

**BRITISH COLUMBIA
MINISTRY OF FORESTS, LANDS AND
NATURAL RESOURCE OPERATIONS**

Revelstoke Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective July 28, 2011

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Objective of this document

This document provides an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Revelstoke timber supply area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Acknowledgement

For preparation of the information I have considered in this determination, I am indebted to staff of the BC Ministry of Forests, Lands and Natural Resource Operations in the Selkirk Resource District – Columbia Zone and Forest Analysis and Inventory Branch. I am also grateful to the individuals and companies who contributed to this process.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider a number of specified factors in determining AACs for timber supply areas (TSAs) and TFLs. Section 8 of the *Forest Act* is reproduced in full as Appendix 1 of this document.

Description of the Revelstoke TSA

The Revelstoke timber supply area (TSA) is situated in the eastern portion of the Kootenay Boundary Region and is administered by the B.C. Ministry of Forests, Lands and Natural Resource Operations (FLNR), Selkirk Resource District – Columbia Zone office, located in Revelstoke. This district includes two TSAs (Golden and Revelstoke), Tree Farm Licences (TFL) 55 and 56, a portion of TFL 23, Mount Revelstoke National Park, and Glacier National Park. The Trans Canada Highway and a major railway pass through the southern portion of the TSA.

The Revelstoke TSA occupies just over 527 000 hectares with TFLs and other non-TSA ownership classes removed. Approximately 55 percent of this area is non-forested. Of the forested area (45 percent), only 10 percent is currently suitable and available to support timber harvesting. A large portion of the area available for timber harvesting, referred to as the timber harvesting land base (THLB), exists in younger age classes (0-40 years) and older classes (older than 141 years); relatively little is available in the age class between 41 and 140 years.

The productive forest in the TSA falls nearly equally into the Interior Cedar–Hemlock (ICH) and the Engelmann Spruce-Subalpine Fir (ESSF) biogeoclimatic zones. The main commercial tree species are Engelmann spruce (31 percent), western hemlock (23 percent), western redcedar (22 percent), and Douglas-fir (18 percent).

The forests of the Revelstoke TSA provide a variety of habitat for wildlife, including large animals such as black bear, grizzly bear, moose, elk, mule deer and mountain goat. The TSA provides important habitat for the Revelstoke-Shuswap caribou herd.

Although there are no resident First Nation communities or Indian Reserves within the Revelstoke TSA, the area is situated within the asserted traditional territories of three different Nations: Ktunaxa, Shuswap and Okanagan. A total of thirteen First

Nations groups — three tribal councils and ten bands have an interest in the Revelstoke TSA.

Revelstoke, with a population of 7267 in 2009, has the largest population in the TSA. Within the northern portion of the TSA, a small number of residents live in Mica Creek. The economy of the area is well-diversified and is well-balanced between the forestry, tourism, railway and public service sectors.

History of the AAC

In 1981, the AAC was 130 000 cubic metres. Following the transfer of area to TFL 23 and the use of improved information, the AAC was increased to 269 000 cubic metres in 1985. In 1995, the AAC was decreased to the current level of 230 000 cubic metres.

This was apportioned by the Minister of Forests and Range (now FLNR) as shown in Table 1.

Table 1. Apportionment of 2005 AAC for the Revelstoke TSA

Form of Tenure	Commitment (cubic metres per year)
Forest Licences (replaceable)	180 835
BC Timber Sales	44 510
Forest Service Reserve	4 655
Total	230 000

New AAC determination

Effective July 28, 2011, the new AAC for the Revelstoke TSA will be 225 000 cubic metres. This AAC will remain in effect until a new AAC is determined, which may take place within 10 years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Revelstoke TSA includes the following:

- B.C. Ministry of Forests. 1998. *Procedures for Factoring Visual Resources into Timber Supply Analyses*. Timber Supply Branch;
- B.C. Ministry of Forests. 2004. *Timber Supply Review, Revelstoke Timber Supply Area Analysis Report*. Timber Supply Branch;
- B.C. Ministry of Forests. 2003a. *DFAM interim standards for data package preparation and timber supply analyses*. Timber Supply Branch;
- B.C. Ministry of Forests. 2003b. *DFAM interim standards for public and First Nations review*. Timber Supply Branch;
- B.C. Ministry of Forests. 2003c. *Modelling options for disturbance of areas outside the timber harvesting land base*. Draft working paper. Forest Analysis Branch;

- B.C. Ministry of Forests. 2003d. *Harvest Flow Considerations for the Timber Supply Review*. Draft working paper. Forest Analysis Branch:
http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/365082/DFAM_harvest_flow_options.pdf;
- B.C. Ministry of Forests and B.C. Ministry of Environment, Lands and Parks. 1995. *Biodiversity Guidebook*. Forest Practices Code, Victoria, B.C.;
- Forsite Consultants Ltd., Timber Supply Area Timber Supply Review #4 Analysis Report FINAL, September 7, 2010. Prepared for Revelstoke Licencee/BCTS Group;
- *Forest and Range Practices Act. Forest Planning and Practices Regulation*;
- Government of B.C. 2002. *Kootenay-Boundary Higher Level Plan Order*. B.C. October 26, 2002;
<http://archive.ilmb.gov.bc.ca/slrp/lrmp/cranbrook/kootenay/pdf/KBHLPOrder0925.pdf>
- Government of British Columbia, Revelstoke Higher Level Plan Order, March 2005;
- *Heritage Conservation Act*:
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96187_01;
- Jones, C., Stehle, K., and E.Valdal. Silvatech. 2006. Revelstoke Predictive Ecosystem Mapping Final Report (BAPID #4316). Prepared for Mount Revelstoke National Park, Revelstoke Community Forest Corporation and BC Ministry of Forests and Range – Small Business Program;
- Kootenay Inter-Agency Management Committee. 1997. *Kootenay-Boundary Land Use Plan Implementation Strategy*. Land Use Coordination Office;
- Letter from the Minister of Forests and Range to the Chief Forester, Re: Economic and Social Objectives of the Crown, July 4, 2006;
- Ministry of Environment, Ungulate Winter Range Order U-4-001, December 2005;
- Ministry of Environment, Wildlife Habitat Areas for Coeur d’Alene Salamander, 4-038, 4-039, 4-040, 4-041, 4-043, July 2005 and April 2006;
- Ministry of Environment, Caribou Government Actions Regulation (GAR) Order U-3-005, February 2009;
- Ministry of Environment, Provincial Identified Wildlife Management Strategy, 1999;
- Ministry of Environment, Accounts and Measures Managing Identified Wildlife – Appendices V.2004’ (Number 13);
- Ministry of Forests, Ministry of Environment, Landscape Unit Planning Guide, 1999;
- Ministry of Forests, Lake Classification and Lakeshore Management Guidebook: Nelson Forest Region, September 1996;
- Ministry of Forests and Range, Visuals GAR Order, Columbia Forest District, January 2007;
- Ministry of Forests and Range, Draft TSR First Nation Consultation Workbook, 2007;

- Ministry of Forests, Age to Green-up Height: Using Regeneration Survey Data by Region, Species and Site Index, 2000. Available at: <http://www.for.gov.bc.ca/hre/pubs/docs/age-to-greenup.pdf>;
- Ministry of Forests, Ministry of Environment, Landscape Unit Planning Guide, 1999;
- Ministry of Forests, Riparian Management Area Guidebook, December 1995;
- Snetsinger, J. 2005. Revelstoke Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination. B.C. Ministry of Forests, Timber Supply Branch;
- Timberline, 2008. Level 4 Map accuracy assessment of the Revelstoke TSA and TFL 56 Predictive Ecosystem mapping, Analysis Report (Interim). Prepared for Dieter Offermann, Downie Street Sawmills and Del Williams, Revelstoke Community Forest Corporation;
- Wilmer, F. 2007. Revelstoke Timber Supply Area Old Growth Management Areas Report. B.C. Ministry of Agriculture and Lands.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. Most of the technical information used in determinations is in the form of a timber supply analysis and its inputs of inventory and growth and yield data. These are concerned primarily with biophysical factors – such as the rate of timber growth and the definition of the land base considered available for timber harvesting – and with management practices.

