MINISTRY OF FORESTS AND RANGE

Quarterly Stumpage Adjustment and Log Hauling Accidents

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Ministry of Forests and Range
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Quarterly Stumpage Adjustment and Log Hauling Accidents

Dear Ms Balcaen:

As per your instructions, I have investigated the possible relationship between quarterly stumpage adjustment and the rate of log hauling accidents.

My overall conclusion is that the rates of log hauling accidents cannot be attributed to the stumpage rate adjustment policy, and therefore the policy should not change.

Yours sincerely,

David W. Ormerod, MF, RPF

Executive Summary

This study set out to answer the long standing question of whether or not the Ministry's quarterly stumpage adjustment policy could aggravate the concentration of log hauling activity in certain seasons, thereby compromising safety. There has been a call for the Ministry to modify the quarterly stumpage adjustment policy to eliminate the incentive for adjusting seasonal rates of harvest.

In order to investigate the question the Ministry of Forests and Range provided eleven years of scaled volume data, product price index data, and stumpage system parameters. Additional product price index data were obtained from Statistics Canada. The BC Forest Safety Council provided all available data for log hauling accidents that they have been able to tabulate to date, and WorkSafe BC assisted in qualifying the data as to Forest District and date.

The study was comprised of two parts: an investigation of the possible correlation between changes in the quarterly rates of harvest and the following quarters stumpage rate adjustments; and secondly, an investigation of the possible correlation between changes in seasonal harvesting rates and the observed rates of log hauling accidents.

The principal observations made from this study are:

1. While adjustments to the usual seasonal level of harvest are correlated with impending stumpage rate changes, future stumpage rates are well predicted from past movements in forest products prices, regardless of the adjustment policy;

2. The presently available data for log hauling accidents are insufficient to determine conclusively if there is a relationship between changes in the seasonal rates of harvest and the changes in the seasonal rates of log hauling accidents.

Two recommendations flow from these observations:

1. The Ministry of Forests and Range not change its policy of quarterly stumpage adjustment;

2. The Ministry of Forests and Range encourage the BC Forest Safety Council and WorkSafe BC to look further back in time at the number, type, location and dates of log hauling accidents, so that any possible relationships can be objectively studied in the future.

The analysis of the evidence available for this study leads to an overall conclusion that the rates of log hauling accidents cannot be attributed to the stumpage rate adjustment policy, and therefore the policy should not change.

Assignment

The consultant was asked to submit a report that determines whether or not there are relationships between the practice of quarterly stumpage adjustment and log hauling accidents. The specific tasks assigned were:

1. Determine statistically:
    a) whether or not harvest levels are correlated with expected quarterly changes in stumpage rates, and if so;
    b) whether or not these changes in harvest levels are correlated with the rate of log hauling accidents.

2. If correlation is found, consider if the quarterly stumpage adjustment policy could be a contributing factor.

3. Provide options and recommendations for the Ministry's consideration, outlining advantages and disadvantages, and a methodology to monitor if any recommended policy change has an effect over time.

Background

The BC Forest Safety Council (BCFSC) was formed in September 2004 to promote safety in the forest sector. BCFSC was implemented out of Action Plan recommendations of the Forest Safety Task Force, which was established by the Ministry of Skills and Labour in 2003. The heightened concern for forest safety arose out of public concern about the rate of accidents in forestry operations.

One particular area of forest safety concern is log hauling. For several years the Central Interior Logging Association (CILA) has suggested that the rate of log hauling accidents has been exacerbated by the Ministry of Forests and Range quarterly stumpage rate adjustment policy. Under this policy, fully appraised harvesting authorities have their stumpage rates adjusted on January 1, April 1, July 1, and October 1, each year. These adjustments are made to reflect changing prices for forest products, which affect the profitability of the licensees harvesting Crown timber. By this policy the Province seeks to maximize forest rents within the constraints of the market and the legislated forest practice standards. When

markets have been strong the licensees pay more stumpage than when the markets have been weak.

Since 1987 the stumpage system employed by the Province is the Comparative Value Pricing (CVP) system, which is in the process of being replaced by the Market Pricing System (MPS). The process of conversion from CVP to MPS is complete for the Coast Region, and is ongoing for the Interior. Regardless of the stumpage system quarterly stumpage adjustment has been a long standing practice in British Columbia, and will continue under MPS.

The quarterly adjustments for CVP are based on changes in the open market for lumber and chips, and for MPS logs. If the product prices in the market rise, this will be reflected in a rise in the quarterly adjusted stumpage rates, and vice versa. These quarterly adjustments, of necessity, reflect past changes in market prices, not current market pricing.

It has been asserted by Central Interior Logging Association and others that licensees will increase the present rate of harvest, if they expect the stumpage rate to rise at the next quarterly adjustment, and vice versa. These asserted adjustments to the level of harvesting activity, in response to expected stumpage rate changes, have been called "stumpage bingo".

The term is somewhat misleading, as bingo is a game of chance, whereas stumpage rate changes are likely to be predictable, if one knows what the open market prices for forest products have been doing. Further, any well-run business will do what it can to reduce its costs when presented with an opportunity to do so, and therefore reacting to predicted stumpage rate changes is to be expected of any licensee.

The concern about licensees expanding or retrenching their rate of harvesting activity as a result of the predicted changes in stumpage rates, is that the relative safety of forestry operations may be compromised. This study has been initiated by the Ministry of Forests and Range to determine if log hauling accident rates can be related to quarterly stumpage adjustments.

The study will assist the Ministry and BCFSC to work together to ensure that stumpage policy is consistent with a suitable safety regime for forestry operations, and in particular, log hauling.

While it is logical to expect licensees to minimize their stumpage costs by adjusting seasonal harvesting rates, there are several motivating factors and constraints which will limit such responses. While stumpage is a cost, whose quantum is related to relatively recent market pricing of forest products, current and anticipated market prices are likely to influence the current demand for logs. In addition to the market forces that motivate the level of logging operations, there are significant constraints that limit the flexibility of log supply managers to respond to the market and stumpage cost directions. These include the number and diversity of developed cutting authority areas, the operational capacities and availability of the logging fleets, crews and contractors, mill log inventory capacity and consumption rates, season, and weather.

The seasonal influences on the pattern of harvesting are particularly strong in the Interior plateau and the north. In these regions there is much ground that is too wet in the summer, and there are extensive systems of lakes and rivers which limit access. In these regions much of the logging takes place after the ground has frozen and can be logged without soil damage, or the lakes can be crossed on ice roads. Logs are stored in inventory at the mills, with logging stopping at spring break-up of the frozen conditions, and does not start again until drier summer areas become available.

