

Appendix D

Evaluation Process

- **Report on Analysis and Evaluation of Alternatives and Technically Preferred Alternative**

Report on Analysis and Evaluation of Alternatives and Technically Preferred Alternative

United Counties of Leeds and Grenville

**Class EA for the Four Lane Upgrade of CR43
Report on Analysis and Evaluation of
Alternatives and Selection of Technically
Preferred Alternative**

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December 17, 2009

Les Shepherd
Director of Works, Planning Services and Asset Management
United Counties of Leeds and Grenville
25 Central Avenue West, Suite 100
Brockville, Ontario K6V 4N6

Dear Mr Shepherd

Project No: 108480
Regarding: Class EA for the Four Lane Upgrade of CR43
Report on Analysis and Evaluation of Alternatives and Selection of Technically Preferred Alternative

We are pleased to present our evaluation report for the above mentioned project.

This report details the various alternatives that were considered by the Technical Steering Committee (TSC) and how they were evaluated to arrive at the Technically Preferred Alternative. The TSC made frequent reference to the Existing Conditions Report, which includes various specialist studies, in making its decisions. The reader may also wish to make reference to that document to better understand the TSC's position.

The TSC had previously identified three specific areas for which alternatives should be considered:

- for the typical cross section for the corridor,
- for the intersection control for the centre corridor (CR44 to James Street), and
- for the CR43 Bridge crossing of the South Branch of the Rideau River (Kemptville Creek).

A Technically Preferred Alternative has been chosen for each corridor aspect. Our next step is to seek public and agency input, following which the TSC will meet to consider changes or refinement of the preferred alternatives.

Sincerely,
AECOM Canada Ltd.



Guy Laporte, P.Eng.
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Executive Summary

This Study is a continuation of work that was undertaken by the United Counties of Leeds and Grenville in 2005/06. In April of 2006 the United Counties issued a report entitled "United Counties of Leeds and Grenville, County Road 43 Corridor Master Plan." The purpose of the Master Plan was to address transportation needs associated with a rapidly growing and developing corridor.

The intent of the Master Plan was to provide a sufficient level of planning to meet environmental assessment (EA) requirements for all Schedule 'B' projects in the Study Area. Various alternative solutions were considered to address the corridor's evolving transportation needs (Phases 1 and 2 of the Municipal Class EA process).

The study concluded with a decision by the Technical Steering Committee (TSC) to widen the corridor to four through lanes in the Kemptville urban area (from Highway 416 westerly to Somerville Road) which put this portion into a Schedule 'C' Municipal Class EA category. Schedule 'C' projects require more detailed environmental assessments, the Master Plan includes a recommendation that this work be completed, which is the objective of this study. Recommendations for the remainder of the corridor (from Highway 416 easterly to South Gower Drive) do not involve widening and will consist of a series of Schedule 'A' projects. Schedule 'A' projects are pre-approved and can proceed without further study. Construction of a roundabout is a Schedule 'A' project and may proceed at any time. Projects which are approved under the Planning Act may also proceed without an Environmental Assessment.

The Master Plan also looked in detail at alternative intersection controls, as these have significant impact on overall corridor requirements. With strong public support the Master Plan recommended that CR43 between Somerville Road and Highway 416 be developed as a four lane roundabout corridor.

In general, it was not the intent of this study to revisit the recommendations of the Master Plan. This study picks up at Phase 3 of the Municipal Class Environmental Assessment, looking at alternative design concepts for the Corridor Cross-Section Features, Centre Corridor Intersection Control and the CR43 Bridge. A team of technical specialists were assembled to provide an inventory of existing corridor features and to consider how different designs would impact important features. An Existing Conditions Report has been completed to document the specialist's work and to assist the TSC with its evaluation of alternatives. The Existing Conditions Report was completed in August 2009 and has been used by the TSC to assess the alternative design concepts.

The following report documents the analysis and evaluation of alternatives and the TSC's selection of the Technically Preferred Alternative. Alternatives have been evaluated against the natural, social and cultural environmental impacts as well as property impacts, engineering criteria and cost. A list of mitigation measures has also been developed which can be found in Chapter 3.

The TSC has identified and recommends the following Technically Preferred Alternative:

Alternative 5 for the corridor cross-section features – This alternative utilises a 30m corridor to contain a 2m wide centre median, 3.5m wide driving lanes and a landscaped boulevard with separation between the bicycle path (which is behind the curb) and the side walk.

Option 1 for the Centre Corridor Intersection Control – This alternative results in a complete roundabout corridor where all major intersections are controlled by roundabouts. This alternative is consistent with the philosophy set by the Corridor Master Plan.

Option 6 for the CR43 Bridge – This alternative maintains the existing 2-lane bridge while constructing a new, two-lane, 3-span bridge to the south. Approaches to the new bridge and would be constructed with reinforced earth, vertical retaining walls. This alternative has low impacts to the natural, social and cultural environments, and has low property and construction impacts.

The next step in the Class EA process is to present the Technically Preferred Alternative to the public and agencies. Feedback will be considered by the Technical Steering Committee and changes or refinements to the preferred alternative may follow.

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1. Introduction

AECOM has been retained by the United Counties of Leeds and Grenville to complete the Municipal Class Environmental Assessment for County Road 43 along the Kemptville Corridor from Somerville Road to the Ministry of Transportation boundary at Highway 416. This EA is to be completed in accordance with the 'Schedule C' requirements outlined in the "Municipal Class Environmental Assessment October 2000, as amended in 2007".

1.1 Purpose of Report

Phase 3 of the Municipal Class EA for a 'Schedule C' project requires an evaluation of alternative design concepts for the preferred solution identified in Phase 2 (Phase 2 for this study was completed by the previous Master Plan study).

The following report documents the analysis and evaluation of alternatives and the selection of the technically preferred alternatives made by the Technical Steering Committee (TSC) for the corridor. This report has been prepared by Shane Gray, EIT and Guy Laporte, P.Eng., of AECOM.

2. Background

The Technical Steering Committee met on two occasions to evaluate alternatives - on August 11, 2009 and September 8, 2009. The committee considered alternatives for three aspects of the corridor - Corridor Cross-Section Features, Centre Corridor Intersection Control and the CR43 Bridge. Due to the large number of alternatives for these three aspects, the evaluation process was stretched out over the two meetings and a technically preferred solution for each aspect was found.

During a summary and endorsement meeting on October 20, 2009 the TSC endorsed the two-lane bridge option to the south but recommended that further options with respect to approach fills be considered. The TSC scored harmful alteration, disturbance or destruction (HADD) of fish habitat as a major criterion ahead of cost which suggested that further options to reduce HADD area should be considered. A third alternative selection and evaluation meeting was held on November 24, 2009. This meeting evaluated four additional 2 lane bridge structures to the south of the existing bridge to determine if there was a better alternative which would decrease HADD area at an 'acceptable cost'.

August 11, 2009 meeting TSC attendees:

Les Shepherd,	United Counties of Leeds & Grenville
Sandy Hay,	United Counties of Leeds & Grenville
Jeff McEwen,	Municipality of North Grenville
Forbes Simon,	Municipality of North Grenville
Doug Boyd,	MTO
Mike Gibbs,	MTO
Hal Stimson,	RVCA
Guy Laporte,	AECOM
Shane Gray,	AECOM

September 8, 2009 meeting TSC attendees:

Les Shepherd,	United Counties of Leeds & Grenville
Jeff McEwen,	Municipality of North Grenville
Karen Dunlop,	Municipality of North Grenville
Doug Boyd,	MTO
Mike Gibbs,	MTO
Hal Stimson,	RVCA
Guy Laporte,	AECOM
Shane Gray,	AECOM

November 24, 2009 meeting TSC attendees:

Les Shepherd,	United Counties of Leeds & Grenville
Sandy Hay,	United Counties of Leeds & Grenville
Jeff McEwen,	Municipality of North Grenville
Karen Dunlop,	Municipality of North Grenville
Mike Gibbs,	MTO
Hal Stimson,	RVCA
Guy Laporte,	AECOM
Shane Gray,	AECOM

The Committed received specialist advice to assist it with its consideration of alternatives. This advice is summarized in the Existing Conditions Report which includes specialist studies on:

- Stormwater Management
- Bridge design and engineering alternatives
- Waterway Navigability
- Environment Site Evaluation
- Geotechnical
- Traffic
- Traffic Noise
- Socio-Economic and
- Archaeological

Presentations of these specialist reports were conducted at the two meetings prior to the August 11 meeting. Furthermore, to answer any additional enquiries the TSC may have while deciding on the preferred alternative AECOM's transportation engineer was present at all three evaluation meetings while AECOM's road designer were present at the first two meetings. They did not participate in the scoring of alternatives.

3. Mitigation of Impacts

Impacts to the corridor whether they are permanent impacts or temporary construction impacts will be mitigated to the extent possible. For the assessment of alternatives, it is assumed that mitigation measures will be undertaken. The alternatives under consideration are the mitigated alternatives.

The following table on page 3 and 4 summarises impacts and their proposed mitigation. As the entire corridor is being widened the majority of mitigated impacts listed below apply to all construction within the corridor and are therefore not analysed in all of the following sections. There are site specific mitigated impacts which deal specifically with different areas of the corridor.

The mitigation measures are an important component of the Technically Preferred Alternative. At the end of this study, when the Recommended Solution is endorsed by Council, the mitigation measures become commitments that are binding on the Municipality.

Table 1: Environmental Effects and Mitigation Measures

ISSUE	MITIGATING MEASURE
<p><u>Traffic & Transportation</u></p> <ul style="list-style-type: none"> • The continual growth in traffic and proposed widening has impact on accessibility • Construction activities will impede traffic • Emergency Vehicle Access to businesses and institutions will be affected by construction 	<ul style="list-style-type: none"> • The United Counties is committed to working with the United Counties and Municipality of North Grenville Accessibility Committees to mitigate impacts to the extent feasible. • The United Counties will adhere to recommendations of the Ontario Traffic Conference when its new manual "Pedestrian Control and Protection" is issued in the near future which will include recommendations on Roundabouts. • Considerations for this corridor may also include: <ul style="list-style-type: none"> • Pedestrian Crossovers • HAWK Beacons • Detectible surfaces • Two lanes of traffic on CR43 will be maintained at all times, to the extent practical. • A single lane access to all businesses & institutions will be maintained at all times, to the extent practical
<p><u>Social and Cultural</u></p> <ul style="list-style-type: none"> • Stage 1 Archaeological Assessment has identified areas of moderate potential • The north face of the existing bridge is within the UNESCO designated Rideau Canal World Heritage Site • The new road will require illumination • Construction activities will be noisy • Minor Aesthetic Features to the Bridge will enhance the bridge greatly and can increase community pride 	<ul style="list-style-type: none"> • The United Counties will undertake a Stage 2 Archaeological Assessment in advance of construction • The United Counties will commit to working with Parks Canada to ensure preservation of the national historic features of the Rideau Canal. • Directional lighting will be used to minimize light pollution but maintain vehicle and pedestrian safety. • Adherence to municipal noise by-law will be required • Unnecessary equipment noise caused by faulty or non-operating components will be prohibited • Duration of construction equipment idling will be restricted to the minimum time necessary to complete the specific task • All of the above will be contract requirements and will be enforced by contract administrator • Complete minor aesthetic features during design & construction phases, promote community feedback.

<p><u>Natural Environment</u></p> <ul style="list-style-type: none"> Widening of bridge over South Branch Rideau River (i.e. Kemptville Creek) will require construction in fish habitat Stormwater quality impacts Construction activities can result in water quality impacts The Municipal Class EA may be complete before Federal input is received. Construction activities can result in dust and odours. 	<ul style="list-style-type: none"> The United Counties will negotiate a compensation agreement with the appropriate authority, the Department of Fisheries and Oceans south of the bridge or Parks Canada north of the bridge. In water construction will not be allowed during spawning season, March 15 to June 30. Access for fish to pass under CR43 will be maintained at all times. Best available technology economically achievable (BATEA) will be used – Level II treatment New bridge deck drains will be piped to storm water treatment facility. If the existing structure is to be maintained then an effort will be made to pipe existing deck drains to the treatment facility also. Erosion protection will be provided at all discharge points, water quality control will be provided on direct discharges to Kemptville Creek. Erosion protection to be completed where required for existing wetland areas. The municipality will continue to require storm water quality and quantity controls for new development, and in particular for development upstream of the new stormwater treatment facility. Good construction practices will be a contractual requirement The United Counties will continue to work with Federal agencies to complete a screening under the Canadian Environmental Assessment Act and it is understood that this may result in refinements to the Recommended Solution. Good construction practices will be a contractual requirement
<p><u>Engineering</u></p> <ul style="list-style-type: none"> Potential impacts on underground Utilities Existing watermain servicing the Forestry Centre extends into CR43. Soft soils in vicinity of bridge may be displaced by fill material for new approaches. Soil conditions on CR43 Corridor have been found to be highly variable. 	<ul style="list-style-type: none"> Underground utilities will be protected during construction Watermain will be re-located and replaced if required. New fills will be placed within sheet pile cofferdams to avoid disturbance of river bed. Detailed geotechnical investigations will be undertaken as part of detail design.

4. Corridor Cross-section Features

A number of preliminary cross-section features and drawings were discussed during the Corridor Master Plan study. These features included a 1m centre median to separate the two directions of traffic, pedestrian and bicycle facilities, 3.5m wide driving lanes etc. These preliminary drawings of the corridor can be found in the Master Plan. The preliminary cross-sections from the master plan are shown in Appendix A under Figure 1.

The TSC recognised that there are alternatives for the size and location of various corridor features identified within the Master Plan. While the Master Plan identified a number of features it did not detail the corridor in depth and did not include additional features such as landscaping and the aesthetics of the corridor.