The analytical techniques used to assess timber supply necessarily are simplifications of the real world. Many of the factors used as inputs to timber supply analysis are uncertain, due in part to variation in physical, biological and social conditions. Ongoing scientific studies of ecological dynamics will help reduce some of this uncertainty.

Furthermore, computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Technical information and analysis; therefore, do not necessarily provide the complete answers or solutions to forest management decisions such as AAC determinations. Such information does provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

In determining this AAC for the Revelstoke TSA I have considered known limitations of the technical information provided. I am satisfied that the information provides a suitable basis for my determination.

Guiding principles for AAC determinations

Rapid changes in social values and in the understanding and management of complex forest ecosystems mean there is always uncertainty in the information used in AAC determinations. In making the large number of periodic determinations required for British Columbia's many forest management units, administrative fairness requires a

reasonable degree of consistency of approach in incorporating these changes and uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. In any specific circumstance where I may consider it necessary to deviate from these principles, I will explain my reasoning in detail.

Two important ways of dealing with uncertainty are:

- (i) minimizing risk, in respect of which in making AAC determinations I consider particular uncertainties associated with the information before me and attempt to assess and address the various potential current and future, social, economic and environmental risks associated with a range of possible AACs; and
- (ii) redetermining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, I intend to reflect, as closely as possible, those forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect to factors that could affect the timber supply that are not substantiated by demonstrated performance or are beyond current legal requirements.

In many areas, the timber supply implications of some legislative provisions remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

It is my practice not to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government. However, where specific protected areas, conservancies, or similar areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting resource management objectives such as for biodiversity.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyse and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring, for instance, further detailed planning or legal designations such as those provided for under the *Land Act* and the *Forest and Range Practices Act* (FRPA). In cases where there is a clear intent by government to implement these decisions that have not yet been finalized, I will consider information that is relevant to the decision in a manner that is appropriate to the circumstance. The requirement for regular AAC reviews will ensure that future determinations address ongoing plan-implementation decisions.

Where appropriate I will consider information on the types and extent of planned and implemented silviculture practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of their timber supply effects.

Some persons have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until

better data are available. I agree that some data are incomplete, but this will always be true where information is constantly evolving and management issues are changing. The requirement for regular AAC reviews will ensure that future determinations incorporate improved information.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligation resulting from recent court decisions to consult with First Nations regarding asserted rights and title (aboriginal interests) in a manner proportional to the strength of their aboriginal interests and the degree to which the decision may impact these interests. In this regard, I will consider the information provided to First Nations to explain the timber supply review (TSR) process and any information brought forward respecting First Nations' aboriginal interests including how these interests may be impacted, and any operational plans and actions that describe forest practices to address First Nations' interests, before I make my decision. As I am able, within the scope of my authority under Section 8 of the *Forest Act*, where appropriate I will seek to address aboriginal interests that will be impacted by my decision. When aboriginal interests are raised that are outside my jurisdiction, I will endeavour to forward these interests for consideration by appropriate decision makers. Specific concerns identified by First Nations in relation to their aboriginal interests within the TSA are addressed in various sections of this rationale.

The AAC that I determine should not be construed as limiting the Crown's obligations under court decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Revelstoke TSA. It is also independent of any decisions by the Minister of Forests, Lands and Natural Resource Operations with respect to subsequent allocation of wood supply.

Overall, in making AAC determinations, I am mindful of my obligation as a steward of the forested land of British Columbia, of the mandate of the Ministry of Forests, Lands and Natural Resource Operations as set out in Section 4 of the *Ministry of Forests and Range Act*, and of my responsibilities under the *Forest and Range Practices Act (FRPA)*.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review Program (TSR) for timber supply areas (TSA) and TFLs.

For most AAC determinations, a timber supply analysis is carried out using an information package including data and information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and

a computer simulation model, a series of timber supply forecasts can be produced to reflect different starting harvest levels, rates of decline or increase, and potential trade-offs between short- and long-term harvest levels.

From a range of possible forecasts, one is chosen in which an attempt is made to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the “base case” forecast and forms the basis for comparison when assessing the effects of uncertainty on timber supply. The base case is designed to reflect current management practices.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity – as with all the other forecasts provided – depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which resulting predictions of timber supply must be adjusted to more properly reflect the current and foreseeable situation.

These adjustments are made on the basis of informed judgment using currently available information about forest management, and that information may well have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans.

Thus, in reviewing the considerations that lead to the AAC determination, it is important to remember that the AAC determination itself is not simply a calculation. Even though the timber supply analysis I am provided is integral to those considerations, the AAC determination is a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that in part may be based on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation would be gained by attempting a computer analysis of the combined considerations.

Base case for the Revelstoke TSA

The base case harvest forecast presented in *Revelstoke Timber Supply Area: Timber Supply Review #4 Analysis Report* (“analysis report”) was prepared by Forsite Consulting Limited (Forsite) using Forest Planning Studio (FPS-ATLAS). The base case incorporated the most current available information on forest management, land base and timber yields for the TSA. Specific assumptions about the TSA and the management of its forests are discussed in detail in the analysis report. Some of the key input data and methodologies that differ from the 2004 analysis include the following:

- Old growth management areas (OGMAs) and mature plus old growth (MOGMAs) were established in 2006 to meet biodiversity requirements for 10 years as part of the Revelstoke Higher Level Plan Order. The 2004 timber supply analysis applied seral stage targets to meet these objectives for the entire planning horizon.
- Government Actions Regulation (GAR) order U-4-001 for mule deer and moose habitat, proclaimed in 2007, requires that, in each Ungulate Winter Range (UWR) management unit, a minimum percentage of forest—ranging from 10 to 40 percent—be maintained above a threshold age of between 60 and 100 years, and requires that no more than 40 percent of the forest be less than 21 years. The assumptions applied in the 2004 analysis were more constraining; they required a minimum of 40 percent of the forest to be greater than 120 years old and a maximum of 25 percent to be less than two metres in height.
- Visual Quality Objectives (VQO's) which were legally established for the TSA in 2000, were updated in 2007. The accompanying assumptions for visual management were also revised.
- GAR order U-3-005 for caribou habitat, proclaimed in 2009 and amended in 2010 to reflect updated mapping, established spatially explicit caribou habitat reserves that include incremental reserves beyond what was previously required under the Revelstoke Higher Level Plan. These reserves reduced the size of THLB relative to the previous timber supply analysis done in 2004; when most of these areas were included and subject to forest cover constraints.
- Wildlife Habitat Areas (WHAs) have been designated in the TSA.
- Revelstoke Mountain Resort Boundary has been established and the area excluded.
- Changes to the THLB: The THLB defined in the current analysis is 78 018 hectares which is 20 110 hectares smaller than the THLB defined for the 2004 analysis. This difference was due primarily to the use of spatially-explicit Caribou reserves instead of forest cover constraints for most of these areas.

