

Galloway Lands Development

Transportation Impact Assessment – Winter Addendum

Final - Reduced

Prepared for
Handshake Holdings Inc.

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CORPORATE AUTHORIZATION

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Engineer's Stamp

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1. EXECUTIVE SUMMARY

Handshake Holdings Inc. is seeking approval of a Land Use Application for a site located north of the Fernie Alpine Resort, west of Highway 3. The proposed development will have 74 residential units.

This Transportation Impact Assessment (TIA) is an addendum to the *Galloway Lands Development* (August 27, 2021) completed by Bunt & Associates, included in **Appendix B**, and reviews the traffic impacts of the proposed development on the internal intersections and with peak ski hill traffic. Findings and recommendations are summarized below.

1.1 Trip Generation

Proposed development densities, phasing, and forecasted trip generation is summarized in **Table 1.1**. It is noted that the development will generate a very small amount of traffic; approximately 16 total trips, 21 total trips, and 28 total trips in the weekday AM, weekday PM, and weekend PM peak hours, respectively. This represents an extremely minimal increase to the background traffic, especially in the busier winter season. Note that for the purpose of analysis it was assumed that these residential units would generate their peak volumes year-round.

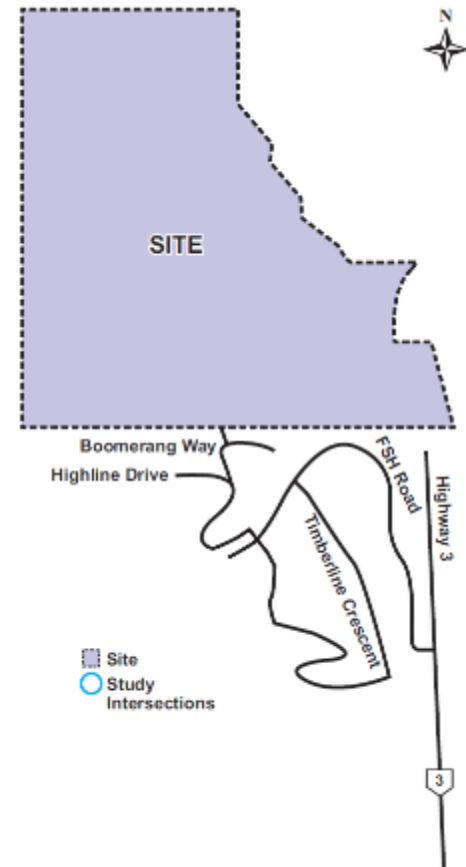


Table 1.1: Trip Generation

HORIZON	USE	DENSITY	TOTAL TRIP GENERATION		
			AM Peak Hour	PM Peak Hour	Wknd Peak Hour
Opening Day (2030)	Recreational Homes	74 units	16	21	28

1.2 Findings & Recommendations

Study findings and recommendations are described in **Table 1.2**.

Table 1.2: Findings & Recommendations

SECTION		FINDINGS
Safety		<p>With or without development of the site, the speed limits on Highline Drive and Boomerang Way should be posted at 30 km/h and the roadways should be provided with “shared space” signage.</p> <p>Delineation lighting on Fernie Ski Hill (FSH) Road is warranted at the Highway 3 intersection under existing conditions, without consideration of new traffic. The addition of the delineation lighting will fully illuminate the intersection.</p> <p>While the intersection of FSH Road & Highway 3 meets the minimum sight distance, the collision history indicates that two casualties have occurred along FSH Road, with assumed one at the Highway 3 intersection, in the past 5 years. The implementation of the delineation lighting would help address the safety issue.</p>
Intersection Analysis	Existing	All study intersections operate within acceptable capacity limits. No improvements are required.
	Opening Day (2030) Background	The study intersections are expected to continue operating within acceptable capacity limits.
	Long Term (2040) Background	<p>The intersection of FSH Road & Highway 3 will reach capacity during the 2040 Background horizon, without consideration of new site traffic. Potential improvement options available for implementation by MoTI include:</p> <ul style="list-style-type: none"> • Manual intersection control by RCMP officers during peak winter periods (specifically the afternoon peak for outbound traffic flows). • A roundabout. • Signalization with retention of current approach laning, • The interchange improvement as per the Highway 3 – West Fernie Access Study. <p>The most straightforward of the three options is the signalization of the intersection while maintaining the existing laning as it would be able to be implemented within the current physical constraints of the intersection. However, as the peak condition occurs infrequently and only during the peak times of the ski season, and adding delay to a highway is not favorable, this intersection control improvement will not be required unless other ambient traffic conditions change beyond what has been assumed in this analysis for 2040. It is recommended that MoTI monitor the intersection independent from the proposed development and that improvements be made for 2040 as needed.</p> <p>All internal intersections will continue to operate within capacity limits.</p>
	Opening Day (2030) After Development	The addition of site traffic has no significant impact on the study intersections.
	Long Term (2040) After Development	<p>As noted in the 2040 Background horizon, the FSH Road & Highway 3 intersection will be a candidate for improvement based on the highest ski hill peak volumes. However, no improvements are recommended due to site traffic as the intersection will not operate with large delays as stop-controlled.</p> <p>All internal study intersections will continue to operate acceptably.</p>

2. INTRODUCTION

2.1 Scope of Work

Based on discussions with BC Ministry of Transportation and Infrastructure (MoTI) and the approved Terms of Reference (TOR) from the 2021 TIA (**Appendix C**), the scope of work for of this addendum was confirmed to include the following:

Development Trip Generation

- *Trip Generation* – Calculate development trips based on industry standards.
- *Trip Assignment* – Assign development trips to the network based on expected draw.

Traffic

- *Horizons* – Review traffic conditions for:
 - Existing
 - Opening Day (2030)
 - Long Term (2040)
- *Intersection Capacity* – Complete winter weekend peak hour analysis, based on January and February 2022 counts, at:
 - Highway 3 & Fernie Ski Hill (FSH) Road.
 - Timberline Crescent & FSH Road.
 - Timberline Crescent/Highline Drive & FSH Road.
 - Highline Drive & Boomerang Way.
- *Recommendations* – Identify improvements required to support background or development traffic.
- *Safety Analysis* – Complete a collision history and sight distance review.
- *Active Modes* – Review active modes connections to the site and at the study intersections.

This TIA Addendum provides complete analysis for the internal Fernie Alpine Resort intersections as well as updated counts for the four study intersections.

2.2 Site Context

The Galloway Lands site is located north of the Fernie Alpine Resort and is bounded by the City of Fernie and Mount Fernie Provincial Park to the north, Lizard Creek to the east, residential development to the south, and undeveloped lands to the west. The site context is illustrated in **Figure 2.1**.