While break-up is not a seasonal pattern south and east of the Interior plateau and on the coast, the snow pack in the operating areas at higher elevations limits logging, and in these regions more of the logging can be done in the summer. Province-wide late summer logging is usually limited by high fire hazard conditions, and early shift or fire closure restrictions on forestry operations are common practice.

The natural seasonal limitations on harvesting activity will mute some of the ability of the licensees to react to predicted stumpage changes, as they have mills to keep supplied with logs, and they have to provide sufficient log inventory to keep the mills running when logging activity is curtailed. While the seasons are predictable, the weather that occurs within the season can be quite variable and further limits the ability of log supply managers to react to predicted stumpage rate changes.

In addition to the natural season and weather constraints on log supply flexibility, there are capacity limitations and external influences such as labour relations. The capacity limitations are governed mostly by economics. Obviously maintaining a large fleet of equipment and personnel for a short operational window will be costly, and therefore the capacity of a manager to ramp up operations to take advantage of lower stumpage rates is limited. Further, labour relations, such as union agreements, labour law, and transportation regulations such as hours of service, may also limit the flexibility to adjust the rate of log supply.

Do quarterly changes in stumpage rates affect harvesting rates?

Overall, if the seasonal harvest rates and stumpage adjustment data show a statistical relationship, it might be expected to be a weak relationship, considering all the factors that impinge on the ability of log supply managers to react. This study uses timber volume scaled in the years 1995 to 2005 together with the associated CVP quarterly adjustment target rates to study a possible relationship.

The timber scaled data used in this study includes timber from private land and from land under the jurisdiction of the Government of Canada. There are no stumpage payments to the Government of B.C. for private and federal timber. Consequently, the possible statistical relationship between the level of harvest and the quarterly adjustment of stumpage rates may be weakened in the presence of these non-stumpage timber volumes.

It is not practical to compile scaled timber volumes prior to 1995 because of the limitations of what has been archived, and while the CVP stumpage system is being replaced by MPS; it provides the most consistent basis on which to study the relationship as it has been in place throughout the period. In this study the CVP parameter, chosen to represent expected changes in stumpage, is the target rate as opposed to a base rate or a composite index. This choice was made as this parameter is best allied with the distribution of the total amount of stumpage billed under the CVP system.

The CVP composite index is based on Statistics Canada compilations of open market lumber and chip pricing, and is the principal determinant of changes in a base rate and a target rate. The base rate is the rate of stumpage that will be paid on sawlog grade logs, once an individual licence is adjusted by the ratio of its cost structure to the industry average cost structure. The target rate is the blend between the base rate and the minimum stumpage rates, according to the historical low grade proportions of the harvest that will pay minimum stumpage rates.

To ascertain whether harvest levels vary in concert with anticipated stumpage rate changes it is necessary to have some measure of response. As discussed, any response is likely to be muted by current and anticipated forest products pricing, by the realities of seasonal logging, capacity constraints and by other factors that limit

the ability of log supply managers to adjust their levels of operation. Given that logging in British Columbia, especially in the Interior, is strongly moderated by season, it seems likely that response will most likely be seen on a seasonal basis rather that continuously. Consequently the study to focuses on the Quarterly Proportion of the Annual Harvest as the dependent variable that might likely respond to anticipated changes in stumpage rates. The sum of these proportions for any one year will be 100 per cent.

Specifically, the period January 1995 to January 2006 is used to study if the quarterly proportion of the calendar year harvest is correlated with the change in the CVP target rate set for the following quarter. The Interior CVP target rates are not available for the entire period: for they are only available to January 2004. While there may be academic interest in studying possible relationships between other variables related to this subject, it does not serve the objects of this assignment to investigate these relationships, unless they can advance the understanding of seasonal response to anticipated stumpage rate changes. Unless a statistically significant correlation between quarterly proportion of annual harvest and the target stumpage rate change in the next quarter exists, it is unlikely to be shown for other variables that relate proportional harvest volume and CVP parameters.

If a statistical correlation is shown to exist between a quarter's harvest volume and the following quarter's stumpage rate adjustment then further amplifying study is not required of this assignment. However, in the interests of understanding the possible responses of licensees to impending stumpage rate changes, any correlations that are found will be discussed in the context of the parameters that determine the degree of observed response.

This study is done at the Forest Region level. The regional characteristics previously discussed, such as the predominance of winter logging in the Interior plateau and the north, could mask the possible response relationship at the provincial level. Further, while there is a considerable range of conditions within the regions, any policy initiatives that might flow from this study would first be considered regionally and provincially; consequently, unless correlations exist at the regional level, it would be difficult for the Ministry of Forests and Range to consider varying policy at lower levels.

Scaled volume by Region and Quarter is shown in Appendix 1(a). These figures, and their associated sample statistics, are shown for the calendar years 1995 to 2005, as well as for Government of B.C. fiscal years ending March 31st. The figures for fiscal year are included because in the Interior plateau and the north this year corresponds with the "break-up to break-up" year. It is not known, nor investigated, whether licensees plan and budget on a calendar year or government fiscal year basis. It can be assumed that practices vary within the forestry sector. However, it can be observed that on the Coast, summer logging is the busiest, and there is traditionally a significant industry shut-down over the year-end holiday season. Contrasting this, Interior logging is busiest in the winter, and a substantial shut-down is experienced at break-up. Further, most of the weigh-scaling sampling years in the Interior coincide with the government's fiscal year. For this analysis the focus will be on the calendar year, but limited observations are also made for fiscal year data.

The Quarterly Proportion of the Annual Harvest values is shown in Appendix 1(b), together with the descriptive statistics for the study sample (1995-2005). Year-to-year variation in annual harvest volume is highest in the Interior in the spring quarter, as might be expected, given the small proportion of the annual harvest taken. Also, as expected the concentration of harvest prior to break-up is higher in the north than in the south.

The quarterly harvest volume statistics for the eleven calendar year sample used in this study follow in Table 1. These are the mean, and the coefficient of variation.[1] For readability, harvest level proportions are shown as percent in this table. The total provincial harvest over the eleven years has ranged from a low of 66 million m^3 in 1998 to a high of 83 million in 2005.

[1] Coefficient of variation is the standard deviation expressed as a percentage of the mean, and is a useful way of expressing dispersion around the mean when this is normally distributed in a population. Standard deviation for a sample is the square root of the sample variance, and the variance is the sum of the squared deviations from the mean, divided by the sample size less one. In normally distributed populations about 95% of observations would be observed inside of plus or minus two standard deviations from the population mean. The sample variance is an unbiased estimator of the population variance.