Along with the TSC, the public were urged to comment on features during the Public Information Centre No.4 in early March 2009. Comments such as the inclusion of bicycle lanes within the road or a multiuse pathway were encouraged as well as any additional comments or recommendations they may have on the corridor features and the study.

This section identifies the various features and alternatives of the corridor that were proposed and the recommended cross-section.

4.1 Features

The TSC considered a number of features for the corridor including:

- Bicycle Lanes within the road
- Sidewalk within the boulevard
- Shared multiuse pathway in the boulevard
- Separate bicycle lane and sidewalk within the boulevard
- A small 1m wide centre median to separate traffic
- A large 5.5m wide centre median which included landscaping
- A smaller 2m wide centre median which includes street lighting and possibly planter boxes
- Location for utilities and street signage
- Corridor width

From the various features identified above, AECOM's Road Designer provided the TSC with four (4) additional alternative cross-sections for the corridor. These can be viewed as Figure 2 and Figure 3 in Appendix A.

4.2 Alternatives

The TSC chose to evaluate these five alternatives

Alternative 1 – This alternative is from the Master Plan and includes a 26m Right of Way (ROW). It contains a 1m wide concrete centre median, all driving lanes to be 3.5m wide, a 1.5m wide bicycle lane extended from the roadway pavement, a 1.75m wide boulevard (includes street signs and utilities), a 1.5m wide sidewalk and a 0.5m buffer. All curbs are to be barrier.

Alternative 2 – This alternative increases the corridor ROW to 30m. It contains a 5.5m wide landscaped centre median, all driving lanes to be 3.5m wide, a 1.5m wide bicycle lane extended along the roadway pavement, a 1.3m wide boulevard (includes street signs and utilities), a 1.5m wide sidewalk and a 0.5m buffer. All curbs are to be barrier.

Alternative 3 – This alternative uses the smaller corridor ROW of 26m. It contains a 3.4m wide centre median which can include planter boxes but cannot be directly landscaped, the left hand driving lane to be 3.5m wide and right hand driving lane to be 4.25m (this includes a bicycle allowance), a 0.8m wide paved boulevard (includes street signs and utilities), a 1.5m wide sidewalk and a 0.5m buffer. All curbs are to be barrier.

Alternative 4 – This alternative uses the larger corridor ROW of 30m. It contains a 2m wide centre median, all driving lanes to be 3.5m wide, a 1.35m wide paved boulevard (contains street signs), a 2m wide paved bicycle lane, a 1.5m wide concrete sidewalk 50mm higher than the bicycle path and a 1.5m buffer (includes utilities). All curbs are to be barrier.

Alternative 5 – This alternative also uses the larger corridor ROW of 30m. It contains a 2m wide centre median, all driving lanes to be 3.5m wide, a 2m wide paved bicycle lane separated from the roadway by a 0.8m wide mountable curb, a 1.95m wide boulevard (contains street signs and utilities), a 1.5m wide concrete sidewalk and a 0.5m buffer. The median curb is to be barrier.

4.3 Evaluation of Alternatives

Alternatives 1, 2 and 3 were presented by AECOM in the meeting held on August 11, 2009. During this meeting the TSC agreed it was more practical to discuss and choose the various features and alternatives rather than using a scoring system. As a result the TSC discussed the various features of each cross-section and their advantages and disadvantages. Eventually the TSC requested preliminary drawings of an additional two cross-sections. Alternatives 4 and 5 were then presented to the TSC during the September 8, 2009 meeting. The discussions on the corridor features include:

Centre Median width – Due to salt spray, the centre median would need to be at least 5m wide if it were to be landscaped. The TSC decided that it was important to landscape the boulevards than the centre median, and the additional property and cost required to landscape and maintain both sections could not be justified. However it was agreed that the centre median should contain some aesthetical feature that did not require large amounts of maintenance. The preferred alternative was to place architectural street lighting in a 2m wide concrete median. This feature was then included in alternatives 4 and 5 for confirmation from the TSC.

Pedestrian and bicycle facilities – were recommended in the Master Plan and were commented on again within the traffic section of the existing conditions report. TSC discussions with AECOM's Road Designer and Transportation Engineer revealed that a multiuse pathway would be beneficial to the community but would still require an additional bicycle lane to be included in the roadway for experience riders. As a result it was decided that the pedestrian and bicycle facilities should be separated. Although alternatives 1, 2 and 3 show separate bicycle lanes within the roadway which is acceptable to increase safety the TSC wished to view other options for the separated bicycle lanes (paths) within the boulevard area behind the curb. Alternatives 4 and 5 show bicycle lanes within the boulevard area. Bicycle lanes in these situations will join both the road, and the sidewalk prior to entering the roundabout. This will allow cyclists to negotiate the roundabout as a vehicle or as a pedestrian. Alternative 5 was preferred as it separated the pedestrian and cyclists while also separating the cyclists from the vehicles.

Utility Location – Discussions were held during the August 11, 2009 meeting regarding the possibility of placing the current utility services underground as they will need to be relocated anyway. The TSC agreed that although it would be aesthetically pleasing, the additional cost required to re-locate the services underground is huge and cannot be justified. As a compromise it was decided it would be valuable to re-locate all utility overhead road crossings underground. All other utilities can be relocated within the boulevard and extend parallel to the road.

Boulevard size – The TSC recommended that the boulevard area should be large enough to be landscaped and used for snow storage in winter. When the boulevard is generally less than 1.5m wide it is paved for maintenance purposes. The steering committee agreed that a 0.5m minimum buffer should always be maintained between the sidewalk and the property line.

ROW width – The Master Plan made a number of recommendations for certain features to be included within the corridor ROW. The preliminary cross-section drawing in the Master Plan aimed to minimise the ROW width by minimising the width of features such as the boulevard and the centre median. When discussing corridor features in the August 11, 2009 meeting the TSC were supplied with a plan of the corridor showing the existing residences and possible 26m and 30m ROW options. It was decided by the TSC that because the additional 4m of land can, in most cases, be acquired with minimal impact on current uses, the 30m ROW offers more advantages and was recommended for alternatives 4 and 5. There is an understanding that it may not always be possible to obtain the 4m widening without unfairly impacting current uses, in those cases the road designer will need to consider compromises to the proposed cross section.

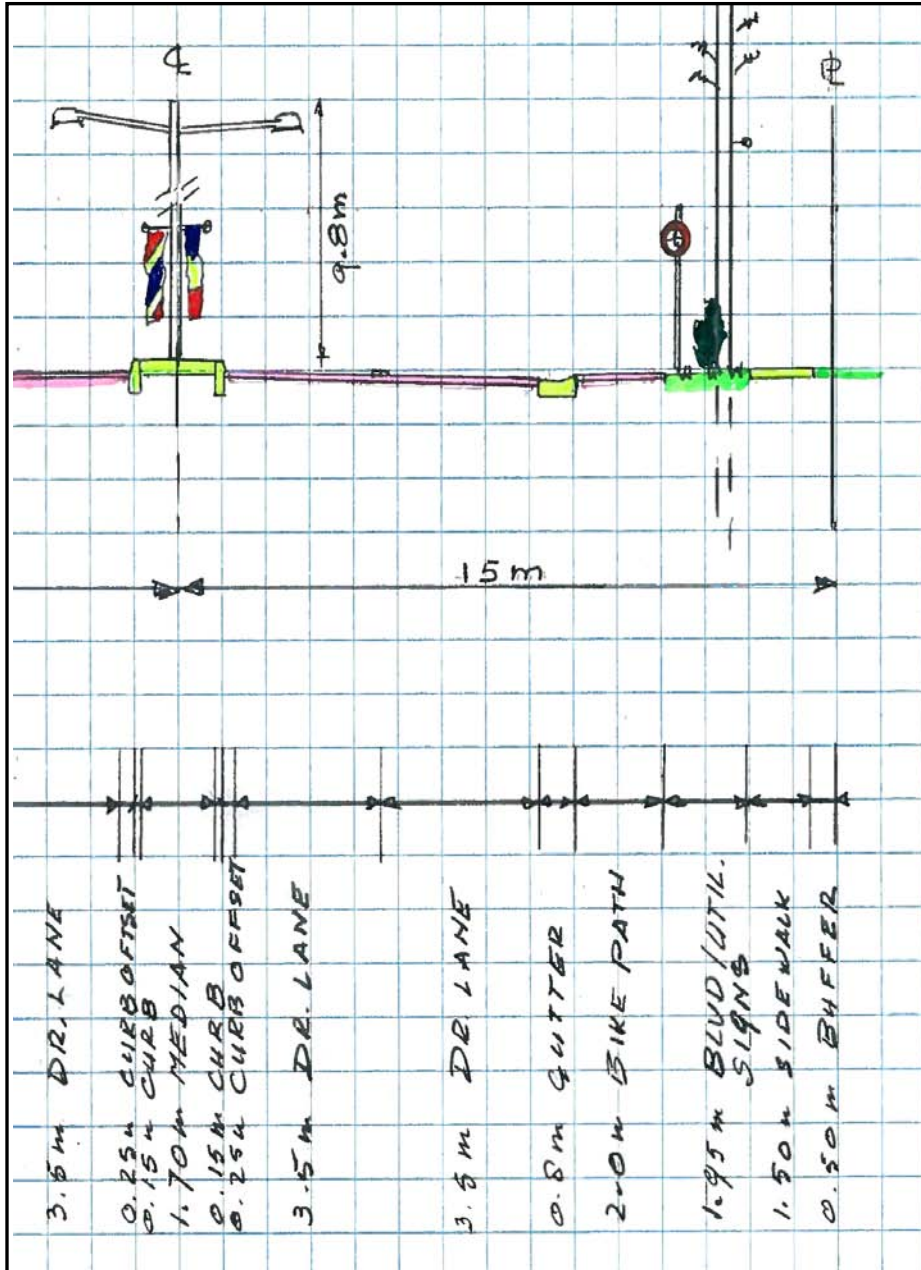
4.4 Technically Preferred Alternative

During the September 8, 2009 meeting, after considering all five (5) alternatives and discussing the recommended features '**Alternative 5**' was chosen as the Technically Preferred Alternative. This alternative includes a 2m wide centre median with street lighting. A 2m wide paved bicycle lane is located directly behind the mountable curb. The location of this bicycle lane is preferred because it is away from flowing traffic but still maintains its intended function. It can also be used as a snow storage area in the winter. The 1.95m wide boulevard is large enough and far enough away from the salt spray that it can be landscaped. Street signs and utilities can also be placed in this area. The 1.5m sidewalk and 0.5m buffer from the property line are maintained in this alternative. This alternative requires widening of the existing road right-of-way from 26m to 30m.

A preliminary design of the road was completed and presented to the TSC at both the October 20, 2009 meeting and the November 24, 2009 meeting. It can be found in Appendix D of this report. It will be presented to the public at the next Public Information Centre.

A sketch of the preferred alternative is shown below.

Figure 4.1 - Sketch of Alternative 5 (Technically Preferred Alternative)



5. Centre Corridor Intersection Control

The centre area of the corridor extends from County Road 44 to St Michael's High School (James Street). This area is being re-assessed as part of this Environmental Assessment because the Master Plan recommended that the CR43 corridor be constructed as a roundabout corridor. However, when that study was completed, there was not a lot of information on pedestrian safety for two-lane roundabouts in Canada. As a result of the traffic and pedestrian demand within this centre corridor area, traffic signals were recommended for the CR43 – CR44 intersection and for a pedestrian crossing adjacent to St Michaels High School.

Over the past four (4) years more data has been collected and analysed on two-lane roundabouts in Canada. In particular a lot more data has been analysed on high pedestrian demand, safety and movements at two-lane roundabouts. The traffic report within the Existing Conditions Report comments that the existing traffic signals at CR44 and at the community square entrance "cannot accommodate the future demand without major upgrades including pole relocation/replacement, new control hardware and additional signal hardware". As a result of the recommended upgrades and new data, the traffic report revisited the original decision to install traffic signals over roundabouts within this area.

5.1 Alternatives

Five (5) alternative configurations of intersection control for the centre area of the corridor were selected by the TSC for evaluation. These include:

- Do Nothing** – Signals at CR44, Signals at Community Square, and roundabout at St Michaels High School (i.e. as recommended by the Corridor Master Plan).
- Option 1** – Roundabout at CR44, Roundabout at Community Square, Roundabout at St. Michaels High School
- Option 2** – Roundabout at CR44, Partial signals at Community Square, Roundabout at St. Michaels High School
- Option 3** – Roundabout at CR44, Median at Community Square, Roundabout at St. Michaels High School
- Option 4** – Roundabout at CR44, Signals at Community Square, Roundabout at St. Michaels High School

A recommendation for the preferred option was not completed in the traffic report. However the 'do nothing' option and options 1, 2, and 3 were discussed and include details on the positives and negatives of each option. The decision for the preferred option was left to be made by the TSC.

During the August 11, 2009 meeting a preliminary analysis of the 'do nothing' option and options 1, 2, and 3 was presented to the TSC. This was initially completed by AECOM and was scored against eleven environmental factors. Each alternative was scored against each environmental factor using a basic scoring system where full, half or no points are given for a rating of good, acceptable and poor respectfully. In this scenario 'option 3' scored the highest with 7.5 points while 'option 1' followed with 6.5 points. Both the 'do nothing' option and 'option 2' scored 4 points. Score sheet No.1 is shown in Appendix B.

After further discussions the TSC determined that 'option 3' was not a fair or viable option as it impeded vehicular access to the community square. Consequently it was decided to remove this option from the list but include 'option 4' which incorporates a full set of traffic signals at community square.

Score sheet No.2 was then produced for the September 8, 2009 meeting. This score sheet included the 'do nothing option', 'option 1', 'option 2' and 'option 4' and it was decided to use the weighted additive method to compare alternatives. The score sheet was updated to include measurements which illustrate whether the options are better or worse when compared to the existing 'do nothing' scenario. A copy of this score sheet is included in Appendix B.

