

**SPRING CREEK**  
**MOUNTAIN VILLAGE**  
Traffic Impact Study

Stamped reports, with the permit to practice and professional engineer stamp of Alberta, were submitted to the Town of Canmore on October 30, 2003.

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## 1.0 INTRODUCTION AND CONCLUSIONS

### 1.1 Background to this Study

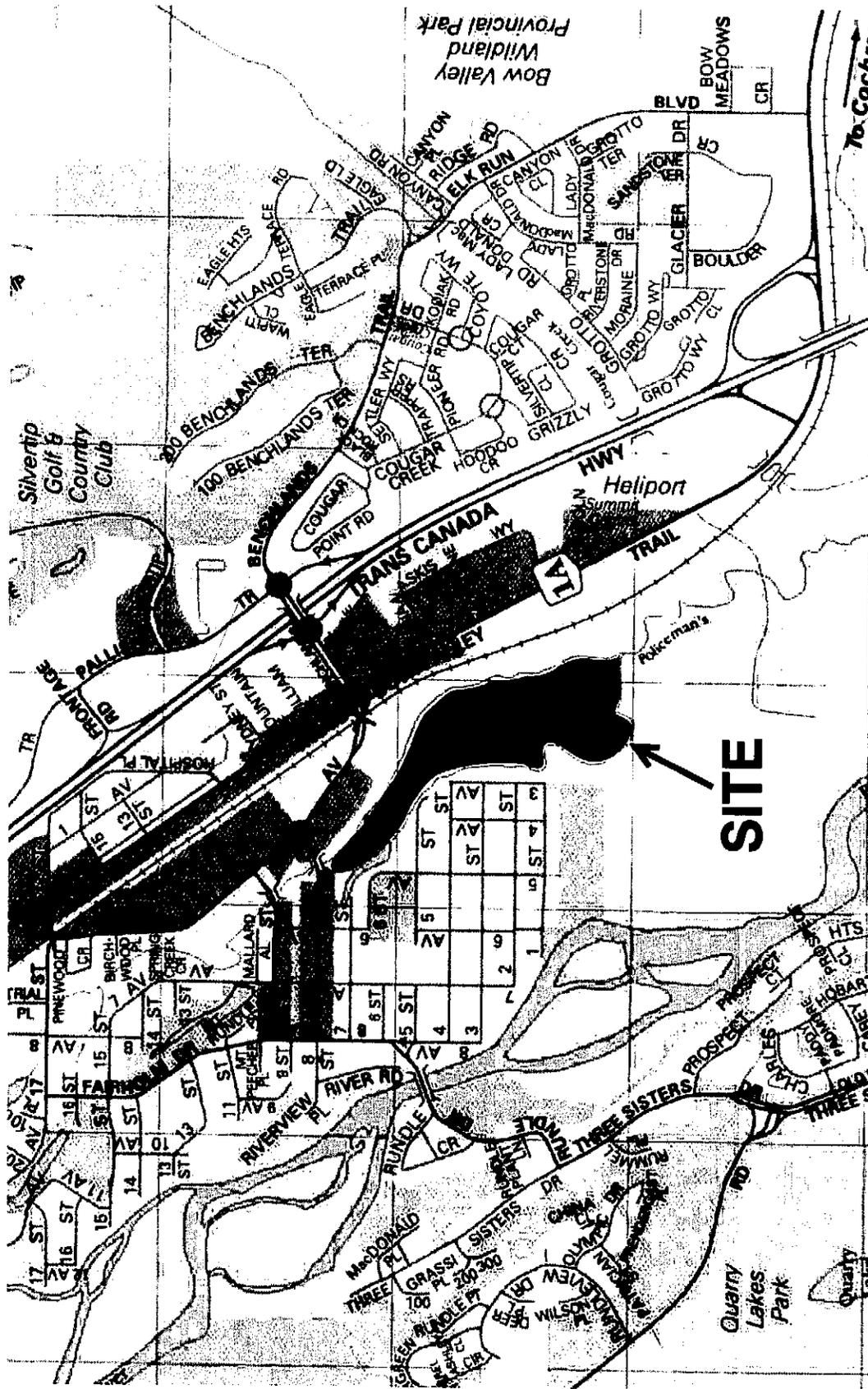
Restwell Trailer Park is proposed to be redeveloped (**Figure 1**) from a trailer park into a comprehensive residential and resort community to be known as the Spring Creek Mountain Village. This site is located within the Town of Canmore, covers approximately 65.5 acres of land, is within walking distance of downtown and is bounded to the east by CPR tracks and to the west by Spring Creek. The site currently accesses the adjacent road network via 5 Avenue at Main Street.

The current site operates as a lease and mobile home community with approximately 220 mobile homes and 250 recreational vehicle sites. The site also contains two permanent residential homes and various ancillary buildings. When full, the population of the site can exceed 1,000 residents including both permanent and vacation residents.

The developer proposes a staged development of the site to include both residential and commercial properties. Spring Creek Mountain Village would consist of about 7 single family homes, 605 apartment units, 210 townhome units and 225 senior apartment units. These residential properties are envisioned to consist of 60% permanent-use and 40% non-permanent use. The commercial component will consist of three hotels with 580 rooms in total and about 40,000 ft<sup>2</sup> of other boutique type commercial properties (artist studios, specialty stores ... etc.).

A new access is proposed for the site that will connect directly to Bow Valley Trail opposite Montane Road. The purpose of the new access is to accommodate increased traffic from the proposed development and provide emergency access for the development across the railway. The existing traffic volumes at the intersection of 5 Avenue/Main Street intersection (existing Restwell Trailer Park site access) after the full re-development of the site are not expected to exceed 3,000 vehicles per day. Instead, the additional traffic from the site will be directed to the new access at Bow Valley Trail/Montane Road. This study will outline the trips generated by the proposed development and how these trips are distributed to the two accesses for the Spring Creek Development.

The goal for portions of this proposed development is to develop properties where residents may live and work. The intent is to construct these residential units with the living space immediately above the street-level workspace. The retail component will cater to the tourist traffic from the hotels and to the local residents on the site. The development by its close proximity to downtown will offer residents other attractive modal options, apart from the car, such as walking or biking.



# SITE LOCATION

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The developer retained Finn Transportation Consultants to examine the future traffic impact on the area road system resulting from the full build-out of Spring Creek Mountain Village. Build-out of the site is expected to take between 15 and 20 years. This timeframe coincides roughly with the build-out of the Town, which is expected to reach the 30,000 population within 10 to 20 years. Therefore, this transportation study will examine the effect of the proposed development, at full-build-out, on the surrounding road network in the immediate vicinity of the site for the weekday morning, afternoon and Saturday peak hours. This study also examines the internal road network and ensures that the internal road system can accommodate the site traffic generated.

## 1.2 Study Area

The study area examined for the proposed development includes the two site access locations (existing and proposed) as well as the three additional intersections as follows:

- Main Street/6 Avenue
- Main Street/5 Avenue (existing site access)
- Main Street/Railway Avenue
- Bow Valley Trail/Benchlands Trail
- Bow Valley Trail/Montane Road (proposed site access)

## 1.3 Conclusions

The following are FINN's primary conclusions drawn from this study:

- The existing Restwell Trailer Park site generates approximately 2,500 vpd. The existing road network and surrounding intersections typically experience little to no congestion or level-of-service problems due to the existing development on the Restwell site.
- The future background traffic volumes match those presented in the latest Town of Canmore Transportation Study for the ultimate build-out of the Town of Canmore less that traffic generated by the existing Restwell Trailer Park site. In completing our future analyses we assumed that Railway Avenue, Bow Valley Trail and Benchlands Trail were widened to four-lane roadways with separate left-turn lanes at key intersections. With these upgrades, the intersections within the study area function at acceptable Levels-of-Service (LoS) for the weekday morning, afternoon and Saturday peak hours with the following exceptions. The **Main Street/Railway Avenue** intersection exhibited several movements

that were close to capacity and a single movement (the eastbound left-turn) which is expected to operate with a calculated volume-to-capacity ratio (V/C) of greater than 0.9 during the p.m. peak hour. In other words, the volume of traffic making the eastbound left turn is expected to be greater than 90% of the physical capacity of the turning lane. The intersection of **Bow Valley Trail/Montane Road** has side-street movements in the weekday p.m. and Saturday peak hour that experience long delays and results in an overall failing LoS for this intersection.

- At full build-out of the development we estimate that the Spring Creek Mountain Village site will generate approximately 9,250 vpd. As indicated in Section 1.1, Spring Creek Mountain Village site will access the area road network at two locations. The 5 Avenue access is projected to carry of the order of 2,970 vpd while the Bow Valley Trail access is estimated to carry about 6,270 vpd.
- The future post-development traffic volumes were calculated by adding the site generated volumes from the full build-out of the Spring Creek Mountain Village to the future background traffic volumes. The same road network as was analysed in the future background scenario was used except that the Bow Valley Trail/Montane Road intersection was assumed to be signalized. Based on our review of the weekday morning, afternoon and Saturday peak hours, we note the following:
  - The **Main Street/Railway Avenue** intersection had four movements with V/Cs greater than 0.9 for the weekday p.m. peak hour. It should be noted that the Spring Creek Mountain Village traffic is less than 5% of the traffic for three of these critical movements and 14% of the eastbound left-turn traffic. Therefore, the majority of the capacity for these movements is utilized by future background traffic.
  - The **Main Street/5 Avenue** intersection was analysed as unsignalized. The northbound left-turn experienced long delays during the weekday p.m. peak hour. It was recommended that the traffic signals along Main Street be co-ordinated to provide more gaps between eastbound/westbound traffic platoons and thereby increasing the turning opportunities for the northbound left-turn movement.

\* \* \* \* \*

Subsequent to our analysis, the developer has provided us updated information in regards to staging and residential unit numbers for the Spring Creek Mountain Village site. These numbers are as follows and are shown in **Table 1**:

**TABLE 1. SPRING CREEK MOUNTAIN VILLAGE DEVELOPMENT BY STAGE**

	<b>STAGE 1 (2005-2010)</b>	<b>STAGE 2 (2010-2015)</b>	<b>STAGE 3 (2015-2020)</b>	<b>STAGE 4 (2020-2025)</b>	<b>TOTAL</b>
<b>LAND AREA</b>					
Area Hectares	14.4	2.2	4.9	7.0	28.5
Area Acres	35.6	5.4	12.1	17.3	70.4
<b>RESIDENTIAL</b>					
Mature Adult/Seniors Apartments	63	58	75	58	254
Other Apartments	102	58	179	309	648
Residential Townhomes	14	33	30	64	141
Residential Single Detached	7	0	0	0	7
Total Residential Units	186	149	284	431	1,050
<b>COMMERCIAL</b>					
Hotel Rooms (anticipated)	200	0	350	0	550
Hotel Related Commercial (sq.ft.)	15,000		15,000		30,000
Other Street-front Commercial (sq.ft.)		3,500	3,000	3,500	10,000
Mobile Homes remaining (Existing = 220)	176	116	76	0	

**Note: Table provided by Mountain Engineering Ltd. October 23, 2003**

We compared the total trips generated based on the information provided in Table 1. The total trips generated based, on this information, result in 611 vph in the weekday a.m. peak hour, 825 vph in the weekday p.m. peak hour and 774 vph in the Saturday p.m. peak hour. The total weekday daily trips generated are 9100 vpd. This is approximately 2% less than the total daily trips generated from the stated development reviewed in this study. Therefore, even with these new numbers proposed in Table 1, the results of this study are still valid because the trips generated are almost identical.

Our study indicated the need for traffic signals at the intersection of Bow Valley Trail/Montane Road at the full-buildout of the site. However, the need for traffic signals at this intersection should be evaluated as development proceeds, on and off the Spring Creek Mountain Village site, and if signals are required then they should be installed prior to full-buildout.

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## **2.0 EXISTING OPERATING CONDITIONS**

### **2.1 Existing Road Network**

The following roads comprise the main road network in the vicinity of the site:

- Main Street is a two-way, arterial standard road and is the main east-west road through the downtown. There are commercial properties on either side and on-street parking is provided. Sidewalks are provided on both sides of the street to encourage and protect pedestrian traffic.
- 6 Avenue is a collector standard road that leads into the residential area south of downtown Canmore and to residential and commercial to the north.
- Railway Avenue is an arterial standard road. This road serves commercial and residential development in Canmore. For this study, Railway Avenue is considered to have a north/south orientation.
- Bow Valley Trail, previously Highway 1A, is an arterial road that contains many hotels and restaurants. For this study, Bow Valley Trail is considered to have a north/south orientation.
- Benchlands Trail is an arterial-standard, divided roadway that connects to the residential subdivisions to the east of the Trans-Canada Highway.

The main intersections that were analysed were as follows. The traffic controls stated below are as exist currently:

- Main Street/6 Avenue (signalized)
- Main Street/5 Avenue (unsignalized – existing site access)
- Main Street/Railway Avenue (signalized)
- Bow Valley Trail/Benchlands Trail (signalized)
- Bow Valley Trail/Montane Road (unsignalized)

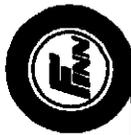
## 2.2 Existing Traffic Volumes

FINN conducted both turning movement counts and tube counts at the main study intersections and the adjacent roadway sections. Most of the data was collected in August 2002 and supplemental turning movement data was collected in August 2003. The existing data collected included data for the weekday a.m. peak hour, weekday p.m. peak hour and typical Saturday peak hour. These counts are summarized in **Figures 2 and 3**.



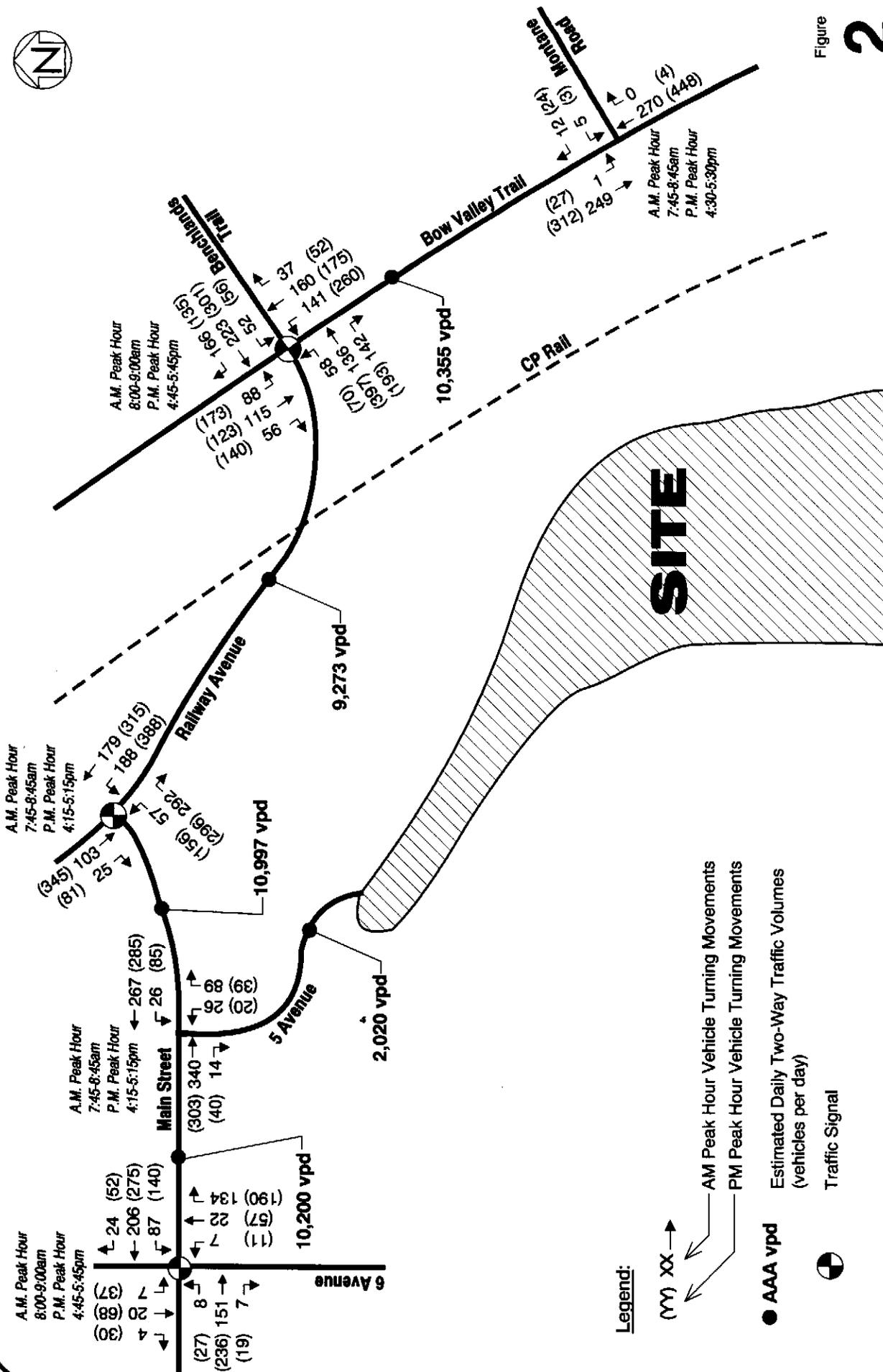
Figure

2



# EXISTING TRAFFIC VOLUMES - WEEKDAY

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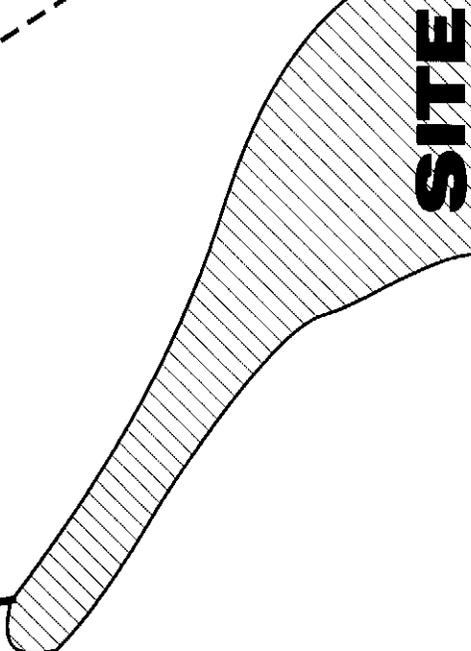
Legend:

(M) XX →

AM Peak Hour Vehicle Turning Movements  
PM Peak Hour Vehicle Turning Movements

● AAA vpd  
Estimated Daily Two-Way Traffic Volumes  
(vehicles per day)

⊙ Traffic Signal



CP Rail

Benchlands Trail

Road Horlane

6 Avenue

Main Street

5 Avenue

Railway Avenue

Bow Valley Trail

Road Horlane

CP Rail

Benchlands Trail

Road Horlane

6 Avenue

Main Street

5 Avenue

Railway Avenue

Bow Valley Trail

Road Horlane

CP Rail

Benchlands Trail

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CP Rail

Benchlands Trail

Road Horlane

6 Avenue

Main Street

5 Avenue

Railway Avenue

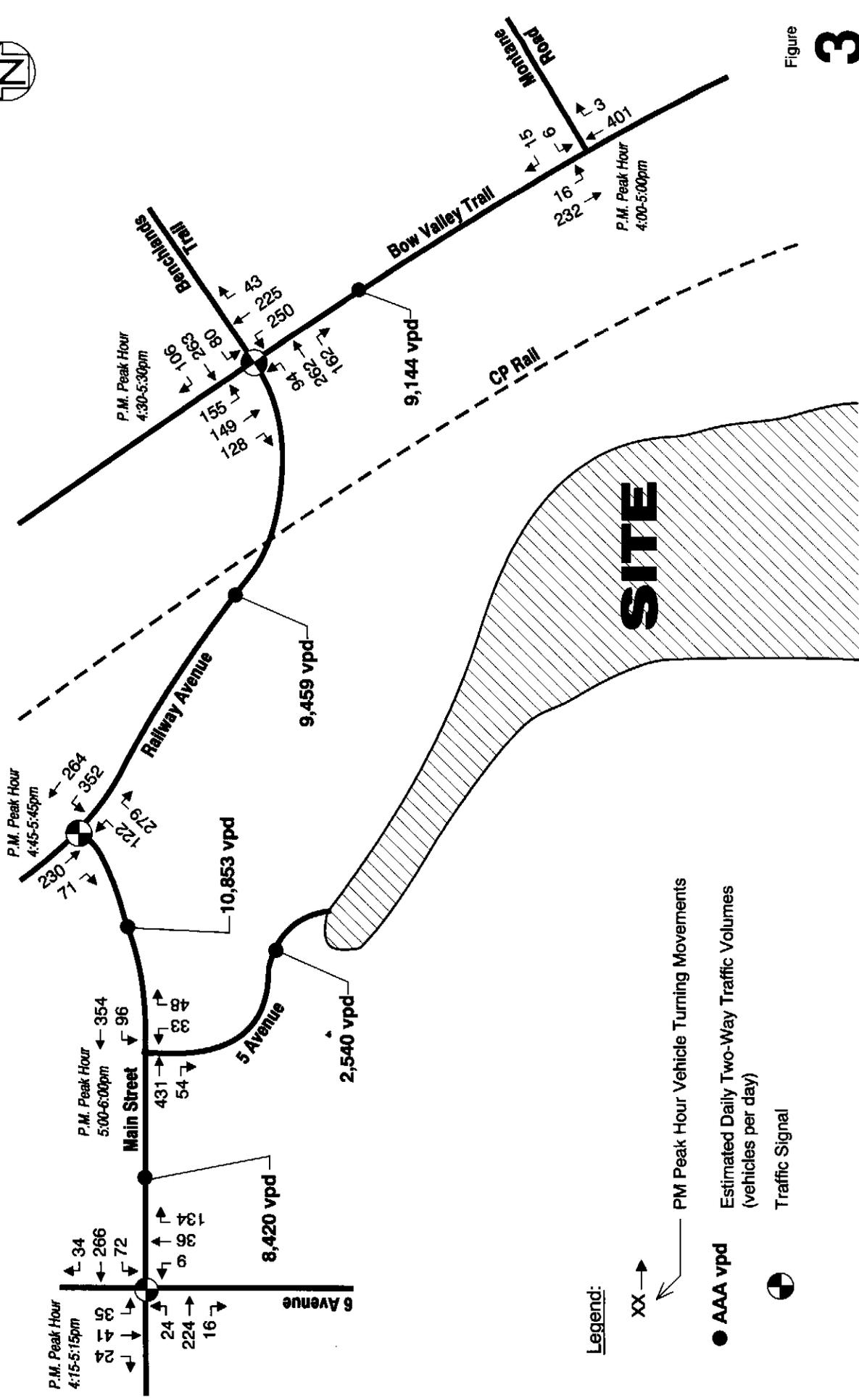


Figure 3



# EXISTING TRAFFIC VOLUMES - SATURDAY PM PEAK

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## 2.3 Intersection Performance

We evaluated the existing operating conditions using the Synchro/SimTraffic v.5 software package (based on the Highway Capacity Manual)<sup>1</sup>.

For unsignalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit and the type of intersection control. The average delay for each individual movement from the minor street, the major street left-turn movements and the overall intersection are calculated. An operational Level-of-Service (LoS) is then assigned based on the calculated average delay. LoS A and B represent good operational conditions with average delays of less than 15 seconds per vehicle. LoS C and D represent fair operating conditions, with average delays of between 15 and 35 seconds per vehicle. LoS E represents poor operating conditions, with average delays of between 35 and 50 seconds per vehicle. LoS F represents very poor operating conditions, or failure, with average delays in excess of 50 seconds per vehicle. Generally, geometric improvements or signalisation are recommended at unsignalized intersections, which experience LoS F.

For signalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, the traffic signal phasing/timing plan as well as pedestrian volumes. The average delay for each lane group and the overall intersection are calculated. An operational LoS is then assigned based on the calculated average delay. LoS A and B represent good operational conditions with average delays of less than 20 seconds per vehicle. LoS C and D represent fair operating conditions with average delays of between 20 and 55 seconds per vehicle. LoS E represents poor operating conditions with average delays of between 55 and 80 seconds. Generally, geometric or phasing improvements are recommended at signalized intersections that experience LoS E or LoS F.

Another operational indicator for signalized intersections is the volume-to-capacity ratio (V/C). The V/C ratio compares the actual (or projected) demand to the capacity of a particular movement. A theoretical V/C ratio greater than or equal to 1.0 indicates that the approach is operating at or above capacity (i.e. greater-than-or-equal to 100%). For design purposes, most municipalities use a threshold of 0.9 (i.e. 90%) as a V/C ratio where improvements (phasing or geometric) are required.

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<sup>1</sup> Transportation Research Board, Highway Capacity Manual, Washington, DC, 2000.

## 2.4 Existing Operating Conditions

We assessed the existing peak hour operating conditions at the five intersections within the study area and the results are summarized in **Table 2**. For these and all other analyses quoted in this report, the outputs are attached in **Appendix A**.

The intersections were assessed based on the existing lane arrangements. We analysed the intersections based on signal timing information provided by the Town of Canmore that we further optimised in Synchro. The existing analysis also includes the site traffic from the existing Restwell Trailer Park site. The results are summarized in **Table 2** below:

**TABLE 2. EXISTING OPERATING CONDITIONS**

INTERSECTION	PEAK HOUR	OVERALL INTERSECTION LoS	AVERAGE DELAY (secs/veh)	V/C RATIOS ABOVE 0.90 THRESHOLD
Main St/6 Ave (signalized)	AM	A	5	--
	PM	A	6	--
	SAT	A	6	--
Main St/5 Ave (unsignalized)	AM	A	2	n.a.
	PM	A	2	n.a.
	SAT	A	2	n.a.
Main St/Railway Ave (signalized)	AM	A	6	--
	PM	B	12	--
	SAT	A	9	--
Bow Valley Tr/Benchlands Tr (signalized)	AM	B	17	--
	PM	C	22	--
	SAT	C	22	--
Bow Valley Tr/Montane Rd (unsignalized)	AM	A	<1	n.a.
	PM	A	<1	n.a.
	SAT	A	<1	n.a.

**Table 2** indicates that there are no capacity or delay issues at the study intersections. This analysis includes the traffic from the existing Restwell Trailer Park.