Table 1 includes a column which shows the average percentage of the annual harvest which is made up of non-stumpage bearing timber. Such timber will be from private lands or from lands under the jurisdiction of Canada. While the percentage in the Interior is about 5 per cent, it is about 25 per cent on the Coast. The presence of non-stumpage bearing timber in this analysis may influence the possible correlation between seasonal proportion of harvest and quarterly stumpage adjustment; however, as non-stumpage bearing timber is being traded in the same market period as the stumpage bearing timber, such an influence is likely small, and for the purposes of this study it is assumed that this is so.

Table 1. Quarterly Distribution of Scaled Volume

		Calendar Year Scaled Volume (million m^3)				
Region	Statistic	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Year
N. Interior	Mean	12.18	1.31	6.44	6.58	26.51
	Coeff Var %	7.0	69.0	16.4	20.2	8.9
S. Interior	Mean	7.95	2.37	7.29	8.10	25.71
	Coeff Var %	9.6	44.3	12.5	9.6	8.6
Coast	Mean	4.23	6.94	5.99	5.30	22.46
	Coeff Var %	21.7	11.4	20.0	15.5	10.1
Province	Mean	24.35	10.63	19.73	19.98	74.69
	Coeff Var %	8.9	22.5	12.0	12.0	6.9
		Percent of Calendar Year Volume				Non-stumpage bearing %
N. Interior	Mean	46.2%	4.8%	24.3%	24.7%	4.9%
	Coeff Var %	9.7	59.1	13.8	15.2	23.5
S. Interior	Mean	30.9%	9.0%	28.4%	31.6%	6.1%
	Coeff Var %	7.3	34.1	11.6	9.7	25.6
Coast	Mean	18.9%	30.9%	26.5%	23.7%	25.1%
	Coeff Var %	22.7	6.1	15.3	14.3	10.2
Province	Mean	32.7%	14.1%	26.5%	26.8%	11.4%
	Coeff Var %	8.8	15.8	11.4	10.7	9.1

The statistics in Table 1 confirm how concentrated the Northern Interior harvest is in the winter - on average 70% of the annual harvest. In the Southern Interior the concentration of the harvest in winter is much reduced, and on the Coast logging is much more evenly distributed, although overall busiest in the summer. Consequently, any possible connection between seasonal harvest level and the safety record in log hauling might be more keenly felt in the north than in the south or on the coast.

Appendix 1(a) and (b) also show the data on a Government of B.C. fiscal year basis (April 1 to March 31). This fiscal year may only have relevance to the Interior, as previously discussed, and it is interesting that year-to-year fiscal variation in the Interior is less than on a calendar-year basis.

Table 2. Target Rate Adjustment and Correlation with Proportional Harvest Level

Region	Statistic	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
		Target Rate Change in Following Quarter (no change = 1)				
Interior	Mean	0.93	1.07	1.00	1.00	
	Coeff Var %	9.9	14.2	20.2	16.6	
Coast	Mean	0.99	0.99	0.98	1.00	
	Coeff Var %	3.6	11.2	8.3	4.2	
		Linear Correlation Coefficients ***r*** for 1994-2005 data				Number of Observations
N. Interior	Calendar	.4707	.6366	.7374	.4355	11,11
	Fiscal	.1554	.4742	.7835	.5727	
S. Interior	Calendar	.6403	.5927	.5876	.6196	11,11
	Fiscal	.3105	.4650	.6091	.6639	
Coast	Calendar	.0830	-.0865	.7257	.8199	9,9,10
	Fiscal	.0508	.2215	.6996	.6663	

The CVP Target Rates, and other parameters, are usually published by the Ministry about two weeks prior to the effective date. For example, the parameters for April 1, 2006 were published on March 14. The last set of parameters published for the Coast was effective January 1, 2004. Target rates for the period 1994 to 2006 are shown in Appendix 2(a), and the Next Quarter Target Rate Change for the

years 1995 to 2005 (the study period) is shown in Appendix 2(b), together with descriptive statistics for both. As previously discussed the target rates reflect forest product price shifts in recent past months, as well as the proportion of the harvest that is of low grade and will pay the minimum stumpage rates. The Next Quarter Target Rate Change, as shown in Table 2, is the target rate for the next quarter divided by the target rate for the present quarter. If there is no change, the value of this variable will be 1. If the rate increases next quarter, the value will be >1, and if it decreases, then <1.

Table 2 summarizes the statistics for the rate change in the following quarter, and provides the sample linear correlation coefficients [***r***] between the quarterly distribution of scaled volume and the following quarterly adjustment of the target rate of stumpage.[2] The ***r*** values are provided for both the calendar and fiscal years. Most of the ***r*** values show a definite positive correlation. Additional ***r*** values were computed for other ranges of data within the span of the eleven year study period, and the pattern of positive correlation was consistent. There are, as expected, some quarters for some ranges in years which yield small positive or negative ***r*** values, but the trend to a moderate positive correlation is significant.

This analysis has only established that the seasonal rate of harvest is statistically correlated with future target rate changes, despite other motivating factors and a large number of constraints which may mitigate such correlation. One might wonder how it is possible that the next quarter's rate change, which is only published two weeks before the end of the current quarter, could influence the current quarter's harvest level to the extent shown by the analysis.

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The linear correlation coefficient ***r*** measures the linear association between two variables ***y*** and ***x***. If close to plus or minus 1 the linear relationship is strong. If close to 0 the linear relationship is weak, but there may be non-linear association between the variables. The coefficient ***r*** is calculated as the sum of product of each ***x*** deviation from the mean of ***x*** and each ***y*** deviation from the mean of ***y***, all divided by the square root of the sum of the square of each ***x*** deviation from the mean of ***x*** times the sum of the square of each ***y*** deviation from the mean of ***y***. The coefficient of determination r^2 is the proportion of the total variation in the dependent variable ***y*** that can be explained by the linear relationship with the independent variable ***x***. Residual (unexplained) variation in ***y*** will be due to other factors not considered in this analysis.

A target rate change reflects market pricing information that can be some months old by the time the change is posted. The market price data gathered by Statistics Canada to update monthly indices will be dated by the time the index is published. The Ministry of Forests and Range use indices for three consecutive months before updating the target rates, and this will add a few months to the lag. Consequently, target rate changes may reflect market shifts that were made perhaps up to six months ago. Anyone in the forest industry who pays stumpage will have a keen interest in how the system works, and therefore will have their own ways of predicting future changes in stumpage rates, and may be able to do so several months in advance of the posted changes. These prediction methods will be trade secrets within the industry, and therefore we can only speculate on how effective they are.