The base case harvest projection was modelled according to the provincial policy objectives of creating a sustainable harvest flow that avoids both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. The modelled harvesting priority rules included use of the 'oldest first' rule while ensuring all forest cover constraints were met at all times. Other objectives included: achieving a timber supply flow that most equitably spreads the current and subsequent step downs in harvest between the early decades in the planning horizon, and ensuring a gradual transition from short- to mid- to long-term, by avoiding large and abrupt disruptions in the timber supply.

In the base case the initial harvest level could not be maintained at the current AAC level of 230 000 cubic metres per year. Instead, an initial harvest level of 207 000 cubic metres per year – 10 percent lower than the current AAC – was maintained for one decade before declining by 10 percent per decade for the next four decades. The lowest harvest level in the forecast horizon – 135 900 cubic metres per year – was reached in

decade five. Beginning in the sixth decade, the harvest level increased each decade for five decades to a long-term level of 240 500 cubic metres per year.

The contribution of natural and managed stands in the base case forecast indicates that for the first three decades, the harvest is supported primarily by existing, natural stands. In the fifth decade the harvest contribution shifts to existing managed stands and by the seventh decade the contribution from managed stands is more than half of the harvest volume.

Mean harvest age is above 250 years in the short term, harvest ages gradually decline through the mid term to a long-term mean of 113 years, when harvesting is primarily from managed stands. Mean harvest volume starts at 390 cubic metres per hectare with volume primarily from older stands and then increases as future managed stands, which are predicted to have higher volumes than existing natural stands, become available for harvesting.

The annual harvest area is forecast to average 468 hectares per year during the first 100 years and 567 hectares during the last 150 years of the base case forecast. This increase in the average annual harvest area occurs despite the shift to harvesting higher volume managed stands because more total area is required to meet the higher long-term harvest level of 240 500 cubic metres per year.

I have reviewed in detail the assumptions and methodology incorporated in the base case; as well as the total growing stock, the harvest contributions from managed and unmanaged stands, the average volumes per hectare, the total area harvested annually, and the average ages of the forest stands harvested. Based on my review, I am satisfied, subject to the qualifications accounted for in various sections of this document, that the information presented to me provides a suitable basis from which I can assess the timber supply for the Revelstoke TSA. In addition to the base case forecast, I was provided with alternative harvest flows, a number of sensitivity analyses carried out using the base case as a reference, and supplemental analysis work. This and other information noted below have been helpful in the considerations and reasoning leading to my determination.

Consideration of factors as required by Section 8 of the *Forest Act*

I have reviewed the information for all of the factors required for consideration under Section 8 of the *Forest Act*. Where I have concluded that the modelling of a factor in the base case appropriately represents current management or the best available information, and uncertainties about the factor have little influence on the timber supply projected in the base case, no discussion is included in this rationale. These factors are listed in Table 2.

Table 2. List of factors for which base case modelling assumptions have been accepted

Forest Act section and description	Factors accepted as modelled
8(8)(a)(i) Land base contributing to timber harvesting	Economic and physical operability Environmentally sensitive areas/terrain stability Low productivity sites Roads, trails, and landings Woodlot licences Archaeological sites
8(8)(a)(i) Composition of the forest and expected rate of growth	Age class structure and species profile Site productivity estimates
8(8)(a)(ii) Expected time for the forest to be re-established following denudation	Regeneration delay Impediments to prompt/successful regeneration Not sufficiently restocked (NSR)
8(8)(a)(iii) Silvicultural treatments to be applied	Silvicultural systems Incremental silviculture
8(8)(a)(iv) Standard of timber utilization and allowance for decay, waste, and breakage	Utilization standards and compliance; decay, waste, and breakage and coarse woody debris
8(8)(a)(v) Constraints on the amount of timber produced by use of the area for other purposes	Cutblock adjacency and green-up Recreation areas of significance Riparian management Community and domestic watersheds; drinking water intakes Identified wildlife Ungulate winter range
8(8)(a)(vi) Other information	—
8(8)(b) Short and long-term implications of alternative rates of timber harvesting from the area	—
8(8)(d) Economic and social objectives of the government	—
8(8)(e) Abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area	Forest health Unsalvaged losses

Section 8 (8)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area:

Land base contributing to timber harvesting

- general comments

The total area of the Revelstoke timber supply analysis area, as reported in the analysis report, is 527 005 hectares. As part of the process used to define the area available for

timber harvesting – referred to as the timber harvesting land base (THLB), a series of deductions were made from the Crown forest land base (CFLB). These deductions account for economic or ecological factors that operate to reduce the forest area available for harvesting. In reviewing these deductions, I am aware that some areas may have more than one classification. To ensure accuracy in defining the THLB, care must be taken to avoid any potential double-counting associated with overlapping objectives. Hence, a specific deduction for a given factor reported in the analysis or the AAC rationale does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification.

For the Revelstoke TSA, I acknowledge that the above approach was used in the timber supply analysis, resulting in a THLB of 57 908 hectares. Given that the CFLB is 236 126 hectares, the remaining non-THLB area of 178 218 hectares is forested land which is reserved from timber harvesting in order to provide for other forest resource values.

The current THLB is 26 percent smaller than the land base assumed in the 2004 analysis. Several factors contributed incrementally to cause this decrease in the area considered to be productive and operable, principal among them being the spatially explicit mapping of caribou and biodiversity reserves. A significant proportion of the area excluded for this analysis was previously subject to forest cover constraints.

The inventory information used in the analysis was updated for depletion and then growth was projected using either the VDYP model for existing stands older than 30 years or Table Interpolation Program for Stand Yields model (TIPSY) for managed stands. Existing managed stands were defined as those stands known to have been harvested in the last 30 years, i.e. between 1980 and 2010. Following harvest, existing stand and existing managed stand volumes were projected using TIPSY; however, genetic gains were applied.

- existing stand volumes

A vegetation resources inventory (VRI) audit was carried out in the operable area of the Revelstoke TSA. The objective was to assess the accuracy of the volumes by comparing those predicted by the ministry's Variable Density Yield Projection model version 7 (VDYP7) from photo interpreted inventory attributes (VRI Phase 1) to the volumes compiled using ground sample data (VRI Phase 2) corrected with net volume adjustment factors (NVAF). Ground sampling was completed for the five leading-species stand types in the TSA: hemlock, cedar, spruce-balsam, Douglas-fir/pine, and deciduous. The results of the comparison indicate that overall inventory volumes are currently underestimated by about 17 percent. The results for individual leading-species stand types ranged from a minimal volume bias for cedar, to five percent in the spruce-balsam leading stands, to 70 percent in Douglas-fir/pine stands.

A forecast was prepared to assess the effect on timber supply of using the VRI audit-corrected inventory data for hemlock, cedar, and spruce-balsam, as well as the forest management requirements of the amended Revelstoke Higher Level Plan Order (RHLPO). The inventory correction excluded Douglas-fir/pine stands due to the high sampling error for this stand type, as well as deciduous stands for which there is

minimal utilization in this TSA. These adjustments resulted in seven percent and four percent increases in the short- and mid-term base case timber supply, respectively.