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### 3.0 FUTURE BACKGROUND OPERATING CONDITIONS

The Spring Creek Mountain Village site is proposed to develop in stages, over the next 15-20 years, after which time the site will be fully built. As such we have assessed the full build-out of the site. The Municipal Development Plan<sup>2</sup> and Transportation Plan<sup>3</sup> state that the Town expects the full-build-out of Canmore to occur when the population reaches 30,000. This is expected to occur within the next 10-20 years. Because the future build-out of the Town and Restwell Trailer Park site is to occur at approximately the same time, the future background traffic volumes represent the ultimate build-out scenario for the Town of Canmore.

#### 3.1 Future Road Network

The future road network within the study area is expected to remain as it currently exists with the exception of some upgrading of the arterials to provide for four lane cross-sections on Bow Valley Trail, Railway Avenue and Benchlands Trail to accommodate the increase in traffic volumes.

The Spring Creek Mountain Village development will continue to access the area road system via 5 Avenue. However, the developer has committed to the fact that the 5 Avenue traffic volumes generated by the Spring Creek Mountain Village will remain mostly unchanged and not exceed 3,000 vpd. As such, the developer is proposing an alternate access to the east across the single Canadian Pacific Railway (CPR) track to Bow Valley Trail opposite Montane Road (**Figure 4**). CPR has indicated in discussions with the study team that based on their criteria, which is dependent on the number of trains per day at a crossing, the daily traffic volumes using the Bow Valley Trail access must remain at or below approximately 7,000 vpd. Daily traffic volumes in excess of this number will require an upgrade of the proposed at-grade railway crossing in order to safely accommodate the additional traffic.

#### 3.2 Future Background Traffic Volumes

The future background turning movement volumes at the study intersections were not readily available from the Town of Canmore. Therefore, the future background turning movement and link volumes were obtained by factoring up the existing volumes to match the screenline volumes presented in the Transportation Study for the 30,000-population horizon.

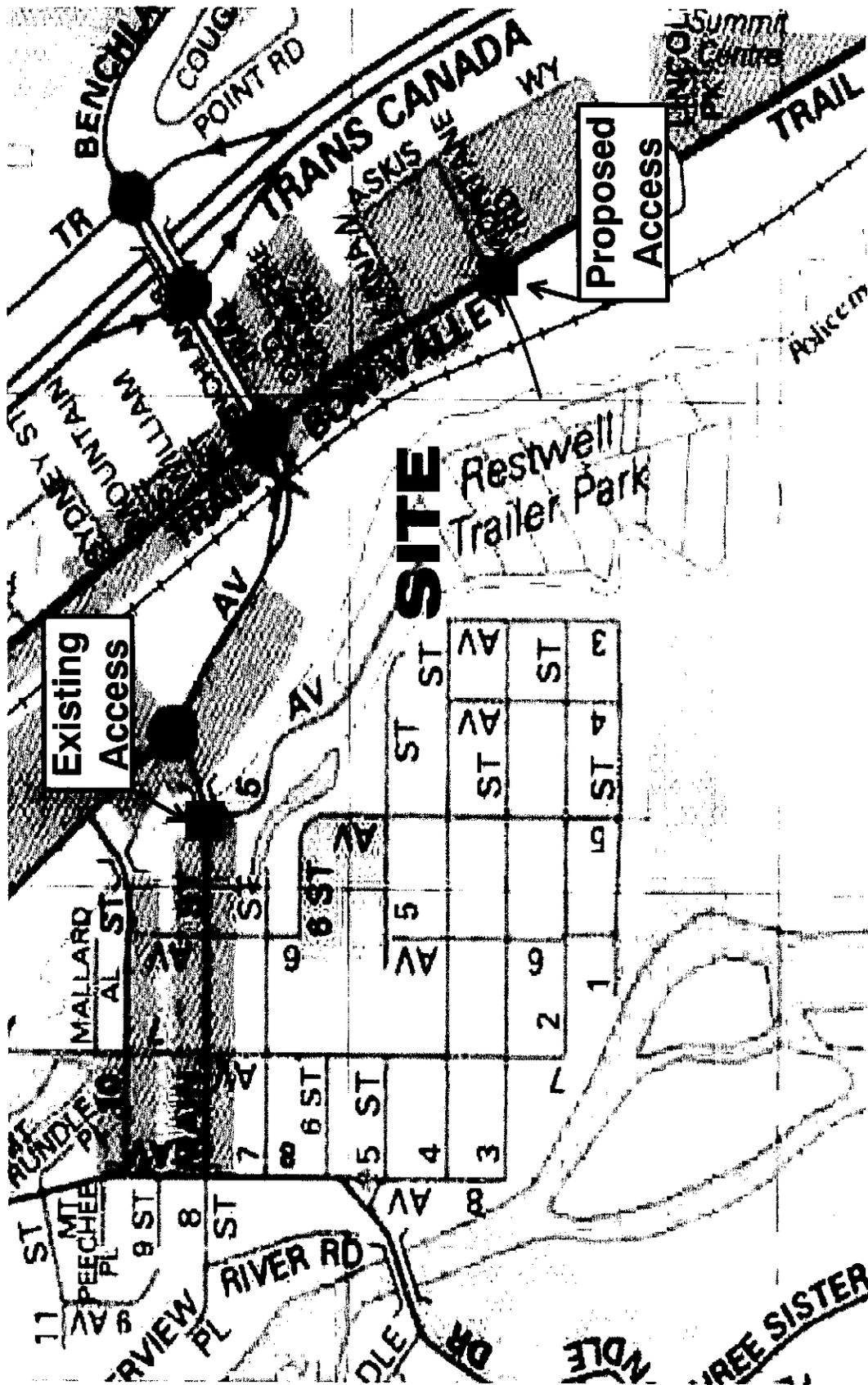
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<sup>2</sup> Town of Canmore Municipal Development Plan

<sup>3</sup> Town of Canmore, Transportation Master Plan Final Report, September 2001



Figure 4



FUTURE ROAD NETWORK

File# 56883.02, September 2003

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Specifically, we undertook the following in order to obtain future background traffic volumes:

- We obtained the forecasted daily, traffic volumes, along selected road sections from the 2001 Transportation Plan for the Town of Canmore. Table 2.2<sup>4</sup> presents both existing (2000) daily traffic volumes and forecasted daily traffic volumes at the 30,000-population horizon. These forecasted daily volumes reflect changes in transportation patterns due to increased use of transit and alternative forms of transportation and the resulting link traffic volumes were outlined in Table 2.3<sup>5</sup>. We calculated, the percentage growth along each road section by comparing the existing traffic volumes (Table 2.2) and the future adjusted traffic volumes (Table 2.3).
- We then related this future “link” growth to growth estimates for the turning movements at each intersection within the study area. In order to project the future turning movements we also reviewed historical turning movement data obtained from previous reports completed for the Town of Canmore<sup>6</sup> and other work FINN has completed in the Town of Canmore<sup>7</sup>. It was observed that some movements have grown more than others and are influenced by growth in different areas of Canmore. We also considered where future growth in the Town of Canmore would occur (e.g., Three Sister’s Area) and where the Town has already been built-out. Therefore, all three factors - the link growth, observations made from historical data and recognition of future growth in the Town - were taken into consideration to estimate the future forecasted turning movement volumes.
- Lastly, we netted out the existing traffic volumes generated by the Restwell Trailer Park in order to ensure that we did not ‘double count’ any traffic in assessing the impact of the proposed Spring Creek Mountain Village.

The resulting future background traffic volumes for the weekday and Saturday peak periods are shown in **Figures 5 and 6**.

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<sup>4</sup> Ibid. p. 2-16

<sup>5</sup> Ibid. p. 2-17

<sup>6</sup> IMC Consulting Group Inc., Town of Canmore Transportation Study Final Report, February 1993

<sup>7</sup> Finn Transportation Consultants, Canmore Station Traffic/Parking Study, July 1997

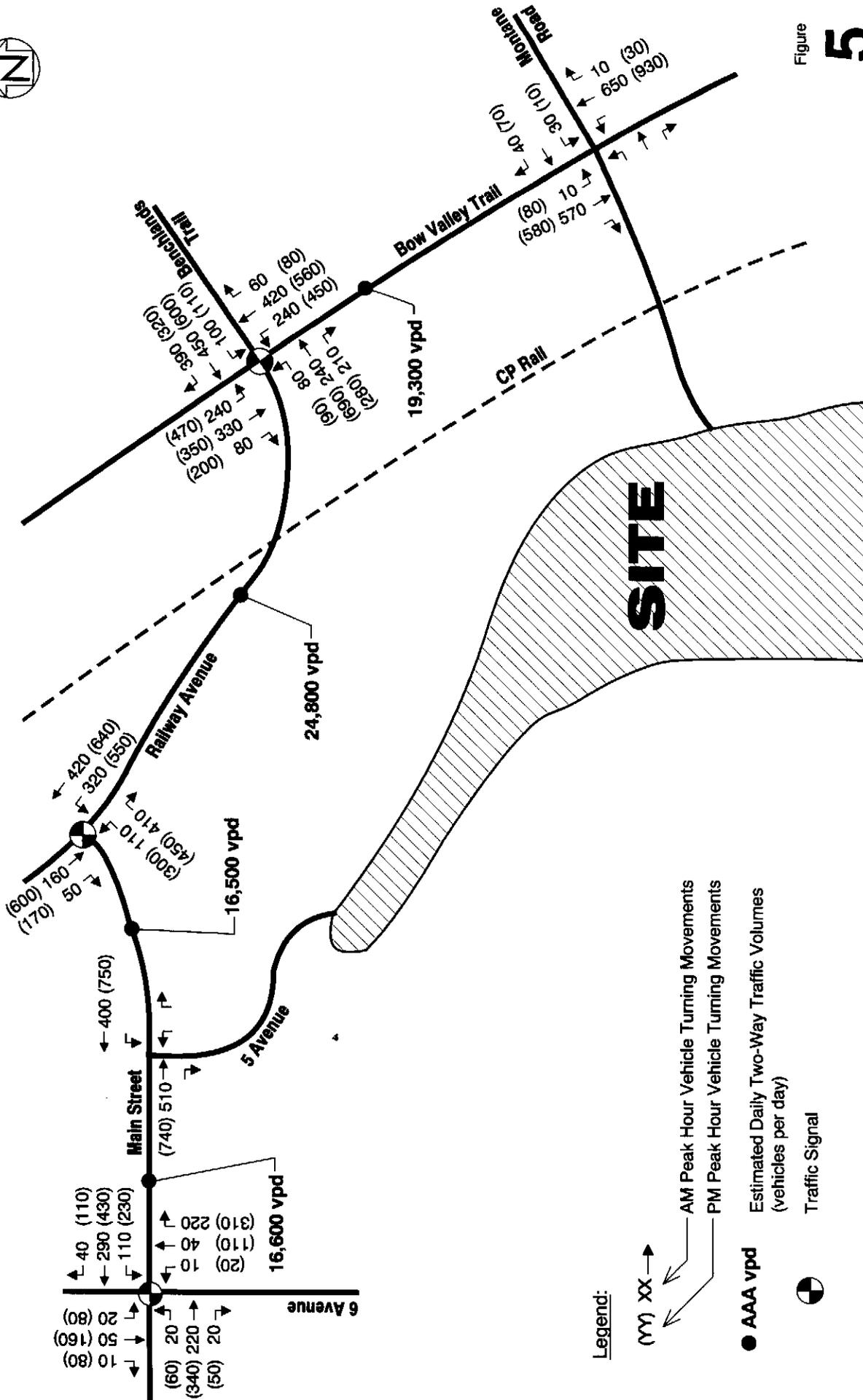


Figure 5



# FUTURE BACKGROUND TRAFFIC VOLUMES - WEEKDAY

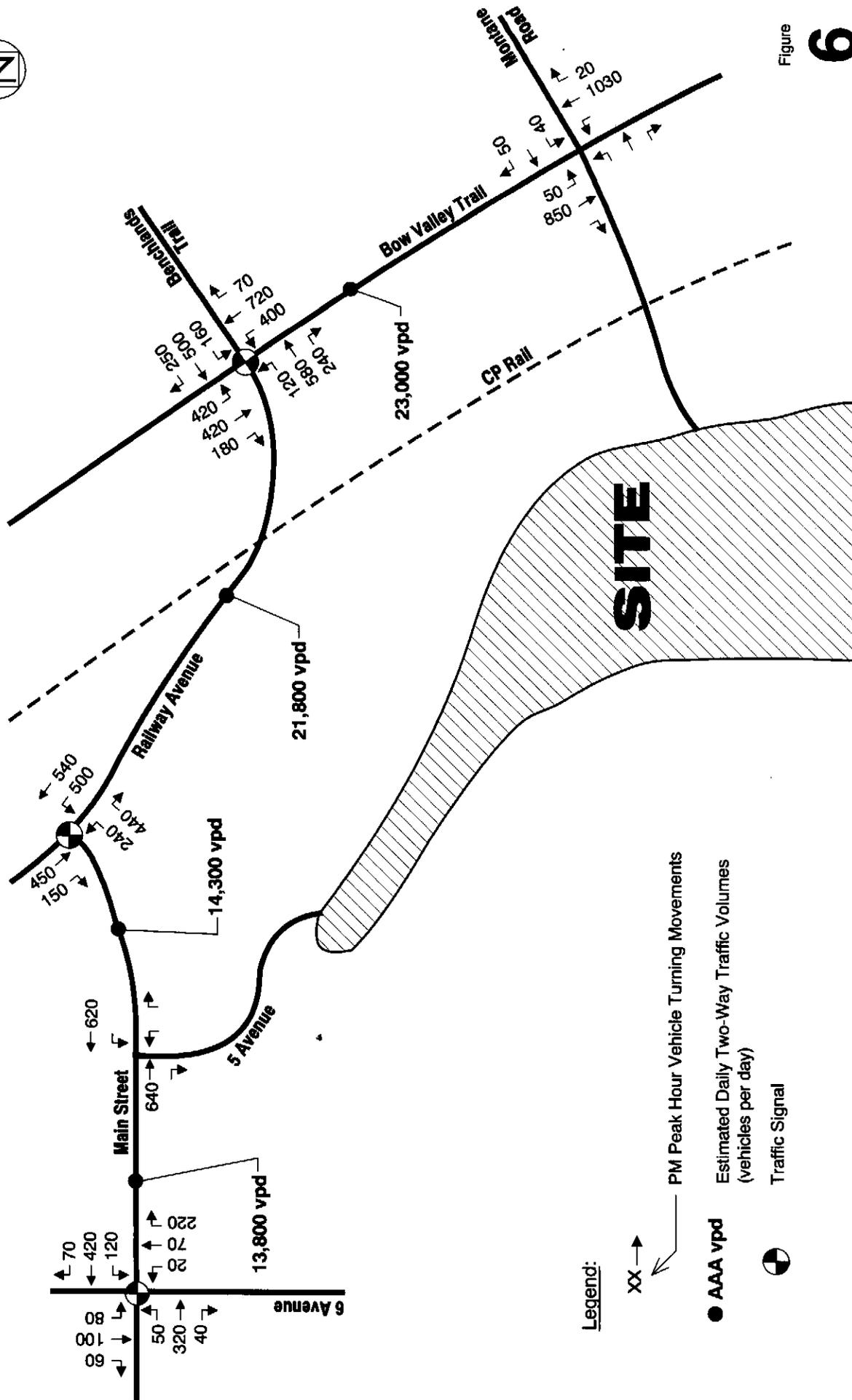
**Legend:**

(YY) XX →

AM Peak Hour Vehicle Turning Movements  
PM Peak Hour Vehicle Turning Movements

● AAA vpd  
Estimated Daily Two-Way Traffic Volumes  
(vehicles per day)

⊕ Traffic Signal



Legend:



PM Peak Hour Vehicle Turning Movements



Estimated Daily Two-Way Traffic Volumes (vehicles per day)



Traffic Signal

Figure

6



FUTURE BACKGROUND TRAFFIC VOLUMES - SATURDAY PM PEAK

### 3.3 Future Background Operating Conditions

It was observed that there is a significant increase in the link volumes along the roadways from the existing situation. As well, the 2001 Transportation Plan for the Town of Canmore indicates that there will be associated road improvements along Railway Avenue, Bow Valley Trail and Benchlands Trail to accommodate future population growth<sup>8</sup>. Therefore, based on the future increase in volumes and comments from the 2001 Transportation Plan, the following road improvements were incorporated into the future background analysis:

- Railway Avenue was analysed as a four-lane cross-section with left turn bays at the major intersections.
- Benchlands Trail was analysed as a four lane arterial.
- Bow Valley Trail was analysed as a four-lane undivided arterial.

We assessed the future background peak hour operating conditions at the five intersections within the study area. The results are summarized in **Table 3**.

**TABLE 3. FUTURE BACKGROUND OPERATING CONDITIONS**

INTERSECTION	PEAK HOUR	OVERALL INTERSECTION LoS	AVERAGE DELAY (secs/veh)	V/C RATIOS ABOVE 0.90 THRESHOLD
Main St/6 Ave (signalized)	AM	A	6	--
	PM	B	11	--
	SAT	A	7	--
Main St/5 Ave (unsignalized)	AM	A	<1	n.a.
	PM	A	<1	n.a.
	SAT	A	<1	n.a.
Main St/Railway Ave (signalized)	AM	B	14	--
	PM	C	34	EBL 0.93
	SAT	C	23	--
Bow Valley Tr/Benchlands Tr (signalized)	AM	B	20	--
	PM	C	24	--
	SAT	C	27	--
Bow Valley Tr/Montane Rd (unsignalized)	AM	A	1	n.a.
	PM	F	2	n.a.
	SAT	F	10	n.a.

<sup>8</sup> Town of Canmore, Transportation Master Plan Final Report, September 2001, pp. 2-20 to 2-21.

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The results summarized in **Table 3** indicate the following:

- **Main Street/6 Avenue** will operate with acceptable overall Levels-of-Service during the weekday a.m. and p.m. peak hour and Saturday peak hour.
- **Main Street/5 Avenue** will operate with acceptable overall Levels-of-Service with the site traffic netted-out from the background traffic volumes.
- **Main Street/Railway Avenue** will operate with acceptable overall Levels-of-Service during the weekday morning, afternoon and Saturday peak hours. However, the eastbound left-turn experiences capacity problems during the p.m. peak hour. It should be noted that the southbound through, northbound left-turn and northbound through movements are near capacity with V/C ratios of 0.86, 0.88 and 0.88 respectively.
- **Bow Valley Trail/Benchlands Trail** will operate with acceptable overall Levels-of-Service in the a.m. peak hours and Saturday peak hour.
- **Bow Valley Trail/Montane Road** will operate with acceptable overall Levels-of-Service for the weekday morning and failing LoS during the weekday afternoon and Saturday peak hours. The failing LoS is due to the westbound left-turn which will operate with delays in excess of 50 seconds/vehicle (LoS F) during the weekday p.m. and Saturday peak hours but this traffic constituted less than 2% of the total traffic entering the intersection. We conducted a traffic signal warrant analysis for this intersection using the methodology outlined in the Manual of Uniform Traffic Control Devices for Canada to determine if a signal is warranted (**Appendix B**). This warrant calculation accounts for collisions, crossing gaps, intersecting volumes and pedestrian volumes. A signal is warranted if 100 warrant points are calculated. From our analysis we calculated a traffic signal is not warranted (warrant points calculated less than 10). These warrant calculations do not include collision data because it is not available at this time for the future situation. Even without this data, the points calculated are still well below 100 points required to warrant a traffic signal. Therefore, this intersection does not require a traffic signal in the future background situation to address the side-street delay based on this analysis. The queue length for the westbound movement in the weekday p.m. peak hour is 3m and is 33m in the Saturday p.m. peak hour.

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## 4.0 PROPOSED DEVELOPMENT

### 4.1 Proposed Development

The proposed development consists of 7 single family homes, 605 apartment units, 210 townhome units and 225 senior apartment units. The split between permanent and non-permanent accommodation will be 60/40. This split is based on a socio-economic study completed for the Spring Creek Mountain Village. The commercial component will consist of 3 hotels with 580 rooms in total, including an associated commercial component (i.e. restaurant...etc.) and 40,000 square feet of other boutique type commercial properties (artist studios, specialty stores). **Figure 7** outlines the land-uses associated with the proposed development. It should be noted that any non-permanent properties would be interspersed among the development area.

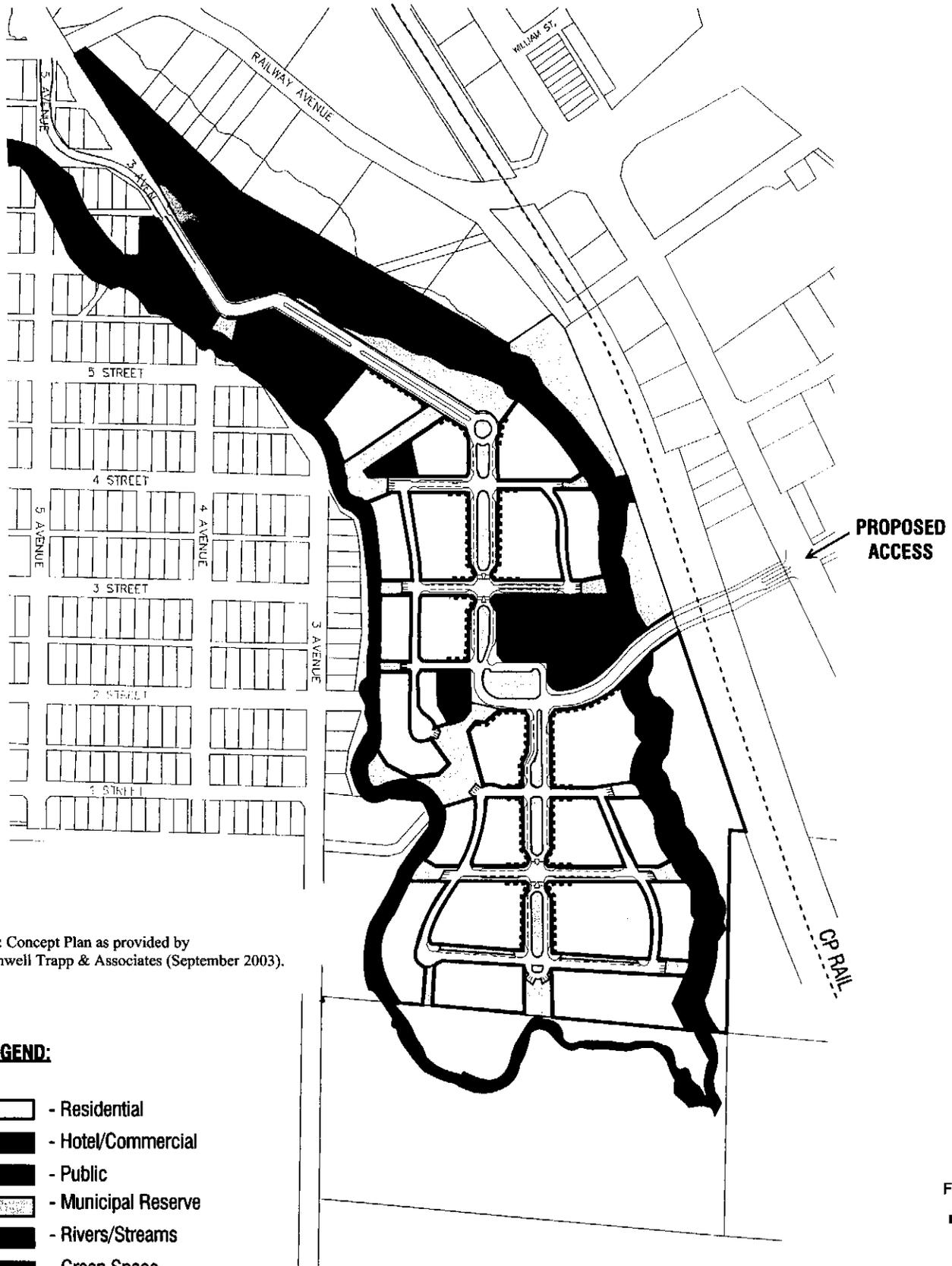
### 4.2 Traffic Generation

In assessing the trip-generating potential of the proposed development, we reviewed published ITE trip generation data, City of Calgary data and FINN previous studies. The widely used publication *Trip Generation*<sup>9</sup> provides a good database of trip generation data (based on studies of existing developments) for a wide variety of uses. The following points summarize our approach to establishing the trip generation of the development areas assessed in the study:

- Traditionally, generalized trip rates of **0.8 (25/75 split) and 1.0 (64/36 split) vehicle per hour (vph) per unit**, during the **weekday** morning and afternoon street peak hours respectively, have been applied to **single-family residential** developments. The **Saturday p.m. peak hour** rate for single-family residential developments was taken at **0.94 (54/46 split) vph per unit**.
- Similarly, trip rates of **0.56 (25/75 split) and 0.70 (65/35 split) vph per unit** have been applied to **multi-family residential** developments (apartments/townhomes) during the **a.m. and p.m. street peak hours**. The **Saturday p.m. peak hour** rate for multi-family residential developments was taken as **0.58 (54/46 split) vph per unit**. These rates are supported by the data presented in the ITE manual.

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<sup>9</sup> Institute of Transportation Engineers, *Trip Generation 6<sup>th</sup> Edition*, Washington, D.C.; 1997



Note: Concept Plan as provided by Southwell Trapp & Associates (September 2003).