The first step in the evaluation process is to score each alternative for each factor. These are to be scored out of 10, where the best option for an environmental factor gets a high score and the worst option gets a low score.

As some environmental factors are essentially more important than others it is vital that they are weighted against each other. Therefore the second step in the evaluation process was to assign a weight to each environmental factor. TSC members assigned a weighting out of 100 to each of the 11 factors. A copy of this can be found in Appendix B.

To produce a weighted score for each alternative for each factor, the alternatives score is multiplied by the equivalent weighted factor score. The total weighted score for an alternative is the sum of all of these values. The preferred alternative is the alternative with the largest average score from all of the members of the TSC.

5.2 Analysis of and Evaluation of Alternatives

5.2.1 Environmental Factors

Air Quality

The average delay at a roundabout is significantly less than for a traffic signal. Therefore alternatives with more roundabouts have shorter delays and hence shorter idling times, resulting in reduced GHG emissions. A roundabout with 25,000 daily entering vehicles can reduce fuel consumption by 227,000 Litres per year compared to a signal.

Accessibility

Access and egress is better with roundabouts as the slower speeds of the roundabout allow traffic to merge which reduces the delay at intersections. Roundabouts generally reduce an access to right in and right out along the corridor. By maintaining a roundabout corridor where the roundabouts are positioned so that U-turns can occur frequently, good access is generally preserved. Option 2 eliminates the left hand exit from the Community Square.

Safety

Introducing roundabouts with a centre median will reduce vehicular collisions as there will be no left hand exiting or entering the corridor mid block. Vehicles will be required to complete a U-turn at the next roundabout. Speeds at roundabouts are also much slower and the opportunity for Head on or T-bone accidents is almost eliminated, therefore the severity of an accident is reduced.

Pedestrians & Cyclists

Traffic signals may be more pedestrian and cyclist friendly than a 2-lane roundabout as they instruct a pedestrian or cyclist when it is safe to cross. This is a major help to those who are mobility or vision impaired. There are a number of additional pedestrian safety devices which are now being integrated with the construction of roundabouts. These include pedestrian cross-overs, HAWK beacons, detectable surfaces and other designs being considered by the OTC committee. Data is continuing to be collected on pedestrian and cyclist activity at 2-lane roundabouts and will add to any future recommendations.

Spacing of Intersections

There may be some conflicts between intersection operations in the future at the CR44 and Community square signals. These conflicts will be reduced by removing the full intersection at Community Square. These intersections are ideally spaced for roundabouts.

Travel Time

Roundabouts improve travel time through reduction of queuing. This is because roundabouts have slower speeds which allow traffic to merge easy and quicker and hence reduces the delay at intersections.

Business Impacts

Businesses generally have a preference for traffic signals at their entrances. They are a standard form of intersection control in Canada and everyone knows how to use them.

Roundabout Corridor

Traffic signals can delay movement through a roundabout corridor as they disrupt the flow of traffic travelling through the other roundabouts. They are also consistent with design the philosophy that has been established for this corridor.

Capital Cost

Allowing that intersections will be fully reconstructed when road is widened to four lanes, road construction costs are nominally the same for roundabouts vs. signalized intersections with turn lanes. Traffic signals are an additional cost that is not required for roundabouts therefore making roundabouts a cheaper alternative.

Operation Cost

Roundabouts have little operating costs and have less maintenance costs then traffic signals. Allow \$1,500 per year for maintenance and power for each set of traffic signals.

Property Acquisition

Property requirements are slightly higher for roundabouts as they require a large area for operation. Additional turning lanes required for traffic signals mean that there would also be property requirements when upgrading the existing signals to a four lane road.

5.3 Technically Preferred Alternative

Each TSC member present during the September 8, 2009 meeting scored both the weighting and options score sheets. The weighting scores when averaged found that the TSC believed safety to be the most important factor and property acquisition to be the least important factor. The results of the evaluation are found in Appendix B. Option 1, the roundabout option, scored best with a score of 738.5 out of a possible 900. Option 2 was scored second best at 614.6.

Sensitivity testing is performed after the scoring for each alternative is completed. Sensitivity testing involves eliminating individual criteria, or groups of criteria, to determine if the highest scoring alternative changes when specific criteria are removed. If this is the case, the TSC can be asked to reconsider a smaller group of alternatives to ensure that they have selected the best criteria. In this evaluation, the roundabout option scored best on 7 out of 10 criteria which resulted in a total score that was much higher than the second best. This is considered a "very robust" result. Further evaluation was not needed.

6. CR43 Bridge Crossing the South Branch of the Rideau River (Kemptville Creek)

The County Road 43 Bridge is arguably the most significant and largest part of this Municipal Class Environmental Assessment as it deals with some very sensitive areas.

6.1 Background

The CR 43 Bridge, crossing the South Branch of the Rideau River (Kemptville Creek) was constructed in 1955 by the Ministry of Transportation Ontario (MTO) and has since been handed over to the United Counties of Leeds and Grenville.

The two-lane concrete bridge spans approximately 36m across the creek and contains a central concrete pier halfway along which extends to bedrock. The abutments are concrete and extend along the water's edge and it is predicted that these also extend to bedrock. The bridge arches between the abutments and the pier and has a clearance at the top of the arch of 3.35m (11 feet) above the average water elevation of the creek. The approaches to the bridge are constructed from unknown fill material and are approximately 55m long (each side) with 1.5:1 (H:V) grassed slopes supporting the CR43 roadway. With the scheduled major rehabilitation, the existing bridge has over 20 years of life left, but is too small for the current demand of the corridor and for this reason the crossing needs to be upgraded to include four lanes.

The challenge is that the creek is a provincially significant wetland where despite there being no species of risk found in the area during the site evaluation, no work causing impact is to be completed. There is a greater area of wetland to the south of the bridge which contains various flora and fauna, while to the north of the bridge there is a greater area of water which contains fish spawning and habitat areas.

To the north side of the bridge is the boundary of Parks Canada's jurisdiction, which is also the boundary of the UNESCO designation as part of the Rideau Canal system. Any work on this side of the bridge including any amendments to the current visual impact of the bridge is subject to scrutiny by Parks Canada and the UNESCO committee. The Rideau Valley Conservation Authority (RVCA) has authority of the southern portion of the creek which starts from the north face of the CR43 Bridge.

The type, size, cost and location for either expanding the existing bridge, constructing a second two-lane bridge or constructing a brand new four-lane bridge creates a vast number of alternatives. The TSC was able to screen the possible options from 162 to 11 before undertaking the first detailed analysis.

6.2 Alternatives

As mentioned previously there are a vast number of possible alternatives for the CR43 Bridge. The various features for the bridge are:

6.2.1 Alignment

- Construct the additional two-lanes immediately to the north of the existing bridge
- Construct the additional two-lanes immediately to the south of the existing bridge
- Construct the additional two lanes so that there is one lane immediately on each side of the existing bridge

Previously the master plan recommended that the corridor be widened from two lanes to four lanes. It is the TSC's desire to expand the corridor so that it has as little impact as possible on the existing environment.

The creek is a provincially significant wetland where each side of the current bridge contained different wetland and water features. As mentioned earlier area to the north of the bridge is predominately water and fish habitat, area to the south is predominately wetland and contains various fauna and flora species.

In addition to the natural environment, there is one major property impact. It is foreseen that the only major impact is to the existing residential property on the north eastern side of the bridge, and this property is only affected if the bridge extends to the north. There should be little impact to the other corners of the bridge as properties on the north western and south eastern corners of the bridge are currently undeveloped and the United Counties have previously purchased land on the south western corner of the bridge adjacent to the commercial development.

6.2.2 Bridge

- Widen the existing two-lane bridge.
- Construct a second two-lane bridge adjacent to the existing bridge.
- Replace the existing bridge with a new four-lane bridge.

The existing bridge is due for major rehabilitation. With this maintenance the United Counties can expect well over 20 years of service. Given that the existing bridge is in good condition, options that include retaining this bridge for the interim are included.

Widening an existing bridge is an accepted practice but can be much harder and time consuming than building a new bridge. There are issues, such as differential settlement, that make tying into an existing structure difficult. After discussions with the bridge engineers it was decided that it was not necessary to look at options that involved widening the existing bridge by two lanes. It would be easier and less costly to build a separate two lane bridge, option that involved construction of a new two lane bridge to the north or south were carried forward. These options include renovation of the existing bridge to include relevant features of the new corridor.

The option of expanding the existing bridge by one-lane to each side was included as it is much cheaper than building a new one lane bridge on each side. However this option reduces traffic flow to one lane while construction of the first side is being completed.

Replacing the existing bridge with a brand new four lane bridge is a viable option as it allows the entire four-lane structure to be of the same age. This also allows the alignment of the corridor to be kept straight or expand the additional two lanes to the north or south. This option reduces traffic flow to one lane while removal of the first half of the bridge and construction of the first two lanes being completed. There are also costs for removal of the existing bridge.

6.2.3 Spans

- Construct the new bridge or section of bridge to the same standard as the existing bridge i.e. 2 span
- Construct the new bridge or section of bridge to span the creek and adopt the same size and type of approaches i.e. 1 span
- Construct the new bridge or section of bridge to span the creek in one span and span the majority of the approaches i.e. 3 span

As noted above, the existing bridge is a two-span bridge which is supported by an abutment on each side of the creek and a pier in the centre of the creek. This alternative was included as it is a viable option and it would allow any additional widening or structure to replicate the existing structure. This option has more HADD affected area due to the extra in water works for the centre pier.

A single span alternative was included as it allows the removal of the existing pier and reduces the in water works and HADD affected area. This option is also less costly option then the 2-span option as it does not involve the extra cost of constructing the centre pier.

The 3-span option was considered as it allowed the HADD impacts to be greatly reduced. The 3-span option would contain two piers spaced at 36m (minimum) apart on either side of the creek. The bridge would then span an additional 27m from the piers to the approaches. The additional spans would reduce the HADD impacts as the approaches would not need to be as long and therefore the approach fill areas will be reduced. The down side to this option is that it is more expensive to construct the longer bridge than the approaches.

6.2.4 Clearance

- Construct the new bridge or section of bridge to the same height as the existing bridge i.e. 3.35m (11 feet) clearance
- Construct the new bridge or section of bridge to the same clearance height as the Rideau Canal standard i.e. 6.7m (22 feet) clearance.
- Construct the new bridge or section of bridge to a clearance height of somewhere between 3.35m and 6.7m. Therefore a clearance height of 4.9m (16 feet) was adopted.

During the Public Information Centre and Public Open Houses for the Corridor Master Plan and the start of this study there were a large number of comments received requesting that the clearance of the bridge be increased so that larger boats may pass under and travel to downtown Kemptville. Transport Canada was also contacted to confirm the requirements of a new structure under the Navigable Waters Act.

Transport Canada advised that the standard clearance height of the Rideau Canal is 6.7m but this would not have to be met as Kemptville Creek is not part of the main channel. Any additional structure or amendments to the existing structure would have to ensure that the existing clearance of 3.35m is maintained. The 2005 navigational charts for this creek indicate there are two shallow sections downstream of the bridge which impedes larger boats from reaching the CR43 Bridge. These charts advise that "Kemptville Creek is noted to be navigable only by shallow draft vessels which do not require a vertical clearance greater than 8 feet".

Additionally by increasing the heights of the bridges the approach heights also increase, hence increasing the fill areas and increasing the HADD affected area.

As a result this option was looked at in depth and the above three heights were evaluated by TSC.

6.2.5 Construction Technique

- Precast Concrete structure
- Cast *in-situ* structure

Both Precast and Cast *in-situ* (cast in place) structures were discussed with the bridge engineers. While both work effectively it was decided that any widening of the existing bridge would have to be completed as cast *in-situ*. This would be the same standard as the existing bridge and would allow the widening to be tied in and attached much more effectively. As a result there is more in water works associated with constructing *in-situ* structures as there are large amounts of formwork that need to be constructed.

Precast concrete structures were adopted for any of the new bridges as they are less costly, quicker and have less in water works.

Steel and Truss type bridges were not looked at as they are expensive and require a lot of maintenance.

6.3 Analysis and Evaluation of Alternatives

The analysis and evaluation of the above alternatives took place over two meetings on August 11, 2009 and September 8, 2009.

From the 162 possible alternatives that these five features create, the committee narrowed the number of alternatives down to 46 feasible/practical alternatives. The TSC were shown the 46 feasible alternatives during the August 11, 2009 meeting; these options are shown in Bridge score sheet 1 in Appendix C. The table shows the 46 alternatives against the various environmental factors that affect their evaluation.

The factors were placed in the following major categories:

- Natural Environment,
- Social and Cultural Environment,
- Land Use and Property and
- Engineering.
- Transportation

During this meeting the TSC discussed the various alternatives and determined that there were too many to score correctly and that the number of alternatives needed to be reduced. After further discussions the TSC decided to remove the alternatives with bridge clearances greater than the existing 3.35m. These options were removed due to significantly greater environmental impacts and cost – the higher structures require higher and wider approaches that have wetland and property impacts. Further, the TSC considered the downstream water depth to be a limiting factor that restricted larger boats (greater than 3.35m clearance) from reaching the bridge. The small number of boaters that the additional clearances would benefit would be restricted by the Bridge Street Bridge only 820m further up the creek and would still not be able to access downtown Kemptville. The TSC deemed that there were not sufficient benefits to offset impacts associated with the higher clearances and therefore screened out the higher options.

As a result it was found that the grades and alignment differences between the remaining alternatives had no impact on the analysis and therefore Transportation was not included in the second score sheet. It was also found that the potential for archaeological impacts was the same for each item and could be removed as it would not separate the alternatives.

