Section 1: Evaluation Criteria and Indicators

Specific criteria and indicators were developed to help evaluate the Alternative Solutions based on their potential to fulfill the project's Need and Opportunities as well as the Planning and Design Principles of the study. Table 1-1 lists the evaluation criteria and the corresponding indicators.

Table 1-1: Criteria and Indicators

Criteria	Indicators
Eliminates conflict at the crossing.	• Minimizes the potential for collision between a train and pedestrians and/or cyclists at the crossing. • Minimizes the potential for pedestrians and/or cyclists to cross when a train is approaching. • Minimizes the willingness of pedestrians and/or cyclists to "beat" the train.
Eliminates potential conflict with nearby private accesses to Jockvale Road.	• Minimizes the need to remove or relocate any existing private accesses to Jockvale Road.
Improves accessibility across the rail line.	• Improves accessibility by providing a barrier-free crossing. • Pedestrians are provided with an unobstructed view of the crossing and pathway leading to the crossing. • Provides adequate crossing surface to minimize slips, falls or mobility devices from being caught in the tracks.
Improves the connectivity of the active transportation network at this location.	• Provides a clear and direct route across the rail line crossing. • Requires minimal navigation and time by pedestrians and/or cyclists to reach the other side of the crossing.
Improves the connectivity of the active transportation network to the north and south of the rail line.	• Provides a direct route connecting neighbourhoods and destinations both north and south of the railway line. • Provides an intuitive path to join adjacent pathways.
Eliminates the need for ongoing and future maintenance and inspection of MUP signalization rail crossing infrastructure.	• Requires limited amount of infrastructure hardware (i.e. lights, bells, barriers, etc.) to alert pathway users. • Provides infrastructure hardware that is common and simple to replace, when needed. • Provides infrastructure at reasonable locations and height, reducing the potential for accidents and falls during maintenance and inspection cycles.
Eliminates the risk of future MUP signalization/mechanical/electrical rail line infrastructure failure.	• Allows snow clearing operations. • Minimizes the potential for vandalism of rail infrastructure.
Compatibility with the future grade-separation of Jockvale Road at this location.	• Minimizes physical and infrastructure constraints when the Jockvale Road grade-separation is later implemented. • Continues to provide accessibility and connectivity to all MUP users. • Utilizes materials which would be complementary to the future grade-separation of Jockvale Road.

Criteria	Indicators
Addresses local social environmental factors, including: land use, noise, air quality and vibration, cultural and archeological features, and the visual environment.	• Minimizes the potential for anti-social behavior (i.e. loitering, graffiti, dangerous behaviour) at the crossing. • Minimizes adverse noise, air pollution and vibration effects during construction and/or operation. • Minimizes adverse effects on archaeological features. • Minimizes adverse visual and landscape effects of new infrastructure.
Addresses local natural environmental factors, including: the effects of the project on climate change, terrestrial and aquatic habitats and ecological corridors.	• Minimizes the need for vegetation clearance. • Provides opportunities for planting context-sensitive landscaping.
Addresses local physical environmental factors, including: the effects of climate change on the project, geotechnical and hydrogeological factors.	• Minimizes the risk of flooding at the crossing and elsewhere around the Study Area. • Adequately addresses surface water and rainfall events. • Provides simplified drainage. • Minimizes or prevents the build-up of ice and snow.
Addresses local economic factors, including: construction cost and life-cycle costs.	• Minimizes construction costs. • Minimizes operation and maintenance costs.

Section 2: Grade-Separation Alternatives

The EA Study investigated the following two alternatives for grade-separation:

- Overpass: the MUP would cross over the VIA Rail tracks; and
- Underpass: the MUP would cross under the VIA Rail tracks.

Table 2-1 lists the evaluation criteria and the corresponding indicators and Table 2-2 presents the evaluation results of the two grade-separation alternatives.