**LEGEND:**

-  - Residential
-  - Hotel/Commercial
-  - Public
-  - Municipal Reserve
-  - Rivers/Streams
-  - Green Space
-  - Commercial

Figure

**7**

**PROPOSED LAND-USE**



- 
- The rates applied to **senior housing** were **0.18 (29/71 split) vph/unit** in the **weekday a.m. peak hour** and **0.21 (63/37 split) vph/unit** in the **p.m. peak hour**. The **Saturday p.m. peak hour** trip rate was **0.39 (60/40 split) vph per unit**. The rates for senior housing were obtained from a study that FINN completed at the Prince-of-Peace Village senior housing near Calgary, AB. This study was completed in May 2003.
  - FINN contacted other resort communities to gain information on trip generation rates for non-permanent properties. We were able to obtain information from Aspen, CO and Whistler, BC.. In Aspen, the rate for a single-family unit is used to evaluate non-permanent properties. Whistler evaluates these properties at 80% of the trip generation potential of single-family units. The range of rates for non-permanent properties in Whistler were from 0.45-0.75 and are for the weekend peak hour. We extrapolated this information to obtain a representative rate for the Canmore situation. The proposed non-permanent units are apartment/townhome type and therefore we applied the apartment/townhome trip generation rates at 80%. The non-permanent properties constitute 40% of the total number of proposed apartment units. The trip generation rates for non-permanent properties are therefore **0.45 (25/75 split) vph/unit** and **0.56 (64/36 split) vph/unit** in the **weekday a.m. and p.m. peak hours**. The Saturday trip generation rate was **0.46 (54/46 split) vph/unit**.
  - FINN conducted a study of a local hotel, the Sheraton Four Points, to obtain trip generation rates representative of the Canmore specific site. The study was completed in August 2003 for a weekday and Saturday. The resulting trip generation rates were **0.29 (37/63 split) vph/room** in the **weekday a.m. peak hour** and **0.30 (50/50 split) vph/room** in the **weekday p.m. peak hour**. The **Saturday** rate was **0.32 (59/41 split) vph/room**.

The commercial component of the proposed development includes commercial associated with the hotels (restaurants, small shops) and other commercial such as (boutiques, artist studios, specialty shops). The developer indicated that the intended market for the commercial properties would be tourists and local residents. The targeted tourist market would be those who stay at the four hotels within the development. Therefore, the trip generation rates for the commercial development were reduced to account for the high internal draw of these commercial developments.

- The trip generation rate for the commercial is negligible in the weekday a.m. peak hour. The **weekday p.m. peak hour rate** and **Saturday p.m. peak hour rate** was accessed at **2.50 (50/50 split) vph per 1000 sq. ft** based on the factors mentioned above.

A detailed summary of the resultant peak hour numbers of vehicle trips based on land use is provided in **Table 4**. The values in the tables reflect the use of non-permanent properties to be at 80%. This is representative of occupancy that would occur during a peak period such as the summer or Christmas. The total daily trips generated by the site were calculated from the p.m. peak hour trips multiplied by 11.<sup>10</sup>

**TABLE 4. SITE-GENERATED TRAFFIC VOLUMES**

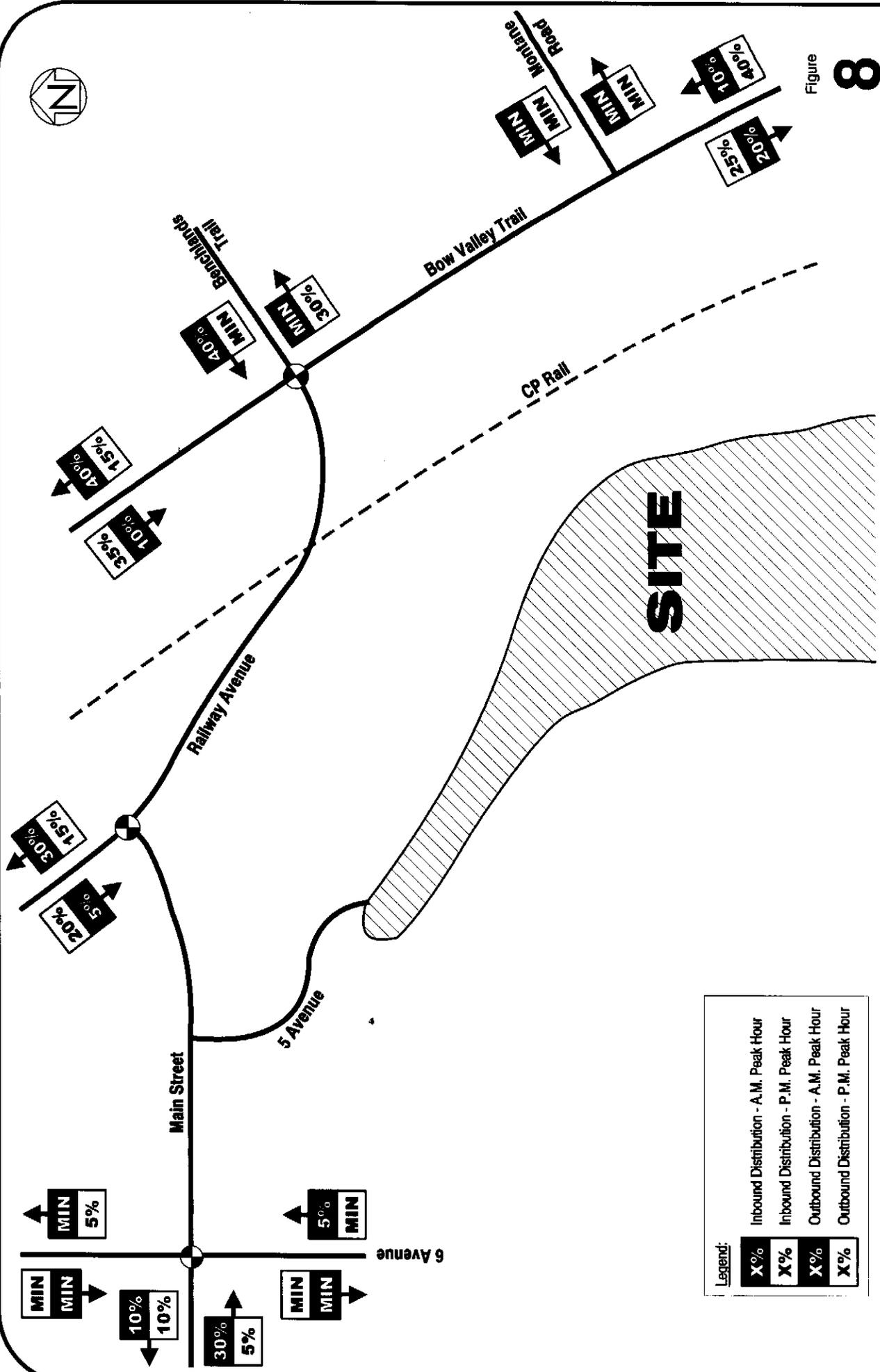
LAND USE	WEEKDAY A.M. PEAK HOUR			WEEKDAY P.M. PEAK HOUR			SATURDAY PEAK HOUR			DAILY		
	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out
Single Family	6	2	4	7	4	3	7	4	3	77	39	38
Apartments	204	51	153	255	166	89	211	114	97	2805	1403	1402
Townhomes	71	18	53	88	57	31	74	40	34	968	484	484
Senior Apartments	25	7	18	29	18	11	53	32	21	319	160	159
Non-Permanent Units	150	38	112	188	120	68	154	83	71	2068	188	188
Hotel	169	63	106	174	87	87	186	110	76	1914	957	957
Commercial	Neg.	Neg.	Neg.	100	50	50	100	50	50	1100	550	550
<b>Total</b>	<b>625</b>	<b>179</b>	<b>446</b>	<b>841</b>	<b>502</b>	<b>339</b>	<b>785</b>	<b>433</b>	<b>352</b>	<b>9251</b>	<b>3781</b>	<b>3778</b>

### 4.3 Traffic Distribution and Assignment

The directional-distribution of the traffic generated by the proposed Spring Creek Mountain Village development was based primarily on information contained in the 2001 Canmore Census<sup>11</sup>. The weekday a.m. and p.m. peak hour distributions were based on employment information and density of residential areas within Canmore obtained from this document. We anticipated that the employment patterns would remain relatively the same in the future and accounted for additional residential growth in the Three Sister's Area to determine the final trip distribution. The Saturday distribution used some of the information utilized for the weekday distribution and adjusted where necessary to take into account locations of attractions in and around Canmore (golf, skiing, shopping). **Figures 8** and **9** outline these distributions. The trips generated by each of the proposed uses were then assigned to the surrounding roadway network and are summarized in **Figures 10** and **11**.

<sup>10</sup> Town of Canmore, 1997 Canmore Transportation Study Final Report, November 1997 p 15

<sup>11</sup> Town of Canmore, 2001 Canmore Census, August 2001



**Legend:**

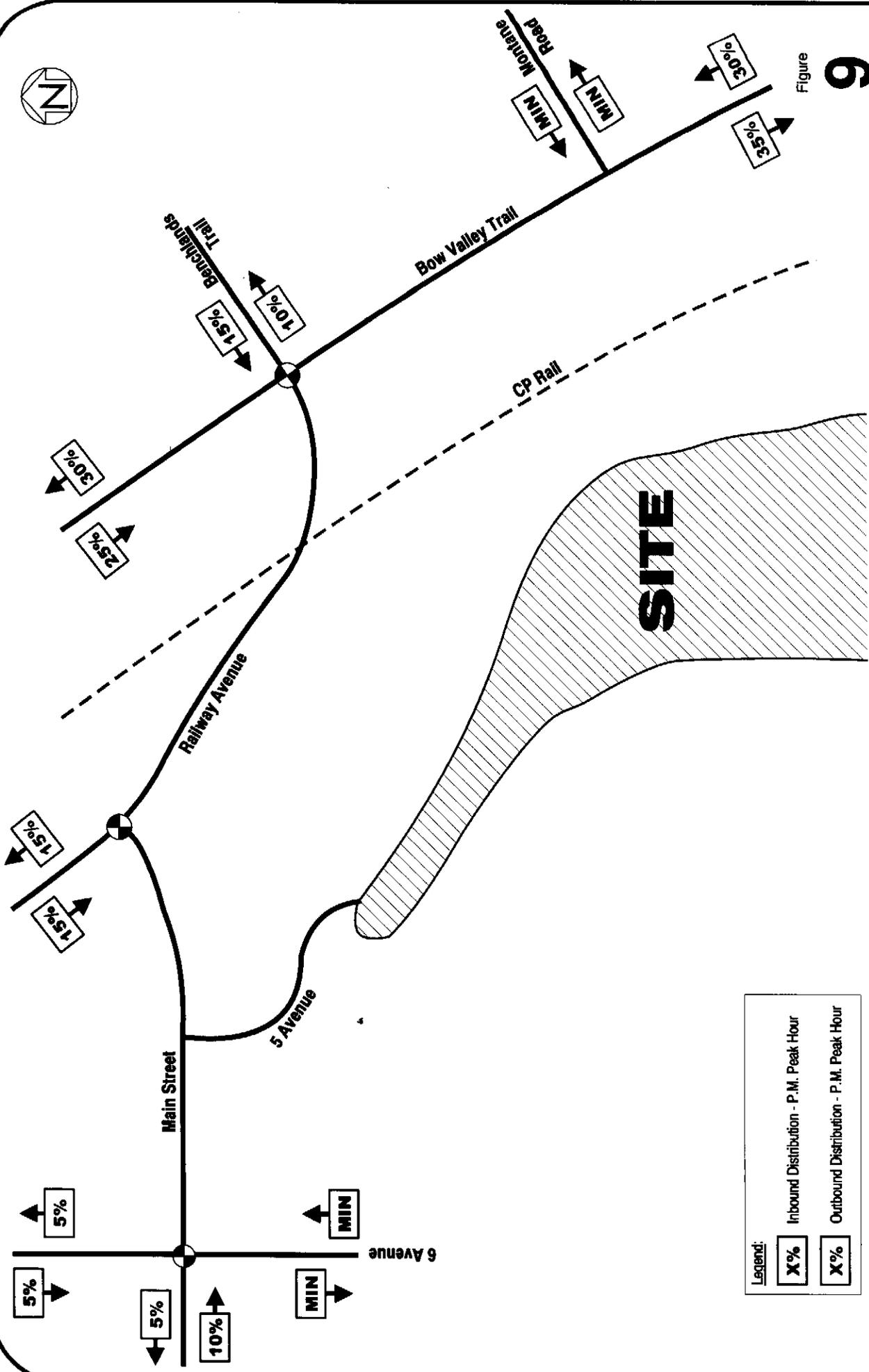
X%	Inbound Distribution - A.M. Peak Hour
X%	Inbound Distribution - P.M. Peak Hour
X%	Outbound Distribution - A.M. Peak Hour
X%	Outbound Distribution - P.M. Peak Hour

Figure 8



**TRIP DISTRIBUTION - WEEKDAY**

File# 5688.02, September 2003



Legend:

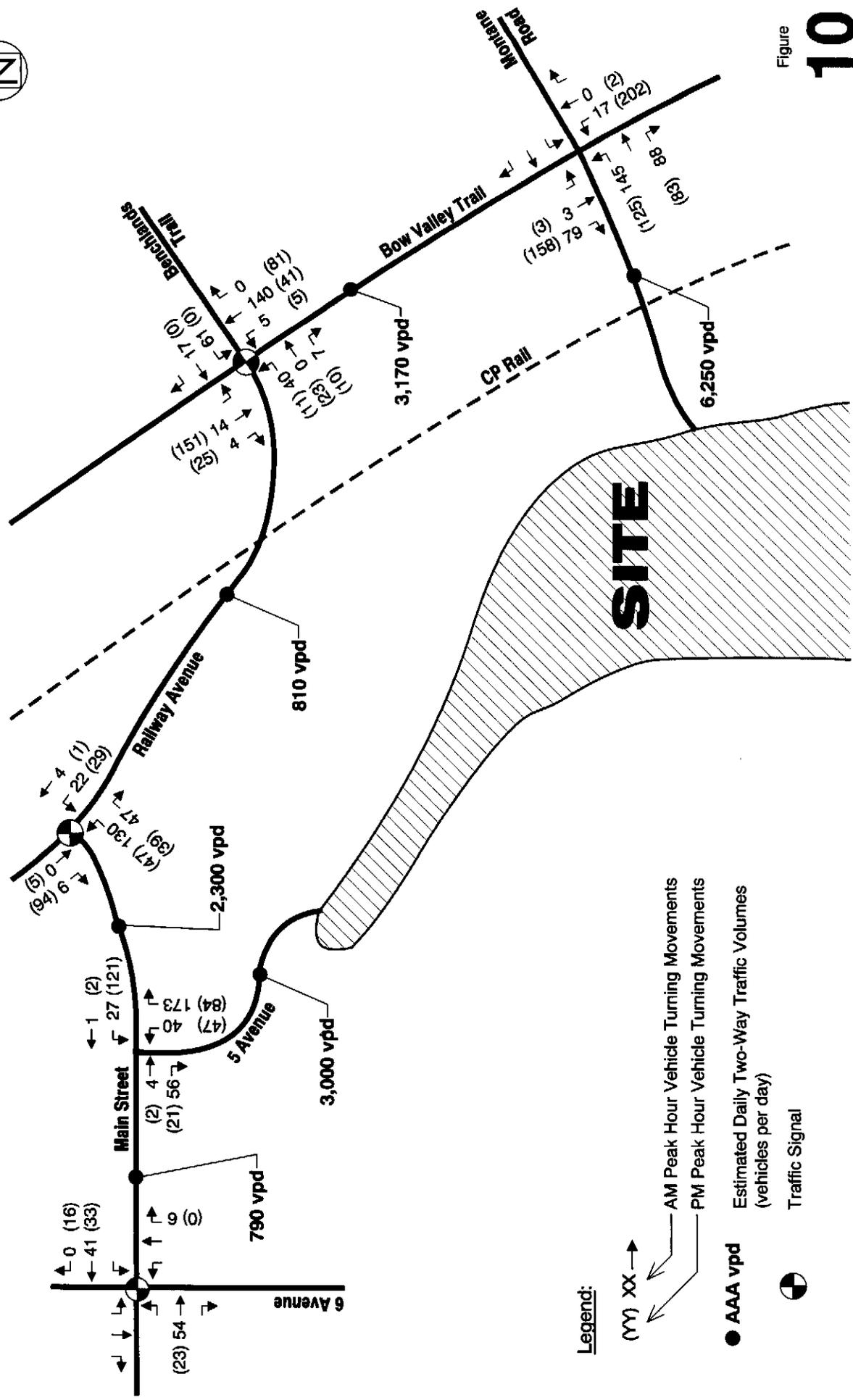
X%	Inbound Distribution - P.M. Peak Hour
X%	Outbound Distribution - P.M. Peak Hour

Figure 9



# TRIP DISTRIBUTION - SATURDAY PM PEAK

File# 5688.02, September, 2003



**Legend:**

(YY) XX →

AM Peak Hour Vehicle Turning Movements  
PM Peak Hour Vehicle Turning Movements

● AAA vpd  
Estimated Daily Two-Way Traffic Volumes  
(vehicles per day)



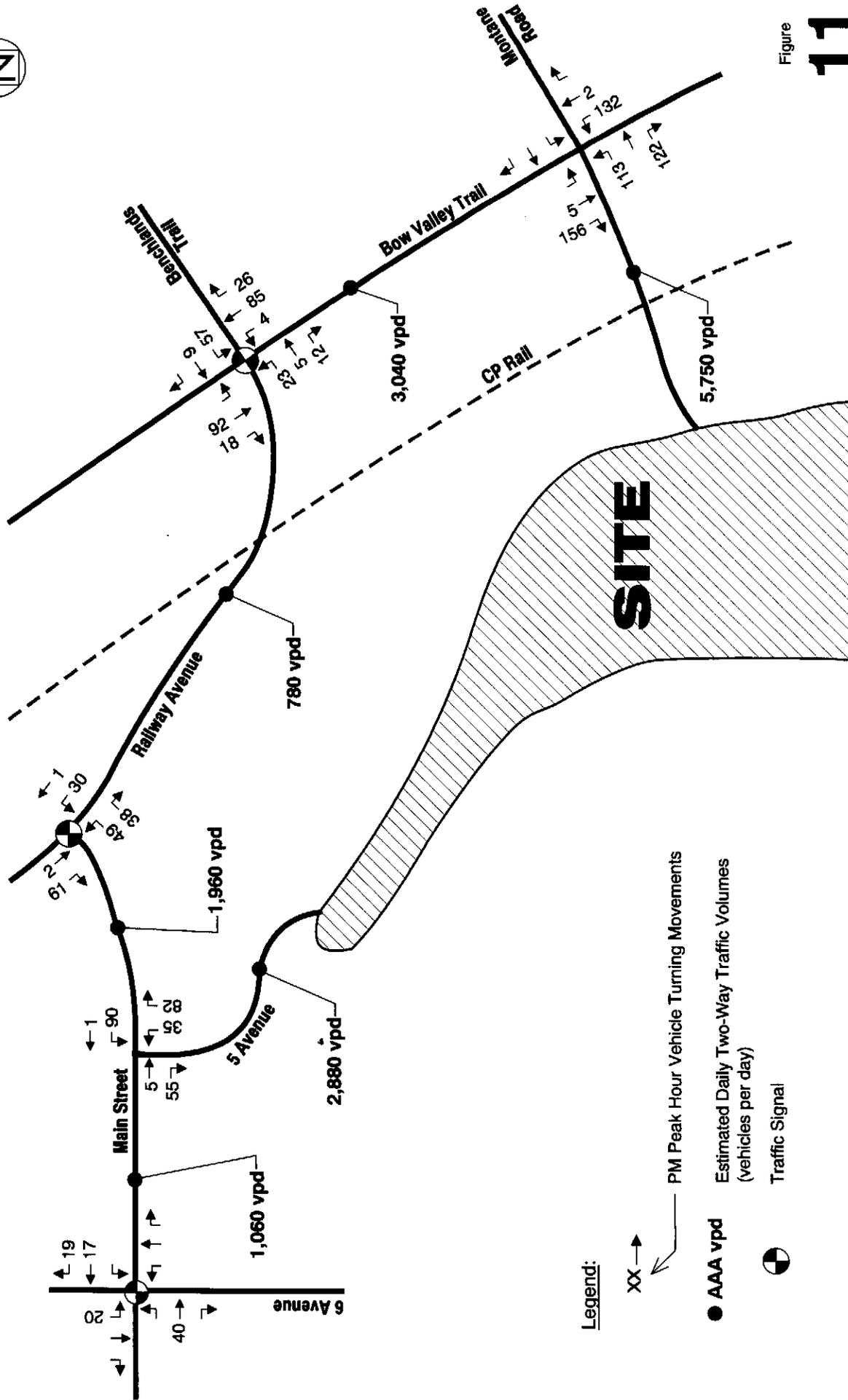
Traffic Signal

Figure

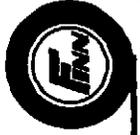
10



**SITE-GENERATED TRAFFIC VOLUMES - WEEKDAY**



Figure



**SITE-GENERATED TRAFFIC VOLUMES - SATURDAY PM PEAK**

#### 4.4 Internal Roadway Classification

We used the TRANMAP software package to assign the site traffic to the internal and area road networks based on the directional-distribution patterns outlined in Section 4.3. This assignment tool allows us to take into consideration driver's behaviour in selecting the shortest, most logical route between their origin and destination. The resulting estimated weekday daily traffic volumes within the proposed Spring Creek Mountain Village are shown in **Figure 12**.

**Figure 13** shows the recommended internal roadway classification for the Spring Creek Mountain Village. A brief summary of the pertinent Town of Canmore roadway standards based on those roads proposed for the Spring Creek Mountain Village are included in **Table 5**. The developer is proposing three road classes within the proposed Spring Creek Development and these classes are collector, local and mews (private) roads. Table 5 below outlines the corresponding cross-section information.

**TABLE 5. INTERNAL ROADWAY STANDARDS<sup>12</sup>**

TYPE	DAILY TRAFFIC VOLUME (vpd)	NUMBER OF LANES	RIGHT-OF-WAY	PARKING ALLOWED	MINIMUM INTERSECTION SPACING	RESIDENTIAL FRONTAGE/DIRECT ACCESS
Collector	1,000 – 12,000	2	21.0 m	Yes	100 m / 220* m	Yes
Local	< 3,000	2	15.0 m	Yes	60 m /100**	Yes
Mews <sup>13</sup>	< 1,500	2	9.0m	No	---	Yes

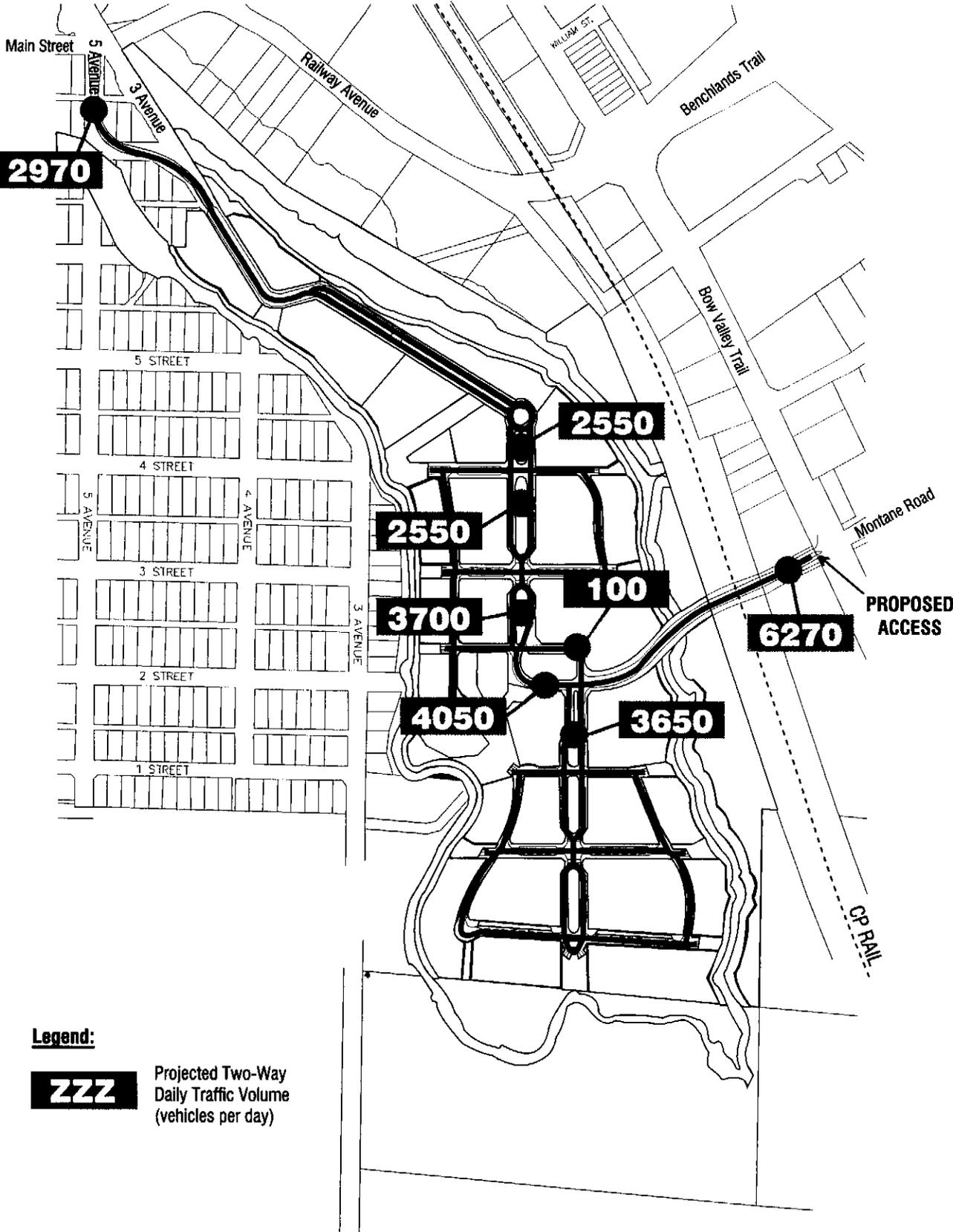
\* Minimum acceptable intersection spacing is 100.0 m between centrelines. If back-to-back left turn bays are required then the minimum spacing shall be 220 m.

\*\* Minimum acceptable intersection spacing is 60.0 m between centrelines (residential). Minimum acceptable intersection spacing is 100.0 m between centrelines (industrial/commercial)

The proposed road network for the Spring Creek Mountain Village is based on the standards stated above and based on these standards should satisfactorily carry the traffic resulting from the proposed development.

