BRITISH COLUMBIA
MINISTRY OF FORESTS

Robson Valley Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective June 1, 2001

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Chief Forester

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Objective of this document

This document is intended to provide 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 Robson Valley Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Robson Valley Timber Supply Area (TSA) is situated in east-central British Columbia and covers approximately 1.2 million hectares. Located in the southeast portion of the Prince George Forest Region, the TSA is administered from the forest district office located in McBride. The TSA lies mainly in the Rocky Mountain trench, with the Cariboo and Monashee Mountains to the west, and the Rocky Mountains and Alberta border to the east. The TSA straddles the upper reaches of the Fraser River watershed in the north and the Canoe River, a tributary of the Columbia River, in the south.

The TSA is bordered by two provincial parks to the west (Wells Gray, Bowron Lake), the Mitchell Lake-Niagara protected area that connects them, and by the Kakwa Recreation Area to the north. To the east are the Willmore Wilderness Area, Jasper National Park and Mount Robson and Mount Terry Fox Provincial Parks.

The largest communities in the Robson Valley TSA are McBride and Valemount, which are home to about 50 percent of the TSA's population of 4,080 people (1996 census). Other smaller communities include Crescent Spur-Loos, Dunster, Tete Jaune and Albreda.

The forest industry is the leading employer in the Robson Valley TSA. In 1996, the forestry sector accounted for 37 percent of the TSA's total employment. The major forest licensees in the TSA are McBride Forest Industries Limited (formerly Zeidler Forest Industries Limited) and Slocan Forest Products Limited. The public sector, tourism, and agriculture sectors are the other major employers.

There are no First Nations communities in the Robson Valley TSA. However, four First Nations assert territorial interests in the Robson Valley TSA: the Lheidli T'enneh Nation and the North Thompson Band assert they have traditional territory that covers the entire TSA, and the Canim Lake and Red Bluff bands assert territorial interests that cover portions of the TSA.

The terrain in the Robson Valley TSA is quite variable, ranging from the wide bottomlands of the Rocky Mountain trench to steep rugged forested slopes of snow-capped mountain ranges, deeply cut side valleys and fast-moving mountain streams. The TSA contains four biogeoclimatic zones: Alpine Tundra, Engelmann Spruce – Subalpine Fir, Interior Cedar – Hemlock, and Sub-boreal Spruce. The TSA supports an abundance and wide variety of wildlife species, including more than 50 mammal species and more than 200 bird species.

Productive forest land managed by the British Columbia Forest Service (BCFS) is 535 366 hectares or approximately 43 percent of the total area in the TSA. The timber harvesting land base – the area considered available for timber harvesting – comprises 213 383 hectares or approximately 17 percent of the Robson Valley TSA. Forests in this TSA are dominated by mature and older stands.

History of the AAC

The allowable annual cut (AAC) for the Robson Valley TSA from 1981 to 1987 was 500 000 cubic metres. In 1987, the AAC was raised to 560 000 cubic metres and a non-replaceable license of 60 000 cubic metres per year was issued January 1988 to harvest mature and over-mature cedar and hemlock stands. In 1990, the AAC was raised to 600 000 cubic metres. In 1992 the non-replaceable license of 60 000 cubic metres per year was cancelled, and in 1993 two 50 000 cubic metres per year non-replaceable forest licenses were awarded for development of new access into the upper Morkill drainage. In 1996, the AAC for the Robson Valley TSA was increased to 602 377 cubic metres which included a partition of 6000 cubic metres per year to deciduous leading forest types. The allocation of 3623 cubic metres per year was made for woodlots, and therefore excluded from the AAC. A further 6377 cubic metres per year is apportioned from the current AAC, but has not yet been allocated for woodlots. The harvestable volume for the area is currently apportioned by the Minister of Forests as follows:

Apportionment	AAC (m^3/yr)	% of total AAC
Forest licences – replaceable	371 458	61.7
Forest licences – non-replaceable	100 000	16.6
Timber sale licences (>10 000 m^3/yr)	11 372	1.9
Timber sale licences (< 10 000 m^3/yr)	1 262	0.2
Small Business Forest Enterprise Program — all categories	98 908	16.4
Forest Service Reserve	7 000	1.2
Woodlot licences	6 377	1.1
Deciduous partition	6 000	1.0
Total	**602 377**	**100.0**

New AAC determination

Effective June 1, 2001, the new AAC for the Robson Valley TSA will be the maintenance of 602 377 cubic metres per year of which 6000 cubic metres is a deciduous partition. This determination excludes all woodlot licences issued at this time.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

- *Robson Valley Timber Supply Area (TSA) Data Package and Information Report*, British Columbia Forest Service (BCFS), December 1998.
- *Robson Valley TSA Analysis Report and Public Discussion Paper*, BCFS, May 2000.
- *Robson Valley TSA Summary of Public Input on Data Package and TSA Analysis Report*, BCFS, October 2000.
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province.
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources.
- Letter from the deputy ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives for achieving acceptable impacts on timber supply from biodiversity management.
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the MOF and MELP, including the AAC determination meeting held in McBride, October 16 and 17, 2000.
- *Robson Valley Timber Supply Analysis*, BCFS, September 1994.
- *Robson Valley TSA Rationale for AAC determination,* BCFS, June 1, 1996.
- *Robson Valley TSA Inventory Audit,* BCFS Resources Inventory Branch, 1998.
- *Robson Valley Land and Resource Management Plan,* BCFS, April 1999.
- *Forest Practices Code of British Columbia Act*, July 1995.
- *Forest Practices Code of British Columbia Act Regulations and Amendments,* April 1995.
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP.
- *Forest Practices Code Timber Supply Analysis,* BCFS and MELP, February 1996.
- *Working Paper 36/1998, Site Index Adjustments for Old-Growth Stands Based on Veteran Trees,* Nigh, G.D., BCFS Research Branch, 1998.
- *Working Paper 37/1998, Site Index Adjustments for Old-Growth Stands Based on Paired Plots,* Nussbaum, A.F., BCFS Research Branch, 1998.
- *An Old Growth Conservation Strategy for the Robson Valley Forest District,* BCFS Robson Valley Forest District, July 1992.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as existing timber volumes, the rate of timber growth, and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. Many of the factors used as inputs to timber supply

analysis are uncertain due in part to variations in physical, biological and social conditions. Ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the relevant social, cultural and economic factors when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

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

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining the AAC for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

1) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and
2) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to

factors that could work to *increase* the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or factors that could work to *reduce* the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code*.

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still 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.

As British Columbia progresses toward the completion of strategic land use plans, the eventual timber supply impacts associated with land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

Forest Renewal British Columbia funds a number of intensive silviculture activities that could have the potential to affect timber supply, particularly in the long term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as

relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some 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 not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to re-determine many outdated AACs between 1992 and 1996. In any case, the data and models available today are superior to those available in the past, and will undoubtedly provide for more reliable determinations.

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 obligations resulting from recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Robson Valley TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

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 for TSAs and TFLs.

For each AAC determination for a TSA, BCFS staff carry out a timber supply analysis 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 model (FSSIM—"Forest Service Simulator"; in this case for the Robson Valley TSA, version 3), a series of timber supply forecasts are produced reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one forecast is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while

ensuring the long-term productivity of forest lands. Often termed the "base case," it serves as a reference forecast and forms the basis for comparison when assessing the implications of uncertainty for timber supply.

Because it represents only one of many theoretical forecasts and incorporates information that has some uncertainty, the reference forecast for a TSA 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, many of the following considerations examine the degree to which all the assumptions made in generating the reference forecast are realistic and current, and the degree to which the resulting predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are based on informed judgement, using current, available information about forest management. Such information may have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, such as the enactment of the *Forest Practices Code*, or during the implementation of new policies, procedures, guidelines or plans.

The timber supply analysis is integral to the considerations that lead to the AAC determination. However, the AAC determination itself is not a calculation. Rather it is a synthesis of judgement 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 reference forecast. Judgements that may be based in part 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 may be gained by a computer analysis of the combined considerations to confirm the exact AAC determined.

Base case for the Robson Valley TSA

The base case in this timber supply analysis incorporates several changes from the base case that was generated in the analysis used in the 1996 AAC determination. In overview, it includes changes to reflect the following:

- the *Forest Practices Code* is now factored in more completely (only forest cover constraints were applied for riparian and stand-level biodiversity in the previous analysis)
- the update of the forest inventory for recent disturbances for the entire TSA
- changes to operability classification
- government's approval of the Robson Valley Land and Resource Management Plan which provides direction for resource management in the region
- changes to modelling to include draft landscape units
- changes to accounting for recreation values

- changes to how the minimum harvestable ages are defined
- a higher estimate of unsalvaged losses, and
- the deciduous partition

With these and other appropriate factors incorporated, a base case forecast was generated and submitted for public review. The base case forecast showed that the current harvest level (after accounting for 3623 cubic metres issued to woodlot licences) of 602 377 cubic metres, of which 6000 cubic metres is a deciduous partition could be maintained for one decade. The projected harvest level then declined by about 10 percent per decade over six decades to a steady long-term level of 340 000 cubic metres per year.

As discussed in the following considerations and with the qualifications there expressed, I am satisfied that the base case projection provides a suitable point of reference for my assessment of the timber supply for this AAC determination.

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

Section 8 (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

Land base contributing to timber harvest

- *general comments*

The total area of the Robson Valley TSA, as reported in the May 2000 timber supply analysis, is 1 236 227 hectares. Of the total TSA area, 535 366 hectares (about 43 percent) are classified as productive Crown forest land.

In defining the timber harvesting land base for the Robson Valley TSA (i.e., the area estimated to be economically and biologically available for harvesting), a series of deductions were made from the total productive forest area. These deductions account for factors that effectively reduce the suitability or availability of the productive forest for economic, ecological or social (e.g., parks) reasons. In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors before quantifying appropriate amounts of areas to be deducted from the productive forest, in order to derive the timber harvesting land base.

In the Robson Valley TSA, areas were deducted from the productive forest to account for many factors including roads, trails and landings; riparian reserves; sensitive soils; areas of low productivity; protected areas; wildlife habitat and inoperable areas. The deducted

areas are detailed and summarized in Table 2 of the *Analysis Report*. The current timber harvesting land base after reductions is 213 383 hectares.

- *physical and economic operability*

Those portions of the TSA that are not physically accessible for harvesting, or that are not feasible to harvest economically, are excluded from contributing to the timber harvesting land base. In this analysis, physical and economic operability was reviewed separately, which provided a more refined approach to defining the operable land base.

- *physical operability*

Current operability mapping, which defines what type of harvesting method will likely be used across the land base, was completed in 1997. Harvesting method is based on soil and slope parameters, and some air photo interpretation. Operability classes that contributed to the timber harvesting land base were the following: conventional (ground skidder), cable (includes helicopter), and mixed conventional/cable. Given these criteria, 56 928 hectares were deducted from the productive forest to account for physically inoperable areas; and two areas (King and Holliday Creek) were assessed as being inaccessible with a further reduction of 1146 hectares.

Staff have expressed some uncertainty about access/economic issues for the Cariboo and Foster landscape units (13 671 hectares or 6.4 percent of the timber harvesting land base). Both areas have access issues involving steep terrain. However, economic constraints appear to be the main issue, as road access is still technically feasible, although expensive.

A sensitivity analysis was run excluding the Cariboo and Foster landscape units with an initial level of 550 362 cubic metres per year and declining to a long-term harvest level of 310 590 cubic metres. A second sensitivity analysis with the current harvest maintained for one decade would require increasing the decadal decline to 12 percent to reach 310 590 cubic metres. In both cases the result was a 9 percent reduction to long-term harvest levels.

A number of public submissions raised concerns about operability. Public input on the data package from a consultant stated that operability is probably the key determinant of available timber supply over the next 20 years and more accurate estimates of operability could be achieved through a more specific netdown by mapsheet.

Zeidler Forest Industries Ltd. stated that the operability codes used in the Robson Valley TSA must be adjusted to consider use of helicopter logging in the past three years. District staff note that no areas were netted out of the physical operability because they were considered to be helicopter ground.

Another public submission suggested that new methods such as long distance skyline or helicopter grapple logging could increase operating area while maintaining environmental and visual integrity. District staff note that skyline and helicopter ground has already been included in the cable category of the physical operability.

I have reviewed the points raised and accept that improvements in the data used in the analysis have provided a reasonable approximation of current practices related to physical

operability. However, there remains some uncertainty about future access into the Cariboo and Foster landscape units. Having been advised there is very limited development in these landscape units, I direct district staff to undertake further cost/benefit studies such that any additional information will be incorporated into the next analysis.

For this determination, based on the sensitivity analyses that excluded the Cariboo and Foster landscape units, I note that the magnitude of the uncertainty does not create a risk to the short-term timber supply but could represent a risk in the longer term. I have considered this in my determination as discussed under "Reasons for decision".