Table 2-1 Evaluation Criteria for Grade-Separation Alternatives

Criteria	Indicators
Barrier-free accessibility	• Provides a barrier-free crossing, most direct and shortest route.
Overall project footprint	• Requires limited amount of new infrastructure and materials. • Minimizes construction costs.
Visual and access impacts to surrounding properties	• Minimizes the need to remove or relocate any existing private accesses to Jockvale Road. • Minimizes the need for third-party property acquisitions and easements. • Minimizes visual adverse effects of the new infrastructure on existing landscape and area.
Connectivity with the adjoining pathway network	• Provides a simplified and user-friendly connection to join existing adjacent pathways. • Compatibility with future east-west pathway connection, east of Jockvale Road.

Criteria	Indicators
Constructability of the grade-separated option	• Minimizes impacts to VIA Rail's train operation schedule. • Minimizes physical and infrastructure constraints if the Jockvale Road grade-separation is implemented in the future.
Long-term railway track maintainability	• Minimizes the impact on railway operation for future track and adjacent crossing maintenance activities. • Maximizes the ease and speed with which the structure can be restored to operational status should maintenance be required.
Compatibility with VIA Rail Future Expansion Plans	• Provides a structural solution that can easily be expanded to add a future second track. • Compatibility with a twin track high frequency rail operation. • Minimizes conflicts with VIA Rail's design standards.

Table 2-2 Evaluation of Grade-Separation Alternatives

Grade-Separation Options / Criteria	Overpass	Underpass
Barrier-free accessibility	◑	●
Overall project footprint	○	●
Visual and access impacts to surrounding properties	○	●
Connectivity with the adjoining pathway network	○	●
Constructability of the grade-separated option	◑	◑
Long-term railway track maintainability	●	◑
Compatibility with VIA Rail Future Expansion Plans	◑	●
Legend ● Performs best ◑ Performs moderately ○ Performs poorly		

The evaluation results (Table 2-2) indicate that an overpass solution entails a significantly larger project footprint (Figure 2-1) to provide the required vertical clearance for a bridge over the railway tracks in order to be compatible with VIA Rail's future high frequency rail expansion plans. The lengthy ramps and potential embankments would lead to adverse landscape and visual impacts and lack of connectivity with the adjoining pathway network. It would also impact existing private property access to Jockvale Road. The existing access to the Fellowship Christian Reformed Church from Jockvale Road would require relocation to Townsend Drive. Higher project and maintenance costs are also expected due to an overall larger project footprint. Table 2-2 also highlights some benefits of the overpass option such as it is less impactful to VIA Rail's train operating schedule during construction and to long-term track maintenance.

Given these considerations, an underpass solution is selected as the preferred alternative.

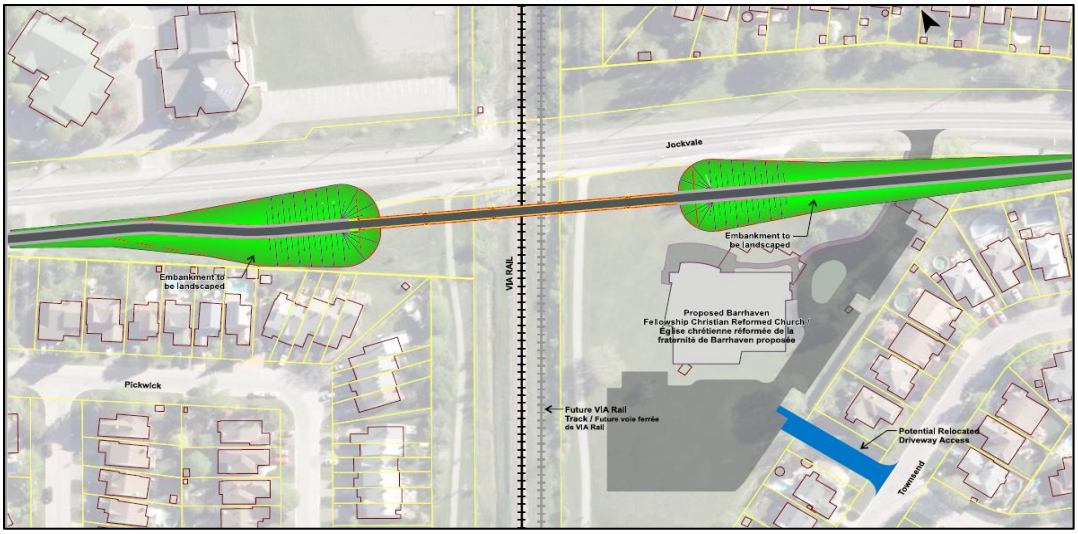

Figure 2-1: Illustration of Approximate Overpass Project Footprint

Section 3: Underpass Structure Type

The EA study considered three alternative structure types to provide an underpass design. These are:

1. Structural plate corrugated steel pipe (SPCSP) culvert structure.
2. Culvert, a prefabricated enclosed concrete box structure (Figure 3-1).
3. Bridge, a Steel Through Plate Girder structure (Figure 3-2).

The SPCSP culvert structure could conceivably be ‘tunnelled’ and not require shutting down the active VIA Rail track. However, results of geotechnical assessment concluded that tunnelling was likely not feasible in the till soils at this site and even with pre-support of the ground, would be a very high-risk operation. Therefore, this alternative was screened out from further consideration.

Figure 3-1: Culvert Alternative

Figure 3-2: Bridge Alternative

Table 3-1 presents the assessment of the two feasible alternatives considering the following criteria for evaluation:

- Constructability, including risks to delay VIA Rail's operations
- Compatibility with VIA Rail's future plans to twin the tracks
- Construction cost
- Maintenance
- Inspection
- Accessibility, perception of safety and user experience
- Geotechnical and ground-water considerations

Table 3-1: Evaluation of Underpass Structure Type

Alternative	Pros	Cons
Culvert	• Remains consistent with other rail underpasses in the City of Ottawa, which are culvert structures. • The culvert could be extended, and new wing wall/retaining walls built at one end. The existing retaining walls would need to be modified or removed; these existing walls would be, therefore, considered "throwaway". • Shorter inspection time, however not all culvert components are visible and anti-graffiti coatings can obscure details.	• Longer installation process required, therefore posing a potential higher risk to VIA Rail's train schedule. • Requires construction of retaining walls and a temporary bridge, which increase the overall construction cost by approx. 20%. • Requires regular cleaning of debris from trench drains on approaches at culvert, repair/replacement of drain gratings, removal of graffiti, and regular underpass lighting maintenance. • In accordance with Crime Prevention Through Environmental Design (CPTED) guidelines and experience, the closedness of a culvert leads to the perception that a culvert offers an unsafe passage, provides a dark environment (even with lighting), opportunities for unsightly graffiti, and less visibility for users merging from the East-West pathways. • A culvert option would require deeper excavations and the structure would likely be located within the high groundwater table.
Bridge	• Faster to construct due to options for construction phasing, therefore posing a potential lesser risk to VIA Rail's train schedule. • The existing bridge would be operational and a second (twin) bridge would need to be built. • Requires minimal retaining walls or a temporary bridge to facilitate construction, therefore a less costly option.	• Longer inspection time, however bridge components are more visible to inspect.

Alternative	Pros	Cons
	• Requires regular clearing of ballast to provide maintenance and safety for the bridge structure. • In accordance with CPTED guidelines and experience, the openness of a bridge provides better visibility as users can see their full path ahead and any obstruction. The openness minimizes concealment, loitering and anti-social activities, and potential for collisions from users coming from the east-west pathways. Jockvale Road users have better view of activities taking place at the underpass. • A bridge option would require shallower excavations and the structure would be located further from groundwater table. This option would also best interact with existing soil conditions and location of bedrock.	

Given these considerations, the preferred alternative is a bridge structure.

Section 4: Crossing of Jockvale Road

In order to address the need for a crossing of Jockvale Road, following five alternatives were developed:

Alternative # 1 - Straight and Controlled Mid-Block Crossing: This option provides a controlled crossing of Jockvale Road which includes painted lines, pedestrian-activated overhead signals and flashing beacons.