<sup>12</sup> Town of Canmore, Engineering Design Guidelines 2003

<sup>13</sup> Design provided by Spring Creek Mountain Village Redevelopment Study Team



**Legend:**

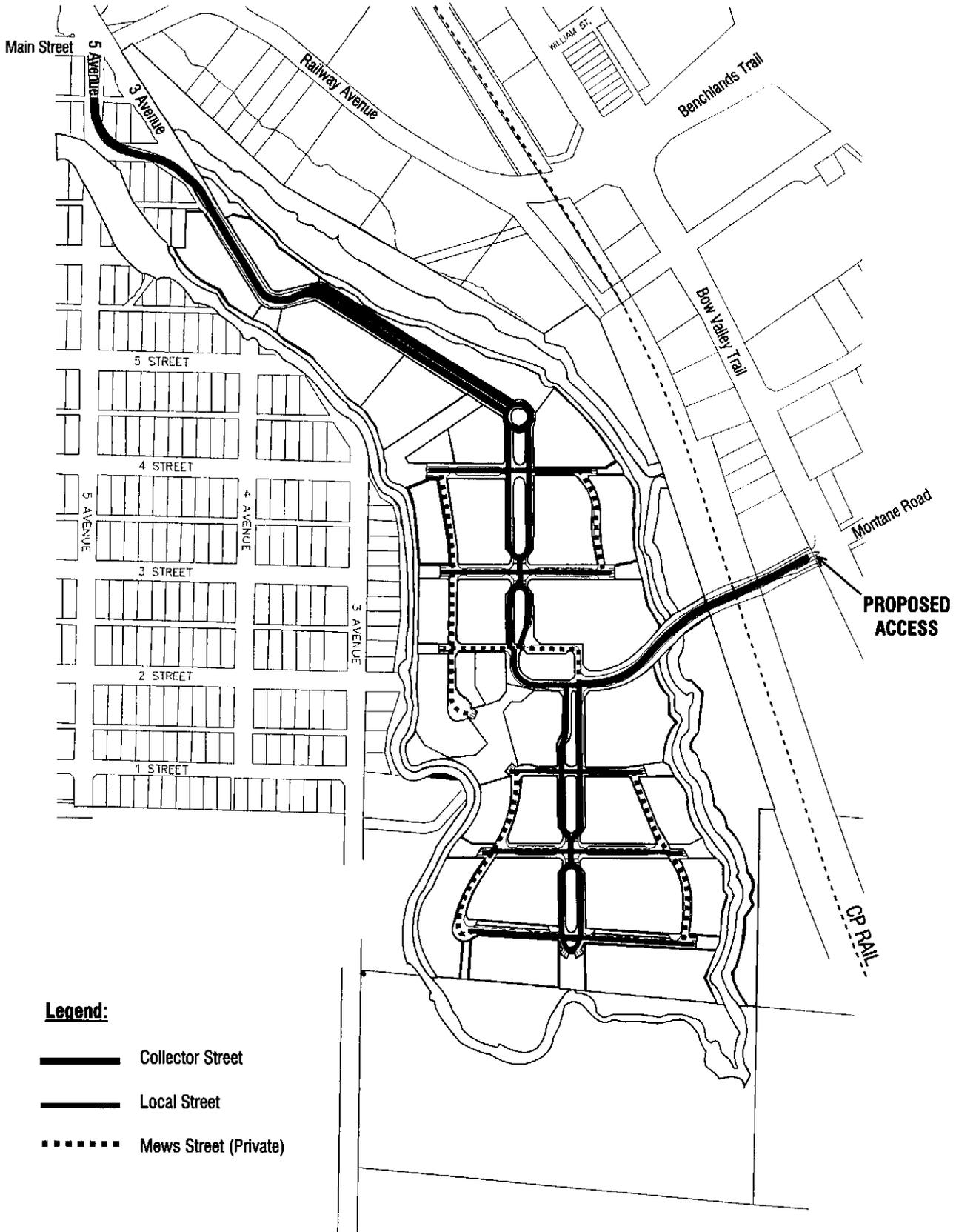
**ZZZ** Projected Two-Way Daily Traffic Volume (vehicles per day)

Figure

**12**

**PROJECTED DAILY TRAFFIC VOLUMES**





**Legend:**

-  Collector Street
-  Local Street
-  Mews Street (Private)

Figure

**13**



**RECOMMENDED INTERNAL ROADWAY CLASSIFICATIONS**

## 5.0 POST-DEVELOPMENT OPERATING CONDITIONS

### 5.1 Post-Development Traffic Volumes

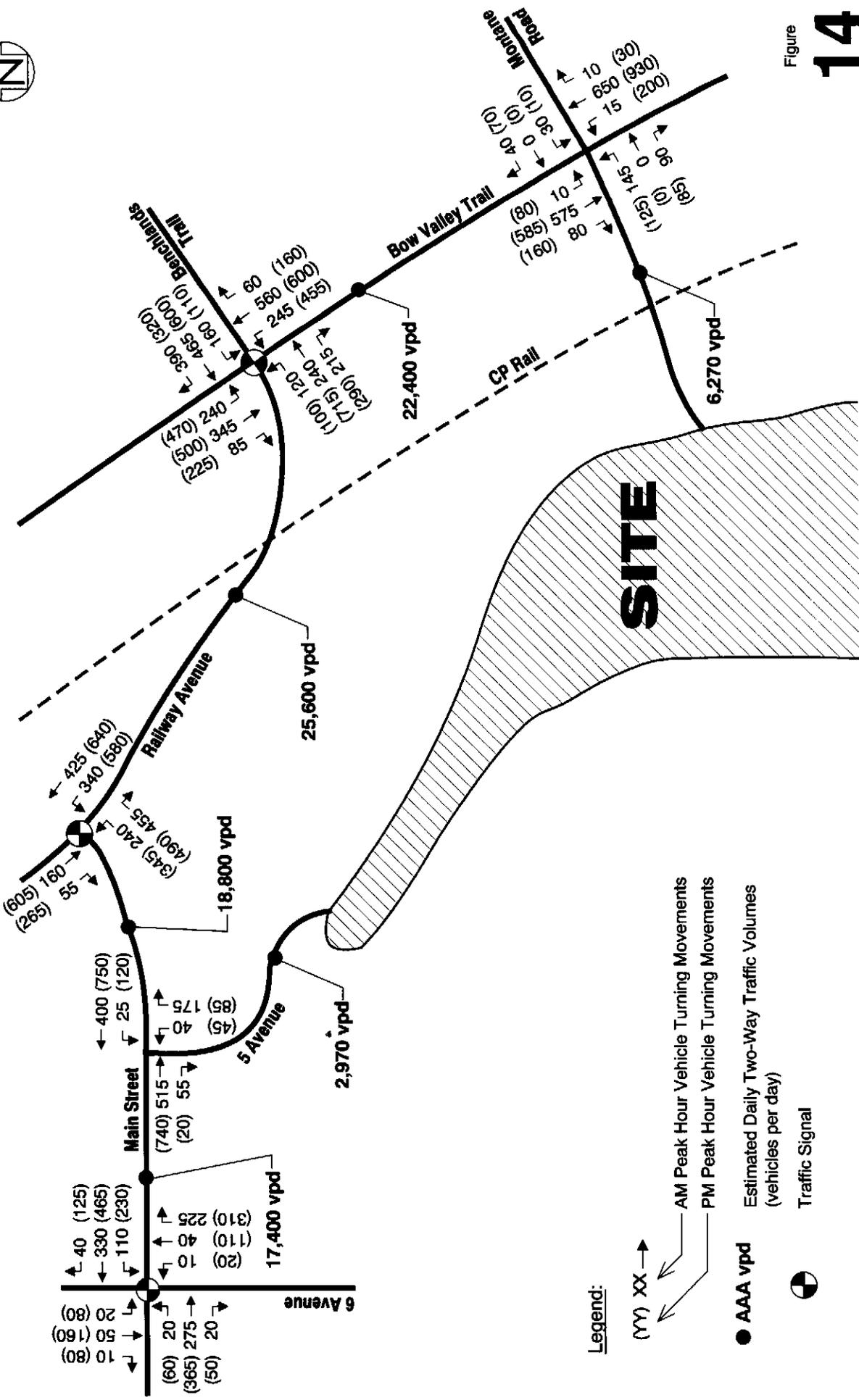
The post-development traffic volumes were obtained by adding the site-generated traffic to the future background traffic volumes. **Figures 14** and **15** outline the post-development traffic volumes.

### 5.2 Post-Development Road Network and Traffic Controls

We assessed the five intersections within the study area assuming the identical lane assumptions and road upgrades assumed in our future background scenario with one exception – the intersection of Bow Valley Trail/Montane Road. In the future background analysis, it was shown that the side-street movements (westbound left-turn) experience long delays. In the future post-development situation, these side-street movements increase from 5% to 30% of the intersection traffic with 25% of this traffic entering and exiting the Spring Creek Mountain Village site. We carried out a traffic signal warrant analysis for this intersection and determined that it still did not meet the warrants (45/100 during the weekday p.m. peak hour and 32/100 during the Saturday peak hour (**Appendix C**). However, without a traffic signal the side-street movements, especially the eastbound left-turn, would experience significant delays and queuing. **Table 6** demonstrates the calculated lane LoS, delay and queue length for the critical movements – westbound left-turn and eastbound-left-turn. As expected, these movements experience poor LoS, long delays and long queue lengths without a signal at this location. In fact, the eastbound left-turn queues would back up well past the Canadian Pacific Railway line and could thus interfere with railway operations and/or present a potential safety concern. Therefore, in order to better facilitate these movements we recommend a traffic signal for the intersection and have assumed such in the analysis presented herein.

**TABLE 6. OPERATING CONDITIONS OF PROPOSED ACCESS (UNSIGNALIZED)**

INTERSECTION	PEAK HOUR	CRITICAL MOVEMENTS					
		WB LEFT-TURN			EB LEFT-TURN		
		Lane LoS	Delay (sec)	95% Queue Length (m)	Lane LoS	Delay (sec)	95% Queue Length (m)
Bow Valley Tr/Montane Road (unsignalized)	AM	F	> 50	11	F	> 50	73
	PM	F	> 50	12	F	> 50	>100
	SAT	F	> 50	> 100	F	> 50	>100



**Legend:**

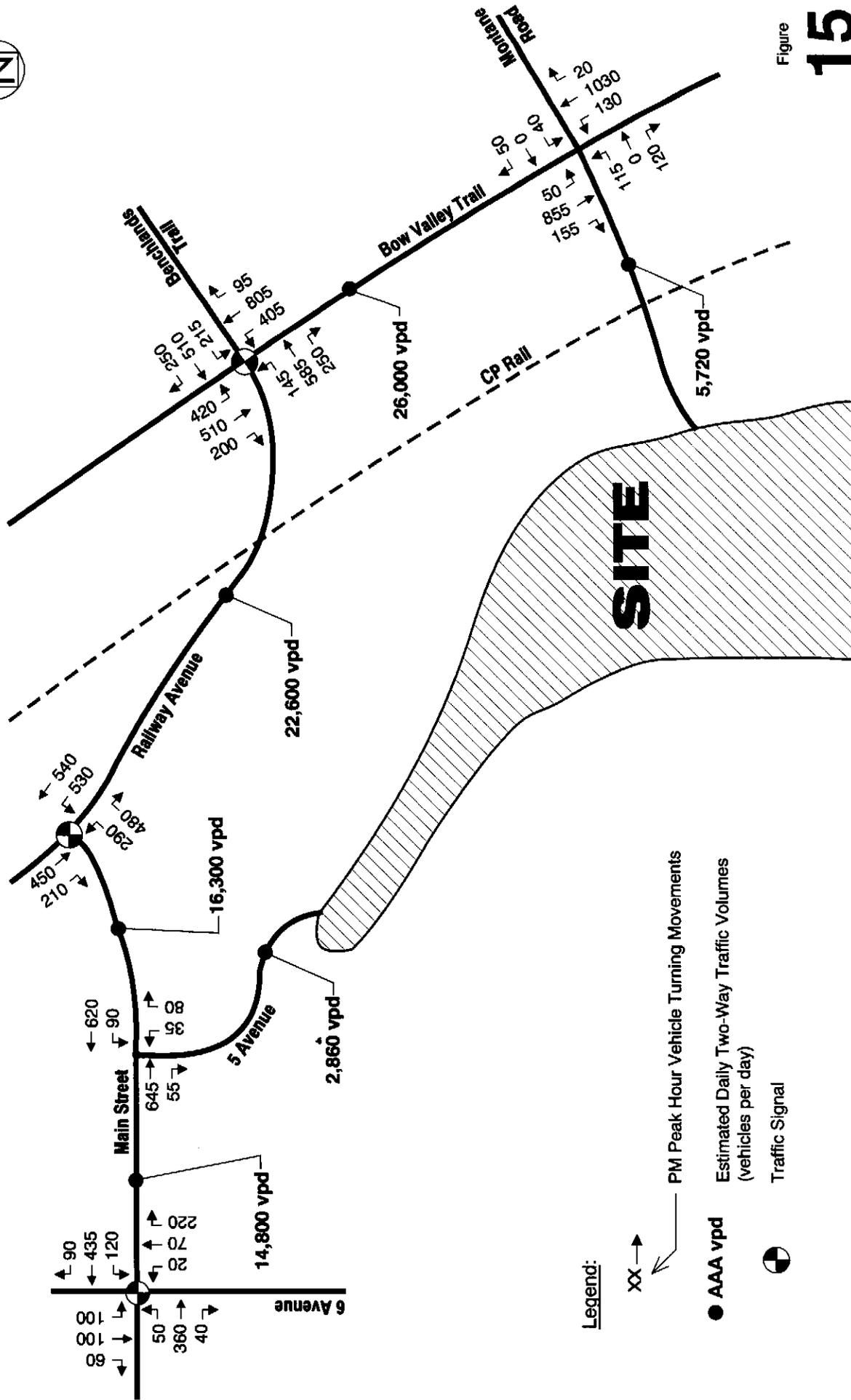
- (YY) XX → AM Peak Hour Vehicle Turning Movements
- PM Peak Hour Vehicle Turning Movements
- AAA vpd Estimated Daily Two-Way Traffic Volumes (vehicles per day)
- ⊙ Traffic Signal

Figure 14



# POST-DEVELOPMENT TRAFFIC VOLUMES - WEEKDAY

File# 5686.02, September 2003



**Legend:**



PM Peak Hour Vehicle Turning Movements



Estimated Daily Two-Way Traffic Volumes (vehicles per day)



Traffic Signal

Figure 15



# POST-DEVELOPMENT TRAFFIC VOLUMES - SATURDAY PM PEAK

File# 5888.02, September 2003

### 5.3 Post-Development Operating Conditions

We assessed the future post-development peak hour operating conditions at the five intersections within the study area. The results are summarized in **Table 7**.

**TABLE 7. FUTURE POST-DEVELOPMENT OPERATING CONDITIONS**

INTERSECTION	PEAK HOUR	OVERALL INTERSECTION LOS	AVERAGE DELAY (secs/veh)	V/C RATIOS ABOVE 0.90 THRESHOLD
Main St/6 Ave (signalized)	AM	A	6	--
	PM	B	11	--
	SAT	A	7	--
Main St/5 Ave (unsignalized)	AM	A	3	n.a.
	PM	A	5	n.a.
	SAT	A	3	n.a.
Main St/Railway Ave (signalized)	AM	B	19	--
	PM	D	42	EBL=0.98; SBT=0.96; NBL=0.94; NBT=0.93
	SAT	C	26	--
Bow Valley Tr/Benchlands Tr (signalized)	AM	C	22	--
	PM	C	26	--
	SAT	C	35	--
Bow Valley Tr/Montane Rd (signalized)	AM	A	9	--
	PM	A	10	--
	SAT	B	14	--

The results summarized in **Table 7** indicate the following:

- **Main Street/6 Avenue, Bow Valley Trail/Benchlands Trail and Bow Valley Trail/Montane Road** are expected to operate at acceptable overall Levels-of-Service during the weekday a.m. and p.m. peak hour and Saturday peak hour. At the intersection of Bow Valley Trail/Montane Road, for the eastbound left-turn movement the queue length is 34 m in the weekday p.m. peak hour and 31 m in the Saturday p.m. peak hour. The

---

queue length for the westbound left-turn movement at this intersection is 5 m for the weekday p.m. peak hour and 15 m in the Saturday p.m. peak hour.

- **Main Street/5 Avenue** will operate at acceptable overall Levels-of-Service with the site traffic during the a.m., p.m. and Saturday peak hours. If we assumed that the traffic signals along Main Street continued to not be coordinated with each other we expect the northbound left-turn movement to operate at LoS F during the p.m. peak hour. However, this delay can be reduced to acceptable levels by simply coordinating the traffic signals along Main Street in order to provide good two-way traffic progression along the corridor. Once the resulting platoons of vehicles have passed 5 Avenue, the outbound traffic will be provided with better opportunities for completing the northbound left-turn.
- **Main Street/Railway Avenue** will operate at acceptable overall Levels-of-Service during the weekday a.m. and Saturday p.m. peak hours. For the weekday p.m. peak hour the eastbound left-turn, southbound through, northbound left and northbound through are expected to operate with V/Cs greater than the 0.9 threshold. It should be noted that of this traffic, for these critical movements, Spring Creek Mountain Village consists of 14% of the eastbound left-turn movement traffic and less than 5% of the southbound through, northbound left-turn and through movement traffic.

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## 6.0 INTERSECTION OF BOW VALLEY TRAIL / SITE ACCESS

### 6.1 Preliminary Design

A preliminary design for the proposed intersection of Bow Valley Trail/Site Access was prepared by FINN and is shown in **Figure 16**. This design was developed prior to starting the TIS for the Spring Creek Mountain Village and was based on the current collector standard roadway guidelines for the City of Calgary.

### 6.2 Access Requirements to Parcel A and B

The proposed intersection will divide the existing land west of Bow Valley Trail into two Parcels – A and B (see Figure 16). The current landowner, from which the new intersection ROW will be taken, in negotiations with the developer has requested that the two resulting land parcels have access off the proposed access road and Bow Valley Trail. Therefore, access would be required at four separate locations.

### 6.3 Access Requirements – Design Guidelines

The Transportation Association of Canada (TAC) has developed a document entitled the Geometric Design Guide for Canadian Roads (GDGCR). Chapter 3.2<sup>14</sup> provides guidelines with respect to access management for a full range of road classifications, from freeways to local rural and urban roads.

We note that there is approximately 100m from the proposed centreline of Bow Valley Trail (at the proposed intersection) to the railway tracks located west of the intersection. Section 2.3.13 in the GDGCR details the requirements for railway grade crossings including distance from the nearest intersection or access to the railway crossing. Based on these requirements the minimum distance from the travelled way of the intersecting road or entrance way shall not be closer than 30m to any part of the grade crossing surface, where train speeds exceed 25 km/h<sup>15</sup>. If an access was placed 30m from the railway crossing for both Parcel A and B, along

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<sup>14</sup> Transportation Association of Canada, **Geometric Design Guide for Canadian Roads**, Ottawa, Canada, September 1999

<sup>15</sup> Transportation Association of Canada, **Geometric Design Guide for Canadian Roads**, Ottawa, Canada, September 1999, Pg. 2.3.13.1

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the proposed road, then the access would be about 70m from Bow Valley Trail. In Calgary, 60m is used for all-turns intersection spacing on collector roadways. Therefore, at this time, from a geometric perspective, it seems feasible to have two accesses off of the proposed collector road – one to Parcel A and B. However, the design of these accesses would have to be further verified through discussions with CPR and operational analyses of proposed developments on these land Parcels.

Direct all-turns access to the two Parcels from Bow Valley Trail is feasible however operational analyses of the proposed developments on Parcels A and B will be required to determine the impact of the traffic. We note that the provision of all-turns access from Bow Valley Trail and the proposed collector road allows for better traffic circulation.



MONTANE ROAD

TRAIL

SMR

BOW VALLEY

10

S.W. 1/4 SEC. 33 24-10-5

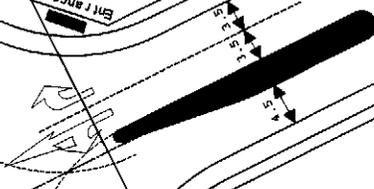
Parcel B

Parcel A

ENTRANCE 65'0"

ENTRANCE 65'0"

21.0' R.R.W.



Figure

16



**PRELIMINARY PROPOSED INTERSECTION PLAN**

File# 5688.02, October 2003

**Preliminary  
For Discussion  
Purposes Only**

Not To Scale

## APPENDIX A: Synchro/SimTraffic Operational Analysis Outputs

### 1. Existing Weekday AM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 2. Existing Weekday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 3. Existing Saturday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 4. Future Background Weekday AM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 5. Future Background Weekday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 6. Future Background Saturday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Montane Road & Bow Valley Trail

### 7. Future Post-Development Weekday AM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Site Access & Bow Valley Trail

### 8. Future Post-Development Weekday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Site Access & Bow Valley Trail

### 9. Future Post-Development Saturday PM Peak

- a. Main Street & 6 Avenue
- b. Main Street & 5 Avenue
- c. Main Street & Railway Avenue
- d. Benchlands Trail & Bow Valley Trail
- e. Site Access & Bow Valley Trail

### 10. Future Post-Development at Bow Valley Trail/Site Access

- a. Weekday AM Peak
- b. Weekday PM Peak
- c. Saturday PM Peak

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Existing Weekday AM Peak  
9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇄			⇄			⇄			⇄	
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.994			0.990			0.889			0.983	
Fl <sub>t</sub> Protected		0.998			0.986			0.998			0.989	
Satd. Flow (prot)	0	2025	0	0	1996	0	0	1780	0	0	1756	0
Fl <sub>t</sub> Permitted		0.983			0.894			0.993			0.950	
Satd. Flow (perm)	0	1994	0	0	1810	0	0	1771	0	0	1687	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			10			134			4	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	8	151	7	87	206	24	7	22	134	7	20	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	1%	3%	4%	0%	9%	4%	14%	20%	0%
Adj. Flow (vph)	8	151	7	87	206	24	7	22	134	7	20	4
Lane Group Flow (vph)	0	166	0	0	317	0	0	163	0	0	31	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		3	8		2	2		6	6	
Minimum Initial (s)	15.0	15.0		5.0	15.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	20.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	16.0	44.0	0.0	26.0	26.0	0.0	26.0	26.0	0.0
Total Split (%)	40%	40%	0%	23%	63%	0%	37%	37%	0%	37%	37%	0%
Maximum Green (s)	24.0	24.0		13.0	40.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		0.0	1.0		1.0	1.0		1.0	1.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		15.2			15.2			10.2			10.2	
Actuated g/C Ratio		0.45			0.45			0.32			0.32	
v/c Ratio		0.19			0.39			0.25			0.06	
Uniform Delay, d1		4.4			4.8			1.0			5.1	
Delay		4.9			5.2			3.3			7.7	
LOS		A			A			A			A	
Approach Delay		4.9			5.2			3.3			7.7	

Lanes, Volumes, Timings  
 5: Main Street & 6 Avenue

Existing Weekday AM Peak  
 9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 26.4  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.39  
 Intersection Signal Delay: 4.8  
 Intersection Capacity Utilization 51.0%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 5: Main Street & 6 Avenue

26.4	16.4	28.4
26.4	14.4	

HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Existing Weekday AM Peak  
 9/12/2003

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑	↘	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	340	14	26	267	26	89
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	340	14	26	267	26	89
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage (veh)						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			354		666	177
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			354		666	177
tC, single (s)			4.4		7.0	7.0
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.4
p0 queue free %			98		93	89
cM capacity (veh/h)			1113		371	820

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	227	127	26	267	115
Volume Left	0	0	26	0	26
Volume Right	0	14	0	0	89
cSH	1700	1700	1113	1700	1060
Volume to Capacity	0.13	0.07	0.02	0.16	0.11
Queue Length (m)	0.0	0.0	0.5	0.0	2.8
Control Delay (s)	0.0	0.0	8.3	0.0	11.2
Lane LOS			A		B
Approach Delay (s)	0.0		0.7		11.2
Approach LOS					B

**Intersection Summary**

Average Delay		2.0			
Intersection Capacity Utilization		24.4%		ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

Existing Weekday AM Peak  
9/12/2003

						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2		15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	0.95	1.00	1.00
Fr <sub>t</sub>		0.850	0.971			
Fl <sub>t</sub> Protected	0.950				0.950	
Satd. Flow (prot)	1354	1217	3256	0	1256	1533
Fl <sub>t</sub> Permitted	0.639				0.546	
Satd. Flow (perm)	911	1217	3256	0	722	1533
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		292	25			
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	57	292	103	25	188	179
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	11%	13%	12%	16%	21%	18%
Adj. Flow (vph)	57	292	103	25	188	179
Lane Group Flow (vph)	57	292	128	0	188	179
Turn Type		custom			pm+pt	
Protected Phases		4	6		5	2
Permitted Phases	4				2	
Detector Phases	4	4	6		5	2
Minimum Initial (s)	10.0	10.0	15.0		5.0	15.0
Minimum Split (s)	20.0	20.0	20.0		8.0	20.0
Total Split (s)	29.0	29.0	21.0	0.0	20.0	41.0
Total Split (%)	41%	41%	30%	0%	29%	59%
Maximum Green (s)	25.0	25.0	17.0		17.0	37.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		0.0	1.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		None	None
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	11.9	11.9	15.9		19.0	24.8
Actuated g/C Ratio	0.27	0.27	0.35		0.46	0.55
v/c Ratio	0.23	0.53	0.11		0.41	0.21
Uniform Delay, d1	10.3	0.0	7.1		3.5	3.4
Delay	16.6	3.3	11.3		4.6	4.3
LOS	B	A	B		A	A
Approach Delay	5.5		11.3			4.4

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Existing Weekday AM Peak  
9/12/2003



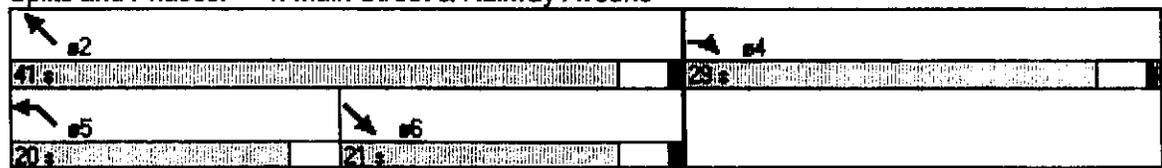
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Approach LOS	A		B			A