Figure 2.1: Site Context

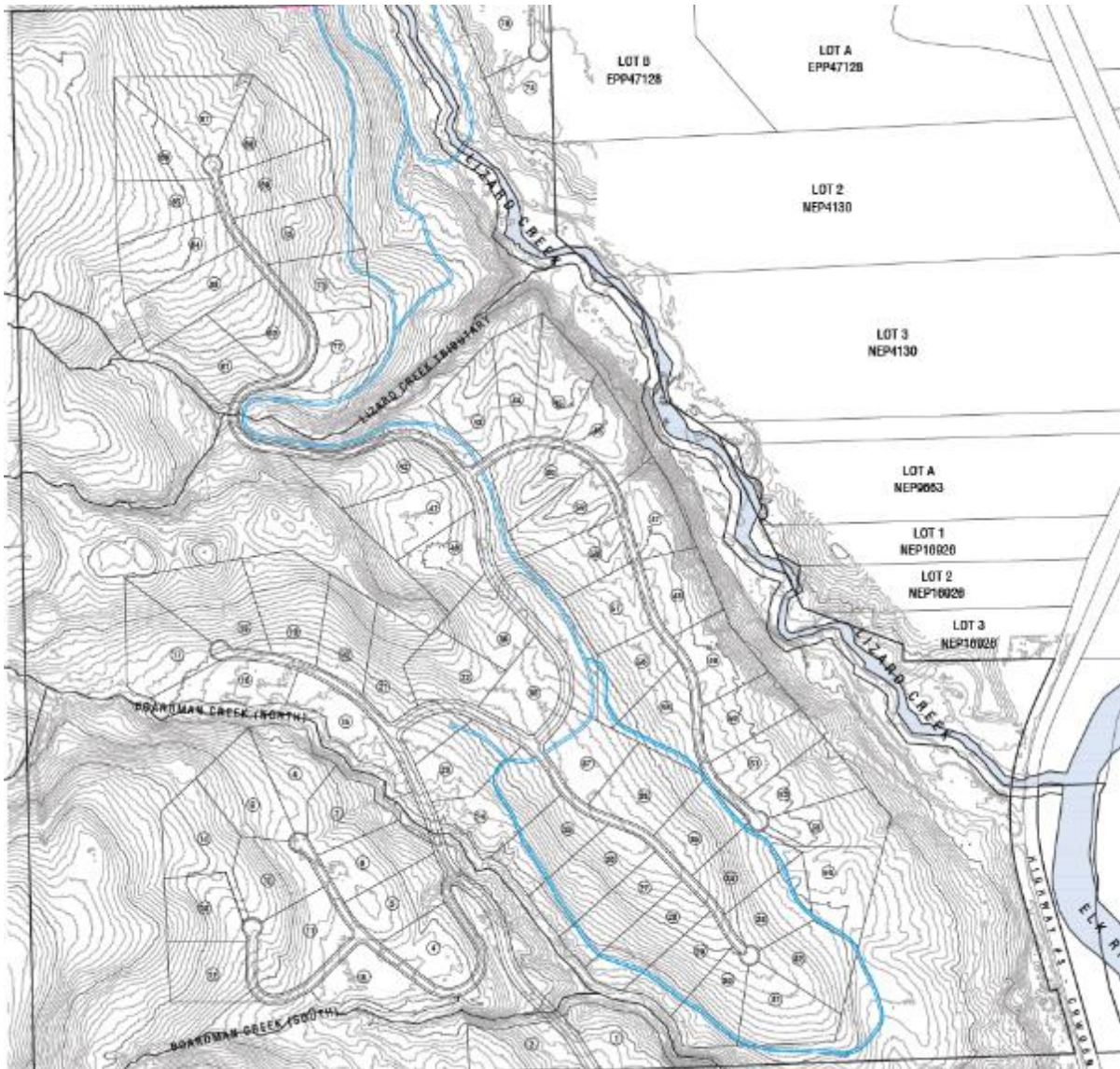


Base Map Source: Google Maps

3. DEVELOPMENT

The site plan is illustrated in **Figure 3.1**.

Figure 3.1: Site Plan



3.1 Densities

The development will include 74 single-family residential units, with an Opening Day full buildout by 2030.

3.2 Trip Generation

The trip generation rates used in this analysis are summarized in **Table 3.1**. The trip generation rates are based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual (10th Edition)*.

ITE Land Use 260 for recreational homes was used for all base analysis given the nature of the dwellings and the proximity to the Fernie Alpine Resort. The site traffic is expected to have a greater percentage of trips outside of peak hours based on the vacation nature of the resort as the residents would not be following standard office hours.

As a comparison, the existing dwelling units on Boomerang Way, comprised of 55 dwelling units, were observed to have a Saturday Peak Hour trip rate of 0.23 trips/unit on January 22, 2022, and 0.21 trips/unit on February 19, 2022. The ITE trip rate used is 0.38 trips/unit.

Table 3.1: Trip Generation Rates

USE	AM PEAK HOUR			PM PEAK HOUR			SATURDAY PEAK HOUR		
	Trip Rate	In	Out	Trip Rate	In	Out	Trip Rate	In	Out
Recreational Homes (ITE 260)	0.22 per unit	67%	33%	0.28 per unit	41%	59%	0.38 per unit	48%	52%

The expected development generated trips using ITE 260 are summarized in **Table 3.2**.

Table 3.2: Vehicle Trip Generation

USE	DENSITY	AM PEAK HOUR			PM PEAK HOUR			SATURDAY PEAK HOUR		
		Total	In	Out	Total	In	Out	Total	In	Out
Residential	74 units	16	11	5	21	9	12	28	13	15

3.3 Trip Distribution

Vehicle trips were distributed based on expected draw. It is noted a portion of the generated trips would not be destined for the highway, given the proximity to the ski resort. However, this difference was not considered in the analysis, resulting in a more conservative analysis at the highway. The site trips are distributed 90% to/from the North on Highway 3 in the direction of the City of Fernie and 10% to/from the South on Highway 3. This distribution is a balance between the observed summer and winter movements.

3.4 Access

Access to the majority of the development will be provided from FSH Road. There are also two (2) of the 74 total units, located to the northeast of Lizard Creek, that will use the Mount Fernie Park Road access. The effect of those two residences on the operations at the Highway 3 & Mount Fernie Park Road intersection are negligible and were not analyzed in this report.

The site will be accessed using the road network of the Fernie Alpine Resort, specifically FSH Road, Highline Drive and Boomerang Way. These roads have a rural cross section with swales and no shoulders as well as no on-street parking. There is currently no separate pedestrian or cycling infrastructure

associated with the Highline Drive and Boomerang Way. The resulting development generated traffic volumes for the 72 remaining units are illustrated in **Exhibit 3.1**.

