

# **Accommodating Pedestrians and Cyclists at a Suburban Freeway Interchange**

**Mark Roen, P.Eng., MBA**  
Civil Engineer, Transportation  
AECOM

Paper prepared for presentation at the  
**“Geometric Design Considerations to Accommodate Other Transportation Modes”**  
Session of the 2011 Annual Conference of the Transportation Association of Canada.  
Edmonton, Alberta

May, 2011

## Abstract

Freeways are typically physical barriers to active modes of transportation. For the Nose Hill Drive and Stoney Trail interchange in Calgary Alberta, there is a freeway barrier, a railway barrier, and a wildlife coulee corridor. On all sides of these physical barriers, there exists a demand to connect the surrounding suburban communities to 12 Mile Coulee and the Bow River for recreational use.

The objective of the study was to find a way to provide safe, efficient, and convenient access for active modes of transportation across the physical barriers, while minimizing cost, and improving freeway and interchange capacity. The demand for active modes includes commuter bicyclists, pedestrians, pathway users, and recreational park users.

The methodology of the study focused on providing active transportation mode connections, while improving safety for all transportation modes.

The study found that a fully grade-separated pathway system would provide access across the physical corridors, at a similar cost to the traditional method of piggy-backing all of the modes through the ramp terminal intersections. The additional benefit is that the grade-separation provides free-flow conditions for both the roadway users, and the pathway users. The recommended solution eliminates five pedestrian-vehicle conflict points where high traffic volumes and tight ramp geometry create predictable collision locations.

The primary finding is that typical policies for handling active modes across physical freeway barriers may not always be the least expensive or safest solution available. By separating the active transportation modes into their intended purposes or travel usage characteristics, a safer and more economical solution can be found.

## Accommodating Pedestrians and Cyclists at a Suburban Freeway Interchange

Freeways are typically physical barriers to active modes of transportation. For the Nose Hill Drive and Stoney Trail interchange in Calgary Alberta, there is a freeway barrier, a railway barrier, and a wildlife coulee corridor. On all sides of these physical barriers, there exists a demand to connect the surrounding suburban communities to 12 Mile Coulee and the Bow River for recreational use.

The objective of the study was to find a way to provide safe, efficient, and convenient access for active modes of transportation across the physical barriers, while minimizing cost, and improving freeway and interchange capacity. The demand for active modes includes commuter bicyclists, pedestrians, pathway users, and recreational park users. These active modes of transportation are in conflict with the purpose of the Transportation Utility Corridor (TUC) that is designed to convey truck traffic, commuter traffic, and various utilities. In addition to these conflicts, the active modes of transportation are in an area that wildlife use as a corridor.

### Interchange Background

The location of the interchange has been planned since the 1970's as part of the TUC that circles The City of Calgary. The Calgary Ring Road was named Stoney Trail in 1981 by the Calgary City Council. The Province of Alberta and The City of Calgary entered into an agreement for the design, construction, maintenance, and operation of the Calgary Ring Road and the connecting Penetrator Roadways in 1991. In 1996, a study called "*Functional Planning Study – Stoney Trail, Trans-Canada Highway (west) to Deerfoot Trail*" was published and subsequently, 7.4km of Stoney Trail was constructed between the Trans-Canada Highway and Country Hills Boulevard. In 2003, Earth Tech (Canada) Inc. was retained to review the 1996 functional study based on changes to the forecast land use and development rates north of Stoney Trail for the Calgary 1.5 million population horizon. The findings were documented in the report titled "*Calgary Ring Road – Stoney Trail: Trans-Canada Highway to Deerfoot Trail.*"

Alberta Transportation commissioned the construction of the north-western portion of the Calgary Ring Road in 2005, and the north-eastern portion in 2006. At the time of writing this report, the entire northern portion of the Calgary Ring Road is open to traffic from the Trans-Canada Highway west to 17th Avenue east. Stoney Trail is currently comprised of 44km of access controlled freeway with the exception of an at-grade intersection at Nose Hill Drive. AECOM was employed to complete planning and design studies to determine the preferred interchange configuration for the grade separation of Nose Hill Drive with Stoney Trail.

As part of the study to determine the preferred interchange configuration, the sidewalk and pathway connectivity needed to be established to permit active modes of transportation. The focus of this report explores some of the options reviewed to determine the recommended pathway connections in the vicinity of the proposed Nose Hill Drive and Stoney Trail interchange.

## Current Project Status

The project is currently in the late stages of detail design and tender preparation. Construction is set to begin in the summer of 2011, with completion estimated to be in fall 2013. The Province of Alberta owns and controls the TUC, but has sought design and operation input from the City of Calgary and adjacent stakeholders.

The interchange planning stage determined that a Partial Cloverleaf type configuration is required for the location, which is fairly typical for service type interchanges. As the interchange configuration was primarily set by traffic volume forecasts and site constraints, active transportation modes are accommodated as a secondary priority.

## Site Constraints That Affect Pathway Connectivity

Physical barriers to active modes of transportation that exist in the vicinity of the interchange include:

- The north-south Stoney Trail freeway lanes that will not permit any pedestrians or bicyclists due to safety risks as the roadway is designed for high speed vehicles
- The east-west Nose Hill Drive Major roadway that permits an adjacent pathway, however crossing can typically only occur at intersection locations
- The east-west Canadian Pacific Railway mainline and Keith Yard that is private property and does not permit pedestrians or bicyclists
- The east-west Bow River watercourse
- The Bears paw Water Treatment Plant in the south east quadrant of the interchange that is fully fenced for security
- The topographical elevation change from the communities to the Bow River (40-50m vertically) due to the Bow River valley escarpment

Other barriers that exist which are not necessarily physical, but impact the movement of active modes of transportation include:

- The north-south wildlife corridor that follows 12 Mile Coulee which runs parallel to Stoney Trail on the west side. A wildlife underpass currently exists underneath Nose Hill Drive, however, human use is discouraged
- The current and future land use of the TUC property in the southeast quadrant of the interchange

The primary site constraints in the vicinity of the Nose Hill Drive and Stoney Trail interchange are shown in **Figure 1**.