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 37.8  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.53  
 Intersection Signal Delay: 5.9  
 Intersection Capacity Utilization 43.2%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Existing Weekday AM Peak  
 9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		0.0	96.0		0.0	35.0		0.0	18.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	0.95	1.00	*1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr		0.923			0.936			0.972				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1357	2927	0	1186	3135	0	1152	1598	0	1325	1577	1275
Flt Permitted	0.950			0.950			0.643			0.555		
Satd. Flow (perm)	1357	2927	0	1186	3135	0	779	1598	0	774	1577	1275
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		142			166			14				56
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50				50
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	58	136	142	52	223	166	141	160	37	88	115	56
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	17%	24%	31%	15%	13%	32%	28%	19%	16%	16%	9%
Adj. Flow (vph)	58	136	142	52	223	166	141	160	37	88	115	56
Lane Group Flow (vph)	58	278	0	52	389	0	141	197	0	88	115	56
Turn Type	Split			Split			pm+pt			pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases							2			6		6
Detector Phases	4	4		8	8		5	2		1	6	6
Minimum Initial (s)	15.0	15.0		15.0	15.0		5.0	15.0		5.0	15.0	15.0
Minimum Split (s)	22.5	22.5		22.5	22.5		8.0	22.5		8.0	22.5	22.5
Total Split (s)	22.5	22.5	0.0	22.5	22.5	0.0	12.0	24.0	0.0	11.0	23.0	23.0
Total Split (%)	28%	28%	0%	28%	28%	0%	15%	30%	0%	14%	29%	29%
Maximum Green (s)	16.0	16.0		16.0	16.0		9.0	17.5		8.0	16.5	16.5
Yellow Time (s)	4.5	4.5		4.5	4.5		3.0	4.5		3.0	4.5	4.5
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0		0.0	2.0	2.0
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0 *		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0			0			0	0
Act Effct Green (s)	17.6	17.6		17.8	17.8		25.1	18.8		23.3	18.0	18.0
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.33	0.25		0.30	0.24	0.24
v/c Ratio	0.18	0.35		0.18	0.45		0.48	0.48		0.31	0.30	0.16
Uniform Delay, d1	23.1	11.4		22.9	13.6		17.3	22.2		16.1	23.6	0.0
Delay	24.9	12.6		24.7	14.4		18.1	23.5		16.2	25.1	7.6

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Existing Weekday AM Peak  
 9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	B		C	B		B	C		B	C	A
Approach Delay		14.7			15.6			21.2			18.3	
Approach LOS		B			B			C			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 74.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.48  
 Intersection Signal Delay: 17.3  
 Intersection Capacity Utilization 44.3%  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail

 s1	 s2	 s4	 s8
17.5 s	23.5 s	22.5 s	22.5 s
 s5	 s6		
12.5 s	23.5 s		

HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Existing Weekday AM Peak  
 9/12/2003

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	5	12	270	0	1	249
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	5	12	270	0	1	249
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	521	270			270	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	521	270			270	
tC, single (s)	6.8	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.3			2.2	
p0 queue free %	99	98			100	
cM capacity (veh/h)	455	774			1305	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	5	12	270	250
Volume Left	5	0	0	1
Volume Right	0	12	0	0
cSH	455	774	1700	1305
Volume to Capacity	0.01	0.02	0.16	0.00
Queue Length (m)	0.3	0.4	0.0	0.0
Control Delay (s)	13.0	9.7	0.0	0.0
Lane LOS	B	A		A
Approach Delay (s)	10.7		0.0	0.0
Approach LOS	B			

**Intersection Summary**

Average Delay		0.4		
Intersection Capacity Utilization		24.6%	ICU Level of Service	A

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Existing Weekday PM Peak  
9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.991			0.985			0.901			0.970	
Fit Protected		0.995			0.985			0.998			0.986	
Satd. Flow (prot)	0	2033	0	0	2024	0	0	1842	0	0	1960	0
Fit Permitted		0.938			0.784			0.989			0.892	
Satd. Flow (perm)	0	1917	0	0	1611	0	0	1825	0	0	1773	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			16			190			21	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	27	236	19	140	275	52	11	57	190	37	68	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	2%	0%	4%	2%	3%	3%	0%
Adj. Flow (vph)	27	236	19	140	275	52	11	57	190	37	68	30
Lane Group Flow (vph)	0	282	0	0	467	0	0	258	0	0	135	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		3	8		2	2		6	6	
Minimum Initial (s)	15.0	15.0		5.0	15.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	20.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	30.0	30.0	0.0	15.0	45.0	0.0	25.0	25.0	0.0	25.0	25.0	0.0
Total Split (%)	43%	43%	0%	21%	64%	0%	36%	36%	0%	36%	36%	0%
Maximum Green (s)	26.0	26.0		12.0	41.0		21.0	21.0		21.0	21.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		0.0	1.0		1.0	1.0		1.0	1.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		17.0			17.0			10.7			10.7	
Actuated g/C Ratio		0.49			0.49			0.32			0.32	
v/c Ratio		0.30			0.58			0.36			0.23	
Uniform Delay, d1		4.8			5.7			2.0			6.6	
Delay		5.4			6.5			4.3			9.6	
LOS		A			A			A			A	
Approach Delay		5.4			6.5			4.3			9.6	

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Existing Weekday PM Peak  
9/12/2003

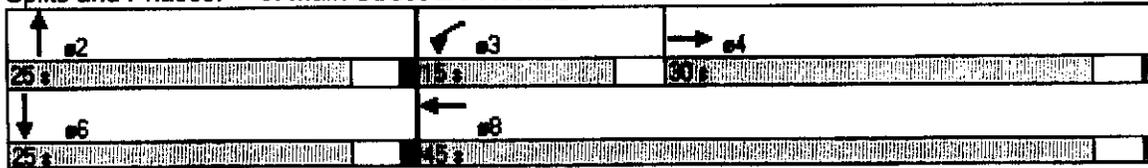
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 30.9  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.58  
 Intersection Signal Delay: 6.1  
 Intersection Capacity Utilization 70.0%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Existing Weekday PM Peak  
 9/12/2003

A 11

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	303	40	85	285	20	39
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	303	40	85	285	20	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage (veh)						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			343		778	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			343		778	172
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		93	95
cM capacity (veh/h)			1213		304	833

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	202	141	85	285	59
Volume Left	0	0	85	0	20
Volume Right	0	40	0	0	39
cSH	1700	1700	1213	1700	897
Volume to Capacity	0.12	0.08	0.07	0.17	0.07
Queue Length (m)	0.0	0.0	1.7	0.0	1.6
Control Delay (s)	0.0	0.0	8.2	0.0	12.3
Lane LOS			A		B
Approach Delay (s)	0.0		1.9		12.3
Approach LOS					B

**Intersection Summary**

Average Delay		1.8			
Intersection Capacity Utilization		28.8%		ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Existing Weekday PM Peak  
9/12/2003

Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2		15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	0.95	1.00	1.00
Fr <sub>t</sub>		0.850	0.971			
Fl <sub>t</sub> Protected	0.950				0.950	
Satd. Flow (prot)	1459	1297	3419	0	1434	1660
Fl <sub>t</sub> Permitted	0.532				0.340	
Satd. Flow (perm)	817	1297	3419	0	513	1660
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		296	42			
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	156	296	345	81	388	315
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	6%	8%	5%	6%	9%
Adj. Flow (vph)	156	296	345	81	388	315
Lane Group Flow (vph)	156	296	426	0	388	315
Turn Type		custom			pm+pt	
Protected Phases		4	6		5	2
Permitted Phases	4				2	
Detector Phases	4	4	6		5	2
Minimum Initial (s)	10.0	10.0	15.0		5.0	15.0
Minimum Split (s)	20.0	20.0	20.0		8.0	20.0
Total Split (s)	25.0	25.0	21.0	0.0	24.0	45.0
Total Split (%)	36%	36%	30%	0%	34%	64%
Maximum Green (s)	21.0	21.0	17.0		21.0	41.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		0.0	1.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		None	None
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	16.2	16.2	15.7		36.6	36.6
Actuated g/C Ratio	0.27	0.27	0.26		0.60	0.60
v/c Ratio	0.72	0.53	0.47		0.69	0.32
Uniform Delay, d <sub>1</sub>	20.2	0.0	16.9		6.6	5.9
Delay	26.1	3.0	19.1		8.6	6.9
LOS	C	A	B		A	A
Approach Delay	11.0		19.1			7.9

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Existing Weekday PM Peak  
9/12/2003

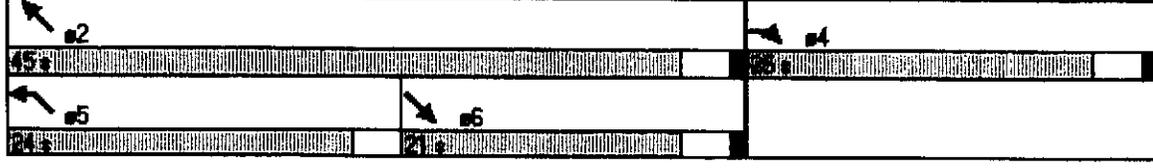
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Approach LOS	B		B			A

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 61  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.72  
 Intersection Signal Delay: 11.8  
 Intersection Capacity Utilization 58.3%  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Existing Weekday PM Peak  
9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		0.0	96.0		0.0	35.0		0.0	18.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	0.95	1.00	*1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.951			0.954			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1357	3297	0	1284	3302	0	1345	1836	0	1423	1577	1287
Flt Permitted	0.950			0.950			0.628			0.498		
Satd. Flow (perm)	1357	3297	0	1284	3302	0	889	1836	0	746	1577	1287
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		111			95			18				140
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	70	397	193	56	301	135	260	175	52	173	123	140
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	8%	15%	21%	8%	16%	13%	9%	10%	8%	16%	8%
Adj. Flow (vph)	70	397	193	56	301	135	260	175	52	173	123	140
Lane Group Flow (vph)	70	590	0	56	436	0	260	227	0	173	123	140
Turn Type	Split			Split			pm+pt			pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases							2			6		6
Detector Phases	4	4		8	8		5	2		1	6	6
Minimum Initial (s)	15.0	15.0		15.0	15.0		5.0	15.0		5.0	15.0	15.0
Minimum Split (s)	22.5	22.5		22.5	22.5		8.0	22.5		8.0	22.5	22.5
Total Split (s)	22.5	22.5	0.0	22.5	22.5	0.0	12.0	24.0	0.0	11.0	23.0	23.0
Total Split (%)	28%	28%	0%	28%	28%	0%	15%	30%	0%	14%	29%	29%
Maximum Green (s)	16.0	16.0		16.0	16.0		9.0	17.5		8.0	16.5	16.5
Yellow Time (s)	4.5	4.5		4.5	4.5		3.0	4.5		3.0	4.5	4.5
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0		0.0	2.0	2.0
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0			0			0	0
Act Effect Green (s)	18.1	18.1		17.7	17.7		27.0	19.0		24.7	17.9	17.9
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.35	0.24		0.32	0.23	0.23
v/c Ratio	0.22	0.69		0.19	0.53		0.73	0.49		0.58	0.34	0.35
Uniform Delay, d1	24.1	21.8		24.2	20.3		19.3	23.1		16.9	24.9	0.0
Delay	25.0	22.3		25.1	20.7		25.3	23.9		19.0	25.7	5.2

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Existing Weekday PM Peak  
 9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C		C	C		C	C		B	C	A
Approach Delay		22.6			21.2			24.6			16.5	
Approach LOS		C			C			C			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 77.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 21.5  
 Intersection Capacity Utilization 73.1%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service C

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Existing Weekday PM Peak  
 9/12/2003

A16

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	3	24	448	4	27	312
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	3	24	448	4	27	312
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	816	450			452	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	816	450			452	
tC, single (s)	6.7	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.8	3.5			2.3	
p0 queue free %	99	96			98	
cM capacity (veh/h)	300	579			1083	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	3	24	452	339
Volume Left	3	0	0	27
Volume Right	0	24	4	0
cSH	300	579	1700	1083
Volume to Capacity	0.01	0.04	0.27	0.02
Queue Length (m)	0.2	1.0	0.0	0.6
Control Delay (s)	17.1	11.5	0.0	0.9
Lane LOS	C	B		A
Approach Delay (s)	12.1		0.0	0.9
Approach LOS	B			

**Intersection Summary**

Average Delay	0.8		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Existing Saturday PM Peak  
9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt		0.992			0.988			0.899			0.968	
Flt Protected		0.995			0.990			0.997			0.983	
Satd. Flow (prot)	0	2052	0	0	2031	0	0	1844	0	0	1974	0
Flt Permitted		0.951			0.921			0.989			0.874	
Satd. Flow (perm)	0	1961	0	0	1889	0	0	1829	0	0	1755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			12			134			24	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	24	224	16	72	266	34	9	36	134	35	41	24
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	1%	0%	0%	1%	3%	11%	3%	1%	3%	0%	0%
Adj. Flow (vph)	24	224	16	72	266	34	9	36	134	35	41	24
Lane Group Flow (vph)	0	264	0	0	372	0	0	179	0	0	100	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		3	8		2	2		6	6	
Minimum Initial (s)	15.0	15.0		5.0	15.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	20.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	28.0	28.0	0.0	16.0	44.0	0.0	26.0	26.0	0.0	26.0	26.0	0.0
Total Split (%)	40%	40%	0%	23%	63%	0%	37%	37%	0%	37%	37%	0%
Maximum Green (s)	24.0	24.0		13.0	40.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		0.0	1.0		1.0	1.0		1.0	1.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		15.2			15.2			10.1			10.1	
Actuated g/C Ratio		0.46			0.46			0.32			0.32	
v/c Ratio		0.29			0.43			0.27			0.18	
Uniform Delay, d1		4.9			5.2			1.8			5.4	
Delay		5.6			5.9			3.7			7.3	
LOS		A			A			A			A	
Approach Delay		5.6			5.9			3.7			7.3	

Lanes, Volumes, Timings  
 5: Main Street & 6 Avenue

Existing Saturday PM Peak  
 9/12/2003

A18

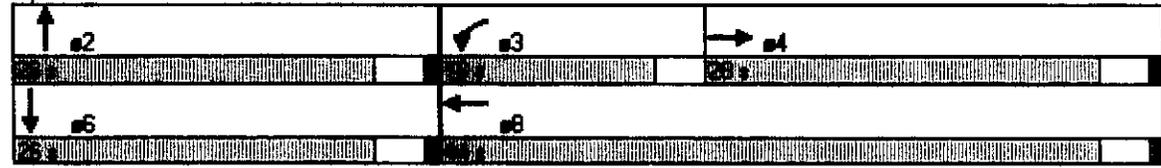
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A			A			A			A	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 29.2  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.43  
 Intersection Signal Delay: 5.5  
 Intersection Capacity Utilization 57.3%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Existing Saturday PM Peak  
 9/12/2003

A19

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑	↘	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	431	54	96	354	33	48
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	431	54	96	354	33	48
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage veh						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			485		1004	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			485		1004	242
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			91		84	93
cM capacity (veh/h)			1013		201	734

Direction Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	287	198	96	354	81
Volume Left	0	0	96	0	33
Volume Right	0	54	0	0	48
cSH	1700	1700	1013	1700	493
Volume to Capacity	0.17	0.12	0.09	0.21	0.16
Queue Length (m)	0.0	0.0	2.4	0.0	4.4
Control Delay (s)	0.0	0.0	8.9	0.0	16.8
Lane LOS			A		C
Approach Delay (s)	0.0		1.9		16.8
Approach LOS					C

Intersection Summary					
Average Delay			2.2		
Intersection Capacity Utilization			33.7%	ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

Existing Saturday PM Peak  
9/12/2003

A20

						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2		15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	0.95	1.00	1.00
Fr		0.850	0.965			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1474	1297	3517	0	1476	1756
Flt Permitted	0.550				0.452	
Satd. Flow (perm)	853	1297	3517	0	702	1756
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		279	61			
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	122	279	230	71	352	264
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	6%	4%	3%	3%	3%
Adj. Flow (vph)	122	279	230	71	352	264
Lane Group Flow (vph)	122	279	301	0	352	264
Turn Type		custom			pm+pt	
Protected Phases		4	6		5	2
Permitted Phases	4				2	
Detector Phases	4	4	6		5	2
Minimum Initial (s)	10.0	10.0	15.0		5.0	15.0
Minimum Split (s)	20.0	20.0	20.0		8.0	20.0
Total Spllt (s)	24.0	24.0	22.0	0.0	24.0	46.0
Total Split (%)	34%	34%	31%	0%	34%	66%
Maximum Green (s)	20.0	20.0	18.0		21.0	42.0
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		0.0	1.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		None	None
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
Act Effct Green (s)	13.9	13.9	15.3		34.8	34.8
Actuated g/C Ratio	0.24	0.24	0.27		0.61	0.61
v/c Ratio	0.58	0.53	0.30		0.55	0.25
Uniform Delay, d1	18.8	0.0	12.8		5.6	5.0
Delay	20.9	3.2	15.2		6.5	5.8
LOS	C	A	B		A	A
Approach Delay	8.6		15.2			6.2

Lanes, Volumes, Timings  
**4: Main Street & Railway Aveune**

Existing Saturday PM Peak  
 9/12/2003

A21

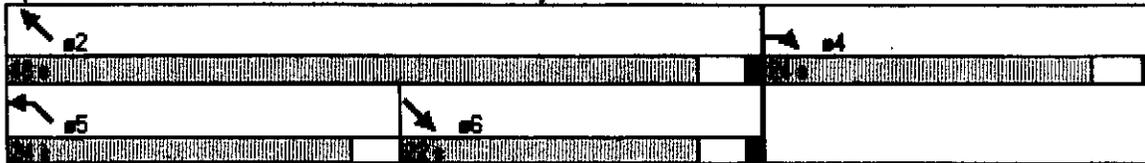
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Approach LOS	A		B			A

**Intersection Summary**

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 56.8  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.58  
 Intersection Signal Delay: 9.0  
 Intersection Capacity Utilization 54.0%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

**Splits and Phases: 4: Main Street & Railway Aveune**



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Existing Saturday PM Peak  
9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		0.0	96.0		0.0	35.0		0.0	18.0		0.0
Storage Lanes	1		0	1		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	0.95	1.00	*1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr		0.954			0.957			0.976				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1333	3421	0	1509	3508	0	1394	1903	0	1436	1794	993
Flt Permitted	0.950			0.950			0.579			0.422		
Satd. Flow (perm)	1333	3421	0	1509	3508	0	850	1903	0	638	1794	993
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		94			79			11				128
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	94	363	162	80	263	106	250	225	43	155	149	128
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	9%	6%	8%	3%	2%	10%	9%	6%	9%	7%	2%	40%
Adj. Flow (vph)	94	363	162	80	263	106	250	225	43	155	149	128
Lane Group Flow (vph)	94	525	0	80	369	0	250	268	0	155	149	128
Turn Type	Split			Split			pm+pt			pm+pt		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases							2			6		6
Detector Phases	4	4		8	8		5	2		1	6	6
Minimum Initial (s)	15.0	15.0		15.0	15.0		5.0	15.0		5.0	15.0	15.0
Minimum Split (s)	22.5	22.5		22.5	22.5		8.0	22.5		8.0	22.5	22.5
Total Split (s)	22.5	22.5	0.0	22.5	22.5	0.0	12.0	24.0	0.0	11.0	23.0	23.0
Total Split (%)	28%	28%	0%	28%	28%	0%	15%	30%	0%	14%	29%	29%
Maximum Green (s)	16.0	16.0		16.0	16.0		9.0	17.5		8.0	16.5	16.5
Yellow Time (s)	4.5	4.5		4.5	4.5		3.0	4.5		3.0	4.5	4.5
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0		0.0	2.0	2.0
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	None		None	None	None
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0			0			0	0
Act Effct Green (s)	18.1	18.1		17.7	17.7		27.3	19.3		24.9	18.1	18.1
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.35	0.25		0.32	0.23	0.23
v/c Ratio	0.30	0.61		0.23	0.43		0.71	0.56		0.57	0.36	0.39
Uniform Delay, d1	24.7	21.6		24.5	20.0		18.7	24.5		16.6	25.0	0.0
Delay	25.7	22.1		25.5	20.4		23.9	25.2		18.3	25.7	5.5

Lanes, Volumes, Timings  
**13: Benchlands Trail & Bow Valley Trail**

Existing Saturday PM Peak  
 9/12/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C		C	C		C	C		B	C	A
Approach Delay		22.6			21.3			24.6			17.1	
Approach LOS		C			C			C			B	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 77.9  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.71  
 Intersection Signal Delay: 21.6  
 Intersection Capacity Utilization 70.4%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service C

**Splits and Phases: 13: Benchlands Trail & Bow Valley Trail**



HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Existing Saturday PM Peak  
 9/12/2003

A24

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	6	15	401	3	16	232
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	6	15	401	3	16	232
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	666	402			404	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	666	402			404	
tC, single (s)	7.4	6.4			4.3	
tC, 2 stage (s)						
tF (s)	4.4	3.5			2.4	
p0 queue free %	98	98			99	
cM capacity (veh/h)	299	611			1069	

Direction Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	6	15	404	248
Volume Left	6	0	0	16
Volume Right	0	15	3	0
cSH	299	611	1700	1069
Volume to Capacity	0.02	0.02	0.24	0.01
Queue Length (m)	0.5	0.6	0.0	0.3
Control Delay (s)	17.3	11.0	0.0	0.7
Lane LOS	C	B		A
Approach Delay (s)	12.8		0.0	0.7
Approach LOS	B			

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		31.9%	ICU Level of Service A

A25

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Background Weekday AM Peak  
9/15/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔		↔	↔		↔	↔
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Fit Protected												
Satd. Flow (prot)	0	2041	1375	0	2047	1322	0	1956	1322	0	1773	1375
Fit Permitted		0.955			0.822			0.961			0.937	
Satd. Flow (perm)	0	1949	1375	0	1682	1322	0	1880	1322	0	1661	1375
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			20			40			220			10
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	20	220	20	110	290	40	10	40	220	20	50	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	1%	3%	4%	0%	9%	4%	14%	20%	0%
Adj. Flow (vph)	20	220	20	110	290	40	10	40	220	20	50	10
Lane Group Flow (vph)	0	240	20	0	400	40	0	50	220	0	70	10
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	28.0	28.0	28.0	15.0	43.0	43.0	27.0	27.0	27.0	27.0	27.0	27.0
Total Split (%)	40%	40%	40%	21%	61%	61%	39%	39%	39%	39%	39%	39%
Maximum Green (s)	24.0	24.0	24.0	12.0	39.0	39.0	23.0	23.0	23.0	23.0	23.0	23.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		16.0	16.0		16.0	16.0		10.4	10.4		10.4	10.4
Actuated g/C Ratio		0.47	0.47		0.47	0.47		0.32	0.32		0.32	0.32
v/c Ratio		0.26	0.03		0.50	0.06		0.08	0.39		0.13	0.02
Uniform Delay, d1		5.0	0.0		5.7	0.0		7.2	0.0		7.3	0.0
Delay		5.6	2.8		6.5	2.3		9.5	2.5		9.7	6.2

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Background Weekday AM Peak  
9/15/2003

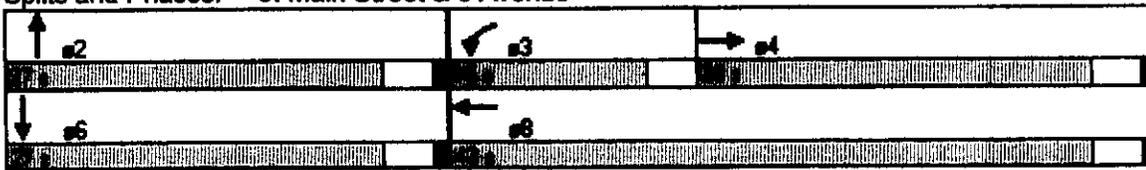
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A	A		A	A		A	A
Approach Delay		5.4			6.1			3.8			9.3	
Approach LOS		A			A			A			A	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 30.1  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.50  
 Intersection Signal Delay: 5.6  
 Intersection Capacity Utilization 53.3%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Future Background Weekday AM Peak  
 9/15/2003

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑	↘	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	510	0	0	400	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	510	0	0	400	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage (veh)						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			510		910	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			510		910	255
tC, single (s)			4.4		7.0	7.0
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			966		263	729

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	340	170	0	400	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.20	0.10	0.00	0.24	0.00
Queue Length (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary					
Average Delay			0.0		
Intersection Capacity Utilization			25.0%	ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Future Background Weekday AM Peak  
9/15/2003

Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	0.91	0.91
Fr <sub>t</sub>				0.850		
Flt Protected						0.991
Satd. Flow (prot)	1425	1432	3377	1408	1203	2752
Flt Permitted	0.607					0.991
Satd. Flow (perm)	865	1432	3377	1408	1203	2752
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		410		50		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	110	410	160	50	320	420
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	11%	13%	12%	16%	21%	18%
Adj. Flow (vph)	110	410	160	50	320	420
Lane Group Flow (vph)	110	410	160	50	223	517
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	23.0	23.0	20.0	20.0	27.0	27.0
Total Split (%)	33%	33%	29%	29%	39%	39%
Maximum Green (s)	19.0	19.0	16.0	16.0	23.0	23.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	13.8	13.8	15.2	15.2	18.7	18.7
Actuated g/C Ratio	0.25	0.25	0.26	0.26	0.34	0.34
v/c Ratio	0.51	0.62	0.18	0.12	0.55	0.55
Uniform Delay, d1	18.0	0.0	18.7	0.0	15.0	15.1
Delay	21.6	2.9	19.3	7.6	18.6	17.2

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Future Background Weekday AM Peak  
9/15/2003

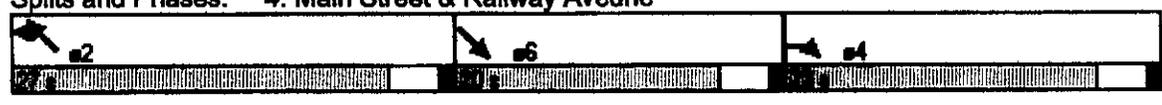
						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	C	A	B	A	B	B
Approach Delay	6.8		16.5			17.6
Approach LOS	A		B			B