According to inventory staff, preliminary study of cedar in the Interior Cedar–Hemlock (ICH) zone suggests that the actual volume of merchantable cedar may be significantly lower than the estimates used in this analysis. The discrepancy in inventory cedar volume and post-harvest cedar volumes appears to be due to an overestimation of merchantable wood found in a recent study that compared the volumes from a joint scale and NVAF destructive sample. In the VRI audit process, the NVAF destructive sample results in a correction of the estimation of the amount of sound wood fibre but in the case of Interior cedar, the sound wood is so intermingled with decayed wood, there is a negative impact on merchantability that is not readily predicted by just the level of decay, waste and breakage.

I have reviewed the information regarding the volume estimates for existing stands used in the base case. Based on the results of the VRI audit and the additional analysis that examined the timber supply effects of using VRI-audit adjusted inventory information, I conclude that the base case short-term timber supply and mid-term timber supply have been underestimated by seven percent and four percent, respectively, and I will account for this in my determination as discussed in **‘Reasons for Decision’**. Given that the majority of the Revelstoke TSA timber harvesting land base occurs in this zone, further study of the potential impact of actual post-harvested cedar volumes on timber supply is recommended, as indication in **‘Implementation’**.

- problem forest types

Problem or non-merchantable forest types are stands that contain tree species that are not currently utilized, or timber of low quality, small size and/or low volume. In the Revelstoke TSA, problem forest types include: balsam-leading stands in which more than 80 percent of the volume is balsam; balsam-leading stands in which the next most abundant species is hemlock and hemlock-leading stands in which more than 80 percent of the volume is hemlock.

In response to a request made by the chief forester during the previous timber supply review, district staff reviewed harvest performance in problem forest types. They found that for the five-year period (2002 – 2007), licensees were harvesting the profile for these stand types. Consequently, these stands were assumed to contribute to the THLB used in this timber supply review.

A subsequent review of harvest performance following completion of the timber supply analysis indicated that there had been a significant decrease in the harvest of hemlock-leading stands (over 80 percent hemlock). In a sensitivity analysis, excluding hemlock-leading stands from the THLB resulted in about a six percent decrease in the short- to mid-term timber supply and in about a five percent decrease in the long-term harvest level.

I have reviewed harvest performance in problem forest types and note that it is not unusual for the level of harvest activity in given stand types to vary over time in response to cyclical changes in market conditions. Therefore, I accept that the assumptions used in the analysis for problem forest types were adequate for use in this determination.

However, if the harvesting decrease in hemlock-leading stands continues, there is a significant risk of over harvesting other stand types in the THLB. Therefore, I request that district staff continue to monitor harvest performance in stands classified as problem forest types, particularly hemlock-leading stands with over 80 percent hemlock volume, and that this information be incorporated in the next timber supply review, as outlined in **‘Implementation’**.

- deciduous volumes

For the analysis, Forest Analysis and Inventory Branch provided the licensees’ analyst with existing stand yield tables that included deciduous volumes. However, deciduous tree species are not harvested extensively in the Revelstoke TSA and this information should have been excluded from the yield tables.

Removing the deciduous volume component from the existing stand yield tables resulted in a 2.6 to 3.5 percent decrease in short-term timber supply.

On this basis, I will account for about a three percent overestimation in the short-term harvest levels projected in the base case, as discussed in **‘Reasons for Decision’**.

- Interior log grade changes

A new log grade system for the interior of British Columbia was implemented in April 2006 to recognize the volume potential from trees impacted by the mountain pine beetle epidemic. Harvest volumes from Grade 3 (dead and dry sawlog) and Grade 5 (dead and dry lumber reject) logs were previously excluded from cut control summaries. Additionally, grades are now based on the log size and quality at the time of scaling regardless of whether the tree it came from was alive or dead at harvest. The volumes from these grades now contribute to the total volume calculation and are charged against the AAC. Therefore, the volume from the dead component of stands (dead potential) must be accounted for in my AAC determination.

Estimates of timber volume in the base case did not include dead potential volume. Possible sources of data about dead potential volume include inventory audit plots, inventory ground samples, permanent sample plots, and temporary sample plots. Based on data from inventory audit plots, dead potential volume is about 3.7 percent to 5.1 percent of the volume from existing natural stands over 60 years of age in the Revelstoke TSA.

Based on my review of the interior log grade changes, I conclude that the short-term timber supply in the base case was underestimated by up to five percent and I will account for this in my determination, as discussed in **‘Reasons for Decision’**.

(ii) the expected time that it will take the forest to become re-established on the area following dedundation:

- volume estimates for existing managed and future managed stands

In the Revelstoke TSA, silvicultural management regimes have been in regular use since 1980. Therefore, in the analysis existing managed stands were defined as those known to have been harvested in the last 30 years between 1980 and the start of the timber supply forecast period. After harvest, existing natural stands and existing managed stands were assigned to future managed stand analysis units based on the originating stand type and silvicultural regime.

Existing managed stand and future managed stand yields were obtained from the ministry's Table Interpolation of Potential Stand Yield (TIPSY) model. As opposed to existing managed stands, future managed stands were subject to adjustment for genetic gain due to the use of improved seed.

- existing managed stand age and genetic gain

Following the inventory depletion update completed as part of the process to predict existing managed stand volumes, it was determined that many stands that had regenerated after 1995 were incorrectly reset to age zero.

In a sensitivity analysis, correcting these errors had no impact on the base case initial harvest level. However, the mid-term harvest level and the minimum harvest age were improved by four percent as stands reached green-up height and minimum harvest age sooner.

Historical seed use information for the TSA obtained from the FLNR Seed Planning and Registry System (SPAR) and the Reporting Silviculture Updates and Land-status Tracking System (RESULTS) was used to calculate genetic worth values for larch and spruce planted between 1980 and 2007. Values for other species were not calculated due to the limited use of these seedlings in the TSA.

The resultant 28-year genetic gain averages were based on 18 years of planting with no genetic gains followed by 10 years of planting with genetic gains. However, the 28-year averages applied in the base case were higher than the actual mean value of 1.2 percent for both larch and spruce. FLNR analysis staff indicated that application of the corrected value would likely result in a slight decrease in the mid-term timber supply.

On this basis, I conclude that in combination these factors result in about a three-percent underestimation in the base case mid-term timber supply and I will account for this in my determination, as discussed in '**Reasons for Decision**'.

- minimum harvest age

In the base case, minimum harvest ages (MHA) for existing stands were defined by the age at which the following criteria were met: 95 percent of culmination of mean annual increment (CMAI) and species specific minimum harvest volume and diameter thresholds. For existing and future managed stands an additional piece-size criterion was applied. However, review of the base case indicates that volume per hectare and diameter thresholds had no influence on MHA. Furthermore, although stands are not

eligible for harvest before achieving MHA, many stands were harvested well after attainment of MHA in order to meet forest management constraints and sustainability requirements.

Two sensitivity analyses, one prepared by Forsite and one prepared by FAIB, examined the effect of decreasing the MHA by 10 years. Both alternatives resulted in a 25-percent increase in the mid-term harvest level and a 3.4-percent increase in the long-term harvest level. The FAIB alternative indicates that it might be possible to maintain the current AAC for the next 10 years if managed stands can be harvested 10 years earlier than in the base case.