Exhibit 3.1: Site Traffic Volumes

4. TRAFFIC CONDITIONS

4.1 Road Network

The characteristics of roadways near the site are summarized in **Table 4.1**.

Table 4.1: Existing Roadway Characteristics

ROADWAY	CLASSIFICATION	CROSS-SECTION		POSTED SPEED	FACILITIES	
		# Lanes	Median		Shoulder	Illumination
Highway 3	Rural Arterial Undivided	2	No	80 km/h	Yes	At intersection
Fernie Ski Hill Road	Rural Collector	2	No	50 km/h	No	At intersection
Timberline Crescent	Rural Residential	2	No	N/A	No	None
Highline Drive	Rural Residential	2	No	N/A	No	None
Boomerang Way	Rural Residential	2	No	N/A	No	None

4.2 Intersections

Existing intersection configurations and controls at the study intersections are illustrated in **Exhibit 4.1**.

4.3 Sight Distance

A sight distance review was undertaken at study area intersections based on the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* (2017) for the following:

- *Minimum Stopping Sight Distance (SSD)*, which is the distance a vehicle travels from the instant the driver sights an object and decides to stop, to the instant the vehicle comes to a complete stop after applying brakes. This distance is usually sufficient to allow reasonably competent and alert drivers to come to a hurried stop under ordinary conditions. (Source: Table 2.5.2)
- *Intersection Sight Distance (ISD)*, which is defined as the sight distance required for a vehicle to complete either a crossing or turning manoeuvre safely. (Source: Table 9.9.4 – Case B1 left turn from stop for a passenger vehicle, as well as further calculations). Case B1 is the most conservative scenario as left turns require the highest gap time. Passenger cars require a gap time of 7.5 seconds, whereas it is 9.5 seconds and 11.5 seconds for single unit trucks and combination trucks (WB 19 and WB 20), respectively. The required intersection sight distance is calculated using the following formula:

$$ISD = 0.278V_{major}t_g$$

where V_{major} is the speed on the major road
and t_g is the gap time

Minimum sight distances based on design speeds are summarized in **Table 4.2**. The sight distances for the FSH Road intersection with Highway are greater than 500 metres from both the north and the south of the intersection. The review confirms sight distance requirements are met for the design speed of 110 km/h (posted speed of 80 km/h).

Table 4.2: Sight Distance

DESIGN SPEED	STOPPING SIGHT DISTANCE	PASSENGER CAR ISD	SINGLE UNIT TRUCK ISD	COMBINATION TRUCK ISD
60 km/h	85 m	130 m	160 m	195 m
70 km/h	105 m	150 m	185 m	225 m
80 km/h	130 m	170 m	215 m	260 m
90 km/h	160 m	190 m	240 m	290 m
100 km/h	185 m	210 m	265 m	320 m
110 km/h	220 m	230 m	295 m	355 m

The stopping sight distance is also achieved for the internal intersections with one exception. This is for north bound traffic on Highline Drive approaching Boomerang Way. However, given the tighter geometry of Highline Drive, it is not anticipated that vehicles will be travelling at 60 km/hr along this section of Highline Drive.

4.4 Collision History

The collision history for Highway 3 and FSH Road was sourced from the *Insurance Corporation of British Columbia* Reported Crashes. Note that no collisions were found to have occurred using the filter for intersections crashes at the convergence of Highway 3 and Fernie Ski Hill Road. Instead, the total number of non-parking lot crashes on Fernie Ski Hill Road is summarized in **Table 4.3** and included in **Appendix D**.

Table 4.3: Annual Collision History on Fernie Ski Hill Road

YEAR	TOTAL # OF COLLISIONS	SEVERITY - CASUALTY	SEVERITY - PROPERTY DAMAGE ONLY
2016	3	1	2
2017	2	0	2
2018	4	0	4
2019	3	0	3
2020	3	1	2
TOTAL	15	2	13

The data indicates that there have been two (2) casualties along FSH Road in the past five (5) years, with one assumed to have occurred at the intersection of Highway 3. Section 4.8 of the report identifies that delineation lighting on FSH Road is currently warranted for the intersection based on background volumes. This improvement will help address the collision severity at this location.

4.5 Volumes

4.5.1 Existing

Traffic counts were done by Bunt & Associates on two busy weekends in early 2022, one of which was the Family Day weekend in February. The traffic counts used in this study are summarized in **Table 4.4**. All traffic count data is included in **Appendix E**.

Table 4.4: Traffic Data Summary

INTERSECTION	COUNT DATE	DAY OF WEEK	SOURCE
Highway 3 & FSH Road	2022/01/20	Thursday	Bunt & Associates
	2022/01/22	Saturday	
	2022/02/18	Friday	
	2022/02/19	Saturday	
	2022/02/21	Monday	
Timberline Crescent & FSH Road	2022/01/20	Thursday	
	2022/01/22	Saturday	
	2022/02/18	Friday	
	2022/02/19	Saturday	
	2022/02/21	Monday	
Timberline Crescent/Highline Drive & FSH Road	2022/01/20	Thursday	
	2022/01/22	Saturday	
	2022/02/18	Friday	
	2022/02/19	Saturday	
	2022/02/21	Monday	
Highline Drive & Boomerang Way	2022/01/20	Thursday	
	2022/01/22	Saturday	
	2022/02/18	Friday	
	2022/02/19	Saturday	
	2022/02/21	Monday	

Of the many different traffic counts performed at the four study intersections, the highest peak hour traffic volumes were noted during on the following days:

- Weekday AM Peak Hour – Monday, February 21, 2022
- Weekday PM Peak Hour – Friday, February 18, 2022
- Weekend Peak Hour – Saturday, January 22, 2022

These three peak hours were used as the basis for all analysis and represent peak conditions on the roadways. The counts were also balanced up in between the intersections. The existing traffic volumes used in this study are summarized in **Exhibit 4.2**.

It is noted that the peak winter volumes observed in 2022 were lower than the winter volumes assumed in the 2021 TIA. As such, all winter analysis and results in this report supersedes the 2021 TIA.

4.5.2 Background

Background traffic is traffic that would be present on the road network in future years regardless of the development of the site. This traffic is representative of yearly growth on the roadways as well as other residential, commercial, or industrial developments that have been approved in the area.

From the BC MoTI Traffic Data Program, at the count station on the Lizard Creek Bridge, just north of the FSH Road access, the 2012 AADT was 5,815 vehicles/day and the 2018 AADT was 6,553 vehicles/day. This results in a 2.115% linear growth rate per year. For this study, a growth rate of 2.2% per annum was used. This is in line with the 2.1% rate used by Urban Systems in the Highway 3 functional study.

The 2.2% growth rate was applied to through volumes along the highway. Background traffic volumes are illustrated in **Exhibit 4.3** (Opening Day – 2030) and **Exhibit 4.4** (Long Term – 2040).

