West Transitway Extension
Bayshore Station to West of Moodie Drive

Document 5 – Development of the Preliminary Recommended Plan

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Executive Summary

The City of Ottawa initiated this planning and design study in February 2009 to identify a Recommended Plan to extend the bus rapid transit (BRT) network (Transitway) from Bayshore Station to Moodie Drive. As part of this study, alternatives are being evaluated and all necessary permits and approvals required for project implementation are being obtained.

This project is being planned in accordance with the Transit Project Assessment Process (TPAP) as described in Ontario's Transit Project Regulation (O. Reg. 231/08). Prior to initiating the formal approvals process, the TPAP requires proponents to have a clearly defined transit project which necessitates a considerable amount of pre-planning work. In the context of this project, pre-planning activities completed by the City have included:, corridor selection, route selection, selecting a preferred preliminary design including conceptual measures to mitigate environmental impacts, identifying a strategy to guide implementation and an on-going stakeholder engagement program. Together, findings from these pre-planning activities constitute the Preliminary Recommended Plan

The purpose of this report, in conjunction with the Assessment of Effects and Comparative Evaluation of Route Alternatives (AECERA) Report (MRC, February 2010) is to document the process through which a Preliminary Recommended Plan was generated, evaluated and identified. Specifically, the AECERA Report provides an overview of the project history and objectives, a discussion of project need, a summary of existing environmental conditions, an overview of the corridor selection process completed by the City through previous EA studies, and the assessment and evaluation of route alternatives that supported the identification of a recommended Transitway route on the north side of Highway 417 (Queensway North route). This report documents the development of the Preliminary Recommended Plan including an assessment and evaluation of preliminary design alternatives, a description of the conceptual mitigation strategy, and the assessment of potential implementation scenarios.

The planning work completed to date has been carried out at a sufficient level of detail to define a Preliminary Recommended Plan, identify key issues and constraints, and develop preliminary approaches and strategies to address them. Council approval of the Preliminary Recommended Plan is required prior to the initiation of the formal 6-month TPAP approvals process. As National Capital Commission (NCC) lands are required for this project, a Screening under the *Canadian Environmental Assessment Act* (CEA Act) will also be carried out.

Recognizing the importance of stakeholder participation in the planning process, a comprehensive consultation program is being undertaken to ensure that all concerns and issues are identified and given appropriate consideration early and throughout the study. This consultation program includes Public Open Houses, meetings with a Technical Advisory Committee (TAC), meetings and presentations to City Advisory Committees and regular meetings with the Crystal Beach/Lakeview Community Association (CBLCA).

To identify a preferred preliminary design, the Queensway North route (recommended in the AECERA Report - MRC, February 2010) was subdivided into three distinct segments (east, central and west) within which design alternatives were developed, assessed and evaluated in consultation with stakeholders, review agencies and the general public.

Net effects (after mitigation), were assessed to identify the advantages and disadvantages associated with each design alternative. Design alternatives were then compared and evaluated

based on these advantages and disadvantages and a comprehensive rationale for the selection of a preferred preliminary design was developed. The evaluation and rationale was presented at POH 3 and refined in consultation with stakeholders and technical advisors.

The preferred preliminary design locates the Transitway on the north side of Highway 417 and is comprised of two 4.0 m transitway lanes and two 2.5 m paved shoulders. The Transitway is for exclusive transit use and is grade-separated at both Holly Acres Road and Moodie Drive. A transit station is proposed immediately east of Moodie Drive with local bus access from Corkstown Road. This station is fully integrated with the existing multi-use pathway network and provides OC Transpo with the flexibility to terminate/turn around local and shuttle bus services at the station. A small "kiss-and-ride" facility is also proposed adjacent to the station on Corkstown Road in order to improve community access to rapid transit.

Based on input received through consultation with interested stakeholders, a number of elements have been incorporated into the preferred preliminary design to enhance the existing pedestrian and cycling environment including: removing one southbound traffic lane on the Moodie Drive bridge over Highway 417 to allow for the widening of the southbound cycling lane and the provision of a new 3.0m multi-use pathway on the west side of the bridge; relocating existing cycling lanes on the Moodie Drive bridge to the shoulders; providing bike boxes to give cyclists priority at ramp intersections; and new and enhanced multi-use pathway connections at Holly Acres Road and Moodie Drive.

To limit encroachment into the Stillwater Creek Valley and avoid direct impacts to sensitive valley vegetation, the plan includes a 750m long retaining wall which contains the proposed West Transitway facility entirely within the Highway 417 right-of-way from Bayshore Station to approximately 550m east of Moodie Drive. The direct removal of approximately 1.2 ha of vegetation located in the meadow area just east of Moodie Drive is required to accommodate the station at Corkstown Road. Overall ecological significance of this meadow is considered relatively low.

The noise analysis completed in support of this study has concluded that the contribution to environmental noise from the Transitway is expected to range from 0.1 to 0.2 dBA and be indistinguishable from local background traffic noise in 2031. The dominant source of roadway noise is, and will continue to be Highway 417. In accordance with the City's Environmental Noise Control Guidelines for Capital Works Projects (Surface Transportation Corridors), this predicted increase does not warrant noise attenuation (an increase of 5.0 dBA, and a total future noise level of > 60 dBA is required to meet the warrant). It is recognized, however, that without noise attenuation, the projected growth in highway traffic will result in future noise levels that exceed 60 dBA at a number of receptor locations (this threshold is already exceeded in some areas). In response to this issue, the Ministry of Transportation (MTO) has identified two sites in the study area as candidate sites for their Retrofit Noise Barrier Program (extending from Bayshore Station to near the proposed station at Corkstown Road). The Preliminary Recommended Plan has been developed so as not to preclude the installation of these barriers by MTO.

The preferred preliminary design described above represents the ultimate, long-term plan for a fully grade-separated Transitway facility. Policy 5.2.2 (2) of the TMP, however, directs staff to defer the cost of grade-separating rapid transit elements by introducing measures that improve reliability by incrementally introducing enhancements to isolate transit from mixed traffic. In accordance with this direction, an analysis was undertaken to determine whether the construction of grade separations at Holly Acres Road and/or Moodie Drive could be deferred until a future date. This analysis concluded that, while the grade separation of Holly Acres Road is required in the near term to avoid construction staging and ground vibration impacts, the construction of three structures at the Moodie Drive interchange (and the long-term transitway station at Corkstown Road) can be deferred until at least 2021.

The proposed implementation of this project is as follows:

	Timeframe	**Description of Works**	**Estimated Cost (2010$)**
Phase 1	2011 to ~2021	• Construct exclusive Transitway from Bayshore Station to Moodie Drive; • Construct grade separation of Holly Acres Road; • Construct improvements to the existing multi-use pathway and on-road cycling network in the vicinity of Holly Acres Road and Moodie Drive; • Construct intersection modifications at Moodie Drive to accommodate Transitway termination; • Implement environmental mitigation measures; and • Construct interim station configuration at the at-grade Transitway intersection with Moodie Drive.	$29.2M
Phase 2	~2021 to Beyond 2031	• Construct grade separation of Moodie Drive for westbound Transitway buses. • Construct long-term transit station configuration at Corkstown Road.	$27.8M
End of Planning Horizon			
	Beyond 2031 <to be completed by others>	• Tie-in to future extension of the West Transitway from west of Moodie Drive to west of Eagleson Road. Alternatively, a new Transitway bridge could be constructed over Highway 417 west of Moodie Drive to connect EB buses travelling on highway shoulder lanes to the Transitway east of Moodie (this configuration would not be convertible to rail).	TBD

This project requires 5.5 hectares of MTO land, 1.2 hectares of NCC land, and 0.2 hectares of private property as follows:

Project Phase	**MTO**	**NCC**	**Private Property**
Phase 1 (2012 - ~2021)	5.5 ha	0.2 ha	0.2 ha
Phase 2 (~2021 to Beyond 2031)	0.0 ha	1.0 ha	0.0 ha

The Recommended Plan will be presented to Committee and Council for endorsement in August/September 2010. Following Council approval of the Preliminary Recommended Plan, the formal provincial Environmental Assessment (EA) approvals process will be initiated in accordance with the Transit Project Assessment Process (TPAP {O. Reg. 231/08}). In addition, as National Capital Commission (NCC) lands are required, a screening under the Canadian Environmental Assessment Act (CEA Act) has been initiated.

CHAPTER 1: INTRODUCTION

The City of Ottawa initiated this planning and design study in February 2009 to identify a Recommended Plan to extend the bus rapid transit (BRT) network (Transitway) from Bayshore Station to Moodie Drive. As part of this study, alternatives are being evaluated and all necessary permits and approvals required for project implementation are being obtained.

This project is being planned in accordance with the Transit Project Assessment Process (TPAP) as described in Ontario's Transit Project Regulation (O. Reg. 231/08). Prior to initiating the formal approvals process, the TPAP requires proponents to have a clearly defined transit project which necessitates a considerable amount of pre-planning work. In the context of this project, pre-planning activities completed by the City have included; corridor selection, route selection, selecting a preferred functional design including conceptual measures to mitigate environmental impacts, identifying a strategy to guide implementation and an on-going stakeholder engagement program. Together, findings from these pre-planning activities constitute the Preliminary Recommended Plan.

The Queensway Corridor was identified as the preferred corridor for the extension of the Transitway to Kanata through numerous approved planning and Environmental Assessment (EA) studies completed by the City of Ottawa and former Regional Municipality of Ottawa-Carelton (RMOC). A recommended Transitway route, however, was never identified within this corridor between Bayshore Station and Moodie Drive. This study therefore began with an assessment of effects and comparative evaluation of route alternatives which was documented in the AECERA Report (MRC, February 2010). The AECERA Report provides an introduction to the study including an overview of the project history and objectives, a summary of existing conditions, an overview of the corridor selection process completed by the City through previous EA studies, a discussion of project need, and a detailed description of the process followed to identify a recommended Transitway route on the north side of the Queensway (Queensway North Route).

Building on the foundation of the AECERA Report, this report documents the development of the Preliminary Recommended Plan including an assessment and evaluation of functional design alternatives within the Queensway North Route, a description of the conceptual mitigation strategy, and the assessment of potential implementation scenarios.

The planning work completed to date has been carried out at a sufficient level of detail to define a Preliminary Recommended Plan, identify key issues and constraints, and develop preliminary approaches and strategies to address them. With Council approval of the Preliminary Recommended Plan, the 6-month TPAP approvals process will be initiated. Also, as National Capital Commission (NCC) lands are required, a Screening under the Canadian Environmental Assessment Act (CEA Act) has also been initiated. The Preliminary Recommended Plan presented in this report will therefore be further refined through on-going consultation with City staff, Advisory Committees, Regulatory Agencies and the general public as the study progresses through the EA approval and design phases. In accordance with the TPAP, the Final Recommended Plan will be documented in an Environmental Project Report which will be placed on the public record for a 30-day review period. If no objections are received that cannot be resolved, the City will proceed with the Phase 1 implementation of the West Transitway Extension Project from Bayshore Station to west of Moodie Drive.

CHAPTER 2: ASSESSMENT AND EVALUATION OF DESIGN ALTERNATIVES

As documented in the AECERA Report (MRC, February 2010), a recommended route has been identified on the north side of Highway 417 from Bayshore Station to west of Moodie Drive. To identify a preferred design, the Queensway North route was subdivided further into three distinct segments within which design alternatives were developed, assessed and evaluated in consultation with stakeholders, review agencies and the general public. The following presents the assessment and evaluation of these design alternatives.

2.1 Preliminary Design Selection Process

The process used to generate, evaluate and identify a recommended preliminary design mirrors the process followed during the route selection phase and adheres to the overall guiding principles established for this study. The preliminary design selection process was designed to facilitate the identification of a Preliminary Recommended Plan that:

- Is consistent with the City of Ottawa's vision and objectives for transit as identified in the approved 2008 Official Plan and Transportation Master Plan Update;
- Provides a cost-effective, near-term solution to current transit service reliability issues while accommodating plans for the ultimate westerly extension of the West Transitway to Kanata (including conversion to rail);
- Minimizes effects to terrestrial and aquatic ecosystems and processes and incorporates measures to mitigate these effects in the design;
- Minimizes effects on the adjacent community and incorporates measures to mitigate these effects in the design;
- Minimizes effects on Greenbelt lands (property requirements and effects to user experience etc.);
- Minimizes effects on provincial highway infrastructure;
- Supports municipal and federal land use planning objectives; and
- Represents a responsible use of public funds.

The assessment of effects and comparative evaluation of preliminary design alternatives was carried out in four steps as described below.

Step 1: Identify Preliminary Design Alternatives

The first step in the preliminary design selection process was to identify a 'reasonable range' of design alternatives within the Queensway North route, including Transitway alignments and station locations. Preliminary design alternatives tie in to a common start point (Bayshore Station) and end point (1997 approved alignment north of Highway 417 and west of Moodie Drive). To be considered 'reasonable', all design alternatives must be capable of accommodating a facility that is constructible and satisfies the City's transit objectives.

Step 2: Refine Evaluation Criteria

As part of the route selection process, a series of criteria were developed in consultation with stakeholders to determine the potential effects (both positive and negative) of various route alternatives. To assist in the identification of a recommended preliminary design, these criteria were refined to optimize their ability to differentiate design alternatives and determine preference including the addition of several design specific criteria.

The refined list of criteria used to assess and evaluate preliminary design alternatives are presented in Table 2-1.

Table 2-1: Preliminary Design Evaluation Criteria

	Criteria	Performance Measures
NATURAL ENVIRONMENT		
1	Fish and Fish Habitat	Minimizes permanent direct and indirect effects to fish and fish habitat considering sensitivity and relative magnitude of potential effect.
2	Designated Natural Environment Features/ Areas	Minimizes permanent direct and indirect effects to designated natural environmental features/areas including ESAs, ANSIs, etc.
3	Wetlands	Minimizes permanent direct and indirect effects to wetland vegetation/communities considering sensitivity, quality and significance of wetland vegetation (including regionally rare/uncommon plant species) and relative magnitude of potential effect.
4	Upland Vegetation	Minimizes permanent direct and indirect effects to upland vegetation (including wooded tablelands and valleys and culturally influenced communities such as cultural thicket, meadow and hedgerows) considering sensitivity, quality and significance of vegetation (including regionally rare/uncommon plant species) and relative magnitude of potential effect.
5	Wildlife	Minimizes effects on habitat considering sensitivity, quality and significance (including migratory birds and known habitat for regional wildlife species of conservation concern) and relative magnitude of potential effect.
6	Fluvial Geomorphology	Minimizes permanent direct and indirect impacts on Graham Creek and Tributary A with respect to flow regime, energy regime, sediment transport, erosion and/or sedimentation and quality and functioning of existing fluvial features.
7	Groundwater Effects	Avoids permanent draw-down and associated environmental impacts
8	Drainage/ Hydrology	Minimize deleterious runoff to watercourses. Minimize increases to flood flows.
9	Construction Effects	Minimizes effects during construction such as: vegetation impacts; erosion and sedimentation of watercourses; groundwater impacts; and noise etc.
SOCIAL/CULTURAL ENVIRONMENT		
10	Heritage/ Archaeology	Avoids areas with heritage/archaeological potential.
11	Contaminated Property	Avoids contaminated property.
12	Noise	Minimizes noise level increases at sensitive receivers NOTE: Sound level calculated from nearest noise sensitive receiver.
13	Ground Vibration	Minimizes ground vibration impacts on sensitive receivers.
14	Visual/Aesthetic Impacts	Maintains/Enhances buffer areas and scenic vistas.
15	Recreation Resources	Maintains/Enhances recreational resources (multi-use pathway, cycling paths, playing fields etc.)
16	Land Use	Compatibility with existing land use designations.

Table 2-1: Preliminary Design Evaluation Criteria		
	Criteria	**Performance Measures**
17	Safety/Security	Maximizes safety and security for transit users, cyclists, pedestrians and multi-use pathway users.
18	Pedestrian/Cycling Connectivity	Maximizes pedestrian and cycling connections to and from transit.
TECHNICAL CONSIDERATIONS		
19	Illumination	Avoids impacts to the "dark night sky". Minimizes light trespass on residential receivers.
20	Property	Bundles transportation corridors and requires least amount of new NCC Greenbelt lands and/or private property.
21	Local/ Highway Traffic	Avoids immediate and long-term impacts to local and highway traffic (Delays, Queue Lengths, etc.). Provides maximum flexibility for future traffic operations.
22	Transit Operations	Maximizes efficiency and flexibility for immediate and long-term transit operations.
23	Staging	Minimizes temporary disruptions to transit operations, local traffic, highway traffic and pedestrian and cyclist traffic during construction.
24	Constructability/ Capital Cost	Avoids complex constructability issues and can be constructed at the lowest capital cost.
25	Long Term Maintenance	Avoids the need for undesirable long-term maintenance operations.

Step 3: Assess Net Effects

Once the assessment criteria had been refined, the potential effects of each design alternative were determined by project team specialists and opportunities to mitigate these effects were identified. Based on the significance of the criteria and the magnitude of net effects, design alternatives were assigned either a 'Good', 'Fair', or 'Poor' performance grade for each criterion.

Figure 2-1 provides a conceptual illustration of the process used to determine the performance grade for each criterion.

