

**REVIEW OF HIGHWAY 97 SPRUCE STREET
INTERSECTION OPERATIONAL ANALYSIS – EBA
ENGINEERING CONSULTANTS LTD
AUGUST 2008**

Location: Prince George, British Columbia
Reference: Independant Study and Peer Review of
Veteran's Land Act Area, British Columbia
Our File: 90179RGB

Prepared for:

LeftTurnNow.com - Community Action Group
PO Box 2641
Prince George, BC, V2N 4T5

Participating Consultants:



Russell Brownlee, B.Sc., M. A. Sc., FITE, P. Eng. (Licence #33262)



April 8, 2009

TABLE OF CONTENTS

1.0	SUMMARY	1
2.0	INTRODUCTION	3
2.1	Scope of Services	3
2.2	Available Information and Data	4
3.0	OPTIONS ANALYSIS	5
4.0	OPERATIONAL ANALYSIS	6
4.1	Left Turn Volume	6
4.2	Existing Northbound Through Volume	6
4.3	Traffic Forecasting	7
4.4	Intersection Capacity Analysis	8
5.0	SAFETY ANALYSIS	9
5.1	Methodology	9
5.2	Collision and Cost of Collision Quantification	9
5.3	Collision Rate Comparison	11
6.0	CONCLUSIONS	12

APPENDIX A – Curricula Vitae

1.0 SUMMARY

For over ten years, the Province of British Columbia has considered a number of requests from the community to provide southbound left turn access from Highway 97 in the vicinity of Spruce Street. In August 2008 a report titled 'Operational Safety Analysis Highway 97/Spruce Street, Prince George, B.C.' (the 'EBA Report') was submitted to the MoT. The findings of this report included a number of capacity and safety issues associated with the southbound left turn and the report was used to deny the request of the community members.

The LeftTurnNow.com Community Action Group ('LeftTurnNow.com') was formed to collectively pursue the provision of the subject southbound left turn. LeftTurnNow.com is a group of area residents, workers and visitors associated with the Veteran's Land Act ('VLA') Subdivision.

In March 2009, LeftTurnNow.com retained Giffin Koerth to undertake a review of the EBA Report. Our review and analysis of the EBA report indicates that overall the analysis methodologies applied in the EBA Report are industry accepted standards; however, we do not support a number of volume and analysis assumptions incorporated into the operational and safety analysis. Specifically,

- The existing traffic volumes assumed in the operational and safety analysis appear to be significantly higher than those documented on Highway 97 through recent MoT counts and other independent sources;
- The forecasted traffic growth of 3.8% per annum on Highway 97 in the PM peak hour cannot be justified based on current volume trends and other primary indicators in the Prince George Area;
- The failing performance measures and poor level of service identified in the future capacity analysis of the proposed southbound left turn intersection is based on a robust background growth rate applied to volumes that greatly exceed the existing traffic flows along Highway 97; and,
- The safety prediction analysis solely focuses on the collision potential between southbound left turns and the northbound through movements at this isolated intersection. The analysis ignores the potential for collision reduction that would be observed on the area road network if existing motorists were diverted from the alternative routes they are currently taking.

The analysis summaries and basic calculations associated with the intersection capacity analysis and the collision prediction model were not provided in the report and therefore could not be replicated or confirmed. We would require this information in order to undertake a detailed review of the EBA analysis.

Based on our review we do not agree with the EBA report conclusions that the provision of the subject left turn will result in a significant increase in collision frequency or create a condition of operational failure on Highway 97.

2.0 INTRODUCTION

For over ten years, the Province of British Columbia has considered a number of requests from the community to provide southbound left turn access from Highway 97 in the vicinity of Spruce Street. In the Spring of 2008, the British Columbia Ministry of Transportation and Infrastructure (the 'MoT') retained EBA Engineering Consultants Ltd. to undertake an operational and safety review of the proposed left turn. The technical work for this study was completed by de Leur Consulting Limited and NovaTrans Engineering Inc. and peer reviewed by EBA Engineering Consultants. In August 2008 a report titled 'Operational Safety Analysis Highway 97/Spruce Street, Prince George, B.C.' (the 'EBA Report') was submitted to the MoT. The findings of this report included a number of capacity and safety issues associated with the southbound left turn and the report was used to deny the request of the community members.

