further east, the alignment in this western section needs to have regard for the Leitrim PSW and the RCR development (existing and future). Three possible alternative corridors for the roadway for this section were considered; these are listed below and shown in Figure 2-3**:**

1a. Continue straight at the EA defined alignment

1b. Abut northern RCR property line

1c. Curve north to avoid RCR site

Figure 2-3 Alternative Corridors for Section 1: Albion Road to the Casino Wetland (Leitrim PSW)



To assist with the evaluation of the three alternatives for focused evaluation for section 1, the differentiating criteria were selected from the long list of criteria. The full evaluation and discussion follows:

Table 2-4 Results of Focused Evaluation for Section 1

			Alternative			
Number	**Criteria**	**Indicator**	**1a**	**1b**	**1c**	**Qualifier**
Transportation System Sustainability						
4c	**Arterial Road Network**	Provides an efficient and continuous east-west travel route through the Study Area				Longer alternatives will perform poorly for this indicator. Alternatives that result in optimal sightlines will perform better for this indicator.
Land Use and Community Sustainability						
12b	**Community Planning & Design**	Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses				Alternatives that minimize or avoid large property takings or minimize creating awkward property shapes and sizes will perform better for this indicator.
12c		Minimizes impacts to existing land uses				Alternatives that minimize or avoid acquisition or relocation of built assets will perform better for this indicator.
Economic Sustainability						
19d	**Life Cycle Cost**	Minimizes property acquisition cost				Alternatives with the least amount of land acquisition will perform better for this indicator.

- Performs Very Well
- Performs Well
- Performs Adequately
- Performs Poorly
- Fails

In order to avoid the wetland, alternative 1a curves northerly to turn southerly. This alternative would require the greatest amount of property and would result in remnant awkward pieces of land which may require acquisition by the City if deemed undevelopable.

Alternative 1b avoids disruption to RCR's facilities (parking lot and practice track), crossing only through undeveloped land. Alternative 1b is more direct and would require less land requirement for the right-of-way as well as leave a suitable size and shape of land to the north for future development.

Alternative 1c provides the most direct road alignment and would set up the road to pass south of the wetland, however it would cause substantial disruption to RCR's current development (parking areas and practice track) as well as planned future intensification of the parking area close to the north property line.

For these reasons, Alternative 1b is considered the Preliminary Preferred Corridor for this section.

2-5 Focused Evaluation of Section 2: Casino Wetland (Leitrim PSW) and the Raceway Facilities Alternatives

Presently, there is very little space to align a new road corridor between the Leitrim PSW (more specifically, the Casino named portion of the PSW) and the existing RCR infrastructure, specifically the practice race track and horse barns. Four possible alternative corridors for the roadway for this section were considered; these are listed below and shown in Figure 2-4**:**

- **2a.** Adjacent to the wetland boundary (no offset)
- **2b.** Equal distance offset to the wetland boundary and Raceway facilities
- **2c.** 50m offset from the wetland boundary
- **2d.** 120m offset from the wetland boundary

Cross sections have been prepared to help illustrate the discussion of options 2a through 2c (Figure 2-5). The cross-sections also consider topography and the vertical differences between the PSW, a potential road corridor, and the RCR facilities.

Figure 2-4 Alternative Corridors for Section 2- Casino Wetland (Leitrim PSW) and the Raceway Facilities

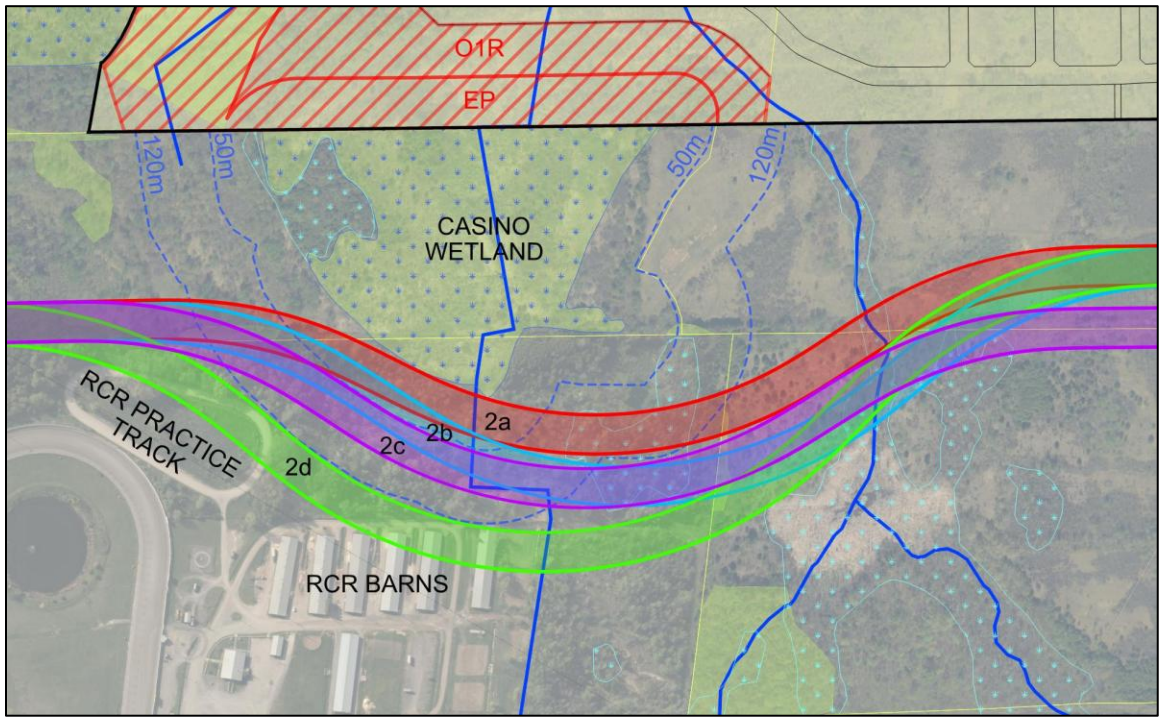
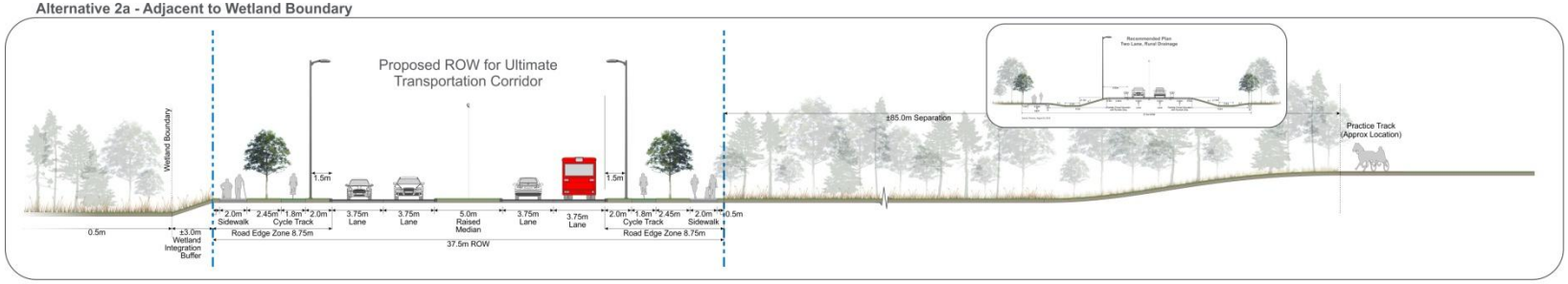
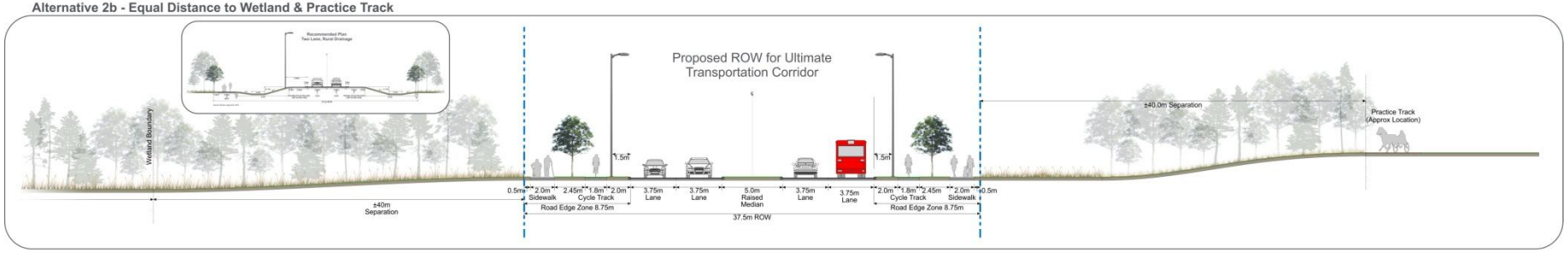