## Pathway Origin-Destination Desire Lines

The community of Scenic Acres in the northeast interchange quadrant has a fairly stable population of approximately 9,400 residents. The community of Tuscany in the northwest interchange quadrant has a population of approximately 18,000 residents as of 2008, and is still growing. The active modes of transportation around the interchange originate locally from the two communities, with a smaller portion of users coming from further away communities.

The destinations for active modes of transportation include intercommunity trips (between Tuscany and Scenic Acres), trips to the environmental area of 12 Mile Coulee, the lands adjacent to the Bow River, and locations further away.

Currently, a north-south pathway connection exists from Nose Hill Drive to the south. In the east-west direction, a pathway parallels Nose Hill Drive, with a second east-west connection underneath Stoney Trail approximately 200m north of Nose Hill Drive. 12 Mile Coulee contains multiple informal pathways that are used for recreational use.

### **Primary Wildlife Desire Lines**

The primary wildlife desire line follows 12 Mile Coulee and its tributary coulees. The largest movement is north-south along 12 Mile Coulee which parallels Stoney Trail. The City of Calgary has completed studies of the wildlife movement in the area and has found evidence and captured video of various types of wildlife in the north-south direction through the existing Wildlife Underpass that traverses underneath Nose Hill Drive.

### **Preferred Pathway Connections**

Alberta Transportation prefers not to have any pathway connections within the TUC and especially along freeway corridors. However, agreement has been made with the City of Calgary to permit crossings in the vicinity of major roads that cross the TUC (like Nose Hill Drive). Wide curb lanes (4.3m wide versus the normal 3.7m) have been provided along Nose Hill Drive for use by commuter bicyclists. These wider lanes allow bicyclists to follow the same route as vehicles with minimal disruptions typically present with recreational pathways. To permit the other active modes of transportation through the TUC corridor, Alberta Transportation agreed to provide pathway connections in the east-west direction along the Nose Hill Drive alignment to cross Stoney Trail, and in the north-south direction to cross the Canadian Pacific Railway Right-of-Way. These connections currently exist, and Alberta Transportation permitted that they remain within the TUC once the Nose Hill Drive and Stoney Trail interchange is complete.

The City of Calgary has a license to use a portion of the TUC (specifically 12 Mile Coulee) for recreational and parks use. The City has plans to construct a pathway in the north-south direction on the west side of Stoney Trail, north of Nose Hill Drive. While not formalized, this potential pathway connection was considered during review of the pathway connection options.

There currently exists a pedestrian underpass beneath Stoney Trail approximately 200m north of Nose Hill Drive which connects the community of Scenic Acres with 12 Mile Coulee. As Stoney Trail needs to be widened to create a separate southbound carriageway, the existing pedestrian underpass needs to be modified and extended or fully abandoned.

Adjacent to the Nose Hill Drive and Stoney Trail interchange location, the next available active transportation mode crossings are:

- An east-west pathway across Stoney Trail 1.4km north of Nose Hill Drive at the Scenic Acres Link interchange
- An east-west pathway across Stoney Trail 0.8km south of Nose Hill Drive along the Bow River

- A north-south pathway across the Canadian Pacific Railway Right-of-Way 1.0km east of Stoney Trail along the 85<sup>th</sup> Street alignment

To the west of Stoney Trail, there is currently no formal crossing of the Canadian Pacific Railway Right-of-Way for active modes.

### **Pathway Connection Options Investigated**

While the interchange configuration was already determined, the objective of this study was to provide safe, efficient, and convenient access for alternative modes of transportation. At the same time, the study aimed to minimize capital costs and improve freeway and interchange capacity.

Multiple pathway connection options were investigated to determine the recommended option that would provide a safe and economical solution for active modes of transportation through the interchange area. All of the actual options investigated were reviewed to various extents during design, although only the three primary options have been summarized and listed numerically for clarity in this report. For simplicity, the other options that were reviewed and eliminated are not explored in detail in this report.

### **Option 1: East Typical Solution**

The typical service interchange solution for crossing the Calgary TUC involves attaching a 2.5m wide sidewalk to the bridge that crosses Stoney Trail. Option 1 includes attaching the sidewalk to the north side of the Nose Hill Drive Bridge over Stoney Trail with pathway connections weaving (or piggy-backing) through the interchange ramps and intersections. Option 1 also includes a north-south crossing over the Canadian Pacific Railway on the east side of Stoney Trail. The general layout of Option 1 is shown in **Figure 2**.

With Option 1, the pathway crosses four interchange ramps and also Nose Hill Drive at grade. This forces all of the active modes of transportation to travel adjacent to the roadway and cross the roadways. Two of the crossings occur at the intersections where they can be controlled, however, the remaining three occur along free flow ramps with high traffic volumes. The safety of these crossings was the basis for this study and the reason to evaluate whether a safer solution existed.

Since Option 1 provides an east-west pathway along Nose Hill Drive, the existing pedestrian underpass would be filled-in or obliterated. This would create a dead-end for the existing pathway that follows along Scenic Acres Coulee.

Option 1 was used as the “Base Option” for comparison purposes since the existing north-south pathway crosses the Canadian Pacific Railway Right-of-Way on the east side of Stoney Trail.

### **Option 2: West Typical Solution**

Option 2 is very similar to Option 1 except that the north-south crossing over the Canadian Pacific Railway is on the west side of Stoney Trail. This is due to the potential widening in the future of Stoney Trail to the east of the existing road. If a pedestrian bridge is constructed on the east side, it needs to be moved far enough away from Stoney Trail to permit future

expansion. The issue with pushing the pedestrian bridge to the east is the environmental impact it would have on the 12 Mile Coulee drainage course and the additional retaining walls required.