- *economic operability*

In the analysis, economic operability criteria were developed to exclude three uneconomic forest types: immature stands exhibiting low productivity, non-merchantable mature stands, and mature stands with low volume. A total of 61 856 hectares were deducted from the productive forest to account for uneconomic forest types.

1) low productivity sites

In the timber supply analysis, after accounting for other land base deductions, 11 907 hectares of young stands were defined as having characteristics that exhibit a low potential for timber productivity and were therefore excluded from the productive forest land base. The exclusion criteria were based on harvesting system and minimum site indices (estimated tree height at 50 years) that ranged from about 8 metres for spruce with conventional ground-based system to just over 16 metres for Douglas-fir leading with a cable system. I find the criteria for minimum site indices to be reasonable and for this determination I have no further adjustments regarding low productivity sites.

2) unmerchantable stands

In the analysis, a total of 49 949 hectares of certain forest types were excluded from contributing to the timber supply due to low merchantability or low volume. These types include older Douglas-fir, redcedar and hemlock, balsam, spruce, pine, and deciduous stands. Of these stands 34 454 hectares were excluded for low merchantability using criteria based on species, minimum height for certain age classes, stocking class, and harvesting method. A further 15 495 hectares of mature stands were excluded using criteria based on minimum volume and harvesting method for all coniferous tree species, and those deciduous, cedar and hemlock stands with mixed cable/conventional and cable operability.

In the previous determination, I instructed staff to monitor the harvesting activity in cedar and hemlock stands to confirm their level of utilization and evaluate the appropriateness of their projected contribution to the timber supply. Data from the previous timber supply review indicated that 17 percent of the harvest was to come from cedar and hemlock stands. Staff carried out monitoring over the period March 1994 to January 1998, and the reported actual harvest was 15 percent from cedar and hemlock stands on conventional operability ground. Based on these performance data, I am satisfied with the harvest performance in these stands and therefore accept their continued contribution to the timber supply forecast.

Public input from Slocan Forest Products Ltd. stated their concern with how much effort is put into restricting areas from harvesting on the operable land base, and which they consider amount to 15 percent in the TSR package, and still does not include the proposed PAS areas. They believe effort is required to find ways to include more harvesting along with other forest values.

Zeidler Forest Industries Ltd. agreed that cedar and hemlock stands on cable and mixed operability ground are uneconomical to harvest. However, given new initiatives undertaken by the Ministry of Forests in conjunction with major licensees, they feel these stands have potential to contribute to future timber supply. I agree these stands could be considered in the Timber Supply Review if licensees can begin showing performance with cable and mixed conventional/cable systems.

For this determination, I consider the unmerchantable stand exclusion criteria to be reasonable and the assumptions for economic operability to be suitable in the base case and have made no adjustments.

- *environmentally sensitive areas*

An environmentally sensitive area (ESA) is an area identified during a forest inventory that is sensitive to disturbance (such as unstable terrain or areas that are difficult to reforest) and/or is significantly valuable for fisheries, wildlife, water or recreation resources. Areas can be identified as either very sensitive (E1) or moderately sensitive (E2) to disturbance, and are either entirely or partially removed from the timber harvesting land base, according to their level of sensitivity.

In deriving the timber harvesting land base for the Robson Valley TSA timber supply analysis, 120 955 hectares or 22.6 percent of the productive forest, were excluded for ESAs. Exclusions for sensitive soils were based on a cross-reference between selected soils sensitivity ESA mapping with terrain stability mapping.

The exclusions applied for various environmental sensitivities were as follows. Areas for recreation (Er1) were reduced by 100 percent due to high recreation values. Areas with highly unstable soils (Es1), avalanche risk (Ea1), or regeneration problems (Ep1 and 2) were reduced by 90 percent. Areas with moderately unstable soils (Es2) were reduced by 10 percent, as were areas of the land base identified as valuable for wildlife (Ew1 and 2). I have been informed by BC Environment staff that all caribou sensitive areas are now included in the caribou habitat inventory rather than in the ESA wildlife mapping.

In the previous determination, I instructed staff to quantify the amount of environmentally sensitive areas in supply block J (known as the Betty Wendle area). District staff completed the ESA designations. Subsequently through the Robson Valley LRMP process and by order in council issued June 29, 2000, the entire Betty Wendle (14 410 hectares) has become part of the Bowron Lake Park.

The WATERSHED (We Are The Environmental Reality for Sustainable Harvest & Economic Development) Group recommended that the inoperable areas and environmentally sensitive areas (Es1 and Es2) be re-evaluated, and areas that are within helicopter operability be added back into the timber supply calculations. District staff are

confident with the reduction factors in those areas and note that areas with helicopter operability were included within the cable operability category.

For this determination, I accept the assumptions made in the base case for environmental sensitivity as reasonable and have made no adjustments.

- *deciduous forest types*

The AAC determined for the TSA effective June 1, 1996 includes a partition of 6000 cubic metres attributable to deciduous-leading forest types. Staff have informed me that harvestable deciduous stands have been spatially located, but there has been limited performance in them due to difficulties with economic viability related to access, merchantability, and market conditions.

In the analysis, the deciduous partition of 6000 cubic metres or approximately 1 percent of the AAC was modelled in the base case. This level of deciduous harvest is well below the annual growth of deciduous-leading types. Deciduous leading forest types occupy 4 percent of the timber harvesting land base but were limited, by district request, to supplying only 1 percent of the harvest.

It is important to note that this partition was established in the previous determination due to a number of submissions to the district to test the economic viability of a deciduous harvest. There is little evidence of any harvesting of the deciduous resource even to the low level of 6000 cubic metres, however, I see no reason to remove the partition as there may not have been enough time to gain a sense of their economic viability. I will look to the district for evidence of performance over the 5-year term of this determination and will revisit this matter at the time of the next determination.

- *roads, trails and landings*

To estimate the amount of area covered by existing roads, trails, and landings, district staff used a methodology that sampled six representative mapsheets with completed first harvest pass to arrive at a reduction factor of 2.35 percent for the operable land base in the TSA. To focus the reduction to areas with a harvesting history, a reduction of 12.9 percent was made to all areas with forest stands less than 40 years (equates to a 2.35 percent reduction in operable land base). The total area removed for these existing features was 5628 hectares from the productive forest. Staff assumed no significant area is lost to trails, thus no reduction was made for trails in the analysis.

To account for future roads, trails and landings, a land base reduction of 6.9 percent was made to all stands greater than 40 years, after they were harvested for the first time by the timber supply model.

Public input from a consultant pointed out the netdown of 2.3 percent for roads, bladed trails and landings appears low, especially compared to the netdowns used by some districts with similar steep terrain. Staff note that the netdown of 2.3 percent is applied only to young forests less than 40 years, resulting in an actual reduction of 12.9 percent to those stands.

I discussed this methodology with district staff and found the reduction factors to be reasonable. However, for the next analysis, I encourage staff to quantify losses to trails through some of the survey information available from ISIS or other sources.

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to exclude the areas and timber volumes allocated to woodlot licences.

In the analysis, all areas classified as woodlot licences, with an associated volume of 3623 cubic metres, were not included in the projections for timber supply. Staff advise me that the area expansion of the woodlot program is on-going and once the top-ups are completed, and if further woodlot licences are to be developed, then the associated area and volume will need to be accounted for in the next AAC determination for the TSA. However, as no top-ups or new licences have yet been issued, and as the woodlot area has been appropriately excluded from the timber harvesting land base, I do not consider it necessary to make further adjustments for woodlots for this determination.

- *newly protected areas*

Government released *A Protected Areas Strategy for British Columbia* in 1993, which describes the policies and process to protect 12 percent of the province. The strategy has two goals: representativeness (Goal 1) which protects viable examples of the natural diversity of the province, and; special features (Goal 2) which protect the special natural, cultural heritage and recreational features of the province.

Ten new protected areas with a total area of 69 487 hectares under the *Robson Valley Land and Resource Management Plan* were approved by government in April 30,1999. Five protected areas including part of a sixth area (West Twin) were declared protected by order in council on June 29, 2000. The remaining four areas and the rest of the West Twin area received protected designation under the *Environment and Land Use Act* on January 26, 2001. In the analysis, the base case removed all 10 protected areas from the timber harvesting land base, a total of 13 097 hectares from the productive forest.

A submission from the public suggests that the AAC should be temporarily reduced to offset the undue concentration and level of harvest in the rest of the TSA when the Betty Wendle/Cariboo and West Twin areas became proposed protected areas. The level of harvest was modelled with the removal of the newly protected areas including the Betty Wendle/Cariboo and West Twin areas from the timber harvesting land base in the base case of the analysis.

I have reviewed the information presented and I am satisfied that there has been an appropriate accounting for newly protected areas in the timber supply analysis. I note that the amount of land base excluded to account for newly created protected areas is approximately 6 percent of the timber harvesting land base in the Robson Valley TSA.

Existing forest inventory

- *current inventory*

The forest inventory data used for the timber supply analysis was based on a re-inventory of the Robson Valley TSA that was completed in 1995, using 1991 aerial photography and overlaid on a 1983 Terrain Resource Information Management (TRIM) base map. The inventory was updated for harvesting disturbances up to 1998. Stand attributes such as tree height, stocking and age have been projected up to 1998.

In 1998, an audit was completed for the Robson Valley TSA on the mature, immature and non-forest components of the inventory. The audit found no significant problems with forest cover labeling or volume estimates. I will discuss the results of the audit under *volume estimates for existing stands* and *site productivity estimates.*

Given the re-inventory and inventory audit carried out in the Robson Valley TSA, I consider the existing inventory to represent the best available information regarding current forest inventory. I am satisfied that the data used in the timber supply analysis forms a suitable basis for this determination.

- *age-class composition and species profile*

The distribution of age categories in the TSA may be summarized as follows.

In the timber harvesting land base, about 57 percent of the area is occupied by stands over 140 years of age. About 14 percent of stands in the timber harvesting land base have a history of logging and subsequent management treatments, the other 86 percent of stands generally have yet to be harvested and therefore have no management history.

In the Robson Valley TSA, 60 percent of the total forest land base is covered by stands which are excluded from timber harvesting, but nevertheless contribute indirectly to the timber supply. These inoperable stands affect how much harvesting can be conducted and the pattern of the harvesting within the TSA by providing old-forest and biodiversity attributes. Of the forest stands excluded from the timber harvesting land base, about 20 percent are older than 250 years, 3 percent of the stands are 20 years or younger, 17 percent are between 21 and 100 years old, and 59 percent are between 101 and 250 years of age. A significant portion of the stands greater than 250 years old are outside of the timber harvesting land base and assist in meeting most of the old growth requirements for landscape-level biodiversity.

The forest inventory for the Robson Valley TSA currently shows that the timber harvesting land base is comprised primarily of spruce stands (46 percent) followed by subalpine fir (17 percent), lodgepole pine (16 percent), cedar (7 percent), Douglas-fir (5 percent) and hemlock (5 percent) with small amounts of deciduous (4 percent). After harvest, the coniferous stands are generally expected to regenerate to the same leading species.

A public input submission questioned why the forest inventory showed 60 000 hectares of forests were 210 years old, but only 5000 hectares of forests were 200 years old. Staff note that in both forest inventory and timber supply analysis work, stand age is handled in

classes as it is very difficult to get exact ages for older stands. In reality, some of the 210- year old stands could be 200 or 220 years old, but this does not impact the analysis.

In my determination I have been mindful of the distribution of ages of the forest stands both in and outside the timber harvesting land base.

- *volume estimates for existing stands*

The Variable Density Yield Prediction (VDYP) model version 6.5a, developed and supported by the Ministry of Forests Resources Inventory Branch, was used to estimate timber volumes for existing unmanaged coniferous and all deciduous leading stands in the Robson Valley TSA. In the previous AAC determination, district staff were concerned the mature stand volumes were possibly overestimated. As noted above in *current inventory*, an inventory audit for the TSA was completed in the summer of 1998, which addressed the uncertainties in the estimates for existing volumes in the TSA. The results of the audit for the mature component of the inventory suggest that the inventory volumes, which reflect those used in the analysis, are statistically acceptable for the land base as a whole. Subsequent analysis of post-stratified data showed similar levels of acceptability for volume estimates in the operable forest areas (based on 49 sample plots).

Public input from a consultant put forward the need to check yield curves against actual volumes. However, from the 49 sample plots, I find the audit mean volume of 281 cubic metres per hectare was very similar to the inventory mean volume of 288 cubic metres per hectare.

I have reviewed the information presented, including the results of the inventory audit and conclude that the existing natural stand yields as projected using the inventory and VDYP are suitable for this determination. I accept that the best available information was used in the analysis.