Figure 2-5 Representative Cross Sections for Section 2

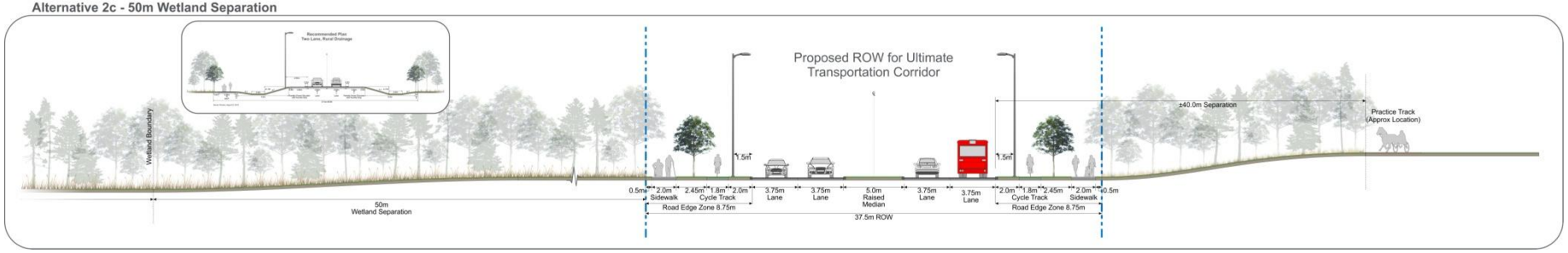
Alternative 2a - Adjacent to Wetland Boundary



Alternative 2b - Equal Distance to Wetland & Practice Track



Alternative 2c - 50m Wetland Separation



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To assist with the evaluation of the four options for focused evaluation for section 2, differentiating criteria were selected from the long list of criteria. The full evaluation and discussion follows.

Table 2-5 Results of Focused Evaluation for Section 2

			Alternative				
Number	**Criteria**	**Indicator**	**2a**	**2b**	**2c**	**2d**	**Qualifier**
Ecological and Physical Sustainability							
5a	**Protection of Existing Vegetation**	Optimizes the incorporation of existing valued natural/vegetated areas					Indicators that avoid valued natural/vegetated areas will perform better for this indicator.
6c	**Surface Water, hydrology and Aquatic Habitat**	Provides opportunity to maintain hydrologic flow					Alternatives that avoid cutting through Provincially Significant Wetland or respect established buffered areas will perform better for this indicator.
7a	**Natural Heritage Features**	Minimizes or avoids impacts on designated features of the City's natural heritage system					Alternatives that minimize or avoid impacts (including limiting fragmentation) to areas designated in the City's natural heritage system or other identified natural areas will perform better for this indicator.
8a	**Wildlife**	Minimizes disruption to wildlife connection and movements					Alternatives that maintain or create wildlife travel corridors and optimize provision of eco-crossings will perform better for this indicator.
9a	**Wetlands**	Minimizes impacts to the Provincially Significant Wetland within the Study Area					Alternatives that are placed the furthest, and respect studied or provincially recognized buffer areas, from the Leitrim (including Casino portion) Provincially Significant Wetland will perform better for this indicator.
9b		Minimizes impacts to non-Provincially Significant wetlands within the Study Area					Alternatives that propose the least amount of development within non-Provincially Significant wetlands will perform better for this indicator.
Land Use and Community Sustainability							

			Alternative				
Number	**Criteria**	**Indicator**	**2a**	**2b**	**2c**	**2d**	**Qualifier**
12b	**Community Planning & Design**	Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses					Alternatives that minimize or avoid large property takings or minimize creating awkward property shapes and sizes will perform better for this indicator.
12c		Minimizes impacts to existing land uses					Alternatives that minimize or avoid acquisition or relocation of built assets will perform better for this indicator.
14a	**Noise and Vibration**	Maximizes separation between the roadway (a potential noise and vibration source) and sensitive receivers					Alternatives that maximize their separation from existing and planned sensitive land uses will perform better for this indicator.
Climate Change Mitigation and Adaptation							
16e	**Climate Change Mitigation (Effect of Project on Climate Change)**	Potential for protecting and/or enhancing carbon sinks					Alternatives that maintain and enhance forests, wetlands, and vegetated areas will perform better for this indicator.
16f		Maximizes the potential of ecological system to respond successfully to climate change					Alternatives that enable the enhancement or maintenance of green and natural corridors will perform better for this indicator.
Economic Sustainability							
19d	**Life Cycle Cost**	Minimizes property acquisition cost					Alternatives that avoid unnecessary or temporary reconstruction of existing infrastructure will perform better for this indicator.

- Performs Very Well
- Performs Well
- Performs Adequately
- Performs Poorly
- Fails

Abutting the wetland boundary (Alternative 2a), with no natural buffer, would not consider recommendations from a completed environmental management plan (Golder Associates Ltd., 2016) that required buffer areas adjacent to the PSW including a 50m no-build zone and additional 70m limited use zone for ecological function and value. This corridor would deplete the natural value of these lands which also contribute to managing climate change by providing vegetated areas that could act as carbon sinks.

A corridor was drawn that attempted to split the distance between the identified wetland boundary and the RCR facilities while keeping an appropriate geometric design (Alternative 2b). This corridor would require mitigation/compensation for impacts to the PSW as it fails to provide the 50m offset required to ensure hydrologic flow to the PSW.

A 50m offset to the PSW (Alternative 2c) provides some protection to its ecological function, by respecting the no-build buffer outlined in approved environmental management plans. It should further be noted that 50m is measured from the pinch point between the boundary of the PSW and the raceway facilities, specifically the practice track; this offset is greater for most of the alternative. This buffer will also respect the natural environment's value as a carbon sink providing a positive influence on reducing impacts of the project on climate change. This alternative would place the edge of the right-of-way within approximately 40m of the raceway facilities and approximately 50m to the edge of travel.

The distance between the wetland boundary and the raceway facilities is precisely 120m offset. The Provincial Policy Statement (2014) establishes the 120m offset to items of provincial importance, such as the PSW in this case. Outside of 120m, development could occur without the requirement for an environmental impact assessment or mitigation measures. Alternative 2d illustrates a corridor that fully respects this offset. However, the Raceway facilities would be significantly impacted, requiring the relocation of the practice track and several horse barns and would sterilize a large portion of the property from development. Following evaluation, this alternative was removed from further consideration. It is important to note that the Provincial Policy Statement does not include public infrastructure as development, and as such, a roadway, such as the extension of Earl Armstrong Road, could be built within the wetland or other natural heritage features themselves as well as their associated adjacent areas. However, alternatives that impact these lands should be avoided or minimized to the greatest extent possible, especially if other alternatives exist.

Following evaluation, Alternative 2c is the Preliminary Preferred Corridor for this section.

2-6 Focused Evaluation of Section 3: East to Bank Street Alternatives

There are six alternatives in the vicinity of the on-going development in the southern portion of the Leitrim Community referred to as Findlay Creek, adjacent to the current Urban Boundary, travelling east towards Bank Street. The alternative corridors were developed with consideration given to separation distances and triggers for noise mitigation to planned sensitive uses (future residential backyards) as well as consideration for the remaining property sizes and their flexibility for future land use planning. Six possible alternative corridors for the roadway for this section were considered; these are listed below and shown in Figure 2-6:

3a. Abutting North Property Limit, Noise Mitigation Wall

3b. Adjacent to North Property Limit, Noise Mitigation Earth Berm

3c. 130m Separation from North Property Limit, No Noise Mitigation Requirement

3d. Straddling South Property Line

3e. Diagonal Route

3f. Southerly Route

Cross sections have been prepared to help illustrate the discussion of options 3a through 3f as shown in Figure 2-7.