FAIB conducted an additional sensitivity analysis in which MHAs were based on the minimum volume per hectare and diameter criteria while disregarding the 95 percent CMAI requirement. This resulted in significantly lower MHAs and significantly improved harvest flow flexibility in the short- to mid-term timber supply forecast.

Operationally, harvesting stands at ages below the assumed MHAs could take place in managed stands, for example managed stands that are located on lower slopes and closer to processing facilities. The decreased operating costs associated with these stands may allow harvesting early than indicated in the base case.

The potential flexibility in the short- to mid-term timber supply was not reflected in the base case, and although I will make no adjustment to the harvest levels projected in the base case, this flexibility is an important factor in my determination, as discussed in **‘Reasons for Decision’**.

- stand development monitoring

Stand development monitoring (SDM) is a relatively new approach by the FLNR to check stand growth and health after stands are free growing and before harvest. The objective of SDM is to improve estimates of stand yield at rotation age based on measurements of tree and stand attributes at mid-rotation.

Preliminary data from 21 sites in the neighbouring Golden TSA and seven sites in the Revelstoke TSA suggest that not all planted trees become crop trees, i.e. only about 70 percent of the well-spaced crop trees could be considered planted trees and ingress of natural trees is greater than previously assumed. The ingress trees are not as well-spaced, are established later than the planted trees and have no genetic gain. In order to confirm the statistical validity of these initial findings, a total of 30 sample sites are required in each of the Golden and Revelstoke TSAs.

Current regeneration inputs to TIPSYS do not allow for a staggered initiation of crop trees and poor spacing. Therefore, the future managed stand yields used in this analysis do not account for the ingress of natural trees. In a sensitivity analysis, decreasing future managed stand yields by 10 percent had no effect on the short- to mid-term harvest levels projected in the base case. However, the long-term harvest level was reduced by about 11 percent.

I am concerned about the preliminary SDM findings for the Revelstoke TSA, particularly in light of similar findings in the neighbouring Golden TSA. However, as sensitivity analysis results indicate that reduced future stand productivity has no effect on the short- to mid-term harvest levels and the statistical validity of the initial SDM findings has yet

to be confirmed, I will not account for this information in the current determination. Prior to the next determination, it is my expectation that FLNR will continue SDM and that the confirmed results will be used to inform the next timber supply review, as noted in **‘Implementation’**.

(iii) silvicultural treatments to be applied to the area:

As noted in Table 2, I accept as modelled the factors usually considered under this section, and I will not discuss them further.

(iv) the standard of timber utilization and allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area:

As noted in Table 2, I accept as modelled the factors usually considered under this section, and I will not discuss them further.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production:

- landscape-level biodiversity

The Revelstoke Higher Level Plan Order (RHLPO) specifies the required amount of old and mature forest that must be retained for the biodiversity emphasis objective (BEO) specified for each landscape unit (LU). The RHLPO requirements replace the provisions in the Order the following three ways:

1. Seral stage targets must be spatially defined through the establishment of old growth management areas (OGMA) and mature-plus-old management areas (MOGMA) and these are more constraining than aspatial percentages;
2. The full level of old and mature seral targets must be met in low BEO LU's; while in the Provincial Non-Spatial Old Growth Order there is an allowance in low BEO areas to meet old and mature limits over three rotations; and
3. Seral stage targets must be met from stands both above and below the operability line.

The OGMAs and MOGMAs designated to meet these biodiversity requirements were mapped spatially in advance of the current analysis. In the base case, these spatial constraints were applied for the first 10 years of the forecast, after which aspatial forest cover constraints were applied.

To meet the retention targets, any forested non-contributing area (non-THLB) such as Caribou GAR Order reserves can be used. For this reason, the spatial biodiversity mapping was combined with the RHLPO spatial requirements for caribou habit with the objective to create as much overlap as possible. Even with this approach, the analysis showed that within the THLB, 23 000 hectares of old, and 11 000 hectares of mature-plus-old stands were considered to be “tightly constrained” and the harvest was limited at the landscape unit-biogeoclimatic variant level in some areas.

FLNR staff indicate that a request for an amendment to the RHLPO biodiversity requirements is currently being developed and is expected to be finalized later this year.

However, at the time of this determination, no changes have been to the legal requirements outlined in the RHLPO.

In a sensitivity analysis, applying the equivalent of the Provincial Non-Spatial Old Growth Order biodiversity requirements increased short- to mid-term timber supply by 7.6 percent and long-term timber supply by 3.5 percent.

In keeping with my guiding principles, it is not my practice to speculate on factors “that could affect timber supply that are not substantiated by demonstrated performance or are beyond current legal requirements”. Therefore, I will not adjust the base case on account of the likely, but not yet finalized and implemented, amendment to the RHLPO biodiversity requirements other than to note that once implemented, the amendment should increase the flexibility in the short- to mid-term timber supply and I will refer to this in ‘**Reasons for Decision**’.

- existing and future wildlife tree retention

Existing wildlife tree patches (WTP) were excluded from the THLB used in the analysis. Future wildlife tree retention was modelled based on the licensee’s Forest Stewardship Plans (FSP) that are based on the default seven percent retention required for cutblocks. Where possible, WTPs are placed within areas already excluded from the THLB to account for other values. WTPs are generally managed so that they are a maximum of 500 metres apart.

Based on these two factors, minimum cutblock retention of seven percent and 500-metre maximum spacing distance, a procedure was developed to estimate the area required for future wildlife tree retention. Based on this procedure, future stand yields were reduced by 0.41 percent. District reviewed and accepted the assumptions for future wildlife tree retention.

However, based on the levels of retention I have observed in other TSAs, I am concerned that future wildlife tree retention may have been underestimated in the base case. On this basis, I request that district staff work with licensees to ensure that wildlife tree retention is appropriately reported and that the results be used to inform the next timber supply review, as indicated in ‘**Implementation**’. For this determination, I accept that existing and future wildlife tree retention assumptions used in the base case are adequate for use in this determination.

- scenic areas

In the Revelstoke TSA, about 28 percent or 16 222 hectares of THLB occur in scenic areas subject to visual quality objectives (VQO). In the analysis, VQOs were modelled as maximum disturbance constraints, i.e. limits were placed on the proportion of scenic areas that could be below the age at which the stand is perceived to be ‘greened-up’ (visually effective green-up height) at any one time.

District staff completed nine visual effectiveness evaluations that represent the majority of the harvesting that has occurred in scenic areas over the last five years. Eight of the nine evaluations, indicate that VQOs were either being ‘met’ or ‘well met’. However, for five of the nine evaluations, staff indicate that the VQOs were only met because the harvested areas were relatively small, not as a result of effective visual design.

According to FAIB staff, after the fourth decade in the analysis, VQOs tightly constrain timber supply on a substantial proportion of the area to which they apply. As 28 percent of the THLB is subject to VQOs this could have a significant effect on the mid- to long-term timber supply.

For this determination, I conclude that the base case assumptions for scenic areas appropriately represent current practices and are appropriate for use in this determination. However, over time, harvesting will have to shift towards scenic areas and unless visual design techniques improve, VQOs could become a significant factor restricting mid- to long-term timber supply. Therefore, I encourage licensees to improve the visual design of cutblocks in scenic areas and request that district staff continue to monitor visual effectiveness as indicated under '**Implementation**'.