Expected rate of growth

- *volume estimates for regenerating stands*

For the Robson Valley TSA timber supply analysis, the Table Interpolation Program for Stand Yields (TIPSY) was used to estimate growth and yield estimates for all future regenerating coniferous stands. Managed stands were defined as all stands less than 10 years old, 95 percent of stands 11 to 20 years of age and 83 percent of stands 21 to 30 years of age. Volume estimates of regenerating deciduous stands were made using VDYP version 6.5a.

TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition in the stand. Certain operational conditions, such as less than ideal tree distribution, small non-productive areas, endemic pests and diseases, or age dependent factors such as decay, waste and breakage may cause yields to be reduced over time. Operational adjustment factors (OAFs) are applied to yields generated using TIPSY to account for losses of timber volume as a result of these operational conditions. OAF1 can account for factors affecting the yield curve across all ages, such as small stand openings. OAF2 can account for

factors whose impacts tend to increase over time, and whose influence on a stand may be reduced through management practices, such as pests, disease, decay, waste and breakage.

In the analysis, the standard provincial reductions of 15 percent for OAF1 (accounting for less than ideal tree distribution, small non-productive areas, endemic pests and disease, and random risk factors such as windthrow), and 5 percent for OAF2 (accounting for decay, waste and breakage) were applied, with the exception of areas at risk to spruce weevil and Armillaria root disease.

About 64 000 hectares or 30 percent of the timber harvesting land base is impacted by weevil losses. For areas with spruce leading stands in the Interior Cedar – Hemlock and Sub-boreal Spruce biogeoclimatic zones, OAF1 was increased to 25 percent to reflect weevil losses. The district has completed spruce weevil surveys for 70% of spruce plantations and identified hazard zones for use in predicting and minimizing spruce weevil impacts.

About 1120 hectares or less than 1 percent of the timber harvesting land base is considered as moderate and high risk for Armillaria root disease. For the BCFS analysis OAF2 was increased to 10 percent for areas mapped as moderate, and increased to 20 percent for areas mapped as high risk. Staff have informed me that the district's Enhanced Forest Management Pilot Project (EFMPP) has initiated a study to refine the impact assessments of Armillaria root disease and OAF1 estimates. I am satisfied that there has been proper accounting for spruce weevil and root rot in the base case.

In the analysis, no allowance was made for volume gains from the use of Class A genetically improved seed. This is discussed under *incremental silviculture*.

Public input from a consultant provided an estimate of 10 to 20 percent expected growth loss in high risk spruce weevil areas, which was comparable to the expected growth loss modelled in the base case using a 25 percent OAF1. Further comment was made that the Armillaria loss estimates appeared to be accurate.

Sensitivity analyses that tested an increase and decrease of 10 percent in regenerated stand volume for this TSA show that uncertainty in regenerated volumes has implications only for the mid to long-term timber supply projected in the base case. Subject to the uncertainty regarding site productivity estimates in the Robson Valley TSA, which significantly impacts managed stand yield estimates and is discussed under *site productivity estimates*, I am confident that volume estimates for managed stands were modelled appropriately with the best available data, and are adequate for the purposes of this determination.

- *site productivity estimates*

Inventory data includes estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced in regenerated stands and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, in British Columbia, site indexes determined from younger stands (i.e., less than 31 years old) and older stands (i.e., over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been managed for stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This assumption has been verified in several areas of the province where studies—such as the old-growth site index or OGSI project—suggest that actual site indexes may be higher than those indicated by existing provincial data from old-growth forests. In recent years it has been consistently concluded from such studies that site productivity has generally been underestimated; managed forest stands tend to grow faster than projected by inventory-based site index estimates from old-growth forests.

Public input from Slocan Forest Products Ltd. questioned whether revised site index information could reduce the area deducted for low site netdown. District staff note there would be no expected impact, as this netdown applies only to stands less than 140 years, and the OGSI project sampled stands in excess of 140 years old. Slocan also suggested the OGSI adjustments be given serious consideration in the AAC determination process, as the increase in levels of productivity are consistent with their local experience and expectations based on the ecosystems of the area, and will also affect the long-term mean annual increment (MAI). Current practice in timber supply analysis for TSAs in B.C. is to incorporate these results in a base case analysis where they have been obtained from a localized study within the TSA; where no such results are available, generalized OGSI adjustments are applied in a sensitivity analysis.

To test the sensitivity of the harvest forecast for the Robson Valley TSA to changes in site indices for old-growth stands, OGSI adjustments based on the results described in the 1998 BCFS Research Branch paired plots (Working Paper No. 36) and veteran studies (Working Paper No. 37) were applied. These adjustments reflect the maximum site potential (productivity) given ideal management and stocking conditions. Managed stand volume estimates, green-up ages and minimum harvestable ages were also redefined, based on the site index adjustments. This resulted in a mid and long-term harvest level after decade three of 489 500 cubic metres or about 44 percent higher than in the base case.

Site index adjustments were not included in the base case as there is little local data, and a lack of long-term monitoring data. While these results show the mid and long-term timber supplies are significantly sensitive to uncertainty in site productivity estimates, in respect of cautions expressed in the OGSI study, the forecast should be viewed as an indication of general trends in the timber supply, rather than an accurate and precise projection of the timber supply.

As for many areas of the province, I generally conclude that site productivity has been underestimated. This appears to be a methodology issue, as demonstrated by research data from the paired plots, veteran, Site Index/BEC site series correlation, and growth intercept studies, that in general, productivity of sites currently occupied by mature or old-growth stands will most likely be higher than currently estimated. However, uncertainties related

to the applicability of province-wide study results to the Robson Valley TSA, to the inventory, and to the degree to which full site potential will be achieved, mean that I cannot reasonably assume that timber supplies will be as high as shown in the sensitivity analysis employing OGSI adjustments.

Staff have informed me that site productivity has been identified as an issue in their resource management planning process. If funds could be made available, I strongly recommend the District undertake a study to resolve the appropriate adjustments to make to site indices in the Robson Valley TSA, and to carry out monitoring of second growth stands. In my determination I have therefore accepted the potential upward pressure in the order of 40 percent to the mid and long-term timber supply, as noted in "Reasons for decision".

- *minimum harvestable age*

A minimum harvestable age is an estimate of the earliest age at which a forest stand has grown or will grow to a harvestable condition. The minimum harvestable age assumption mainly affects when second growth will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of harvestable timber may be maintained.

For the Robson Valley TSA analysis, the minimum harvestable ages for stands in each analysis unit were generally defined by the age at which stands attain a minimum merchantable volume for a given operability classification. The minimum volume per hectare for conventional harvesting system was 140 cubic metres per hectare; 200 for mixed conventional/cable; and 250 for cable system. Minimum volume was assigned to all polygons within an analysis unit based on operability code and then area weighted. The resulting minimum volume was then compared to the analysis unit's regeneration yield curve to derive a minimum harvestable age for each analysis unit (both regenerated and managed stands). The resulting minimum harvestable ages were generally well below culmination age.

In the base case, minimum harvestable ages initially average 113 years, and in the long term, average 104 years for the entire timber harvesting land base. However, in the base case these stands are projected to be harvested at an average of 150 years, well beyond the minimum harvestable age, and close to the average age of culmination.

Public input from Slocan Forest Products Ltd. noted that minimum volumes used to determine minimum harvestable age can be reduced by 50 cubic metres per hectare, especially in spruce leading stands. The reduction in minimum volume would further reduce minimum harvestable ages, however, given minimum harvestable age is not a limiting factor in the analysis, there would be no impact on the base case harvest forecast.

A sensitivity analysis shows that if the minimum harvestable ages were increased or decreased by 10 years there is no impact on the base case harvest forecast.

Staff confirm that the criteria for minimum volume required to be harvestable are reflective of current practice. As I find the ages reasonable and noting the low sensitivity

of the analysis to changes in this factor, I conclude there is no risk in accepting the minimum harvestable ages assumed in the analysis for this determination.

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

Forest re-establishment

- *regeneration delay*

Regeneration delay is the elapsed time between the harvesting of an area and when it becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, a regeneration delay of 4 years was applied to all analysis units.

A public submission stated that an effective regeneration delay of 2.6 years (seedlings average 1.4 years when planted) is too short due to several plantation failures in the past and suggested the base case should allow for an effective regeneration delay of four years.

A sensitivity analysis was run which increased the regeneration delay by 5 years and shows the mid to long-term timber supply is sensitive to an increase in the regeneration delay. However, I am advised that the TSA does not experience many plantation failures, and the effective regeneration delay of 2.6 years was an average over the whole district, including the failed sites.

Recently, and on closer review, district staff concluded that the regeneration delay has been overestimated in the base case, possibly by 1 to 2 years. This was due to the older data extracted from the history records in the silviculture information systems. More recent data from the past 5 years reflects the current practice of Ministry and licensees striving to plant immediately after logging or one year later, and reduced plantation failure. I consider this to primarily represent a small upward influence on the long-term harvest level and have accounted for this in my determination as discussed in "Reasons for decision".

- *not-satisfactorily-restocked (NSR) areas*

Not-satisfactorily-restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered "current" NSR. Where a suitable stand has not been regenerated and the site was disturbed before 1987, the classification is "backlog" NSR.

The current Robson Valley TSA forest inventory file, updated in 1998 identifies 5220 hectares as current and backlog NSR. However, more recent information to the year 2000 from the integrated silviculture information system (ISIS) and the major licensee silviculture information system (MLSIS) summaries indicates that there is a total of about 3340 hectares of NSR, of which 2142 hectares are current NSR, and

1198 hectares are backlog NSR. The decline in current NSR of about 1700 hectares seems reasonable taking into consideration the discussion under *regeneration delay*.

Public input addressed the need to be more accurate in determining NSR by polygon and identifying levels of funding for treatments on backlog NSR. District staff used data in ISIS and MLSIS to calculate NSR at the polygon level and then assign the areas to analysis units. Regeneration of backlog NSR areas has been one of Forest Renewal BC's highest priorities and they provided funds to licensees for this purpose. As well, the district plans to continue to plant or re-classify about 150 hectares per year of NSR for the next 10 years.

From my discussions with district staff I conclude that even though there is some uncertainty, it is not significant and the impact is on the long-term timber supply, therefore, I am satisfied that the assumptions in the analysis are adequate for this determination.

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

Silvicultural treatments to be applied

- *silviculture systems*

As reflected in the analysis, timber harvesting in the Robson Valley TSA is primarily by clearcut or clearcut with reserves. Partial cutting systems such as shelterwood and selection systems are not modelled in the base case, but are being applied on a limited basis in visually sensitive zones. Logging methods employed are conventional ground-based, cable and helicopter, with small amounts of horse logging.

Based on the average volume harvested per year by all licensees including the small business and woodlot license programs, district staff estimate that about 77 percent of the volume is harvested using conventional ground-based methods; 21 percent is cable harvested; and 2 percent is helicopter-logged.

In my previous AAC determination, I requested staff to monitor the use of alternative silviculture systems and examine any effects on the timber supply to facilitate an understanding of expected future yields. District staff reported that over the period January 94 to December 96, about 6 percent of the harvested volume was logged using alternative silviculture systems. The BCFS Research Branch has examined potential productivity changes at varying levels of retention. However, due to the complexity of interacting variables—including distribution of retained cover, incident light through the forest canopy, changes in moisture regimes, and forest health conditions, and others—much work remains to be done before forest productivity under the various systems of partial harvesting can be predicted with certainty.

It will be important to combine emerging productivity information with an assessment by district staff of the expected use of these systems, the extent of the areas affected, the amounts of expected retention and the frequency of harvesting entries, for incorporation in the next timber supply analysis for the Robson Valley TSA. I have noted the need for this information in the "Implementation" section. I am satisfied that for this determination the

timber supply base case projection is based on best available information and adequately reflects the silvicultural systems currently in use in the TSA.

- *incremental silviculture*

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning, fertilizing and planting improved seed that are beyond the basic silviculture activities required to establish a free-growing forest stand.

In the Robson Valley TSA incremental silviculture has been mainly limited to minor amounts of juvenile spacing and was not modelled in the analysis. A spatial strategic silviculture analysis funded by Forest Renewal BC is currently underway in co-operation with the major licensees and McGregor Model forest.

The *Forest Practices Code* requires the use of improved (class A) seed from seed orchards for regeneration where available. Class A seed is the product of B.C.'s tree improvement program, which uses standard domestication/breeding techniques to select naturally occurring well-performing trees. Spruce orchard seed has been in use in the Robson Valley TSA for the past three years, but the expected gains were not included in the base case assumptions due the unavailability of certain yield modelling tools at the time the base case was developed. Subsequently, the yield modelling tools became available, and a sensitivity analysis was run with the expected gain of 18 percent for planted spruce and showed an increase of about 6 percent in the mid and long-term timber supply, but no impact in the short term.

This figure could increase in the future if more improved stock becomes available, with higher anticipated gains. As volume gains were not reflected in the analysis, I accept that this represents an upward pressure on timber supply and have taken this into account as discussed in "Reasons for decision". I encourage staff to continue to monitor trends in Class A seed use such that any additional information can be used in future determinations.