Figure 2-6 Alternative Corridors for Section 3 – East to Bank Street

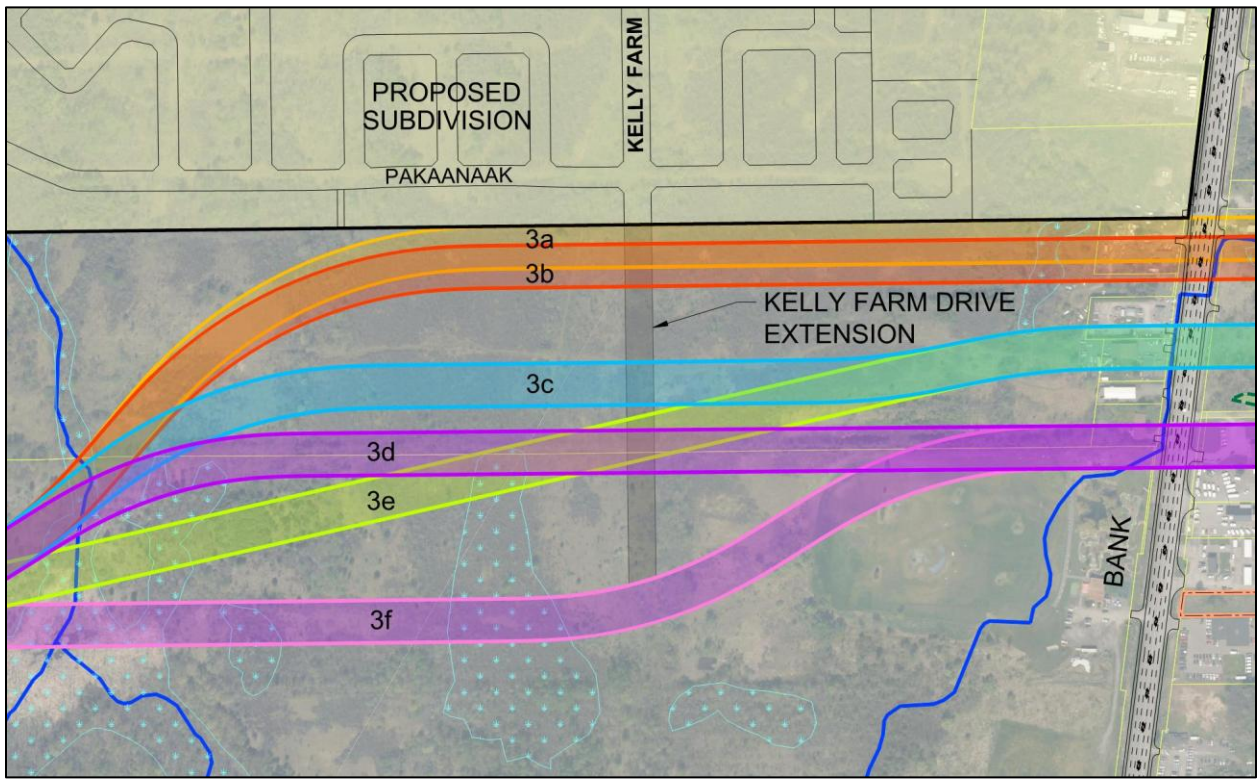
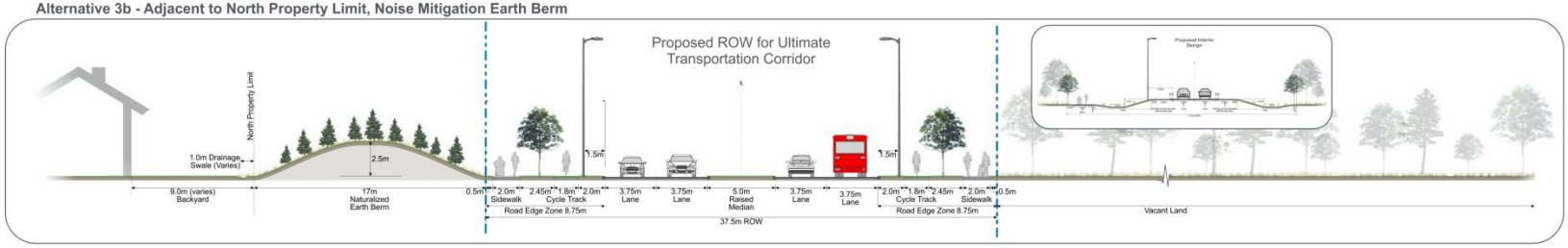


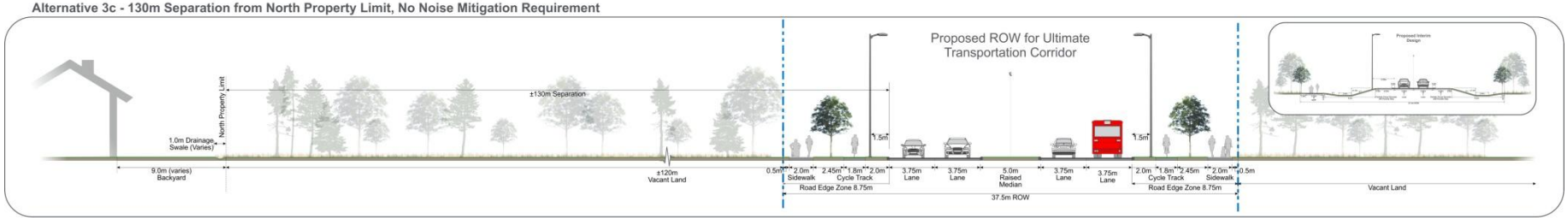
Figure 2-7 Representative Cross Sections for Section 3

Alternative 3a - Abutting North Property Limit, Noise Mitigation Wall

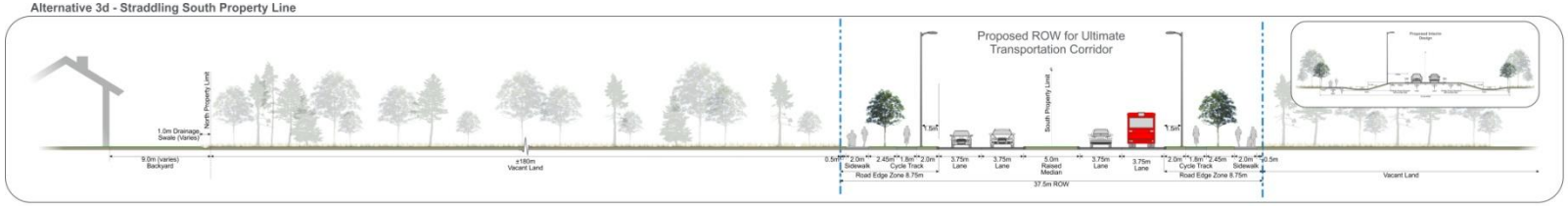
Alternative 3b - Adjacent to North Property Limit, Noise Mitigation Earth Berm



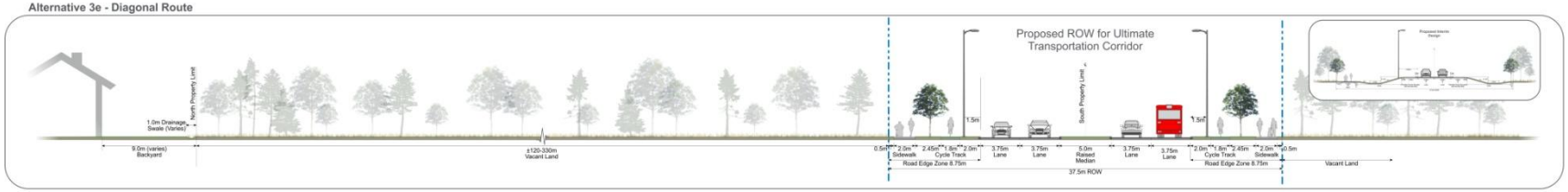
Alternative 3c - 130m Separation from North Property Limit, No Noise Mitigation Requirement



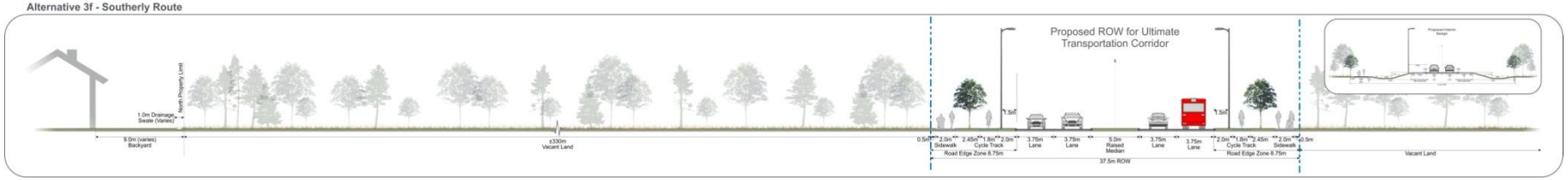
Alternative 3d - Straddling South Property Line



Alternative 3e - Diagonal Route



Alternative 3f - Southerly Route



To assist with the evaluation of the six alternatives for focused evaluation for section 3, the differentiating criteria were selected from the long list of criteria. The full evaluation and discussion follows.