In order to illustrate that because target rates are in large measure driven by past movement in product price indices, the Interior target rate is regressed on past index values. Data for three readily available indices were reviewed. Madison's spruce-pine-fir, random length, kiln-dried, #2 & better monthly index data were provided by the Ministry from 1994 to the present.[3] In addition lumber and timber and lumber and other products indices data have been obtained from Statistics Canada's Table 329-0042-2318 for the same period.[3] For these data sets the index values for each quarter have been averaged, so that they could be paired with the quarterly target rate data.

As the updating of the target rate will lag behind the updating of the indices by several months, lags of three, six and nine months have been investigated. Index data lagged by six months correlated best with the target rates. Further, a regression model would be constantly updated as new data came in, and the oldest data may be dropped if the relationship appears to gradually change over time. Consequently, rolling sample periods of 18 months, 2 years, 3 years, 30 months and 60 months have been reviewed. The two-year rolling sample window provided the most consistent correlations over time. Of the three indices, the Statistics Canada lumber and timber index from Table 329-0042-2318 produced the best overall

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Madison's data may be subscribed to by contacting the publisher at www.madisonsreport.com. Statistics Canada index data may be ordered on-line from www.statcan.ca.

results. Within the study period the mean predicted Interior target rate was $0.42 higher than the actual target rate mean, and the coefficient of variation for the predicted values was 25.4 per cent as contrasted to 24.1 per cent for the actual values.

While the target rate is published about two weeks before its effective date, the Statistics Canada indices are usually updated a month or more later than the month for which they apply. Consequently in actual use, a regression model developed on an index lag of six months might only be useful two or three months ahead of the posting of new target rates. However, much more sophisticated models are likely in use by industry, and these models may be calibrated on forest products price data that is available well before the indices are published; consequently, accurately predicting target rates many months before they are posted is probably being done.

In order to verify that predicted target rate changes may be observed to be related to the seasonal rates of harvest, in a way that is similar to that observed for real target rates, a correlation analysis using predicted future rate changes has been completed. Because of the sample length window, and the six month lag, rates can only be predicted rates from the fourth quarter of 1996 to the fourth quarter of 2005. These have been used to compare sample linear correlation coefficients between those obtained when actual target rates are used and those from using the predicted rates. These are summarized in Table 3 following.

Table 3. Correlation Comparison for Simple Prediction Model

Correlation Coefficients 4th Quarter 1996 to 4th Quarter 2005

	for Actual Target Rates				for Predicted Target Rates			
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
NORTHERN INTERIOR	**0.4751**	**0.6523**	**0.8013**	**0.4262**	**0.3068**	**0.7195**	**0.7138**	**0.0529**
SOUTHERN INTERIOR	**0.6330**	**0.6128**	**0.6102**	**0.6403**	**0.1267**	**0.6502**	**0.6265**	**0.1102**
observations	9	9	9	10	9	9	9	10

Table 3 shows that a very simple prediction model, which can be applied perhaps three or four months in advance of the target rate change, produces target rate estimates that also show correlation with seasonal harvest levels. More sophisticated models should predict the future movement of CVP target rates more

precisely than the simple model used here. The slope and intercepts for the regressions used to predict the Interior target rates from the Statistics Canada lumber and timber index values are shown in Appendix 3.

While the ability to predict stumpage rate changes may influence decisions made about impending or future levels of harvest, these decisions are controlled by other factors as well, including present and future forest products prices. Log demand by the lumber milling sector is likely to be affected by present and predicted lumber prices. Fulfilling log demand, and managing levels of log inventory available to a mill, is of course constrained by season and capacity, but as this study finds, may also be affected by stumpage costs. Consequently, observed changes in the seasonal rates of harvest, as shown in Appendix 1, may reflect log supply demand shifts created by perceptions of opportunity in the forest products markets, as well as by stumpage cost shifts, as driven by past forest product price movements. To what extent each factor contributes to change in seasonal harvest rates is a complex subject, and well beyond the requirements of this assignment.

It is not the purpose of this study to develop a model for predicting stumpage rate changes, nor to develop a model to predict changes in seasonal rates of harvest. While these are interesting topics, this study seeks only to see if future stumpage rate changes are correlated with observed shifts in the seasonal rates of harvest. The results show that some correlation exists. Sophisticated stumpage rate prediction models, particularly if calibrated on the same price indices, as used by the Ministry, or their underlying price data, and also the Ministry's weightings of those indices, are likely to be effective in forecasting stumpage months in advance of the quarterly rate adjustments. Consequently, seasonal harvest plans can be adjusted to take advantage of the predicted stumpage rate changes. However, as has been previously discussed, there are many other constraints and motivating factors that will likely mute such response.

Does the rate of harvest affect the hauling accident rate?

The BC Forest Safety Council has entered 81 accident records into its database relating to log hauling. These records have subsequently been qualified by staff at WorkSafe BC as to the forest district they occurred in, and the date of occurrence. Of these, 2 records were considered unrelated to this activity, and 8 records could not be qualified as to location. The 79 records accepted as log hauling related are summarized by Region and Quarter, and separated into Fatal and Non-Fatal. Over the 46 months represented by the record there have been 26 accidents resulting in fatalities, and 53 in non-fatal injuries. The base records are available from the BC Forest Safety Council's web site, at www.bcforestsafe.org.

There may be more accidents that have gone unreported to WorkSafe BC and are therefore unknown to the BC Forest Safety Council - however, it is believed that all accidents involving fatalities since at least mid-2004 are known to BC Forest Safety Council. The known accidents over the period May 2002 to February 10, 2006, are shown in Appendix 4(a).

The volume of timber harvested varies considerably by quarter, as shown earlier. Over the period May 2002 to February 2006, the volume (to the nearest million cubic metres) scaled by quarter and region is shown in the Appendix 4(a), and with this the accident rate per million cubic metres of scale. Adjustments have been made to the first and last quarter scaled volumes to account for the partial quarters covered by the period of study.

The overall rate of reported log hauling accidents or incidents across the province is 0.264 per million m^3 harvested. The provincial rate for accidents that result in fatalities is 0.087 per million m^3 harvested. On the Coast the accident rate is highest in the summer and fall. In the Northern Interior the highest rates occur in the fall and winter quarters and in the Southern Interior in the fall. These higher rates do occur when the seasonal harvesting rates are highest.