Commercial thinning

In the timber supply analysis, no stands were assumed to be harvested by commercial thinning. Opportunities for commercial thinning in the Robson Valley are currently limited by lack of suitable stands. Only 12 percent of the timber harvesting land base supports candidate forest stands between 40 and 100 years old consisting of either spruce, pine, or Douglas-fir.

I consider the assumption in the analysis of no commercial thinning activity to be appropriate.

(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:

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be removed from an area during harvesting operations. In the timber supply analysis, the current interior utilization standards were applied—a maximum 30-centimetre stump height, a minimum 10-centimetre top diameter inside bark, a minimum 12.5-centimetre diameter measured at breast height (dbh) for all lodgepole stands, and a minimum 17.5-centimetre diameter (dbh) for all other species.

Western redcedar is actually utilized to a 15-centimetre top diameter inside bark, however, data for modelling was unavailable and therefore, not reflected in the analysis. Results from a provincial study show this change in utilization standard had no impact on timber supply. For this determination, I accept that the utilization assumptions used in the timber supply analysis are reasonable.

Decay, waste and breakage

The estimation of volumes using VDYP for existing stands incorporates the loss of volume due to decay, waste and breakage. For decay, volume losses are incorporated directly into the volume estimates, while standard waste and breakage factors are applied to the analysis in the development of VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples. For regenerated stands, as discussed in *volume estimates for regenerating stands*, the TIPSY projections incorporate OAFs that account for anticipated decay, waste and breakage.

In my rationale for the 1996 AAC determination for the Robson Valley TSA, I noted that staff had concerns that the provincial inventory factors did not reflect actual levels of decay, waste and breakage for cedar and hemlock stands in the northern part of the TSA, particularly in the Longworth Public Sustained Yield Unit, and I requested that BCFS staff investigate and resolve this uncertainty. Other priorities have prevented this work from being carried out, but in that time there has been much provincial work initiated on loss factors that can be likely extended to the TSA in future determinations.

Public input expressed concern that less wood is delivered to the mills than is cruised on the stump, particularly in mature Interior Cedar – Hemlock stands. While waste and breakage levels do appear to be high when viewing a mature cedar hemlock cut block, in reality, compiled cruise and scaling data from 1995 to 2000 in the TSA showed scale volume was about 2 percent greater than cruise volume for the ICH.

I am satisfied that losses have been accounted for based on the provincial loss factors, and that this still represents the best available information for use in this determination. Therefore, I have made no adjustment to the assumptions applied in the analysis for this factor.

(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:

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources 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. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

- *cutblock adjacency and green-up*

To manage for resources such as water quality, soil stability, wildlife and aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum levels of disturbance in any given watershed (as reflected by the area covered by stands of less than a specified height), and require minimum green-up heights for regeneration on harvested areas before adjacent areas may be harvested.

For the analysis, timber harvesting land base in the Robson Valley TSA was subject to different management emphases as follows: about 71.4 percent is in the IRM zone; about 28.6 percent in the visual management zone; 1 percent in watershed management; and 7.6 percent in the caribou habitat zone (percentages total more than 100 percent because some areas assist in meeting more than one management requirement). For the IRM zone, the allowable disturbance, or area allowed to be below a green-up height of 3 metres, was limited to a maximum of 33 percent of the timber harvesting land base.

Sensitivity analysis showed that if the green-up period was decreased by 5 years across all management zones, there would be no impact in the short term, and a very small impact on the medium and long-term timber supply across all resource emphasis areas, mainly due to adjacent stands being available for harvest sooner.

To further help assess the extent to which changes in the applied forest cover constraints might affect the availability of the timber supply in the IRM areas, a sensitivity analysis was carried out in which the area permitted to be below green-up height was reduced from 33 percent to 25 percent in the IRM zone only. Under this constraint the projected harvest level for the base case was not affected. A further reduction to 20 percent showed no short-term impact, but the base case harvest forecast could not be maintained in the long-term.

Public input from Slocan Forest Products Ltd. noted the use of local silviculture records in other management units has often resulted in shorter estimates of the time required to reach green-up heights. However, district staff have reviewed the assumptions regarding adjacency and green-up in the IRM zone not subject to the other constraints mentioned above, and found them to reasonably reflect current practice. I accept the constraints as applied in the analysis as satisfactory for use in this determination.

- *visually sensitive areas*

Careful management of scenic areas visible from communities, public use areas and travel corridors is an important IRM objective. The Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve this, visual landscape inventories are carried out to identify, classify and record visually sensitive areas. On completion of such an inventory, a specialist may derive recommended visual quality classes (RVQCs, i.e.: 'Preservation'; 'Retention'; 'Partial retention'; 'Modification' or 'Maximum Modification') to identify levels of alteration that would be appropriate for particular areas. The Code requires these areas to be identified, by the district manager or in a higher level plan, and to be made known to licensees. When this has been done and an RVQC has become current practice, it may be incorporated into a timber supply analysis, preferably as a VQO established by the district manager or contained in a higher level plan. Established VQOs reflect the desired level of visual quality, based on the physical characteristics and social concern for an area, and seek to balance the perceptions and needs of people with the social and economic needs of the province. Managing for visual resources is important in the Robson Valley TSA due to the significance of tourism to the region.

To achieve the VQOs, constraints are placed on timber harvesting, road building and other forest practices. The constraints, which are based on experience, research findings and public preferences, are expressed in terms of "forest cover" requirements that relate to the maximum percentage of a "viewshed" that may be harvested at any one time, and to 'visually effective green-up' (VEG)—the stage at which a stand of reforested timber is perceived by the public to be satisfactorily "greened-up" from a visual standpoint.

In the Robson Valley TSA, the District Manager has established VQOs for the Rocky Mountain Trench along Highway 5 and Highway 16 as recommended by the Land and Resource Management Plan (LRMP). Other areas outside the Highway 5 and 16 corridors are considered scenic and have recommended visual quality classes (RVQCs) associated with them.

In the timber supply analysis, visual quality objectives apply to approximately 61 026 hectares or 28.6 percent of the timber harvesting land base (preservation 0.1 percent, retention 3.7 percent, partial retention 15.4 percent, and modification 9.4 percent). Zones were created for the areas with retention, partial retention and modification VQOs. RVQCs were not modelled in the base case. Values for maximum percentage of disturbance that would reflect current practice were determined using provincial guidelines for factoring visual resources into timber supply analyses. In the base case the visually effective green-up height is 5 metres and the allowable disturbance is generally in the middle of the disturbance range for each visual quality objective. The restrictions for green-up were applied to the entire productive forest land base because disturbance restrictions in visual areas apply to the entire viewscape regardless of operability.

Discussion with staff has raised a concern related to how well different visual disturbance limits will meet the VQOs because there has been little recent harvesting in areas with VQOs (i.e., less than half of the level assumed in the analysis). Sensitivity analyses tested the effect of applying the minimum and maximum allowable visible disturbance levels for all VQOs and the results showed an impact on the mid and long-term timber supply. With the LRMP direction to give partial cutting harvesting systems priority over clearcutting in this area, a sensitivity analysis was run testing the impact of using partial harvesting to meet VQOs. The results show a possible increase in the medium and long-term timber supply of 8000 cubic metres per year or 2.4 percent over the base case. The increased volume is largely due to harvesting stands more frequently, and assumes a drop in the average harvest age in the base case under a partial harvesting regime. Overall, more stands will be accessed and disturbed every year than under a clearcutting regime with forest cover restrictions.

The LRMP has identified approximately 16 specific areas that will likely be subject to some level of visual constraints in order to meet objectives for scenic values, wilderness, and public and commercial recreation. This could lead to revisions to the RVQCs or establishment of VQOs in these areas. To test the impact of increasing the area covered by VQOs, a sensitivity analysis was run by including RVQCs with allowable visible disturbance defined in the base case as well as the established VQOs. The results showed an increase of the timber harvesting land base covered by VQOs from 61 000 hectares (29 percent) in the base case to 150 000 hectares (70 percent). However, there is only a small effect on the long-term harvest level because all the RVQCs are modification and maximum modification, in which allowable visual disturbance is highest.

If current RVQCs are re-inventoried consistent with LRMP objectives, a reduction in timber supply could be expected but the decrease has not been quantified – the result would be fewer areas with RVQCs, but higher constraints. In view of this possibility, I requested a sensitivity analysis to assess the impact of RVQCs being assigned a higher level of constraint and being designated as VQOs. The results show the impact on timber supply from adding more timber harvesting area to VQOs will depend on the level of constraint and the amount of inoperable area assisting in meeting the allowable disturbance constraint. RVQCs in the Robson Valley are mainly in maximum modification and modification visual classes and include a large amount of inoperable area. The results indicate the impact on timber supply under the reasonable assumptions of some of the RVQCs becoming established as VQOs (including the inoperable area), with a level of constraint that does not exceed partial retention, will likely be small, and mid to long-term in nature.

After the analysis report was written, two other sensitivity analyses were conducted to assess the effect of removing the existing area within VQOs from the timber harvesting land base. The impact is an immediate drop to 494 552 cubic metres per year and subsequent 10 percent steps to below the long-term harvest level at decade 7 and level out at 272 000 cubic metres per year at decade 16. The second analysis maintained the starting level in the base case, but required 16 percent steps to bottom out one decade earlier and reach the same long-term harvest level of 272 000 cubic metres per year.

Public input included the comment that highway viewpoints are not sufficient to address resident and village concerns, or railways viewpoints. District staff note that it is true that viewpoints were originally established along highway routes.

Various submissions were received expressing concern for the visual quality requirements for the Raush Valley. The LRMP identified the Raush Valley as one of eight areas in the TSA with commercial and recreational development potential. In the context of VQOs, and noting the public input with respect to this area, it is clear that there is much work to be done in order to clarify the management objectives that will apply there.

A submission from Slocan Forest Products Ltd. suggested that given the present emphasis on visual design and precedents from TSRs in other units, it would be appropriate to use the top of the allowable disturbance range. In response, I believe it would be prudent to first have current performance demonstrate reaching the mid-point disturbance level before opening discussion on using the maximum disturbance level.

The current performance in these visually sensitive areas show there has been some effort made on the contribution of VQOs to the harvest volumes, however, it is not up to the level assumed in the analysis. I am encouraged with the steps being taken in the TSA to collaborate with experts in landscape design and the establishment of partial harvest trials. While the current undercut harvest levels allow some flexibility in time to determine how to properly design partial harvesting plans in visually sensitive areas, the LRMP is expected to impose more constraints on areas with VQOs.

I encourage the district to monitor developments related to revisions to the RVQCs and establishment of VQOs and refine the knowledge for the next analysis. In summary, due to the current limited performance in visually sensitive areas and the possibility of increasing the area of the timber harvesting land base covered by VQOs, I accept there is some downward pressure on the mid to long-term timber supply and I have considered this in my determination, as discussed in “Reasons for decision”.

- *recreation*

Recreational use of the forests by both residents and tourists is high due to the proximity of provincial and national parks and the exceptional natural scenery. Recreational activity in the Robson Valley TSA is diverse and includes heli-skiing, heli-hiking, cross-country skiing, snowmobiling, guided back country trekking, hunting and golfing. Developed and undeveloped recreation areas such as campgrounds, trails and lookout sites are identified in the inventory file through feature significance and management class codes.

The recreation inventory for the Robson Valley TSA was updated in 1996 and 1997 for a number of mapsheets. The remainder of the mapsheets was adjusted in 1997 to remove the visual features component of the label. The LRMP provides clear direction with respect to the identification and management of recreation values such as trails and recreation sites, so the visual impacts of timber harvesting are minimized.

In the analysis, areas with a recreation management class ‘0’ and any feature significance (A, B, C or D) are identified as high value areas and were entirely removed from the area available for timber harvesting. Areas with a recreation management class ‘1’ and that do

not coincide with a VQO were modelled as follows: 50 percent of areas with feature significance 'B' were excluded, 25 percent of areas with feature significance 'C' were assumed to be accounted for within a riparian reserve or management zone, and half of the remaining area was included in the timber harvesting land base. All areas with recreation management classes '2' and 'X' were included in the timber harvesting land base. After other exclusions for overlapping objectives, a total of 2668 hectares were excluded specifically for areas with high recreation value from the timber harvesting land base.

Public input from the Canoe-Robson Environmental Coalition included a request to review the specifics of how the recreation areas were identified and the classifications assigned to them. This is a reasonable request and staff are willing to provide the information.

I commend the district for their work in updating the recreation inventory according to Resource Inventory Committee (RIC) standards, and for the application of the information in the analysis. I consider the recreational values to have been adequately accounted for in the base case timber supply projection.

- *botanical resources*

Botanical forest products are defined under the *Forest Practices Code* as any prescribed plant or fungus that occurs naturally on Crown forest land. Current harvesting of botanical resources in the Robson Valley TSA is mainly berry picking for personal consumption, and some mushroom harvesting. In the analysis, no specific management criteria were applied for botanical forest products.