Table 2-6 Results of Focused Evaluation for Section 3

			Alternative						
Number	**Criteria**	**Indicator**	**3a**	**3b**	**3c**	**3d**	**3e**	**3f**	**Qualifier**
Transportation System Sustainability									
2a	**Active Transportation**	Provides the opportunity to connect to existing pedestrian and cycling facilities within the Study Area							Alternatives that provide more flexibility and are more centrally located to land uses to existing or planned facilities will perform better for this indicator.
3a	**Transit Network**	Maximizes opportunity for convenient and accessible bus stops							Alternatives that are bordered by ridership generating land uses will perform better for this indicator.
Ecological and Physical Sustainability									
6c	**Surface Water, hydrology and Aquatic Habitat**	Provides opportunity to maintain hydrologic flow							Alternatives that avoid disruption to hydrologic flow will perform better for this indicator.
8a	**Wildlife**	Minimizes disruption to wildlife connection and movements							Alternatives that maintain or create wildlife travel corridors and optimize provision of eco-crossings will perform better for this indicator.
9b	**Wetlands**	Minimizes impacts to non-Provincially Significant wetlands within the Study Area							Alternatives that propose the least amount of development within non-Provincially Significant wetlands will perform better for this indicator.
Land Use and Community Sustainability									
12a	**Community Planning & Design**	Consistent with area plans for Leitrim community development							Alternatives that minimize potential changes to current or planned land use designations will perform better for this indicator.

			Alternative						
Number	Criteria	Indicator	3a	3b	3c	3d	3e	3f	Qualifier
12b		Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses							Alternatives that minimize or avoid large property takings or minimize creating awkward property shapes and sizes will perform better for this indicator.
12c		Minimizes impacts to existing land uses							Alternatives that minimize or avoid acquisition or relocation of built assets will perform better for this indicator.
14a	Noise and Vibration	Maximizes separation between the roadway (a potential noise and vibration source) and sensitive receivers							Alternatives that maximize their separation from existing and planned sensitive land uses will perform better for this indicator.
14b		Minimizes the need for noise mitigation							Alternatives that avoid the need for noise walls and earth berms as noise mitigation will perform better for this indicator.
Climate Change Mitigation and Adaptation									
16e	Climate Change Mitigation (Effect of Project on Climate Change)	Potential for protecting and/or enhancing carbon sinks							Alternatives that maintain and enhance forests, wetlands, and vegetated areas will perform better for this indicator.
16f		Maximizes the potential of ecological system to respond successfully to climate change							Alternatives that enable the enhancement or maintenance of green and natural corridors will perform better for this indicator.
17j	Climate Change Adaption (Effect of Climate Change on Project)	Maximizes the safety and comfort of corridor users exposed to the environment							Alternatives that provide the best shading, sheltering, visibility and are located central to land uses will perform better for this indicator.
Economic Sustainability									
19d	Life Cycle Cost	Minimizes property acquisition cost							Alternatives with the least amount of land acquisition will perform better for this indicator.

			Alternative						
Number	Criteria	Indicator	3a	3b	3c	3d	3e	3f	Qualifier
	Performs Very Well								
	Performs Well								
	Performs Adequately								
	Performs Poorly								
	Fails								

Based on the current understanding of the subdivision plan for the development lands in Leitrim, those lands immediately abutting the urban boundary and Alternative 3a would require a lengthy noise wall along the corridor to buffer the roadway from the backyards of the planned residential uses. The resulting design would be counter to policy direction to avoid lengthy noise walls along Arterial Roads not only for the capital cost implication, but also the poor visual environment it would create along the corridor.

Similarly, Alternative 3b would require the use of noise attenuation but would be in the form of an earth berm to provide noise mitigation to the backyards of the planned residential uses in Leitrim. This alternative would create a better visual environment but would require a large property acquisition to accommodate it (approximately 14m in addition to the road corridor requirement). The berming also has the potential to create a barrier to wildlife movements and hydrologic flow to the Leitrim PSW.

Alternative 3c places the corridor away from the planned development in Leitrim at a distance that was determined by noise experts to be a distance where noise mitigation would not be required. The remaining property, approximately 120m between the proposed corridor and the current urban boundary is sufficient in depth that it could be developed in the future for a range of land uses. The alternative would essentially bisect the property east-west and may limit the range of uses that could be developed south of the corridor unless additional lands could be sought to consolidate.

Alternative 3d places the corridor centerline on the property boundary of two large adjacent parcels. This alternative would require property from two owners, therefore sharing the right-of-way property requirement. Noise mitigation would not be required between the new roadway and the planned residential uses within Leitrim community. Further, this corridor has the additional benefit of a relatively straight roadway providing an efficient and direct east-west connection. This alternative provides approximately 180m of remaining property between the proposed corridor and the Findlay Creek community which provides many options for future use.

Alternatives 3e and 3f would result in large property fragmentation and create awkward property parcels due to diagonal alignments across existing property boundaries or indirect curves in the roadway for east-west travel. Further, Alternative 3f provides a longer and less-efficient route based on the predominant travel demand destined north and northeast of the Study Area (e.g. to Bank Street and to Hunt Club at Highway 417 interchange).

Following evaluation, Alternative 3d was identified as the Preliminary Preferred Corridor for this section.

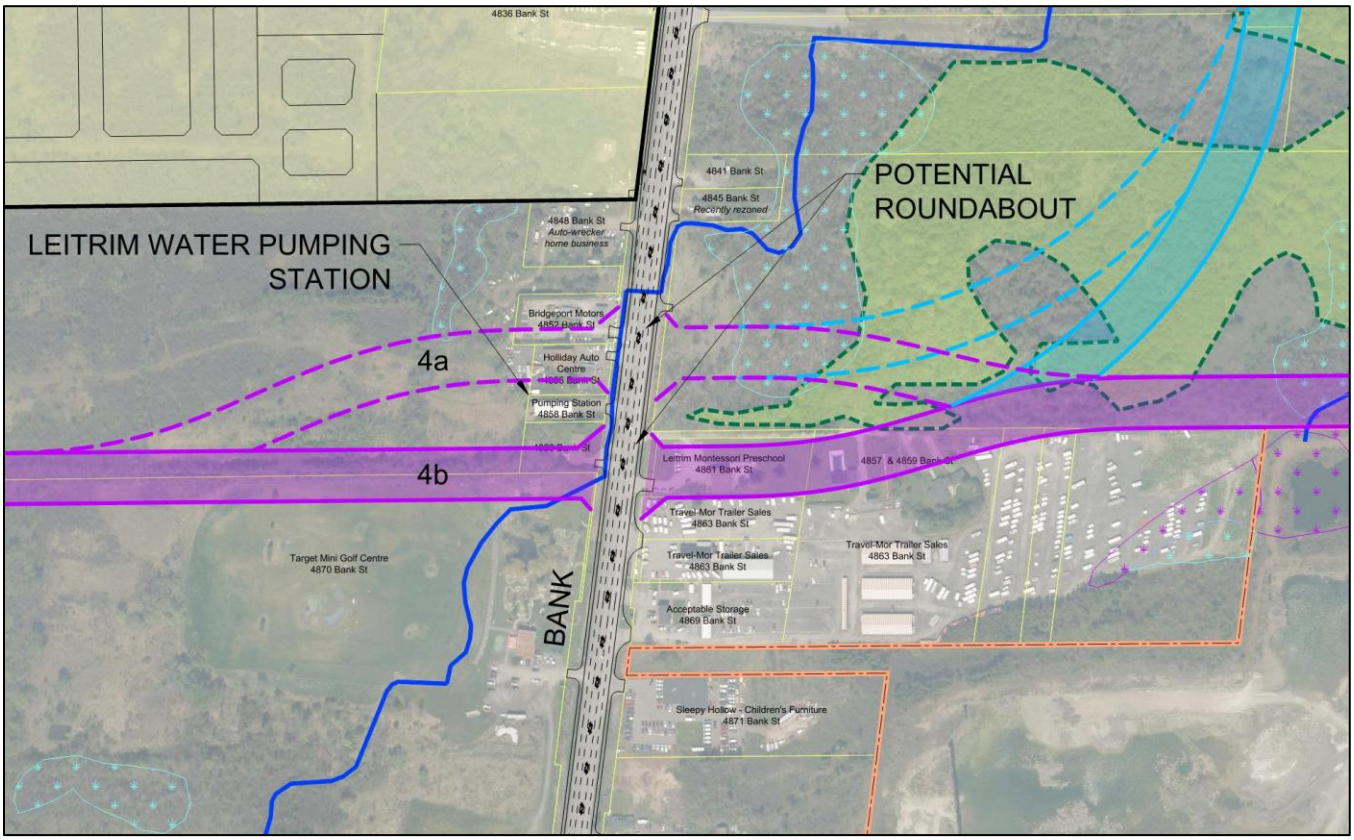
2-7 Focused Evaluation of Section 4: Bank Street Crossing Alternative