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 55  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.62  
 Intersection Signal Delay: 13.7  
 Intersection Capacity Utilization 49.3%  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Background Weekday AM Peak  
9/15/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Fr			0.850			0.850			0.850			
Fit Protected								0.994			0.992	
Satd. Flow (prot)	1429	3268	1109	1249	3325	1217	1103	2923	1156	1269	2847	1501
Fit Permitted	0.378			0.598				0.994			0.992	
Satd. Flow (perm)	540	3268	1109	747	3325	1217	1103	2923	1156	1269	2847	1501
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			210			390			60			80
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	80	240	210	100	450	390	240	420	60	240	330	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	17%	24%	31%	15%	13%	32%	28%	19%	16%	16%	9%
Adj. Flow (vph)	80	240	210	100	450	390	240	420	60	240	330	80
Lane Group Flow (vph)	80	240	210	100	450	390	179	481	60	175	395	80
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	8.0	23.0	23.0	8.0	23.0	23.0	26.0	26.0	26.0	23.0	23.0	23.0
Total Split (%)	10%	29%	29%	10%	29%	29%	33%	33%	33%	29%	29%	29%
Maximum Green (s)	5.0	16.5	16.5	5.0	16.5	16.5	19.5	19.5	19.5	16.5	16.5	16.5
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	21.6	18.5	18.5	21.6	18.5	18.5	20.1	20.1	20.1	18.5	18.5	18.5
Actuated g/C Ratio	0.28	0.25	0.25	0.28	0.25	0.25	0.27	0.27	0.27	0.25	0.25	0.25
v/c Ratio	0.40	0.30	0.49	0.42	0.55	0.66	0.61	0.62	0.17	0.56	0.57	0.19
Uniform Delay, d1	18.0	23.4	0.0	19.6	25.1	0.0	24.6	24.6	0.0	25.1	25.2	0.0
Delay	19.9	24.4	4.5	21.1	26.0	3.5	26.0	25.1	6.8	27.2	26.2	6.7

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Future Background Weekday AM Peak  
 9/15/2003

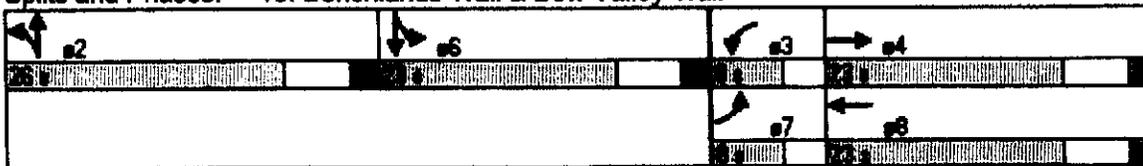
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C	A	C	C	A	C	C	A	C	C	A
Approach Delay		15.8			16.1			23.8			24.1	
Approach LOS		B			B			C			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 75.3  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.66  
 Intersection Signal Delay: 19.8  
 Intersection Capacity Utilization 57.6%  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Future Background Weekday AM Peak  
 9/15/2003

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	30	40	650	10	10	570
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	30	40	650	10	10	570
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1245	655			660	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1245	655			660	
tC, single (s)	6.8	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.3			2.2	
p0 queue free %	81	91			99	
cM capacity (veh/h)	159	470			938	

Direction Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	30	40	660	580
Volume Left	30	0	0	10
Volume Right	0	40	10	0
cSH	159	470	1700	938
Volume to Capacity	0.19	0.09	0.39	0.01
Queue Length (m)	5.1	2.1	0.0	0.2
Control Delay (s)	32.8	13.4	0.0	0.3
Lane LOS	D	B		A
Approach Delay (s)	21.7		0.0	0.3
Approach LOS	C			

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		47.0%	ICU Level of Service A

A53

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Background Weekday PM Peak  
9/15/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↑		↑	↑		↑	↑		↑	↑
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr												
Fr Protected												
Satd. Flow (prot)	0	2062	1618	0	2089	1586	0	2028	1586	0	2036	1618
Fr Permitted		0.854			0.583			0.935			0.852	
Satd. Flow (perm)	0	1761	1618	0	1218	1586	0	1896	1586	0	1734	1618
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			50			110			310			80
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	60	340	50	230	430	110	20	110	310	80	160	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	2%	0%	4%	2%	3%	3%	0%
Adj. Flow (vph)	60	340	50	230	430	110	20	110	310	80	160	80
Lane Group Flow (vph)	0	400	50	0	660	110	0	130	310	0	240	80
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	41.0	41.0	41.0	8.0	49.0	49.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (%)	59%	59%	59%	11%	70%	70%	30%	30%	30%	30%	30%	30%
Maximum Green (s)	37.0	37.0	37.0	5.0	45.0	45.0	17.0	17.0	17.0	17.0	17.0	17.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		35.9	35.9		35.9	35.9		13.7	13.7		13.7	13.7
Actuated g/C Ratio		0.70	0.70		0.70	0.70		0.25	0.25		0.25	0.25
v/c Ratio		0.33	0.04		0.78	0.10		0.27	0.49		0.55	0.17
Uniform Delay, d1		4.0	0.0		6.8	0.0		18.1	0.0		19.5	0.0
Delay		5.3	1.6		14.2	1.2		20.4	3.5		21.4	6.2

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Background Weekday PM Peak  
9/15/2003

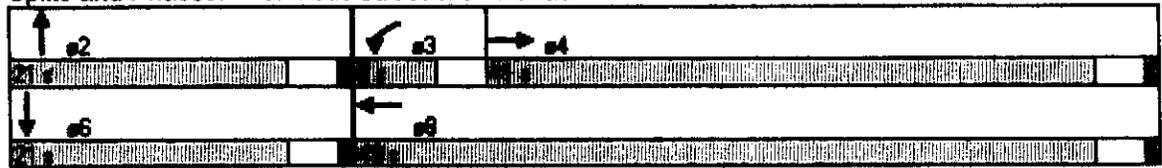
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		B	A		C	A		C	A
Approach Delay		4.9			12.3			8.5			17.6	
Approach LOS		A			B			A			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 51.5  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.78  
 Intersection Signal Delay: 10.7  
 Intersection Capacity Utilization 88.0%  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Future Background Weekday PM Peak  
 9/15/2003

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↖	↑	↗	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	740	0	0	750	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	740	0	0	750	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage veh						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			740		1490	370
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			740		1490	370
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			862		111	619

Direction Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	493	247	0	750	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.29	0.15	0.00	0.44	0.00
Queue Length (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary					
Average Delay			0.0		
Intersection Capacity Utilization			43.9%	ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↘	↙	↕	↘	↙	↕
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	*1.00	*1.00
Frt						
Fit Protected						
Satd. Flow (prot)	1536	1526	3502	1830	1509	3339
Fit Permitted						
Satd. Flow (perm)	0.540					
Satd. Flow (perm)	830	1526	3502	1830	1509	3339
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		450		125		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	300	450	600	170	550	640
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	6%	8%	5%	6%	9%
Adj. Flow (vph)	300	450	600	170	550	640
Lane Group Flow (vph)	300	450	600	170	372	818
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	45.0	45.0	23.0	23.0	32.0	32.0
Total Split (%)	45%	45%	23%	23%	32%	32%
Maximum Green (s)	41.0	41.0	19.0	19.0	28.0	28.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	35.6	35.6	18.5	18.5	25.7	25.7
Actuated g/C Ratio	0.39	0.39	0.20	0.20	0.28	0.28
v/c Ratio	0.93	0.52	0.86	0.36	0.88	0.88
Uniform Delay, d1	26.9	0.0	35.3	7.9	31.6	31.5
Delay	44.3	2.1	45.7	11.9	45.1	37.0

A37

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Future Background Weekday PM Peak  
9/15/2003

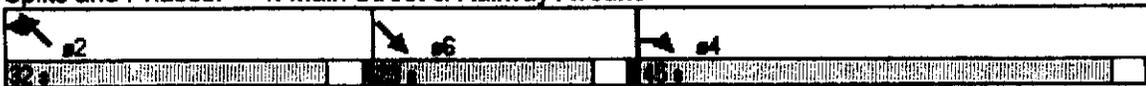
Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	D	A	D	B	D	D
Approach Delay	19.0		38.3			39.5
Approach LOS	B		D			D

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 92.2  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.93  
 Intersection Signal Delay: 33.5  
 Intersection Capacity Utilization 69.8%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service B

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Background Weekday PM Peak  
9/15/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	*1.00	*1.00	1.00	*1.00	*1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	1429	3540	1407	1352	3540	1395	1416	3776	1471	1498	3237	1514
Flt Permitted	0.241			0.216								
Satd. Flow (perm)	344	3540	1407	292	3540	1395	1416	3776	1471	1498	3237	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			235			309			66			200
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	90	690	280	110	600	320	450	560	80	470	350	200
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	8%	15%	21%	8%	16%	13%	9%	10%	8%	16%	8%
Adj. Flow (vph)	90	690	280	110	600	320	450	560	80	470	350	200
Lane Group Flow (vph)	90	690	280	110	600	320	274	736	80	264	556	200
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	9.0	22.5	22.5	9.0	22.5	22.5	25.5	25.5	25.5	23.0	23.0	23.0
Total Split (%)	11%	28%	28%	11%	28%	28%	32%	32%	32%	29%	29%	29%
Maximum Green (s)	6.0	16.0	16.0	6.0	16.0	16.0	19.0	19.0	19.0	16.5	16.5	16.5
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effect Green (s)	22.3	18.4	18.4	22.3	18.4	18.4	20.7	20.7	20.7	18.8	18.8	18.8
Actuated g/C Ratio	0.28	0.24	0.24	0.28	0.24	0.24	0.27	0.27	0.27	0.24	0.24	0.24
v/c Ratio	0.55	0.81	0.54	0.73	0.71	0.56	0.72	0.72	0.18	0.72	0.70	0.38
Uniform Delay, d1	18.4	28.0	3.8	20.1	27.1	0.8	25.8	25.8	3.7	27.0	26.8	0.0
Delay	21.1	32.5	6.6	36.1	27.9	4.3	30.2	26.3	8.5	33.0	27.7	4.4

A39

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Future Background Weekday PM Peak  
 9/15/2003

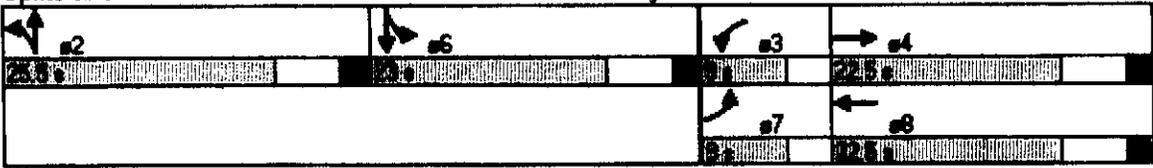
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	C	A	C	C	A	C	C	A
Approach Delay		24.7			21.5			26.0			24.5	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 76.9  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.81  
 Intersection Signal Delay: 24.2  
 Intersection Capacity Utilization 75.7%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service C

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Future Background Weekday PM Peak  
 9/15/2003

A40

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↘	↗	↓
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	70	930	30	80	580
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	10	70	930	30	80	580
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1685	945			960	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1685	945			960	
tC, single (s)	6.7	6.4			4.2	
tC, 2 stage (s)						
tF (s)	3.8	3.5			2.3	
p0 queue free %	87	76			89	
cM capacity (veh/h)	77	298			697	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	10	70	960	660
Volume Left	10	0	0	80
Volume Right	0	70	30	0
cSH	77	298	1700	697
Volume to Capacity	0.13	0.24	0.56	0.11
Queue Length (m)	3.2	6.8	0.0	2.9
Control Delay (s)	58.7	20.8	0.0	3.0
Lane LOS	F	C		A
Approach Delay (s)	25.5		0.0	3.0
Approach LOS	D			

Intersection Summary				
Average Delay			2.4	
Intersection Capacity Utilization		101.4%	ICU Level of Service	F

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Background Saturday PM Peak  
9/15/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>			0.850			0.850			0.850			0.850
Fl <sub>t</sub> Protected												
Satd. Flow (prot)	0	2079	1375	0	2080	1335	0	2001	1361	0	2069	1375
Fl <sub>t</sub> Permitted		0.889			0.750			0.924			0.835	
Satd. Flow (perm)	0	1848	1375	0	1560	1335	0	1849	1361	0	1728	1375
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40			70			220			60
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	50	320	40	120	420	70	20	70	220	80	100	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	1%	0%	0%	1%	3%	11%	3%	1%	3%	0%	0%
Adj. Flow (vph)	50	320	40	120	420	70	20	70	220	80	100	60
Lane Group Flow (vph)	0	370	40	0	540	70	0	90	220	0	180	60
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	35.0	35.0	35.0	12.0	47.0	47.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	50%	50%	50%	17%	67%	67%	33%	33%	33%	33%	33%	33%
Maximum Green (s)	31.0	31.0	31.0	9.0	43.0	43.0	19.0	19.0	19.0	19.0	19.0	19.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		20.2	20.2		20.2	20.2		11.7	11.7		11.7	11.7
Actuated g/C Ratio		0.52	0.52		0.52	0.52		0.31	0.31		0.31	0.31
v/c Ratio		0.39	0.05		0.67	0.10		0.16	0.38		0.34	0.13
Uniform Delay, d1		5.2	0.0		6.4	0.0		8.7	0.0		9.3	0.0
Delay		5.8	2.1		7.3	1.7		13.0	3.3		13.5	5.3

Lanes, Volumes, Timings  
 5: Main Street & 6 Avenue

Future Background Saturday PM Peak  
 9/15/2003

A42

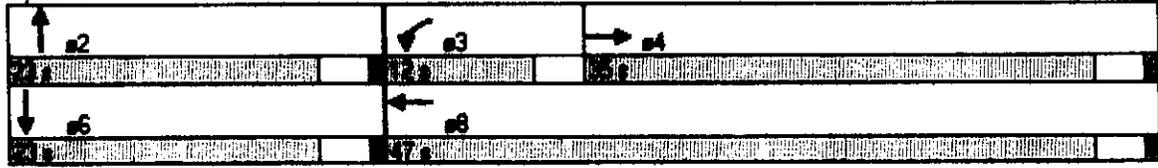
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A	A		B	A		B	A
Approach Delay		5.4			6.7			6.1			11.4	
Approach LOS		A			A			A			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 35.2  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.67  
 Intersection Signal Delay: 7.0  
 Intersection Capacity Utilization 76.3%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Future Background Saturday PM Peak  
 9/15/2003

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↓		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	640	0	0	620	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	640	0	0	620	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage (veh)						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			640		1260	320
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			640		1260	320
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			882		149	653

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	427	213	0	620	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.25	0.13	0.00	0.36	0.00
Queue Length (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

**Intersection Summary**

Average Delay	0.0
Intersection Capacity Utilization	36.8%
ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	0.91	0.91
Fr <sub>t</sub>				0.850		
Fit Protected						0.988
Satd. Flow (prot)	1551	1526	3637	1585	1414	3158
Fit Permitted	0.551					0.988
Satd. Flow (perm)	855	1526	3637	1585	1414	3158
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		440		143		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	240	440	450	150	500	540
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	6%	4%	3%	3%	3%
Adj. Flow (vph)	240	440	450	150	500	540
Lane Group Flow (vph)	240	440	450	150	319	721
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	43.0	43.0	21.0	21.0	36.0	36.0
Total Split (%)	43%	43%	21%	21%	36%	36%
Maximum Green (s)	39.0	39.0	17.0	17.0	32.0	32.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	26.2	26.2	16.7	16.7	24.6	24.6
Actuated g/C Ratio	0.33	0.33	0.21	0.21	0.31	0.31
v/c Ratio	0.86	0.55	0.60	0.34	0.74	0.74
Uniform Delay, d1	24.9	0.0	28.3	1.2	24.4	24.5
Delay	29.5	2.3	32.9	7.9	28.0	26.5

Lanes, Volumes, Timings  
4: Main Street & Railway Aveune

Future Background Saturday PM Peak  
9/15/2003

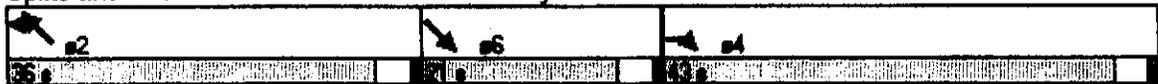
						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	C	A	C	A	C	C
Approach Delay	11.9		26.7			27.0
Approach LOS	B		C			C

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 80.3  
 Natural Cycle: 75  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.86  
 Intersection Signal Delay: 22.5  
 Intersection Capacity Utilization 58.7%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service A

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Background Saturday PM Peak  
9/15/2003

A46

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Fr			0.850			0.850			0.850			
Flt Protected								0.994			0.986	
Satd. Flow (prot)	1403	3607	1273	1588	3748	1250	1336	3532	1262	1376	3174	1168
Flt Permitted	0.327			0.258				0.994			0.986	
Satd. Flow (perm)	459	3607	1273	410	3748	1250	1336	3532	1262	1376	3174	1168
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			240			250			48			180
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	120	580	240	160	500	250	400	720	70	420	420	180
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	9%	6%	8%	3%	2%	10%	9%	6%	9%	7%	2%	40%
Adj. Flow (vph)	120	580	240	160	500	250	400	720	70	420	420	180
Lane Group Flow (vph)	120	580	240	160	500	250	305	815	70	249	591	180
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	9.0	22.5	22.5	9.0	22.5	22.5	26.0	26.0	26.0	22.5	22.5	22.5
Total Split (%)	11%	28%	28%	11%	28%	28%	33%	33%	33%	28%	28%	28%
Maximum Green (s)	6.0	16.0	16.0	6.0	16.0	16.0	19.5	19.5	19.5	16.0	16.0	16.0
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	23.3	18.3	18.3	24.1	20.1	20.1	21.8	21.8	21.8	18.3	18.3	18.3
Actuated g/C Ratio	0.29	0.23	0.23	0.30	0.25	0.25	0.27	0.27	0.27	0.23	0.23	0.23
v/c Ratio	0.63	0.70	0.50	0.80	0.53	0.50	0.83	0.84	0.18	0.79	0.81	0.44
Uniform Delay, d1	20.0	27.8	0.0	19.6	25.9	0.0	27.4	27.5	6.8	29.0	29.2	0.0
Delay	25.9	28.5	4.2	43.7	26.7	4.1	38.1	30.6	10.6	37.8	32.3	4.7

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Future Background Saturday PM Peak  
 9/15/2003

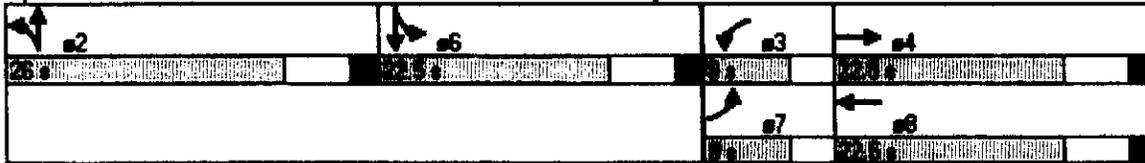
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	C	A	D	C	B	D	C	A
Approach Delay		21.9			23.5			31.3			28.8	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 79.4  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.84  
 Intersection Signal Delay: 26.7  
 Intersection Capacity Utilization 78.2%  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service C

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



HCM Unsignalized Intersection Capacity Analysis  
 18: Montane Road & Bow Valley Trail

Future Background Saturday PM Peak  
 9/15/2003

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	40	50	1030	20	50	850
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	40	50	1030	20	50	850
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1990	1040			1050	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1990	1040			1050	
tC, single (s)	7.4	6.4			4.3	
tC, 2 stage (s)						
tF (s)	4.4	3.5			2.4	
p0 queue free %	0	81			92	
cM capacity (veh/h)	33	258			602	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	40	50	1050	900
Volume Left	40	0	0	50
Volume Right	0	50	20	0
cSH	33	258	1700	602
Volume to Capacity	1.20	0.19	0.62	0.08
Queue Length (m)	32.7	5.3	0.0	2.1
Control Delay (s)	401.0	22.3	0.0	2.4
Lane LOS	F	C		A
Approach Delay (s)	190.6		0.0	2.4
Approach LOS	F			

Intersection Summary				
Average Delay			9.5	
Intersection Capacity Utilization		119.0%	ICU Level of Service	G

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Weekday AM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected												
Satd. Flow (prot)	0	2040	1375	0	2046	1322	0	1956	1322	0	1773	1375
Flt Permitted		0.961			0.785			0.961			0.936	
Satd. Flow (perm)	0	1960	1375	0	1606	1322	0	1880	1322	0	1659	1375
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			20			40			225			10
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	20	275	20	110	330	40	10	40	225	20	50	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	1%	3%	4%	0%	9%	4%	14%	20%	0%
Adj. Flow (vph)	20	275	20	110	330	40	10	40	225	20	50	10
Lane Group Flow (vph)	0	295	20	0	440	40	0	50	225	0	70	10
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0	30.0	14.0	44.0	44.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	43%	43%	43%	20%	63%	63%	37%	37%	37%	37%	37%	37%
Maximum Green (s)	26.0	26.0	26.0	11.0	40.0	40.0	22.0	22.0	22.0	22.0	22.0	22.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		17.0	17.0		17.0	17.0		10.6	10.6		10.6	10.6
Actuated g/C Ratio		0.49	0.49		0.49	0.49		0.32	0.32		0.32	0.32
v/c Ratio		0.31	0.03		0.56	0.06		0.08	0.39		0.13	0.02
Uniform Delay, d1		5.0	0.0		5.9	0.0		7.5	0.0		7.6	0.0
Delay		5.6	2.6		6.6	2.1		10.4	2.8		10.6	6.9

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Weekday AM Peak  
9/20/2003

A50

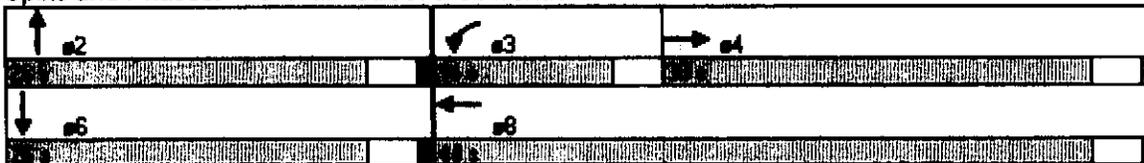
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A	A		B	A		B	A
Approach Delay		5.4			6.3			4.2			10.1	
Approach LOS		A			A			A			B	
Queue Length 50th (m)		8.8	0.0		15.4	0.0		1.9	0.0		2.6	0.0
Queue Length 95th (m)		19.5	1.8		34.4	2.6		8.1	11.2		10.5	2.3
Internal Link Dist (m)		141.8			146.9			127.6			162.8	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (m)			30.0			30.0			30.0			30.0
50th Bay Block Time %												
95th Bay Block Time %					18%							
Queuing Penalty (veh)					3							

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 30.8  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.56  
 Intersection Signal Delay: 5.8  
 Intersection Capacity Utilization 58.4%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
2: Main Street & 5 Avenue

Future Post-Dev. Weekday AM Peak  
10/29/2003

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	515	55	25	400	40	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	515	55	25	400	40	175
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage (veh)						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			570		992	285
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			570		992	285
tC, single (s)			4.4		7.0	7.0
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.4
p0 queue free %			97		82	75
cM capacity (veh/h)			914		226	697

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	343	227	25	400	215
Volume Left	0	0	25	0	40
Volume Right	0	55	0	0	175
cSH	1700	1700	914	1700	856
Volume to Capacity	0.20	0.13	0.03	0.24	0.25
Queue Length (m)	0.0	0.0	0.6	0.0	7.5
Control Delay (s)	0.0	0.0	9.0	0.0	14.2
Lane LOS			A		B
Approach Delay (s)	0.0		0.5		14.2
Approach LOS					B

Intersection Summary					
Average Delay	2.7				
Intersection Capacity Utilization	36.0%		ICU Level of Service		A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

Future Post-Dev. Weekday AM Peak  
9/20/2003

A52

Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↖	↗	↕	↗	↖	↕
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	0.91	0.91
Fr				0.850		
Flt Protected						0.990
Satd. Flow (prot)	1425	1432	3377	1408	1203	2748
Flt Permitted	0.602					0.990
Satd. Flow (perm)	858	1432	3377	1408	1203	2748
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		455		55		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	240	455	160	55	340	425
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	11%	13%	12%	16%	21%	18%
Adj. Flow (vph)	240	455	160	55	340	425
Lane Group Flow (vph)	240	455	160	55	230	535
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	28.0	28.0	20.0	20.0	22.0	22.0
Total Split (%)	40%	40%	29%	29%	31%	31%
Maximum Green (s)	24.0	24.0	16.0	16.0	18.0	18.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	20.3	20.3	15.2	15.2	18.2	18.2
Actuated g/C Ratio	0.33	0.33	0.23	0.23	0.30	0.30
v/c Ratio	0.84	0.58	0.20	0.15	0.64	0.65
Uniform Delay, d1	19.0	0.0	21.8	0.0	18.7	18.8
Delay	32.4	2.2	21.9	7.4	29.0	23.4

A53

Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	C	A	C	A	C	C
Approach Delay	12.6		18.2			25.1
Approach LOS	B		B			C
Queue Length 50th (m)	27.4	0.0	8.5	0.0	29.6	34.7
Queue Length 95th (m)	#64.0	17.2	15.4	7.9	#64.0	#53.0
Internal Link Dist (m)	34.5		163.5			104.0
50th Up Block Time (%)						
95th Up Block Time (%)	42%					
Turn Bay Length (m)				30.0		
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)	50					

**Intersection Summary**

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 60.9  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.84  
 Intersection Signal Delay: 19.0  
 Intersection Capacity Utilization 53.1%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

**Splits and Phases: 4: Main Street & Railway Aveune**



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Post-Dev. Weekday AM Peak  
9/20/2003