Like Option 1, Option 2 has a 2.5m wide sidewalk attached to the north side of the Nose Hill Drive Bridge with the pathway connections weaving through the interchange ramps and intersections. The general layout of Option 2 is shown in **Figure 3**.

Option 2 has all of the same vehicle conflict points as Option 1; however, two of them occur at different locations. The traffic volumes are very similar at the conflict points to Option 1 which doesn't improve the safety concern.

While Option 2 provides a north-south pathway connection on the west side of Stoney Trail for route continuity with the planned City of Calgary extension to the north, the vertical profile is not as desirable as Option 1. The pathway grade between Nose Hill Drive and the Pedestrian Bridge across the Canadian Pacific Railway Right-of-Way is approximately 7% slope for 300m continuously. Switchbacks could be provided for active mode rest; however, large retaining walls would be required to allow the grading adjacent to the roadway.

As Option 1 and 2 are examples of how active modes of transportation are typically accommodated at service interchanges, the subsequent safety issues were the basis for exploring non-traditional or non-standard options.

### **Option 3: Full Pathway Grade Separation Solution**

Because there is an existing pedestrian underpass beneath Stoney Trail only 200m north of Nose Hill Drive, options were reviewed to determine whether or not the existing structure could be salvaged. As only one east-west connection would be provided at the interchange, it would be either a sidewalk attached to the Nose Hill Drive Bridge like in Options 1 and 2, or the use of the existing pedestrian underpass.

Option 3 utilizes the existing pedestrian underpass beneath Stoney Trail by extending it to the full width of the future roadway. Option 3 provides full pathway grade separation by extending the underpass beneath Stoney Trail, constructing a new pedestrian underpass beneath Nose Hill Drive, and providing a north-south crossing over the Canadian Pacific Railway on the west side of Stoney Trail. The general layout of Option 3 is shown in **Figure 4**.

Because the pathway crosses under Nose Hill Drive, its lower elevation reduces the required length and steepness of the grade between Nose Hill Drive and the Pedestrian Bridge across the Canadian Pacific Railway Right-of-Way.

The main benefit of Option 3 over the other options is that the active modes of transportation are completely separated from crossing vehicular traffic at-grade. This not only improves safety, but also improves interchange capacity by reducing delay for all modes of transportation.

### **Evaluation of Pathway Connection Options**

To fairly evaluate the three options, an evaluation matrix was created to quantify the differences between the options and determine a recommended option. While the following criteria were

used informally to evaluate all options considered during design, for the simplicity of this report, only the three options contained in this report are formally evaluated.

Each option was compared based on safety, cost, operations, constructability, and environmental impact. Evaluation matrix weightings were approximated to be 40% for safety, 30% for cost, 15% for operations, 15% for constructability and environmental impact. Each of the four criteria were further broken into sub criteria to compare each option to the “Base Case” option which was assumed to be Option 1 (which most closely resembles the existing pathway connections).

### **Safety**

To evaluate the relative safety of each option, the following sub criteria were evaluated:

- Transportation Mode Conflict Points – Less conflict points between transportation modes are desired as they correlate to accident occurrence
- Severity of Conflict Points – Less severe conflict points between transportation modes are desired as they correlate to more minor accident occurrence
- Pathway User Comfort – The overall level of comfort that an active mode user would experience in relation to pinch-points and restrictive cross sections
- Refuge Availability – The amount of rest areas for active modes and their relative safety
- Clear Sightlines – Sufficient sightline distance for curves, other users, and pathway conditions ahead
- User Expectations and Complexity – The level of difficulty that a non-local user may experience when navigating through the study area interchange
- Horizontal Alignment – Continuous alignments with minimal disruptions are preferred to ones that are segmented by conflicting transportation modes
- Vertical Alignment – Profiles that are flatter and have larger vertical curves were preferred to profiles with large slopes and minimum vertical curves

### **Cost**

To evaluate the relative cost of each option, the following sub criteria were evaluated:

- Pathway Construction – The total cost to construct each pathway option including grading, ACP, GBC, fencing, and intersectional treatments required
- Structural Components – The total cost to construct the structural components required to permit the active modes of transportation (Bridges, Culverts, Retaining Walls)

Rather than weighting each of the sub criteria, the total estimated construction cost was compared for each option with the most economical solution being most preferred.

### **Operations**

To evaluate the relative operations of each option, the following sub criteria were evaluated:

- Travel Distance – Shorter travel distances for all active modes are preferred to minimize users “short-cutting” along informal or restricted routes
- LOS Peak Hour – Maintaining higher Level of Service LOS (lower time delay) is preferred versus more congested intersections and ramps
- Design Speed – More tangential routes are preferred over tight radius turns and delays at intersections and ramp crossings
- Maintenance – The amount of effort and difficulty of maintaining the pathway network



## ***Constructability and Environmental***

To evaluate the relative constructability and environmental impact of each option, the following sub criteria were evaluated:

- Staging and Duration of Detouring – Minimal detouring is preferred versus complex or time consuming construction staging
- Accommodation of Future Construction – Allowance for future planning and design for Stoney Trail expansion plans is preferred to avoid throw away costs of any infrastructure
- Maximization of Existing Infrastructure – Utilizing existing infrastructure value where feasible is preferred
- Biophysical and Environmental – Minimal impact to natural areas is preferred. Separation between wildlife routes and human routes is preferred

Each of the criteria were evaluated in comparison to the Base Scenario Option which was Option 1. The sub criteria were rated in the following fashion:

A “+2” was given when the current option had a clear improvement over the Base option

A “+1” was given when the current option had a slight improvement over the Base option

A “0” was given when the current option was similar to the Base option

A “-1” was given when the current option was slightly worse than the Base option

A “-2” was given when the current option was much worse than the Base option

A completed evaluation matrix table, including basic notes for Options 1 through 3, is shown in **Tables 1, 2, and 3**, respectively. While an evaluation matrix is not a perfectly scientific way to quantitatively evaluate the three options, it is a method of considering multiple criteria in a weighted fashion. The magnitude and values given for each option could be argued, however, the overall outcome for the purpose of this study would likely remain the same.