The previous sections of this report have identified the Preliminary Preferred Corridor for the sections west of Bank Street. The next step is to determine the optimal location to cross Bank Street. In this area, the Leitrim Water Pumping Station (PS) at 4858 Bank Street is a major infrastructure asset that would have significant cost and service disruption to move. To avoid impacts to the Leitrim Water PS there are two alternatives to cross Bank Street, listed below and shown in Figure 2-8:

4a North of the Leitrim Water Pumping Station

4b. South of the Leitrim Water Pumping Station

Figure 2-8 Alternative Corridors for Section 4 - Bank Street Crossing



To assist with the evaluation of the two options for focused evaluation for section 4, differentiating criteria were selected from the long list of criteria. The full evaluation and discussion follows.

Table 2-7 Results of Focused Evaluation for Section 4

			Alternative		
Number	**Criteria**	**Indicator**	**4a**	**4b**	**Qualifier**
Transportation System Sustainability					
4c	**Arterial Road Network**	Provides a direct, efficient and continuous east-west travel route through the Study Area			Longer alternatives will perform poorly for this indicator. Alternatives that result in optimal sightlines will perform better for this indicator.
Ecological and Physical Sustainability					
5a	**Protection of Existing Vegetation**	Optimizes the incorporation of existing valued natural/vegetated areas			Indicators that avoid valued natural/vegetated areas will perform better for this indicator.
7a	**Natural Heritage Features**	Minimizes or avoids impacts on designated features of the City's natural heritage system			Alternatives that minimize or avoid impacts (including limiting fragmentation) to areas designated in the City's natural heritage system or other identified natural areas will perform better for this indicator.
Land Use and Community Sustainability					
12b	**Community Planning & Design**	Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses			Alternatives that minimize or avoid large property takings or minimize creating awkward property shapes and sizes will perform better for this indicator.
12c		Minimizes impacts to existing land uses			Alternatives that minimize or avoid acquisition or relocation of built assets will perform better for this indicator.
15a	**Air Quality**	Maximizes fuel efficient driving behavior			Alternatives that have adequate vehicle capacity and that have an efficient arrangement of intersections including sightlines for approaches will perform better for this indicator.
Climate Change Mitigation and Adaptation					
16a	**Climate Change Mitigation (Effect of Project on Climate Change)**	Minimizes potential effects on climate resulting from driving behaviour			Alternatives that encourage fuel efficiency by providing the most direct and efficient travel route through the Study Area will perform better for this indicator.

			Alternative		
Number	Criteria	Indicator	4a	4b	Qualifier
	Performs Very Well				
	Performs Well				
	Performs Adequately				
	Performs Poorly				
	Fails				

Alternative 4a proposes crossing Bank Street north of the Leitrim Water Pumping Station. This alternative is a less direct route, as it brings travelers north, only to go south again (assuming findings for section 5) which creates a less fuel-efficient route. This alternative displaces two businesses and also fragments another property parcel resulting in odd geometry which would limit options for future use. This alternative would also fragment a portion of the natural heritage system which includes significant woodlands and unevaluated wetlands.

Alternative 4b is the more direct and efficient route, which maximizes fuel efficient driving behavior and minimizes travel distance. This alternative does not fragment the natural heritage system. Alternative 4b results in slightly less awkward development parcels. Alternative 4b brings the road alignment adjacent to rural commercial and industrial uses providing an opportunity to better serve these land uses. Both alternatives will impact businesses, and 4b will impact an institutional land use that is located in a rural commercial zone. Two (2) residences are also displaced in Alternative 4b. However, one of the residences can be considered an interim use given that it is located in a rural industrial zone.

Following evaluation, Alternative 4b has been identified as the Preliminary Preferred Corridor for this section.

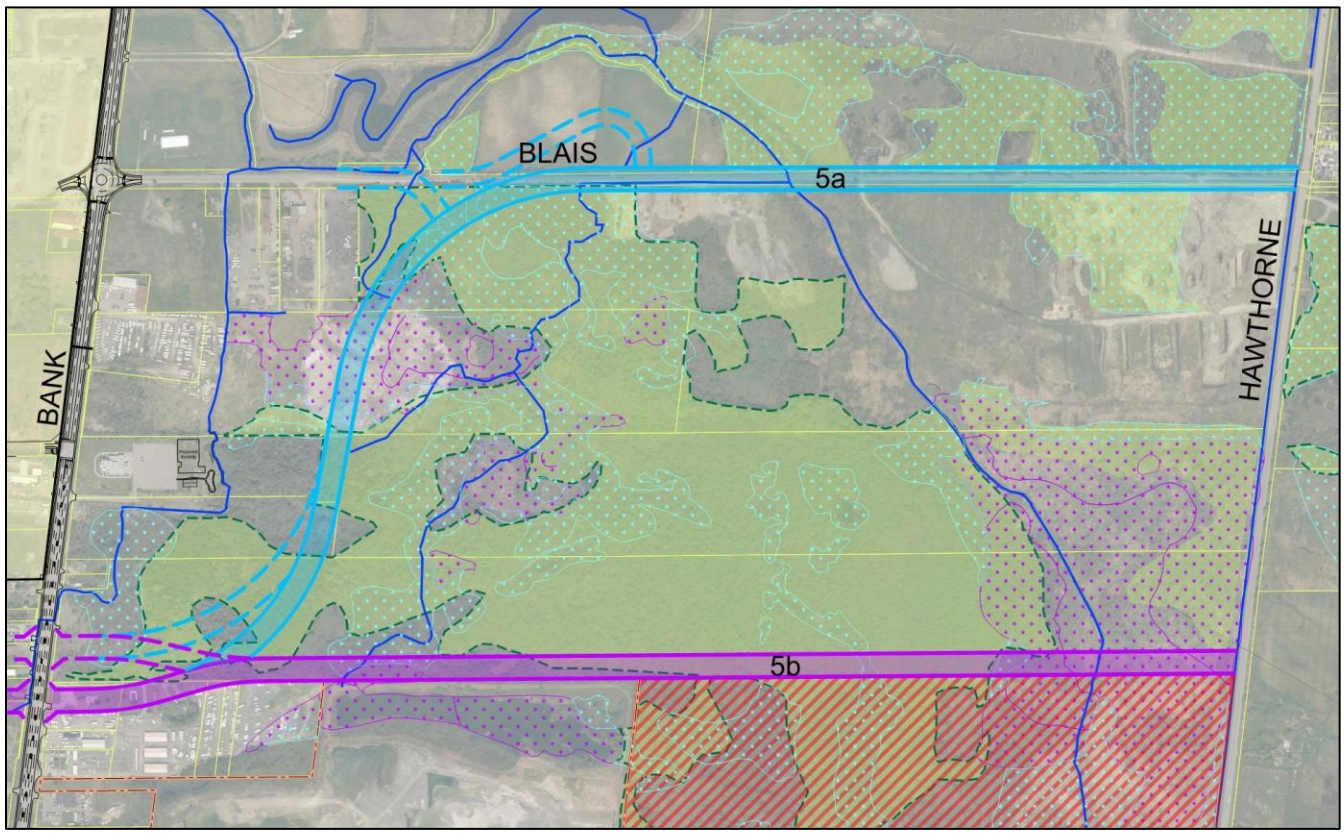
2-8 Focused Evaluation of Section 5: Bank Street to Hawthorne Road Alternatives

Two alternative corridors between Bank Street and Hawthorne Road were subject to a focused evaluation. These are listed below and shown in Figure 2-9**.**

5a A diagonal northeast alignment that would utilize a portion of Blais Road

5b. A straight alignment that would form the northern edge to the Rural Commercial and Rural Industrial active and future aggregate use zones.

Figure 2-9 Alternative Corridors for Section 5 - Bank Street to Hawthorne Road



To assist with the evaluation of the two options for section 5, differentiating criteria were selected from the long list of criteria. The full evaluation and discussion follows.