4.5.3 After Development

Development generated traffic volumes (**Exhibit 3.1**) were added to respective Background traffic volumes to forecast the After Development traffic volumes illustrated in **Exhibit 4.5** (Opening Day – 2030) and **Exhibit 4.6** (Long Term – 2040).

Exhibit 4.1: Existing Intersection Configurations

Exhibit 4.2: Existing Traffic Volumes

Exhibit 4.3: Opening Day (2030) Background Traffic Volumes

Exhibit 4.4: Long Term (2040) Background Traffic Volumes

Exhibit 4.5: Opening Day (2030) After Development Traffic Volumes

Exhibit 4.6: Long Term (2040) After Development Traffic Volumes

4.6 Intersection Analysis

Synchro 10 traffic analysis software was used to review intersection operational conditions based on the methods outlined in the Highway Capacity Manual. Traffic operations were assessed using the performance measures of volume-to-capacity (v/c) and Level of Service (LOS).

The volume-to-capacity (v/c) ratio of an intersection movement represents the ratio between the demand volume and available capacity. The Level of Service (LOS) rating is based on average vehicle delays ranging from LOS A (minimal delay) to LOS F (significant delay).

Intersection capacity analysis was completed for the summer and winter seasons with the following scenarios:

- Background
 - Existing
 - Opening Day (2030)
 - Long Term (2040)
- After Development
 - Opening Day (2030)
 - Long Term (2040)

The analysis is completed with a saturation flow rate of 1850 vehicles per hour and a peak hour factor of 0.92. The analysis uses a minimum hourly volume of 5 vehicles per movement. The volume to capacity (v/c) ratio, level of service, average control delay (measured in seconds), and 95th percentile queue (measured in metres) are summarized in this report.

SIDRA 9 will be used as the software to analyze roundabouts. Synchro and SIDRA output reports are provided in **Appendix F**.

4.6.1 Background Analysis

Existing

Existing intersection analysis is based on the intersection configurations illustrated in **Exhibit 4.1**. The Winter Average analysis is summarized in **Table 4.5** based on the volumes illustrated in **Exhibit 4.2**.

Table 4.5: Existing Intersection Analysis

INTERSECTION	MOVEMENT & LANES		AM PEAK HOUR				PM PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.15	B	10	<5	0.65	C	20	39
	EBR	1	0.15	B	10	<5	0.65	C	20	39
	NBL	1	0.02	A	8	<5	<0.02	A	8	<5
	NBT	1	<0.02	A	0	<5	<0.02	A	0	<5
	SBT	1	0.07	A	0	<5	0.21	A	0	<5
	SBR	1	0.15	A	0	<5	0.08	A	0	<5
	Overall		-	A	2.8	-	-	A	9.4	-
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.08	A	0	<5	0.26	A	0	<5
	WB	1	<0.02	A	1	<5	<0.02	A	1	<5
	NB	1	0.02	B	10	<5	0.04	B	12	<5
	Overall		-	A	0.4	-	-	A	0.5	-
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	<0.02	A	1	<5	0.02	A	1	<5
	WB	1	<0.02	A	1	<5	0.03	A	2	<5
	NB	1	0.08	B	11	<5	0.08	B	12	<5
	SB	1	0.11	B	12	<5	0.18	C	15	5
	Overall		-	A	3.2	-	-	A	3.3	-
Highline Drive & Boomerang Way (SB Stop)	EB	1	~*	A	1	<5	-	A	1	<5
	NB	1	-	A	1	<5	-	A	1	<5
	SB	1	-	A	5	12	-	A	6	11
	Overall		-	A	1.2	-	-	A	0.7	-
INTERSECTION	MOVEMENT & LANES		SATURDAY PEAK HOUR							
			v/c	LOS	Delay	Queue				
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.71	C	18	50				
	EBR	1	0.71	C	18	50				
	NBL	1	<0.02	A	8	<5				
	NBT	1	<0.02	A	0	<5				
	SBT	1	0.06	A	0	<5				
	SBR	1	0.09	A	0	<5				
	Overall		-	B	12.9	-				
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.38	A	0	<5				
	WB	1	<0.02	A	1	<5				
	NB	1	0.04	B	14	<5				
	Overall		-	A	0.3	-				
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	0.02	A	1	<5				
	WB	1	0.02	A	1	<5				
	NB	1	0.08	C	17	<5				
	SB	1	0.15	C	18	<5				
	Overall		-	A	2.1	-				
Highline Drive & Boomerang Way (SB Stop)	EB	1	-	A	1	<5				
	NB	1	-	A	1	<5				
	SB	1	-	A	6	10				
	Overall		-	A	0.6	-				

*Synchro cannot calculate v/c ratio for this intersection configuration.

Opening Day (2030) Background

Opening Day (2030) Background intersection analysis is summarized in **Table 4.6** based on the volumes illustrated in **Exhibit 4.3**.

Table 4.6: Opening Day (2030) Background Intersection Analysis

INTERSECTION	MOVEMENT & LANES		AM PEAK HOUR				PM PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.15	B	10	<5	0.73	C	25	50
	EBR	1	0.15	B	10	<5	0.73	C	25	50
	NBL	1	0.02	A	8	<5	<0.02	A	9	<5
	NBT	1	<0.02	A	0	<5	<0.02	A	0	<5
	SBT	1	0.09	A	0	<5	0.25	A	0	<5
	SBR	1	0.15	A	0	<5	0.08	A	0	<5
	Overall		-	A	2.7	-	-	B	11.0	-
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.08	A	0	<5	0.26	A	0	<5
	WB	1	<0.02	A	1	<5	<0.02	A	1	<5
	NB	1	0.02	B	10	<5	0.04	B	12	<5
	Overall		-	A	0.4	-	-	A	0.5	-
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	<0.02	A	1	<5	0.02	A	1	<5
	WB	1	<0.02	A	1	<5	0.03	A	2	<5
	NB	1	0.08	B	11	<5	0.08	B	12	<5
	SB	1	0.11	B	12	<5	0.18	C	15	5
	Overall		-	A	3.2	-	-	A	3.3	-
Highline Drive & Boomerang Way (SB Stop)	EB	1	.*	A	1	<5	-	A	1	<5
	NB	1	-	A	1	<5	-	A	1	<5
	SB	1	-	A	5	9	-	A	6	11
	Overall		-	A	1.1	-	-	A	0.6	-
INTERSECTION	MOVEMENT & LANES		SATURDAY PEAK HOUR							
			v/c	LOS	Delay	Queue				
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.73	C	19	53				
	EBR	1	0.73	C	19	53				
	NBL	1	<0.02	A	8	<5				
	NBT	1	<0.02	A	0	<5				
	SBT	1	0.07	A	0	<5				
	SBR	1	0.09	A	0	<5				
	Overall		-	B	13.3	-				
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.38	A	0	<5				
	WB	1	<0.02	A	1	<5				
	NB	1	0.04	B	14	<5				
	Overall		-	A	0.3	-				
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	0.02	A	1	<5				
	WB	1	0.02	A	1	<5				
	NB	1	0.08	C	17	<5				
	SB	1	0.15	C	18	<5				
	Overall		-	A	2.1	-				
Highline Drive & Boomerang Way (SB Stop)	EB	1	-	A	1	<5				
	NB	1	-	A	1	<5				
	SB	1	-	A	6	11				
	Overall		-	A	0.7	-				

*Synchro cannot calculate v/c ratio for this intersection configuration.