The sub criteria for each option was totaled and then multiplied by the relevant evaluation weighting to determine a comparative weighted average for each option.

## **Study Findings and Recommendations**

From the evaluation matrix, Option 3 proved to be the recommended pathway configuration to accommodate active modes of transportation through the Nose Hill Drive and Stoney Trail interchange area. While Option 1 and 2 had very similar outcomes, with Option 2 being slightly more desirable than Option 1, Option 3 was determined to be safer for virtually the same cost. **Table 4** shows the comparison of Options 1 through 3 side-by-side to illustrate how the options differ.

In summary, the study found that a fully grade-separated pathway system would provide access across the physical corridors, at a similar cost to the traditional method of piggy-backing all of the modes through the ramp terminal intersections. The additional benefit is that the grade-separation provides free-flow conditions for both the roadway users, and the pathway users. The recommended solution eliminates five pedestrian-vehicle conflict points where high traffic volumes and tight ramp geometry create predictable collision locations.

The primary finding is that typical policies for handling active modes across physical freeway barriers may not always be the least expensive or safest solution available. In certain

instances, by separating the active transportation modes into their intended purpose and travel usage characteristics, a safer or more economical solution may be found.

## REFERENCES

The following information was used to aid in the creation of this report:

- ***“Calgary Ring Road – Stoney Trail: Trans-Canada Highway to Deerfoot Trail”***  
Earth Tech (Canada) Inc. November, 2003
- ***“As-Built Construction Drawings – Nose Hill Drive Extension”***  
Southwell Trapp & Associates Ltd. April, 2004
- ***“Design Guidelines for Subdivision Servicing”***  
The City of Calgary, August, 2004
- ***“The City of Calgary Regional Transportation Model – 2.75 million Regional Population”***  
The City of Calgary Transportation Planning. December, 2006
- ***“Stoney Trail Capacity Review – Trans-Canada Highway to Nose Hill Drive NW”***  
Focus Corporation. January, 2009
- ***“Geometric Design Guide for Canadian Roads”***  
Transportation Association of Canada, 1999 Edition Part 1, 2
- ***“Highway Geometric Design Guide – 1995”***  
Alberta Transportation, 1999 updated to 2009