In accordance with the TPAP, the relative significance of criteria was determined based on whether the criterion pertains to a matter of provincial importance relating to the natural environment or has cultural heritage value or interest. Greatest significance was therefore placed on natural and social/cultural criteria with less significance being placed on technical considerations.

The magnitude of the potential net effects (after mitigation) was established by first determining the direction of the anticipated effect (is it positive or negative). If the effect was positive, the magnitude was assumed to be nil. If the effect was negative, the degree of magnitude was determined based on an assessment of the following:

Area of Influence: What is the geographic extent of the potentially affected area.
Overlap of Area of Influence and Resources of Interest (i.e. adjacent residents, transit users, highway users, plant species etc.): What is the extent to which resources of interest will be affected?
Deviation from Existing Conditions: Will the effect cause a significant change to existing conditions?

Duration: Is the effect permanent of temporary?
Sensitivity: How sensitive (or tolerant) are potentially affected resources?

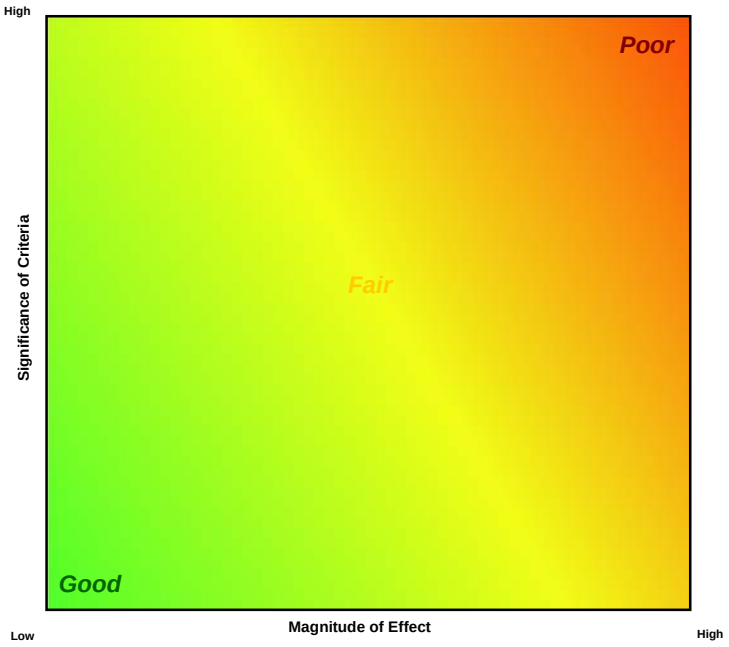


Figure 2-1: Conceptual Depiction of Process used to Assess Net Effects

Based on the assigned performance grades, alternatives were ranked in order of preference for each criterion and for each overall factor area. The ranking was determined based on the advantages and disadvantages of each alternative.

Step 4 - Evaluate Alternatives & Select Preferred Preliminary Design

In Step 4 a comparative evaluation of the overall advantages and disadvantages of each alternative was carried out using the trade-off method. This approach isolates criteria that demonstrate a measurable difference in effect amongst alternatives. These 'decision relevant' criteria were used to identify trade-offs and establish overall design preference. Finally a rationale for the recommendation of a preferred Preliminary Design was documented.

2.2 Identification of Preliminary Design Alternatives

As noted above, to identify a preferred design, the Queensway North route was subdivided into three distinct segments (East, Central and West) within which design alternatives were developed, assessed and evaluated.

2.2.1 *East Segment* - Bayshore Station to Graham Creek Tributary

In the East Segment, the following four design alternatives were identified:

(i) Alternative A1: Under Holly Acres Maintaining Existing Ramp Highway Ramp Alignment

Heading west from Bayshore Station, this alignment alternative passes *under* Holly Acres Road and *under* the Holly Acres south to Highway 417 westbound on-ramp (which is maintained in its existing location) (see figure 2-2).

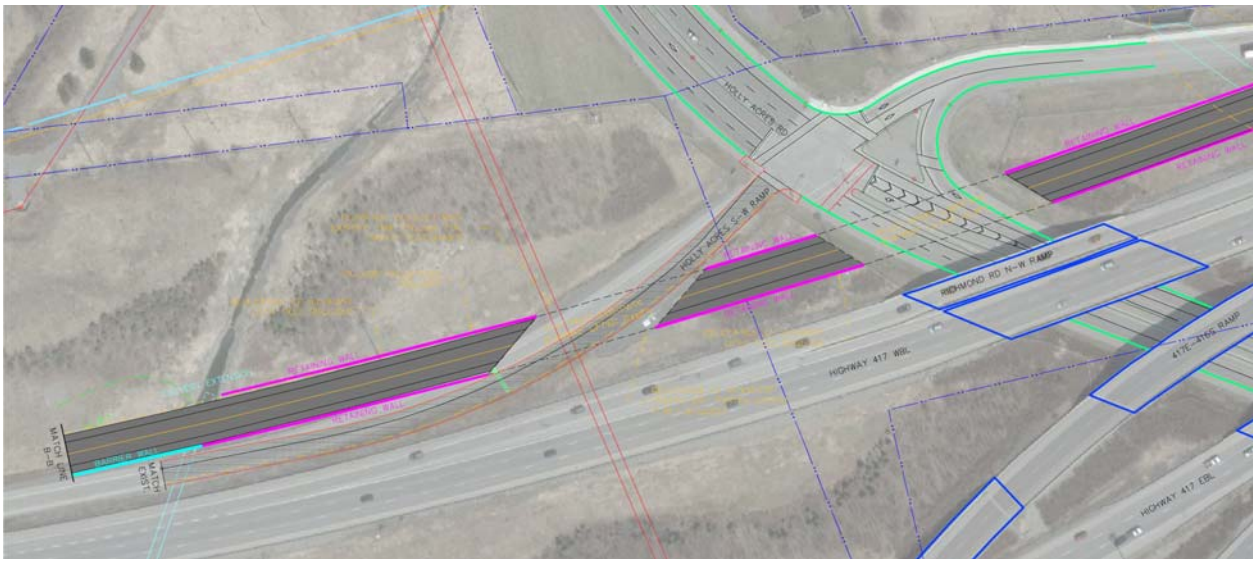


Figure 2-2: Alternative A1 - Under Holly Acres Maintaining Existing Highway Ramp Alignment

(ii) Alternative A2: Over Holly Acres Maintaining Existing Highway Ramp Alignment

Heading west from Bayshore Station, this alignment alternative passes *over* Holly Acres Road and *over* the Holly Acres south to Highway 417 westbound on-ramp (which is maintained in its existing location) (see figure 2-3).

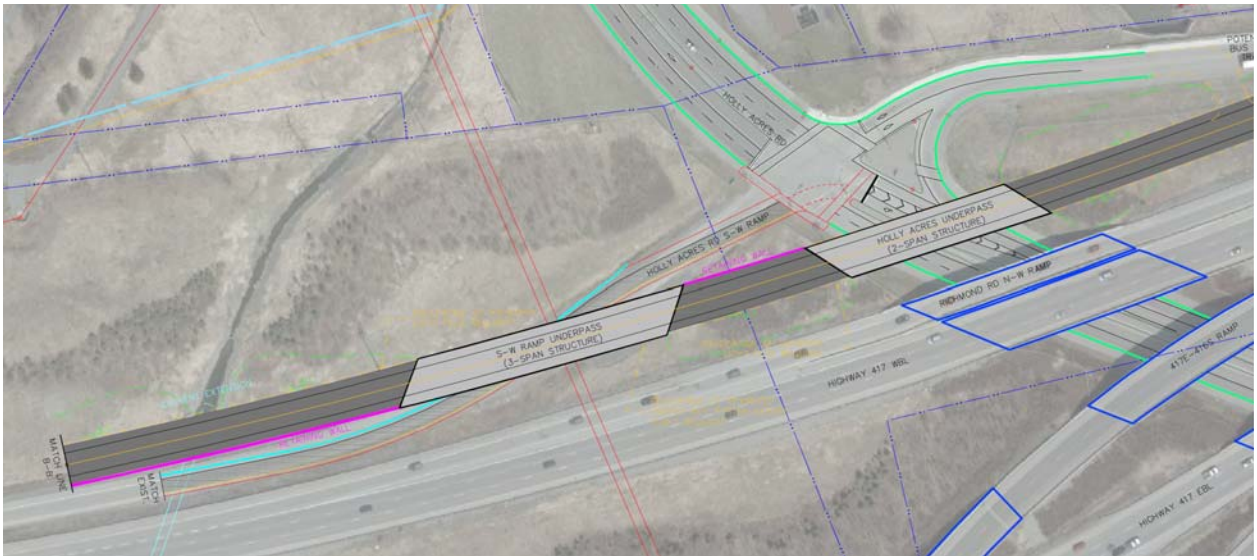


Figure 2-3: Alternative A2 - Over Holly Acres Maintaining Existing Highway Ramp Alignment

(iii) Alternative B1: Under Holly Acres with Relocated Highway Ramp

Heading west from Bayshore Station, this alignment alternative passes *under* Holly Acres Road and travels adjacent to the north side of the Holly Acres south to Highway 417 westbound on-ramp which is relocated 30m to the south (see figure 2-4).

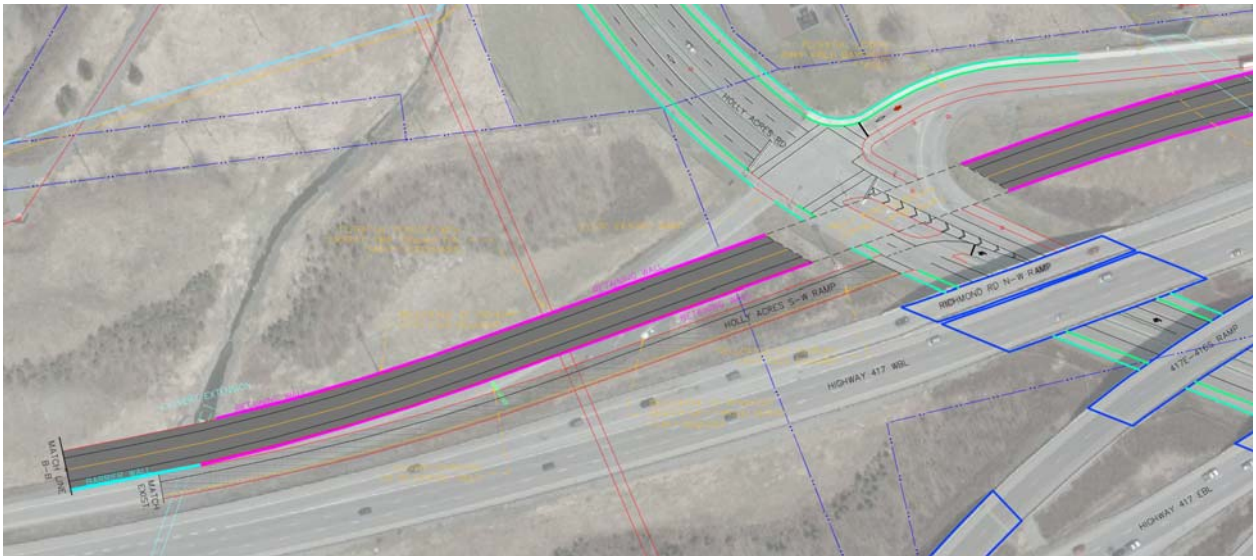


Figure 2-4: Alternative B1 – Under Holly Acres with Relocated Highway Ramp

(iv) Alternative B2: Over Holly Acres with Relocated Highway Ramp

Heading west from Bayshore Station, this alignment alternative passes *over* Holly Acres Road and travels adjacent to the north side of the Holly Acres south to Highway 417 westbound on-ramp which is relocated 30m to the south (see figure 2-5).

Figure 2-5: Alternative B2 – Over Holly Acres with Relocated Highway Ramp

2.2.2 *Central Segment* - Graham Creek Tributary to Stillwater Creek Tributary A

Within the Central Segment, the following two design alternatives were identified:

(i) Alternative A: Transitway Adjacent to Highway 417 Westbound Lanes

This alternative locates the Transitway immediately adjacent to the existing Highway 417 westbound lanes. A barrier separates Transitway and highway lanes (see figure 2-6).

(ii) Alternative B: Two Highway 417 Lanes and Reconstruct Lanes in Median

This alternative repurposes the two (northernmost) Highway 417 westbound ramp lanes for Transitway use and requires the reconstruction of these ramp lanes in the highway median (thus resulting in a highway crown shift towards the median) (see figure 2-7).

Figure 2-6: Alternative A – Transitway Adjacent to Highway 417 Westbound Lanes

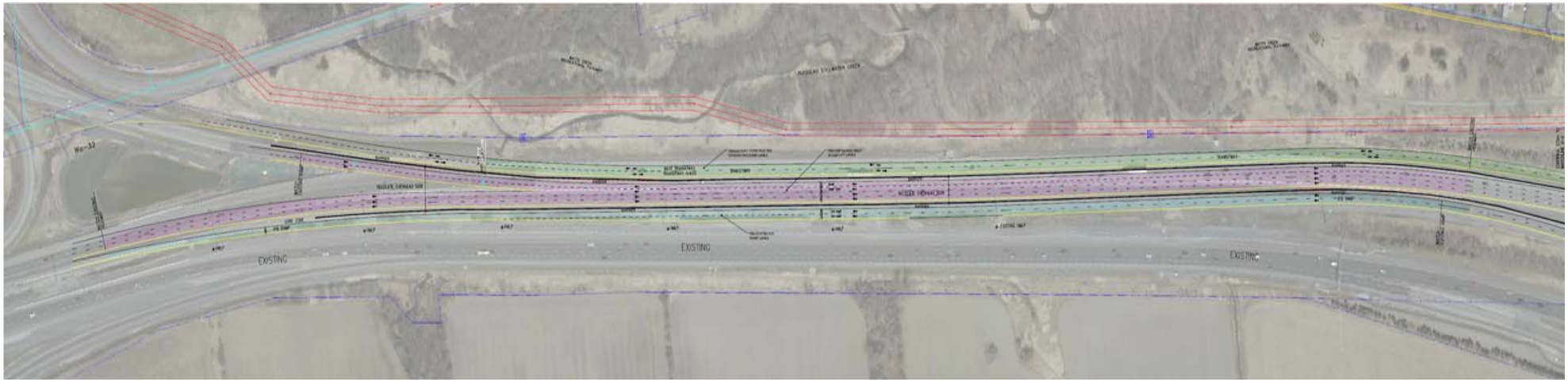


Figure 2-7: Alternative B – Two Highway 417 Lanes and Reconstructed Lanes in Median

2.2.3 *West Segment* - Stillwater Creek Tributary A to west of Moodie Drive

For the West Segment, the following four design alternatives were identified:

(i) Alternative A1: Alignment North of the Moodie Drive Interchange and Under Moodie Drive with a Station at Corkstown Road.

This alternative aligns the Transitway *around* the Moodie Drive interchange (to the north) and passes *under* Moodie Drive before continuing west through the Greenbelt. A Transitway station serving both local and rapid transit services is located east of Moodie Drive with local access from Corkstown Road (see figure 2-8).

Figure 2-8: Alternative A1 – Alignment North of the Moodie Drive Interchange and Under Moodie Drive with a Station at Corkstown Road

(ii) Alternative A2: Alignment North of the Moodie Drive Interchange and Over Moodie Drive with a Station at Corkstown Station.

This alternative aligns the Transitway *around* the Moodie Drive interchange (to the north) and passes *over* Moodie Drive before continuing west through the Greenbelt. A Transitway station serving both local and rapid transit services is located east of Moodie Drive with local access from Corkstown Road (see figure 2-9).

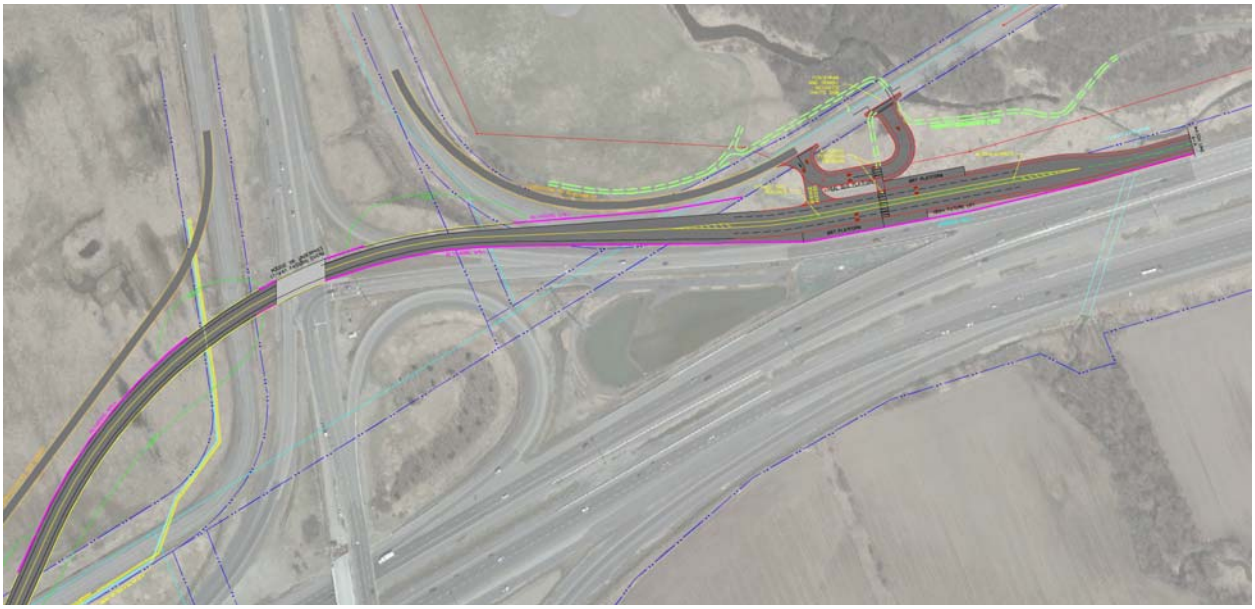


Figure 2-9: Alternative A2 – Alignment North of the Moodie Drive Interchange and Over Moodie Drive with a Station at Corkstown Road

(iii) Alternative B1: Alignment Through the Moodie Drive Interchange and Under Moodie Drive with a Station on Moodie Drive.