The LeftTurnNow.com Community Action Group ('LeftTurnNow.com') was formed to collectively pursue the provision of the subject southbound left turn. LeftTurnNow.com is a group of area residents, workers and visitors associated with the Veteran's Land Act ('VLA') Subdivision. Members of LeftTurnNow.com reviewed the findings of the EBA Report and noted a number of key deficiencies in the analysis which they felt significantly affected the overall findings.

2.1 Scope of Services

In March 2009, LeftTurnNow.com retained Giffin Koerth to assess the operations and safety aspects of providing a southbound left turn from Highway 97 to Spruce Street or Victoria Street in the City of Prince George. In particular, we were asked to:

Undertake an independent review of the operations and safety of the proposed southbound left turn; and,

- Review the EBA Report and identify:
 - Areas of agreement or disagreement with the reported findings;
 - Data or analysis deficiencies and/or unsubstantiated conclusions / recommendations based on best practice; and,
 - Identify matters that required further clarification prior to offering an opinion.

This report represents our review of the EBA report. Our lack of comment on other aspects of the EBA report should not be taken as agreement or disagreement with those other aspects. An independent review of the operations and safety of the proposed southbound left turn lane is under separate cover.

For uniformity within this report and with those produced by others in this area, Highway 97 will be referenced as a north-south roadway. Accordingly, all other roadways intersecting with Highway 97 will be designated as east-west facilities.

2.2 Available Information and Data

In the course of our review, we completed field observations of the study area March 31 and April 1, 2009, in addition to an examination of the following provided materials:

- Numerous video tapes of turning movement counts, pedestrian counts and driving routes within the study area from August 2008 to March 2009;
- Victoria - Highway 97 Conceptual Left Turn, L&M Engineering Limited, dated June 23, 2008;
- City of Prince George Official Community Plan, dated November 27th, 2008;
- BC Stats, accessed on-line March 26th, 2009;
- Prince George Community Profile, Statistics Canada accessed on-line March 30, 2009 and April 6, 2009;
- Transcripts from a Prince George Council Meeting, LeftTurnNow.com, dated September 8, 2008;
- Operational and Safety Analysis Highway 97/Spruce Street, Prince George, B.C., EBA Engineering Consultants Ltd., dated August 2008;
- Geometric and Laning design drawings, Highway 97, Province of British Columbia, dated May 2008;
- Various study area photographs, LeftTurnNow.com, dated 2008 and 2009
- Various turning movement counts accessed from the MoT and City of Prince George websites, various dates;
- Recreation Place Traffic Assessment, dated June 6, 2006;
- St. Laurent Motel Traffic Impact Study, L&M Engineering Limited, dated October 2004;
- Highway 16 West Corridor Study, McElhanney Consulting Services Ltd., dated October 2000; and,
- Simon Fraser Bridge Highway 97 Report – Prince George, dated April 2005.

3.0 OPTIONS ANALYSIS

Overall we take no issue with the three options reviewed in the EBA report. We note two matters that we do not agree with:

- The analysis of Option 2 assumes all-way stop control at the Victoria Street/Ford Avenue intersection. This right-of-way control is appropriate for the existing condition. It will need to be modified to reflect common right-of-way control in the Prince George community, which gives priority to traffic entering from the highway facility; and,
- There is reference to a 16 meter separation distance between Highway 97 and Ford Avenue. It appears that this may reflect the distance between the actual rights-of-way of the two facilities. Based on field observations, the separation distance of the travel portions of the two facilities is greater than 20 meters.

4.0 OPERATIONAL ANALYSIS

4.1 Left Turn Volume

EBA provides a qualitative justification for estimating the potential for 150 vehicles per hour on opening day of the proposed left turn on Page 11 of their report. We take no issue with this estimate.

An additional 30 southbound left trips are added to account for future growth. The rationale for this infill development related traffic appears to be arbitrary and not based on any actual development applications or land use plan.

4.2 Existing Northbound Through Volume

The existing northbound traffic volumes on Highway 97 used in the EBA report were based on data collected in 2004 as part of the Simon Fraser Bridge Report. Neither report provides the date or source of the counts. Given a 2008 preparation date, a 2004 count would be considered too old to reference based on an industry practice of three year old data.