## FIGURES

**Figure 1:** Site Plan and Major Barriers to Active Transportation Modes

**Figure 2:** Option 1: (Base Option) East Typical Solution

**Figure 3:** Option 2: West Typical Solution

**Figure 4:** Option 3: Full Pathway Grade Separation

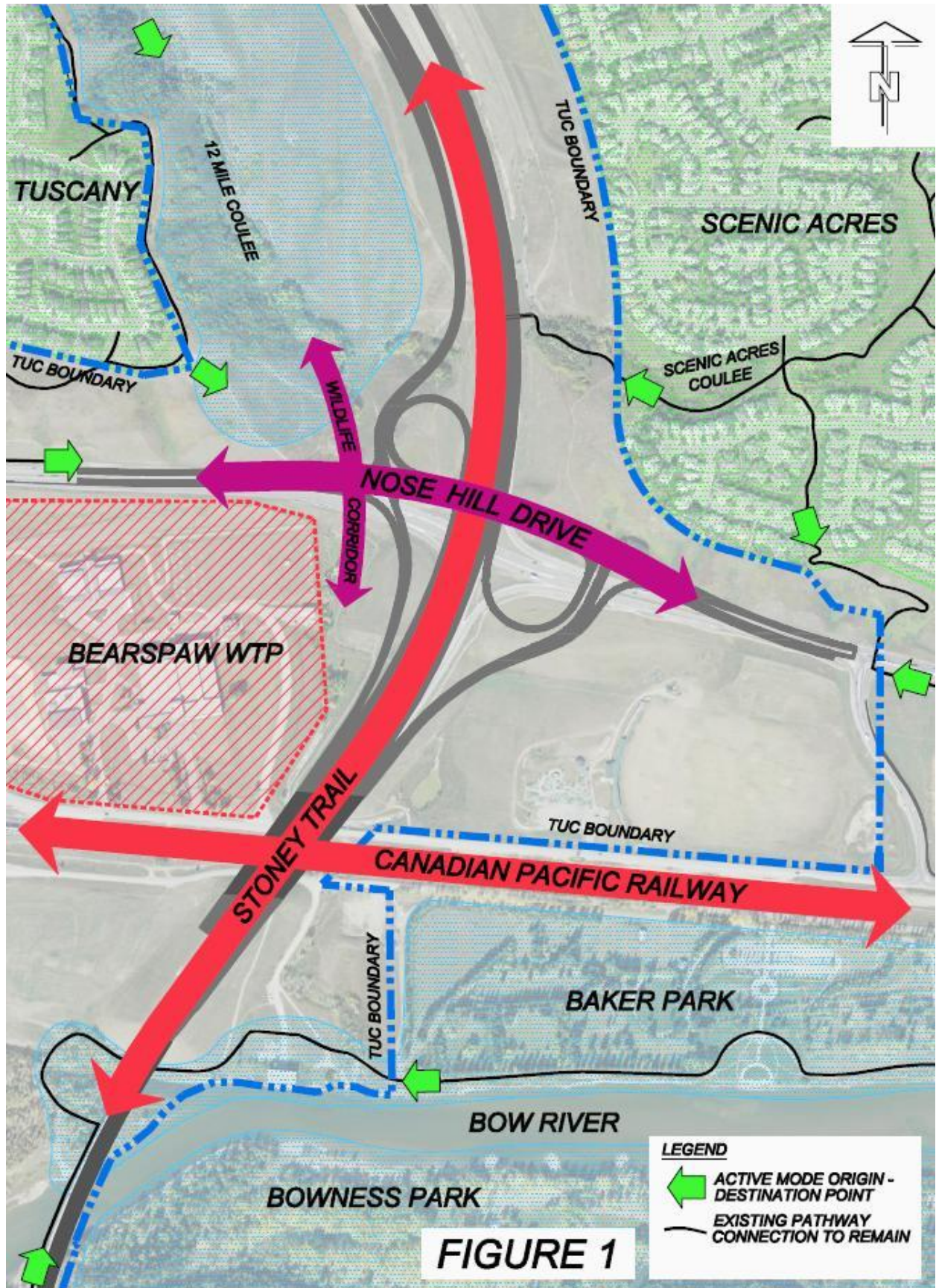
## TABLES

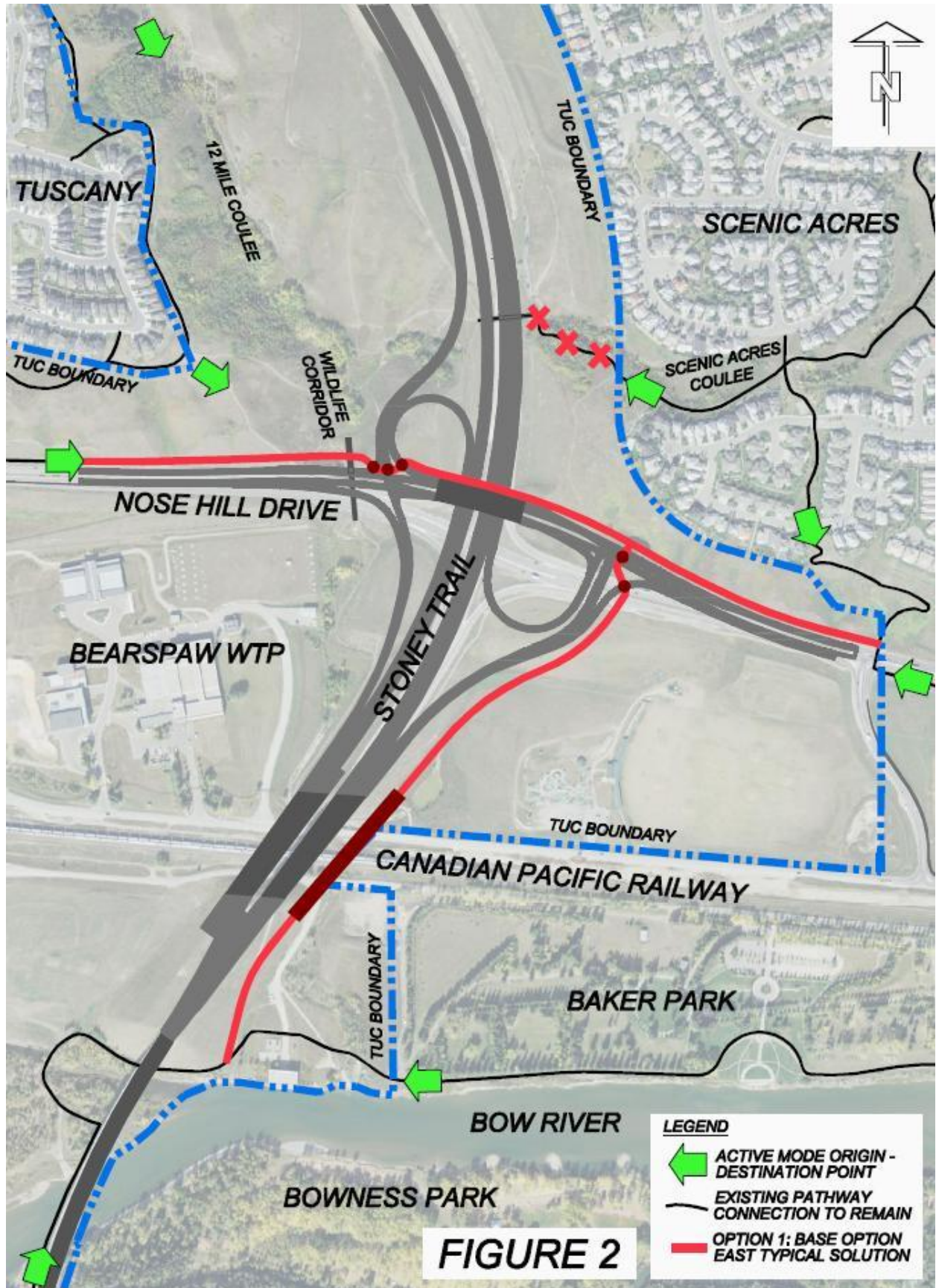
**Table 1** - Option 1: (Base) East Typical Solution