The Enhanced Forest Management Pilot Project (EFMPP) has a project underway to identify botanical forest product sites and uses. One of the LRMP objectives is to recognize other potential economic activities (e.g., botanical products, potable water, medicinal plants) consistent with other resource objectives. Within the LRMP strategy, any new identified economic activity requires the responsible agency or proponent to identify the area of interest, the scope of the project, the impact to other resource values, and to create a management plan to address any issues.

I am aware of the increasing interest in developing economic opportunities associated with botanical forest products, and therefore support the need for gathering relevant information that assists in considering short- and long-term implications to the province of alternative rates of timber harvesting. Given the available information on botanical forest products, I am satisfied that the assumptions in the base case are appropriate for this determination. Any changes arising from new management directions can be accommodated in a future determination.

- *cultural heritage resources*

Cultural heritage resources are defined in the *Forest Act* and include archaeological sites, traditional use sites and objects such as culturally modified trees (CMTs). Archaeological sites and CMTs that predate 1846 are protected under the *Heritage Conservation Act*. The nature and extent of required protection of archaeological sites are detailed under this legislation.

There are no First Nation communities in the Robson Valley TSA, however, four First Nations assert territorial interests. The North Thompson Band and the Lheidli T'enneh Nation assert they have traditional territory over the entire TSA; and the Canim Lake and Red Bluff bands assert traditional territorial interests over portions of the TSA.

No cultural sites have been located in the Robson Valley TSA that meet the requirements of the *Heritage Conservation Act*. In 1995 an Archaeological Overview Assessment (AOA) was completed for the Robson Valley TSA in conjunction with the LRMP process. The Lheidli T'enneh Band conducted a Traditional Use Study (TUS) in 1998-1999, but no report is yet available to the district. In 1999 the band also completed an Archaeological Inventory Survey (AIS) of the Goat River Trail. Over the period 1998-2000, the North Thompson Band carried out work on a Traditional Use Study and Ethnobotany report, and the district has received most of the report.

In the analysis, no specific reductions were applied as it was assumed that most archaeological sites do not preclude timber harvesting but require adjustments in harvesting methods. At this time the impacts of these adjustments on the size of the timber harvesting land base are unknown.

Various public input noted that there are known cultural features, both aboriginal and early European, (e.g., village sites and trails), as well as suspected ones which should be accounted for in the analysis. At this time, there is no certainty on the exact location of these cultural features, i.e., whether they overlap with riparian or private land designations. No new information has been provided by the AOA and traditional use studies that could lead to further constraints on the timber harvesting land base. In the future, there may be more constraints when the Lheidli T'enneh TUS is completed and made available to the district. It is also noted that elsewhere in the province it has often been observed that there is a strong correlation between archaeological site locations and constraints applied to the land base due to other values which are reflected in TSRs, such as riparian zone management constraints.

For this determination I accept that the base case timber supply projection has appropriately reflected the absence of measurable or known impacts on timber supply to date from managing cultural heritage resources, and any emerging information from the Lheidli T'enneh TUS or other processes can be accounted for in the next AAC determination. Finally, I wish to point out that the province is obliged and committed to meeting its obligations to First Nations through operational activities in the district and in no way should this decision be viewed as constraining or limiting in this regard.

- *community and domestic watersheds*

Guidelines for forest practices for hydrological recovery in community and domestic watersheds are found in *Interior Watershed Assessment Plan Guidebook*. In the timber supply analysis, three community watersheds, two in the McBride area (Dominion Creek and Martinson Creek) and one in the Valemount area (Swift Creek), cover 15 176 hectares or 1.1 percent of the total TSA land base or 2229 hectares (1 percent) of the timber harvesting land base. To reflect practices in these watersheds, no more than 5 percent of the area could be covered by forest stands less than 3 metres tall at any time in the

analysis. A public submission from Canoe-Robson Environmental Coalition expressed concern that sources of domestic water supplies apart from community watersheds are not accounted for in the analysis. They also stated that minimum riparian setbacks required under the *Forest Practices Code* provide inadequate protection, and request the LRMP be used as the base case. District staff indicate there are informal procedures in place to protect domestic water intakes and these will be addressed further as LRMP recommendations are implemented. The LRMP recommends a 20-meter reserve on known domestic water intakes and a 30-meter machine-free management zone on the main creek upstream of known domestic water intakes.

The Martinson Creek community watershed has a selective and clearcut logging research project from the early 1990s and the Small Business Forest Enterprise Program has an operating area nearby. There has been some selective logging in the lower reaches of the Swift Creek community watershed, and some areas have been allocated for future forest developments. Forest health concerns related to bark beetle attack in pine and spruce have been raised in this area.

In summary, some harvesting activity has occurred in the community watersheds in past years, and the actual practices and harvesting rate may vary from the assumptions in the analysis. However, I am mindful that the modelling constraints have been applied to reflect provisions which limit or restrict harvesting in these areas. I find the approach in the analysis does not pose a significant risk to timber supply. I encourage district staff to bring new information related to domestic water intakes from the LRMP implementation into the next timber supply review. For this determination, I consider the assumptions regarding community and domestic watersheds to be adequate.

- *riparian areas*

Riparian areas occur along streams, around lakes and in wetlands. The *Riparian Management Area Guidebook* requires the establishment of riparian reserve zones that exclude timber harvesting in most cases, and riparian management zones that restrict timber harvesting in order to protect riparian and aquatic habitats. As no stream class inventory is available for the district, to estimate the area needed in riparian reserves and riparian management zones, BCFS and MELP staff examined the riparian assessments conducted on four map sheets and extrapolated the results for the Robson Valley TSA. Application of the guidelines to reflect the protection of riparian areas resulted in a deduction of 25 601 hectares from the productive forest land base, which was 8.68 percent of the land base at the point at which the deduction was made.

District staff inform me the forest cover maps used to estimate the riparian reserve and management zone impacts may under represent the number of actual creeks (mainly S4, S5, and some S3 creeks) on the land base by 30-50 percent. I have examined the riparian assessments with staff and note that a 50 percent underestimation of all S4, S5 and S6 creeks and the low equivalent area constrained would result in an insignificant impact on timber supply, given that operational practices do not result in significant constraints being applied.

Public input from Zeidler Forest Industries note the need to re-evaluate the total riparian management zone strategy and especially the amount of netdowns on the various stream classes with management zones, particularly for S1 and S2 streams. Slocan Forest Products Ltd. suggested that the 50 percent netdown of S1 and S2 management zones should be reduced to 30 percent given current practice of clearcutting the majority of management zones or removing the dominant trees.

Several questions were raised about the riparian deductions based on four map sheets in the analysis. Slocan considered the area deduction to be significantly higher than other similar units. Canoe-Robson Environmental Coalition questioned the statistical viability of assessing only four mapsheets to approximate the area affected by these management requirements. Based on my experience with other units with similar topography, I do not find the 8.68 percent deduction unreasonable. However, I agree it would be desirable to strengthen the estimate and I encourage licensees and district staff work together to improve the stream class inventories. Also as noted above, district staff have informed me of the possible under representation of actual creeks on the forest cover maps.

Given all of this information, I have reasoned as follows. I note there have been numerous comments and concerns raised with respect to the small sample size and methodology leading to the riparian constraints applied in the analysis. I also note that I am not aware of any other information source or study that is available for the Robson Valley TSA to address these concerns. Notwithstanding the questions and concerns, it is my view that the net result of an 8.68 percent reduction to the timber harvesting land base appears reasonable to me, and I accept it as an approximation of the riparian management requirements for this determination. I look forward to new or more refined information that can be developed for consideration at the time of the next AAC determination.

- *wildlife habitat*

For a few species of wildlife in the Robson Valley TSA there are various requirements for habitat management, as summarized in the following sections.

1) identified wildlife

'Identified wildlife' refers to those species at risk (red- or blue-listed) and to regionally significant species (yellow-listed) that are considered to be sensitive to habitat alteration associated with forest and range practices, and that have not been adequately accounted for with existing management strategies, such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints. Volume I of the Identified Wildlife Management Strategy (IWMS) was released in February 1999 and details several species that occur or potentially occur within the Robson Valley TSA, and that require future consideration, including: bull trout, American bittern, northern goshawk, fisher, grizzly bear, mountain goat and bighorn sheep.

Species identified under the IWMS will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures, or through other management practices specified in higher level plans. There are no established or proposed WHAs in the TSA for any of the identified wildlife species. Government has

limited the impact of management for identified wildlife over the next two years to a maximum of 1 percent of the short-term harvest level for the province. No specific constraints were applied in the analysis to reflect this projected impact, although I think it is reasonable to reflect the likelihood of constraints being applied up to the 1 percent level.

Grizzly bears are resident in the Robson Valley TSA and are a blue-listed 'identified wildlife' species under the *Forest Practices Code*. In the TSA, there are several habitat elements critical to grizzly bear survival, including avalanche chutes. South and west facing slide chutes in the ESSF zone have been identified as grizzly bear habitat. Current management applies a 50-meter forested buffer on all south and west facing chutes. In the analysis, a reduction of 2288 hectares was applied to the total productive forest or approximately 1 percent of the timber harvesting land base. The Robson Valley LRMP recommends a 100-meter buffer be applied to "important avalanche paths". These paths will be a subset of the south and west facing chutes, but having richer herbaceous growth. MELP staff note that although the inventory of these paths is not yet completed through a study by the Enhanced Forest Management Pilot Project (EFMPP), an estimate of an additional 0.5 percent reduction to the timber harvesting land base due to the buffer increases is expected.

Public input from the Fraser Headwaters Alliance expressed concern that the 50-meter buffers on south and west facing chutes in the ESSF zone are not adequate for habitat protection and do not comply with the 100-meter reserve zones prescribed by the LRMP. As noted earlier, a study undertaking the inventory of avalanche paths requiring the 100-meter buffers is being completed as part of the EFMPP.

Industry input from Zeidler Forest Industries Ltd. considered the area set aside for grizzly bear habitat as very high, and note that the LRMP recommends 100-meter reserve zones only on "important avalanche chutes which will reduce displacement from key foraging areas". MELP staff indicate the LRMP direction will likely require higher level plan designation and be based on inventory work, some of which is underway through the EFMPP. Slocan Forest Products Ltd. expressed the opinion that the 1 percent reduction for important grizzly bear habitat was excessive given the amount of riparian, protected areas, caribou habitat, and other reductions from the productive forest land.

Having reviewed the analysis and the public input with respect to identified wildlife, I have come to the following conclusions. I will take into account a possible downward pressure of up to 1 percent on the timber supply for the 'identified wildlife' species other than grizzly bear. There is also the likelihood that some additional area will be required to meet the needs of grizzly bears in a manner that is consistent with the approved LRMP. While it is unclear what the combined impact of these two constraints will be, it is likely to be higher than shown in the base case and could be in the range of 1.5 percent, as discussed in "Reasons for decision".

2) caribou habitat

Mountain caribou in the Robson Valley TSA were identified as a blue-listed species at the time of the data analysis. Subsequently, mountain caribou have been down-graded to red-listed status and have been designated as threatened by Committee on the Status of

Endangered Wildlife in Canada (COSEWIC). A caribou management strategy has been endorsed by the cabinet-approved LRMP, and is being implemented as part of current practice. The LRMP caribou management strategy identified high quality caribou habitat, medium quality caribou habitat, and caribou corridor movement areas.

In the analysis, all high quality caribou habitat areas (26 640 hectares) were removed from the timber harvesting land base. Management of areas designated as medium quality caribou habitat and caribou movement corridors was modelled with forest cover requirements applied to control the maximum level of disturbance and the minimum amount of mature forest. The medium quality caribou habitat zone (7608 hectares or 3.6 percent of the timber harvesting land base) used a forest cover constraint that maintains a minimum of 67 percent of forested stands greater than 80 years old. The caribou corridor movement areas (8669 hectares or 4.1 percent of the timber harvesting land base) used a forest cover constraint that maintains a minimum of 20 percent of forested stands greater than 100 years old and a maximum of 20 percent of stands less than 3 metres tall.

To assess the impact on timber supply if harvest was permitted in high quality habitat, a sensitivity analysis was run using the same forest cover requirements applied to high quality caribou habitat as for medium quality habitat. The results showed the timber harvesting land base would increase by 9.5 percent. The current harvest level could be maintained for two decades before following a similar pattern as shown for the base case to the new long-term harvest level, 9.7 percent higher than that of the base case.

MELP staff informed me that the medium quality caribou habitat areas have been identified as Ungulate Winter Range (UWR) under the *Forest Practices Code*. Projects implemented through the EFMPP will examine and refine caribou habitat designations. Following this examination, and prior to the 2003 deadline for submissions, high quality caribou habitat areas will be recommended for UWR designation.