Long Term (2040) Background

Long Term (2040) Background intersection analysis is summarized in **Table 4.7** based on the volumes illustrated in **Exhibit 4.4**.

Table 4.7: Long Term (2040) Background Intersection Analysis

INTERSECTION	MOVEMENT & LANES		AM PEAK HOUR				PM PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.16	B	11	<5	0.84	E	38	70
	EBR	1	0.16	B	11	<5	0.84	E	38	70
	NBL	1	0.02	A	8	<5	<0.02	A	9	<5
	NBT	1	<0.02	A	0	<5	<0.02	A	0	<5
	SBT	1	0.11	A	0	<5	0.25	A	0	<5
	SBR	1	0.15	A	0	<5	0.08	A	0	<5
	Overall		-	A	2.6	-	-	C	15.3	-
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.08	A	0	<5	0.26	A	0	<5
	WB	1	<0.02	A	1	<5	<0.02	A	1	<5
	NB	1	0.02	B	10	<5	0.04	B	12	<5
	Overall		-	A	0.4	-	-	A	0.5	-
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	<0.02	A	1	<5	0.02	A	1	<5
	WB	1	<0.02	A	1	<5	0.03	A	2	<5
	NB	1	0.08	B	11	<5	0.08	B	12	<5
	SB	1	0.11	B	12	<5	0.18	C	15	5
	Overall		-	A	3.2	-	-	A	3.3	-
Highline Drive & Boomerang Way (SB Stop)	EB	1	-*	A	1	<5	-	A	1	<5
	NB	1	-	A	1	<5	-	A	1	<5
	SB	1	-	A	5	12	-	A	6	11
	Overall		-	A	1.2	-	-	A	0.6	-
INTERSECTION	MOVEMENT & LANES		SATURDAY PEAK HOUR							
			v/c	LOS	Delay	Queue				
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.76	C	21	59				
	EBR	1	0.76	C	21	59				
	NBL	1	<0.02	A	8	<5				
	NBT	1	<0.02	A	0	<5				
	SBT	1	0.09	A	0	<5				
	SBR	1	0.09	A	0	<5				
	Overall		-	B	14.5	-				
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.38	A	0	<5				
	WB	1	<0.02	A	1	<5				
	NB	1	0.04	B	14	<5				
	Overall		-	A	0.3	-				
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	0.02	A	1	<5				
	WB	1	0.02	A	1	<5				
	NB	1	0.08	C	17	<5				
	SB	1	0.15	C	18	<5				
	Overall		-	A	2.1	-				
Highline Drive & Boomerang Way (SB Stop)	EB	1	-	A	1	<5				
	NB	1	-	A	1	<5				
	SB	1	-	A	6	10				
	Overall		-	A	0.7	-				

*Synchro cannot calculate v/c ratio for this intersection configuration.

The eastbound movement at the Highway 3 & FSH Road nears capacity limits at the 2040 Background horizon. As the analysis uses the highest volumes expected during the year at this intersection, it is not likely that intersection improvements will need to be implemented to account for these peak volumes. Nonetheless, mitigation measures were investigated for the highway intersection based on the peak hour volumes.

Based on the BC MoTI Technical Circular T-06-08, a roundabout could be considered as a mitigation measure for this intersection. While a roundabout could not be currently constructed at the same location as the stop-controlled intersection due to physical constraints, analysis of a roundabout was still performed. It is noted that implementation of a roundabout will involve grading and realignment of the intersection.

Another possible mitigation measure, and one that could fit in the existing right-of-way, is the option of signalization. From the existing counts, the intersection satisfies 6 of the 9 criteria in the MoTI signal warrant, included in **Appendix G**.

The results of the analysis for the two improvement options are summarized in **Table 4.8** for the 2040 Background traffic volumes.

Table 4.8: Long Term (2040) Background Intersection Analysis – Mitigation Measures

INTERSECTION	MOVEMENT & LANES		PM PEAK HOUR				SATURDAY PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (Signalized)	EBL	1	0.71	C	22	65	0.80	B	19	87
	EBR	1	0.10	A	5	5	0.05	A	4	<5
	NBL	1	0.02	A	8	<5	0.02	B	14	<5
	NBT	1	0.47	B	12	36	0.54	C	20	41
	SBT	1	0.77	C	20	72	0.33	B	16	26
	SBR	1	0.22	A	3	7	0.28	A	5	11
	Overall		-	B	16.6	-	-	B	16.7	-
Highway 3 & Fernie Ski Hill Road (Roundabout)	EB	1	0.59	B	14	40	0.57	B	10	33
	NB	1	0.37	A	9	14	0.39	B	11	15
	SB	1	0.50	A	8	29	0.24	A	5	9
	Overall		-	B	10.2	-	-	A	9.0	-

Note that signal timings were optimized in Synchro. Both mitigation measures allow for the intersection to operate within acceptable capacity parameter limits.

Another option would be the provision of temporary manual intersection control through the presence of RCMP officers during the critical winter PM peak hour peak period (as/when required). This would require involvement from Fernie Alpine Resort. This would be an interim improvement worthy of consideration with or without site generated traffic.

It is noted that the ultimate improvement to this intersection will be an interchange, with or without consideration of the site traffic, and that this analysis is provided purely as additional information. It is not recommended at this horizon to improve the stop-controlled intersection to accommodate the yearly

highest traffic volumes when the intersection will operate within capacity limits for the vast majority of the year. It is also noted that signalization would increase the delays for the much higher through traffic on Highway 3 year-round.

Background Analysis Summary

Background intersection capacity analysis indicates all study intersections will operate acceptably during in the existing and Opening Day (2020) Background horizons. In the Long Term (2040) horizon, the intersection of Highway 3 & Fernie Ski Hill Road will approach capacity limits. Several possible improvements were analyzed, including a roundabout and signalization. Signalization of the current approach laning will mitigate some of the delay and will have a lower cost. However, the roundabout would have better intersection operations.