The removal of alternatives with clearance heights of 4.9m and 6.7m reduced the number of alternatives from 46 to 16. This number was further reduced by removing the 2-span alternatives. These alternatives were removed because the 2-span option is always more expensive than the single span option and the inclusion of a pier affects a greater HADD area. The removal of the 2-span alternatives reduced the number of alternatives from 16 to 11.

The TSC felt that this number of options was manageable and could be scored. They also felt that the measurements of the HADD areas should be split into areas of water HADD and wetland HADD as the two have different and unique properties.

As the number of alternatives was reduced and there were changes to the environmental factors it was decided to update the score sheet and score it at the next meeting.

At the September 8, 2009 meeting the updated score sheet (score sheet No.2) was provided by AECOM. The score sheet used the weighted additive method to compare alternatives. A copy of the score sheet is included in Appendix C.

The first step in the evaluation process was to score each alternative for each factor. These are scored out of 9, where the best option for an environmental factor gets a high score and the worst option gets a low score.

As some environmental categories are essentially more important than others it is vital that they are weighted against each other. Therefore the second step in the evaluation process was to assign a weight to each environmental category. TSC members assigned a weighting out of 100 to each of the 4 categories. A copy of this can be found in Appendix C.

Likewise the third step is to weight each factor within a category against the other factors within that category. TSC members assigned a weighting out of 100 to the factors in each category. A copy of this can be found in Appendix C.

To produce a weighted score for each alternative, the alternatives score is multiplied by the equivalent weighted factor and weighted category score divided by 1000. The total weighted score for an alternative is the sum of all of these values. The preferred alternative is the alternative with the largest average score taken from all of the members of the TSC.

The following mitigating environmental factors and environmental categories were weighted and scored by the TSC.

6.3.1 Natural Environment

HADD Permanent Water Impacts

This HADD area is equal to the water area that is permanently impacted and lost by the construction of both the bridge and approaches. These areas are classed as HADD areas because they include fish spawning and habitat areas. Alternatives extending to the north of the existing bridge and the single span options have larger impacts on this factor. This factor is measured in square metres.

HADD Permanent Wetland Impacts

This HADD area is equal to the wetland area that is permanently impacted and lost by the construction of both the bridge and approaches. The creek is a provincially significant wetland that contains a large number of wetland flora and fauna. Alternatives extending to the south of the existing bridge and the single span options have larger impacts on this factor. This factor is measured in square metres.

Wetland/Water Construction Impacts

This factor is rated from high to low and is based on the temporary construction impacts to the existing wetland and water area around the bridge. This has been included as some alternatives have a larger impact during construction than others. Widening the existing bridge has a higher impact as it is cast *in-situ* and part of the existing bridge is being removed. The single span alternatives have an average impact as they affect a larger HADD area and as a result will be subject to greater construction impacts than a 3-span bridge which is low.

Connectivity without additional Structure

Currently the abutments of the existing bridge are located along the water's edge. This restricts the movement of animals along the side of the creek and forces them to either enter the creek or cross the CR43 roadway. The alternatives for a new four-lane, 3-span bridge allow connectivity from one side of the bridge to the other without crossing CR43. All other options that include the existing bridge or a single span bridge do not allow connectivity without attaching an additional structure to the abutments. This factor compares the alternatives by identifying if the alternative will allow connectivity or not.

6.3.2 Social and Cultural Environment

Recreational Trail Below

This factor is much the same as the connectivity factor above. The municipality has expressed interest in providing a recreational trail along the creek. This factor compares the alternatives by identifying if the alternative will allow a future recreational trail to be constructed along the creek bank without attaching an additional structure to the abutments. The alternatives for a new four-lane, 3-span bridge allow a trail to continue along the bank while all other options require a structure to be attached to the abutments.

Visual Aesthetics

While this factor is opinion based, the visual aesthetics of each alternative is to be evaluated against each other and to ensure that the current aesthetics of the creek are not reduced. Generally the TSC evaluated that a new bridge has better aesthetics than the old bridge and a 3-span bridge with small approaches has better aesthetics than a single span bridge with large approaches.

Possible UNESCO issues

The Rideau Canal is a UNESCO World Heritage Site which includes the Parks Canada administered property along the Canal. This affects the location of the bridge as the Parks Canada property extends along the South Branch of the Rideau River (Kemptville Creek) from the Rideau River (Canal) to the north face of the CR43 Bridge. Any work to

the north of the bridge or to the north side of the existing bridge would be subject to considerable scrutiny to ensure it supports and enhances the UNESCO designation. There would also be a number of legal issues with this work as all of the legal deeds and documents refer to the north face of the current bridge. While the World Heritage Site does include a 30m buffer past the Parks Canada boundary it is envisaged that the alternatives which retain the existing bridge and construct a new bridge to the south will not be affected.

6.3.3 Land Use and Property

Impacted Residence

It is foreseen that the only residence that will be potentially impacted is the existing residential property on the north eastern side of the bridge and this property will only be affected if the bridge extends to the north. There should be little impact to the other properties on the other corners of the bridge. The properties on the north western and south eastern corners of the bridge are currently undeveloped and the United Counties own a portion of land on the south western corner of the bridge adjacent to the commercial development.

Property Requirements

The existing corridor through this area is 20m wide which is smaller than the bridge cross-sections for any of the proposed alternatives. As a result all of the alternatives require a portion of private property to be acquired. This factor details whether the requirements for property are high or low. As the United Counties own portions of land to the south any alternatives in this direction have a lower score than alternatives that extend to the north.

6.3.4 Engineering

Construction Traffic Impacts

The 2009 updated traffic report noted that the westbound lane (immediately west of CR19) is currently above the planning capacity during the PM peak hour. Consequently the TSC wish to minimise as many disruptions as possible to the existing commuter traffic in the corridor. This factor compares the alternatives by advising if the traffic disruptions for each alternative will be high or low. Alternatives that retain two lanes of through traffic until two additional lanes can be built will have low disruptions. Alternatives that require the existing bridge to be modified or partly removed and only retain one lane of traffic will have high disruptions.

Maintainability

This factor details whether the alternative bridge crossing can be maintained easily and economically. Alternatives that expand the existing bridge to both sides have poor maintainability because it creates an old bridge fixed in between two new bridges. They will have different life cycles and the old bridge will be hard to maintain and replace. A new two lane bridge to the north or south of the existing bridge will have good maintainability as they are smaller bridges and are separated from each other. Replacement of one of the bridges can be easily and economically achieved. A new four lane bridge is measured just below good, while it is a new bridge, it is larger than a two lane bridge and is harder to maintain and eventually replace.

Construction Cost (Bridge and Approaches)

This is the estimated overall cost to construct or expand the bridge and approaches. It includes the cost for materials, labour, machinery, replacement of service/utility crossings, traffic control etc.

Life Cycle Cost (Bridge Only)

This is the estimated life cycle cost of the proposed bridge only.

Construction Schedule

Typically the time for the construction of a new 2-4 lane bridge is one season. As all of the alternatives require the existing bridge to maintain a minimum of one lane of traffic until the additional two lanes are built, it will take over one season to complete all alternatives. The alternatives that construct a separate two-lane bridge have the least construction time as it will take one season to construct the bridge and approximately a fifth of a season to make repairs and rehabilitate the existing bridge. All other alternatives have a two season construction schedule as they will have to build either one or two lanes at a time.

6.3.5 Discussion Points

During the evaluation of this score sheet the TSC decided to remove the factor "**Potential for future HADD impacts**". This was originally included for the new four-lane, 3-span bridge alternatives as removal of the existing structure could potentially allow erosion of the wetland area to occur. The TSC removed this criteria and added a mitigation measure to retain erosion protection of the current wetland area.

AECOM was responsible for organising the scores and providing the results. During the collection and calculations of the results there was found to be an error in the measurements of three of the factors. A third scoring sheet was re-issued to the TSC by AECOM via email. Only the members who were present at the September 8, 2009 meeting and scored the bridge alternatives were allowed to score these three factors again. Both the construction costs and life cycle costs of the score sheet were amended as the costs for the 3-span bridges were incorrect and the life cycle cost for the majority of bridges was incorrect. Amendments were also made to the UNESCO factor on the new four-lane.

6.4 Technically Preferred Alternative

Each TSC member present during the September 8, 2009 meeting scored both the weighting and alternative score sheets. Based on the revised score sheets a two-lane, 3-span bridge to the south of the existing bridge scored best at 68.1 points out of a possible 90. Second best is a two-lane, single span bridge to the south, at 64.7 points. Although the single span option scored best on engineering factors – the cost of a single span is \$2.2M vs. \$3.0M for the three span option - the 3-span option scored better on environmental impacts.

The outcome of this evaluation was not considered robust as the highest scoring alternative did not score 10% better than the second. Sensitivity testing was completed to determine if the scoring had been biased by over-weighting on any specific factor. Sensitivity testing showed that the 3-span bridge to the south scored well (first or second place) when any of the four evaluation criteria categories was pulled out. The two-lane, single span bridge to the south scored best only when the natural environment score was removed. Clearly the TSC had placed a high value on the natural environment.

From the evaluation it can be noted:

- Options to widen the existing bridge to both sides did not score well and need not be considered further.
- Options to construct a two-lane bridge to the north scored better on environmental impacts but this benefit was offset by land use and property scores - the TSC gave significant importance to impacts to the home on River Road and to property requirement issues associated with widening to the north.
- The 3-span options evaluated best on environmental impacts because they require less than half of the in water/wetland work.
- Single span options evaluated best on engineering criteria because they cost less.

6.5 Additional Technically Preferred Alternative Options

At its meeting on October 20, 2009 the TSC agreed that the best option would entail construction of a new two-lane bridge to the south of the existing bridge. However, because the evaluation came down to in-water impacts vs. cost, the committee was not certain if any of the evaluated alternatives were best. The TSC at this meeting decided that other two-lane bridges to the south should be looked at to determine the best option.

With the options narrowed down to a two-lane bridge south of the existing bridge criteria such as alignment, bridge, clearance and construction technique could be removed from the scoring process. All of the remaining options would score the same on these criteria.

6.5.1 Number of Spans

The major feature which needed to be confirmed was the number of spans. It was clear that as the number of spans increased so did the price. The price dramatically jumped when another span was added as it would require an additional pier and footing. However, increasing the number of spans had the benefit of decreasing the HADD area.

A new field survey and current more current aerial photography was used to accurately determine HADD areas for various bridge lengths. An ideal bridge length of 125m was determined. To span this distance the bridge engineers were consulted for their input. Three concrete girder sizes were chosen,

Table 2- Bridge Girder Dimensions

Girder size (mm)	Maximum Span (m)
1600	38
1900	42
2300	45

As the current navigational clearance is to remain the same, the larger girders would increase the height of the bridge. The total depth of the deck on the existing bridge is approximately 0.9m less than the total depth of the new bridge using a 1600mm girder. The larger girders will increase this. It should be noted that the navigational clearance of 3.35m is only over the water area (navigable area) and not over the wetland area however the cost rises considerably with an increase in girder size.

6.5.2 HADD Areas

It was clear that the amount of harmful alteration, disturbance or destruction (HADD) of fish habitat decreased when the number of spans increased. Therefore these options looked at the various bridge options with respect to the HADD area. The majority of the HADD area is caused by the approaches and their slope area. Therefore it was decided to also look at options which would decrease the approach slope and hence decrease the HADD area.

The previous options used a 1H:1V rock fill slope as this is maximum slope allowed for rock fill. The option of an earth slope was not considered as it is required to be a 2H:1V slope which would increase the HADD area. During this evaluation it was decided that retaining walls (reinforced earth) should also be evaluated as they provide a vertical wall and dramatically reduce the HADD area.

6.5.3 Options

From these possible girder lengths 6 viable options were compiled. These options were:

Option 1 – Single span bridge with rock fill slopes on the approaches. This is the same as Option No.11 from the original evaluation which was the 2nd highest scoring alternative

Option 2 – Three span bridge with rock fill slopes on the approaches. This is the same as Option No.13 from the original evaluation which was the highest scoring alternative.

Option 3 – Three span bridge which maximises the bridge size before expanding to another span. It maintains a lower height by using a 1600mm girder over the creek but extends further by using 2300mm girders over the HADD areas.

Option 4 – Single span bridge to mimic Option 1 but uses vertical retaining walls to reduce HADD.

Option 5 –Adopts the maximum 2-span bridge using a 1600mm girder. This option includes a centre pier in the creek and uses vertical retaining walls to reduce HADD.

Option 6 – Adopts the maximum 3-span bridge using a 1600mm girder only. This option includes vertical walls to reduce HADD.

Options which included the 1900mm girder and 2300mm girder were not used for spans extending across the creek as this would increase the cost and height of the bridge. It was preferred to keep the bridge deck as low and close to the height of the existing bridge as possible for aesthetics and for reduced cost for approaches. Therefore it was decided that the extra few metres that the larger girders provided and the small reduction of HADD they gained did not offset the increased cost of the girders or the reduction in aesthetics due to the increase in height.

6.5.4 Criteria

During the first and second evaluation of the bridge alternatives, four (4) environmental categories were identified each with its own environmental factors. Overall there were fourteen (14) environmental factors which were evaluated and weighted to separate the alternatives and find the technically preferred alternative. As a consequence of recommending a two-lane bridge to the south, the majority of these environmental factors could now be removed as they no longer provided any help in separating the remaining alternatives. As such the number of environmental factors were reduced to five (5) and were not categorised. These remaining environmental factors were then weighted out of 100.