A detailed review of the northbound Highway 97 volumes between Ferry Avenue and Highway 16 in the PM peak hour was undertaken by Giffin Koerth and is summarized in Table 1. It should be noted that the 2008 and 2009 counts were conducted after the submission date of the EBA report. However, the 2003, 2005 and 2006 counts from the Ministry of Transportation were available and should have placed some doubt in selecting a base case northbound through volume on Highway 97 in the vicinity of Spruce Street of 1225 vph. Specifically, the northbound right turn volume at Highway 16 is almost 400 vph in August 2005 versus a typical northbound right of 100 – 125 vph present in all other counts.

Table 1: Northbound Highway 97 PM Peak Hour Through Volume.

Date	PM Peak Hour NB Through Volume	Source
January 8, 2003	837 (718 Thru, 119 Rt)	Hwy 97/Spruce St. Count, MoT
March 19, 2003	836 (618 Thru, 111 Lt, 107 Rt)	Hwy 97/Hwy 16 Count, MoT
August 25, 2005	1220 (709 Thru, 133 Lt, 378 Rt)	Hwy 97/Hwy 16 Count, MoT
February 7, 2006	853 (656 Thru, 95 Lt, 102 Rt)	Hwy 97/Hwy 16 Count, MoT
August 25, 2006	972 (721 Thru, 126 Lt, 125 Rt)	Hwy 97/Hwy 16 Count, MoT
August 28, 2008	950 (847 Thru, 103 Rt)	Hwy 97/Spruce St. Count, LTN
August 29, 2008	886 (774 Thru, 112 Rt)	Hwy 97/Spruce St. Count, LTN
September 9, 2008	958 (853 Thru, 105 Rt)	Hwy 97/Spruce St. Count, LTN
October 29, 2008	936 (829 Thru, 107 Rt)	Hwy 97/Spruce St. Count, LTN
October 30, 2008	857 (739 Thru, 118 Rt)	Hwy 97/Spruce St. Count, LTN
March 12, 2009	790 (714 Thru, 76 Rt)	Hwy 97/Spruce St. Count, LTN
March 31, 2009	904 (Total Thru and Rt)	Hwy 97/Spruce St. Count, Giffin Koerth
Notes: LTN = LeftTurnNow.com Community Action Group		

Based on a review of the year and month of the counts currently available, it appears that a typical northbound through volume would be slightly over 900 vph in the PM peak hour. The EBA Report assumes an existing volume of 1225 northbound vph.

4.3 Traffic Forecasting

Traffic forecasts assumed in the EBA report were based on those assumed in the Simon Fraser Bridge Study prepared in 2005 by Ward Consulting Group. These values were derived from an EMME/2 travel forecast model maintained by the City and MoT. Both the EBA report and Ward Consulting report place doubt on the resultant 3.8% per annum growth rate applied to the northbound through volumes north of the bridge. The EBA report terms the 3.8% growth rate “fairly robust” and the Ward Consulting Report refers to them as “relatively high growth rates”. Both reports include scenarios with a typical 2% per annum growth rate, albeit under the premise that it is a low growth scenario. Table 2 is a summary of the sources and information provided which was used to determine traffic growth potential on Highway 97.

Table 2: Traffic growth indicators for Highway 97.

Source	Description
Simon Fraser Bridge Upgrading Ward Consulting Group 2005	3.5% per annum in northbound direction across the Simon Fraser Bridge (1999 to 2020)
MoT Count Station 42-018 South end of Simon Fraser Bridge	1.3% historic per annum growth rate reported in Simon Fraser Bridge Functional Design (April 2005) – Appendix F (Page 5)
City of Prince George Official Community Plan	Low population projections: 1% growth High population projections: 3% growth Likely population projections: 1.5% to 2.0% growth
BC Stats www.bc.stats.gov.bc.ca	2004 Population – 74,880 2008 Population – 74,092 Negative growth
Statistics Canada http://www.statcan.gc.ca/start-debut-eng.html	1996 Population – 75,150 2001 Population – 72,406 2006 Population – 70,981 Negative growth

The majority of the above traffic and population indicators suggest a growth rate less than 2%. The exception to this is the Ward Consulting Report. The bridge study traffic volumes were based on a high growth in employment south of the bridge. Model inputs included a growth in the industrial area south of the bridge of 255% over a 20 year horizon, which resulted in a northbound PM peak hour growth on Highway 97 of 3.8% per annum.