With an interchange being designed as the ultimate improvement, it is not recommended to implement either signalization or a roundabout as the peak condition occurs infrequently and only during the peak times of the ski season. The intersection still operates reasonably well as stop-controlled, even using the highest observed volumes during the winter peak. All other study intersections will continue to operate well within capacity limits.

4.6.2 After Development

Table 4.9 provides some context of the addition of site traffic to the background volumes at the study intersections. The proportional impact of site-generated traffic compared to the background volumes is less than 5% at the three larger intersections. This also shows the impact the site has on the operation of the intersection, even on the peak weekend in the winter, is very minimal.

Table 4.9: Net Change in Future Intersection Vehicle Volumes with New Site Trips – Opening Day

INTERSECTION	AM PEAK HOUR VOLUMES			PM PEAK HOUR VOLUMES			SATURDAY PEAK HOUR VOLUMES		
	BACK-GROUND	SITE	% CHANGE	BACK-GROUND	SITE	% CHANGE	BACK-GROUND	SITE	% CHANGE
Highway 3 & FSH Road	625	16	2.5%	1177	20	1.7%	1030	27	2.6%
Timberline Cr & FSH Road	388	16	4.1%	562	20	3.6%	745	27	3.6%
Timberline Cr/ Highline Dr & FSH Road	438	16	3.7%	622	20	3.2%	798	27	3.4%
Highline Dr & Boomerang Way	79	16	20.3%	150	20	13.3%	92	27	29.3%

Opening Day (2030) After Development

Opening Day (2030) After Development intersection analysis is summarized in **Table 4.10** based on the volumes illustrated in **Exhibit 4.5**.

Table 4.10: Opening Day (2030) After Development Intersection Analysis

INTERSECTION	MOVEMENT & LANES		AM PEAK HOUR				PM PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.16	B	10	<5	0.76	D	27	55
	EBR	1	0.16	B	10	<5	0.76	D	27	55
	NBL	1	0.02	A	8	<5	<0.02	A	9	<5
	NBT	1	<0.02	A	0	<5	<0.02	A	0	<5
	SBT	1	0.09	A	0	<5	0.25	A	0	<5
	SBR	1	0.16	A	0	<5	0.09	A	0	<5
	Overall		-	A	2.8	-	-	B	11.9	-
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.08	A	0	<5	0.27	A	0	<5
	WB	1	<0.02	A	1	<5	<0.02	A	1	<5
	NB	1	0.02	B	10	<5	0.04	B	12	<5
	Overall		-	A	0.4	-	-	A	0.5	-
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	<0.02	A	1	<5	0.02	A	1	<5
	WB	1	<0.02	A	1	<5	0.03	A	2	<5
	NB	1	0.09	B	11	<5	0.08	B	12	<5
	SB	1	0.12	B	12	<5	0.22	C	16	7
	Overall		-	A	3.2	-	-	A	3.6	-
Highline Drive & Boomerang Way (SB Stop)	EB	1	.*	A	1	<5	-	A	1	<5
	NB	1	-	A	1	<5	-	A	1	<5
	SB	1	-	A	6	13	-	A	6	13
	Overall		-	A	1.2	-	-	A	1.0	-
INTERSECTION	MOVEMENT & LANES		SATURDAY PEAK HOUR							
			v/c	LOS	Delay	Queue				
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.75	C	20	56				
	EBR	1	0.75	C	20	56				
	NBL	1	<0.02	A	8	<5				
	NBT	1	<0.02	A	0	<5				
	SBT	1	0.07	A	0	<5				
	SBR	1	0.10	A	0	<5				
	Overall		-	B	13.9	-				
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.38	A	0	<5				
	WB	1	<0.02	A	1	<5				
	NB	1	0.04	B	14	<5				
	Overall		-	A	0.3	-				
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	0.02	A	1	<5				
	WB	1	0.02	A	1	<5				
	NB	1	0.08	C	17	<5				
	SB	1	0.21	C	20	6				
	Overall		-	A	2.4	-				
Highline Drive & Boomerang Way (SB Stop)	EB	1	-	A	1	<5				
	NB	1	-	A	1	<5				
	SB	1	-	A	6	13				
	Overall		-	A	1.0	-				

*Synchro cannot calculate v/c ratio for this intersection configuration.

Long Term (2040) After Development

Long Term (2040) After Development intersection analysis is summarized in **Table 4.11** based on the volumes illustrated in **Exhibit 4.6**.

Table 4.11: Long Term (2040) After Development Intersection Analysis

INTERSECTION	MOVEMENT & LANES		AM PEAK HOUR				PM PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.16	B	11	<5	0.88	E	44	79
	EBR	1	0.16	B	11	<5	0.88	E	44	79
	NBL	1	0.02	A	8	<5	<0.02	A	9	<5
	NBT	1	<0.02	A	0	<5	<0.02	A	0	<5
	SBT	1	0.11	A	0	<5	0.31	A	0	<5
	SBR	1	0.16	A	0	<5	0.09	A	0	<5
	Overall		-	A	2.7	-	-	C	17.8	-
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.08	A	0	<5	0.27	A	0	<5
	WB	1	<0.02	A	1	<5	<0.02	A	1	<5
	NB	1	0.02	B	10	<5	0.04	B	12	<5
	Overall		-	A	0.4	-	-	A	0.5	-
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	<0.02	A	1	<5	0.02	A	1	<5
	WB	1	<0.02	A	1	<5	0.03	A	2	<5
	NB	1	0.09	B	11	<5	0.08	B	12	<5
	SB	1	0.12	B	12	<5	0.22	C	16	7
	Overall		-	A	3.2	-	-	A	3.6	-
Highline Drive & Boomerang Way (SB Stop)	EB	1	.*	A	1	<5	-	A	1	<5
	NB	1	-	A	1	<5	-	A	1	<5
	SB	1	-	A	6	13	-	A	6	13
	Overall		-	A	1.3	-	-	A	0.9	-
INTERSECTION	MOVEMENT & LANES		SATURDAY PEAK HOUR							
			v/c	LOS	Delay	Queue				
Highway 3 & Fernie Ski Hill Road (EB Stop)	EBL	1	0.78	C	23	63				
	EBR	1	0.78	C	23	63				
	NBL	1	<0.02	A	8	<5				
	NBT	1	<0.02	A	0	<5				
	SBT	1	0.09	A	0	<5				
	SBR	1	0.10	A	0	<5				
	Overall		-	B	15.2	-				
Timberline Crescent & Fernie Ski Hill Road (NB Stop)	EB	1	0.38	A	0	<5				
	WB	1	<0.02	A	1	<5				
	NB	1	0.04	B	14	<5				
	Overall		-	A	0.3	-				
Timberline Crescent/ Highline Drive & Fernie Ski Hill Road (NB/SB Stop)	EB	1	0.02	A	1	<5				
	WB	1	0.02	A	1	<5				
	NB	1	0.08	C	17	<5				
	SB	1	0.21	C	20	6				
	Overall		-	A	2.4	-				
Highline Drive & Boomerang Way (SB Stop)	EB	1	-	A	1	<5				
	NB	1	-	A	1	<5				
	SB	1	-	A	5	13				
	Overall		-	A	1.1	-				

*Synchro cannot calculate v/c ratio for this intersection configuration.