The following environmental factors were used to evaluate the alternatives:

HADD - permanent impacts

This HADD area is equal to the total water and wetland area that is permanently impacted and lost by the construction of both the bridge and approaches. These areas are classed as HADD areas because they include fish spawning and habitat areas as well as wetland flora and fauna. Alternatives with rock fill approaches and single span options have larger impacts on this factor. This factor is measured in square metres. It should be noted that the HADD areas in Score Sheet No.4 are slightly different to the areas used in the previous score sheets as an updated field survey was completed of the wetland area for this evaluation.

Wetland/water construction impacts

This factor is rated from high to low and is based on the temporary construction impacts to the existing wetland and water area around the bridge. This has been included as some alternatives have a larger impact during construction than others. Alternatives which have larger approaches have a higher impact as there will potentially be more construction activity in the wetland area. Low impacts are better than high impacts.

Connectivity

This option joins the two previous environmental factors "Connectivity without additional Structure" and "Recreational Trail Below" as categories were removed and these two factors both deal with access under the bridge. This factor has been slightly modified to compare alternatives which allow for access under the bridge in the future when the existing bridge is upgraded. This is assuming that the upgraded bridge will be identical to this new bridge being placed now.

Visual Aesthetics

While this factor is opinion based, the visual aesthetics of each alternative is to be evaluated against each other. Generally the TSC evaluated that bridges with more spans and less approaches are more aesthetically pleasing. Likewise it was evaluated that retained earth (retaining wall) approaches are better than a rock fill slope.

Construction cost

This is the estimated overall cost to construct or expand the bridge and approaches. It includes the cost for materials, labour, machinery, replacement of service/utility crossings, traffic control etc.

6.6 Final Bridge Preferred Option

During the November 24, 2009 meeting the TSC scored six (6) additional bridge alternatives and weighted the environmental factors. The scores were determined and Option 6 scored best at 73.2 points out of a possible 90. Option 6 was a new alternative which included maximising the length of a three-span bridge using a 1600mm girder. This option also included retaining walls on the approaches to reduce the amount of HADD area.

While this option was one of the more expensive alternatives and scored second lowest in the cost criteria, it was preferred over the other alternatives on all of the other criteria. It scored 14% higher than Option 5, the second place alternative. Option 5 was a 2-span bridge with retaining walls. It was therefore the preferred alternative and this was considered a robust result.

This result was discussed with the TSC and the TSC considered this to be the correct result and endorsed Option 6 as the technically preferred alternative.

The preliminary design and general arrangement drawings of this alternative have been completed and are included in Appendix D. These drawings will also be presented to the public at the next Public Information Centre.

7. Summary

The Technical Steering Committee has selected preferred options for three separate aspects of the County Road 43 Corridor – for Corridor Cross-Section Features, Centre Corridor Intersection Control and the CR43 Bridge. Preliminary designs have been prepared and are included in Appendix D. The Committee has identified the following Technically Preferred Alternative:

Alternative 5 for the corridor cross-section features – This alternative utilises a 30m corridor to contain a 2m wide centre median, 3.5m wide driving lanes and a landscaped boulevard with separation between the bicycle path (which is behind the curb) and the side walk.

Option 1 for the Centre Corridor Intersection Control – This alternative results in a complete roundabout corridor where all major intersections are controlled by roundabouts. This alternative is consistent with the philosophy set by the Corridor Master Plan.

Option 6 for the CR43 Bridge – This alternative maintains the existing 2-lane bridge while constructing a new, two-lane, 3-span bridge to the south. Approaches to the new bridge and would be constructed with reinforced earth, vertical retaining walls. This alternative has low impacts to the natural, social and cultural environments, and has low property and construction impacts.

Preliminary designs have been prepared based on the Committee's selection of Technically Preferred Alternatives. The next step for this Class EA will be to present this report and the preliminary designs to the public and interested review agencies. The TSC will consider comments received and may recommend changes or refinements to the Technically Preferred Alternatives before proceeding to the next steps.

Appendix A

Corridor Cross-section Alternatives

- Figure 1 – Alternative 1
- Figure 2 – Alternative 2 and Alternative 3
- Figure 3 – Alternative 4 and Alternative 5

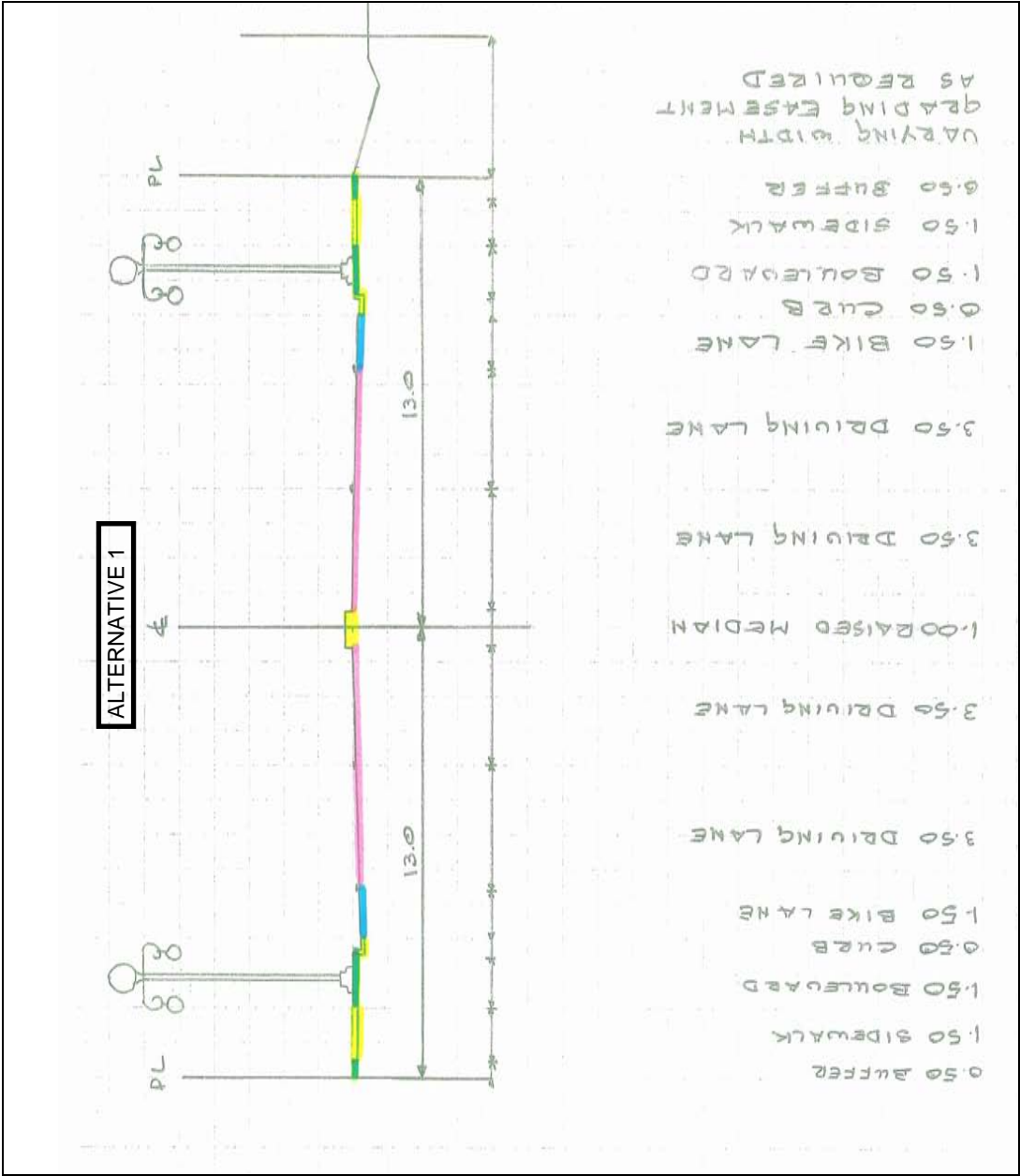


FIGURE 1 - ALTERNATIVE 1

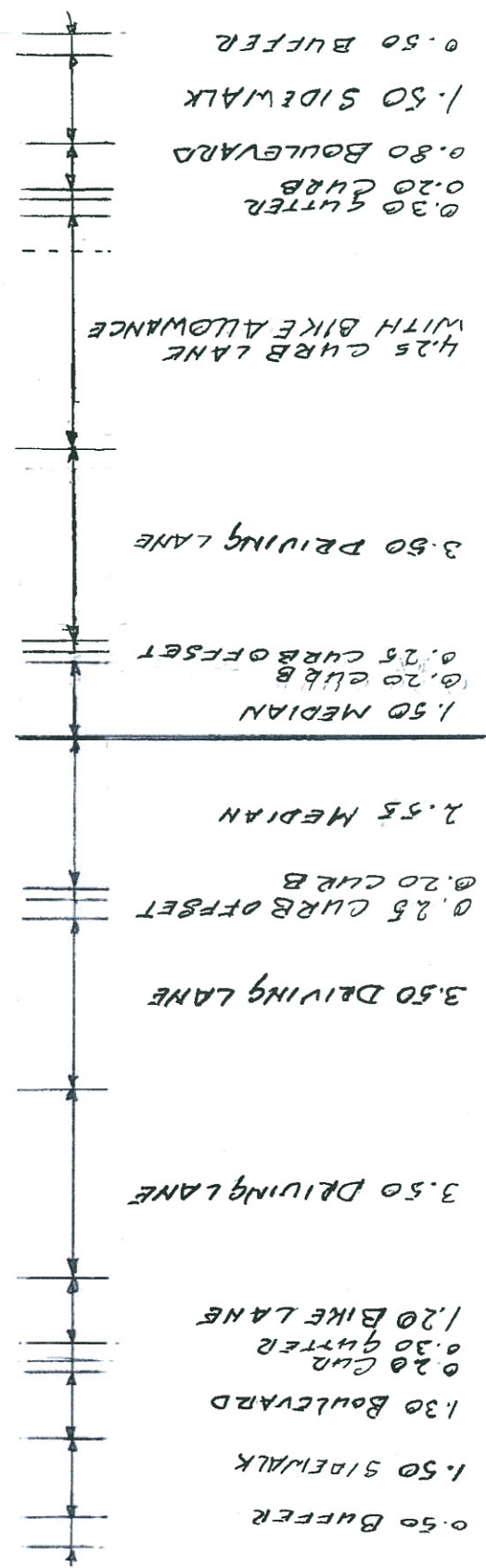
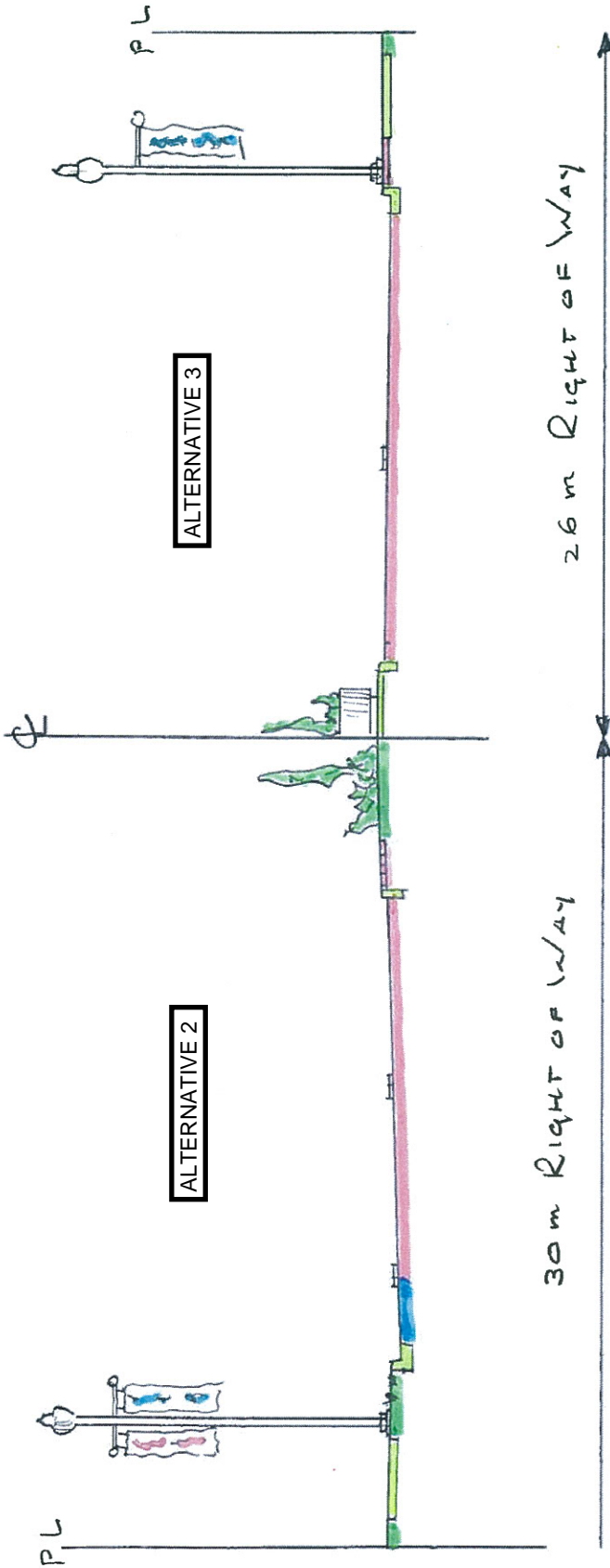