This alternative aligns the Transitway *through* the Moodie Drive interchange and passes *under* Moodie Drive and associated highway ramps before continuing west through the Greenbelt. A transit station is incorporated into the Moodie Drive structure including local platforms on the bridge connected to Transitway platforms below by four elevator towers (see figure 2-10).

Figure 2-10: Alternative B1 - Alignment Through the Moodie Drive Interchange and Under Moodie Drive with a Station on Moodie Drive

(iv) Alternative B2: Alignment Through the Moodie Drive Interchange and Under Moodie Drive with a Station at Corkstown Road.

This alternative aligns the Transitway *through* the Moodie Drive interchange and passes *under* Moodie Drive and associated highway ramps before continuing west through the Greenbelt. A Transitway station serving both local and rapid transit services is located east of Moodie Drive with local access from Corkstown Road (see figure 2-11).

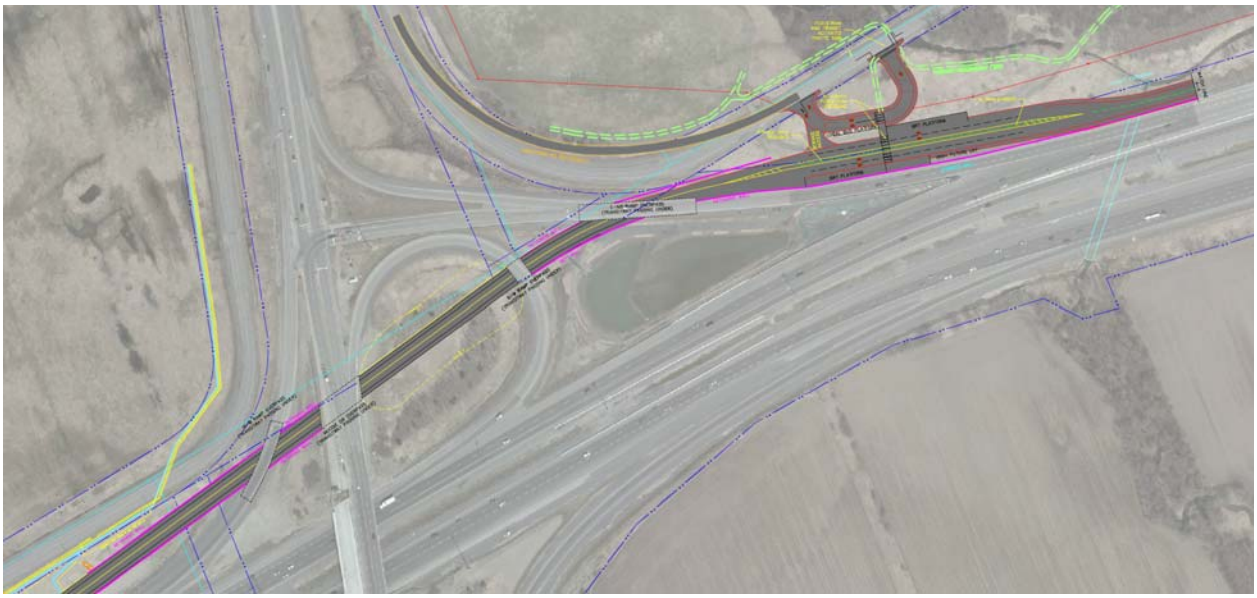


Figure 2-11: Alternative B2 – Alignment Through the Moodie Drive Interchange and Under Moodie Drive with a Station at Corkstown Road

2.3 Assessment of Effects

The assessment of effects identifies the advantages and disadvantages associated with each design alternative described in subsection 2.2 and supports the comparative evaluation presented in subsection 2.4 Only those anticipated effects that are considered 'decision relevant' (i.e. represent a measurable difference in effect amongst two or more alternatives) are summarized in this section. The detailed assessment tables describing all identified effects for each design alternative are included as **Appendix A -** Assessment of Effects and Comparative Evaluation of Preliminary Design Alternatives.

2.3.1 East Segment

Natural Environment

Alternatives in which the Transitway passes under Holly Acres Road (Alternatives A1 and B1) require a deep cut (excavation) to achieve the required profile for the Transitway alignment. This cut would require lowering either Graham Creek or its tributary resulting in significant

anticipated construction and post-construction effects to creek morphology, riparian vegetation and fish and fish habitat.

Alternatives in which the Transitway passes over Holly Acres Road (Alternatives A2 and B2) largely avoid significant post-construction impacts to natural environmental features. Minor effects associated with the required culvert extension at Graham Creek Tributary can be minimized through design and by incorporating standard construction mitigation measures into contract documents.

Social/Cultural Environment

No significant social/cultural environmental effects are anticipated for any alternative.

While alternatives passing over Holly Acres Road (Alternatives A2 and B2) result in the visual separation of Highway 417 westbound lanes from the northern portion of the Greenbelt in this area, these minor aesthetic impacts can be minimized through context sensitive structural and landscape design.

The contribution to future noise and ground vibration levels from each alternative is not expected to be perceptible over ambient levels in the horizon year.

Technical Considerations

Again, the cut required to pass under Holly Acres Road (for alternatives A1 and B1) results in complex constructability and traffic/transit staging impacts due to the required creek modifications and the relocation of underground utilities.

The disadvantage of alternatives A1 and A2 is that, by maintaining the highway ramp in its existing location, these alternatives require the construction and maintenance of an additional roadway structure (to span the existing highway on-ramp). By relocating the highway ramp towards Highway 417 westbound lanes, alternative B1 and B2 do not require this structure.

With the ramp relocation, Alternative B1 and B2 introduce a wider, somewhat unconventional intersection at Holly Acres Road. However, preliminary traffic analysis has demonstrated that this intersection operates well beyond the planning horizon. Additional analysis regarding signal timing and sightlines will be undertaken as part of the detail design.

Table 2-2 provides a comparison of capital cost estimates for each alternative.

Table 2-2: East Segment Design Alternatives (Capital Cost Estimates)

	Alternative A1	**Alternative A2**	**Alternative B1**	**Alternative B2**
Capital Cost Estimate	$21.9 M	$16.9 M	$20.9 M	$15.9 M
Note: Cost estimates are for comparison purposes only. The sum of estimates for East, Central and West segments will be greater than the actual cost estimate for the full build out of this facility as certain construction elements overlap.				

2.3.2 Central

Natural Environment

Alternative A results in a +/- 15m northerly shift of the existing transportation facility and has the potential to result in minor impacts to existing vegetation and habitat adjacent to Highway 417. This vegetation is generally disturbed by proximity to the existing highway and a large portion of the potentially affected forest edge consists of recent restoration/edge buffer plantings presumably installed during reconstruction of Highway 417. Furthermore, these impacts can be mitigated by installing a retaining wall along the entire length of the mainline Transitway to contain the facility within the existing MTO right-of-way and avoid direct effects to the forest edge including young Black Maples observed along the southern edge of Vegetation Unit 6.

Alternative A requires the extension of three existing culverts that currently convey flow under Highway 417. Aside from the crossing at the confluence of Tributary A (C3) with Stillwater Creek, all crossings are considered routine and impacts to fisheries and aquatic habitat can be successfully avoided through standard design and construction practices (embedding of culverts, provision of substrate, adherence to in-water timing restrictions, implementation of an erosion and sediment control plan, etc.). Currently, Tributary A joins Stillwater Creek at C3 at a near 90 degree angle. This unnatural confluence, which was likely modified during the original highway construction, has led to bank erosion in Stillwater Creek. Measures to address these existing erosion concerns can be incorporated into the required culvert extension at C3.

By maintaining the northern edge of the existing transportation facility, Alternative B avoids all direct impacts to the natural environment.

Social/Cultural Environment

Both alternatives bundle the facility within the existing transportation corridor and are compatible with existing land uses. While Alternative A does bring the transportation facility closer to the recreational pathway in some areas, potential impacts to user experience can be mitigated by implementing a retaining wall and adopting context sensitive landscape design principles. Neither alternative is expected to result in perceptible noise level increases when compared to a future 'Do Nothing' scenario.

Technical Considerations

No significant technical constraints have been identified with respect to Alternative A. Construction access can be provided from Highway 417, Corkstown Road or Holly Acres Road. No significant impacts to the travelling public or transit service are expected during construction.

Alternative B requires the removal and reconstruction of recently completed provincial highway infrastructure resulting in significant traffic disruptions affecting approximately 40,000 to 50,000 people a day for up to 3 construction seasons (See **Appendix B**- Constructability/ Operational Review of Central Segment- Alternative B). Specifically, the relocation of the Highway 417 westbound lanes towards the median requires the relocation of high-mast lighting (minimum of 11 poles); existing roadway protection systems such as concrete barrier and steel beam guide rail; reconstruction of storm sewers; and may possibly require the relocation of some of the advanced

traffic management system (ATMS) plant. In addition to constructing 2 new lanes and fully paved shoulders for the relocation of the northbound 416 to 417 westbound ramp, shifting the remaining highway lanes towards the median would potentially involve a pavement crown shift in the Highway 417 westbound lanes. Regrading of the subgrade would be required to maintain positive drainage which would require the removal and reconstruction of the entire pavement structure of the recently constructed highway. In addition to significant traffic disruptions and increased costs, this alternative would delay the opening of the Transitway extension by at least 1 year.

Table 2-3 provides a comparison of capital cost estimates for each alternative.

Table 2-3: Central Segment Design Alternatives (Capital Cost Estimates)

	Alternative A	**Alternative B**
Capital Cost Estimates	$8.8 M	$13.9 M
Note: Cost estimates are for comparison purposes only. The sum of estimates for East, Central and West segments will be greater than the actual cost estimate for the full build out of this facility as certain construction elements overlap.		

2.3.3 West Segment

Natural Environment

By passing through the Moodie Drive interchange and locating the station on Moodie Drive, alternative B1 minimizes direct footprint impacts to the natural environment.

The Corkstown Station location options (Alternatives A1, A2 and B2) result in minor impacts to the natural environment including the removal of approximately 1.0 ha of cultural meadow west of Stillwater Creek. This impact is considered minor as the meadow has low botanical diversity and a high proportion of non-native species; species of regional conservation located on the banks of Stillwater Creek are outside of the Transitway footprint; the meadow is isolated by Highway 417 to the south and Corkstown Road to the north and provides very limited wildlife movement opportunities; and wildlife habitat associated with the meadow area is common and well represented in the study area and adjacent lands.

Alternatives aligned to the north of the interchange (Alternatives A1 and A2) also require a re-alignment of Corkstown Road west of Moodie Drive resulting in the additional removal of horse pasture vegetation and an isolated hedgerow within the National Equestrian Park.

Social/Cultural Environment

Alternative B1 (with a station located on the Moodie Drive structure) requires grade separated local and Transitway platforms which may result in reduced visibility and a sense of isolation for waiting passengers. In addition, as there are currently no sidewalks on the Moodie Drive bridge, the provision of safe pedestrian access to the station is challenging.

The Corkstown station location (Alternatives A1, A2 and B2) is fully integrated with the pedestrian and cycling network and is easily accessible from nearby residential and employment

lands. By locating the station at Corkstown Road, space remains on the Moodie Drive structure to introduce improved pedestrian and cycling facilities across the bridge. Corkstown Station, however, will require an amendment to the Greenbelt Master Plan.

Alternatives aligned to the north of the interchange (Alternatives A1 and A2) also require a re-alignment of Corkstown Road west of Moodie Drive resulting in impacts to the National Equestrian Park.

Technical Considerations

The Moodie Drive Station location (associated with Alternative B1) would serve as a passenger transfer facility only. Due to space restrictions on the bridge, buses do not have the opportunity to terminate/ turn around at the station which limits operational flexibility and increases 'deadheading' (the operation of out-of-service buses). Deadheading increases emissions and operational costs. In addition, the operation and maintenance of four elevator towers required to service the grade-separated local and Transitway platforms is expected to increase long-term operation and maintenance costs.

By providing the ability to terminate/ turn buses around at the station, Alternatives A1, A2, B2 maximize operational flexibility and reduce operational costs and emissions. Corkstown Station would allow OC Transpo to provide efficient and reliable shuttle services to and from nearby employment areas, however, the requirement to use Corkstown Road for local bus access does marginally increasing the distance traveled.

Alternatives aligned to the north of the interchange (Alternatives A1 and A2) also require a re-alignment of Corkstown Road west of Moodie Drive resulting in a 2.9 ha impact to NCC lands.

Alternatives aligned through the interchange (Alternatives B1 and B2) require adjustments to existing Highway 417 ramps and the construction and maintenance of three new roadway structures.

Table 2-4 provides a comparison of capital cost estimates for each alternative.

Table 2-4: West Segment Design Alternatives (Capital Cost Estimates)

	Alternative A1	Alternative A2	Alternative B1	Alternative B2
Capital Cost Estimate	$30.7 M	$ 24.8 M	$34.6 M	$32.4 M

Note: Cost estimates are for comparison purposes only. The sum of estimates for East, Central and West segments will be greater than the actual cost estimate for the full build out of this facility as certain construction elements overlap.

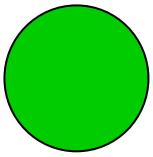
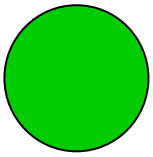
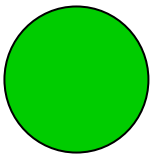
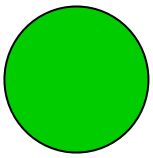
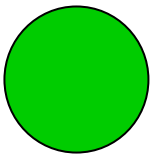
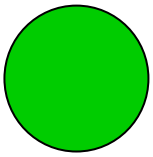
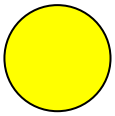
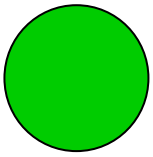
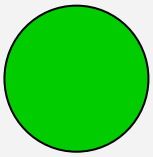
2.4 Comparative Evaluation of Preliminary Design Alternatives

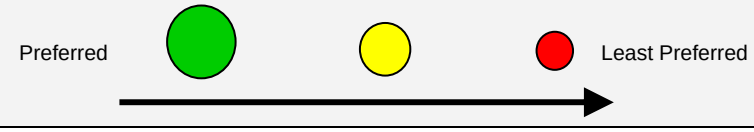
The comparative evaluation was carried out by reviewing the relative advantages and disadvantages of each design alternative (described in section 2.3) and considering tradeoffs in order to provide a comprehensive rationale for the selection of a preferred design

2.4.1 East Segment

Table 2-5 summarizes findings from the comparative evaluation of design alternatives and identifies the preferred design for the East segment. The table is followed by a detailed rationale for this recommendation. The detailed assessment and evaluation is provided in **Appendix A**.

TABLE 2-5: EAST SEGMENT - SUMMARY ASSESSMENT OF EFFECTS OF PRELIMINARY DESIGN ALTERNATIVES

FACTOR AREAS / CRITERIA	Alternative A - Maintain Location of Existing Highway Ramp		Alternative B - Relocate Existing Highway Ramp	
	Under (Alternative A1)	Over (Alternative A2)	Under (Alternative B1)	Over (Alternative B2)
Factor Area 1: Natural Environment • Fish and Fish Habitat • Designated Natural Environment Features / Areas • Wetlands • Vegetation • Wildlife • Fluvial Geomorphology • Groundwater Effects • Drainage/Hydrology • Construction Impacts				
	Significant Potential Effects	**Minor Potential Effects**	**Significant Potential Effects**	**Minor Potential Effects**
Factor Area 2: Social / Cultural Environment • Heritage / Archaeology • Contaminated Property • Noise • Ground Vibration • Visual / Aesthetic Impacts • Recreation Resources • Land Use • Safety / Security • Pedestrian/Cycling Connectivity				
	Minor Potential Effects	**Minor Potential Effects**	**Minor Potential Effects**	**Minor Potential Effects**
Factor Area 3: Technical Considerations • Illumination • Property • Local / Highway Traffic • Transit Operations • Staging Impacts • Constructability / Capital Cost • Long-Term Maintenance				
	Poor Performance	**Good Performance**	**Poor Performance**	**Moderate Performance**
OVERALL PERFOMANCE				
	Poor Performance	**Good Performance**	**Poor Performance**	**Good Performance**
FINAL RECOMMENDATION	NOT RECOMMNENDED	NOT RECOMMENDED	NOT RECOMMENDED	**RECOMMENDED**



Alternative A1 was not recommended as the vertical profile required to pass under Holly Acres Road requires major modifications to Graham Creek and/or its tributary and underground utilities resulting in significant impacts to the natural environment and increased construction/maintenance costs. Also, as this alternative maintains the existing ramp alignment, two structures are required (one to span Holly Acres Road and another to span the highway on-ramp).