- grizzly bear

The RHLPO requires that a 50-metre forested buffer be maintained on one side of an avalanche chute in areas identified as high value grizzly bear habitat, where: harvesting occurs parallel to the chute; both sides of the chute are to be harvested; only one side of the chute is forested; or the width of the forested area on either side of the avalanche chute is less than 50 metres wide. In areas where old and mature-plus-old seral stage retention is required, these areas are to be used to meet these grizzly bear requirements.

At the time of the analysis, about 70 percent of the avalanche chute mapping for the TSA had been completed; however, Ministry of Environment (MOE) wildlife biologists had not yet validated the information. At present, licensees decide where to apply buffers during harvesting and often choose to include these areas in wildlife tree patches.

In the base case, in the absence of spatial data, old and mature-plus-old seral stage requirements were assumed to account for high value grizzly bear habitat. However, the base case did not specifically address grizzly bear management or address the potential harvesting delays that might be required in order to provide for grizzly bears.

I accept that the assumptions used in the base case account for high value grizzly bear habitat represent the best available information and are appropriate for use in this determination. I note at the operational level licensees are mindful of the RHLPO requirements for harvesting along avalanche chutes in high value areas. However, in order to ensure that grizzly bear management requirements are being fully addressed during timber supply reviews, I encourage the MOE to complete the high value habitat mapping project and expect this information to be incorporated in subsequent timber supply reviews, as indicated in '**Implementation**'.

- caribou

The Revelstoke TSA provides important habitat for mountain caribou. The RHLPO historically specified caribou habitat management guidelines to be applied in a number of zones within mapped caribou habitat. These requirements, referred to a 'status quo', were mapped for the Revelstoke-Shuswap herd and according to district policy these areas were considered to be unavailable for harvesting.

In 2007, the Species at Risk Coordination Office recommended additional areas of 'no harvest' caribou reserves that were termed 'incremental' for the Revelstoke-Shuswap

herd. In addition, large tracts of ‘inoperable’ available for caribou management were identified. These three components, ‘status quo’, ‘incremental’ and ‘inoperable’ combined reflect the content of the February 12, 2009 Caribou Government Action Regulation Order (GAR) U-3-005 for the Revelstoke-Shuswap herd.

In the analysis, ‘status quo’ and ‘incremental’ caribou reserves resulted in the exclusion of a total of 18 909 hectares from the THLB, a significant decrease from the previous timber supply review. In view of the large impact on the THLB, interagency work is currently under way to locate caribou reserves in areas that are already constrained or excluded from timber harvesting for other resource values. This work resulted in a amended GAR order being approved on December 9, 2010.

I accept that the assumptions used in the base case appropriately reflect the legal requirements for caribou management in the Revelstoke TSA and will make no adjustments to the base case on this account. I encourage FLNR and licensee staff to continue to seek opportunities to minimize the impact of caribou habitat impact on timber supply, while continuing to ensure that the habitat requirement of the Revelstoke–Shuswap Caribou herd are met, as indicated in ‘**Implementation**’.

(vi) any other information that, in the chief forester’s opinion, relates to the capability of the area to produce timber:

- First Nations considerations

The Revelstoke TSA area is located within the asserted traditional territories of the Ktunaxa Nation, the Secwepemc (Shuswap) Nation and the Sylix (Okanagan) Nation. A total of thirteen First Nations — three tribal councils and ten bands — have an interest in the Revelstoke TSA. There are no First Nations communities or Indian Reserves within the TSA boundary.

Forest Resource Agreements (FRAs) are in place with the Little Shuswap Indian Band and the Lower Similkameen Indian Band. Forest and Range Opportunities Agreements (FROs) are in place with Ktunaxa Nation Council, Aksiq’nuk First Nation, Shuswap Indian Band, Adams Lake Indian Band, Neskonlith Indian Band, Splatsin, Simpcw First Nation, Okanagan Indian Band, and the Penticton Indian Band.

The Ktunaxa Nation (Ktunaxa Kinbasket Treaty Council) is participating in the BC Treaty Process. In June 2010, the Ministry of Aboriginal Relations and Reconciliation (MARR) asked line agencies to review two new Areas of Interest (AOIs) proposed by the Ktunaxa Nation; located within the TSA. Since that time, the area near the City of Revelstoke has been excluded, but the AOI at Clachnacudainn Creek remains included for consideration. MARR has confirmed that there are no reserves under Section 16 of the *Land Act* or any other Act, active cutting permits or road permits within these areas. MARR continues to manage this proposal as part of ongoing treaty negotiations. In the event that these areas are designated, appropriate provisions within the *Lands Act* can be accessed.

Information sharing with the potentially impacted First Nations regarding the Revelstoke TSA Timber Supply Review was initiated by the Selkirk Resource District and an invitation to participate on the Timber Supply Review Technical Committee was

extended to all parties in October, 2008. The required Level Five (Normal) consultation process was initiated on February 6, 2009 by Forsite on behalf of the licensee, BCTS, and the district. The process concluded on May 6, 2010. A first copy of the draft *Revelstoke TSA Timber Supply Review #4: Timber Supply Analysis Data Package* was provided in March, 2009 and follow-up phone calls and discussions were carried out in April, 2009. The *Revelstoke TSA Timber Supply Review #4: Timber Supply Analysis* was provided to the 13 First Nations in February, 2010. A First Nations Consultation Letter was sent in March, 2010 by the Selkirk Resource District and an information-sharing website managed by Forsite has been in place since that time.

From my review of the consultation summary, I believe the Selkirk Resource District and the licensees have made reasonable efforts to engage First Nations in consultation respecting their aboriginal interests and how these interests may be affected by this AAC determination. I agree with district staff that the level of consultation was adequate and that opportunities were provided to all First Nations to share their concerns related to specific aboriginal interests that may be impacted by this decision.

I note that FLNR district staff continue to be available to meet and consult with First Nations on specific issues at the operational planning level.

Based on the results of the consultation process, the lack of permanent First Nations settlements in the TSA, and the protection afforded First Nations cultural heritage resources by current operational practices and the *Heritage Conservation Act*, I am satisfied that First Nations' interests were adequately represented in the analysis. If new information regarding First Nations' aboriginal interests becomes available that significantly varies from the information that was available for this determination, I am prepared to revisit this determination sooner than the 10 years required by legislation.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area

- Harvest sequencing and alternative rates of harvest

In addition to the base case and sensitivity analyses, three alternative harvest forecasts were prepared.

In the first alternative, maintaining an initial harvest level of 230 000 cubic metres per year — the level of the current AAC — for as long as possible resulted in more than a 10-percent decrease in timber supply at the end of the first decade.

In the second alternative, the harvest level was decreased to the highest, non-declining level, which was 164 300 cubic metres per year or 29 percent less than the current AAC. This level was maintained for seven decades before increasing in four decadal steps to the same level as in the base case.

In the third alternative, an initial harvest level of 192 300 cubic metres per year could be maintained for one decade before declining in two decadal steps to a mid-term level of 155 700 cubic metres per year. After one decade, the harvest level increased in four decadal steps to the base case long-term harvest level.