FIGURE 2 - ALTERNATIVE 2 AND ALTERNATIVE 3

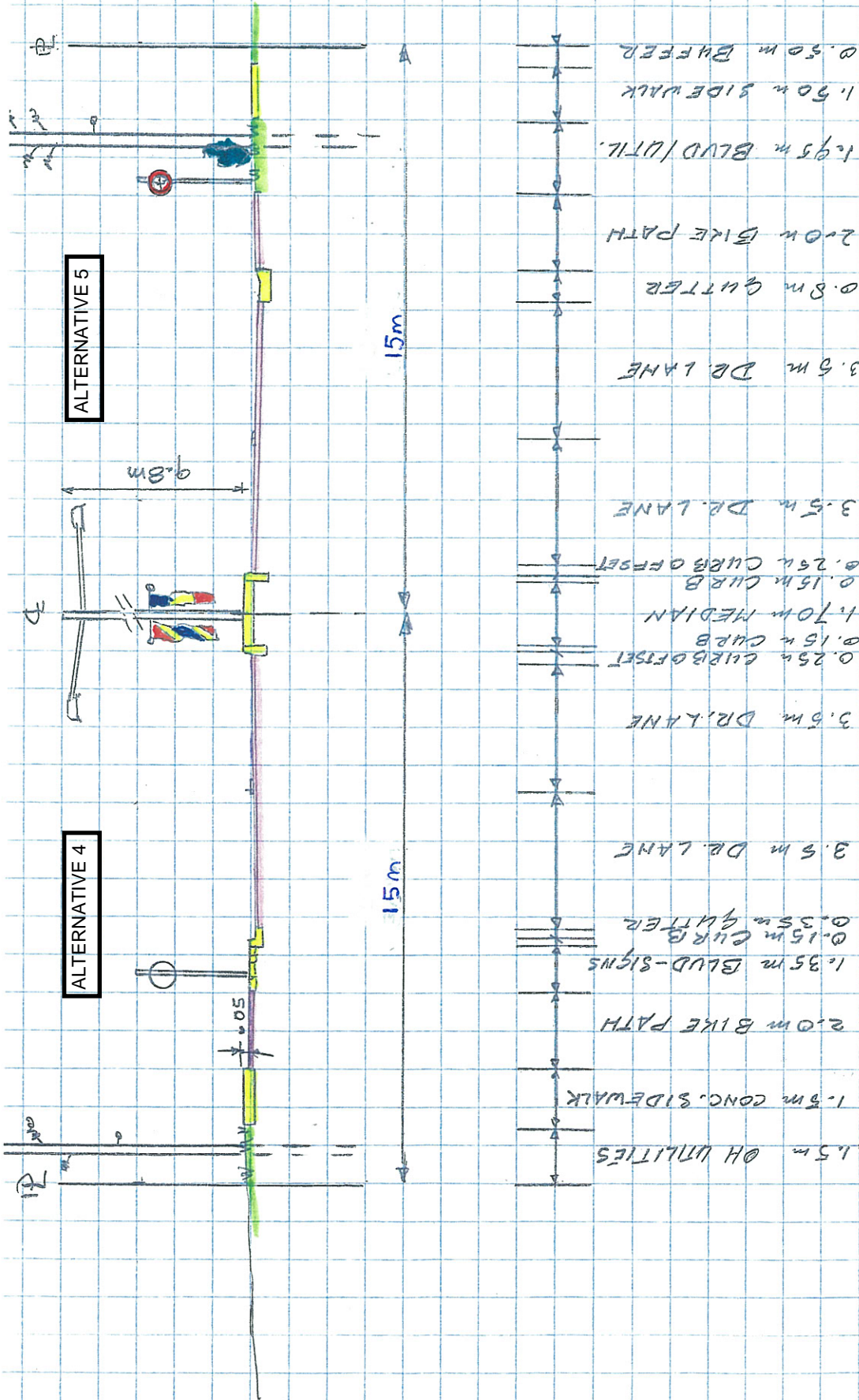


FIGURE 3 - ALTERNATIVE 4 AND ALTERNATIVE 5

Appendix B

Centre Corridor Intersection Configuration Alternatives

- **Score Sheet No.1**
- **Score Sheet No.2**
- **Environmental Factor Weighting Score Sheet**
- **Evaluation Results**

ALTERNATIVES SCORE SHEET No.1

Natural Environment	Air Quality	The average delay at a RAB is significantly less than for a traffic signal, resulting in reduced GHG emissions.	○	●	◐	●
Traffic & Transportation	Accessibility	Access and egress is better with roundabouts. Option 3 will impede access to Community Square.	◐	●	◐	○
	Safety	Introducing a roundabout will reduce collisions	○	●	◐	●
	Pedestrians & Cyclists	Traffic signals may be more pedestrian and bicyclist friendly than a 2-lane roundabout	●	○	◐	◐
	Spacing of Intersections	Conflicts between intersection operations are reduced by removing full intersection at Community Square	○	○	○	●
Socio-Economic Environment	Travel Time	Roundabouts improve travel time through reduction of queuing	○	●	◐	●
	Business Impacts	Businesses generally have a preference for traffic signals at their entrances	●	○	◐	○
Engineering	Roundabout Corridor	Roundabouts are consistent with design philosophy that has been established for this corridor	○	●	○	●
Cost	Capital	Costs will be lowest for Option 3, similar for others.	◐	◐	◐	●
	Operational	Operational costs are lowest for RAB's.	○	●	◐	●
	Property Acquisition	Property requirements are significant for RAB at CR44	●	○	○	○

ALTERNATIVES SCORE SHEET No.2

Factor	Discussion	Do Nothing <ul style="list-style-type: none"> • Signals at CR44 • Signals at Community Square • RAB at St. Michael School 	Option 1 <ul style="list-style-type: none"> • RAB at CR44 • RAB at Community Square • RAB at St. Michael School 	Option 2 <ul style="list-style-type: none"> • RAB at CR44 • Partial Signals at Community Square • RAB at St. Michael School 	Option 4 <ul style="list-style-type: none"> • RAB at CR44 • Signals at Community Square • RAB at St. Michael School
Air Quality	A roundabout with 25,000 daily entering vehicles can reduce fuel consumption by 227,000 Litres per year compared to a signal	NO CHANGE	MUCH BETTER	BETTER	BETTER
Score					
Vehicle Access	Is access maintained to current standard	NO CHANGE	MUCH BETTER	WORSE	BETTER
Score					
Safety	Introducing a roundabout will reduce collisions	NO CHANGE	MUCH BETTER	BETTER	BETTER
Score					
Pedestrians & Cyclists	Traffic signals may be more pedestrian and bicyclist friendly than a 2-lane roundabout	NO CHANGE	MUCH WORSE	WORSE	WORSE
Score					
Travel Time	Roundabouts improve travel time through reduction of queuing	NO CHANGE	MUCH BETTER	BETTER	BETTER
Score					
Business Impacts - Access	Businesses historically have had a preference for traffic signals at their entrances	NO CHANGE	WORSE	NO CHANGE	NO CHANGE
Score					
Roundabout Corridor	Roundabouts are consistent with design philosophy that has been established for this corridor	NO CHANGE	MUCH BETTER	BETTER	BETTER
Score					
Capital	Allowing that intersections will be fully reconstructed when road is widened to four lanes, road construction costs are nominally the same for RAB's vs. signalized interesections with turn lanes. Traffic signals are an additional cost that is not required for RAB.	NO CHANGE	MUCH BETTER	BETTER	BETTER
Score					
Operational	Operational costs are lowest for RAB's. Allow \$1,500 per year for maintenance and power for each set of traffic signals.	\$3,000 per year	--	\$1,500 / year	\$1,500 / year
Score					
Property Acquisition	Development of RAB at 44/43 will require additional property on SE corner.	NO CHANGE	WORSE	WORSE	WORSE
Score					
Score					

ENVIRONMENTAL FACTOR WEIGHTING SCORE SHEET

Factor	Discussion	Weight
Air Quality	A roundabout with 25,000 daily entering vehicles can reduce fuel consumption by 227,000 Litres per year compared to a signal	
Vehicle Access	Is access maintained to current standard	
Safety	Introducing a roundabout will reduce collisions	
Pedestrians & Cyclists	Traffic signals may be more pedestrian and bicyclist friendly than a 2-lane roundabout	
Travel Time	Roundabouts improve travel time through reduction of queuing	
Business Impacts - Access	Businesses historically have had a preference for traffic signals at their entrances	
Roundabout Corridor	Roundabouts are consistent with design philosophy that has been established for this corridor	
Capital	Allowing that intersections will be fully reconstructed when road is widened to four lanes, road construction costs are nominally the same for RAB's vs. signalized interesections with turn lanes. Traffic signals are an additional cost that is not required for RAB.	
Operational	Operational costs are lowest for RAB's. Allow \$1,500 per year for maintenance and power for each set of traffic signals.	
Property Acquisition	Development of RAB at 44/43 will require additional property on SE corner.	
		—
	TOTAL	100

**CR43 - Evaluation of Intersection Options
Scores**

Factor	Do Nothing <ul style="list-style-type: none"> • Signals at CR44 • Signals at Community Square • RAB at St. Michael School 	Option 1 <ul style="list-style-type: none"> RAB at CR44 RAB at Community Square RAB at St. Michael School 	Option 2 <ul style="list-style-type: none"> • RAB at CR44 • Partial Signals at Community Square • RAB at St. Michael School 	Option 4 <ul style="list-style-type: none"> • RAB at CR44 • Signals at Community Square • RAB at St. Michael School
Air Quality	38.6	77.4	60.6	57.1
Vehicle Access	41.3	76.3	46.6	58.1
Safety	84.5	71.0	6.8	5.9
Pedestrians & Cyclists	64.8	40.9	65.8	53.9
Travel Time	38.0	77.5	63.3	54.1
Business Impacts - Access	49.5	37.5	39.8	47.9
Roundabout Corridor	50.6	8.1	83.1	75.0
Capital	48.1	0.5	69.6	67.1
Operational	3.1	53.9	36.6	34.8
Property Acquisition	36.5	5.5	.5	0.0
Total Score	475.0	738.5	614.6	583.9
Rank	4			3

Legend: ue shading indicates top ranked on that line

Appendix C

Bridge Alternatives

- Possible Alternatives
- Bridge Score Sheet No.1
- Bridge Score Sheet No.2
- Bridge Score Sheet No.3
- Bridge Score Sheet No.4
- Environmental Category Weighting Score Sheet No.1
- Environmental Factor Weighting Score Sheet No.1
- Environmental Factor Weighting Score Sheet No.2
- Evaluation Results No.1
- Evaluation Results No.2

162 POSSIBLE BRIDGE ALTERNATIVES

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Cast In-situ																										
Maintain Existing Bridge																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Cast In-situ																										
Construct New 2 lane BridgeG																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
Cast In-situ																										
Construct New 4 lane bridgeG																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
Precast																										
Maintain Existing Bridge																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Precast																										
Construct New 2 lane BridgeG																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
Precast																										
Construct New 4 lane bridgeG																										
Widen to Both Sides									Widen to North									Widen to South								
3.35m			4.9m			6.7m			3.35m			4.9m			6.7m			3.35m			4.9m			6.7m		
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

DENOTES ALTERNATIVE ELIMINATED BY THE TECHNICAL STEERING COMMITTEE PRIOR TO AUGUST 11, 2009 MEETING
 DENOTES ALTERNATIVE ELIMINATED BY THE TECHNICAL STEERING COMMITTEE DURING THE AUGUST 11, 2009 MEETING
 DENOTES ALTERNATIVES EVALUATED DURING SEPTEMBER 8, 2009 MEETING

BRIDGE SCORE SHEET No.3

Option No.
EXISTING BRIDGE
WIDENING
NAVIGATIONAL CLEARANCE
NUMBER OF SPANS

1	2	4	11	13	20	22	29	31	38	40
Maintain Existing Bridge					Replace Existing Bridge					
both sides	widen to north		widen to south		widen to both sides		widen to north		widen to south	
3.35m	3.35m		3.35m		3.35m		3.35m		3.35m	
2	1	3	1	3	1	3	1	3	1	3

CRITERIA & DESCRIPTION	UNITS
------------------------	-------

Natural Environment	
HADD - permanent <u>water</u> impacts	m ² Score
HADD - permanent <u>wetland</u> impacts	m ² Score
wetland/water construction impacts	low/high Score
Connectivity without additional structure	yes/no Score

324	945	406	284	0	324	06	602	270	255	0
825	481	270	296	690	825	458	415	84	877	493
	AVG	LOW	AVG	LOW	AVG	LOW	AVG	LOW	AVG	LOW
NO	NO	NO	NO	NO	NO	YES	NO	YES	NO	YES

Social and Cultural Environment	
Recreational trail below	yes/no Score
Visual Aesthetics	yes/no Score
Possible UNESCO impacts	yes/no

NO	NO	NO	NO	NO	NO	YES	NO	YES	NO	YES
NO CHANGE	NO CHANGE	BETTER	NO CHANGE	BETTER	NO CHANGE	MUCH BETTER	NO CHANGE	MUCH BETTER	NO CHANGE	MUCH BETTER
YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES

Land Use & Property	
Impacted Residence	# Score
Property Requirements	low/high Score

WORSE	MUCH WORSE	MUCH WORSE	NO CHANGE	NO CHANGE	WORSE	WORSE	MUCH WORSE	MUCH WORSE	NO CHANGE	NO CHANGE
AVG	A-H	A-H	LOW	LOW	AVG	AVG	A-H	A-H	LOW	LOW

Engineering	
Construction Traffic Impacts	low/high Score
Maintainability	poor/good Score
Construction cost (Bridge & Approaches)	\$ Score
Life Cycle cost (Bridge only)	\$ Score
Construction Schedule	# years Score

HIGH	LOW	LOW	LOW	LOW	HIGH	HIGH	LOW	LOW	LOW	LOW
POOR	GOOD	GOOD	GOOD	GOOD	A-G	A-G	A-G	A-G	A-G	A-G
5.0M	2.2M	3.2M	2.2M	3.0M	3.3M	5.4M	3.1M	5.2M	3.1M	5.2M
4.6M	2.0M	4.0M	2.0M	4.0M	3.1M	5.5M	2.9M	5.3M	2.9M	5.3M
2	.2	.2	.2	.2	2	2	2	2	2	2