While Alternative A2 avoids significant impacts to Graham Creek, Graham Creek Tributary and underground utilities by passing over Holly Acres Road, maintaining the highway ramp in its existing location results in the requirement for an additional structure (to span the highway on-ramp). This alternative was therefore not recommended.

By relocating the highway ramp, the additional structure (spanning the highway on-ramp) is not required for Alternative B1. However, as with alternative A1, the vertical profile required to pass under Holly Acres Road will require major modifications to Graham Creek and/or its tributary and underground utilities resulting in significant impacts to the natural environment and increased construction/maintenance costs. This alternative was therefore not recommended.

Within the East Segment, Alternative B2 was recommended as it minimizes impacts to the natural environment and adjacent community and avoids technical issues.

Specifically, Alternative B2 was recommended as it:

- Avoids significant effects to Graham Creek and it's tributary:
    - The Transitway alignment is contained primarily within the existing transportation facility footprint and avoids impacts to Graham Creek. An extension of an existing Highway 417 culvert along a previously modified reach of Graham Creek Tributary will be required; however, this culvert extension is considered routine and impacts to fisheries and aquatic habitat can be successfully minimized through standard design and construction practices (embedding of culverts, provision of substrate, adherence to in-water timing restrictions, implementation of an erosion and sediment control plan, etc.).
- Will not result in significant environmental impacts during construction:
    - Construction-related impacts can be minimized by controlling Contractor operations. Specifically, specifications can be included in the contract package requiring that construction be carried out during appropriate timing windows (fisheries and breeding birds), ensuring vegetation clearing is limited to that required for construction and protective fencing is installed during construction to avoid incidental disturbance.
- Provides an opportunity to enhance pedestrian and cycling connectivity to Bayshore Station and the broader network.

- o A new multi-use pathway connection from Aero Drive to Holly Acres Road has been incorporated into the design.

- o The existing asphalt pathway on the West Side of Holly Acres Road and the existing sidewalk connection from Holly Acres Road to Bayshore Station will be upgraded to a 3.0 m multi-use pathway connections.

► Will not result in perceptible increases over ambient roadway noise and vibration levels:

- o The Transitway's contribution to average daily noise levels will be indistinguishable from background traffic (highway) noise in the horizon year.

- o As the functional design for the Holly Acres Road grade separation contemplates a semi-integral abutment bridge, there will be no expansion joints on the structure. From a ground vibrations perspective, the grade separation will therefore result in an improvement over existing conditions.

► Minimizes impacts to transit operations during construction.

- o By relocating the highway ramp first, Transitway operations can be largely maintained during construction.

2.4.2 Central Segment

Table 2-6 summarizes findings from the comparative evaluation of design alternatives and identifies the preferred design for the Central Segment. The table is followed by a detailed rationale for this recommendation. The detailed assessment and evaluation is provided in **Appendix A**.

TABLE 2-6: CENTRAL SEGMENT - SUMMARY ASSESSMENT OF EFFECTS AND COMPARATIVE EVALUATION OF PRELIMINARY DESIGN ALTERNATIVES

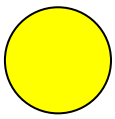
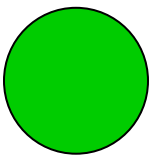
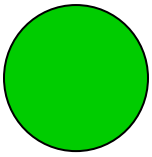
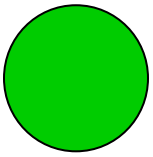
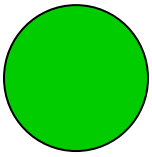
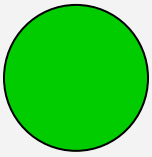
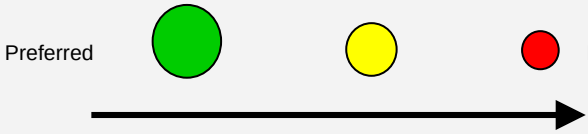
FACTOR AREAS / CRITERIA	Alternative A	Alternative B
	Adjacent to Highway 417 WB Lanes	Reconstruct Highway 417 Lanes in Median
Factor Area 1: Natural Environment • Fish and Fish Habitat • Designated Natural Environment Features / Areas • Wetlands • Vegetation • Wildlife • Fluvial Geomorphology • Groundwater Effects • Drainage/Hydrology • Construction Impacts		
	Moderate Potential Effects	**Minor Potential Effects**

TABLE 2-6: CENTRAL SEGMENT - SUMMARY ASSESSMENT OF EFFECTS AND COMPARATIVE EVALUATION OF PRELIMINARY DESIGN ALTERNATIVES

FACTOR AREAS / CRITERIA	Alternative A	Alternative B
	Adjacent to Highway 417 WB Lanes	Reconstruct Highway 417 Lanes in Median
Factor Area 2: Social / Cultural Environment • Heritage / Archaeology • Contaminated Property • Noise • Ground Vibration • Visual / Aesthetic Impacts • Recreation Resources • Land Use • Safety / Security • Pedestrian/Cycling Connectivity		
	Minor Potential Effects	**Minor Potential Effects**
Factor Area 3: Technical Considerations • Illumination • Property • Local / Highway Traffic • Transit Operations • Staging Impacts • Constructability / Capital Cost • Long-Term Maintenance		
	Good Performance	**Poor Performance**
OVERALL PERFORMANCE		
	Good Performance	**Poor Performance**
FINAL RECOMMENDATION	**RECOMMENDED**	NOT RECOMMENDED
		

Alternative B was not recommended as it requires the removal and reconstruction of a significant portion of the recently completed provincial highway expansion project resulting in substantial 'throwaway' construction. Specifically, the shifting of westbound lanes towards the median would require a pavement crown shift necessitating the removal and reconstruction of the entire pavement structure of the recently constructed highway through this segment. Other impacts to highway infrastructure would include: the relocation of high-mast lighting (minimum of 11 poles); existing roadway protection systems such as concrete barrier and steel beam guide rail; reconstruction of storm sewers; and potentially the relocation of some advanced traffic management system (ATMS) plant.

Based on the work described above, construction would likely be carried-out in 4 stages over 2 to 3 years assuming a six-month construction season. The greatest impact to Highway 416/417 traffic would take place during Stage 2 where mainline lane closures would be required affecting up to 40,000-50,000 vehicles daily in the westbound direction. Similar traffic queuing could be expected as was experienced during the Highway 417 Expansion construction from 2007 to 2009 where two traffic lanes were maintained at all times. Furthermore, as the construction of the Transitway lanes would likely be carried-out in the final stage, this configuration would delay the opening of the Transitway facility by approximately 1 year when compared to Alternative A. (See **Appendix B**)

Within the Central Segment, Alternative A was recommended as it avoids significant impacts to the travelling public and recently constructed provincial highway infrastructure whilst avoiding significant adverse environmental effects.

Specifically, Alternative A:

- Avoids effects to NCC Greenbelt lands and associated valley vegetation:
  - The Transitway footprint is contained entirely within the existing MTO right-of-way through the installation of a 750 m long retaining wall along the north side of the Transitway through this segment. By bundling the Transitway within the existing transportation facility, direct effects to sensitive valley vegetation are avoided.
- Avoids significant net effects to Stillwater Creek and tributaries:
  - Alternative A requires the extension of three existing culverts that currently convey flow under Highway 417. Aside from the crossing at the confluence of Tributary A (C3) with Stillwater Creek, all other crossings are considered routine and impacts to fish and aquatic habitat can be successfully avoided through standard design and construction practices. Currently, Tributary A joins Stillwater Creek at C3 at a near 90 degree angle. This previously modified (or unnatural) confluence has led to bank erosion in Stillwater Creek. Regardless of the Transitway construction, modifications are required to address the on-going erosion at this location. Alternative A provides an opportunity to address this issue as part of the Transitway construction. A preliminary concept has been developed and will be further refined in consultation with the NCC and RCVA to ensure that there are no net effects to the creek. All applicable permits and approvals will be obtained prior to construction.
- Will not perceptibly increase noise levels for adjacent residents:
  - While this alternative does bring the transportation facility marginally closer to the community (approximately 15 m), due to the separation from noise sensitive receivers, the contribution of Transitway noise to average daily noise levels will be indistinguishable from background traffic noise (highway) in the horizon year.

► Minimizes effects on provincial highway infrastructure:

- o While some short term lane closures may be required during installation of the barrier between the Transitway and the highway, this alternative avoids significant impacts to the main travelled portion of the highway and the approximately 40,000 – 50,000 users that travel in the corridor each day.

► Minimizes effects on Greenbelt lands:

- o Through the installation of a 750m long retaining wall, Alternative A is contained entirely within the MTO right of way and does not directly impact Greenbelt lands or the Watts Creek Recreational Pathway.

2.4.3 West Segment

Table 2-7 summarizes findings from the comparative evaluation of design alternatives and identifies the preferred design for the Wast segment. The table is followed by a detailed rationale for this recommendation. The detailed assessment and evaluation is provided in **Appendix A**.

TABLE 2-7: WESTERN SEGMENT - COMPARATIVE EVALUATION OF PRELIMINARY DESIGN ALTERNATIVES

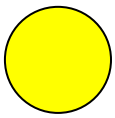
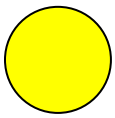
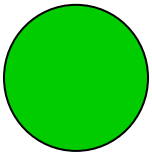
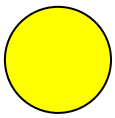
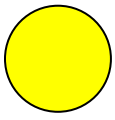
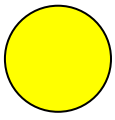
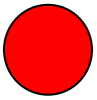
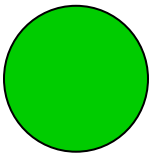
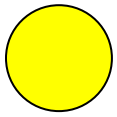
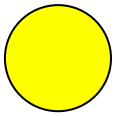
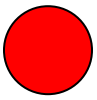
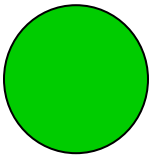
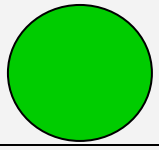
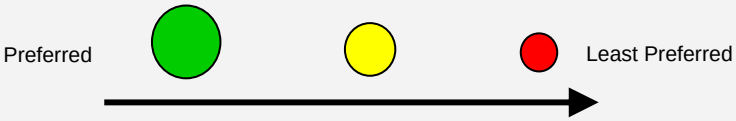
FACTOR AREAS / CRITERIA	Alternative A - Alignment North of Moodie Interchange		Alternative B - Alignment Through Moodie Interchange	
	Under Moodie w/Station at Corkstown (Alternative A1)	Over Moodie w/Station at Corkstown (Alternative A2)	Under Moodie w/Station at Moodie (Alternative B1)	Under Moodie w/Station at Corkstown (Alternative B2)
Factor Area 1: Natural Environment • Fish and Fish Habitat • Designated Natural Environment Features / Areas • Wetlands • Vegetation • Wildlife • Fluvial Geomorphology • Groundwater Effects • Drainage/Hydrology • Construction Impacts				
	Moderate Potential Impacts	**Moderate Potential Impacts**	**Minor Potential Impacts**	**Moderate Potential Impacts**
Factor Area 2: Social / Cultural Environment • Heritage / Archaeology • Contaminated Property • Noise • Ground Vibration • Visual / Aesthetic Impacts • Recreation Resources • Land Use • Safety / Security • Pedestrian/Cycling Connectivity				
	Moderate Potential Impacts	**Moderate Potential Impacts**	**Significant Potential Impacts**	**Minor Potential Impacts**

TABLE 2-7: WESTERN SEGMENT - COMPARATIVE EVALUATION OF PRELIMINARY DESIGN ALTERNATIVES

FACTOR AREAS / CRITERIA	Alternative A - Alignment North of Moodie Interchange		Alternative B - Alignment Through Moodie Interchange	
	Under Moodie w/Station at Corkstown (Alternative A1)	Over Moodie w/Station at Corkstown (Alternative A2)	Under Moodie w/Station at Moodie (Alternative B1)	Under Moodie w/Station at Corkstown (Alternative B2)
Factor Area 3: Technical Considerations • Illumination • Property • Local / Highway Traffic • Transit Operations • Staging Impacts • Constructability / Capital Cost • Long-Term Maintenance				
	Moderate Performance	**Moderate Performance**	**Poor Performance**	**Good Performance**
OVERALL PERFORMACE				
	Moderate Performance	**Moderate Performance**	**Poor Performance**	**Good Performance**
FINAL RECOMMENDATION	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	**RECOMMENDED**



Alternatives A1 and A2 were not recommended as the alignment north of the Moodie Drive interchange requires the realignment of Corkstown Road west of Moodie Drive and results in avoidable impacts to Greenbelt lands (National Equestrian Park). Also, the curvilinear alignment required to travel north of the interchange is expected to result in reduced ride comfort.

Alternative B1 was not recommended as the station at Moodie Drive does not provide adequate accessibility or transit service flexibility. Moodie Drive Station would serve primarily as a transfer facility (from local routes on Moodie to the Transitway below) with limited potential to attract walk-in ridership from nearby residential and employment lands. Currently there are no sidewalks on the Moodie Drive bridge, therefore, there is no opportunity to provide pedestrian access to the station from Moodie Drive itself. Access to the Transitway platforms could be provided via a multi-use pathway under Moodie Drive; however, as this pathway is located in a trench through the interchange, visibility is poor introducing personal safety concerns. Furthermore, as the Transitway platforms are not visible from adjacent streets or Highway 417, Moodie Station increases the sense of isolation for waiting passengers which could be expected to discourage ridership, particularly during off peak hours. Finally, as the station at Moodie Drive does not provide the operational flexibility to terminate local/shuttle routes at the station, peak hour shuttle services travelling from either Carling or Bells Corners would be required to travel twice as far without passengers (deadheading) in order to complete the round trip. This

requirement for deadheading increases operational costs, emissions, and the potential for service delays.

Within the West Segment, Alternative B2 was recommended as the direct alignment through the interchange (and under Moodie Drive) maximizes ride comfort and operational efficiency and the station at Corkstown Road provides maximum accessibility, operational flexibility and design opportunities whilst avoiding significant adverse environmental effects.

Specifically, this alternative is preferred because it:

- Maximizes pedestrian and cycling connectivity:
  - The proposed station located at Corkstown Road is fully integrated with the existing and proposed multi-use pathway network and is easily accessible from nearby employment and residential lands.
  - Locating the station at Corkstown Road provides an opportunity to remove one traffic lane in the southbound direction on the Moodie Drive Bridge over Highway 417. This provides an opportunity to widen existing cycling lanes, provide a 3.0 multi-use pathway connection across the bridge, relocate cycling lanes to the shoulders and introduce bike boxes to give cyclists priority at ramp terminal intersections north of the highway.
- Minimizes personal safety concerns:
  - As both local and rapid transit platforms are located at-grade, there will be increased station activity and visibility thereby reducing the sense of isolation for waiting passengers.
- Maximizes operational flexibility for OC Transpo:
  - In addition to accommodating direct passenger transfers between local north and southbound services on Moodie Drive (projected to be 600 person trips in the am peak hour in 2031), by providing the ability to turn buses around at the station, Corkstown Station also avoids unnecessary deadheading and the associated costs to OC Transpo, passengers and the environment.
- Provides an opportunity to introduce ‘green’ design elements:
  - It is proposed that each roof be vegetated to soften the visual impact of the buildings in this rural and agricultural setting and to reduce the amount of summer heat.
  - Glulam timbers are proposed for most of the structural support instead of steel or concrete for their durability and strength as well as their pleasing aesthetic quality.

- Avoids significant impacts to the natural environment.
    - While Corkstown Station does require the removal approximately 1.2 ha of meadow vegetation west of Stillwater Creek, the overall significance of the affected portion of the meadow is considered relatively low as the meadow has low botanical diversity and a high proportion of non-native species; species of regional conservation located on the banks of Stillwater Creek have been transplanted as part of the on-going 3W Watermain construction; the meadow is isolated by Highway 417 to the south and Corkstown Road to the north and provides very limited wildlife movement opportunities; and wildlife habitat associated with the meadow area is common and well represented in the study area and adjacent lands.

CHAPTER 3: PRELIMINARY RECOMMENDED PLAN

3.1 Transitway Alignment

As illustrated in Figures 3-2 to 3-7, the Transitway comprises two 4.0 m lanes and two 2.5 m paved shoulders. From the east, the Transitway exits Bayshore Station and passes over Holly Acres Road via a new grade separation (bridge). The existing Holly Acres northbound to Highway 417 westbound on-ramp has been relocated approximately 30 m to the south to simplify construction staging and eliminate the requirement for an additional Transitway structure over the ramp. The existing local bus access ramp from Holly Acres Road to Bayshore Station will be maintained.

The local transit access ramp to Bayshore Station and the relocated highway on-ramp will be operated as a single, signalized intersection to ensure safe and efficient crossings for pedestrians and cyclists.