A54

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Frts			0.850			0.850			0.850			
Fit Protected								0.998			0.993	
Satd. Flow (prot)	1429	3268	1109	1249	3325	1217	1103	2942	1156	1269	2850	1501
Fit Permitted	0.359			0.597				0.998			0.993	
Satd. Flow (perm)	513	3268	1109	745	3325	1217	1103	2942	1156	1269	2850	1501
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			215			390			57			85
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	120	240	215	160	465	390	245	560	60	240	345	85
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	17%	24%	31%	15%	13%	32%	28%	19%	16%	16%	9%
Adj. Flow (vph)	120	240	215	160	465	390	245	560	60	240	345	85
Lane Group Flow (vph)	120	240	215	160	465	390	219	586	60	179	406	85
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	9.0	22.5	22.5	9.0	22.5	22.5	26.0	26.0	26.0	22.5	22.5	22.5
Total Split (%)	11%	28%	28%	11%	28%	28%	33%	33%	33%	28%	28%	28%
Maximum Green (s)	6.0	16.0	16.0	6.0	16.0	16.0	19.5	19.5	19.5	16.0	16.0	16.0
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	23.1	18.1	18.1	24.0	20.0	20.0	21.0	21.0	21.0	18.1	18.1	18.1
Actuated g/C Ratio	0.29	0.23	0.23	0.31	0.26	0.26	0.27	0.27	0.27	0.23	0.23	0.23
v/c Ratio	0.59	0.32	0.51	0.62	0.55	0.65	0.74	0.74	0.17	0.61	0.62	0.21
Uniform Delay, d1	19.4	24.7	0.0	20.0	25.5	0.0	26.4	26.4	1.1	27.2	27.2	0.0
Delay	22.5	25.5	4.5	25.9	26.7	3.5	32.5	26.6	7.5	28.4	27.7	6.6

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Future Post-Dev. Weekday AM Peak  
 9/20/2003

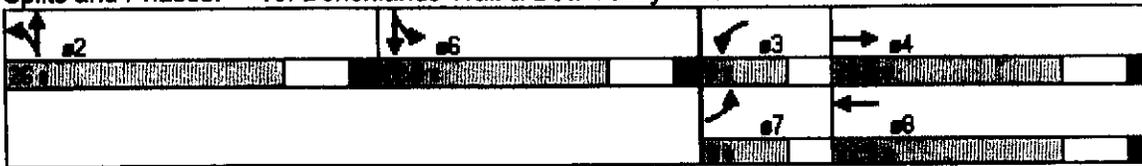
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	C	C	A	C	C	A	C	C	A
Approach Delay		17.0			17.7			26.8			25.2	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	12.9	15.1	0.0	18.0	31.6	0.0	32.9	44.1	0.3	26.8	30.4	0.0
Queue Length 95th (m)	#26.8	24.4	17.1	#37.6	45.8	24.6	#67.9	62.6	8.7	#49.4	45.3	10.3
Internal Link Dlst (m)		58.1			204.8			153.3			276.1	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		
50th Bay Block Time %								16%		26%	32%	
95th Bay Block Time %	20%	17%				4%	37%	33%		49%	47%	
Queuing Penalty (veh)	12	10				5	55	53		76	70	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 78.2  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 21.7  
 Intersection Capacity Utilization 64.8%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: C  
 ICU Level of Service B

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



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Lanes, Volumes, Timings  
18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday AM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	30.0		0.0	0.0		0.0	100.0		0.0	100.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	1551	1834	0	1130	1871	0	1551	1513	0	1582	1542	0
Flt Permitted	0.731			0.699			0.320			0.317		
Satd. Flow (perm)	1134	1834	0	790	1871	0	496	1513	0	502	1542	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		347			298			2			18	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		216.0			176.5			211.8			261.9	
Travel Time (s)		15.6			12.7			12.7			15.7	
Volume (vph)	145	0	90	30	0	40	15	650	10	10	575	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	40%	2%	0%	2%	24%	0%	0%	24%	2%
Adj. Flow (vph)	145	0	90	30	0	40	15	650	10	10	575	80
Lane Group Flow (vph)	145	90	0	30	40	0	15	660	0	10	655	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		26.5	26.5		26.5	26.5	
Total Split (s)	24.0	24.0	0.0	24.0	24.0	0.0	56.0	56.0	0.0	56.0	56.0	0.0
Total Split (%)	30%	30%	0%	30%	30%	0%	70%	70%	0%	70%	70%	0%
Maximum Green (s)	19.0	19.0		19.0	19.0		49.5	49.5		49.5	49.5	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.3	14.3		14.3	14.3		35.5	35.5		35.5	35.5	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.68	0.68		0.68	0.68	
v/c Ratio	0.49	0.12		0.15	0.06		0.04	0.64		0.03	0.62	
Uniform Delay, d1	18.8	0.0		17.0	0.0		3.5	6.1		3.5	5.7	
Delay	21.6	0.0		20.7	0.0		5.1	8.2		5.1	7.7	

Lanes, Volumes, Timings  
 18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday AM Peak  
 9/20/2003

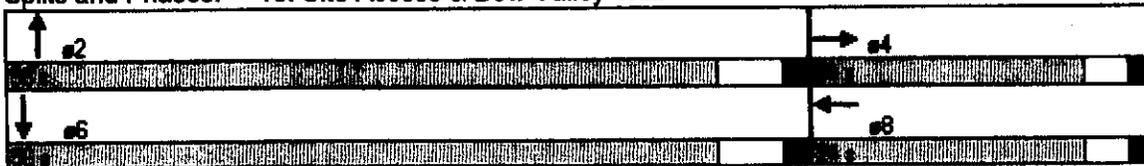
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A		C	A		A	A		A	A	
Approach Delay		13.3			8.9			8.1			7.7	
Approach LOS		B			A			A			A	
Queue Length 50th (m)	10.8	0.0		2.0	0.0		0.5	35.5		0.3	33.3	
Queue Length 95th (m)	36.6	0.0		10.3	0.0		2.7	89.8		2.1	84.1	
Internal Link Dist (m)		192.0			152.5			187.8			237.9	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (m)	30.0						100.0			100.0		
50th Bay Block Time %												
95th Bay Block Time %	20%						4%				2%	
Queuing Penalty (veh)	9											

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 52.3  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.64  
 Intersection Signal Delay: 8.7  
 Intersection Capacity Utilization 58.9%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service A

**Splits and Phases: 18: Site Access & Bow Valley Trail**



Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Weekday PM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕		↕	↕		↕	↕
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr												
Fit Protected												
Satd. Flow (prot)	0	2061	1618	0	2090	1586	0	2028	1586	0	2036	1618
Fit Permitted		0.853			0.592			0.934			0.849	
Satd. Flow (perm)	0	1758	1618	0	1237	1586	0	1894	1586	0	1728	1618
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			50			123			310			80
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	60	365	50	230	465	125	20	110	310	80	160	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	2%	0%	4%	2%	3%	3%	0%
Adj. Flow (vph)	60	365	50	230	465	125	20	110	310	80	160	80
Lane Group Flow (vph)	0	425	50	0	695	125	0	130	310	0	240	80
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	50.0	50.0	50.0	8.0	58.0	58.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (%)	63%	63%	63%	10%	73%	73%	28%	28%	28%	28%	28%	28%
Maximum Green (s)	46.0	46.0	46.0	5.0	54.0	54.0	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		40.6	40.6		40.6	40.6		14.4	14.4		14.4	14.4
Actuated g/C Ratio		0.72	0.72		0.72	0.72		0.24	0.24		0.24	0.24
v/c Ratio		0.34	0.04		0.78	0.11		0.28	0.50		0.58	0.18
Uniform Delay, d1		3.9	0.0		6.7	0.0		20.3	0.0		22.0	0.0
Delay		5.1	1.5		13.1	1.1		23.7	3.9		24.7	7.0

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Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Weekday PM Peak  
9/20/2003

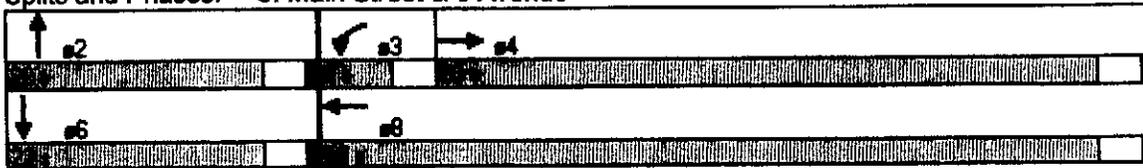
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		B	A		C	A		C	A
Approach Delay		4.8			11.3			9.7			20.3	
Approach LOS		A			B			A			C	
Queue Length 50th (m)		18.5	0.0		52.3	0.1		12.2	0.0		24.4	0.0
Queue Length 95th (m)		37.2	2.9		#150.8	4.5		31.0	18.7		55.7	10.1
Internal Link Dist (m)		141.8			146.9			127.6			162.8	
50th Up Block Time (%)												
95th Up Block Time (%)					10%							
Turn Bay Length (m)			30.0			30.0			30.0			30.0
50th Bay Block Time %					21%							
95th Bay Block Time %		12%			28%			10%			40%	
Queuing Penalty (veh)		3			65			14			16	

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 56.7  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.78  
 Intersection Signal Delay: 10.8  
 Intersection Capacity Utilization 91.2%  
 Intersection LOS: B  
 ICU Level of Service E

- \* User Entered Value
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Future Post-Dev. Weekday PM Peak  
 10/29/2003

A60

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑	↘	↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	740	20	120	750	45	85
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	740	20	120	750	45	85
<b>Pedestrians</b>						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type				None		
Median storage veh						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			760		1740	380
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			760		1740	380
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		31	86
cM capacity (veh/h)			848		65	609

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	493	267	120	750	130
Volume Left	0	0	120	0	45
Volume Right	0	20	0	0	85
cSH	1700	1700	848	1700	187
Volume to Capacity	0.29	0.16	0.14	0.44	0.69
Queue Length (m)	0.0	0.0	3.7	0.0	32.4
Control Delay (s)	0.0	0.0	9.9	0.0	59.0
Lane LOS			A		F
Approach Delay (s)	0.0		1.4		59.0
Approach LOS					F

**Intersection Summary**

Average Delay	5.0
Intersection Capacity Utilization	50.5%
ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↘	↗	↕	↗	↘	↕
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	*1.00	*1.00
Frnt						
Flt Protected						
Satd. Flow (prot)	1536	1526	3502	1830	1509	3341
Flt Permitted						
Satd. Flow (perm)	823	1526	3502	1830	1509	3341
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		490		190		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	345	490	605	265	580	640
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	6%	8%	5%	6%	9%
Adj. Flow (vph)	345	490	605	265	580	640
Lane Group Flow (vph)	345	490	605	265	381	839
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	47.0	47.0	22.0	22.0	31.0	31.0
Total Split (%)	47%	47%	22%	22%	31%	31%
Maximum Green (s)	43.0	43.0	18.0	18.0	27.0	27.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effect Green (s)	42.8	42.8	18.0	18.0	26.9	26.9
Actuated g/C Ratio	0.43	0.43	0.18	0.18	0.27	0.27
v/c Ratio	0.98	0.52	0.96	0.55	0.94	0.93
Uniform Delay, d1	27.9	0.0	40.4	9.9	35.5	35.5
Delay	61.2	1.8	60.0	11.9	57.5	45.6

Lanes, Volumes, Timings  
 4: Main Street & Railway Aveune

Future Post-Dev. Weekday PM Peak  
 9/20/2003

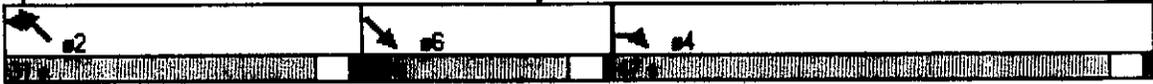
						
Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	E	A	E	B	E	D
Approach Delay	26.4		45.3			49.3
Approach LOS	C		D			D
Queue Length 50th (m)	64.0	0.0	58.7	12.6	72.1	79.2
Queue Length 95th (m)#	120.9	17.5	#90.8	36.1	#127.1	#113.9
Internal Link Dist (m)	34.5		163.5			104.0
50th Up Block Time (%)	29%					
95th Up Block Time (%)	50%				23%	14%
Turn Bay Length (m)				30.0		
50th Bay Block Time %			43%			
95th Bay Block Time %			58%	16%		
Queuing Penalty (veh)	136		134	24	44	60

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 99.7  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.98  
 Intersection Signal Delay: 41.6  
 Intersection Capacity Utilization 73.5%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: D  
 ICU Level of Service C

**Splits and Phases: 4: Main Street & Railway Aveune**



A63

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

Future Post-Dev. Weekday PM Peak  
 9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	*1.00	*1.00	1.00	*1.00	*1.00	1.00
Frt												
Fit Protected												
Satd. Flow (prot)	1429	3540	1407	1352	3540	1395	1416	3779	1471	1498	3207	1514
Fit Permitted	0.249			0.211								
Satd. Flow (perm)	356	3540	1407	285	3540	1395	1416	3779	1471	1498	3207	1514
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			237			311			125			202
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	100	715	290	110	600	320	455	600	160	470	500	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	7%	8%	15%	21%	8%	16%	13%	9%	10%	8%	16%	8%
Adj. Flow (vph)	100	715	290	110	600	320	455	600	160	470	500	225
Lane Group Flow (vph)	100	715	290	110	600	320	286	769	160	312	658	225
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	8.0	23.0	23.0	8.0	23.0	23.0	25.0	25.0	25.0	24.0	24.0	24.0
Total Split (%)	10%	29%	29%	10%	29%	29%	31%	31%	31%	30%	30%	30%
Maximum Green (s)	5.0	16.5	16.5	5.0	16.5	16.5	18.5	18.5	18.5	17.5	17.5	17.5
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effect Green (s)	23.1	19.0	19.0	23.9	20.7	20.7	20.7	20.7	20.7	19.9	19.9	19.9
Actuated g/C Ratio	0.28	0.24	0.24	0.30	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.25
v/c Ratio	0.65	0.85	0.56	0.79	0.65	0.54	0.78	0.78	0.34	0.83	0.82	0.42
Uniform Delay, d1	20.2	28.7	4.4	19.5	26.6	0.6	27.6	27.7	5.0	28.6	28.5	2.4
Delay	30.3	33.7	6.7	51.6	27.4	4.0	34.0	28.2	7.7	39.0	31.7	5.5

ABA

Lanes, Volumes, Timings  
 13: Benchlands Trail & Bow Valley Trail

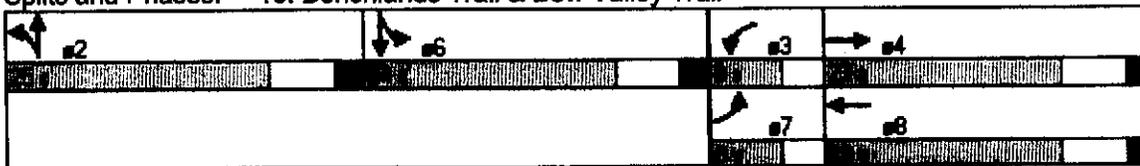
Future Post-Dev. Weekday PM Peak  
 9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	C	A	C	C	A	D	C	A
Approach Delay		26.3			22.7			26.9			28.7	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	10.7	52.0	6.4	11.9	41.9	1.1	40.1	54.0	4.0	44.9	47.2	2.7
Queue Length 95th (m)	#27.4	#78.4	28.0	#35.6	58.4	21.0	#77.1	72.9	18.0	#86.3	#71.6	19.0
Internal Link Dist (m)		58.1			204.8			153.3			276.1	
50th Up Block Time (%)												
95th Up Block Time (%)		25%										
Turn Bay Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		
50th Bay Block Time %		49%					16%	31%		48%	49%	
95th Bay Block Time %	21%	58%	6%				45%	42%		62%	58%	
Queuing Penalty (veh)	37	144	10				117	104		181	167	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 79.6  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.85  
 Intersection Signal Delay: 26.3  
 Intersection LOS: C  
 Intersection Capacity Utilization 80.1%  
 ICU Level of Service D  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



A65

Lanes, Volumes, Timings  
18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday PM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	30.0		0.0	0.0		0.0	100.0		0.0	100.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr												
Fit Protected												
Satd. Flow (prot)	1551	1834	0	1190	1599	0	1551	1664	0	1479	1633	0
Fit Permitted	0.711			0.702			0.288			0.173		
Satd. Flow (perm)	1103	1834	0	835	1599	0	447	1664	0	256	1633	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		363			185			5			39	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		219.0			176.5			211.8			261.9	
Travel Time (s)		15.8			12.7			12.7			15.7	
Volume (vph)	125	0	85	10	0	70	200	930	30	80	585	160
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	33%	2%	17%	2%	12%	25%	7%	18%	2%
Adj. Flow (vph)	125	0	85	10	0	70	200	930	30	80	585	160
Lane Group Flow (vph)	125	85	0	10	70	0	200	960	0	80	745	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		26.5	26.5		26.5	26.5	
Total Split (s)	21.0	21.0	0.0	21.0	21.0	0.0	59.0	59.0	0.0	59.0	59.0	0.0
Total Split (%)	26%	26%	0%	26%	26%	0%	74%	74%	0%	74%	74%	0%
Maximum Green (s)	16.0	16.0		16.0	16.0		52.5	52.5		52.5	52.5	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.4	14.4		14.4	14.4		46.8	46.8		46.8	46.8	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.74	0.74		0.74	0.74	
v/c Ratio	0.52	0.12		0.05	0.14		0.60	0.77		0.42	0.61	
Uniform Delay, d1	24.5	0.0		22.0	0.0		5.0	6.5		4.0	4.7	
Delay	27.9	0.0		25.5	0.0		10.9	11.1		7.5	6.3	

Lanes, Volumes, Timings  
 18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday PM Peak  
 9/20/2003

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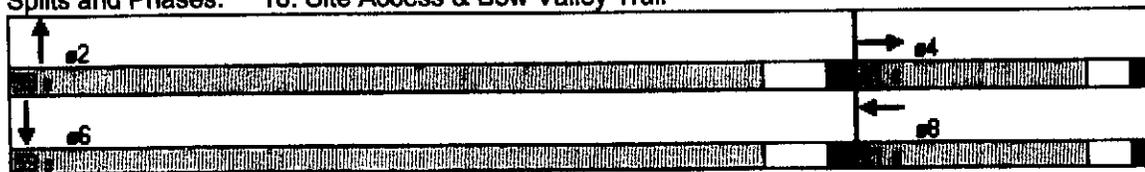
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A		C	A		B	B		A	A	
Approach Delay		16.6			3.2			11.1			6.4	
Approach LOS		B			A			B			A	
Queue Length 50th (m)	15.7	0.0		1.1	0.0		12.6	78.7		4.1	44.5	
Queue Length 95th (m)	33.6	0.0		5.2	0.0		#53.4	#173.8		17.4	84.3	
Internal Link Dist (m)		195.0			152.5			187.8			237.9	
50th Up Block Time (%)								5%				
95th Up Block Time (%)												
Turn Bay Length (m)	30.0						100.0			100.0		
50th Bay Block Time %								2%				
95th Bay Block Time %	15%							19%			3%	
Queuing Penalty (veh)	6							18				

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 62.9  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.77  
 Intersection Signal Delay: 9.6  
 Intersection Capacity Utilization 93.7%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: A  
 ICU Level of Service E

Splits and Phases: 18: Site Access & Bow Valley Trail



Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Saturday PM Peak  
9/20/2003

A67

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔		↔	↔		↔	↔
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7	3.7	4.8	3.7
Storage Length (m)	0.0		30.0	0.0		30.0	0.0		30.0	0.0		30.0
Storage Lanes	0		1	0		1	0		1	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frts			0.850			0.850			0.850			0.850
Flt Protected												
Satd. Flow (prot)	0	2078	1375	0	2080	1335	0	2001	1361	0	2066	1375
Flt Permitted		0.897			0.721			0.921			0.808	
Satd. Flow (perm)	0	1864	1375	0	1500	1335	0	1843	1361	0	1669	1375
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40			90			220			60
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.8			170.9			151.6			186.8	
Travel Time (s)		11.9			12.3			10.9			13.4	
Volume (vph)	50	360	40	120	435	90	20	70	220	100	100	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	1%	0%	0%	1%	3%	11%	3%	1%	3%	0%	0%
Adj. Flow (vph)	50	360	40	120	435	90	20	70	220	100	100	60
Lane Group Flow (vph)	0	410	40	0	555	90	0	90	220	0	200	60
Turn Type	Perm		Perm	pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	15.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	36.0	36.0	36.0	11.0	47.0	47.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	51%	51%	51%	16%	67%	67%	33%	33%	33%	33%	33%	33%
Maximum Green (s)	32.0	32.0	32.0	8.0	43.0	43.0	19.0	19.0	19.0	19.0	19.0	19.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)		21.9	21.9		21.9	21.9		12.5	12.5		12.5	12.5
Actuated g/C Ratio		0.53	0.53		0.53	0.53		0.31	0.31		0.31	0.31
v/c Ratio		0.42	0.05		0.70	0.12		0.16	0.39		0.39	0.13
Uniform Delay, d1		5.4	0.0		6.6	0.0		9.3	0.0		10.0	0.0
Delay		6.0	2.1		7.8	1.6		14.3	3.4		14.9	5.7

Lanes, Volumes, Timings  
5: Main Street & 6 Avenue

Future Post-Dev. Saturday PM Peak  
9/20/2003

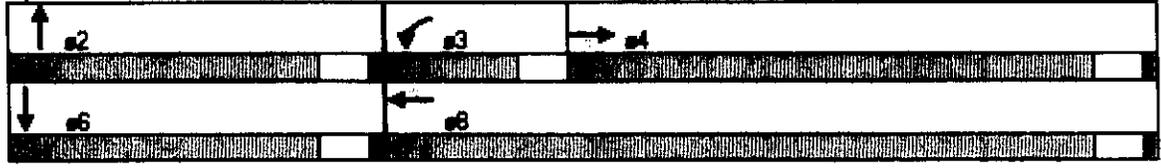
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		A	A		A	A		B	A		B	A
Approach Delay		5.7			6.9			6.6			12.7	
Approach LOS		A			A			A			B	
Queue Length 50th (m)		13.4	0.0		22.3	0.0		4.1	0.0		9.9	0.0
Queue Length 95th (m)		36.3	2.9		64.4	4.3		17.8	13.7		36.5	7.4
Internal Link Dist (m)		141.8			146.9			127.6			162.8	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (m)			30.0			30.0			30.0			30.0
50th Bay Block Time %					5%							
95th Bay Block Time %		15%			26%						20%	
Queuing Penalty (veh)		3			11						6	

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 37.8  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.70  
 Intersection Signal Delay: 7.4  
 Intersection Capacity Utilization 80.4%  
 \* User Entered Value

Intersection LOS: A  
 ICU Level of Service D

Splits and Phases: 5: Main Street & 6 Avenue



HCM Unsignalized Intersection Capacity Analysis  
 2: Main Street & 5 Avenue

Future Post-Dev. Saturday PM Peak  
 10/29/2003

ALA

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	645	55	90	620	35	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	645	55	90	620	35	80
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type					None	
Median storage veh						
Upstream signal (m)	171			136		
pX, platoon unblocked						
vC, conflicting volume			700		1472	350
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			700		1472	350
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			89		63	87
cM capacity (veh/h)			835		96	624

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	430	270	90	620	115
Volume Left	0	0	90	0	35
Volume Right	0	55	0	0	80
cSH	1700	1700	835	1700	314
Volume to Capacity	0.25	0.16	0.11	0.36	0.37
Queue Length (m)	0.0	0.0	2.7	0.0	12.4
Control Delay (s)	0.0	0.0	9.8	0.0	27.3
Lane LOS			A		D
Approach Delay (s)	0.0		1.2		27.3
Approach LOS					D

Intersection Summary					
Average Delay			2.6		
Intersection Capacity Utilization			43.5%	ICU Level of Service	A

Lanes, Volumes, Timings  
4: Main Street & Railway Avenue

Future Post-Dev. Saturday PM Peak  
9/20/2003

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Lane Group	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↶	↷	↶↷	↶	↶	↶↷
Ideal Flow (vphpl)	1600	1600	1850	1900	1600	1850
Lane Width (m)	3.5	3.7	3.8	3.7	3.6	3.4
Storage Length (m)	0.0	0.0		30.0	0.0	
Storage Lanes	1	1		1	1	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24	14		14	24	
Lane Util. Factor	1.00	1.00	*1.00	1.00	0.91	0.91
Frnt				0.850		
Flt Protected						0.987
Satd. Flow (prot)	1551	1526	3637	1585	1414	3155
Flt Permitted	0.546					0.987
Satd. Flow (perm)	847	1526	3637	1585	1414	3155
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		480		198		
Headway Factor	*1.00	*1.00	*1.00	*1.00	1.00	*1.00
Link Speed (k/h)	50		50			48
Link Distance (m)	58.5		187.5			128.0
Travel Time (s)	4.2		13.5			9.6
Volume (vph)	290	480	450	210	530	540
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	6%	4%	3%	3%	3%
Adj. Flow (vph)	290	480	450	210	530	540
Lane Group Flow (vph)	290	480	450	210	328	742
Turn Type		custom		Perm	Split	
Protected Phases		4	6		2	2
Permitted Phases	4			6		
Detector Phases	4	4	6	6	2	2
Minimum Initial (s)	10.0	10.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	48.0	48.0	20.0	20.0	32.0	32.0
Total Split (%)	48%	48%	20%	20%	32%	32%
Maximum Green (s)	44.0	44.0	16.0	16.0	28.0	28.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	* 3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	32.7	32.7	16.3	16.3	24.3	24.3
Actuated g/C Ratio	0.38	0.38	0.19	0.19	0.28	0.28
v/c Ratio	0.90	0.55	0.65	0.46	0.82	0.83
Uniform Delay, d1	24.6	0.0	31.8	1.6	28.4	28.5
Delay	31.1	1.8	37.5	7.2	38.0	32.9

Lanes, Volumes, Timings  
 4: Main Street & Railway Aveune

Future Post-Dev. Saturday PM Peak  
 9/20/2003

Lane Group	EBL	EBR	SET	SER	NWL	NWT
LOS	C	A	D	A	D	C
Approach Delay	12.9		27.9			34.5
Approach LOS	B		C			C
Queue Length 50th (m)	46.6	0.0	39.6	1.9	60.5	68.7
Queue Length 95th (m)	#91.5	17.1	#59.7	21.6	#115.0	#104.3
Internal Link Dist (m)	34.5		163.5			104.0
50th Up Block Time (%)	20%					
95th Up Block Time (%)	39%				7%	
Turn Bay Length (m)				30.0		
50th Bay Block Time %			25%			
95th Bay Block Time %			45%			
Queuing Penalty (veh)	85		73		10	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 85.9  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.90  
 Intersection Signal Delay: 26.1  
 Intersection Capacity Utilization 62.6%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: C  
 ICU Level of Service B