While Appendix 4(a) suggest that the seasonal accident rates, in the aggregate, do rise in busier harvesting seasons, it does not reveal whether changes in the seasonal rate of harvest affect the average seasonal rates. Although stumpage rate adjustment does show some correlation with increases or decreases in the seasonal

levels of harvest, Appendix 4(a) does not provide any insight as to whether this will affect the rates of accident.

Appendix 4(b) shows accident rates tabulated by year and quarter for each region, for the Interior combined, and for the province. The table shows that the presently available accident data is sparse, making it difficult to investigate possible correlation between seasonal changes in the accident rate and changes in the seasonal rates of harvest.

From the data provided in Appendices 1(b) and 4(b) one can derive the quarterly change in the eleven-year mean harvest level, and quarterly changes in the three-year mean rates of accident. However, the accident rate data currently available is sparse, and three years of data is clearly an inadequate sample from which to draw firm conclusions. From the limited data that is currently available there is the suggestion that, when all seasons are combined, the overall rate of accident does appear to rise with increases in the seasonal rate of harvest. However, for the busiest harvest season, the winter, the fatal accident rate may decline, if the winter rate of harvest increases.

These tentative but contradictory conclusions about the Northern Interior, and the inability to draw any conclusions about the Southern Interior and the Coast, emphasize that at the present time there is insufficient available data to carry out an objective analysis of the possible relationships between changes in the seasonal levels of harvest and changes in the rates of log hauling accidents. Consequently, although this study does confirm that quarterly adjustment of stumpage rates does affect the seasonal rates of harvest, changes in these seasonal rates of harvest are not conclusively shown to affect the rates of log hauling accidents.

Conclusions and Recommendations

This study set out to answer the long standing question of whether or not the Ministry's quarterly stumpage adjustment policy could aggravate the concentration of log hauling activity in certain seasons, thereby compromising safety. There has been a call for the Ministry to modify the quarterly stumpage adjustment policy in order to eliminate the incentive for adjusting seasonal rates of harvest. If the direction of future stumpage rate changes was not known until the Ministry posted the new CVP parameters, there would be only about a two-week window in which to respond by adjusting the levels of harvesting and hauling operations.

Moderate positive correlation is shown between changes to the usual seasonal level of harvest and impending stumpage rate changes. However, it is also shown that it is relatively easy to predict future stumpage rate changes well in advance of they being posted, using readily available forest products price indices and simple regression models. Consequently, if stumpage costs were the only motivating factor to adjust seasonal levels of harvesting activity, such decisions could be taken some months in advance of the posted CVP parameter changes. Even if the Ministry were to make the stumpage adjustments more or less frequently, or somewhat randomly, it would probably not affect the other intelligence that the logging sector uses to make decisions on the seasonal rates of harvest. Intimate knowledge of forest product prices is likely the key component of this intelligence. Prices from the past will predict present and future stumpage costs; present prices and future price predictions will influence the milling sector's demand for logs.

Further, as has been discussed there are other motivating factors affecting harvesting location and level decisions, and many constraints that limit the flexibility to deviate from the historical patterns. Seasonal logging conditions are probably the largest constraint which would mute any response to an opportunity to save on stumpage costs. In the north, most logging has to take place on frozen ground, which concentrates activity in the late winter. Elsewhere snow pack, fall rains, and summer drought are usual seasonal conditions that constrain harvesting opportunities.

On these conclusions alone, **it is recommended that the Ministry of Forests and Range not change its policy of quarterly stumpage adjustment**. The present

policy is a practical compromise between responsiveness to forest products market changes and practical administration of the system. Changing the timing or frequency of stumpage adjustment is unlikely to have any effect on changes in the seasonal rates of harvest that have been observed, and which do show some correlation with stumpage rate changes, because such changes are driven by the underlying market data which is available long before the stumpage rate changes are announced, and such data can readily be used to predict future stumpage rates months in advance.

The study shows that the presently available data for log hauling accidents is insufficient to determine conclusively if there is a relationship between changes in the seasonal rates of harvest and the changes in the seasonal rates of log hauling accidents. **It is recommended that the Ministry of Forests and Range encourage the BC Forest Safety Council and WorkSafe BC to look further back in time at the number, type, location and dates of log hauling accidents, so that any possible relationships can be objectively studied in the future**.

Regardless of the conclusions of future studies on these possible relationships, it is questionable whether they can in any way be affected by changes in the policy for quarterly stumpage rate adjustment. The seasonal rates of logging respond, within the constraints of tenure and shareholder obligations, log inventory management, and industry capacities, to price changes in the forest products marketplaces. Stumpage rate adjustment policy is simply not a prime determinant in these responses. As has been emphasized above, future stumpage rates will be well predicted from past prices for forest products, regardless of the adjustment policy. Therefore, rates of log hauling accidents cannot be attributed to the stumpage rate adjustment policy.

Acknowledgements

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Limitations

The report has been prepared according to terms of reference provided the Ministry of Forests and Range. The information, interpretations and conclusions in the report are based on the investigations conducted within the defined scope of services. The consultant cannot accept responsibility for independent conclusions of the client and others which may be based on information contained in this report.

Appendix 1(a), Quarterly Scaled Volume 1995-2005

Scaled Volume	NORTHERN INTERIOR				Calendar Year	Fiscal Year
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		
1994		1128518	6596092	6600704	14325314	26547789
1995	12222475	1124287	6204564	6800427	26351753	26227418
1996	12098140	793919	6186515	6938174	26016748	25483155
1997	11564547	695845	5382598	5653746	23296736	22953466
1998	11221277	655504	6289991	5874075	24040847	24256925
1999	11437355	1247382	7662145	6295775	26642657	28289073
2000	13083771	906169	4921711	6842860	25754511	25545566
2001	12874826	847650	7132047	3560549	24415072	24425890
2002	12885644	1570193	5303185	7098670	26857692	27717067
2003	13745019	681558	6484625	8882608	29793810	27365785
2004	11316994	2335073	6849691	6716075	27217833	27389483
2005	11488644	3592109	8474693	7695795	31251241	
2006						
Total	133938692	14449689	70891765	72358754	291638900	286201617
Minimum	11221277	655504	4921711	3560549	23296736	22953466
Maximum	13745019	3592109	8474693	8882608	31251241	28289073
11y Mean	12176245	1313608	6444706	6578069	26512627	26018329
StdDev	856000	906004	1055461	1327954	2356943	1661428
CoeffVar	7.0%	69.0%	16.4%	20.2%	8.9%	6.4%