As identified in the 2040 Background analysis, the intersection of Highway 3 & FSH Road will be reaching capacity limits. Analysis was performed at this intersection for the two possible mitigation measures identified, a roundabout and a signal, and is summarized in **Table 4.12**.

Table 4.12: Long Term (2040) After Development Intersection Analysis – Mitigation Measures

INTERSECTION	MOVEMENT & LANES		PM PEAK HOUR				SATURDAY PEAK HOUR			
			v/c	LOS	Delay	Queue	v/c	LOS	Delay	Queue
Highway 3 & Fernie Ski Hill Road (Signalized)	EBL	1	0.73	C	23	74	0.80	C	20	93
	EBR	1	0.10	A	5	5	0.05	A	4	<5
	NBL	1	0.03	B	9	<5	0.03	B	14	<5
	NBT	1	0.47	B	12	36	0.55	C	21	41
	SBT	1	0.77	C	20	72	0.33	B	17	26
	SBR	1	0.23	A	3	8	0.31	A	5	11
	Overall		-	B	16.9	-	-	B	16.9	-
Highway 3 & Fernie Ski Hill Road (Roundabout)	EB	1	0.61	B	15	42	0.58	B	10	34
	NB	1	0.38	A	9	14	0.40	B	12	16
	SB	1	0.51	A	8	29	0.25	A	5	9
	Overall		-	B	10.5	-	-	A	9.2	-

After Development Analysis Summary

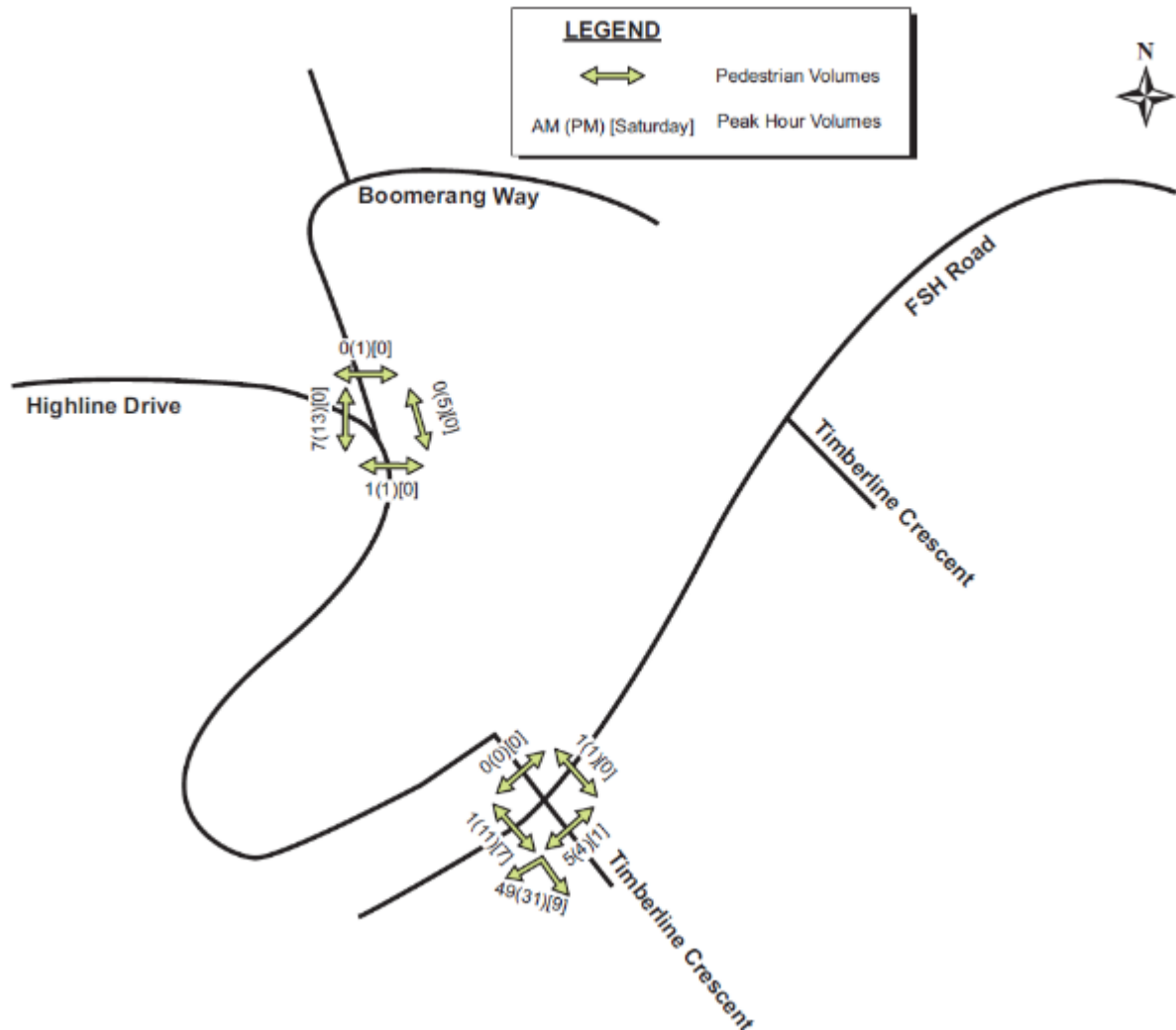
After Development intersection capacity analysis indicates the site traffic will have an insignificant impact on the operations of the Highway 3 & FSH Road intersection. As with the 2040 Background, the highway intersection warrants consideration for improvement, either by signalization or a roundabout, with or without the development of the site. However, improvement is not recommended as the intersection will still operate well within acceptable capacity limits for most of the year. Signalization would increase the delays for the much higher through traffic on Highway 3 year-round.

All other study intersections will continue to operate well within acceptable capacity limits and the new site traffic will have little effect on the intersections.

4.7 Active Transportation

Given the proximity to Fernie Alpine Resort, it is expected some of the residents will walk or cycle towards the ski hill. The ski hill also has bike trails during the summer months so it will generate active modes trips. While the rural standards of the interior roads, such as Boomerang Way and Highline Drive, do not offer any active modes infrastructure, the lower volumes on the roadways allow for active modes.