Splits and Phases: 4: Main Street & Railway Aveune



Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Post-Dev. Saturday PM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.2	3.9	3.7	3.8	3.9	3.7	3.6	4.7	3.7	3.7	3.5	3.8
Storage Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		0.0
Storage Lanes	1		1	1		1	1		1	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	*1.00	1.00	1.00	*1.00	1.00	0.91	0.91	1.00	0.91	0.91	1.00
Frt			0.850			0.850			0.850			
Flt Protected								0.996			0.989	
Satd. Flow (prot)	1403	3607	1273	1588	3748	1250	1336	3542	1262	1376	3194	1168
Flt Permitted	0.300			0.190				0.996			0.989	
Satd. Flow (perm)	421	3607	1273	302	3748	1250	1336	3542	1262	1376	3194	1168
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			188			221			51			200
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		82.1			228.8			177.3			300.1	
Travel Time (s)		5.9			16.5			12.8			21.6	
Volume (vph)	145	585	250	215	510	250	405	805	95	420	510	200
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	9%	6%	8%	3%	2%	10%	9%	6%	9%	7%	2%	40%
Adj. Flow (vph)	145	585	250	215	510	250	405	805	95	420	510	200
Lane Group Flow (vph)	145	585	250	215	510	250	330	880	95	275	655	200
Turn Type	pm+pt		Perm	pm+pt		Perm	Split		Perm	Split		Perm
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8			2			6
Detector Phases	7	4	4	3	8	8	2	2	2	6	6	6
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	8.0	22.5	22.5	8.0	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	13.0	23.0	23.0	15.0	25.0	25.0	35.0	35.0	35.0	27.0	27.0	27.0
Total Split (%)	13%	23%	23%	15%	25%	25%	35%	35%	35%	27%	27%	27%
Maximum Green (s)	10.0	16.5	16.5	12.0	18.5	18.5	28.5	28.5	28.5	20.5	20.5	20.5
Yellow Time (s)	3.0	4.5	4.5	3.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None											
Walk Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0	0	0	0	0	0	0
Act Effct Green (s)	27.6	18.9	18.9	32.3	21.3	21.3	30.1	30.1	30.1	23.0	23.0	23.0
Actuated g/C Ratio	0.28	0.19	0.19	0.33	0.21	0.21	0.30	0.30	0.30	0.23	0.23	0.23
v/c Ratio	0.71	0.85	0.63	0.89	0.63	0.57	0.81	0.82	0.23	0.86	0.88	0.47
Uniform Delay, d1	24.2	38.6	8.5	24.7	35.3	3.6	31.9	32.0	11.5	36.5	36.7	0.0
Delay	33.5	44.2	11.2	53.1	36.0	7.3	38.1	32.6	13.6	52.6	44.5	5.0

Lanes, Volumes, Timings  
13: Benchlands Trail & Bow Valley Trail

Future Post-Dev. Saturday PM Peak  
9/20/2003

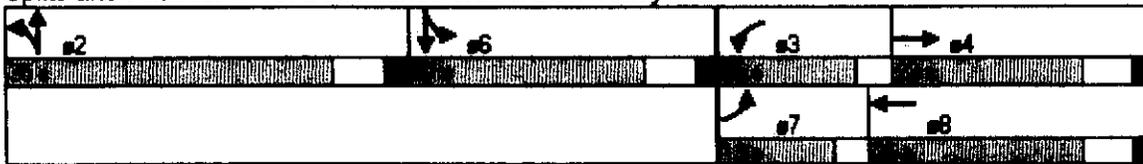
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	D	B	D	D	A	D	C	B	D	D	A
Approach Delay		34.2			32.4			32.6			39.5	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	20.5	55.3	10.3	31.5	45.5	4.6	64.0	85.6	6.1	56.5	67.9	0.0
Queue Length 95th (m)	#38.0	#81.0	35.9	#70.5	61.7	27.5	#111.8	110.0	17.9	#105.4	#100.2	18.1
Internal Link Dist (m)		58.1			204.8			153.3			276.1	
50th Up Block Time (%)		2%										
95th Up Block Time (%)		27%										
Turn Bay Length (m)	21.0		30.0	96.0		30.0	35.0		30.0	18.0		
50th Bay Block Time %	5%	53%					31%	41%		52%	56%	
95th Bay Block Time %	34%	62%	12%			4%	48%	47%		65%	63%	
Queuing Penalty (veh)	56	162	17			4	175	144		192	164	

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 99.1  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.89  
 Intersection Signal Delay: 34.7  
 Intersection Capacity Utilization 85.4%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: C  
 ICU Level of Service D

Splits and Phases: 13: Benchlands Trail & Bow Valley Trail



Lanes, Volumes, Timings  
18: Site Access & Bow Valley Trail

Future Post-Dev. Saturday PM Peak  
9/20/2003

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1600	1850	1600	1600	1850	1600	1600	1850	1600	1600	1850	1600
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	30.0		0.0	0.0		0.0	100.0		0.0	100.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (m)	15.2	15.2		15.2	15.2		15.2	15.2		15.2	15.2	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt												
Flt Protected												
Satd. Flow (prot)	1551	1834	0	791	1559	0	1551	1724	0	1330	1720	0
Flt Permitted	0.724			0.660			0.147			0.125		
Satd. Flow (perm)	1123	1834	0	522	1559	0	228	1724	0	166	1720	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		215			152			3			26	
Headway Factor	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00	*1.00
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		218.5			176.5			211.8			261.9	
Travel Time (s)		15.7			12.7			12.7			15.7	
Volume (vph)	115	0	120	40	0	50	130	1030	20	50	855	155
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	100%	2%	20%	2%	8%	33%	19%	10%	2%
Adj. Flow (vph)	115	0	120	40	0	50	130	1030	20	50	855	155
Lane Group Flow (vph)	115	120	0	40	50	0	130	1050	0	50	1010	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		26.5	26.5		26.5	26.5	
Total Split (s)	21.0	21.0	0.0	21.0	21.0	0.0	59.0	59.0	0.0	59.0	59.0	0.0
Total Split (%)	26%	26%	0%	26%	26%	0%	74%	74%	0%	74%	74%	0%
Maximum Green (s)	16.0	16.0		16.0	16.0		52.5	52.5		52.5	52.5	
Yellow Time (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None										
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.3	14.3		14.3	14.3		48.8	48.8		48.8	48.8	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.75	0.75		0.75	0.75	
v/c Ratio	0.49	0.22		0.36	0.11		0.76	0.81		0.40	0.77	
Uniform Delay, d1	25.4	0.0		24.7	0.0		6.1	6.7		3.8	6.1	
Delay	28.4	0.0		28.6	0.0		37.2	13.4		8.3	11.0	

Lanes, Volumes, Timings  
 18: Site Access & Bow Valley Trail

Future Post-Dev. Saturday PM Peak  
 9/20/2003

A75

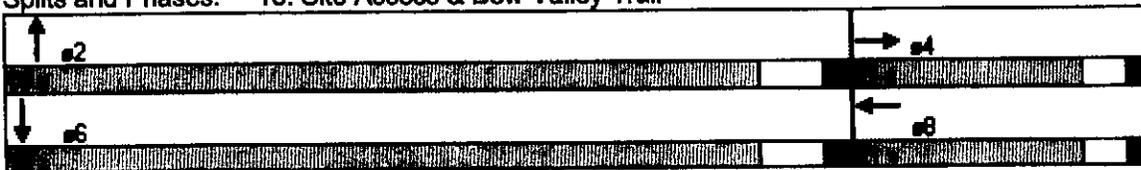
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	A		C	A		D	B		A	B	
Approach Delay		13.9			12.7			16.0			10.9	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	15.4	0.0		5.2	0.0		10.2	90.4		2.4	79.9	
Queue Length 95th (m)	31.1	0.3		14.7	0.0		#24.7	#216.9		#15.4	#201.1	
Internal Link Dist (m)		194.5			152.5			187.8			237.9	
50th Up Block Time (%)								14%				
95th Up Block Time (%)												
Turn Bay Length (m)	30.0						100.0			100.0		
50th Bay Block Time %								6%			3%	
95th Bay Block Time %	10%							25%			19%	
Queuing Penalty (veh)	6							20			5	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 64.7  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.81  
 Intersection Signal Delay: 13.6  
 Intersection Capacity Utilization 97.8%  
 \* User Entered Value  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: B  
 ICU Level of Service E

Splits and Phases: 18: Site Access & Bow Valley Trail



HCM Unsignalized Intersection Capacity Analysis  
18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday AM Peak  
10/17/2003

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	145	0	90	30	0	40	15	650	10	10	575	80
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	145	0	90	30	0	40	15	650	10	10	575	80
<b>Pedestrians</b>												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1355	1325	615	1370	1360	655	655			660		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1355	1325	615	1370	1360	655	655			660		
tC, single (s)	7.1	6.5	6.2	7.5	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.9	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	82	63	100	91	98			99		
cM capacity (veh/h)	113	152	491	82	144	470	932			938		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>				
Volume Total	145	90	30	40	15	660	10	655				
Volume Left	145	0	30	0	15	0	10	0				
Volume Right	0	90	0	40	0	10	0	80				
cSH	113	491	82	470	932	1700	938	1700				
Volume to Capacity	1.28	0.18	0.37	0.09	0.02	0.39	0.01	0.39				
Queue Length (m)	73.0	5.0	10.8	2.1	0.4	0.0	0.2	0.0				
Control Delay (s)	248.1	14.0	72.3	13.4	8.9	0.0	8.9	0.0				
Lane LOS	F	B	F	B	A		A					
Approach Delay (s)	158.5		38.6		0.2		0.1					
Approach LOS	F		E									

**Intersection Summary**

Average Delay		24.4										
Intersection Capacity Utilization		58.9%			ICU Level of Service					A		

HCM Unsignalized Intersection Capacity Analysis  
 18: Site Access & Bow Valley Trail

Future Post-Dev. Weekday PM Peak  
 10/17/2003

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	125	0	85	10	0	70	200	930	30	80	585	160
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	125	0	85	10	0	70	200	930	30	80	585	160
<b>Pedestrians</b>												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2225	2185	665	2175	2250	945	745			960		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2225	2185	665	2175	2250	945	745			960		
tC, single (s)	7.1	6.5	6.2	7.4	6.5	6.4	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.8	4.0	3.5	2.2			2.3		
p0 queue free %	0	100	82	40	100	76	77			89		
cM capacity (veh/h)	18	31	460	17	28	298	863			697		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>				
Volume Total	125	85	10	70	200	960	80	745				
Volume Left	125	0	10	0	200	0	80	0				
Volume Right	0	85	0	70	0	30	0	160				
cSH	18	460	17	298	863	1700	697	1700				
Volume to Capacity	7.05	0.18	0.60	0.24	0.23	0.56	0.11	0.44				
Queue Length (m)	Err	5.1	11.9	6.8	6.8	0.0	2.9	0.0				
Control Delay (s)	Err	14.6	389.0	20.8	10.4	0.0	10.8	0.0				
Lane LOS	F	B	F	C	B		B					
Approach Delay (s)	5957.7		66.8		1.8		1.1					
Approach LOS	F		F									

**Intersection Summary**

Average Delay		553.6										
Intersection Capacity Utilization		82.3%		ICU Level of Service						D		

HCM Unsignalized Intersection Capacity Analysis  
 18: Site Access & Bow Valley Trail

Future Post-Dev. Saturday PM Peak  
 10/17/2003

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Volume (veh/h)	115	0	120	40	0	50	130	1030	20	50	855	155	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (veh/h)	115	0	120	40	0	50	130	1030	20	50	855	155	
<b>Pedestrians</b>													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None								None				
Median storage (veh)													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	2372	2342	932	2375	2410	1040	1010			1050			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	2372	2342	932	2375	2410	1040	1010			1050			
tC, single (s)	7.1	6.5	6.2	8.1	6.5	6.4	4.1			4.3			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	4.4	4.0	3.5	2.2			2.4			
p0 queue free %	0	100	63	0	100	81	81			92			
cM capacity (veh/h)	16	27	323	6	24	258	686			602			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>NB 1</b>	<b>NB 2</b>	<b>SB 1</b>	<b>SB 2</b>					
Volume Total	115	120	40	50	130	1050	50	1010					
Volume Left	115	0	40	0	130	0	50	0					
Volume Right	0	120	0	50	0	20	0	155					
cSH	16	323	6	258	686	1700	602	1700					
Volume to Capacity	7.37	0.37	6.61	0.19	0.19	0.62	0.08	0.59					
Queue Length (m)	Err	12.7	Err	5.3	5.3	0.0	2.1	0.0					
Control Delay (s)	Err	22.6	Err	22.3	11.5	0.0	11.5	0.0					
Lane LOS	F	C	F	C	B		B						
Approach Delay (s)	4904.7		4456.4		1.3		0.5						
Approach LOS	F		F										

**Intersection Summary**

Average Delay		606.5										
Intersection Capacity Utilization		88.7%		ICU Level of Service						D		

## **APPENDIX B: Future Background Traffic Signal Warrant Analysis**



FIGURE B2-6

*Future Background Weekday PM Peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET**

*Ben Valley Trail / Montrose Road*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$  0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points =  $P_1 \times V_{tew} \times F_{eew}$   
 E-W Street - E. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 E-W Street - W. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

Priority points =  $P_1 \times V_{tne} \times F_{ens}$   
 N-S street - N. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 N-S street - S. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

**B. Two-Way Street (Figure B2-3)**

Priority points =  $P_2 \times V_{tew} \times F_{eew}$   
 E-W Street - E. of int. =  $\frac{-0.5}{-0.5} \times \frac{2.09}{0} \times \frac{1.0}{1.0} = \frac{-1.05}{0}$   
 E-W Street - W. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

Priority points =  $P_2 \times V_{tne} \times F_{ens}$   
 N-S street - N. of int. =  $\frac{-0.5}{-0.5} \times \frac{18.26}{17.05} \times \frac{1.0}{1.0} = \frac{-9.13}{-8.52}$   
 N-S street - S. of int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

**III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points

=  $(V_{aew} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow} \times F_T$   
 = (\_\_\_\_\_ + \_\_\_\_\_) x (\_\_\_\_\_ + \_\_\_\_\_) x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

2). Priority points

=  $P_3 \times F_T$  = \_\_\_\_\_

**B. Through Street Two-Way**

Priority points

=  $(V_{aew} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow}$   
 =  $(\frac{0.88}{0} + \frac{0}{0}) \times (\frac{12.32}{0} + \frac{0}{0}) \times \frac{1.0}{1.0} = \frac{15.68}{0}$

**TOTAL PRIORITY POINTS** -3.03

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 80

FIGURE B2-6

Assumptions:

1. Distance from nearest signal = 450m
2. Nearest signal cycle length = 80sec
3. Speed = 60 km/h



FIGURE B2-6

*Future Background Saturday PM peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET**

*Bow Valley Trail / Montbaine Road*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$  0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points =  $P_1 \times V_{tw} \times F_{ew}$   
 E-W Street - E. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 E-W Street - W. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

Priority points =  $P_1 \times V_{ts} \times F_{ns}$   
 N-S street - N. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 N-S street - S. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

**B. Two-Way Street (Figure B2-3)**

Priority points =  $P_2 \times V_{tw} \times F_{ew}$   
 E-W Street - E. of Int. =  $\frac{-0.5}{1.0} \times \frac{1.76}{1.0} \times \frac{1.0}{1.0} = \frac{-0.88}{1.0}$   
 E-W Street - W. of Int. =  $\frac{-0.5}{1.0} \times \frac{0}{1.0} \times \frac{1.0}{1.0} = \frac{0}{1.0}$

Priority points =  $P_2 \times V_{ts} \times F_{ns}$   
 N-S street - N. of Int. =  $\frac{-0.5}{1.0} \times \frac{21.78}{1.0} \times \frac{1.0}{1.0} = \frac{-10.89}{1.0}$   
 N-S street - S. of Int. =  $\frac{-0.5}{1.0} \times \frac{21.34}{1.0} \times \frac{1.0}{1.0} = \frac{-10.67}{1.0}$  *-22.44*

**III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points

=  $(V_{asw} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow} \times F_r$   
 = (\_\_\_\_ + \_\_\_\_ ) x (\_\_\_\_ + \_\_\_\_ ) x \_\_\_\_ x \_\_\_\_ = \_\_\_\_\_

2). Priority points

=  $P_a \times F_t$  = \_\_\_\_\_

**B. Through Street Two-Way**

Priority points

=  $(V_{asw} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow}$   
 =  $(\frac{0.99}{1.0} + \frac{0}{1.0}) \times (\frac{21.45}{1.0} + \frac{0}{1.0}) \times \frac{1.0}{1.0} = \frac{21.24}{1.0}$

**TOTAL PRIORITY POINTS** -1.20

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 60

FIGURE B2-6

*Assumptions:*

1. Distance from nearest signal = 450m
2. Nearest signal cycle length = 80 sec
3. Speed = 60 km/h

**APPENDIX C: Post Development Traffic Signal Warrant Analysis**



C1

FIGURE B2-6

*Future Post-Development Weekday PM Peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT  
AND PRIORITY RATING WORK SHEET**

*Bow Valley Trail / Montane Road*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$

0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points	=	$P_1$	x	$V_{1ew}$	x	$F_{ew}$	=	_____
E-W Street - E. of Int.	=	_____	x	_____	x	_____	=	_____
E-W Street - W. of Int.	=	_____	x	_____	x	_____	=	_____
Priority points	=	$P_1$	x	$V_{1ns}$	x	$F_{ns}$	=	_____
N-S street - N. of Int.	=	_____	x	_____	x	_____	=	_____
N-S street - S. of Int.	=	_____	x	_____	x	_____	=	_____

**B. Two-Way Street (Figure B2-3)**

Priority points =	=	$P_2$	x	$V_{2ew}$	x	$F_{2ew}$	=	_____
E-W Street - E. of Int.	=	<u>-0.5</u>	x	<u>2.09</u>	x	<u>1.0</u>	=	<u>-1.05</u>
E-W Street - W. of Int.	=	<u>-0.5</u>	x	<u>6.27</u>	x	<u>1.0</u>	=	<u>-3.14</u>
Priority points	=	$P_2$	x	$V_{2ns}$	x	$F_{2ns}$	=	_____
N-S street - N. of Int.	=	<u>-0.5</u>	x	<u>21.45</u>	x	<u>1.0</u>	=	<u>-10.73</u>
N-S street - S. of Int.	=	<u>-0.5</u>	x	<u>20.24</u>	x	<u>1.0</u>	=	<u>-10.12</u>

-25.04

**III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points

$$= (V_{aew} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow} \times F_r$$

$$= ( \_ + \_ ) \times ( \_ + \_ ) \times \_ \times \_ = \_$$

2). Priority points

$$= P_3 \times F_1 = \_$$

**B. Through Street Two-Way**

Priority points

$$= (V_{aew} + P_{ew}) \times (V_{ans} + P_{ns}) \times F_{ow}$$

$$= ( \underline{3.19} + \underline{0} ) \times ( \underline{21.84} + \underline{0} ) \times \underline{1.0} = \underline{69.67}$$

**TOTAL PRIORITY POINTS**

44.63

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 80

FIGURE B2-6

Assumptions:

1. Distance from nearest signal = 465m
2. Nearest signal cycle length = 80sec.
3. Speed = 60km/hr



FIGURE B2-6

*Future Post-Development Saturday PM Peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET**

*Bow Valley Trail / Montane Road*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$

0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points =  $P_1 \times V_{tw} \times F_{ew}$   
 E-W Street - E. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 E-W Street - W. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 Priority points =  $P_1 \times V_{trn} \times F_{ns}$   
 N-S street - N. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_  
 N-S street - S. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

**B. Two-Way Street (Figure B2-3)**

Priority points =  $P_2 \times V_{tw} \times F_{ew}$   
 E-W Street - E. of Int. =  $\frac{-1.0}{1.0} \times \frac{1.76}{1.0} \times \frac{1.0}{1.0} = -1.76$   
 E-W Street - W. of Int. =  $\frac{-1.0}{1.0} \times \frac{5.72}{1.0} \times \frac{1.0}{1.0} = -5.72$   
 Priority points =  $P_2 \times V_{trn} \times F_{ns}$   
 N-S street - N. of Int. =  $\frac{-1.0}{1.0} \times \frac{24.81}{1.0} \times \frac{1.0}{1.0} = -24.81$   
 N-S street - S. of Int. =  $\frac{-1.0}{1.0} \times \frac{24.15}{1.0} \times \frac{1.0}{1.0} = -24.15$

*-56.44*

**III Crossing Gaps, intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points  
 =  $(V_{aw} + P_{ew}) \times (V_{ns} + P_{ns}) \times F_{ow} \times F_r$   
 = (\_\_\_\_ + \_\_\_\_ ) x (\_\_\_\_ + \_\_\_\_ ) x \_\_\_\_ x \_\_\_\_ = \_\_\_\_\_

2). Priority points  
 =  $P_3 \times F_t$  = \_\_\_\_\_

**B. Through Street Two-Way**

Priority points  
 =  $(V_{aw} + P_{ew}) \times (V_{ns} + P_{ns}) \times F_{ow}$   
 =  $(3.58 + 0) \times (24.64 + 0) \times 1.0 = 88.21$

**TOTAL PRIORITY POINTS** 31.77

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 80

FIGURE B2-6

*Assumptions:*

1. Distance from nearest signal = 450m.
2. Nearest signal cycle length = 100 sec.
3. Speed = 60 km/h.

FIGURE B2-6

*Future Post-Development Weekday PM Peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET**

*Main Street / 5 Avenue*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$  0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points	=	$P_1$	x	$V_{tew}$	x	$F_{eew}$	=	_____
E-W Street - E. of int.	=	_____	x	_____	x	_____	=	_____
E-W Street - W. of int.	=	_____	x	_____	x	_____	=	_____
Priority points	=	$P_1$	x	$V_{tne}$	x	$F_{ene}$	=	_____
N-S street - N. of int.	=	_____	x	_____	x	_____	=	_____
N-S street - S. of int.	=	_____	x	_____	x	_____	=	_____

**B. Two-Way Street (Figure B2-3)**

Priority points =	=	$P_2$	x	$V_{tew}$	x	$F_{eew}$	=	_____
E-W Street - E. of int.	=	<u>-0.6</u>	x	<u>18.65</u>	x	<u>1.0</u>	=	<u>-11.19</u>
E-W Street - W. of int.	=	<u>-0.6</u>	x	<u>17.11</u>	x	<u>1.0</u>	=	<u>-10.27</u>
Priority points	=	$P_2$	x	$V_{tne}$	x	$F_{ene}$	=	_____
N-S street - N. of int.	=	<u>-0.6</u>	x	<u>0</u>	x	<u>1.0</u>	=	<u>0</u>
N-S street - S. of int.	=	<u>0.6</u>	x	<u>2.97</u>	x	<u>1.0</u>	=	<u>-1.78</u>

*-23.24*

**III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points  
 =  $(V_{aew} + P_{ew}) \times (V_{ans} + P_{ne}) \times F_{ow} \times F_r$   
 = ( \_\_\_\_\_ + \_\_\_\_\_ ) x ( \_\_\_\_\_ + \_\_\_\_\_ ) x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

2). Priority points  
 =  $P_3 \times F_t$  = \_\_\_\_\_

**B. Through Street Two-Way**

Priority points  
 =  $(V_{aew} + P_{ew}) \times (V_{ans} + P_{ne}) \times F_{ow}$   
 =  $(\underline{17.93} + \underline{0}) \times (\underline{1.43} + \underline{0}) \times \underline{1.0}$  = 25.64

**TOTAL PRIORITY POINTS** 2.4

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 80

FIGURE B2-6

*Assumptions:*

1. Distance from nearest signal = 135m
2. Nearest signal cycle length = 100 sec
3. Speed = 50 km/hr

FIGURE B2-6

*Future Post-Development Saturday Pm Peak*

**TRAFFIC CONTROL SIGNAL INSTALLATION WARRANT AND PRIORITY RATING WORK SHEET**

*Main Street / 5 Avenue*

Location \_\_\_\_\_ Year \_\_\_\_\_ Date of Count \_\_\_\_\_

**I Collisions (Figure B2-1)**

Priority points =  $P_a$  0

**II Crossing Gaps, Progression, Delay and Vehicular Stops**

**A. One-Way Street (Figure B2-2)**

Priority points =  $P_1 \times V_{tw} \times F_{ew}$

E-W Street - E. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

E-W Street - W. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

Priority points =  $P_1 \times V_{ts} \times F_{ns}$

N-S street - N. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

N-S street - S. of Int. = \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

**B. Two-Way Street (Figure B2-3)**

Priority points =  $P_2 \times V_{tw} \times F_{ew}$

E-W Street - E. of Int. =  $\frac{-0.6}{1.0} \times \frac{15.79}{1.0} \times \frac{1.0}{1.0} = -9.47$

E-W Street - W. of Int. =  $\frac{-0.6}{1.0} \times \frac{14.91}{1.0} \times \frac{1.0}{1.0} = -8.95$

Priority points =  $P_2 \times V_{ts} \times F_{ns}$

N-S street - N. of Int. =  $\frac{-0.6}{1.0} \times \frac{0}{1.0} \times \frac{1.0}{1.0} = 0$

N-S street - S. of Int. =  $\frac{-0.6}{1.0} \times \frac{2.86}{1.0} \times \frac{1.0}{1.0} = -1.72$  -20.14

**III Crossing Gaps, Intersecting Volumes, and Pedestrian Volumes**

**A. Through Street One-Way (Figures B2-4 and B2-5)**

1). Priority points

=  $(V_{aw} + P_{aw}) \times (V_{ns} + P_{ns}) \times F_{ow} \times F_r$

= (\_\_\_\_\_ + \_\_\_\_\_) x (\_\_\_\_\_ + \_\_\_\_\_) x \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

2). Priority points

=  $P_3 \times F_t$  = \_\_\_\_\_

**B. Through Street Two-Way**

Priority points

=  $(V_{aw} + P_{aw}) \times (V_{ns} + P_{ns}) \times F_{ow}$

=  $(15.51 + 0) \times (12.7 + 0) \times 1.0 = 19.70$

**TOTAL PRIORITY POINTS** -0.44

NOTE: Complete I; the appropriate equation for each intersection leg in Section II A and/or II B; and either Section IIIA or III B.

\* Maximum points for II = + 80

FIGURE B2-6

*Assumptions:*

1. Distance from nearest signal = 135m
2. Nearest signal cycle length = 100 sec.
3. Speed = 50 km/h