Public input included a comment that the neighbouring Clearwater Forest District allows modified timber extraction in high value caribou habitat. It was suggested that while maintaining caribou habitat is important, the Robson Valley District's current policy is not compatible with industrial forest uses and sustainability of communities. MELP staff note current practices reflect the local direction provided through the LRMP.

Zeidler Forest Industries Ltd. stated high quality caribou habitat areas are not necessarily to be excluded from harvesting and that this is supported by statements in the LRMP. They propose that if certain logging methods prove successful in medium quality caribou habitat areas, these may eventually be allowed in high quality caribou habitat areas. MELP staff indicated that the intention of the caribou management strategy is to identify opportunities to combine timber harvest with caribou conservation, but that there is insufficient research to support co-management of timber and caribou in high quality caribou habitat areas.

Slocan Forest Products Ltd. expressed concern that the area reserved for high quality caribou habitat is excessive and that it is difficult to determine the true extent of critical caribou habitat. MELP staff reported the areas were delineated following current practice and are based on best available information from research and monitoring using radio-

telemetry. Slocan believes areas outside the timber harvesting land base should provide adequate reserves/refuge for the small numbers of caribou being managed. MELP staff note current research suggests that areas in the timber harvesting land base remain important for caribou retention in the Robson Valley TSA.

Public input from the WATERSHED Group stated the recent Robson Valley caribou inventory prepared in March 2000 by the Regional Wildlife Ecologist, indicates the LRMP and its inventory is incorrect. They also state that low numbers of caribou suggest no medium or high caribou areas or caribou crossing corridors in the TSA will conflict with or affect the timber harvesting land base. MELP staff agree the March 2000 survey detected limited numbers of caribou. However, this result does not devalue the areas identified as good habitat for caribou, as caribou use large areas extensively rather than intensively.

I acknowledge the strong public input on this factor, but on closer examination of the analysis and to my best understanding, the assumptions are reflective of the LRMP and the management decisions that have been made. Furthermore, while there was a sensitivity analysis, the results were not more applicable than the base case. Therefore, I accept that the best available information through an interpretation of the LRMP caribou management strategy was used, and that caribou habitat was properly modelled in the base case.

- *biodiversity*

Biological diversity, or biodiversity, is defined as the full range of living organisms, in all their forms and levels of organization. Biodiversity includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the *Forest Practices Code*, biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

1) stand-level biodiversity

Stand-level biodiversity management includes retaining wildlife trees and patches (WTPs), within or adjacent to cutblocks to provide structural diversity and wildlife habitat. The *Biodiversity* Guidebook makes recommendations for percentages of area to be retained in WTPs, based on specific assumptions about the land base.

Approximately 8 percent of the forested area in each landscape unit is required to meet stand-level biodiversity requirements. MELP and district staff estimated that three-quarters of this target could be met from forest outside the timber harvesting land base. Therefore, in the analysis the timber harvesting land base was reduced by 2 percent to account for WTPs. I acknowledge the district's concern that coastal standards may be more appropriate for the TSA, therefore, I recommend that staff refine the estimates through a review of silviculture prescription data to assess the area being reserved in WTPs in current practice for the next determination.

I have considered the information regarding stand-level biodiversity, and believe that the assumptions applied in the analysis were sufficiently consistent with the provincial policy, which is intended to ensure adequate accounting for stand-level biodiversity. I accept for

this determination that stand-level biodiversity has been reasonably accounted for in the analysis, and will make no further adjustments in this regard.

2) landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that maintaining these conditions—together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions—will provide for the habitat needs of most forest and range organisms. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

The delineation and formal designation of "landscape units" is a key component of a sub-regional biodiversity management strategy. The *Landscape Unit Planning Guide* outlines three biodiversity emphasis options (BEOs)—lower, intermediate and higher—that may be employed when establishing biodiversity management objectives for a landscape unit. The guide outlines the proportions of each sub-regional planning area that should be assigned to each of the three BEOs. The proportions in lower and intermediate biodiversity emphasis can range from 30 to 55 percent and 35 to 60 percent respectively, but the average is approximately 45 percent of the area in lower, 45 percent in intermediate, and 10 percent in the higher BEO.

Draft landscape units and their biodiversity emphasis for biogeoclimatic units in the TSA have been defined by the district, but not yet formally established by the district manager. However, in practice, the BEOs are being implemented by the district.

In the absence of legally established BEOs, to balance social and economic impacts against risk to biodiversity, the provincial policy generally followed for timber supply analyses—and in the analysis for the Robson Valley—is to model the distribution of BEOs using a weighted average forest cover requirement: 45 percent in the lower, 45 percent in the intermediate, and 10 percent in the higher BEO for each landscape unit/biogeoclimatic subzone combination. In the analysis, landscape-level biodiversity was modelled through the use of these forest cover requirements applied to biogeoclimatic units within each draft landscape unit.

A number of analyses were conducted to test the sensitivity of the harvest forecast to management for landscape-level biodiversity. Even in the most stringent case with all requirements for young, mature plus old and old forest applied to draft landscape units based on corresponding BEOs, and the full old forest constraint being met immediately for low-emphasis landscape units, there was no impact to timber supply. The low sensitivity of timber supply to changes in the assumptions about landscape-level biodiversity is due to the large amount of forest outside the timber harvesting land base that contributes to meeting biodiversity requirements.

Public input included various comments that suggested the timber supply analysis model the BEOs using the July 1992 report, *An Old Growth Conservation Strategy for the*

Robson Valley Forest District to account for appropriate management practices in identified old growth areas. Landscape unit planning is underway within the Robson Valley TSA, as well as determining Old Growth Management Areas (OGMAs) based on provincial guidelines.

Further comments expressed concern with the assumption in the analysis that old forests outside the timber harvesting land base will continue to age over time, and therefore casts doubt on the methodology. In the absence of supporting research, maintaining this assumption in the model does introduce some uncertainty into the decision. However, since the short-term timber supply is relatively insensitive to uncertainty in these assumptions, there is time to further review and refine the approach for future timber supply analyses.

Another comment suggested that managing for old growth will produce overmature stands susceptible to insects, disease, and fire. While these stands may not contribute to the timber supply, they are important in my consideration of accounting for biodiversity conservation concerns.

In summary, I acknowledge the cross-section of public views on this factor, particularly since the analysis was completed without the certainty of established landscape units and their BEOs. I have reviewed the analysis and am satisfied that the assumptions reflect what is currently known and reasonably account for landscape-level biodiversity for this determination. The sensitivity analysis that applied the draft landscape units and BEOs showed there was flexibility in the harvest forecast to meet the concerns in the public input and the harvest flow objectives. Before the next determination, I anticipate the BEOs will be legally established and reflected in the timber supply analysis.

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

Land and Resource Management Plan

Land and Resource Management Planning is an integrated sub-regional process requiring public participation that produces a land and resource management plan (LRMP) for review and approval by government. Completed and approved plans establish direction for land use and specify broad resource management objectives and strategies. The objectives defined through this process can reach higher level plan status under the *Forest Practices Code* if officially declared as such by government.

The Robson Valley LRMP was approved by cabinet on April 30, 1999. The approved plan builds on the agreements that were reached at the planning table and incorporates these consensus recommendations and government's decisions on specific issues where the table members did not reach consensus. In the few areas where consensus could not be reached, the provincial government's decisions strike a balance between conservation and resource development values. In some cases, the government has created subzones within resource management areas that will be managed in ways that take in to account specific environmental concerns within those areas, for example, the Upper Goat River area.

In the analysis, a sensitivity analysis was carried out to assess the impact of increasing the harvest from 10 000 cubic metres per year to 45 000 cubic metres per year from the Goat River Landscape Unit for the first decade, consistent with the LRMP. The results indicated that the harvest level from the Goat River Landscape Unit could be met while still meeting all other forest management objectives and had no impact on the base case timber supply.

District staff advised me that the review process is underway to determine which strategies are expected to receive higher level plan designation and they anticipate a few higher level plan conditions will be declared by spring 2001. A district manager policy for implementing the LRMP was issued on February 1, 2001.

Public input included a comment that as implementation of neither the Robson Valley LRMP nor the landscape unit planning have been completed in the TSA, their direction cannot be considered current practice.

However, as the LRMP has been approved by cabinet, it provides a reasonable contention of what should have been done. I am pleased and confident that the analysis modelled all the zones and constraints ranging from caribou, biodiversity, and level of harvesting in the Goat River Landscape Unit in a manner that is consistent with the approved LRMP direction. As well, the protected areas have been fully excluded from contributing to the timber harvesting land base, thus properly and appropriately accounting for the LRMP. Any future changes that may affect the AAC will be taken into account in the next timber supply review.

Enhanced Forest Management Pilot Project

The *Enhanced Forest Management Pilot Project* (EFMPP) was initiated in September 1995 as a co-operative effort between industry, government, labour, and academic agencies to develop local forest strategies that examine opportunities to boost the productivity of the forest land base in a biologically effective and economically efficient manner where land-use decisions have been made. In March 1999, the Robson Valley Forest District was awarded an EFMPP to focus on biodiversity management and conservation and forest resource integration across the LRMP defined resource management zones. Within the Robson Valley, the major forest licensees, communities, conservation groups and government agencies are committed to delivering forest management strategies for the goals of the EFMPP.

District staff provided me with a thorough overview of the issues, opportunities and focus of the Robson Valley EFMPP. Although results of the work are not available for this determination, I wish to make several observations. I commend district staff for their leadership in seeking ways to meet the biological, economic and social objectives for the TSA through the EFMPP. I am impressed by the very comprehensive list of goals. Even with a portion of the work completed, there will be testing of new science-based, empirical approaches resulting in different management strategies for the Robson Valley. I support the district's efforts to determine whether the assumptions and practices incorporated in the base case forecast can be improved upon. Future information from the EFMPP may provide more choices, and if there is a change in management direction it can be reflected

in the next timber supply review.

Crown Land Plan

The *Robson Valley Crown Land Plan* (CLP) is a land use guide developed through an integrated sub-regional process with active participation of residents and resource users in the Robson Valley for preserving and allocating 38 780 hectares of Crown land. The CLP was prepared in 1985 by the Ministry of Lands and Parks and received approval from the public, BC Agricultural Land Commission, and municipal, regional, and provincial levels of government. Management activities are projected over a 20-year period with reviews of the CLP every 5 years. The last major CLP review was in 1992/1993. The Robson Valley LRMP Round Table has endorsed the CLP.

District staff have informed me there are current projects within the LRMP – an Arability Study and a proposed tourism and recreation development on Canoe Mountain – that may affect the amount of area within the timber harvesting land base. The community of Valemount has also proposed further land alienation through possible town expansion. I am mindful that these projects are underway and will probably place more constraints on the timber supply in the future. When the projects are completed and any proposed land alienations take place that affect the AAC, then they will be taken into account in the next timber supply review.

In the analysis, approximately 14 500 hectares of the timber harvesting land base was designated into 13 classifications under the CLP. A sensitivity analysis tested the impact of excluding 1583 hectares after allowing only a single harvest (areas classified as Agricultural Development Area, Aggregate Management Area and Sand and Gravel Reserves) and full exclusion of the remaining areas (4040 hectares) with the exception of Integrated Forest Management Areas. The results indicated a small effect only on the medium- and long-term harvest forecast, with a long-term harvest level 9000 cubic metres per year or 2.6 percent lower than the base case.

After review of the sensitivity analysis with staff, I considered whether some areas classified under the CLP should have been excluded from the timber harvesting land base, for example, recreation and conservation management areas. With the assistance of Robson Valley district staff, I assessed which CLP categories should be included and those that should have been excluded from the timber harvesting land base to achieve a reasonable accounting for the CLP in the determination. With this ratio adjustment to the assumptions, I accept there is a downward pressure of approximately half of the 2.6 percent impact on the long-term harvest level and have accounted for this as discussed in “Reasons for decision”. I encourage staff to monitor practices as they relate to Crown land for future timber supply analyses.

Harvest Scheduling Priority

In the base case forecast, the highest priority for harvesting was given to stands that were oldest relative to their minimum harvestable age, subject to meeting the mature and old seral retention requirements. Due to the difficult terrain in the Robson Valley, when a drainage is accessed, all available stands, subject to meeting minimum harvest criteria and

forest cover constraints, tend to be harvested before moving into the next drainage. District staff submit that a more randomly chosen harvest pattern would more accurately reflect the current operational harvesting patterns in the Robson Valley.

A sensitivity analysis shows the impact on timber supply of randomly harvesting lodgepole pine stands older than 100 years old, and all other stands over 140 years old if they were otherwise eligible for harvest and not restricted from harvest due to forest cover requirements. In this case, the results show the medium and long-term timber supply is sensitive to a more random harvesting pattern of older stands, and the long-term harvest level is reduced by 40 000 cubic metres or 12 percent from the base case harvest forecast. However, there was no short term impact on timber supply.