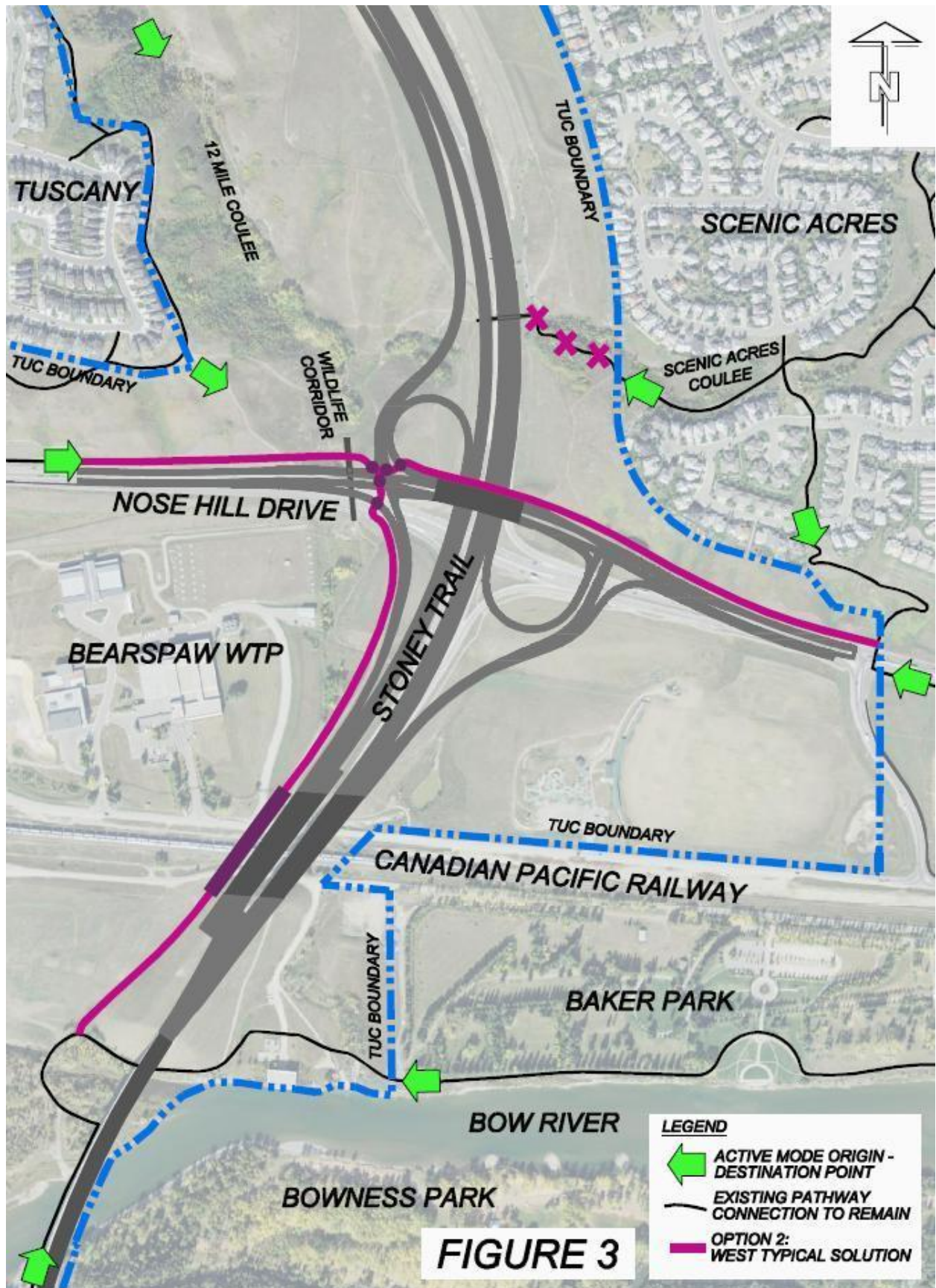
**Table 2** - Option 2: West Typical Solution

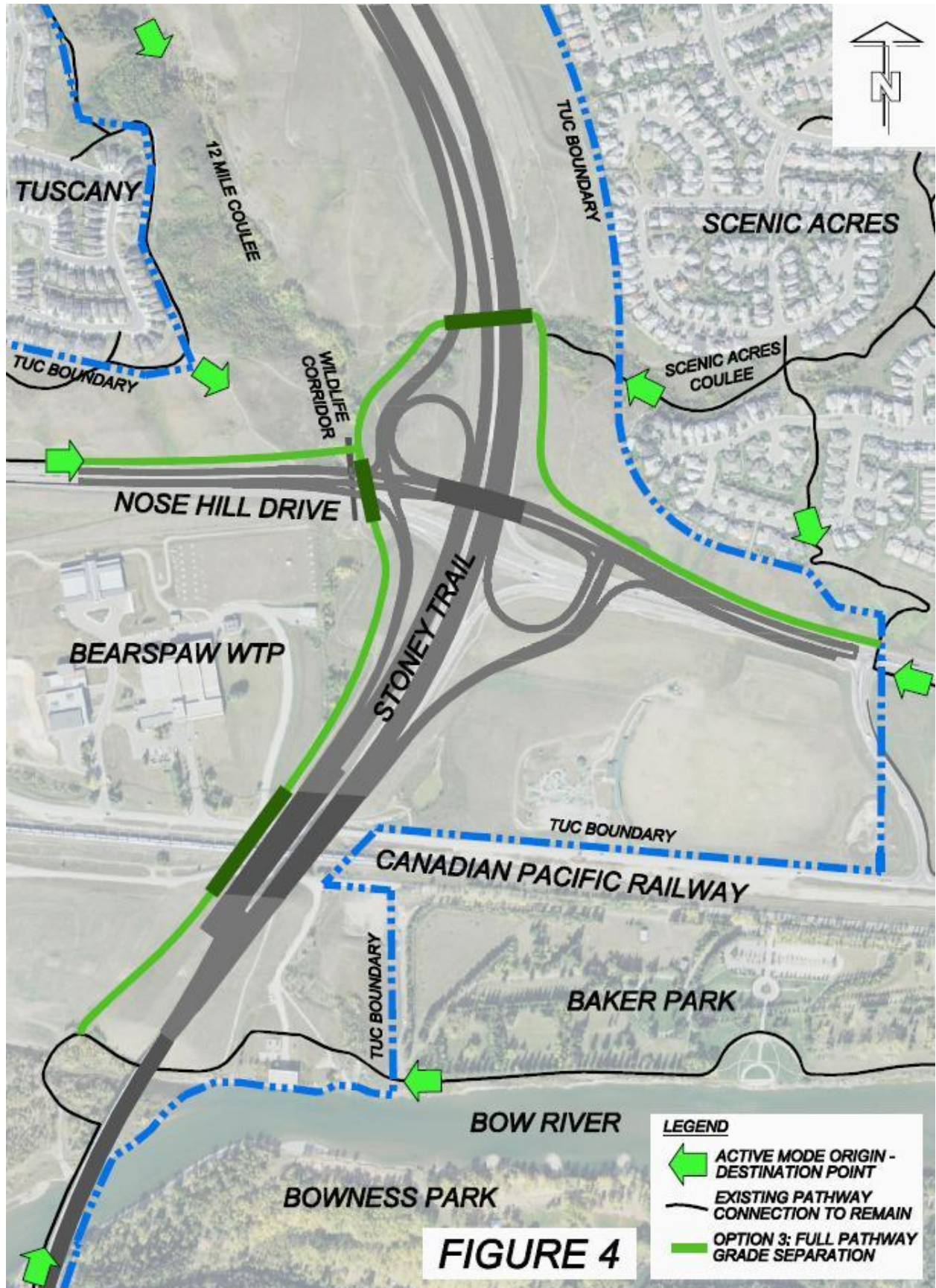
**Table 3** - Option 3: Full Pathway Grade Separation Solution