Figure 4.1: Existing Pedestrian Volumes on Highline Drive and Boomerang Way



With or without the development of the site, it is recommended that the speed limits of Highline Drive and Boomerang Way be reduced to 30 km/h. As well, there should be signage designating the roadways as a “shared space” between vehicles and pedestrians. The roadways currently operate as a shared space, but more signage and a formal reduction in the speed limit will increase pedestrian safety in the area.

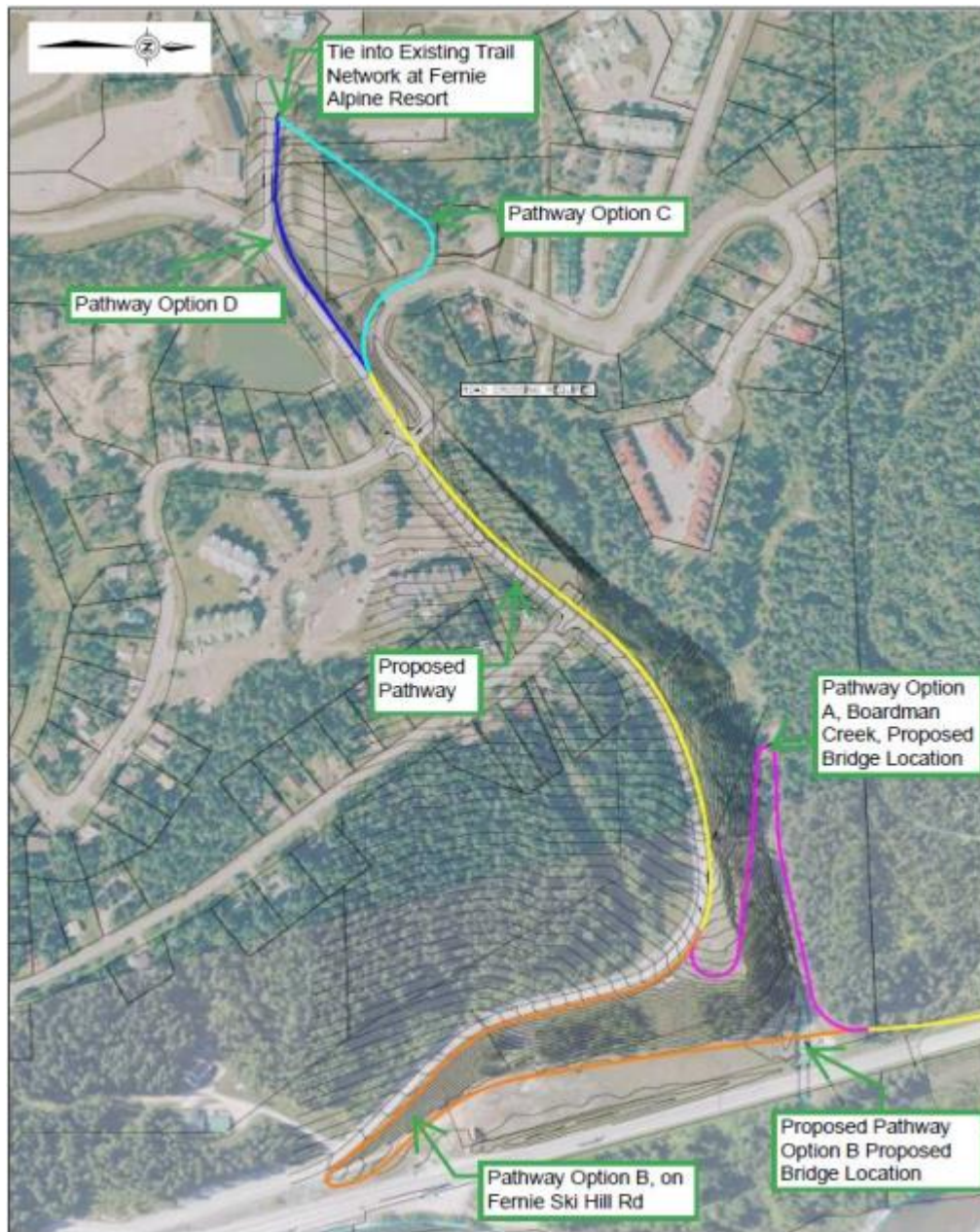
There are also future plans to link FSH Road to West Fernie via a multi-use pathway on the west side on the highway. The Fernie Valley Pathway will be to the east of the site and will provide residents of the development safer active mode access towards both the ski hill and the City. The project is divided into three segments, with segment #3 running along FSH Road and providing access to Fernie Alpine Resort.

Figure 4.2, from McElhanney’s *Fernie Valley Pathway Preliminary Design Report* (June 29, 2020),

illustrates the possible pathway alignment options near FSH Road. The pathway will be accessible to the

site via FSH Road and will continue to the north along the highway, providing good active mode connectivity to West Fernie. It is noted McElhanney has also expressed interest in realigning the pathway through the Galloway Lands, allowing further separation from roadways. This report was prepared for the City of Fernie and Fernie Trail Alliance.

Figure 4.2: Segment 3 Pathway Options at Fernie Alpine Resort



4.8 Illumination Warrants

An illumination warrant was completed at Highway 3 & FSH Road based on the Transportation Association of Canada (TAC) *Illumination of Isolated Rural Intersections* guide. The warrant for illumination is used to determine if lighting at an intersection is required based on several different factors such as geometrics, operations, environmental issues, and collision history.

TAC guidelines state full illumination is warranted at unsignalized intersections where a total score of 240 or more points is achieved. Partial or delineation lighting may be considered at intersections with a score of 120 points or more (partial illumination if 80/120 points achieved in Geometric score; delineation lighting if 120+ points achieved in Operational score). Partial lighting applies to the major road (Highway 3) and delineation lighting applies to the cross-street (FSH Road). Currently the intersection is partially illuminated.

The illumination warrant results if the intersection remains stop-controlled are summarized in **Table 4.13** and are attached in **Appendix G**.

Table 4.13: Illumination Warrant Summary

INTERSECTION	HORIZON	ILLUMINATION SCORE	COMMENT
Highway 3 & FSH Road	Existing	228/240	Delineation Lighting Warranted
	2030 Background	228/240	Delineation Lighting Warranted
	2040 Background	228/240	Delineation Lighting Warranted
	2030 After Development	228/240	Delineation Lighting Warranted
	2040 After Development	228/240	Delineation Lighting Warranted

The lighting analysis confirms that delineation lighting for the FSH Road/Highway 3 intersection is currently warranted for FSH Road. The warrant score does not change throughout the different horizons, nor is it materially affected by the inclusion of site generated traffic.

APPENDIX A

Definitions

APPENDIX B

August 2021 TIA

APPENDIX C

Scope of Work

APPENDIX D

Collision Data

APPENDIX E

Traffic Data

APPENDIX F

Synchro and SIDRA Reports

APPENDIX G

Warrants