I acknowledge the concerns of district staff that under current operational conditions the modelling assumption of "oldest first" in the base case may not exactly reflect the current sequence of harvested ages. Tracking harvesting patterns between now and the next timber supply analysis will provide the necessary information for evaluating the harvest queue assumptions. The sensitivity analysis shows what I view as the lower bracket of the uncertainty around the long-term harvest level. I accept there is a downward pressure on timber supply, but due to the influence of other factors on future growth, I am unable to consider it with a high degree of precision. I have accounted for this risk to timber supply as noted in "Reasons for decision".

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

Alternative rates of harvest

The nature of the transition from harvesting old-growth to second-growth forests is a major consideration in determining AACs in many parts of the province. In the short term, the large timber volumes in older forests often permit harvesting above long-term levels without jeopardizing future timber supplies. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain stable enough so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts beyond that required to maintain forest productivity and future harvest stability.

In the analysis for the Robson Valley TSA, several alternative rates of harvest were evaluated in selecting the base case harvest forecast. One forecast tested the feasibility of maintaining the current harvest without severely affecting future timber supply. It was possible to maintain the current AAC for two decades before declining to a long-term harvest level of 336 000 cubic metres, or 4000 cubic metres per year less than the base case. In another harvest flow projection, if the harvest declined immediately by 10 percent to 542 139 cubic metres per year, it was possible to maintain this harvest for three decades before following the same harvest projection as in the base case. A forecast with a

non-declining harvest flow for the entire analysis horizon would require an immediate 44 percent reduction to an annual harvest level of 340 000 cubic metres, being the same long-term level as that of the base case.

I am satisfied that the base case harvest forecast allows some scheduling flexibility in the short and medium terms, and I believe it is an appropriate basis from which to evaluate timber supply in the TSA.

- *community dependence on the forest industry*

The socio-economic analysis for the Robson Valley TSA details the impact of timber supply adjustments on local communities and the provincial economy. The three most significant contributors to the economy of the Robson Valley TSA are the forestry sector (including harvesting, silviculture, wood products manufacturing), tourism and business travel, and the public sector (federal, regional, and municipal employees). In 1996, the forestry sector supported approximately 37 percent of the total labour force.

The analysis reports the level of forest activity supported by the actual harvest between 1996-1998 was 345 person-years of direct employment within the TSA and a further 140 person-years of direct employment in the rest of the province. The current AAC of 602 377 cubic metres, if fully harvested, could support an additional 115 person-years of direct employment across the province. Annual provincial revenues associated with this AAC, including provincial income tax, royalties, stumpage and rent, total about $19.8 million.

Public input included a comment that the economic dependence on the forest industry was underestimated, and that 65 to 70 percent would be a more realistic figure for the Robson Valley area. Slocan Forest Products noted that the employment dependency pie chart in the *Information Report* is misleading as it suggests the forest industry represents a small portion of the Robson Valley's economy. Reliance of the other categories on the forest sector should be identified, and the number of jobs should be weighted by employment income. Staff note that employment dependency figures from the Ministry of Finance and Corporate Relations include indirect and induced employment, and thus show the dependence of other sectors on forestry. The number of jobs is based on employment income flowing into the region and the average wage per sector, thus the weighting of income is implicit in the employment percentages.

Public input received from the Council of the Village of Valemount stated that to continue using person-years per 1000 cubic metres without adequate analysis of underlying economic difficulties and without input from the forest industry would only compound matters. Another public submission stated that continuing to use the status quo for employment projections detracts from the value of using those projections in the report. Staff inform me that the employment co-efficients used to project employment are based on data from local industry, however no operating or financial data were provided. The socio-economic analysis clearly states that longer-term projections have limitations. Attempts to determine potential changes in industry structure, productivity and market demands and preferences would not necessarily provide a better indication of actual future employment.

I note that the Timber Supply Review strives to adequately reflect the protection measures for all resource values, including visual quality, wildlife habitat, recreation and other values on which tourism is partly dependent. I am satisfied that an appropriate accounting for these resource values has been made in this determination, either in the timber supply analysis assumptions, or as a result of the adjustments I am making to the base case forecast. I have reviewed the socio-economic analysis, which used an established and sound methodology to evaluate the community dependencies for the Robson Valley TSA. I am mindful that the communities within the Robson Valley TSA depend on the timber supply from the TSA, and that any adjustment to the harvest level will impact these communities.

Environmental Analysis

The Enhanced Forest Management Pilot project for the Robson Valley Forest District, as discussed above, included the pilot development of a comprehensive, social, economic, and environmental analysis. As part of my review of the Robson Valley timber supply, Ministry of Environment staff presented the pilot environmental analysis component. The pilot analysis was aimed at attempting to review the risk to ecosystems (biodiversity), plant and wildlife species based on the existing and modelled age-class distribution, and predicted distribution based on mean natural disturbance intervals. Mean natural disturbance intervals are considered to be the average time between natural disturbance events, such as wildfires, catastrophic insect infestations, wind, landslides, or avalanches. Age class distribution of forest types was used because it is one of the measurable surrogates for ecosystem diversity suggested by the Canadian Council of Forest Ministers.

The environmental analysis involved several steps. Firstly, based on mean natural disturbance intervals, age class summaries (old seral and early seral) across the 250-year planning horizon were produced for biogeoclimatic variants using output from the timber supply analysis. Mean natural disturbance intervals as interpreted from the *Biodiversity Guidebook* were supplemented by recent research on fire and insect disturbance in ecosystems found in the Robson Valley TSA. Then qualitative risk categories were assigned which attempted to reflect tolerable limits of change from the range of historic natural variation. The predicted extent of both old and early forest were used to qualitatively evaluate the risk to biodiversity, assuming that the further the age structure of the forest moves beyond the historic range of natural variation, the greater the risk to the maintenance of biodiversity.

I have reviewed and support Ministry of Environment staff's ongoing efforts to produce a useful and informative analysis to help define conservation implications of harvest levels. I have discussed the approach with a number of experts and am advised of its strengths and weaknesses, both of which will be addressed through further review and development of the analysis techniques and assumptions through collaborative efforts by Ministry of Forests and Environment staff. In the meantime, having reviewed the specific findings for the Robson Valley I remain equally mindful of the findings and that the technique is still under development, and therefore cannot conclude that the base case harvest level assessed introduces unacceptable levels of risk to the maintenance of biodiversity. However, I am aware of the trends in certain age classes and biogeoclimatic units moving beyond

Ministry of Forests and Environment's best understanding of historical natural ranges. I look forward to the continued development and refinement of this tool for future use and application in informing AAC decisions about specific conservation concerns. I also observe that development of this tool will have application in the policy development arena outside of AAC determinations.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;

Timber processing facilities

- *existing mills*

Within the TSA there are two major mills: Slocan Forest Industries Ltd. (Slocan) lumber mill in Valemount; and Zeidler forest Industries Ltd. (now McBride Forest Industries Ltd.) veneer plant and lumber mill in McBride. Other licensees and processing facilities include Hauer Bros. Lumber Ltd. in Tete Jaune Cache and Bell Pole Co. Ltd. with four pole mills outside of the TSA. In 1999 many other smaller processors in the Robson Valley TSA processed small volumes of sawlogs and/or other special forest products. They included Marsh Bros. Lumber and Supply Ltd., Lobo Log Crafters, Cedar Three Ltd., Canoe River Wood Products, Ski Lumber, TRC Cedar, Corwood Timber Products Ltd., and Gibbs Custom Sawmill.

Staff presented more recent information for production and employment since the socio-economic analysis was completed. In 1999, the total volume of timber processed by all mills within the Robson Valley TSA was 318 000 cubic metres and supported the employment of 205 people. Production had declined by 49 percent and employment by 21 percent for the period 1997 to 1999. In that same period, approximately 90 percent of the timber processed came from within the TSA.

Public input received from Slocan Forest Products Ltd. noted that their Valemount mill has an annual capacity of about 200 000 cubic metres per shift and their forest license currently has an AAC of 175 018 cubic metres, making it critical that they have an assured timber supply to support at least one shift. A public submission from Zeidler Forest Products Ltd. stated that for many years they have operated with 2 shifts per day and require 225 000 cubic metres per year for their veneer line. District staff note that given the public input information from Slocan and Zeidler on their mill requirements, a 10 percent reduction in the timber supply would result in not enough timber required to operate two shifts, and a 15 percent reduction would result in not enough timber for the Slocan mill to operate one full shift.

After reviewing the information about existing milling facilities, I note that the total processing capacity exceeds the current AAC of the Robson Valley TSA. However, from 1996 to 1998, the average total volume processed per year was approximately 550 000 cubic metres or 25 percent below the total capacity of 750 000 cubic metres. I am aware that the community has voiced concern over timber leaving the TSA for processing in other forest districts, and that a 10 percent decline in the AAC in the first decade as

presented in the base case projection may have implications for the viability of local processing facilities.

- *proposed facilities*

I note that the AAC is fully committed to existing tenures. Current timber processing facilities have the capacity to fully use the current AAC, and no other opportunities for new facilities were identified in the analysis.

Public input received from Giscome Timber Ltd. expressed their interest in locating a manufacturing facility in McBride to process cedar, but indicated they would need a significant and assured supply of raw material. They noted the *Information Report* states that 92 604 cubic metres of timber volume remains unsalvaged from infestations and devastations and they asked if the District Manager plans to issue a license for this salvageable timber. I am advised that district staff have not yet been formally apprised by Giscome of any proposal for a new facility. It seems likely that since this matter has now been raised that it will lead to some further discussions and evaluation. However, the outcome of those discussions cannot be predicted at this time.

(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 and memorandum*

The Minister of Forests has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester: a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996 (attached as Appendix 4). The letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He emphasized the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for the Robson Valley TSA. As discussed under *commercial thinning*, I have concluded there is limited opportunity for commercial thinning at this time. However, opportunities may increase and I will consider this in future determinations. With respect to harvesting in previously uneconomic areas, as discussed under *physical and economic operability,* I am satisfied that improvements in the data used in the analysis provides a

more suitable indication of the extent of the physical and economic harvesting potential in the TSA, but there remains some uncertainty about future access into the Cariboo and Foster landscape units.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. As discussed under *visually sensitive areas*, while VQOs have been established as recommended by the Robson Valley LRMP, there is currently limited performance in visually sensitive areas. There also exists the possibility of an increase in the amount of timber harvesting land base covered by VQOs. I did not find any additional opportunities for those potential areas addressed in the Minister's letter and memorandum, and in fact, for this determination these factors represent a downward pressure on the long-term harvest level.

- *local objectives*

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the Timber Supply Review where these are consistent with government's broader objectives. Public input was received to both the data package and analysis report for the Robson Valley TSA from individuals, local government, licensees, First Nations and interest groups. The summary of public input is reproduced as attached in Appendix 5.

Many of the public responses commented on the harvest levels and allocation of AAC in the district and the Robson Valley TSA. Various submissions requested the AAC be reduced to current actual harvest levels. Several public submissions supported reducing the AAC as quickly as possible to the projected long-term harvest level. The Village of Valemount stated that no reduction in AAC for 10 years was needed to allow communities time to diversify the economy. The McBride & District Chamber of Commerce submitted that a reduction in AAC of existing licensees would negatively impact existing and future job opportunities. They would prefer a smooth transition from the present harvest level to the long-term level. Submissions from industry included a comment from Zeidler Forest Industries Ltd. that the AAC should not be reduced other than for technical or scientific reasons in order to maintain sustainable forest development. With respect to calls for substantial immediate AAC reductions, in my considerations throughout this document I have attempted to account for the need to balance socio-economic and environmental benefits and risks both now and over time.

The Shuswap Nation Tribal Council included as part of their statement that all land use decisions made by the provincial government are subject to the aboriginal title, jurisdiction, rights and interests of the Shuswap Nation.

I am mindful of the public input received, and where possible, I have attempted in appropriate sections of this rationale to respond briefly to the views expressed. Consideration of public input has been an important component of this determination. I note that some of the public input received relates to items beyond my mandate for consideration under the *Forest Act*, which relates specifically to the determination of

AACs for TSAs and TFLs. I also note that local objectives have been an important consideration in my determination of an AAC for the Robson Valley TSA.

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

Abnormal infestations and salvage

Forest stands are susceptible to damaging agents such as wildfires, windthrow, and disease and insects. Timber volume losses due to endemic levels of insects and diseases (normally affecting stands) are generally measured and accounted for during forest inventory sampling for existing stand volumes or through other sampling methods. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *volume estimates for regenerating stands.* Therefore, in the timber supply analysis it is necessary to estimate and account for the unsalvaged losses for epidemic (abnormal) disease and insect losses occurring within the timber harvesting land base, as these are not incorporated into volume estimates.