**Table 4** - Total Summary of Option Weightings









**Table 1 - Option 1: (Base) East Typical Solution**

Criteria		
Sub Criteria	Option 1: (Base) East Typical Solution	Notes
<b>Safety (40%)</b>		
Transportation Mode Conflict Points	0	5 critical vehicle-pedestrian conflict points
Severity of Conflict Points	0	Active modes have to traverse small islands
Pathway User Comfort	0	Restrictive cross section at Nose Hill Drive Bridge and along roads
Refuge Availability	0	Refuge available behind barriers, except at intersection locations
Clear Sightlines	0	Pathway ahead can be seen at all times
User Expectations and Complexity	0	Typical solution found around Calgary
Horizontal Alignment	0	Horizontal alignments are segmented at the intersection locations
Vertical Alignment	0	Moderately steep grades in north-south direction
<b>Total Safety Points</b>	<b>0</b>	
<b>Weighted Total Safety Points</b>	<b>0.00</b>	
<b>Cost (30%)</b>		<b>Total Estimated Cost of \$5.4 Million (2011 CAD)</b>
Pathway Construction		
ACP, GBC, Fencing, and Intersection Treatment	N/A	Estimated cost of \$400,000
Structural Components		
Bridge over the Canadian Pacific Railway ROW	N/A	Estimated cost of \$3,200,000
Widening of Nose Hill Drive Bridge	N/A	Estimated cost of \$1,500,000
Pedestrian Underpass(s)	N/A	N/A
Retaining Walls	N/A	Estimated cost of \$300,000
<b>Total Cost Points</b>	<b>0</b>	
<b>Weighted Total Cost Points</b>	<b>0.00</b>	
<b>Operations (15%)</b>		
Travel Distance	0	Short travel distance, however, steep grades and broken connectivity
LOS Peak Hour	0	All transportation modes overlap at intersections
Design Speed	0	Active modes have to stop at intersection locations
Maintenance	0	Maintenance required for structures and pathways
<b>Total Operations Points</b>	<b>0</b>	
<b>Weighted Total Operations Points</b>	<b>0.00</b>	
<b>Constructability and Environmental Impact (15%)</b>		
Staging and Duration of Detouring	0	Multiple detouring and staging phases are required
Accommodation of Future Construction	0	Restrictive for the future expansion of northbound Stoney Trail
Maximization of Existing Infrastructure	0	Existing pedestrian underpass is throw away
Biophysical and Environmental	0	Minimum infrastructure required
<b>Total Const. &amp; Environ. Points</b>	<b>0</b>	
<b>Weighted Total Const. &amp; Environ. Points</b>	<b>0.00</b>	
<b>Total Overall Points</b>	<b>0</b>	
<b>Total Overall Weighting</b>	<b>0.0</b>	

**Table 2 - Option 2: West Typical Solution**

Criteria		
Sub Criteria	Option 2: West Typical Solution	Notes
<b>Safety (40%)</b>		
Transportation Mode Conflict Points	0	5 critical vehicle-pedestrian conflict points
Severity of Conflict Points	1	Active modes have to traverse small islands and a freeway off ramp
Pathway User Comfort	0	Restrictive cross section at Nose Hill Drive Bridge and along roads
Refuge Availability	0	Refuge available behind barriers, except at intersection locations
Clear Sightlines	0	Pathway ahead can be seen at all times
User Expectations and Complexity	0	Typical solution found around Calgary
Horizontal Alignment	0	Horizontal alignments are segmented at the intersection locations
Vertical Alignment	-1	Long steep grade in north-south direction is not desirable
<b>Total Safety Points</b>	<b>0</b>	
<b>Weighted Total Safety Points</b>	<b>0.00</b>	
<b>Cost (30%)</b>		<b>Total Estimated Cost of \$5.3 Million (2011 CAD)</b>
Pathway Construction		
ACP, GBC, Fencing, and Intersection Treatment	N/A	Estimated cost of \$400,000
Structural Components		
Bridge over the Canadian Pacific Railway ROW	N/A	Estimated cost of \$3,200,000
Widening of Nose Hill Drive Bridge	N/A	Estimated cost of \$1,500,000
Pedestrian Underpass(s)	N/A	N/A
Retaining Walls	N/A	Estimated cost of \$200,000
<b>Total Cost Points</b>	<b>1</b>	
<b>Weighted Total Cost Points</b>	<b>0.30</b>	
<b>Operations (15%)</b>		
Travel Distance	0	Short travel distance, however, steep grades and broken connectivity
LOS Peak Hour	0	All transportation modes overlap at intersections
Design Speed	0	Active modes have to stop at intersection locations
Maintenance	0	Maintenance required for structures and pathways
<b>Total Operations Points</b>	<b>0</b>	
<b>Weighted Total Operations Points</b>	<b>0.00</b>	
<b>Constructability and Environmental Impact (15%)</b>		
Staging and Duration of Detouring	0	Multiple detouring and staging phases are required
Accommodation of Future Construction	2	Meets the current plans for the Stoney Trail corridor
Maximization of Existing Infrastructure	0	Existing pedestrian underpass is throw away
Biophysical and Environmental	0	Minimum infrastructure required
<b>Total Const. &amp; Environ. Points</b>	<b>2</b>	
<b>Weighted Total Const. &amp; Environ. Points</b>	<b>0.30</b>	
<b>Total Overall Points</b>	<b>3</b>	
<b>Total Overall Weighting</b>	<b>0.6</b>	