Scaled Volume	SOUTHERN INTERIOR				Calendar Year	Fiscal Year
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		
1994		2296524	7019714	7419182	16735420	24355927
1995	7620507	1975188	7057224	7677191	24330110	24672941
1996	7963338	1574971	7685753	7760977	24985039	24096243
1997	7074542	1573490	7436081	7688776	23772889	23051285
1998	6352938	1591378	6645369	8140543	22730228	24029495
1999	7652205	1975116	8140822	7767153	25535296	26409013
2000	8525922	2300742	6848968	8233114	25908746	25367555
2001	7984731	2031191	7539699	6711470	24267091	24535253
2002	8252893	2355064	6888638	8454247	25950842	26835609
2003	9137660	1879029	5320212	9868069	26204970	25683391
2004	8616081	4291983	7867220	8123254	28898538	28528713
2005	8246256	4570588	8794867	8642533	30254244	
2006						
Total	87427073	26118740	80224853	89067327	282837993	277565425
Minimum	6352938	1573490	5320212	6711470	22730228	23051285
Maximum	9137660	4570588	8794867	9868069	30254244	28528713
11y Mean	7947916	2374431	7293168	8097030	25712545	25233220
StdDev	766878	1052702	909247	778930	2198476	1552557
CoeffVar	9.6%	44.3%	12.5%	9.6%	8.6%	6.2%

COAST

Scaled Volume **Year**	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Calendar Year	Fiscal Year
1994		8069357	6469546	5097030	19635933	24683333
1995	5047400	7837065	6984058	5253229	25121752	23748627
1996	3674275	7453210	6202887	5047477	22377849	22508371
1997	3804797	6996622	6833838	4605235	22240492	21178460
1998	2742765	5647641	5028988	5445445	18864839	19473839
1999	3351765	6835434	7496623	6262941	23946763	25589750
2000	4994752	7723633	5861739	5996773	24576897	24615361
2001	5033216	6186781	6201741	3840312	21262050	19500763
2002	3271929	6352290	6304925	6562078	22491222	24550227
2003	5330934	5982479	3166789	4463870	18944072	18795166
2004	5182028	7874265	6732366	5838618	25627277	24511493
2005	4066244	7422000	5129843	5027563	21645650	
2006						
Total	46500105	76311420	65943797	58343541	247098863	249155390
Minimum	2742765	5647641	3166789	3840312	18864839	18795166
Maximum	5330934	7874265	7496623	6562078	25627277	25589750
11y Mean	4227282	6937402	5994891	5303958	22463533	22650490
StdDev	918367	793802	1198361	822761	2263829	2489441
CoeffVar	21.7%	11.4%	20.0%	15.5%	10.1%	11.0%

PROVINCE

Scaled Volume **Year**	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Calendar Year	Fiscal Year
1994		11494399	20085352	19116916	50696667	75587049
1995	24890382	10936540	20245846	19730847	75803615	74648986
1996	23735753	9822100	20075155	19746628	73379636	72087769
1997	22443886	9265957	19652517	17947757	69310117	67183211
1998	20316980	7894523	17964348	19460063	65635914	67760259
1999	22441325	10057932	23299590	20325869	76124716	80287836
2000	26604445	10930544	17632418	21072747	76240154	75528482
2001	25892773	9065622	20873487	14112331	69944213	68461906
2002	24410466	10277547	18496748	22114995	75299756	79102903
2003	28213613	8543066	14971626	23214547	74942852	71844342
2004	25115103	14501321	21449277	20677947	81743648	80429689
2005	23801144	15584697	22399403	21365891	83151135	
2006						
Total	267865870	116879849	217060415	219769622	821575756	812922432
Minimum	20316980	7894523	14971626	14112331	65635914	67183211
Maximum	28213613	15584697	23299590	23214547	83151135	80429689
11y Mean	24351443	10625441	19732765	19979057	74688705	73902039
StdDev	2179250	2386848	2370711	2401842	5124853	4862766
CoeffVar	8.9%	22.5%	12.0%	12.0%	6.9%	6.6%

Appendix 1(b), Quarterly Harvest Proportions 1995-2005

Proportion of calendar year — NORTHERN INTERIOR — Proportion of fiscal year

Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994							0.0425	0.2485	0.2486
1995	0.4638	0.0427	0.2355	0.2581		0.4604	0.0429	0.2366	0.2593
1996	0.4650	0.0305	0.2378	0.2667		0.4613	0.0312	0.2428	0.2723
1997	0.4964	0.0299	0.2310	0.2427		0.4538	0.0303	0.2345	0.2463
1998	0.4668	0.0273	0.2616	0.2443		0.4889	0.0270	0.2593	0.2422
1999	0.4293	0.0468	0.2876	0.2363		0.4715	0.0441	0.2709	0.2226
2000	0.5080	0.0352	0.1911	0.2657		0.4625	0.0355	0.1927	0.2679
2001	0.5273	0.0347	0.2921	0.1458		0.5040	0.0347	0.2920	0.1458
2002	0.4798	0.0585	0.1975	0.2643		0.5275	0.0567	0.1913	0.2561
2003	0.4613	0.0229	0.2177	0.2981		0.4959	0.0249	0.2370	0.3246
2004	0.4158	0.0858	0.2517	0.2468		0.4135	0.0853	0.2501	0.2452
2005	0.3676	0.1149	0.2712	0.2463		0.4195			
	5.081	0.529	2.675	2.715	Total	5.159	0.455	2.655	2.731
	0.368	0.023	0.191	0.146	Minimum	0.414	0.025	0.191	0.146
	0.527	0.115	0.292	0.298	Maximum	0.528	0.085	0.292	0.325
	0.462	0.048	0.243	0.247	Mean	0.469	0.041	0.241	0.248
	0.045	0.028	0.034	0.038	StdDev	0.034	0.017	0.030	0.043
	9.7%	59.1%	13.8%	15.2%	CoeffVar	7.3%	41.5%	12.3%	17.2%