BRIDGE SCORE SHEET No.4

Option No.
NUMBER OF SPANS
TOTAL SPAN
APPROACH CONSTRUCTION

1	2	3	4	5	6
1	3	3	1	2	3
36	90	126	36	76	114
1:1			REINFORCED EARTH		

No.	CRITERIA & DESCRIPTION	UNITS
-----	------------------------	-------

1	HADD - permanent impacts	m ²
		Score
2	wetland/water construction impacts	low/high
		Score
3	Allows Connectivity of wildlife and Recreational trail below in the future without an additional structure	yes/no
		Score
4	Visual Aesthetics	worse/better
		Score
5	Construction cost (Bridge & Approaches)	\$
		Score
6		
		Score

1487	782	303	658	435	273
	low	low		avg	low
NO	YES	YES	NO	YES	YES
No Change	Better +2	Better +3	Better +1	Better +2	Better +3
2.0M	2.9M	4.0M	2.4M	2.9M	3.4M

CR43 - Evaluation of Bridge Options

Category Weights:W	
Traffic & Transportation	_____
Natural Environment	
Social & Cultural Environment	
Land Use & Property	
Engineering	
TOTAL:W	100W

CR43 - Evaluation of Bridge Options

Evaluation - Factor Weights	Points
Traffic & Transportation	
	<u>100</u>
Natural Environment	
HADD - Permanent water impactsN	
HADD - Permanent wetland impactsN	
etland/water construction impactsN	
Potential for future HADD impactsN	
Connectivity without additional structureN	
	<u>100</u>
Social and cultural Environment	
Recreational trail belowN	
Visual AestheticsN	
Possible UNESCO impactsN	
	<u>100</u>
Land Use & Property	
impacted ResidenceN	
Property RequirementsN	
	<u>100</u>
Engineering	
Construction Traffic ImpactsN	
MaintainabilityN	
Construction cost (Bridge & Approaches)N	
Life Cycle cost (Bridge Only)N	
Construction ScheduleN	
	<u>100</u>

Environmental Factor Weighting Score Sheet No.2

No.	Evaluation Criteria	Score
1	HADD - permanent impacts	
2	Wetland/water construction impacts	
3	Allows Connectivity of wildlife and Recreational trail below in the future without an additional structure	
4	Visual Aesthetics	
5	Construction cost (Bridge & Approaches)	
6		

Total score 100

30-Sep-09

CR43 - Evaluation Results of Bridge Alternatives

Option No.
EXISTING BRIDGE
WIDENING TO
NUMBER OF SPANS

1	2	4	11	13	20	22	29	31	38	40
Maintain Ex Bridge					Replace Ex Bridge					
Both	North		South		Both		North		South	
2	1	3	1	3	1	3	1	3	1	3

Overall Score
Overall Rank

0C	49.1C	53.8C	64.7C	68.1C	41.2C	51.0C	44.6C	54.2C	54.2C	64.1C
8C	6C	2C			0C	7C	9C	4C	4C	

Natural Environment Score
Natural Environment Rank

5C	0Q	1.3C	2.4C	20.7C	2.5C	23.9C	5.5C	27.3C	4.0C	25.4C
8C	4C	0C	5C	9C			6C		7C	2C

Social and Cultural Score
Social and Cultural Rank

5.1C	5.0C	6.7C	8.8C	0.5C	5.0C	2.1C	5.0C	2.0C	5.3C	2.4C
8C	6C	5C	4C	0C	2C	8C		7C		

Land Use and Property Score
Land Use and Property Rank

7.4C	2.7C	2.7C	5.2C	8C	7.4C	7.4C	2.7C	2.7C	6C	9C
5C	8C	8C	4C	2C	5C	5C	8C	8C		

Engineering Score
Engineering Rank

6.9C	28.3C	23.1C	28.3C	23.2C	6.2C	7.6C	21.4C	2.2C	21.4C	2.4C
		4C			7C	0C	5C	9C	5C	8C

Everything but Natural Environment Rank

9.5C	6.0C	2.5C	52.3C	47.5C	28.6C	27.1C	29.1C	27.0C	40.2C	8.7C
5C	6C		2C		8C	9C	7C	0C		4C

Everything but Social and Cultural Rank

25.8C	44.1C	47.1C	55.9C	57.7C	6.1C	9.0C	9.6C	42.2C	48.9C	51.7C
6C	5C	2C			0C	9C	8C	7C	4C	

Everything but Land Use and Property Rank

23.5C	46.3C	51.1C	49.5C	54.3C	7C	3.6C	41.9C	51.5C	40.6C	50.2C
6C			5C		0C	7C	8C	2C	9C	4C

Everything but Engineering Rank

24C	20.8C	0.8C	6.4C	44.9C	25.0C	43.5C	23.2C	42.0C	2.8C	51.7C
9C		7C	5C	2C	8C		0C	4C	6C	

Evaluation Results No.2

24-Nov-09

CR43 - Evaluation of Scoped Bridge Options Summary

Option No.
Number of Spans
Total Bridge Length
Fill Slopes

Average					
1	2	3	4	5	6
1	3	3	1	2	3
36	90	126	36	76	114
1:1			R. EARTH		

CRITERIA




HADD - permanent impacts
wetland/water construction impacts
Connectivity
Visual Aesthetics
Construction cost

3.0	12.6	24.5	14.6	21.1	27.0
3.7	11.8	13.9	3.7	4	14.5
2.5	11.5	11.5	2.5	10.9	12.1
4.1	7.9	9.0	4.6	3	9.8
24.5	14.9	3.6	21.1	14.9	9.8

Totals
Rank

37.8	6	62.5	46.6	63.5	73.2
6	4	3		2	1

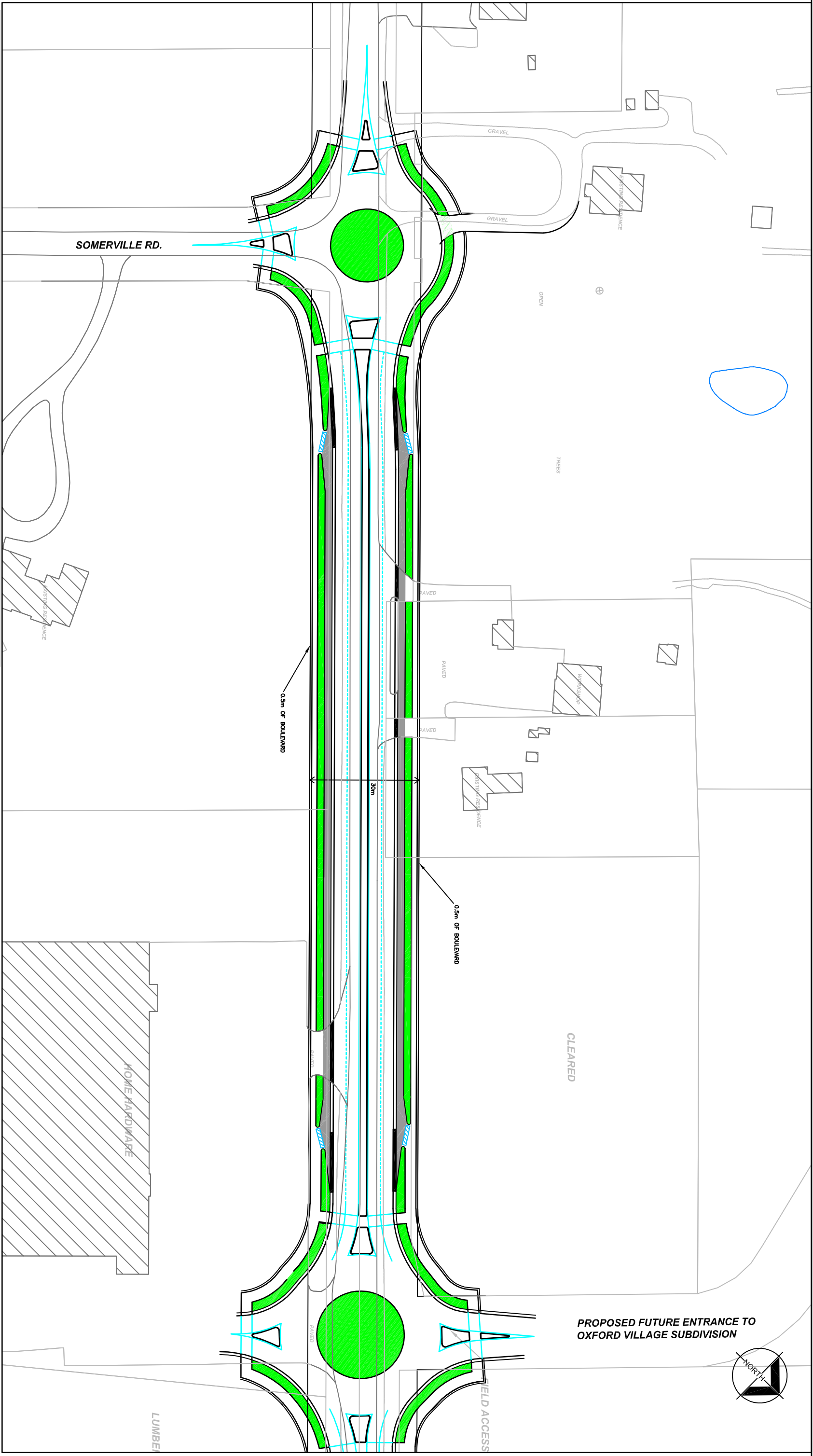
Legend:

	Highest ranking
	2 nd highest ranking
	3 rd highest ranking

Appendix D

Preliminary Design Drawings

- Corridor Plan
- Bridge General Arrangement Drawings



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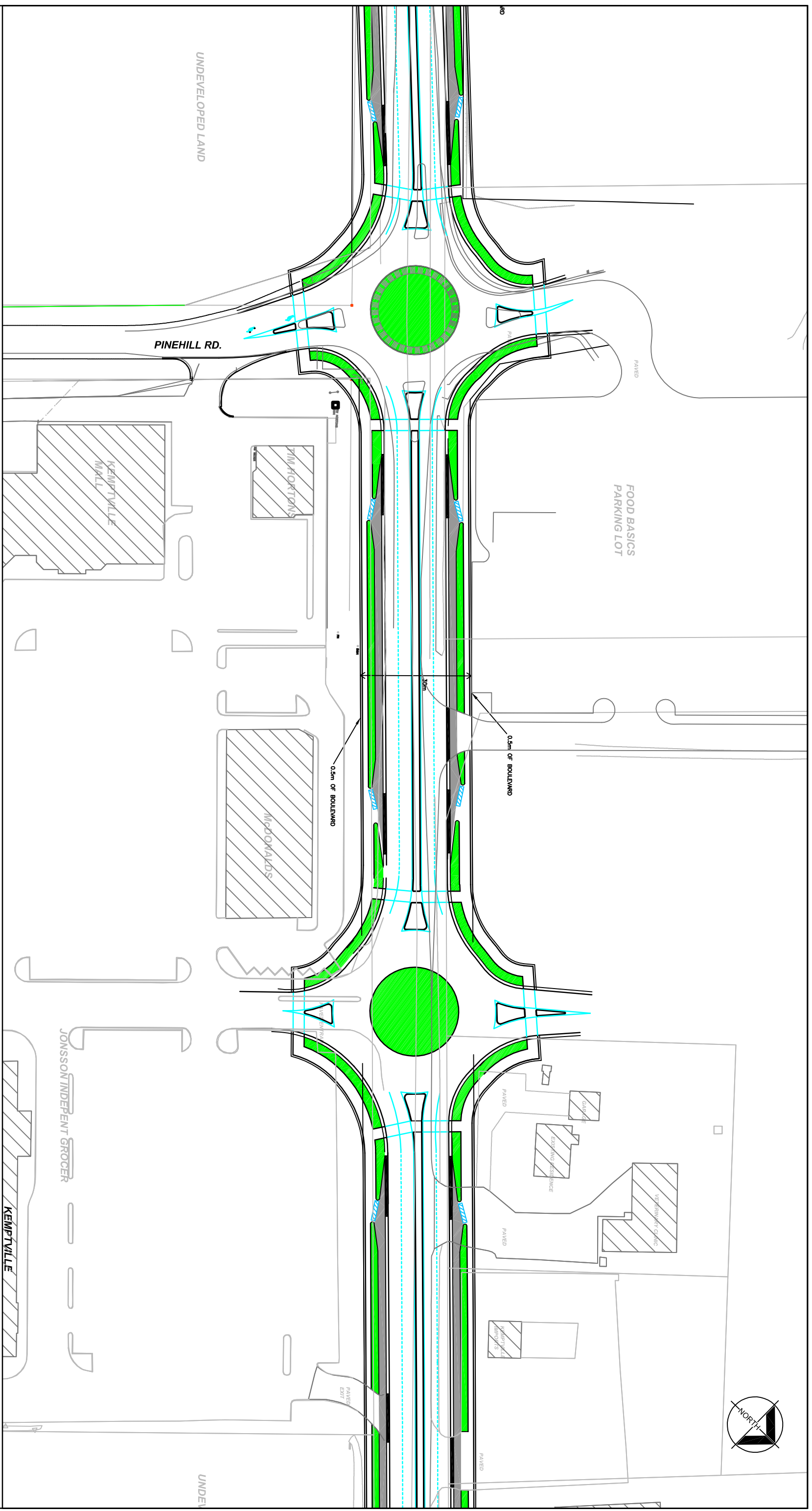
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No.	DATE	BY	ISSUES / REVISIONS
1			