**Table 3 - Option 3: Full Pathway Grade Separation Solution**

<b>Criteria</b>		
<b>Sub Criteria</b>	<b>Option 3: Full Pathway Grade Separation Solution</b>	<b>Notes</b>
<b>Safety (40%)</b>		
Transportation Mode Conflict Points	2	Fully grade separated
Severity of Conflict Points	2	Active modes are adjacent to roadways, but do not have to cross
Pathway User Comfort	1	Have to traverse through underpasses, but cross section is maintained
Refuge Availability	1	Refuge is available away from roads except when in underpasses
Clear Sightlines	-1	Blind corners are created by the underpasses
User Expectations and Complexity	-1	Non-typical solution that may confuse some users along Nose Hill Drive
Horizontal Alignment	1	Active modes have continuous horizontal alignment
Vertical Alignment	0	Moderately steep grades in north-south direction
<b>Total Safety Points</b>	<b>5</b>	
<b>Weighted Total Safety Points</b>	<b>2.00</b>	
<b>Cost (30%)</b>		
<b>Total Estimated Cost of \$5.4 Million (2011 CAD)</b>		
Pathway Construction		
ACP, GBC, Fencing, and Intersection Treatment	N/A	Estimated cost of \$500,000
Structural Components		
Bridge over the Canadian Pacific Railway ROW	N/A	Estimated cost of \$3,200,000
Widening of Nose Hill Drive Bridge	N/A	N/A
Pedestrian Underpass(s)	N/A	Estimated cost of \$1,400,000
Retaining Walls	N/A	Estimated cost of \$300,000
<b>Total Cost Points</b>	<b>0</b>	
<b>Weighted Total Cost Points</b>	<b>0.00</b>	
<b>Operations (15%)</b>		
Travel Distance	-1	Longer travel distance, however, better connectivity is provided
LOS Peak Hour	2	Active modes are completely separated from vehicular modes
Design Speed	2	Active modes can maintain continuous movement around interchange
Maintenance	0	Maintenance required for structures and pathways
<b>Total Operations Points</b>	<b>3</b>	
<b>Weighted Total Operations Points</b>	<b>0.45</b>	
<b>Constructability and Environmental Impact (15%)</b>		
Staging and Duration of Detouring	0	Multiple detouring and staging phases are required
Accommodation of Future Construction	2	Meets the current plans for the Stoney Trail corridor
Maximization of Existing Infrastructure	1	Existing pedestrian underpass is utilized
Biophysical and Environmental	-1	Additional width requires grading into 12 Mile Coulee
<b>Total Const. &amp; Environ. Points</b>	<b>2</b>	
<b>Weighted Total Const. &amp; Environ. Points</b>	<b>0.30</b>	
<b>Total Overall Points</b>	<b>10</b>	
<b>Total Overall Weighting</b>	<b>2.8</b>	

**Table 4 - Total Summary of Option Weightings**

Criteria	Option 1: (Base) East Typical Solution	Option 2: West Typical Solution	Option 3: Full Pathway Grade Separation Solution
Sub Criteria			
<b>Safety (40%)</b>			
Transportation Mode Conflict Points	0	0	2
Severity of Conflict Points	0	1	2
Pathway User Comfort	0	0	1
Refuge Availability	0	0	1
Clear Sightlines	0	0	-1
User Expectations and Complexity	0	0	-1
Horizontal Alignment	0	0	1
Vertical Alignment	0	-1	0
<b>Total Safety Points</b>	<b>0</b>	<b>0</b>	<b>5</b>
<b>Weighted Total Safety Points</b>	<b>0.00</b>	<b>0.00</b>	<b>2.00</b>
<b>Cost (30%)</b>	<b>\$5.4 Million (2011 CAD)</b>	<b>\$5.3 Million (2011 CAD)</b>	<b>\$5.4 Million (2011 CAD)</b>
Pathway Construction			
ACP, GBC, Fencing, and Intersection Treatment	N/A	N/A	N/A
Structural Components			
Bridge over the Canadian Pacific Railway ROW	N/A	N/A	N/A
Widening of Nose Hill Drive Bridge	N/A	N/A	N/A
Pedestrian Underpass(s)	N/A	N/A	N/A
Retaining Walls	N/A	N/A	N/A
<b>Total Cost Points</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>Weighted Total Cost Points</b>	<b>0.00</b>	<b>0.30</b>	<b>0.00</b>
<b>Operations (15%)</b>			
Travel Distance	0	0	-1
LOS Peak Hour	0	0	2
Design Speed	0	0	2
Maintenance	0	0	0
<b>Total Operations Points</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Weighted Total Operations Points</b>	<b>0.00</b>	<b>0.00</b>	<b>0.45</b>
<b>Constructability and Environmental Impact (15%)</b>			
Staging and Duration of Detouring	0	0	0
Accommodation of Future Construction	0	2	2
Maximization of Existing Infrastructure	0	0	1
Biophysical and Environmental	0	0	-1
<b>Total Const. &amp; Environ. Points</b>	<b>0</b>	<b>2</b>	<b>2</b>
<b>Weighted Total Const. &amp; Environ. Points</b>	<b>0.00</b>	<b>0.30</b>	<b>0.30</b>
<b>Total Overall Points</b>	<b>0</b>	<b>3</b>	<b>10</b>
<b>Total Overall Weighting</b>	<b>0.0</b>	<b>0.6</b>	<b>2.8</b>