Alternative # 2 - Offset Mid-Block Crossing: This option provides a controlled crossing of Jockvale Road and includes an accessible median in the middle of the crossing, enabling pedestrians to cross one traffic lane at a time. The median would be designed so that the two separate crossings are offset, hence pedestrians are discouraged from running across all lanes of traffic at once. This option also includes painted lines and pedestrian-activated overhead signals and flashing beacons.

Alternative # 3 - Signalized Intersection at the Barrhaven Fellowship Christian Reformed Church's entrance: This option provides a full signalization of Jockvale Road at the entrance to the church.

Alternative # 4 - Underground Crossing: This option provides an underpass to enable pedestrians and cyclists to cross underneath Jockvale Road in an east-west direction.

Alternative # 5 - At-grade Crossing adjacent/parallel to the VIA Rail line: This option places a pedestrian and cycling crossing of Jockvale Road adjacent to the VIA Rail line as there is a user desire line.

The study team screened out Alternative # 4 due to factors of cost, requirement for a larger project footprint, perception of safety and conflict with potential future grade-separation of Jockvale Road.

Alternative # 5 was also screened out based on its incompatibility with the grade-separation of the MUP and the railway. Once the north-south MUP is grade-separated, there will be a slope preventing this desire line.

The three remaining Alternatives # 1, # 2 and # 3 which assumed a controlled crossing of Jockvale Road to maximize users' safety, were evaluated further and are illustrated in Figure 4-1, Figure 4-2 and Figure 4-3.

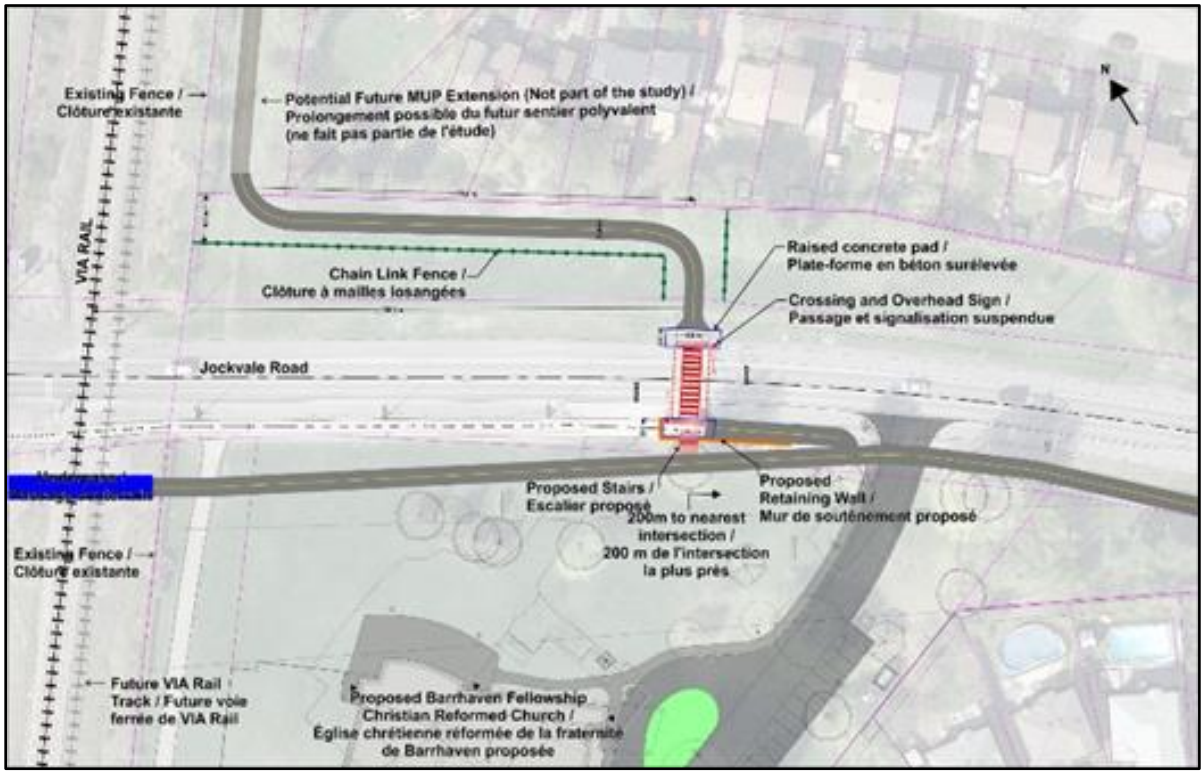

Figure 4-1: Mid-Block Crossing (Alternative # 1)