I have considered all of the harvest forecasts prepared for this timber supply review, and note that the choice of initial harvest level, effect of the VRI-audit adjusted inventory and other factors indicate that there is significant flexibility in the short-term timber supply for the Revelstoke TSA and I will discuss this further in '**Reasons for Decision**'.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia

Economic and social objectives

- Minister's letter

The Minister of Forests and Range (now FLNR) expressed the economic and social objectives of the Crown for the province in a letter to the chief forester, dated July 4, 2006 (attached as Appendix 3). The letter stresses the importance of a stable timber supply to maintain a competitive and sustainable forest industry while being mindful of other forest values. In respect of this, in the base case projection and in all of the alternative harvest flow projections with which I have been provided for reference in this determination, a primary objective in the harvest flow has been to attain a stable, long-term harvest level where the growing stock also stabilizes. In my determination, I have been mindful of the need for the allowable harvest in the short term to remain consistent with maintaining the integrity of the timber supply projection throughout the planning horizon. I have also considered with care the adequacy of the provisions made both in current practice, and assumed in the analyses, for maintaining a range of forest values.

I am therefore satisfied that this determination accords with the objectives of government as expressed by the Minister.

- employment and community dependence

The population of the Revelstoke TSA decreased by about 13 percent between 1996 – 2006; whereas, provincially the population increased by about six percent during this time. Between 2006 and 2009, the population appears to have stabilized at the current level of about 7300.

The main sources of employment in the TSA are forestry, public sector, tourism and transportation, each sector accounting for about 20 percent of local employment. The average total direct forest industry employment supported by the Revelstoke TSA for the period 2006 – 2008 was 232 person-years, which equates to almost one person-year per 1000 cubic metres of current (2004) AAC and 309 person-years of provincial employment. Recently, the annual harvest from the TSA has supported 469 person-years of employment provincially.

Based on information from the provincial harvest billing system, during the period 2006-2010, an average of about 96 percent of the current Revelstoke AAC has been harvested, although harvesting has decreased slightly in 2009-2010.

It is likely that employment associated with wood processing in the TSA would not decrease proportionally with a decrease in AAC or actual harvest level since the largest

wood processor sources a large portion of its fibre supply from outside the TSA through trading arrangements and purchases.

I have reviewed the information regarding employment and community dependence related to the Revelstoke TSA. I am aware of the linkages between AAC volume and employment, both locally and provincially and I have taken this into account in this determination. I also note that in spite of the recent downturn in forest product markets, the level of harvest activity and forest sector employment in the TSA has remained relatively stable.

- local objectives

The Minister's letter of July 4, 2006, also asks that I consider important local social and economic objectives expressed by the public during the TSR process, where these are consistent with the government's broader objectives as well as any relevant information received from First Nations.

Local objectives for land and resource use in the Revelstoke TSA are captured in the Revelstoke Higher Level Plan Order and in orders under the *Government Actions Regulation of the Forest and Range Practices Act*. The base case assumptions reflected the directions as provided by these orders.

The consultation process for First Nations, and the feedback received, is addressed above under 'First Nations considerations'.

I am satisfied that this determination accords with the objectives of government as expressed by the Minister.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area

As noted in Table 2, I accept as modelled the factors usually considered under this section, and I will not discuss them further.

Reasons for Decision

In reaching my AAC determination for the Revelstoke TSA I have considered all of the factors required under Section 8 of the *Forest Act* and I have reasoned as follows.

In the base case an initial harvest level of 207 000 cubic metres per year — about 10 percent lower than the current AAC of 230 000 cubic metres — was maintained for one decade before declining by 10 percent per decade for the next four decades. The lowest harvest level in the forecast horizon — 135 900 cubic metres per year — was reached in decade five. Beginning in the sixth decade, the harvest level increased each decade for five decades to a long-term level of 240 500 cubic metres per year.

I am satisfied that the assumptions applied in the base case forecast for the majority of the factors applicable to the Revelstoke TSA were appropriate. The following is my consideration of those factors for which I consider it necessary in this determination to further take into account implications to the timber supply as projected in the base case forecast.

In determining an AAC for the Revelstoke TSA, I have identified a number of factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Some of these factors can be readily quantified and their impact on the harvest level assessed with reliability. Others may influence timber supply by adding an element of risk or uncertainty to the decision, but cannot be reliably quantified at this time.

I have identified the following factors in my considerations as indicating that the timber supply projected in the base case may have been *overestimated*:

- *Deciduous volumes*: Deciduous volume should have been excluded from the yield tables used in the analysis, as deciduous tree species are not harvested extensively in the TSA at this time. On this basis I concluded that the short- to mid-term timber supply had been overestimated by 2.6 percent and 3.5 percent, respectively.

I have identified the following factors in my considerations as indicating that the timber supply projected in the base case may have been *underestimated*:

- *Existing stand volumes*: the existing stand volume estimates used in the base case were not based on the VRI-audit adjusted inventory information and I concluded that this resulted in a 7 percent and 4 percent underestimation in the short-to mid-term timber supply, respectively.
- *Interior log grade changes*: Estimates of timber volume in the base case did not include dead potential volume, which is estimated to be about 3.7 percent to 5.1 percent of green stand volume of existing stands older than 60 years of age. On this basis I concluded that the short-term timber supply had been underestimated by up to 5 percent.
- *Existing managed stand ages and genetic gain*: I concluded that incorrect age assignments for some managed stands and overestimation of the average genetic gain, in combination, resulted in about a 3 percent underestimation in mid-term timber supply.

In combination, these factors indicate that the short- and mid-term timber supply projected in the base case has likely been underestimated by about 9 percent and 4 percent, respectively. If these adjustments were applied to the base case, the resultant initial harvest level would be about 226 000 cubic metres per year and the resultant mid-term level would be about 141 000 cubic metres per year.

In addition to the base case and alternative harvest forecasts, I was also provided with a number of timber supply forecasts, including sensitivity analyses to examine the effect on the base case of: the VRI-audit adjusted inventory; lower MHAs and seral stage requirements based on the Provincial Non-Spatial Old Growth Order. After reviewing each of these factors I noted that there appears to be significant flexibility in the short- to mid-term timber supply.

In the sensitivity analysis prepared by FAIB in which MHA was based on volume per hectare and piece size criteria, it was possible to maintain the current AAC for the next 10 years by harvesting stands at younger ages than indicated in the base case. Given the rapid changes that can occur in forest products markets, it is hard to predict with any

degree of certainty the stand features (distance to milling facilities, piece size, volume per hectare) that will influence the economic viability of harvesting younger stands in the future. However, in general I accept that it is likely that second-growth stands will likely be harvested earlier than in the base case forecast.

At this point, given the adjustments to the base case short-term timber supply that increased the initial harvest level to about 226 000 cubic metres per year, the flexibility in short- to mid-term timber supply and the result of removing the CMAI requirement in the model, it could be argued that it would be appropriate to maintain the current AAC. However, when I take into account the significant decrease in mid-term timber supply projected for the Revelstoke TSA and the risk associated with a significantly reduced THLB, I find it prudent to begin the transition to the lower mid-term harvest levels at this time. On this basis, I have decided to set the new AAC at 225 000 cubic metres.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next 10 years and that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the TSA by establishing an AAC of 225 000 cubic metres.