DRAWN BY: DDB
DESIGNED BY: SBG
SCALE: 1:1000

CHECKED BY: SBG
APPROVED BY: GML
DATE: NOVEMBER 2009

PROJECT No.: 108480
DRAWING No.: 1



LEGEND

BOULEVARD	
LANE LINE	
BIKE LANE	
DROPPED CURB	
DETECTABLE STRIP	
EXISTING ACCESS TO BE RESTRICTED	



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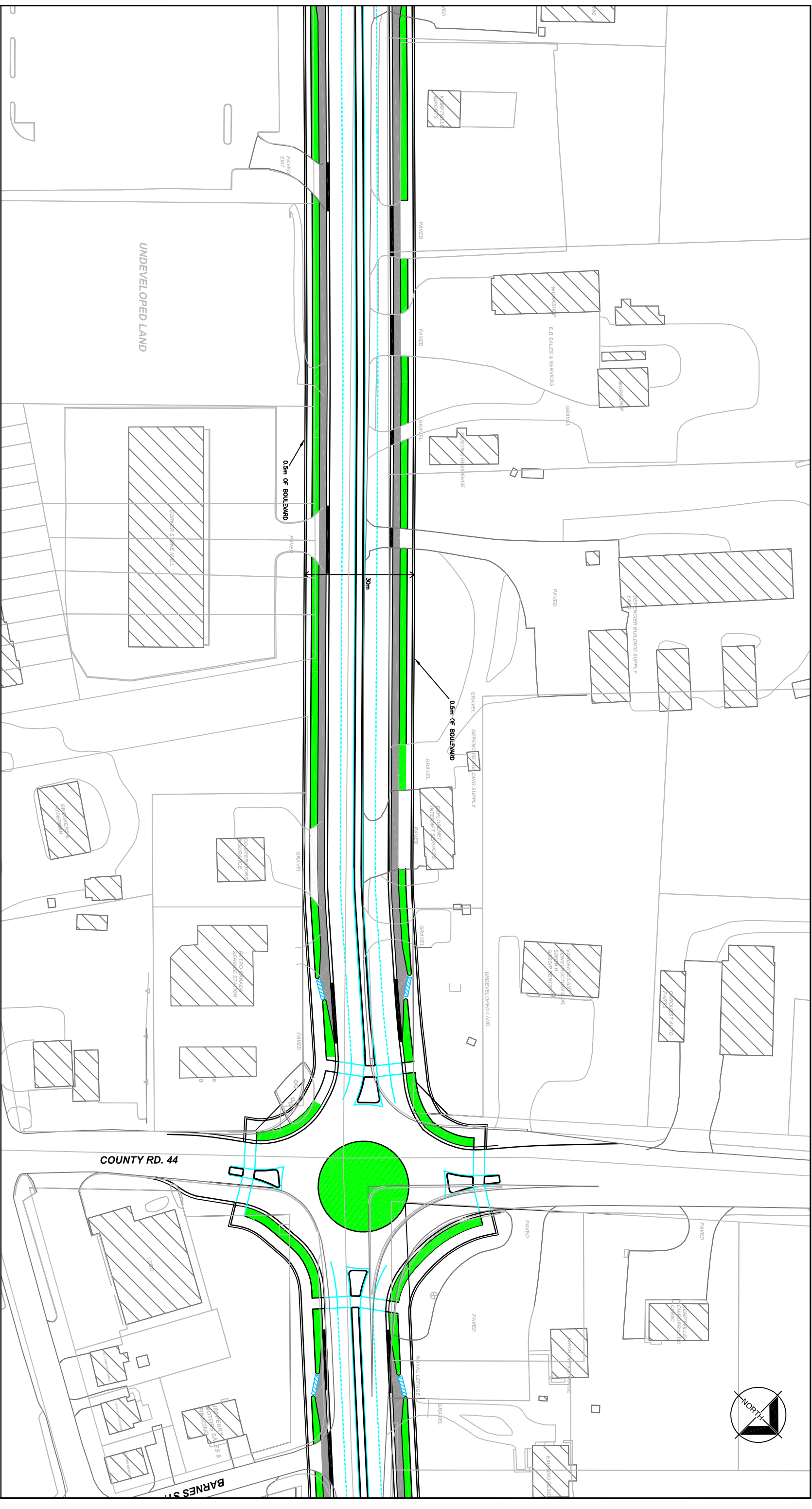
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No.	DATE	BY	ISSUES / REVISIONS







CLIENT: **THE UNITED COUNTRIES OF LEEDS AND GRENVILLE**

DRAWN BY: DJB	CHECKED BY: SSG	PROJECT: COUNTY ROAD 43 CLASS EA
DESIGNED BY: SSG	APPROVED BY: GML	GENERAL CORRIDOR PLAN
SCALE: 1:1000	DATE: NOVEMBER 2009	

PROJECT No.: 108480
 DRAWING No.: 3



LEGEND

	BOULEVARD		BIKE LANE		EXISTING ACCESS TO BE RESTRICTED
	LANE LINE		DROPPED CURB		
			DETECTABLE STRIP		

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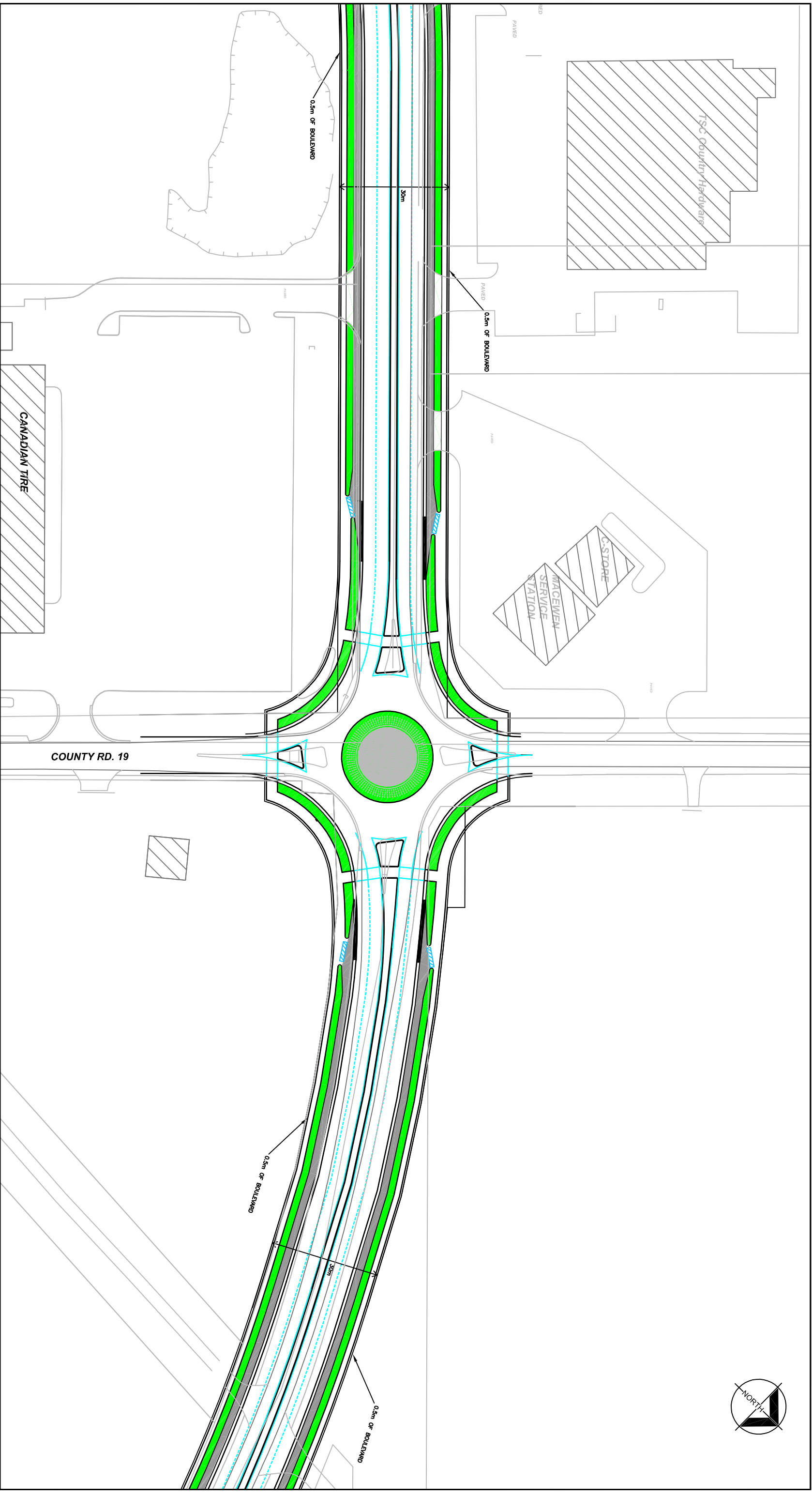
PROJECT No.:		108480	
DRAWING No.:		4	

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



DRAWN BY: DDB
DESIGNED BY: SSG
SCALE: 1:1000

CHECKED BY: SSG
APPROVED BY: GML
DATE: NOVEMBER 2009

PROJECT: COUNTY ROAD 43 CLASS EA
GENERAL CORRIDOR PLAN



LEGEND

	BOULEVARD LANE LINE		BIKE LANE DROPPED CURB
	DETECTABLE STRIP		EXISTING ACCESS TO BE RESTRICTED

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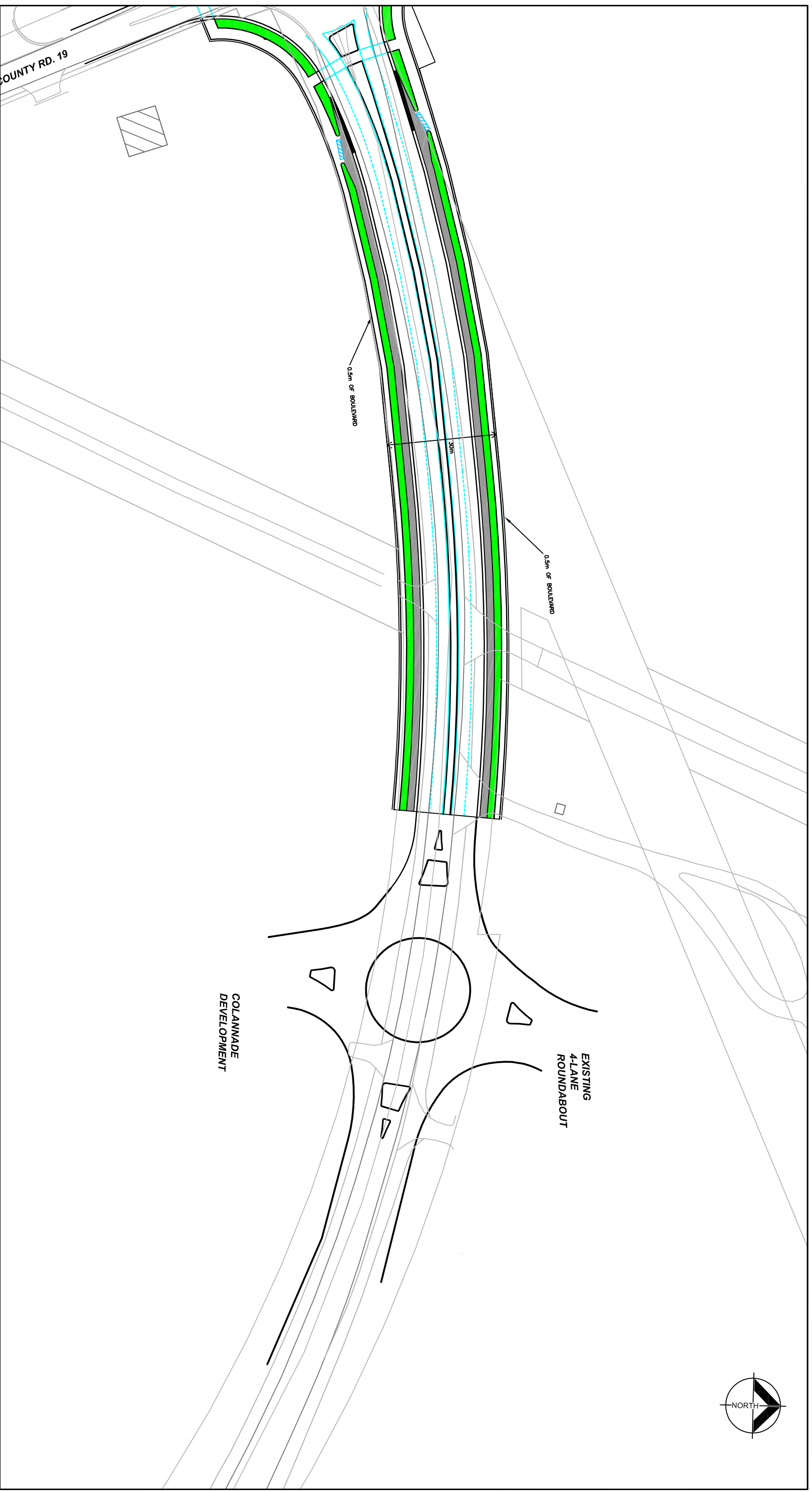
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



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DESIGNED BY: SRS	APPROVED BY: GML	DRAWINGS: GENERAL CORRIDOR PLAN
SCALE: 1:1000	DATE: NOVEMBER 2009	PROJECT No.: 108480
		DRAWING No.: 10



LEGEND

	BOULEVARD LANE LINE
	BIKE LANE DROPPED CURB
	DETECTABLE STRIP
	EXISTING ACCESS TO BE RESTRICTED



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DRAWN BY: DB	CHECKED BY: SBG	PROJECT: COUNTY ROAD 43
DESIGNED BY: SBG	APPROVED BY: GML	CLASS EA
SCALE: 1:1000	DATE: NOVEMBER 2009	GENERAL CORRIDOR PLAN

PROJECT No.: 108480
 DRAWING No.: 11