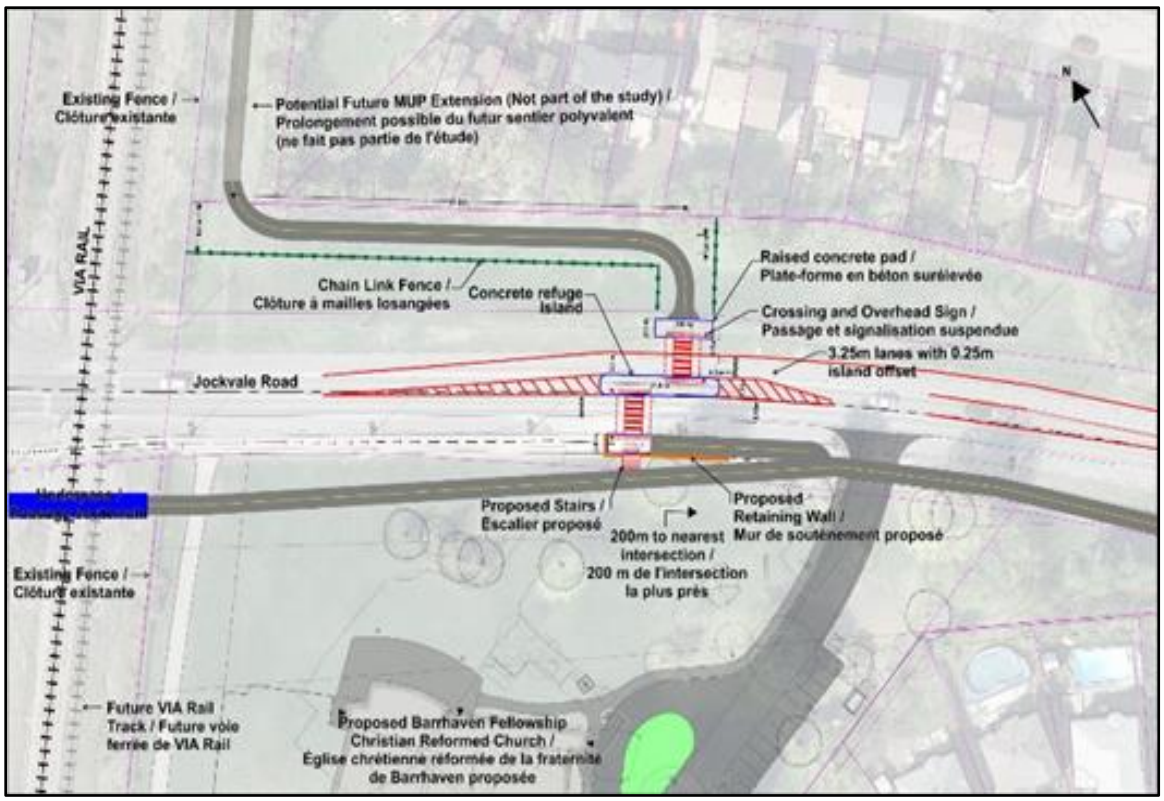

Figure 4-2: Offset Mid-Block Crossing (Alternative # 2)