Proportion of calendar year — SOUTHERN INTERIOR — Proportion of fiscal year

Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994							0.0943	0.2882	0.3046
1995	0.3132	0.0812	0.2901	0.3155		0.3129	0.0801	0.2860	0.3112
1996	0.3187	0.0630	0.3076	0.3106		0.3228	0.0654	0.3190	0.3221
1997	0.2976	0.0662	0.3128	0.3234		0.2936	0.0683	0.3226	0.3336
1998	0.2795	0.0700	0.2924	0.3581		0.2756	0.0662	0.2766	0.3388
1999	0.2997	0.0773	0.3188	0.3042		0.3185	0.0748	0.3083	0.2941
2000	0.3291	0.0888	0.2643	0.3178		0.3228	0.0907	0.2700	0.3246
2001	0.3290	0.0837	0.3107	0.2766		0.3148	0.0828	0.3073	0.2735
2002	0.3180	0.0908	0.2654	0.3258		0.3364	0.0878	0.2567	0.3150
2003	0.3487	0.0717	0.2030	0.3766		0.3405	0.0732	0.2071	0.3842
2004	0.2981	0.1485	0.2722	0.2811		0.3355	0.1504	0.2758	0.2847
2005	0.2726	0.1511	0.2907	0.2857		0.2891			
	3.404	0.992	3.128	3.475	Total	3.462	0.934	3.118	3.486
	0.273	0.063	0.203	0.277	Minimum	0.276	0.065	0.207	0.274
	0.349	0.151	0.319	0.377	Maximum	0.341	0.150	0.323	0.384
	0.309	0.090	0.284	0.316	Mean	0.315	0.085	0.283	0.317
	0.023	0.031	0.033	0.031	StdDev	0.021	0.024	0.033	0.030
	7.3%	34.1%	11.6%	9.7%	CoeffVar	6.6%	28.1%	11.6%	9.5%

COAST

Proportion of calendar year						Proportion of fiscal year			
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994							0.3269	0.2621	0.2065
1995	0.2009	0.3120	0.2780	0.2091		0.2045	0.3300	0.2941	0.2212
1996	0.1642	0.3331	0.2772	0.2256		0.1547	0.3311	0.2756	0.2242
1997	0.1711	0.3146	0.3073	0.2071		0.1690	0.3304	0.3227	0.2174
1998	0.1454	0.2994	0.2666	0.2887		0.1295	0.2900	0.2582	0.2796
1999	0.1400	0.2854	0.3131	0.2615		0.1721	0.2671	0.2930	0.2447
2000	0.2032	0.3143	0.2385	0.2440		0.1952	0.3138	0.2381	0.2436
2001	0.2367	0.2910	0.2917	0.1806		0.2045	0.3173	0.3180	0.1969
2002	0.1455	0.2824	0.2803	0.2918		0.1678	0.2587	0.2568	0.2673
2003	0.2814	0.3158	0.1672	0.2356		0.2171	0.3183	0.1685	0.2375
2004	0.2022	0.3073	0.2627	0.2278		0.2757	0.3212	0.2747	0.2382
2005	0.1879	0.3429	0.2370	0.2323		0.1659			
	2.078	3.398	2.919	2.604	Total	2.056	3.405	2.962	2.577
	0.140	0.282	0.167	0.181	Minimum	0.130	0.259	0.168	0.197
	0.281	0.343	0.313	0.292	Maximum	0.276	0.331	0.323	0.280
	0.189	0.309	0.265	0.237	Mean	0.187	0.310	0.269	0.234
	0.043	0.019	0.041	0.034	StdDev	0.039	0.026	0.042	0.025
	22.7%	6.1%	15.3%	14.3%	CoeffVar	20.8%	8.3%	15.7%	10.5%

PROVINCE

Proportion of calendar year						Proportion of fiscal year			
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994							0.1521	0.2657	0.2529
1995	0.3284	0.1443	0.2671	0.2603		0.3293	0.1465	0.2712	0.2643
1996	0.3235	0.1339	0.2736	0.2691		0.3180	0.1363	0.2785	0.2739
1997	0.3238	0.1337	0.2835	0.2589		0.3113	0.1379	0.2925	0.2671
1998	0.3095	0.1203	0.2737	0.2965		0.3024	0.1165	0.2651	0.2872
1999	0.2948	0.1321	0.3061	0.2670		0.3312	0.1253	0.2902	0.2532
2000	0.3490	0.1434	0.2313	0.2764		0.3314	0.1447	0.2335	0.2790
2001	0.3702	0.1296	0.2984	0.2018		0.3428	0.1324	0.3049	0.2061
2002	0.3242	0.1365	0.2456	0.2937		0.3566	0.1299	0.2338	0.2796
2003	0.3765	0.1140	0.1998	0.3098		0.3567	0.1189	0.2084	0.3231
2004	0.3072	0.1774	0.2624	0.2530		0.3496	0.1803	0.2667	0.2571
2005	0.2862	0.1874	0.2694	0.2570		0.2959			
	3.593	1.553	2.911	2.943	Total	3.625	1.521	2.911	2.944
	0.286	0.114	0.200	0.202	Minimum	0.296	0.117	0.208	0.206
	0.376	0.187	0.306	0.310	Maximum	0.357	0.180	0.305	0.323
	0.327	0.141	0.265	0.268	Mean	0.330	0.138	0.265	0.268
	0.029	0.022	0.030	0.029	StdDev	0.021	0.018	0.029	0.028
	8.8%	15.8%	11.4%	10.7%	CoeffVar	6.4%	12.9%	10.9%	10.6%

Appendix 2(a), Quarterly CVP Target Rates 1994-2006

	Interior Target Rate				Coast Target Rate			
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994	12.28	15.17	27.87	26.65	16.26	17.20	30.28	31.22
1995	26.21	25.56	24.50	20.07	31.61	32.79	33.06	30.19
1996	22.42	21.69	23.23	27.51	29.17	29.18	29.30	30.58
1997	30.39	30.54	31.24	30.59	31.46	32.54	34.15	34.64
1998	28.87	24.90	20.78	19.57	33.80	33.07	23.54	21.35
1999	20.76	20.61	23.40	29.11	21.91	21.26	23.31	24.10
2000	26.95	25.66	24.48	19.90	25.27	23.23	23.19	20.92
2001	16.25	16.00	16.44	22.41	20.89	20.41	20.72	22.88
2002	20.28	16.23	21.26	17.08	20.97	20.50	21.42	21.35
2003	13.93	14.93	14.52	11.89	22.06	22.14	21.20	18.38
2004	16.47	14.75	19.69	23.40	18.78			
2005	22.54	17.32	19.63	17.65				
2006	16.04	16.48						