Table 2-8 Results of Focused Evaluation for Section 5

			Alternative		
Number	**Criteria**	**Indicator**	**5a**	**5b**	**Qualifier**
Transportation System Sustainability					
4b	**Arterial Road Network**	Provides vehicular access to planned communities and development lands			Alternatives that provide direct access to planned communities and development lands perform better for this indicator.
4c		Provides an efficient and continuous east-west travel route through the Study Area			Shorter alternatives and those alternatives that result in optimal sightlines will score better for this indicator.
Ecological and Physical Sustainability					
5a	**Protection of Existing Vegetation**	Optimizes the incorporation of existing valued natural/vegetated areas			Indicators that avoid valued natural/vegetated areas will perform better for this indicator.
6a	**Surface Water, hydrology and Aquatic Habitat**	Results in the least amount of stormwater management requirements			Alternatives with the shortest length will perform better for this indicator.
6b		Minimizes impact on or loss of existing aquatic habitat			Alternatives that involve the fewest number or length of watercourse crossings will perform better for this indicator.
7a	**Natural Heritage Features**	Minimizes or avoids impacts on designated features of the City's natural heritage system			Alternatives that minimize or avoid impacts (including limiting fragmentation) to areas designated in the City's natural heritage system or other identified natural areas will perform better for this indicator.
7b		Minimizes or avoids impacts on significant woodlands			Alternatives that minimize or avoid impacts (including limiting fragmentation) to significant woodlands will perform better for this indicator.
8a	**Wildlife**	Minimizes disruption to wildlife connection and movements			Alternatives that maintain or create wildlife travel corridors and optimize provision of eco-crossings will perform better for this indicator.

			Alternative		
Number	**Criteria**	**Indicator**	**5a**	**5b**	**Qualifier**
9b	**Wetlands**	Minimizes impacts to non-Provincially Significant wetlands within the Study Area			Alternatives that propose the least amount of development within non-Provincially Significant wetlands will perform better for this indicator.
Land Use and Community Sustainability					
12b	**Community Planning & Design**	Supports the orderly arrangement and organization of land uses/diminishes fragmentation of land uses			Alternatives that minimize or avoid large property takings or minimize creating awkward property shapes and sizes will perform better for this indicator.
15a	**Air Quality**	Maximizes fuel efficient driving behavior			Alternatives that have adequate vehicle capacity and that have an efficient arrangement of intersections including sightlines for approaches will perform better for this indicator.
15b		Minimizes travel distance and associated infrastructure			Alternatives with the shortest travel distance and fewer intersections will perform better for this indicator.
Climate Change Mitigation and Adaptation					
16a	**Climate Change Mitigation (Effect of Project on Climate Change)**	Minimizes potential effects on climate resulting from driving behaviour			Alternatives that encourage fuel efficiency by providing the most direct and efficient travel route through the Study Area will perform better for this indicator.
16b		Promotes a reduction in vehicle kilometres travelled			Alternatives that encourage the use of active travel modes and/or alternatives that provide direct travel routes avoiding multiple turning movements will perform better for this indicator.
16e		Potential for protecting and/or enhancing carbon sinks			Alternatives that maintain and enhance forests, wetlands, and vegetated areas will perform better for this indicator.
16f		Maximizes the potential of ecological system to respond successfully to climate change			Alternatives that enable the enhancement or maintenance of green and natural corridors will perform better for this indicator.

			Alternative		
Number	**Criteria**	**Indicator**	**5a**	**5b**	**Qualifier**
16g		Minimizes effects on climate change from the amount of materials used in construction			Alternatives that reuse and upgrade existing facilities will minimize the amount of waste and therefore will perform better for this indicator.
16h		Minimizes the life cycle maintenance and operation requirements			Alternatives with lower infrastructure renewal and operation costs i.e., shorter alternatives will perform better for this indicator.
Economic Sustainability					
18a	**Phasing and Implementation**	Maximizes the ability to phase and incrementally implement the project			Alternatives that utilize existing infrastructure and/or can be implemented as part of adjacent land development will perform better for this indicator.
18b		Minimizes the propensity for traffic diversion during construction			Alternatives that avoid disruption to existing roadways or construction of new intersections in the Study Area will perform better for this indicator.
19b	**Life Cycle Cost**	Minimizes infrastructure design and construction costs			Alternatives that are shorter and contain fewer intersections will perform better for this indicator.
19c		Minimizes maintenance and operation costs			Alternatives that are shorter and contain fewer signalized intersections will perform better for this indicator.
19d		Minimizes property acquisition cost			Alternatives with the least amount of land acquisition will perform better for this indicator.

- Performs Very Well
- Performs Well
- Performs Adequately
- Performs Poorly
- Fails

Alternative 5a quickly curves northward to meet with and utilize a portion of existing Blais Road right-of-way. To facilitate a direct and efficient extension of the roadway, this alternative will also require a road tie-in to existing Blais Road west of the proposed extension tie-in. This alignment creates fragmentation of the natural heritage system and of the property parcels. While a portion of the existing Blais Road right-of-way (approximately 20-23m) would be utilized, this alternative would still require the acquisition of adjacent lands to accommodate the widening to an ultimate four lane cross-section. Coupled with additional land requirements to build a tie-in to existing Blais Road, the overall property impacts would be higher for this alternative as well as include the additional cost of a new intersection to enable the remaining Blais Road to connect with the future Arterial road. This alternative would affect seven different properties with seven different owners. While a possible first phase of the Earl Armstrong Road extension as a two-lane roadway would benefit from using existing Blais Road for a period of time, the roadway would also be out of use during construction requiring travelers to find alternative east-west routes through the Study Area.

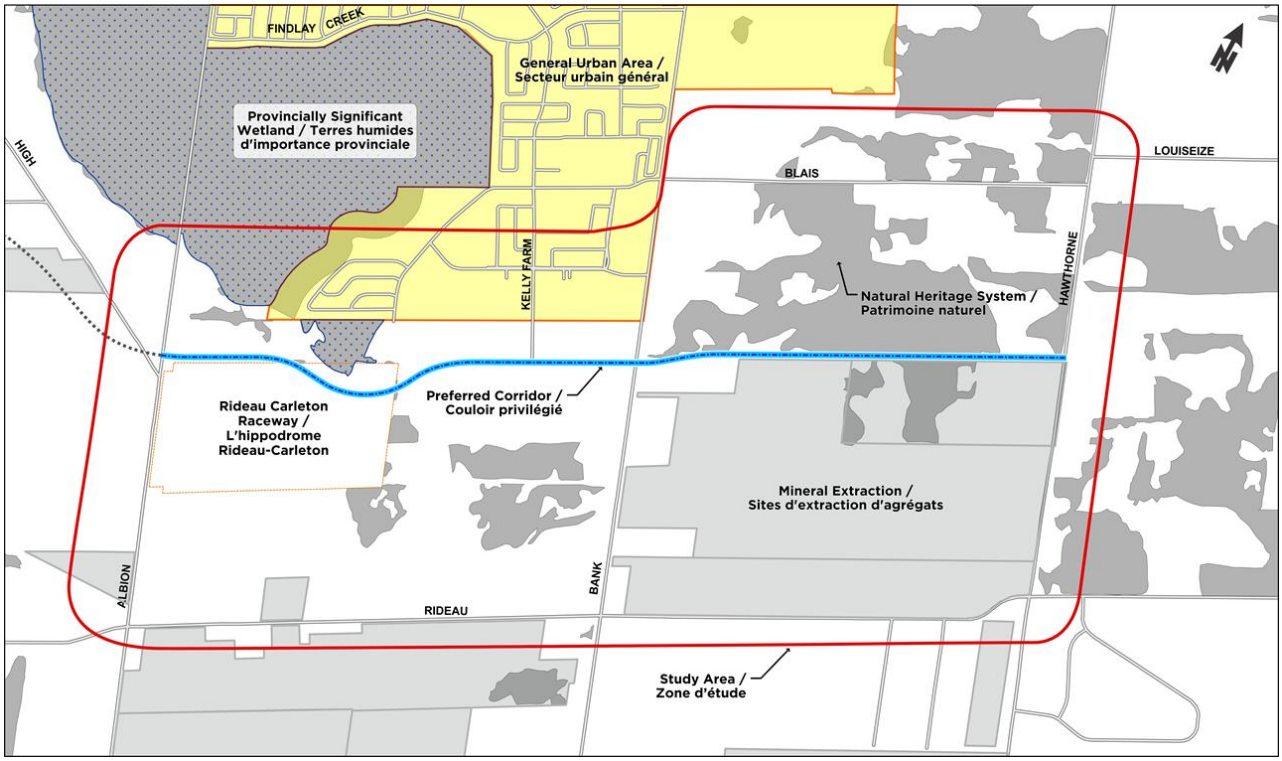
Alternative 5b creates a physical boundary to active and future aggregate uses while providing a direct and efficient easterly extension of the roadway. Further, this alternative provides more resiliency in the transportation network by providing an additional east-west travel option in the Study Area, given that Blais Road would remain in service as a Collector road. Further, a new roadway could be constructed as a two-lane rural Arterial as the first phase to meet the anticipated traffic demand and Blais Road would continue to function as a collector. This would reduce the overall design and construction costs and associated operation and maintenance costs in the future. In addition, this alternative would have minimal traffic disruption during construction given it would be a new corridor. The edge effect to the natural heritage system currently exists being adjacent to existing aggregate uses. The alternative would not further fragment the natural heritage system as aggregate extraction is anticipated to remove existing vegetation along the entire southern extent of the proposed corridor. Only two properties/landowners would be directly affected by this alternative.