Further west, the Transitway is located immediately adjacent to the westbound Highway 417 lanes. The Transitway lanes will be separated from Highway 417 by a concrete barrier incorporating elements to reduce headlight glare for oncoming vehicles. Through the main treed portion of the Stillwater Creek Valley, a 750 m long retaining wall will be installed on the northern edge of the Transitway to contain the facility entirely within the existing MTO right-of-way and prevent encroachment into Greenbelt lands. Through this area (from Bayshore station to ~550 m east of Moodie Drive, no impacts to the Stillwater Creek Valley or the Watts Creek Recreational Pathway are anticipated.

Just east of Moodie Drive, the Transitway passes through a proposed transit station at Corkstown Road (described below) before continuing through the Moodie Drive interchange via grade separations (bridges) under: the existing Highway 417 westbound to Moodie Drive off-ramp; the existing northbound Moodie Drive to Highway 417 westbound onramp; and Moodie Drive itself (3 structures).

West of Moodie Drive, the Transitway connects to the approved Transitway alignment on the north side of the Queensway crossing the Greenbelt to Kanata.

It should be noted that the Preliminary Recommended Plan has been designed so as not to preclude potentially constructing a ‘flyover’ west of Moodie Drive connecting eastbound buses (travelling on bus-only shoulder lanes on Highway 417) to the Transitway. This ‘flyover’ bridge would remove the need to operate buses on Moodie Drive in the interim, but is not recommended within the current planning horizon (to 2031). The feasibility and usefulness of this structure is dependant on the City’s timeline for constructing an exclusive Transitway across the Greenbelt which is currently unknown. The need for this bridge should be monitored as part of future TMP Updates.

3.2 Transitway Station

A transit station is proposed immediately east of Moodie Drive. The station is located on federal lands and requires approximatley 1.0 ha of NCC Greenbelt property. Local bus access to the station is via Corkstown Road providing OC Transpo with the flexibility to terminate/turn around local and shuttle bus services at the station. A small "kiss-and-ride" facility is also proposed adjacent to the station on Corkstown Road in order to improve community access to rapid transit.

The preliminary architectural concept for the station is illustrated in Figure 3-8. All pedestrian crossings at the station are proposed to be at grade, safely placing pedestrians at the head of each platform. This eliminates the capital cost of elevators and a pedestrian overpass, as well as their maintenance costs. Instead, the station has a low shelter over each of the platforms and a canopy to provide weather protection while crossing the Transitway. This modestly-sized station has been designed to allow for future conversion to LRT.

To soften the visual impact of the buildings in this rural and agricultural setting it is proposed that each roof be vegetated. These green roofs will also reduce the amount of summer heat that is inevitably experienced at transit stations. Glulam (laminated) timbers, used for most of the structural support instead of steel or concrete, were chosen for their durability and strength as well as their pleasing aesthetic quality. Wood will also be used at other locations not exposed to the weather, such as the ceilings of the platform canopies. Glass shelters under the canopies will provide weather protection for waiting passengers. Natural stone walls will encircle the planting beds on the platforms and natural stone may be used in retaining walls. The overall effect of the design and materials is a reflection of the rural and agricultural landscape, making this a unique station in a unique setting.

As the study progresses through EA and design phases, the architectural concept will be further refined in consultation with the NCC, OC Transpo and the general public.

3.3 Pedestrian and Cycling Network

Through the consultation process, a number of pedestrian and cycling issues were identified including a need to improve existing facilities on Moodie Drive and Holly Acres Road; and the need to preserve and enhance the existing Watts Creek Recreational Pathway.

On June 14, 2010, members of the Study Team met with the Roads Cycling Advisory Committee (RCAC) to further explore these issues and receive input and feedback on potential solutions. Based on input received at this meeting and further consultation with the general public and Technical Advisory Committee, a number of elements have been incorporated into the Preliminary Recommended Plan to enhance the existing pedestrian and cycling environment.

Near Holly Acres Road a new, more direct multi-use pathway connecting Aero Drive to Holly Acres Road will be provided to improve community access to the existing Watts Creek Recreational Pathway and Bayshore Station. To enhance pedestrian and cyclist connectivity, the existing asphalt sidewalk on the west side of Holly Acres Road will be upgraded to a 3.0 m wide multi-use pathway as will the existing sidewalk connecting Holly Acres Road to Bayshore Station.

Through the Stillwater Creek Valley, the Transitway is contained entirely within the MTO right-of-way and will not impact the existing Watts Creek Recreational Pathway.

Immediately east of Moodie Drive, the proposed Transitway station requires relocating and reconfiguring the existing Watts Creek Recreational Pathway. This reconfiguration provides an opportunity to introduce a number of enhancements including:

- A direct connection to the station including covered bicycle storage facilities;
- A direct connection to the existing pathway north of Corkstown Road;
- A new direct connection to on-road cycling facilities and the proposed multi-use pathway on Moodie Drive at the Highway 417 off-ramp signalized intersection; and
- A new connection to Corkstown Road west of Moodie Drive.

While the design features described above will improve pedestrian/cycling and transit integration, the most significant improvements are proposed on Moodie Drive itself. The existing Moodie Drive bridge over Highway 417 (connecting Crystal Beach/Lakeview to Bells Corners) has no sidewalk and substandard cycling lanes (less than 2.0 m) situated between vehicular travel lanes. To address these deficiencies, the following features have been included in the Preliminary Recommended Plan:

- Removing one traffic lane in the southbound direction to allow widening of the southbound cycling lane from 1.5m to 2.0m and providing a new 3.0m (bi-directional) multi-use pathway on the west side of the bridge;
- Relocating both northbound and southbound cycling lanes to the outside (shoulders) of the bridge to reduce the likelihood of vehicle-bicycle conflicts at the highway on-ramps

and eliminate the need for cyclists to perform "shoulder checks" and yield to vehicles as they cross the outside lanes to the ramps which is required under existing conditions; and

- Providing "bike boxes" at the Moodie Drive / Highway 417 westbound on and off-ramp terminal intersections in order to give cyclists priority. For more information on bike boxes visit: http://www.portlandonline.com/transportation/index.cfm?&a=185112&c=34811.

3.4 Environmental Considerations

The following presents an overview of key environmental impacts and proposed mitigation measures that have been incorporated directly into the Preliminary Recommended Plan. A comprehensive review of mitigation opportunities was incorporated into the assessment of effects and is documented in **Appendix A**. A detailed impact assessment will be completed as part of the EA and design process to ensure that all environmental effects associated with this project are adequately addressed in the detail design. The impact assessment will further refine design-related mitigation measures as well as identify specific provisions to minimize effects during construction. The detailed impact assessment will form part of the Environmental Project Report and will be presented for public review, along with the Final Recommended Plan, at POH #4.

Vegetation and Wildlife

The Preliminary Recommended Plan recognizes the importance of avoiding further encroachment into the Stillwater Creek Valley which is known to contain several regionally significant and regionally uncommon plant species.

To avoid encroachment, the plan incorporates a 750 m long retaining wall to contain the proposed Transitway facility entirely within the Highway 417 right-of-way from Bayshore Station to approximately 550 m east of Moodie Drive.

The direct removal of approximately 1.2 ha of vegetation located in the meadow area just east of Moodie Drive is required to accommodate the station at Corkstown Road. Overall significance of this meadow is considered relatively low based on the following:

- The meadow has relatively low botanical diversity and a high proportion of non-native species;
- Species of regional conservation concern are present, but are concentrated on the banks of Stillwater Creek and would not be directly removed by the proposed station footprint;
- The meadow is isolated by Highway 417 to the south and Corkstown Road to the north and provides very limited wildlife movement opportunities;
- Wildlife habitat associated with the meadow area is common and well represented in the study area and adjacent lands; and

During the May 12, 2009 field visit, a small colony (approximately 7-8 nests) of heron species (Ardeidea sp.) nests were observed within the West Transitway study area, approximately 25-30

m north of the Highway 417 right-of-way. At that time, the heronry was assessed to be inactive due to the lack of significant breeding evidence such as: no adult birds on the nests, no egg shells under the colony, no white-wash (feces) under the colony, and no hatched young in the nests. A subsequent spring site visit on April 27, 2010, followed by consultation with the Canadian Wildlife Service (CWS), the Ministry of Natural Resources (MNR), Environment Canada, and the Ottawa Field Naturalists Club (OFNC) Bird Records Subcommittee, has confirmed the initial assessment that this heronry is not an active breeding colony.

Retained vegetation will be protected from incidental disturbance during construction and a site restoration and planting plan will be implemented to replace removed vegetation with native plant species. Significant net impacts to vegetation and wildlife habitat are therefore not anticipated.

Surface Water/Drainage

The Preliminary Recommended Plan requires the extension of five existing culverts that currently convey flow under Highway 417. Aside from the crossing at the confluence of Tributary A (C3) with Stillwater Creek, all crossings are considered routine and impacts to fisheries and aquatic habitat can be successfully avoided through standard design and construction practices (embedding of culverts, provision of substrate, adherence to in-water timing restrictions, implementation of an erosion and sediment control plan, etc.).

Currently, Tributary A joins Stillwater Creek at C3 at a near 90 degree angle. This unnatural confluence, which was likely modified during the original highway construction, has led to bank erosion in Stillwater Creek (see Figure 5-1). As part of the culvert extension at C3, the initial fluvial geomorphologic assessment has identified a preliminary concept to address existing erosion concerns by directing the tributary's energy downstream (instead of across stream). This concept will be further refined in consultation with the RVCA and the NCC to ensure that proposed modifications arrest on-going erosion at this crossing.

Figure 3-1: On-going Erosion of Stillwater Creek at C3

The community has identified a concern with the flooding of Stillwater Creek as experienced during a storm event in July 2009 during which flood levels breached the bank level and spilled over onto the sports fields east of Moodie Drive and north of Corkstown Road. City staff identified this storm as a 100-year event and, as such, a certain level of flooding and spill onto the overbank areas is expected as part of natural channel/valley functions. In addition, the existing culvert crossing under Corkstown Road had collapsed and therefore impeded flow. This culvert is being rehabilitated as part of the ongoing 3W Watermain construction project.

To ensure the Recommended Plan does not negatively contribute to the flooding of Stillwater Creek, the Study Team is actively working with the RVCA to determine the overall Stillwater Creek floodplain, assess potential impacts and identify recommended mitigation measures. Mitigation measures may include stormwater management facilities to achieve quantity control, limiting development within the 100-year floodplain, and/or providing floodplain compensation for any losses to storage volume that may occur as a result of development. These measures will be incorporated into the Final Recommended Plan and documented in the EA Study.

From a stormwater quality perspective, the Final Recommended Plan will also incorporate treatment systems and employ best management practices (BMP's) to meet all criteria of the MOE Stormwater Management Planning and Design Manual (2003).

Groundwater

Grade separating the Moodie Drive interchange will require a significant excavation which has the potential to impact ground water levels in the immediate vicinity of the cut. A preliminary hydrogeological assessment was carried out to determine the flow rate of groundwater into the proposed excavation and to estimate the extent of the drawdown of the water table. To the extent possible, the vertical profile of the Transitway was raised to minimize potential groundwater impacts. Based on the functional design, the hydrogeological assessment predicts approximately 0.5 metres of drawdown to spring groundwater levels within approximately 15 to 30 metres from the excavation (in all directions). No drawdown of summer groundwater levels is expected as the pavement subdrains are located above the expected summer groundwater levels.

Preliminary groundwater modeling indicates that the localized draw down of spring groundwater levels is not expected to impact water levels in Stillwater Creek, or negatively impact vegetation within the Stillwater Creek Valley to the east of the creek. Further investigation of the hydrogeologic conditions in the vicinity of Stillwater Creek will be carried out as part of the detail design study to verify the modeling predictions including confirmation of flow data, creek bottom elevations, top of water elevations etc. The preliminary hydrogeological assessment is included as **Appendix G**- Preliminary Hydrogeological Assessment.

Roadway Noise

Existing noise levels were calculated at 25 receptor locations within the study area using traffic information provided by the City of Ottawa. Results of this analysis indicate that existing levels range from 48 to 63 dBA for daytime periods, and between 41 and 57 dBA for night-time periods. The highest noise levels occur at receptors closest to Highway 417, with levels

diminishing with increasing distance from the noise source. In addition to theoretically calculated noise levels, at the request of the community, outdoor noise measurements were also performed at six locations representing outdoor living areas of residences backing on to Highway 417. In all cases, measured values were lower than theoretical values.

Existing noise levels were used as the basis for comparison of a Future Do Nothing scenario against a future scenario that includes an operational Transitway from Bayshore Station to west of Moodie Drive in the horizon year (2031). This analysis concluded that the contribution to environmental noise due to the Transitway could be expected to range from 0.1 to 0.2 dBA and would be indistinguishable from local background traffic noise in 2031. The dominant source of roadway noise is, and will continue to be Highway 417. In accordance with the City's Environmental Noise Control Guidelines for Capital Works projects, this predicted increase does not warrant noise attenuation (an increase of 5 dBA, and a total future noise level of > 60 dBA is required to meet the warrant).

It is recognized that, without noise attenuation, the projected growth in highway traffic will result in future noise levels that exceed 60 dBA at a number of receptor locations. As such, the Ministry of Transportation (MTO) has identified two sites in the study area as candidate sites for their Retrofit Noise Barrier Program (extending from Bayshore Station to near the proposed station at Corkstown Road). While included on the retrofit list, due to the separation of receptors from the source of noise (Highway 417) and the length of walls required, these sites were determined to have a low benefit to cost compared to more favourable sites in Ontario. The Ministry will continue to re-evaluate noise levels in this area to periodically update these sites placement on the Noise Barrier Retrofit List.

The Preliminary Recommended Plan has been developed so as not to preclude the installation of these barriers by MTO. To determine the most effective location for these barriers within the future Highway 417/ Transitway cross-section, a number of scenarios were developed and analyzed (See **Appendix H**- Comparison of Future Noise Barrier Options). Table 3-1 presents noise levels predicted for:

- Future Do Nothing (FDN - no Transitway, no MTO noise barriers);
- FDN with MTO highway barrier;
- Construction of Transitway with no noise barriers;
- Construction of Transitway with noise barrier built between Highway 417 and the Transitway; and
- Construction of Transitway with Transitway noise barrier (between the Transitway and the community)

Table 3-1: Comparison of Noise Barrier Options

Receptor	Existing Condition	Future Do Nothing (FDN)	FDN With MTO Highway Barrier	Transitway Constructed - No Barriers	Transitway Constructed - With Highway Barrier	Transitway Constructed - With Transitway Barrier
5	57.2	59.3	57.6	59.2	57.8	59.0
7	57.1	59.1	58.9	59.1	59.0	59.0
10	58.1	60.0	59.3	59.9	59.2	58.8
12	58.2	60.1	59.9	60.1	59.9	60.0
14	63.0	64.3	58.8	64.2	59.7	59.5
15	60.1	62.3	57.5	62.0	58.9	58.2
18	60.5	62.4	57.6	62.4	58.4	58.3
20	58.8	61.1	56.9	60.6	57.5	57.4
23	57.7	59.6	54.6	59.5	53.8	54.3
25	62.5	64.8	62.5	65.5	62.6	62.5

This table illustrates that constructing the Transitway without noise barriers will not result in significant noise level increases over the Future Do Nothing scenario. In terms of total noise exposure, although both barrier locations (Highway and Transitway) perform comparably, a barrier constructed along the Transitway would shield the community from impulse noises. In addition, the visual shield would reduce the overall perception of the Transitway's contribution to ambient noise levels. A decision regarding the location of future MTO noise barriers will be made in consultation with MTO and the NCC as part of the design process.

3.5 Illustration of the Preliminary Recommended Plan

The Preliminary Recommended Plan is illustrated in Figures 3-2 to 3-8. As noted in the introduction, the Preliminary Recommended Plan presented in this report will therefore be further refined through on-going consultation with City staff, Advisory Committees, Regulatory Agencies and the general public as the study progresses through the EA approval and design phases.