For the Robson Valley TSA, epidemic unsalvaged losses were estimated to be 92 604 cubic metres per year in the analysis. Where possible, unsalvaged losses were derived by locating insect and disease activities and estimating the proportion of the area available for harvesting affected by that activity and averaged over a 10 to 20 year period. Other data sources came from ground observation by field staff. After the timber supply analysis was completed, district staff reviewed new data for hemlock looper defoliation and concluded that the unsalvaged losses were overestimated by approximately 32 500 cubic metres per year. Estimates of unsalvaged losses for spruce leader weevil and Armillaria root disease were eliminated as they were considered endemic losses and reflected in the volume estimates. The resulting estimate of unsalvaged losses was 57 031 cubic metres per year (9.5 percent of the projected short-term harvest level), a reduction of 35 573 cubic metres per year from the estimate used in the analysis.

Public input from Zeidler Forest Industries Ltd. stated that an increase of 31.5 percent in unsalvaged timber from the previous timber supply review might be too high. Slocan Forest Products Ltd. noted the unsalvaged losses are high compared to the volume of the current AAC. They consider the estimates of the losses from bark beetles, hemlock looper and fires to be unreasonable, and note that licensees and the Small Business program have actively salvaged timber where possible. Another public submission stated the estimated volume should be much higher, due to the nature of mature and overmature timber in the TSA. I acknowledge the public concern for the estimates of unsalvaged timber. As noted above, after the analysis was completed, district staff received new information about the area of damaged timber, and have adjusted accordingly their estimates for hemlock looper losses.

Fraser Headwaters Alliance and the Canoe-Robson Environmental Coalition consider the hemlock looper event to be catastrophic, and in their view, it would be appropriate to average the volume loss over a minimum of 100 years. Staff note that in the upper

Fraser River, the recorded return interval is 36 years, which is similar to the estimate provided in the *Data Package*.

One public submission included comments that some losses due to endemic causes are already reflected in volume over age curves and that netting out endemic losses may be double counting. The losses due to endemic pests appear high by about 30 percent. District staff note the revised unsalvaged losses are intended to account for epidemic, not endemic losses.

Slocan Forest Products Ltd. noted the loss from fringe blowdown appears to be calculated per hectare instead of by block as suggested in the methodology. However, staff have advised me that the methodology does include converting the fringe damage data into cubic metres per hectare. Other comments expressed concern about the hemlock looper infestation and their probable causes and preventative measures, including discontinuing clearcutting in the Interior – Cedar Hemlock zone. Others suggest reducing unsalvaged losses through adequate opportunities for harvesting and setting minimum stumpage fees.

I note that while this factor has a direct relationship to the base case, as the unsalvaged loss is a direct addition to the volume that the model must attain over the term of the planning horizon, producing a good estimate of unsalvaged losses is far from simple. While the revised 9.5 percent reduction is still a large projected loss, I do accept that the district does experience a high incidence of insects and pathogen damage and is subject to wind patterns resulting in windthrow damage. In summary, staff have informed me they are confident that their revised estimates of unsalvaged losses constitute the best available information. I accept this revision and note that it results in an upward pressure on the short, mid- and long-term timber supply as discussed further in “Reasons for decision”. I encourage district staff to continue to monitor trends such that any additional information can be incorporated into future timber supply analyses.

Reasons for decision

In reaching my AAC determination for the Robson Valley TSA, I have considered all of the factors presented above and have reasoned as follows.

In the 1999 timber supply analysis, the initial base case harvest level of 602 377 cubic metres per year could be maintained for one decade. The projected harvest level then declined by 10-percent for six decades to the long-term harvest level of 340 000 cubic metres per year. In determining this AAC, I have identified a number of factors that indicate that the timber supply may be more or may be less than the level projected in the base case. Generally some of these factors can be quantified and their impacts assessed with some reliability. Other factors may influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at the time of this determination.

In determining the AAC for the Robson Valley TSA, the following factors may indicate an overestimation in the projected timber supply.

- *operability* – there is some level of uncertainty regarding the development potential in the Foster and Cariboo landscape units. However, in my view there is insufficient information to justify removing these units from the timber harvesting land base. Rather, I am mindful that the magnitude of the uncertainty could represent a downward pressure to the short and long term in the order of 1-5 percent on the timber harvesting land base. I have asked staff to undertake further cost/benefit studies to determine their future potential and appropriate contribution to the timber harvesting land base.
- *visually sensitive areas* – two issues that create a risk to the timber supply are the limited performance in visually sensitive areas, and the anticipated increase in area covered by VQOs. I consider the impact could be significant, however, I do not have enough information to quantify the amount for this determination. Given the results of the sensitivity analyses and the general uncertainty associated with this factor, I view the risk as primarily an unquantified downward pressure on the long-term harvest level.
- *Identified Wildlife Management Strategy* – consistent with provincial policy, I am accounting for up to one percent timber supply impact for implementation of IWMS for species other than grizzly bear. The base case had removed one percent from the timber harvesting land base for 50-metre buffers on avalanche chutes considered important for grizzly bears. I will also account for the LRMP direction which results in another .5 percent due to grizzly bear habitat. This arises from an expected 50-metre buffer increase for about half of the total avalanche chutes currently reflected in the analysis. These changes would affect the short and long-term harvest levels in the base case.
- *Crown Land Plan* – some categories from the CLP should have been excluded from the timber harvesting land base. After review of the sensitivity analysis, which examined this issue, I estimate this represents a 1.3 percent reduction in the long-term harvest level.

- *harvest scheduling priority* – uncertainty exists as to whether the use of a relative-oldest-first harvest rule best represents the harvest pattern over the Robson Valley TSA land base. There is enough uncertainty in this factor that the exact impacts are unclear, but I am able to describe the range of uncertainty and use the mid-point of 6 percent as an estimate of the level of impact on the long-term harvest level.

I have identified the following factors as possible indicators of an underestimation in the projected timber supply.

- *unsalvaged losses* – review of new information by district staff show the amount of volume lost to unsalvaged losses was overestimated by an amount of 35 573 cubic metres per year for short and long-term harvest levels. I consider this to represent a 6 percent underestimation of the volume in the short term timber supply and 10 percent in the long-term harvest level.
- *old-growth site index adjustments* – applying the results of OGSI studies indicate the potential for substantial increase in the range of 44 percent for the projected mid and long-term timber supply. I do not consider the increase quantified, however, the direction and the magnitude is clear. Therefore, given the trends in the data and the potential impacts on timber supply in this TSA, I urge verification of the OGSI adjustments through field studies to localize the data related to this issue.
- *regeneration delay* – review of the data used in the analysis indicate the regeneration delay has been overestimated in the base case, and this represents a one percent increase to the long-term harvest level.
- *genetically improved seed* – no genetic gain was assumed in the analysis, and based on seed orchard capacity for spruce, represents a 3-6 percent increase in the mid and long-term timber supply. Further increases are expected over time as established seed orchards for lodgepole pine and other species begin production.

In consideration of those factors discussed above, I weighed the order of magnitude of their short and long-term impact on timber supply and the timber harvesting land base, followed by a broader consideration of all the factors and their overall implications for the AAC.

In consideration of the quantified factor – *unsalvaged losses* – acting to increase the short-term timber supply and timber harvesting land base, it is estimated to have an impact of approximately 6 percent. The other quantified factors – *IWMS, grizzly bear avalanche chutes, and operability* – acting to decrease the timber supply and timber harvesting land base are estimated to have an impact in the range of 1.5 to 6.5 percent. I consider the estimates of upward and upper range of downward pressures to nearly offset each other in their impact on the short-term timber supply, and weigh in favour of maintenance of the AAC.

The factors – *unsalvaged losses, regeneration delay, genetically improved seed, and old-growth site index adjustments* — acting to increase the long term timber supply and the timber harvesting land base are estimated to have an impact in the range of 14 to 64 percent. I consider there to be more certainty in the estimates for the lower range than for the upper range, and I remain mindful of the necessity for verification of the old growth

site index adjustments through localized site productivity studies. The other factors — *harvest scheduling priority, grizzly bear avalanche chutes, operability, IWMS, and visually sensitive areas* — acting to decrease the timber supply and the land base are estimated to have an impact in the range of 10 to 15 percent. However, given the sensitivity analyses for *visually sensitive areas*, I consider the uncertainty for this factor to be unquantified at this time. Notwithstanding this uncertainty for *visually sensitive areas*, but due to the order of magnitude of the potential increase in site productivity estimates, I consider there is likely a net upward pressure on the long-term timber supply. However, as the impact is on the long-term harvest level, it is important to take the time to refine the estimates with additional information for future determinations.

From all these considerations, I have some further observations based on this timber supply review of the Robson Valley TSA. The full AAC is not being cut, and has not been harvested since the previous determination, but at the same time I note that the analysis is trying to project an economically viable timber supply. I do not find any fault with the analysis, but I believe there must be reasons for the undercut — possibly related to the economics of harvesting the growing stock that are not being reflected in the analysis. However, I do not take this to be sufficient reason to reduce the AAC at this time as there are many possible reasons for this which have not been explored at this time.

Nevertheless, I feel there is a need to gain a better grasp of how much of the undercut is attributable to factors that currently have under-performance, such as in the visually sensitive areas (VQOs). Until there is demonstration of performance in the VQO zone, the issues related to achieving the harvest level modelled in the analysis are difficult to identify and quantify. As discussed earlier, I also have some uncertainty about future operability in the Cariboo and Foster landscape units, and whether the analysis has appropriately constrained the land base. Over the next 5 years I request the district to closely examine the causal factors affecting the economic viability of operating in the TSA.

With respect to the deciduous partition of the AAC, I consider it appropriate to leave the partition in the AAC, however, I am concerned that it may not be possible to meet the currently specified harvest level of 6000 cubic metres annually. I am mindful that the district has made some initial efforts in developing this resource. I request that district staff monitor the harvesting performance in these stands during the period for which this determination is in effect. In a future determination I may consider it more appropriate to exclude these stands from contributing to the timber supply — and adjust the projected harvest levels on this account – if the partitioned type does not appear to be operationally attainable. In consideration of the visually sensitive areas, evidence of increased performance and operable viability of harvest operations in the VQOs will also be thoroughly assessed in the next timber supply review.

With respect to the management challenge of the Robson Valley and notwithstanding the undercut, there are obviously high levels of economic dependency on the Robson Valley timber supply as evidenced by the findings of the socio-economic analysis. And yet in the face of a declining forecast, the review has highlighted some factors that might change the shape of the forecast, i.e., site productivity estimates, faster regenerated stands, earlier

green-up, and higher second growth yields. In meeting this challenge, I commend the district's initiative through the Enhanced Forest Management Pilot Project (EFMPP) to find innovative approaches to conserve biological diversity and enhance forest productivity. I encourage and support the staff on their continuing efforts, as this type of work is most needed in areas where community dependency is high and the timber supply forecast shows declines.

In summary, I consider the upward and downward pressures on timber supply to more or less offset each other for those factors that affect the short term. For those factors that impact the long-term harvest level, there is an unquantified net upward influence on timber supply. It is important to note that this unit is still forecasting declining harvest rates over time. Given the two decisions that have now forecast a decline in the near future, it is very possible that the next analysis will be forecasting a reduction in AAC for the TSA. Therefore, I encourage the district to refine the analysis assumptions and information over the next 5 years to continue to increase confidence in the information used to assess the timber supply at the time of the next decision.

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 five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Robson Valley TSA is the maintenance of an AAC of 602 377 cubic metres per year which includes a partition of 6000 cubic metres per year for deciduous dominated stands. This determination comes into effect on June 1, 2001 and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the following list of tasks and studies that I have mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects depends on available staff resource 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 Robson Valley TSA. I recommend that district staff:

- refine information about operability through cost/benefit studies for the Foster and Cariboo landscape units;
- monitor the level of harvesting within the deciduous partition;
- refine methodology to estimate area covered by existing trails;
- resolve the appropriate adjustments to make to site indices in the TSA and monitor growth in second growth stands;

- refine criteria for minimum harvestable ages;
- assess the expected use of alternative silviculture systems, the extent of the areas affected, and the amounts of expected retention and frequency of harvesting entries;
- monitor developments related to the RVQCs and establishment of VQOs; in particular, review RVQCs for consistency with LRMP objectives, and monitor development in VQOs (i.e., area harvested per year, and disturbance levels compared with allowable disturbance ranges);
- review silviculture prescription data to assess the area being reserved in WTPs;
- monitor actual harvest schedule;
- monitor changes to the Crown land plan designations;
- investigate the reasons for the undercut, including the economics of harvesting the growing stock in the timber supply projection; and
- strengthen the estimate for riparian deductions.

Larry Pedersen
Chief Forester

May 11, 2001

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and 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 the result set out under section 39 (1) (a) to (d),

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 5 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 5 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 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(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 portions of the allowable annual cut attributable to

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

(b) different types of timber and 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, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(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) silvicultural 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) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(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.

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

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(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 timber processing industry in British Columbia; and

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

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: Summary of Public Input