This determination is effective July 28, 2011, and will remain in effect until a new AAC is determined, which must take place within 10 years of the effective date of this determination.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the 10 years required by legislation.

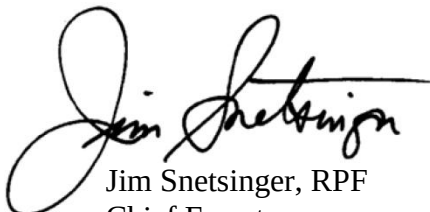
Implementation

In the period following this decision and leading to the subsequent determination, I encourage FLNR staff and licensees to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this document. I recognize that the ability of staff to undertake these projects is dependent on available staff time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the TSA.

- *Existing stand volumes:* there is an apparent discrepancy in inventory cedar volume and post-harvest cedar volumes due to the intermingling of decayed wood with sound wood in cedar growing in the ICH. Given that the majority of the Revelstoke THLB occurs in this biogeoclimatic zone, I recommend that further study be undertaken to examine the potential impact of actual post-harvested cedar volumes on timber supply.
- *Problem forest types:* if the recent decrease in harvesting of hemlock stands in which 80 percent or more of the volume is attributable to hemlock, continues, there is a significant risk of over harvesting other stand types in the THLB. On this basis, I request that district staff continue to monitor harvest performance in

these high percentage hemlock stands and that this information be incorporated in the next timber supply review.

- *Stand development monitoring*: Timber supply modelling of managed stands requires accurate regeneration inputs that reflect actual stand conditions. I support continued stand development monitoring as a mechanism to validate TIPSy regeneration inputs for future yield predictions.
- *Stand level biodiversity*: I request that district staff work with licensees to ensure that the wildlife tree retention is appropriately reported and the results used to inform the next timber supply review.
- *Scenic areas*: Over time harvesting will have to shift towards scenic areas and unless visual design techniques improve, VQOs could become a significant factor restricting mid- to long-term timber supply. Therefore, I encourage licensees to improve the visual design of cutblocks in scenic areas and request that district staff continue to monitor visual effectiveness and to provide this information for the next determination.
- *Grizzly bears*: Increased understanding of the areas utilized by grizzly bears is required; particularly given the mountainous terrain in the TSA. Currently licenses apply modelled wildlife tree patches (WTPs) to estimate these usage areas. I am aware that mapping of avalanche chutes is underway in this area and I encourage the MOE to complete this project to assist with the integration of wildlife and timber values.
- *Caribou*: I encourage FLNR and licensee staff to continue to seek opportunities to minimize the impact of caribou habitat impact on timber supply, while continuing to ensure that the habitat requirement of the Revelstoke-Shuswap Caribou herd are met.


Jim Snetsinger, RPF
Chief Forester

July 28, 2011



Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157, Consolidated to July 13, 2011, reads as follows:

Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 10 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding the Crown land in the following areas:

- (i) tree farm licence areas;
- (ii) community forest agreement areas;
- (iii) first nations woodland licence areas;
- (iv) woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

- (a) makes an order under section 7 (b) respecting a timber supply area, or
- (b) amends or enters into a tree farm licence to accomplish a result set out under section 39 (2) or (3),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 10 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 10 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 10 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

- (a) by written order may postpone the next determination under subsection (1) to a date that is up to 15 years after the date of the relevant last determination, and

- (b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

- (a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

- (b) must give written reasons for setting the earlier date.

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify that portions of the allowable annual cut are attributable to one or more of the following:

- (a) different types of timber or terrain in different parts of Crown land within a timber supply area or tree farm licence area;

- (a.1) different areas of Crown land within a timber supply area or tree farm licence area;

- (b) different types of timber or terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, in accordance with the woodlot licence for that area.

(7) The minister must determine an allowable annual cut for

(a) each community forest agreement area in accordance with the community forest agreement for that area, and

(b) each first nations woodland licence area in accordance with the first nations woodland licence for that area.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silviculture treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) [Repealed 2003-31-2.]

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

(9) Subsections (1) to (4) of this section do not apply in respect of the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*.

(10) Within one year after the chief forester receives notice under section 5 (4) (a) of the *Haida Gwaii Reconciliation Act*, the chief forester must determine, in accordance with this section, the allowable annual cut for

(a) the Crown land in each timber supply area, except the areas excluded under subsection (1) (a) of this section, and

(b) each tree farm licence area

in the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*.

(11) The aggregate of the allowable annual cuts determined under subsections (6), (7) and (10) that apply in the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*, must not exceed the amount set out in a notice to the chief forester under section 5 (4) (a) of that Act.

Appendix 2: Section 4 of the *Ministry of Forests and Range Act*

Section 4 of the *Ministry of Forests and Range Act* (consolidated to July 13, 2011) reads as follows:

Purposes and functions of ministry

4 The purposes and functions of the ministry are, under the direction of the minister, to do the following:

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive

(i) timber processing industry, and

(ii) ranching sector

in British Columbia;

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Appendix 3: Minister's letter of July 4, 2006



JUL 04 2006

Jim Snetsinger
Chief Forester
Ministry of Forests and Range
3rd Floor, 1520 Blanshard Street
Victoria, British Columbia
V8W 3C8

Dear Jim:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the responsibility for determining Allowable Annual Cuts-decisions with significant implications for the province's economy, communities and environment. This letter outlines the economic and social objectives of the Crown you should consider in determining Allowable Annual Cuts, as required by Section 8 of the *Forest Act*. This letter replaces the July 28, 1994 letter expressing the economic and social objectives of the Crown, and the February 26, 1996 letter expressing the Crown's economic and social objectives for visual resources. The government's objective for visual quality is now stated in the Forest Practices and Planning Regulation of the *Forest and Range Practices Act*.

Two of this government's goals are to create more jobs per capita than anywhere in Canada and to lead the world in sustainable environmental management. The Ministry of Forests and Range supports these objectives through its own goals of sustainable forest and range resources and benefits. In making Allowable Annual Cut determinations, I ask that you consider the importance of a stable timber supply in maintaining a competitive and sustainable forest industry, while being mindful of other forest values.

The interior of British Columbia is in the midst of an unprecedented mountain pine beetle outbreak. Government's objectives for management of the infestation are contained in British Columbia's Mountain Pine Beetle Action Plan. Of particular relevance to Allowable Annual Cut determinations are the objectives of encouraging long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans.

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Minister of
Forests and Range
and Minister Responsible
for Housing

Office of the
Minister

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Jim Snetsinger

To assist the province and affected communities in planning their responses to the beetle infestation, it would be best to have realistic assessments of timber volumes that can be utilized economically. Therefore, in determining the best rate of harvest to capture the economic value from beetle-killed timber, I ask that you examine factors that affect the demand for such timber and products manufactured from it, the time period over which it can be utilized, and consider ways to maintain or enhance the mid-term timber supply.

The coast of British Columbia is experiencing a period of significant change and transition. In making Allowable Annual Cut determinations I urge you to consider the nature of timber supply that can contribute to a sustainable coast forest industry, while reflecting decisions made in land and resource management plans.

You should also consider important local social and economic objectives expressed by the public during the Timber Supply Review process, where these are consistent with the government's broader objectives as well as any relevant information received from First Nations.

Sincerely yours,

A handwritten signature in black ink, appearing to be 'Rich Coleman', with a long horizontal stroke extending to the right.

Rich Coleman
Minister