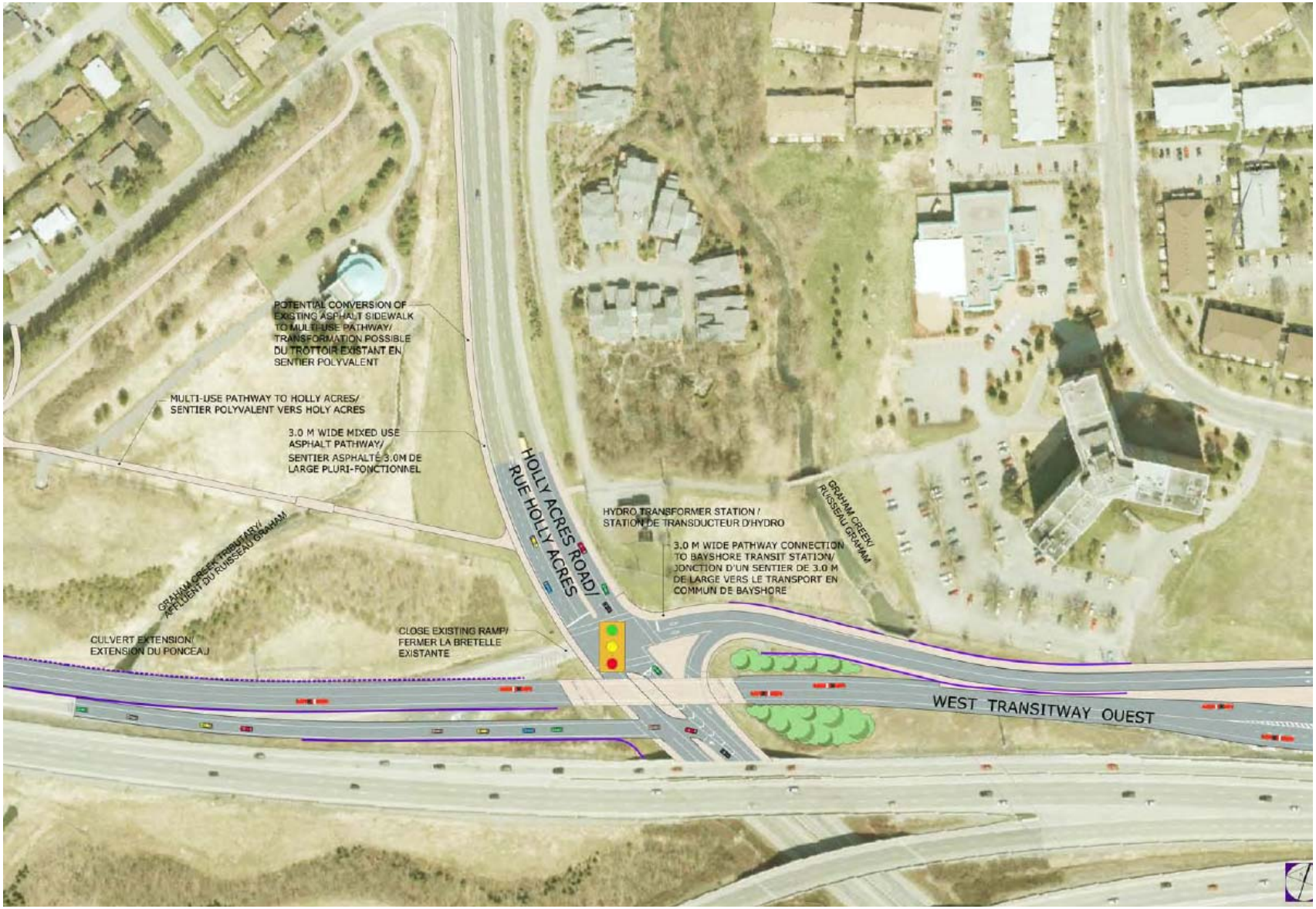


Figure 3-2: Preliminary Recommended Plan 1 of 6

Figure 3-3: Preliminary Recommended Plan 2 of 6

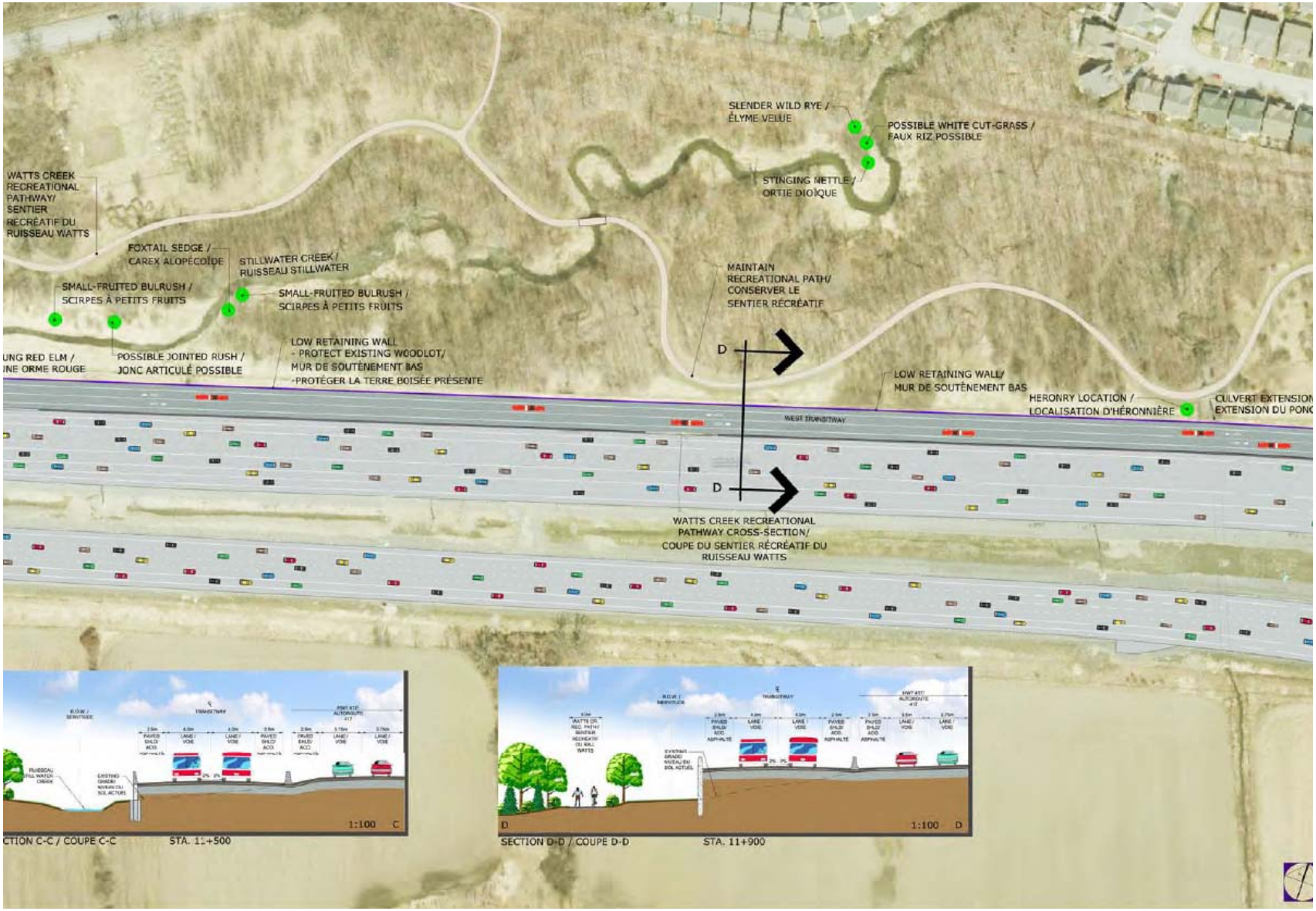


Figure 3-4: Preliminary Recommended Plan 3 of 6

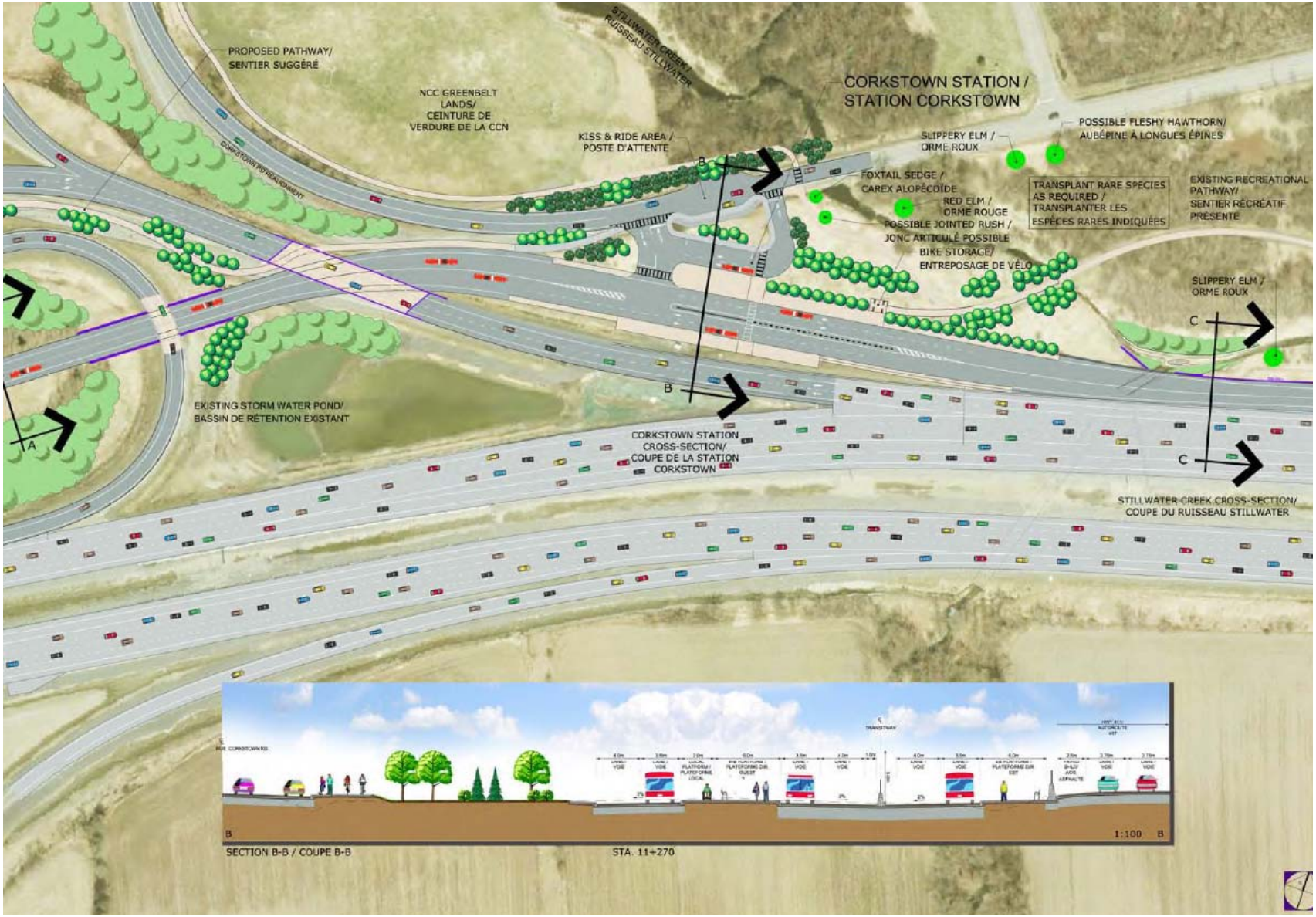


Figure 3-5: Preliminary Recommended Plan 4 of 6

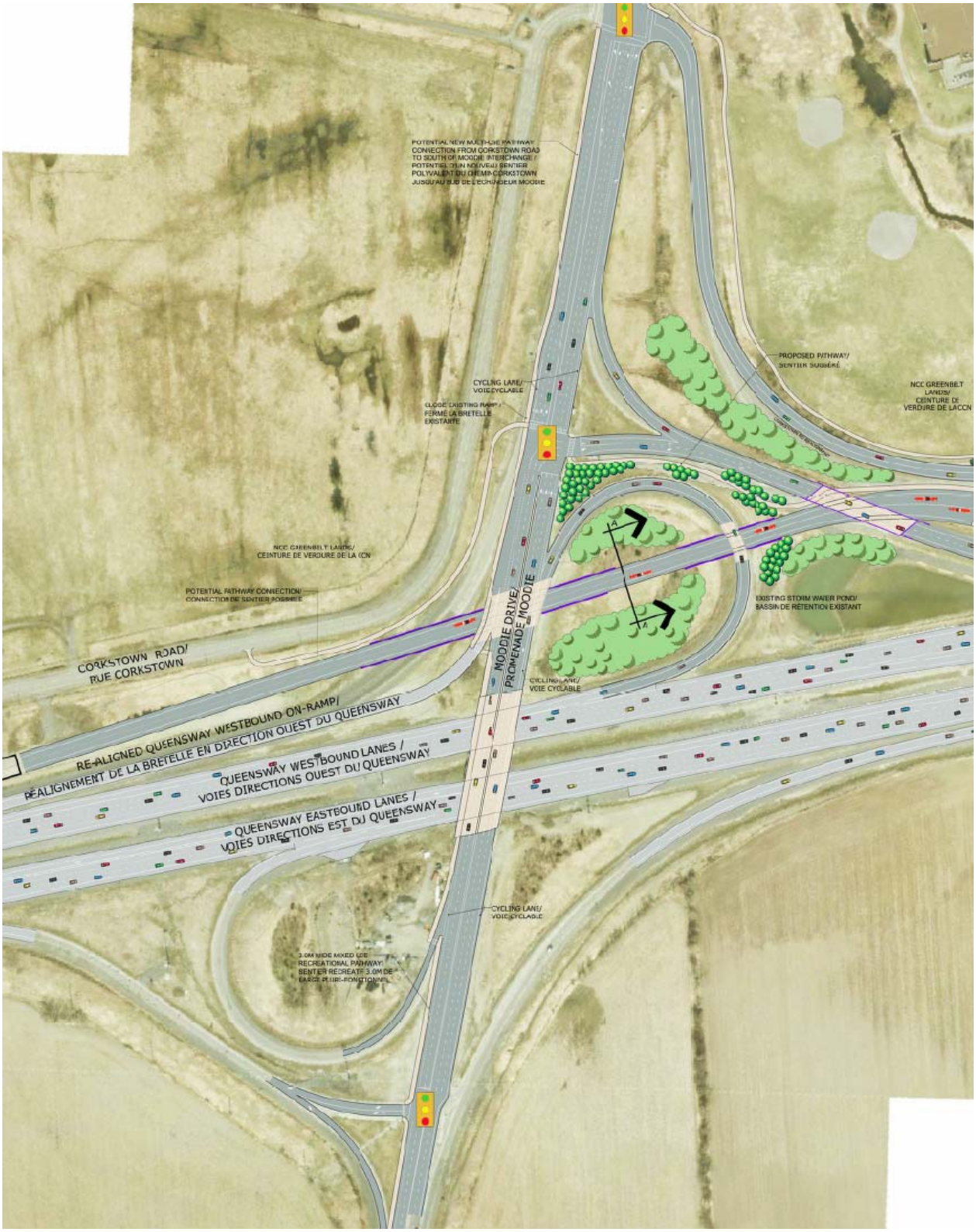


Figure 3-6: Preliminary Recommended Plan 5 of 6

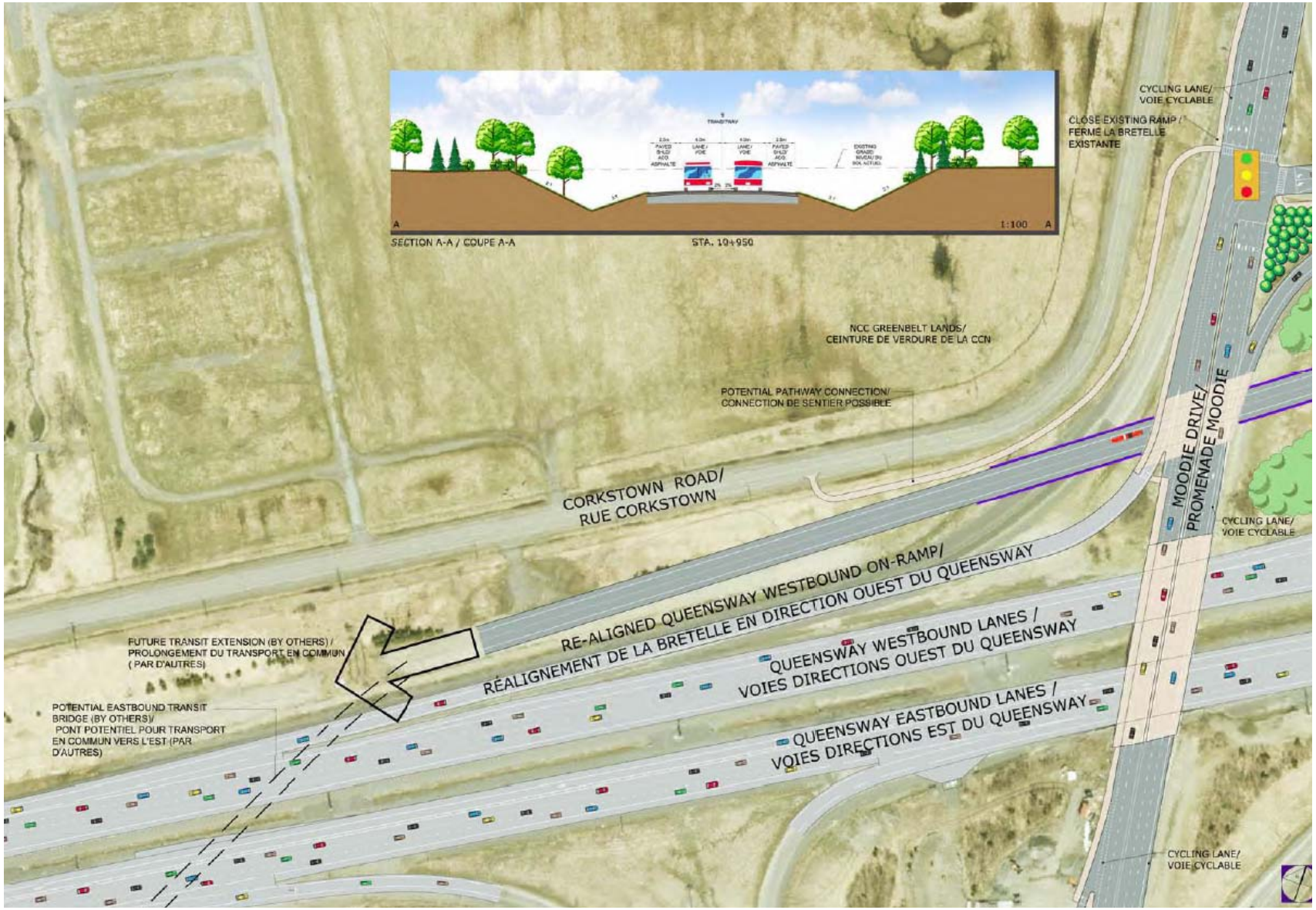


Figure 3-7: Preliminary Recommended Plan 4 of 6

Figure 3-8: Conceptual Transit Station Design

CHAPTER 4: REVIEW OF POTENTIAL IMPLEMENTATION SCENARIOS

The TMP identifies the need for an exclusive, grade separate bus rapid transit (BRT) facility extending from the Southwest Transitway to Kanata.