Table 3.1 in Appendix F of the Ward Report indicates a 1999 modelled volume of 896 northbound vehicles on Highway 97 north of the Ferry Avenue / Queensway Street ramps. The existing 2009 northbound volume is only 40 vehicles more (935 vph) than that modelled in 1999, almost ten years later. The calibrated travel forecast model indicated that the northbound Highway 97 volume north of Ferry Avenue would increase 220% between 1999 and 2020 and then projected

this value to 2030. The ten year growth observed between 1999 and 2009 indicates negligible growth in this volume.

Based on the above information, it would be reasonable for EBA to assume the 2% per annum growth as the most probable growth scenario.

4.4 Intersection Capacity Analysis

The intersection capacity analysis provided in the EBA report is prepared with an industry accepted standard methodology and software. We are unable to assess the overall findings of the EBA operational analysis, as the consultant has not provided the standard output summaries, which would show the calculations. Industry practice is to provide hard copies or digital files of the analysis to facilitate review by a third party.

While a detailed review could not be undertaken, the following were noted:

- There is no indication that the consultant attempted to calibrate their existing conditions analysis to actual field conditions, i.e., available gaps and other typical operational measures; and,
- On Page 13 of the EBA Report, Level of Service (LOS) definitions are provided below Table 5.1. A LOS C is defined as “Average”, whereas LOS C conditions in Table 5.1 are characterized as “marginally well”. The former definition is consistent with industry standard and with the Ward Consulting Report definition where LOS C represents “average traffic delays”.

Given the potential deficiencies related to the higher than observed existing traffic volumes and robust growth rates assumed, it is our opinion that the EBA analysis of the future conditions reflect operating conditions significantly worse than would be expected.

5.0 SAFETY ANALYSIS

5.1 Methodology

The safety analysis in the EBA report relies on a Collision Prediction Model (CPM) developed by UBC for application in the Province of British Columbia. We take no issue with this methodology.

The safety model analysis calibration is based on a 2.3 km section of Highway 97 from Highway 16 to Railway Road. The calibration exercise is not fully explained and it is unknown if it reflects only Highway 97 mainline collisions or if intersection and interchange ramp collisions are included.

Subsequent to this calibration, it appears that the remainder of the analysis provided in Section 7.0 of the EBA Report focuses solely on the southbound left turn intersection on Highway 97. Therefore, the safety analysis is based on a CPM for unsignalized (Options 1 and 2) and signalized (Option 3) intersections, only as a function of the expected entering volume (AADT). Option 3.

5.2 Collision and Cost of Collision Quantification

5.2.1 Safety Analysis Methods

The collision potential calculations are not provided in the EBA report and therefore could not be reviewed in detail.

Overall the collision analysis is predicated on adding the southbound left turn volume and increasing background traffic at the intersection. With this additional conflict point on the highway, the expected collisions increase. The expected collision prediction is not a function of a specific geometric challenge or poor operating condition at the proposed intersection, it is based solely on future volumes. As noted in Section 4.0, the future volumes predicted by EBA appear to be high and therefore will lead to higher collision predictions.

5.2.2 Scope of Analysis

It should also be recognized that the volumes assumed to be negotiating the southbound left turn in the future are not all “new trips” to the transportation system. For the most part they represent trips that would be diverted from the existing alternative routes destined to the neighbourhood and businesses east of Highway 97. The EBA analysis assumes traffic increases at the proposed southbound left turn intersection and assumes the remainder of the system remains unaffected, thereby inflating the number of predicted collisions.

The potential flaw in this analysis assumption is shown with an example of the potential traffic diversions. The scenario is a southbound vehicle approaching the Highway 97 / Highway 16 intersection intending to travel to a residence on Victoria Street or a business on Spruce Street. With the proposed southbound left turn intersection scenario, they would travel straight through the Highway 16 intersection in the southbound direction and turn left into Spruce Street / Victoria

Street. This new left turn conflict is what EBA has quantified in their analysis. Not quantified by EBA is the reduction in collision potential under the existing alternative routes:

- **Highway 16 Route** – The southbound motorist would be required to make a southbound left turn at the Highway 97/Highway 16 intersection, and travel through six arterial road intersections, including two signalized intersections;
- **Ferry Avenue / Upland Street Routes** – The southbound motorist would be required to make a southbound right at the Highway 97 / Highway 16 intersection, negotiate a left turn at the Highway 16 / Ferry Avenue intersection and a subsequent left onto Upland Street. This route would include turning at three heavily traveled intersections and through at least nine lower volume unsignalized intersections;
- **Ferry Avenue / Queensway Street U-Turn** –This scenario represents an existing signed U-turn route for access to Spruce Street. The southbound motorist would be required to travel straight through the Highway 97 / Highway 16 intersection. They would proceed to make a southbound left turn onto Ferry Avenue from the ramp, proceed to make another left turn from Ferry Avenue / Queensway Street onto the ramp, merge into Highway 97 northbound traffic and then negotiate a northbound right onto Spruce Street. This route includes left turns at two arterial roadway intersections on a heavily travelled section of roadway, and re-entering Highway 97.

Detailed analysis of the collision potential for each of these existing routes has not been undertaken. However, logic would suggest that the additional travel distance and conflicts at a greater number of arterial intersections associated with these routes would result in an increase of the collision potential to the motoring public.

With the sole focus of the EBA safety analysis only on the proposed highway intersection, we do not support their findings.

5.2.3 Increase in Collisions

Notwithstanding the potential shortcomings noted above, the overall results indicate that a new intersection on Highway 97 at either Spruce Street or Victoria Street would experience about 0.86 to 1.35 collisions per year. Collisions are a negative by-product of mobility. When we place vehicles in the position of potential conflict there will be occasions where they collide. It is not unreasonable to assume that an unsignalized intersection on a highway would experience an average of one collision per year; however, we do not agree with EBA's conclusion that the proposed southbound left turn "will result in a significant increase in the collision frequency".

If the Province was to apply the rationale provided in the EBA report to all future development and road improvement projects, they would be challenged to recommend another four leg intersection anywhere on their highway system.

5.2.4 Cost of Collisions

We take no issue with the average cost of collision values provided on Page 21 of the EBA report, or the application of these values to the cross-section of “expected” collision types included in Section 7.3.2.

5.3 Collision Rate Comparison

Section 7.3.4 of the EBA Report provides a comparison of the predicted collision rates for the three access scenarios to the provincial averages. Their conclusion is that the collision rates at the proposed southbound left turn will be markedly higher than the provincial average, potentially more than double the expected rate.

The collision potential at the proposed southbound left turn intersection on Highway 97 was estimated using a CPM which was developed as a function of intersection configuration and conflicting volumes (AADT entering the intersection). The CPM and collision calculations are not provided in the report and therefore could not be reviewed. However, the overall collision rate comparison does not appear logical.

The safety performance analysis is applied to a theoretical unsignalized intersection on Highway 97 based only on entering volume. Therefore, the future collision rate at the proposed intersection is based on the “expected” collisions generated by a CPM founded on typical provincial data. Assuming “all else is equal” in the model, with the only variable being AADT, it does not seem logical that this theoretical intersection can perform more than twice the collision rate of peer intersections in the Province.

6.0 CONCLUSIONS

Our review and analysis of the EBA report indicates that:

- Overall the analysis methodologies applied in the EBA Report are industry accepted standards;
- There are a number of volume and analysis assumptions incorporated into the operational and safety analysis which we do not agree with based on the information provided and the observations we made;
- The analysis summaries and basic calculations associated with the intersection capacity analysis and the collision prediction model were not provided in the report and therefore could not be replicated or confirmed. We would require this information in order to undertake a detailed review of their analysis;
- The existing traffic volumes assumed in the operational and safety analysis appear to be significantly higher than those documented on Highway 97 through recent MoT counts and other independent sources;
- The forecasted traffic growth of 3.8% per annum on Highway 97 in the PM peak hour cannot be justified based on current volume trends and other primary indicators in the Prince George Area;
- The failing performance measures and poor level of service identified in the future capacity analysis of the proposed southbound left turn intersection is based on a robust background growth rate applied to volumes that greatly exceed the existing traffic flows along Highway 97; and,
- The safety prediction analysis solely focuses on the collision potential between southbound left turns and the northbound through movements at this isolated intersection. The analysis ignores the potential for collision reduction that would be observed on the area road network if existing motorists were diverted from the alternative routes they are currently taking.