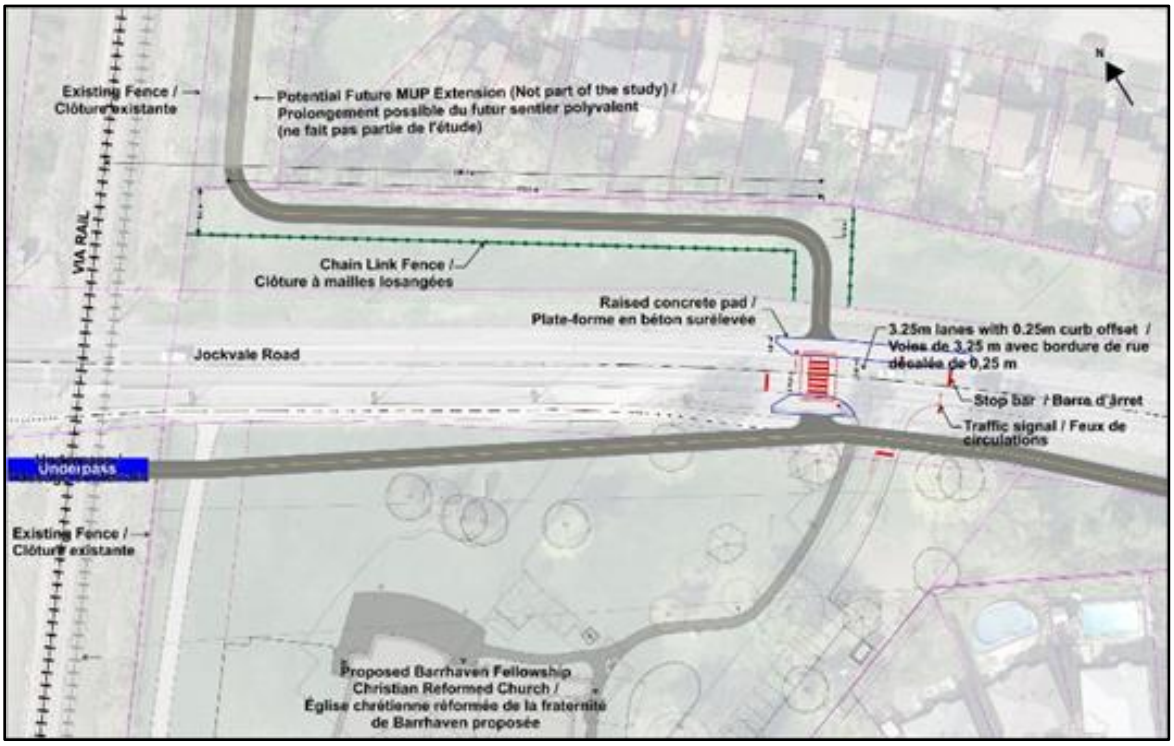

Figure 4-3: Signalized Intersection at the Barrhaven Fellowship Christian Reformed Church's entrance (Alternative # 3)

The following criteria was used to evaluate these alternatives by employing professional judgment, experience on similar projects and knowledge of the existing environmental conditions:

- Ease of use and accessibility requirements
- Length of the crossing
- Potential obstruction to VIA Rail's warning signs
- Implementation and maintenance costs.

Table 4-1 presents the evaluation results of these three alternatives.

Table 4-1 Evaluation of Alternative Designs to Cross Jockvale Road

Alternative	Pros	Cons
Mid-Block Crossing	• Safe and controlled crossing for pedestrians. • Low implementation and maintenance costs. • AODA compliant, ease of use.	• Longer crossing (approx. 12m segment). • Close proximity of signals and overhead signs to VIA Rail. • Obstruction of sight-lines to VIA Rail infrastructure.
Offset Mid-Block Crossing	• Shorter (2-stage) controlled crossing. • Refuge island enhances pedestrian/cyclist safety and comfort. • Overhead signs not required. • No obstruction of sight-lines to VIA Rail infrastructure.	• Moderate implementation and maintenance costs. • AODA compliance issues.
Signalized Intersection	• Crossing can be integrated with potential Church signals. • Traffic signals provide a safe and controlled level-crossing.	• Higher implementation and maintenance costs. • Traffic signals are not currently warranted at this location. • Signal synchronization required with VIA Rail crossing signals. • Obstruction of sight-lines to VIA Rail infrastructure.

Based on the evaluation (Table 4-1), the Mid-Block Crossing (Alternative # 1) is selected as the preferred alternative due to ease of crossing, compliance with the AODA and low implementation and maintenance costs.