The Preliminary Recommended Plan described in Chapter 3 and illustrated in Figures 3-2 to 3-8, represents the long-term plan for this facility. Policy 5.2.2 (2) of the 2008 Transportation Master Plan, however, directs staff to defer the cost of grade-separating rapid transit elements by introducing measures that improve reliability by incrementally introducing enhancements to isolate transit from mixed traffic.

In accordance with this direction, a number of potential implementation scenarios were developed, assessed and evaluated to determine whether the construction of grade separations at Holly Acres Road and/or Moodie Drive could be deferred until a future date. The analysis considered impacts to traffic both during and after construction (including intersection level of service), transit passenger experience (ride comfort), transit reliability and travel time, impacts to pedestrian and cycling facilities, noise/vibration impacts, and impacts to the natural environment. This assessment is documented in **Appendix C** – Assessment of Near Term/ Interim Transitway Configurations. A summary of key findings is presented below.

4.1 Assessment of Near-Term/Interim Configurations at Holly Acres Road

To determine the techncial feasibility of deferring the cost (approximately $6.7M) of constructing the grade separation of Holly Acres Road, a functional design of the intersection was developed and a traffic analysis was carried out using Synchro traffic analysis software, Version 7 to measure the level of service at the intersection (See **Appendix D**- Traffic Analysis – 2031 Planning Horizon & 2021 Interim Year). The traffic analysis concluded that the at-grade crossing of the Transitway with Holly Acres Road operates with satisfactory level of service (LOS) when considering the forecasted 2031 traffic and transit volumes. All of the approaches operate with LOS D or better for both the AM and PM peak periods. It should be noted that, while the at-grade crossing does provide an acceptable level of service, it does not perform as well as the grade-separated crossing.

While the at-grade crossing of Holly Acres Road was found to provide an acceptable level of service from a traffic perspective, the assessment identified the following disadvantages associated with deferring construction of the bridge:

Impacts to Traffic During Construction (Staging): Due to limited site access and limited space for an on-site detour, it would be challenging to construct the bridge in the future while maintaining the at-grade Transitway crossing and operation of the relocated highway ramp. Construction of the of the bridge in the future would likely require the closure of the Transitway connection for a period of up to two years and a temporary closure of the S-W ramp for possibly one year. A detour for westbound Transitway bus service would be required during the closure. One potential detour route would be Holly Acres Road to Carling Avenue to Moodie Drive to

Highway 417. Another possibility would be to redirect westbound buses from Bayshore Station to Woodridge Crescent and Richmond Road west to Highway 417.

The temporary closure of the S-W ramp will require a detour for motorists travelling from Highway 416 north to Moodie Drive. The potential detour route would be Holly Acres Road north to Carling Avenue and west to Moodie Drive. These impacts could be largely avoided by constructing the grade separation concurrent with the balance of the Transitway from Bayshore Station to Moodie Drive.

Noise and Ground Vibration: Consultation with the local community identified a potential concern with existing ground vibrations at residences on Creek's End Lane east of Holly Acres Road. In response to this concern, existing vibrations were measured at a receptor on Creek's End Lane (See Figure 4-1).

Figure 4-1: Location of Receptor on Creek's End Lane

Research indicates that the threshold level of human perception to vibrations is approximately 0.10 mm/s, while the threshold for annoyance due to continuous vibrations are 1.0 mm/s and the threshold for cosmetic building damage is 30 mm/s.

Peak recorded ground vibrations were 1.08 mm/s at this location and corresponded to a bus accelerating from a stop at the intersection. The following additional data was recorded at this receptor.

0.442 mm/s	Bus turning right after stopping
0.459 mm/s	Bus pulling up to stop light
1.08 mm/s	Bus leaving stop light going straight
0.0710 mm/s	Bus turning right without stopping
0.0655 mm/s	Bus approaching stop, before decelerating
0.0692 mm/s	Bus turning right without stopping
0.105 mm/s	Bus travelling through light without stopping

The measured data at location 4 indicates that the starting and stopping activities of the buses are responsible for vibration levels that qualify as perceptible in most circumstances, and as annoying occasionally. It is, however, important to note that the annoyance threshold of 1.0 mm/s refers to continuous vibrations, not intermittent vibrations that are characteristic of transit activities. The implementation of an at-grade Transitway crossing of Holly Acres Road is

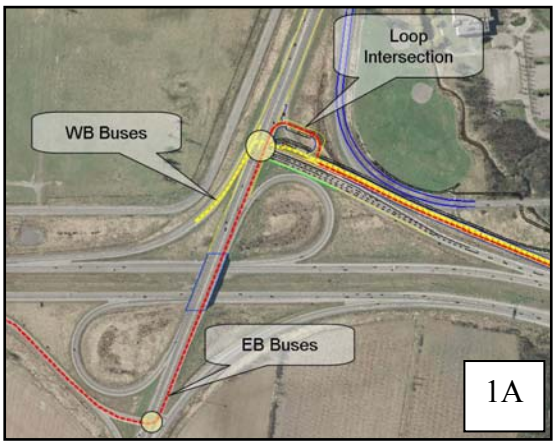
expected to result in an increase in the frequency of these vibration levels (but not the magnitude). By introducing of a semi-integral structure (without expansion joints), the grade separated crossing will result in an improvement to local conditions, as a direct result of the removal of constant starting and stopping activities at this location. The vibration levels will continue to be perceptible; however will remain significantly below the annoyance threshold.

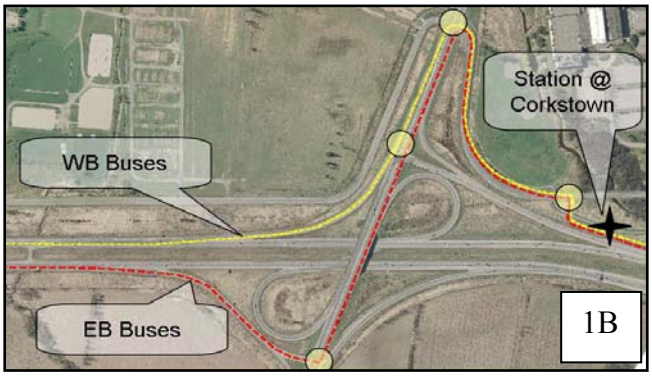
Due to the potential for significant disruptions to future transit operations, it is recommended that the grade separation of Holly Acres Road be constructed concurrently with the construction of the Transitway extension from Bayshore Station to Moodie Drive. In addition to avoiding the requirement for long-term transit detours, the construction of the bridge in Phase 1 will avoid additional vibration impacts associated with the accleration and deceleration of buses at the signalized intersection.

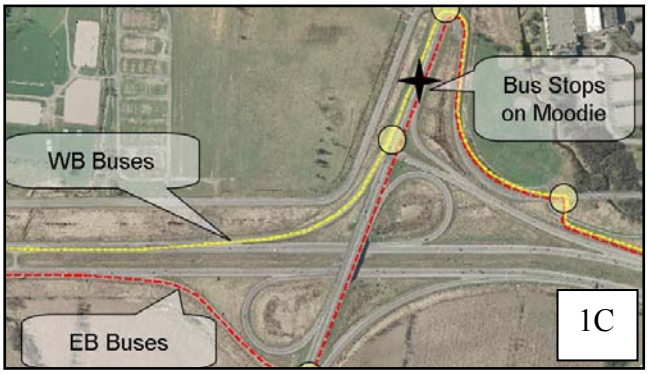
4.2 Assessment of Near-Term/Interim Configurations at Moodie Drive

4.2.1 At-Grade Design Alternatives

The following three design alternatives were identified to provide an at-grade connection to Moodie Drive in the near-term:







1A: At-Grade Loop Intersection with Transitway Stops at the Moodie/ Highway 417 off-ramp intersection.

1B: Transitway Access via Corkstown Road (w/stops on Moodie Drive)

1C: Transitway Access via Corkstown Road (w/ station at Corkstown Road)

Figure 4-2: Design Alternatives for At-Grade Connection to Moodie Drive

Based on the assessment and evaluation documented in **Appendix C**, at-grade alternative 1A was carried forward for further consideration. Alternatives 1B and 1C were not carried forward as

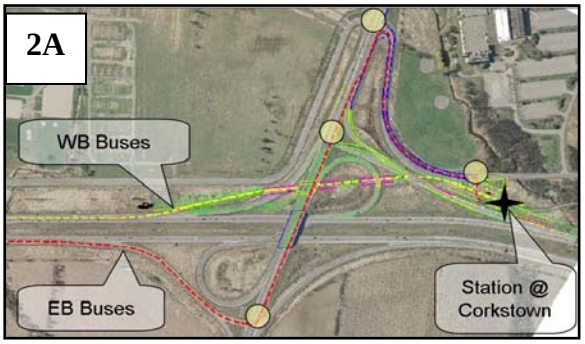
these alternatives require eastbound Transitway buses to travel through a minimum of four intersections on Moodie Drive and Corkstown Road while operating in mixed traffic thereby reducing service reliability. Alternative 1A also provides the shortest overall total travel distance.

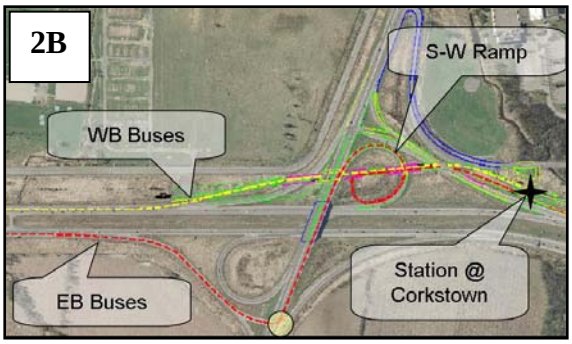
The preferred intersection configuration requires replacing the existing westbound Highway 417 to Moodie Drive northbound free-flow off-ramp with a double right turn at the signalized intersection and constructing a small, interim transit station at the intersection. This configuration defers the grade separation of Moodie Drive and the long-term transit station at Corkstown Road until a future date. Proposed improvements to pedestrian and cycling facilities on Moodie Drive would be implemented as part of the near-term plan to minimize potential conflicts associated with the at-grade Transitway intersection.

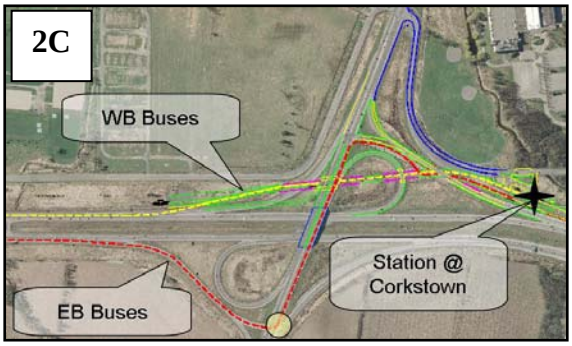
To determine the useful service life of this at-grade configuration, the Level of Service (LOS) of specific traffic movements were analyzed using Synchro™ traffic analysis software, Version 7 (see **Appendix D**). The analysis concluded that, considering existing and projected future traffic volumes, the free-flow highway off-ramp will likely require re-instatement by 2021 which will require grade separating westbound Transitway buses and constructing the long-term station at Corkstown Road. Regular monitoring of intersection traffic volumes will be required to determine the exact timeframe for the westbound grade separation.

4.2.2 Partially Grade Separated Design Alternatives

Again, design alternatives were developed and assessed for the partial grade separation of Moodie Drive for westbound buses. The following three alternatives for this configuration were evaluated:







2A: EB Transitway Access via Corkstown Road.

2B: EB Transitway Access via S-W Ramp.

2C: EB Transitway Access via new Ramp from Moodie Drive.

Figure 4-3: Design Alternatives for Partial Grade Separation of Moodie Drive

Based on the assessment and evaluation documented in **Appendix C**, partially grade separated alternative 2C was carried forward for further consideration. Alternative 2A was not recommended as EB bus access via Corkstown Road reduces transit service reliability and introduces a potentially undesirable pedestrian/cyclist experience at the Corkstown Road/ Moodie Drive intersection due to the introduction of right turning Transitway buses. Alternative 2B was not recommended as EB bus access via the existing S-W loop ramp reduces passenger comfort (long continuous turn).

From a traffic perspective, Alternative 2C was found to operate well beyond the 2031 planning horizon (**See Appendix D**). Eastbound buses will continue to operate on shoulder bus lanes west of Moodie Drive by using the existing Moodie Drive bridge to cross Highway 417 and access the Transitway. The grade separation of EB buses will occur when the Transitway is extended across the Greenbelt to Kanata (not anticipated before 2031) at minimum cost as the infrastructure (grade separations) will already be in place.

4.3 Recommended Implementation Plan

The Recommended Implementation of this project to the end of the current planning horizon (2031) is as follows in table 4-1:

Table 4-1: Recommended Implementation

Phase	Timeframe	Description of Works	Estimated Cost (in 2010 $)
Phase 1	2011 to ~2021	• Construct exclusive Transitway from Bayshore Station to Moodie Drive; • Construct grade separation of Holly Acres Road; • Construct improvements to the existing multi-use pathway and on-road cycling network in the vicinity of Holly Acres Road and Moodie Drive; • Construct intersection modifications at Moodie Drive to accommodate Transitway termination; • Implement environmental mitigation measures; and • Construct interim station configuration at the at-grade Transitway intersection with Moodie Drive.	$29.2M
Phase 2	~2021 to Beyond 2031	• Construct partial grade separation of Moodie Drive for westbound Transitway buses; and • Construct long-term transit station at Corkstown Road.	$27.8M
End of Planning Horizon			
Phase 3	Beyond 2031 <to be completed by others>	• Tie-in to future extension of the West Transitway from west of Moodie Drive to west of Eagleson Road. Alternatively, a new Transitway bridge could be constructed over Highway 417 west of Moodie Drive to connect EB buses travelling on highway shoulder lanes to the Transitway east of Moodie (this configuration would not be convertible to rail).	TBD

The preliminary design of the at-grade connection to Moodie Drive is illustrated in Figure 4-4. The preliminary design of the partial grade separation is illustrated in Figure 4-5.