Following evaluation, Alternative 5b has been identified as the Preliminary Preferred Corridor for this section.

2- 9 Preliminary Preferred Corridor: Complete Alignment

On the basis of the foregoing, the Preliminary Preferred Corridor for the complete project is shown in Figure 2-10. It provides an efficient, continuous corridor, adds travel options and is supportive of a robust and resilient transportation network. West of Bank Street the preliminary preferred corridor minimizes impacts to the PSW and through mitigation can provide opportunities for its enhancement and prevent further encroachment. The corridor is supportive of community development, limits property fragmentation and acquisition and eliminates the need for noise mitigation for existing adjacent communities. East of Bank Street, the Preliminary Preferred Corridor will allow Blais Road to continue to provide east-west travel capacity and operate while the Earl Armstrong extension is constructed. It will provide an additional east-west travel route in the Study Area connecting the southern communities of Riverside South and Leitrim and beyond. Being the most direct route between Bank Street and Hawthorne Road, land acquisition costs will be lower. The corridor would maintain the current edge treatment of the natural heritage system and provide a hard boundary to the existing and future aggregate operations.

Figure 2-10 Preliminary Preferred Corridor



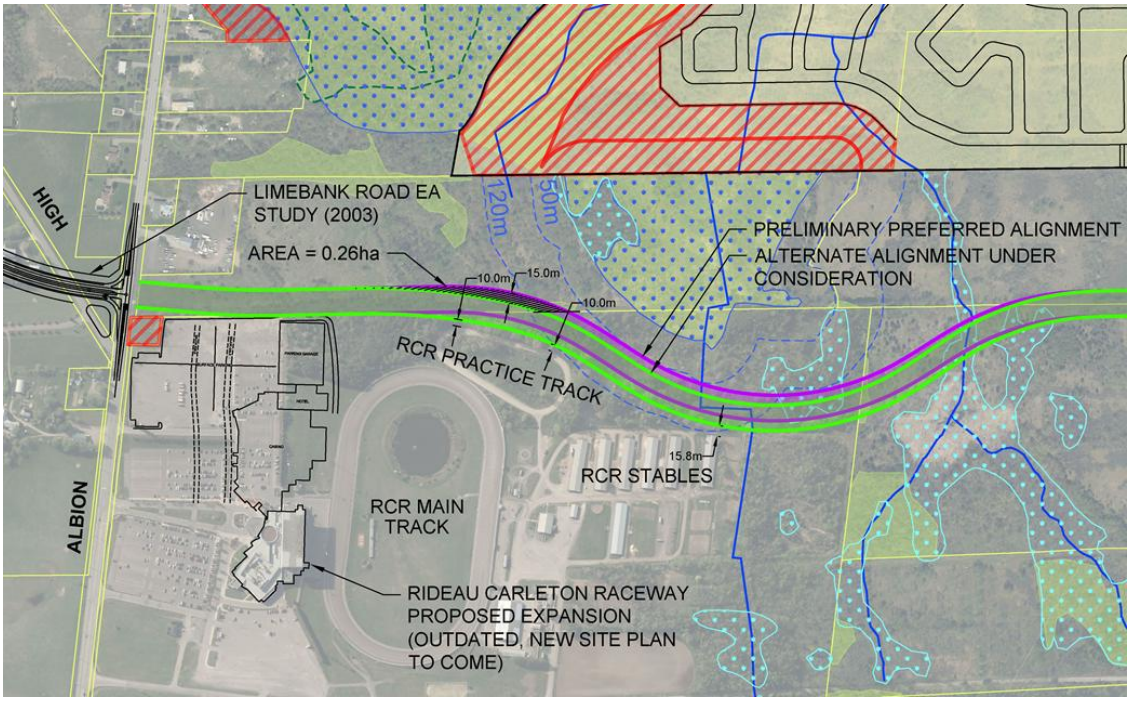
2-10 Stakeholder Consultation and Refinement of Preliminary Preferred Corridor

The first set of meetings with the Agency, Business and Public Consultation groups were held on November 1 and 14, 2018 and the first Public Open House was held on January 16, 2019. The second round of Consultation Group meetings was held on March 18 and 20, 2019, which was followed by the second Public Open House on April 3, 2019. In addition, numerous focused stakeholder meetings were held with landowners on as-needed basis to discuss specific issues and opportunities. These consultation events were used to receive feedback on the evaluation of alternative corridors, preliminary preferred corridor and draft recommended plan. Input received included discussion on the following topics:

- Further analysis of the alignment and intersection location options at Bank Street and Hawthorne Road;
- Clarifying the tie-in location of the intersection at Albion Road for this project;
- Clarifying the future potential extension of Earl Armstrong Road easterly to Highway 417;
- Clarifying the role of Rideau Road and Hawthorne Road in the road network;
- Defining the role of the road extension as part of the City-wide truck route network;
- Leveraging the benefits of the road extension for public transit;
- Respecting the natural environment heritage system and avoid/minimize impacts to it;
- Providing an appropriate setback from the Casino Wetland;
- Considering opportunities to mitigate property impacts;
- Clarifying the impacts to businesses and properties;
- Providing safe facilities for a variety of mobility choices; and,
- Recognizing the need for the north-south travel demand as well as the east-west travel in this area.

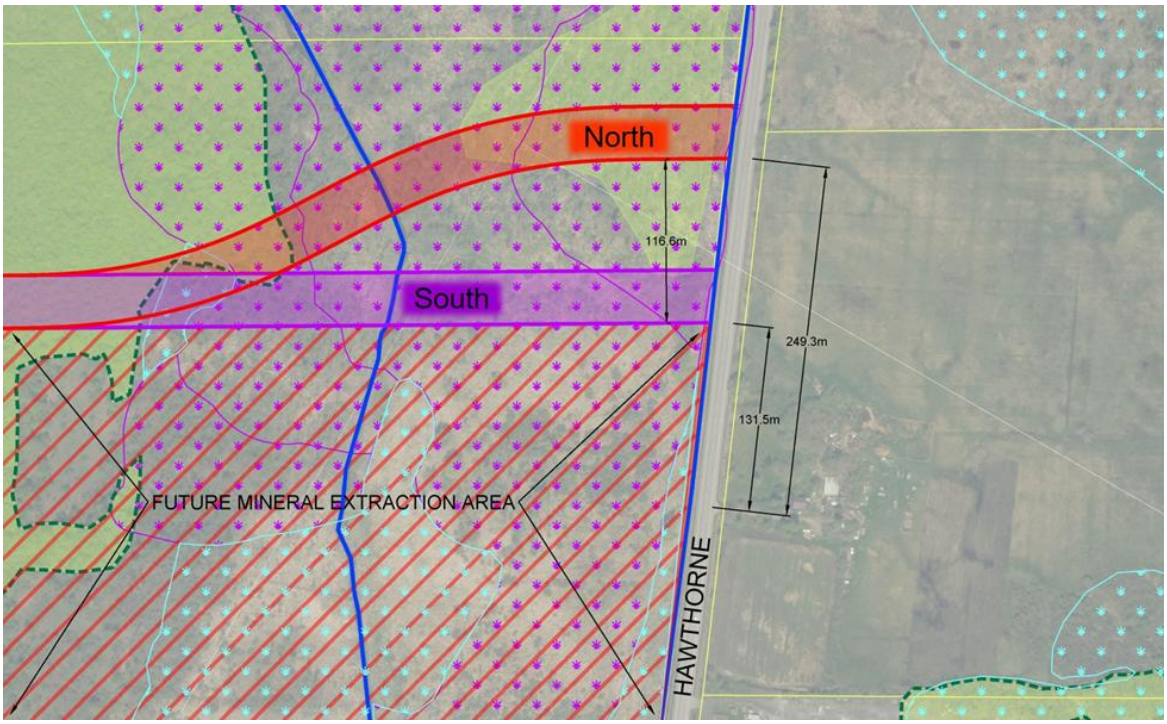
During the development of the Preliminary Recommended Plan, additional analyses were completed to address stakeholder input. The study team evaluated the opportunity to further offset the alignment from the Casino wetland and was able to successfully increase the offset by an additional 12m. The offset from the PSW is revised to be 62m at the narrowest point, and greater for the remainder of its length. This modification also reduced the land requirement impact on the property at 4721 Albion Road, while maintaining the ability for that property to have access to Earl Armstrong Road.