Appendix 2(b), Next Quarter Target Rate Change 1994-2005

	Target RateChangeNext INTERIOR				Target RateChangeNext COAST			
Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1994	1.24	1.84	0.96	0.98	1.06	1.76	1.03	1.01
1995	0.98	0.96	0.82	1.12	1.04	1.01	0.91	0.97
1996	0.97	1.07	1.18	1.10	1.00	1.00	1.04	1.03
1997	1.00	1.02	0.98	0.94	1.03	1.05	1.01	0.98
1998	0.86	0.83	0.94	1.06	0.98	0.71	0.91	1.03
1999	0.99	1.14	1.24	0.93	0.97	1.10	1.03	1.05
2000	0.95	0.95	0.81	0.82	0.92	1.00	0.90	1.00
2001	0.98	1.03	1.36	0.90	0.98	1.02	1.10	0.92
2002	0.80	1.31	0.80	0.82	0.98	1.04	1.00	1.03
2003	1.07	0.97	0.82	1.39	1.00	0.96	0.87	1.02
2004	0.90	1.33	1.19	0.96				
2005	0.77	1.13	0.90	0.91				

Appendix 3, Slope and Intercept for Simple Prediction Model

Year	Qtr	Slope	Intcpt	Year	Qtr	Slope	Intcpt	Year	Qtr	Slope	Intcpt
1996	2	0.2811	-0.536	1999	3	0.6412	-36.135	2003	1	0.3651	-12.847
1996	3	0.2773	-0.029	1999	4	0.6697	-38.711	2003	2	0.4026	-16.214
1996	4	0.2985	-1.661	2000	1	0.3967	-13.964	2003	3	0.5112	-25.787
1997	1	0.3320	-4.375	2000	2	0.4192	-16.150	2003	4	0.4235	-18.590
1997	2	0.3362	-4.665	2000	3	0.4084	-14.958	2004	1	0.3962	-16.162
1997	3	0.3522	-5.768	2000	4	0.3988	-13.977	2004	2	0.3707	-13.996
1997	4	0.3290	-3.515	2001	1	0.4131	-15.285	2004	3	0.3132	-9.321
1998	1	0.3167	-2.381	2001	2	0.4215	-16.073	2004	4	0.4975	-23.425
1998	2	0.3233	-3.192	2001	3	0.4111	-15.051	2005	1	0.4440	-18.942
1998	3	0.5081	-22.192	2001	4	0.3762	-12.275	2005	2	0.4355	-18.022
1998	4	0.6331	-35.183	2002	1	0.4320	-17.114	2005	3	0.4269	-17.027
1999	1	0.6556	-37.400	2002	2	0.4009	-14.925	2005	4	0.3810	-12.981
1999	2	0.6698	-38.616	2002	3	0.3690	-12.342	2006	1		
				2002	4	0.3259	-9.125	2006	2		

Example: Mean lumber & timber Index Oct-Dec 2005 = 74.97; April 1, 2006 Predicted Target = $15.58

Appendix 4(a), Accident Rates May 2002 to February 2006

	Accident & Incidents			Scaled Volume (million m^3) *adjusted for incomplete quarters*		
Quarter	Fatal	Not Fatal		Vol	Rate	F.Rate
Jan-Mar	5	11		43.7	0.366	0.114
Apr-Jun	1	0		7.2	0.140	0.140
Jul-Sep	4	2	N. Interior	27.1	0.221	0.148
Oct-Dec	4	8		30.4	0.395	0.132
All	14	21		108.4	0.323	0.129
Jan-Mar	0	8		31.0	0.258	0.000
Apr-Jun	1	1		11.4	0.175	0.087
Jul-Sep	0	5	S.Interior	28.9	0.173	0.000
Oct-Dec	2	4		35.1	0.171	0.057
All	3	18		106.4	0.197	0.028
Jan-Mar	5	19		74.7	0.321	0.067
Apr-Jun	2	1		18.6	0.161	0.108
Jul-Sep	4	7	Interior	56.0	0.196	0.071
Oct-Dec	6	12		65.5	0.275	0.092
All	17	39		214.8	0.261	0.079
Jan-Mar	0	2		16.3	0.123	0.000
Apr-Jun	1	1		25.4	0.079	0.039
Jul-Sep	3	2	Coast	21.3	0.234	0.141
Oct-Dec	3	3		21.9	0.274	0.137
All	7	8		84.9	0.177	0.082
Jan-Mar	5	24		91.1	0.318	0.055
Apr-Jun	3	2		44.0	0.114	0.068
Jul-Sep	8	10	Province	77.3	0.233	0.103
Oct-Dec	10	17		87.4	0.309	0.114
All	26	53		299.8	0.264	0.087
Jan-Mar	0	3				
Apr-Jun	0	0	Unknown	(included		
Jul-Sep	1	1	Region	in Prov.)		
Oct-Dec	1	2				
All	2	6				

Appendix 4(b), Accidents by Year and Quarter

		Northern Interior			Southern Interior			Interior		
Year	Q	F	NF	All	F	NF	All	F	NF	All
2002	2	0	0	0	1	0	1	1	0	1
	3	3	0	3	0	1	1	3	1	4
	4	0	0	0	0	0	0	0	0	0
2003	1	1	8	9	0	2	2	1	10	11
	2	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	1	1	0	1	1
	4	1	0	1	1	0	1	2	0	2
2004	1	0	1	1	0	3	3	0	4	4
	2	0	0	0	0	1	1	0	1	1
	3	0	1	1	0	0	0	0	1	1
	4	2	2	4	1	0	1	3	2	5
2005	1	3	1	4	0	1	1	3	2	5
	2	1	0	1	0	0	0	1	0	1
	3	1	1	2	0	3	3	1	4	5
	4	1	6	7	0	4	4	1	10	11
2006	1	1	1	2	0	2	2	1	3	4
All		14	21	35	3	18	21	17	39	56

		Coast			Province			Unknown Region		
Year	Q	F	NF	All	F	NF	All	F	NF	All
2002	2	1	0	1	2	0	2	0	0	0
	3	0	0	0	3	1	4	0	0	0
	4	0	1	1	0	1	1	0	0	0
2003	1	0	0	0	1	11	12	0	1	1
	2	0	0	0	0	0	0	0	0	0
	3	1	0	1	1	1	2	0	0	0
	4	0	1	1	3	1	4	1	0	1
2004	1	0	2	2	0	7	7	0	1	1
	2	0	0	0	0	1	1	0	0	0
	3	1	1	2	1	2	3	0	0	0
	4	1	1	2	4	4	8	0	1	1
2005	1	0	0	0	3	3	6	0	1	1
	2	0	1	1	1	1	2	0	0	0
	3	1	1	2	3	6	9	1	1	2
	4	2	0	2	3	11	14	0	1	1
2006	1	0	0	0	1	3	4	0	0	0
All		7	8	15	26	53	79	2	6	8