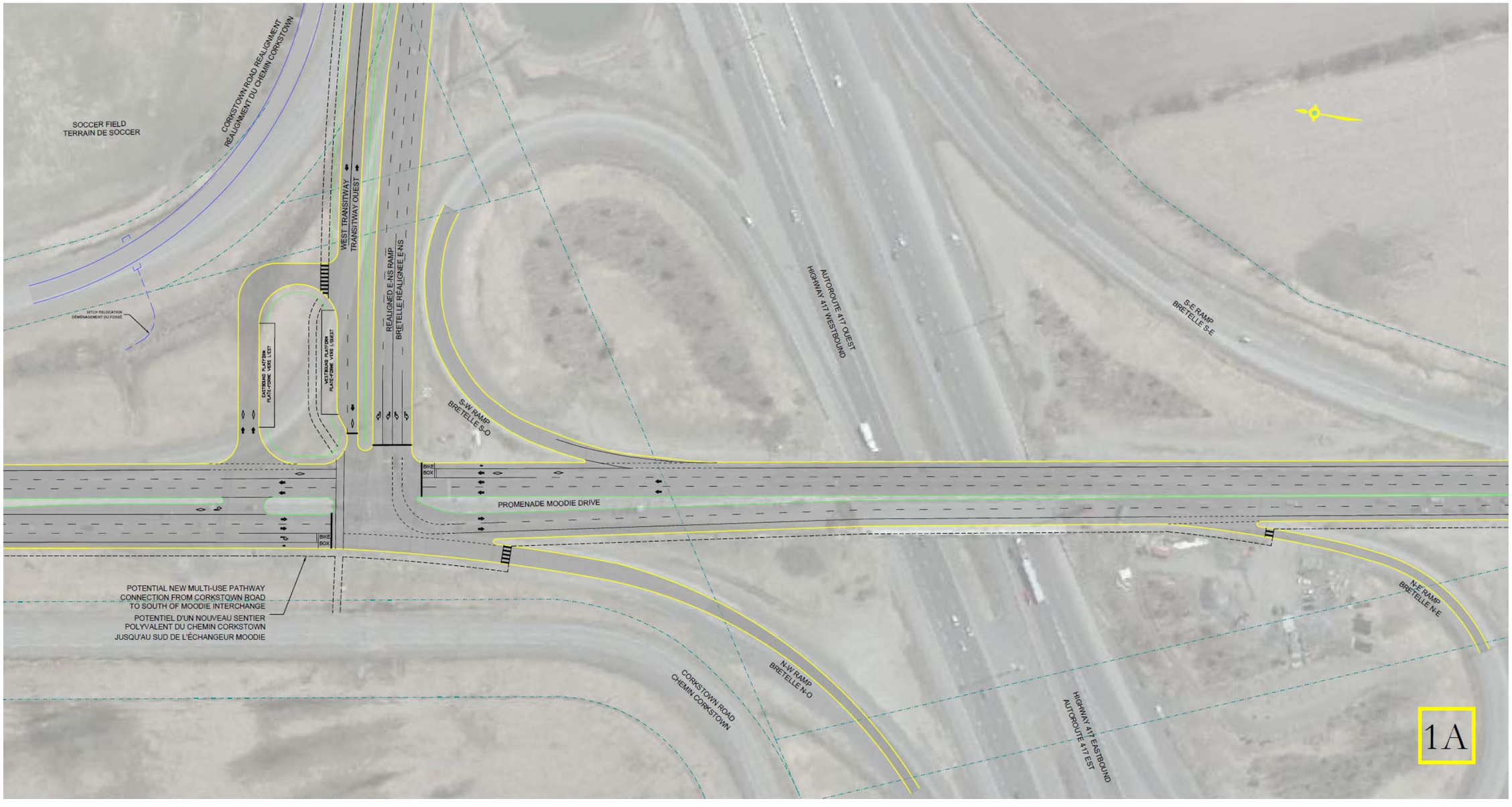


Figure 4-4: Preliminary Design of the At-Grade Connection to Moodie Drive

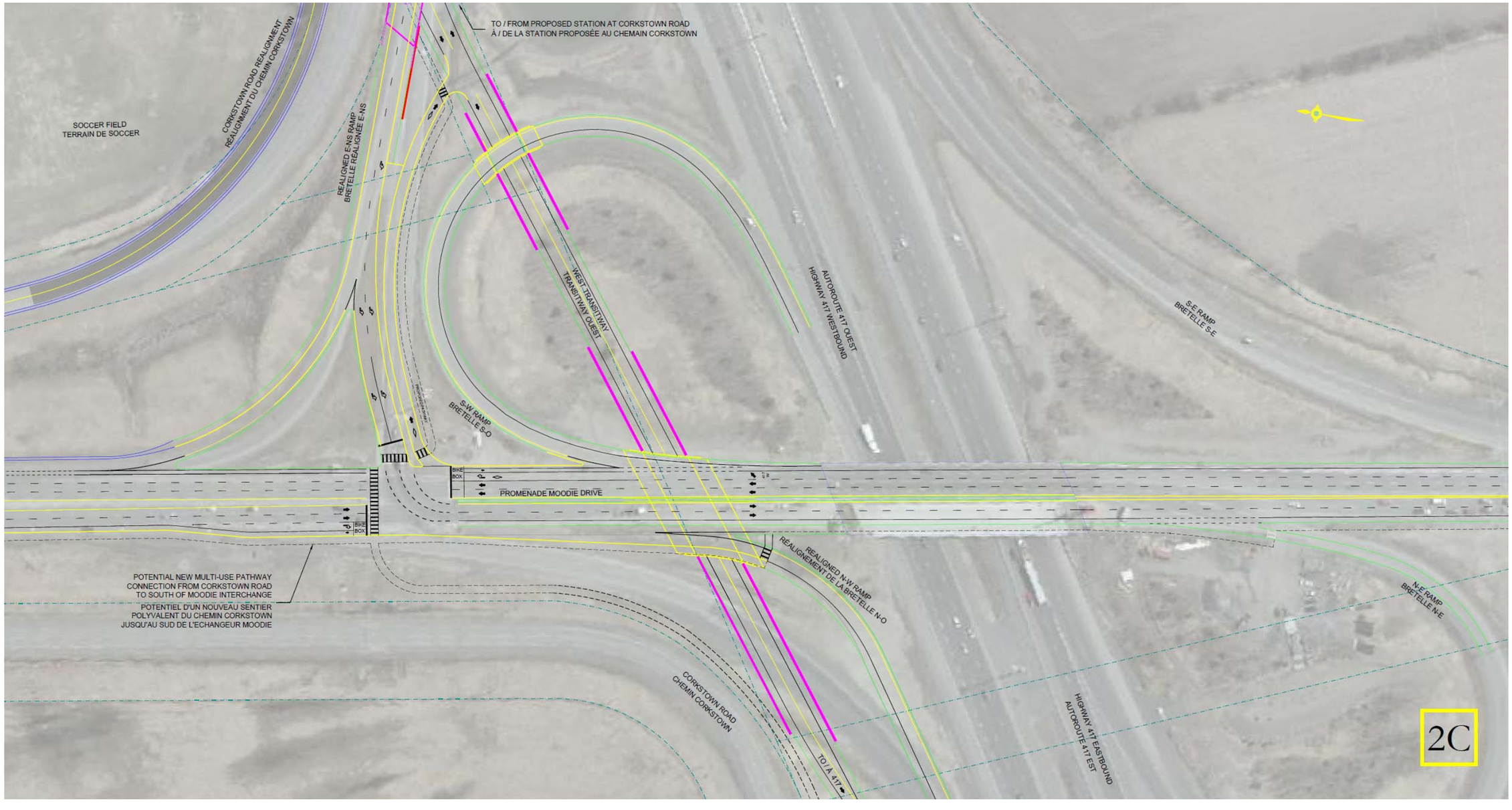


Figure 4-5 Preliminary Design of Partial Grade Separation of Moodie Drive

CHAPTER 5: OPERATIONAL BENEFITS ASSOCIATED WITH RECOMMENDED PLAN

The City of Ottawa has established the strategic goal of increasing the transit modal split to 30% by 2031. The West Transitway Extension from Bayshore Station to west of Moodie Drive forms a critical element in the rapid transit network and will help the City achieve its transit modal split objective by improving service reliability between downtown and the west urban community.

The priority for implementation of this project is founded on the need to address current service reliability issues between Bayshore Station and Moodie Drive. Under existing conditions, travel times between the Eagleson Park and Ride and Bayshore Station vary by as much as 5 minutes in the peak period (from 6 to 11 minutes). The provision of bus only shoulder lanes between Eagleson Road and Moodie Drive suggest that this variance is due entirely to the operation of Transitway service in mixed traffic from Moodie Drive to Bayshore Station.

By removing buses from mixed traffic on Highway 417, travel time variability, and therefore the average time passengers spend waiting at a stop, will decrease. The more evenly spaced buses are when they arrive at a bus stop, the less waiting time passengers are faced with. For short headway routes, for which passengers arrive at bus stops at random, even headways result in an average waiting time of half the headway. If buses experience variable travel times, headways become uneven, which increases the amount of time passengers have to wait and, in effect, reduces the effective service frequency experienced by riders which has a direct impact on transit ridership.

While reducing travel time variability and average passenger waiting times, by deferring the grade separation of Moodie Drive until at least 2021, the Phase 1 project configuration is not expected to reduce average travel times. **Appendix I** – Transit Travel Time Savings analyzes the potential effect of various project configurations on transit travel times. The anticipated changes in travel times are summarized as follows:

Opening Day: At-grade at Moodie Drive

- AM Eastbound buses: 0:46 longer than existing
- PM Westbound buses: 1:25 longer than existing

Interim 2021: Partially separated at Moodie Drive

- AM Eastbound buses: 0:44 shorter than “Do Nothing”
- PM Westbound buses: 1:05 shorter than “Do Nothing”

Ultimate 2031: Fully grade-separated at Moodie Drive

- AM Eastbound buses: 2:13 shorter than “Do Nothing”
- PM Westbound buses: 1:33 shorter than “Do Nothing”

The analysis concludes that, given existing traffic volumes, the near term project is expected to result in a 46 second increase in average AM peak (EB) travel times and a 1 minute 25 second increase in average PM peak (WB) travel times.

The Phase 2 project configuration, (implemented sometime after 2021), is expected to result in average AM peak (EB) travel time savings of 41 seconds and PM peak (WB) travel time savings of 55 seconds when compared to a future do nothing scenario. Finally, the fully grade separated Transitway (beyond 2031), is expected to result in average AM peak (EB) travel time savings of 2 minutes and average PM peak (WB) travel time savings of 1.5 minutes.

While average travel time does have an impact on ridership, research has shown that travelers are more sensitive to a reduction in wait times due to improved service reliability than they are to an equivalent reduction in in-vehicle times. Also, it is important to note that the near-term increase in travel time is due primarily to the requirement for Transitway buses to service the new transit station at Moodie Drive. This near term station will be integrated with the multi-use pathway network and provides OC Transpo with maximum operational flexibility thus significantly improving transit accessibility and service.

Therefore, the improved service reliability, reduction in average wait times, and accessibility to transit provided by the near term configuration is expected offset the increased travel time and generate a net ridership gain. Further ridership gains are expected when the grade separation of Moodie Drive is constructed.

CHAPTER 6: CONSULTATION

Recognizing the importance of stakeholder participation in the planning process, a comprehensive consultation program is being undertaken to ensure that all concerns and issues are identified and given appropriate consideration early and throughout the study.

This consultation program includes Public Open Houses, meetings with a Technical Advisory Committee (TAC), meetings and presentations to City Advisory Committees and regular meetings with the Crystal Beach/Lakeview Community Association (CBLCA).

6.1 Public Open Houses

To date, three Public Open Houses (POH) have been held. A fourth POH is scheduled to occur as part of the formal EA approvals process.

POH #1 was held on June 25, 2009 to provide an introduction to the study and present a preliminary assessment of proposed Transitway Route alternatives and is documented in the AECERA Report (MRC, February 2010). POH #2 was comprised of two sessions: one in Kanata on February 22, 2010 and one in Crystal Beach/Lakeview on February 24, 2010. This Open House was used to present the recommended route (Queensway North) and obtain input into the assessment of functional design alternatives within this route. POH #3 was held on June 24, 2010 and provided interested members of the public with an opportunity to review and provide input into the Preliminary Recommended Plan for the Transitway Extension including mitigation measures and potential implementation scenarios.

The POHs were advertised in both official languages in daily and weekly newspapers prior to each event. Information presented at the Public Open Houses (in English and French) was made available to members of the public following the POH via a secure FTP site established for the study.

Attendance at these events was as follows:

- POH #1 - June 25, 2009 (Maki House): 88 people individuals the register;
- POH #2a – February 22, 2010 (Mlacak Centre): 41 individuals signed the register;
- POH #2b – February 24, 2010 (Maki House): 58 individuals signed the register; and
- POH #3 – June 24, 2010 (Maki House): 96 individuals signed the register.

A consultation record with a copy of all public comments is on file with the City of Ottawa and will be included in the Environmental Project Report. Summaries of comments and questions received at POH #2 and POH #3 are provided in **Appendix E.** Where appropriate, this valuable input was incorporated into the Preliminary Recommended Plan.

6.2 Technical Advisory Committee (TAC) Meetings

A Technical Advisory Committee (TAC) was established early in the study to provide guidance and seek resolution regarding specific technical and regulatory issues. TAC members include representatives from the National Capital Commission (NCC), the Ontario Ministry of Transportation (MTO), the Rideau Valley Conservation Authority (RVCA), OC Transpo, and internal City staff departments.

To date, the following TAC meetings have been held at key project milestones:

- February 25, 2009: Study Introduction;
- July 9, 2009: Refining of Project Scope and Comments from POH 1
- October 19, 2009: Assessment of Route; Preliminary Recommended Route
- February 4, 2010: Identify Preliminary Design Alternatives
- March 18, 2010: Evaluate Preliminary Design Alternatives
- June 15, 2010: Present Preliminary Recommended Plan, Identify Potential Implementation Strategies

In addition to formal TAC meetings, individual meetings have also been held with representatives from the NCC (June 30, September 8, December 18, 2009 and May 19, 2010), MTO (September 2, 2009 and January 10, 2010) and the RVCA (April 27, 2010) to discuss specific project issues and ensure ongoing dialogue throughout the planning process.

Notes of meetings held prior to February 4, 2010 are documented in the AECERA Report (MRC, February 2010). Notes of meetings held following this date are provided in **Appendix F**.

6.3 City Advisory Committees

On (March 22, 2010), study team representatives presented an overview of the project to the Ottawa Forest and Greenspace Advisory Committee (OFGAC). Study Team members also met with a representative of the Roads and Cycling Advisory Committee (RCAC) on June 14, 2010 to obtain feedback on proposed modifications to on-road cycling facilities at Holly Acres Road and Moodie Drive.

6.4 Crystal Beach Lakeview Community Association (CBLCA)

The CBLCA represents the community immediately adjacent to the proposed Transitway extension. Meetings with representatives from the CBLCA have been on-going since the beginning of the study to present information, answer questions and obtain valuable input into specific aspects of the planning and design process.

To date, the following meetings have been held with representatives from the CBCLA at key project milestones:

- April 30, 2009: Study Introduction;

- September 1, 2009: Assessment of Route Alternatives;
- November 2, 2009: Present Route Selection Report;
- January 12, 2010: Discuss Comments on Route Selection Report;
- February 4, 2010: Present Functional Design Alternatives; and
- June 16, 2010: Preliminary Recommended Plan.

At the request of the community, whenever possible, draft study deliverables have been circulated to the CBLCA and feedback has been incorporated into study documentation. These informal, interim public reviews have provided valuable input into the process and have facilitated the identification of key issues requiring follow up through the study.

Notes of meetings held prior to February 4, 2010 are documented in the AECERA Report (MRC, February 2010). Notes of meetings held following this date are provided in **Appendix F**.

6.5 Modifications Brought About Through Consultation

Input received through the study consultation efforts provided valuable guidance towards the development of a Preliminary Recommended Plan. Specifically, the following modifications were incorporated into the plan as a direct or indirect result of effective and constructive stakeholder engagement.

- Upgrading the existing asphalt pathway on the west side of Holly Acres Road to a 3.0 multi-use pathway to improve access from the community to Bayshore Station; and
- Providing a new multi-use pathway connection from Aero Drive to the Bayshore Transitway Station;
- Installing a 750m long retaining wall (varying from 1 to 2.5m in height) along the entire length of the Stillwater Creek Valley to avoid encroachment into Greenbelt lands and ensure the Transitway is maintained within the Highway 417 right-of-way.
- Reducing the footprint of the local transit component of the proposed station at Corkstown Road to avoid potential impacts on Stillwater Creek;
- Adjusting the vertical profile of the Transitway near Moodie Drive to minimize potential impacts to the groundwater table;
- Providing a new multi-use pathway connection from the existing Watts Creek Recreational Pathway to existing on-road cycling facilities on Moodie Drive itself, and on Corkstown Road west of Moodie Drive;
- Removing one southbound lane on the Moodie Drive bridge over Highway 417 to accommodate upgrades to existing on-road cycling lanes and the provision of a 3.0 m multi-use pathway across the bridge connecting Crystal Beach/Lakeview to Bells Corners; and
- Providing a small ‘Kiss-and-Ride’ facility on Corkstown Road to improve community access to the proposed station at Corkstown Road.

CHAPTER 7: NEXT STEPS

As noted in the introduction, the planning work completed to date has been carried out at a sufficient level of detail to define a Preliminary Recommended Plan, identify key issues and constraints, and develop preliminary approaches and strategies to address them. With Council approval of the Preliminary Recommended Plan, the 6-month TPAP approvals process will be initiated. Also, as National Capital Commission (NCC) lands are required, a Screening under the *Canadian Environmental Assessment Act* (CEA Act) has also been initiated.

The TPAP includes a maximum 120-day documentation and consultation period that begins with a Notice of Commencement and concludes with a 30-day public review of the Environmental Project Report (EPR). During the 120-day period, a fourth POH will be held to present and obtain comments on the Draft EPR. The EPR will document all aspects of the study including route selection, preliminary design selection, and the final Recommended Plan, including the mitigation and implementation plans.

As the responsible authority, the NCC is responsible for ensuring that a screening is carried out under the CEA Act. A Notice of Commencement was placed on the Canadian Environmental Assessment Registry (CEAR) on June 28, 2010 and provides a summary description of the project including a description of the project's environmental setting and main environmental issues. A screening will be carried out to analyze, evaluate and identify potential environmental effects. This screening will be documented in an Environmental Assessment Screening Report which describes the project scope, analyzes anticipated residual (net) environmental effects (after mitigation), and determines the significance of these effects. The screening report will be circulated to other expert federal authorities for review and comment. As this study is following a coordinated approach to obtaining provincial and federal EA approvals, information regarding the federal screening will be provided at POH #4. This project will receive federal EA approval if the responsible authority determines that the project is not likely to result in significant adverse environmental effects.

Following federal and provincial approval of the Recommended Plan, a detail design and tender package will be prepared for the Near Term project configuration. Expected timelines for project completion are provided in table 6-1:

Table 6-1: Expected Timelines for Project Completion

2010	
June/July	Initiate Federal Screening Process
August/ September	Present Plan to Transit Committee and Council
October/November	Initiate Provincial EA Processes
2011	
January	Public Open House #4
February	File Environmental Project Report for Public Review
March	Anticipated EA Approvals
March/April	Detail Design of Near Term Project
April	Study Completion and Tender Package Submission