Figure 2-11 Additional offset between Casino Wetland and Earl Armstrong Road alignment



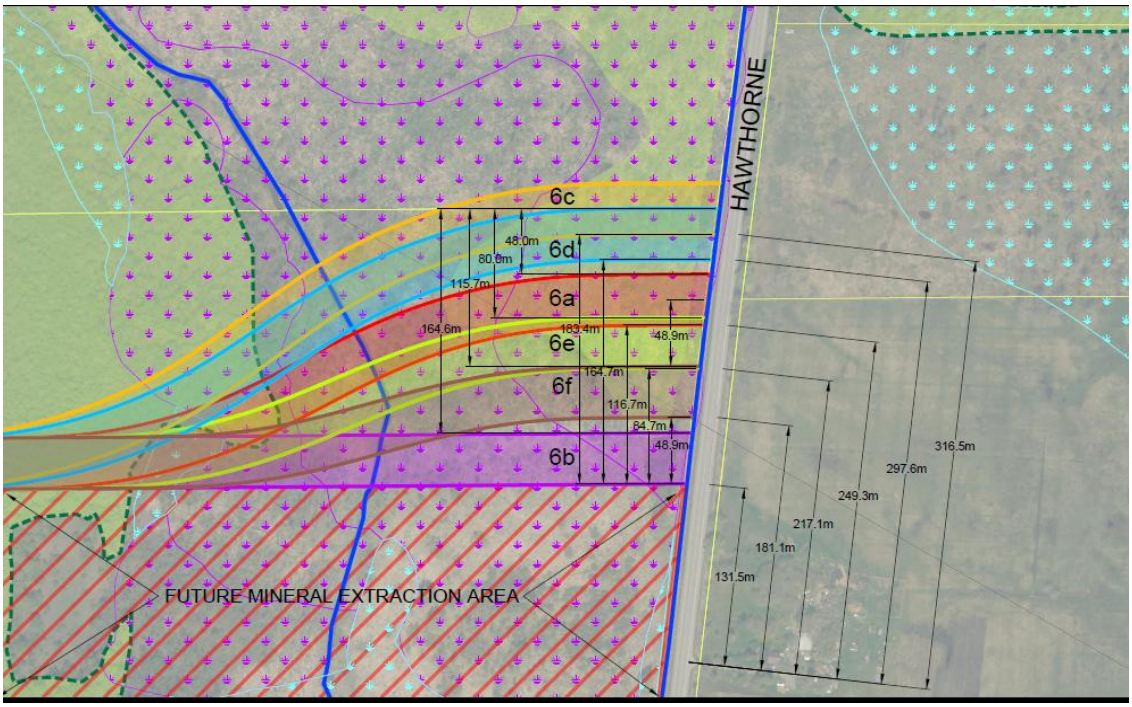
The study team also considered stakeholder input on the location of the intersection of Earl Armstrong Road with Hawthorne Road. A “North” and “South” option (see Figure 2-12) were presented as options. Whereas the North alignment would create a parcel fragment between the alignment and the nearest lot line to the south (west of Hawthorne Road), it has the notable benefits of separating the intersection from a rural residence and farm at 4571 Hawthorne Road and thereby minimizing potential impacts associated with traffic movements at the intersection. It also lines up with the north lot line of Lot 23, Concession 6, which forms the north boundary of the Agricultural Resource Area in the eastern portion of that lot. Furthermore, although the extension of Earl Armstrong Road east of Hawthorne Road is not recommended in the current TMP, aligning the road with the lot line may be helpful if further extension of Earl Armstrong Road is ever considered in the future.

Figure 2-12 Options for intersection location at Hawthorne Road



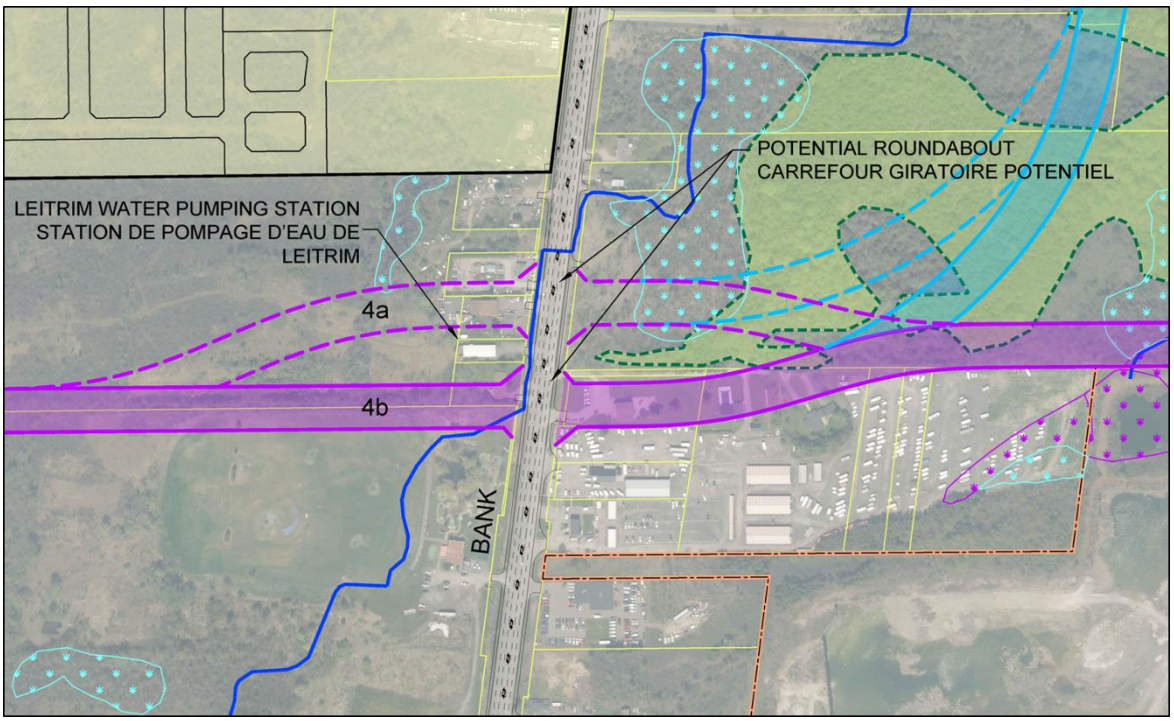
The discussions on the intersection location options at Hawthorne Road were elaborated further by preparing additional alignment options, as shown in Figure 2-13. The additional alignments were discussed with the landowner that would be most impacted by the required right-of-way and by fragmentation of the land parcel. After taking all of the landowners' comments into consideration, the City has recommended that alignment 6a be part of the final recommended alignment. Alignment 6a minimizes potential impacts associated with intersection movements to the existing land use east of Hawthorne Road, and leaves options for future use and development of the parcel west of Hawthorne Road.

Figure 2-13 Additional options for intersection location at Hawthorne Road



The study team also finalized its analysis of the Bank Street crossing location (see Figure 2-14). The straight-across option 4b is recommended since it minimizes land fragmentation, has less impact on commercial businesses, has less impact on the natural environment features, and is shortest and most direct alignment.

Figure 2-14 Alignment options at Bank Street



2-11 Preferred Corridor

Following the numerous consultation events and meetings with individual stakeholders the Preferred Corridor was prepared. The Preferred Corridor for the extension of Earl Armstrong Road is shown in Figure 2-15. It is recommended to be implemented in two phases: Albion Road to Bank Street (Phase 1) and Bank Street to Hawthorne Road (Phase 2).

Figure 2-15 Recommended Corridor