BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 18

Issued to Slocan Forest Products Ltd.

Rationale for Allowable Annual Cut (AAC) Determination

Effective October 25, 2000

Larry Pedersen
Chief Forester

Table of Contents

Objective of this Document 3
Description of the TFL 3
History of the AAC 3
New AAC determination 4
Information sources used in the AAC determination 4
Role and limitations of the technical information used 5
Statutory framework 6
Guiding principles for AAC determinations 6
The role of the base case 8
Timber supply analysis 9
Consideration of Factors as Required by Section 8 of the *Forest Act* 11
Land base contributing to timber harvesting 11
- general comments 11
- non-forested and non-productive areas 11
- economic and physical operability 12
- estimates for roads, trails and landings 12
- non-merchantable and low productivity stands 14
- environmentally sensitive areas 14
Existing forest inventory 15
- current forest inventory 15
- age-class distribution and species profile 15
- volume estimates for existing stands 16
Expected rate of growth 16
- aggregation procedures 17
- site productivity estimates 17
- volume estimates for managed stands 18
- operational adjustment factors 18
- minimum harvestable ages 19
- harvest profile and sequencing 20
Regeneration delay 20
Not-satisfactorily-restocked areas 21
Silvicultural systems 21
Incremental silviculture 21
- fertilization 22
- juvenile spacing 22
- pruning 23
- commercial thinning 23
Utilization standards 24

Decay, waste and breakage 24
Integrated resource management objectives 24
- non-timber resource inventories and assessments 24
- cultural heritage resources 25
- recreation features 25
- range 25
- green-up and adjacency 26
- visually sensitive areas 27
- water resources 28
- riparian habitat 29
- wildlife habitat 31
- biodiversity 32
Kamloops Land and Resource Management Plan 36
Alternative rates of harvest 37
Proposed Management Options 38
Twenty-year plan 39
Residual balsam stands 40
Landscape unit level analysis 42
Timber processing facilities 43
Minister's letter and memorandum 43
Community dependence 44
Public Involvement 44
First Nations 44
Unsalvaged losses 45
Reasons for decision 45
Determination 49
Implementation 49
Appendix 1: Section 8 of the *Forest Act* 51
Appendix 2: Section 4 of the *Ministry of Forests Act* 53
Documents attached: 53
Appendix 3: Minister of Forests' letter of July 28, 1994 53
Appendix 4: Minister of Forests' memo of February 26, 1996 53

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 Tree Farm Licence (TFL) 18. This document also identifies where new or better information is needed for incorporation into future determinations.

Description of the TFL

TFL 18 is situated in the North Thompson region of central British Columbia immediately west of the town of Clearwater and south of Wells Gray Provincial Park. The TFL is held by Slocan Forest Products Ltd. (Slocan) and is administered by the Clearwater Forest District office in Clearwater which is part of the Kamloops Forest Region.

The majority of the TFL area is characterized by a high elevation plateau with gently rolling terrain and an elevation range of about 800 metres. Numerous small lakes and swamp complexes are located within the TFL. Three biogeoclimatic zones occur within the TFL, namely the Sub-Boreal Spruce (SBS) zone, the Engelmann Spruce-Subalpine Fir (ESSF) zone and the Interior Cedar-Hemlock (ICH) zone. The SBS and ESSF zones cover 40 and 44 percent of the TFL area respectively. The ICH zone covers the remainder (16 percent) of the TFL. Commercial tree species on TFL 18 are Engelmann and white spruce, lodgepole pine, subalpine fir (balsam), Douglas-fir, western hemlock and western redcedar.

Forestry is the principal employment sector in the region. Also significant are the tourism, ranching and transportation sectors. Road access is provided by provincial highway 5 which serves the North Thompson region including Wells Gray Park. There is also a connecting railway that is used to transport forest products from local processing facilities.

History of the AAC

TFL 18 was originally issued to Clearwater Timber Products Ltd. in 1954, and then assigned to Slocan Forest Products Ltd. in 1987. The most recent TFL agreement was issued to Slocan Forest Products Ltd. in 1996.

The AAC was set at 70 792 cubic metres in 1955 and increased incrementally during subsequent years to 210 000 cubic metres by 1983. The increases were due primarily to the expanding use of lodgepole pine as a commercial species, closer utilization practices, and improved inventory information. In 1993, the AAC was reduced to its current level of 187 000 cubic metres to manage the transition to the long-term harvest level. The AAC remained at 187 000 cubic metres as a result of the 1995 determination.

The current AAC is allocated as follows: 176 500 cubic metres to the TFL holder and 10 500 cubic metres to the Small Business Forest Enterprise Program (SBFEP). The AAC of the TFL is not partitioned.

New AAC determination

Effective October 25, 2000 the new AAC for TFL 18 will be 177 650 cubic metres.

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

Information sources used in the AAC determination

Information considered in determining the AAC for TFL 18 includes the following:

- *Statement of Management Objectives, Options and Procedures (SMOOP) for draft Management Plan (MP) No. 9*, *TFL 18*, accepted September 11, 1998;
- *Timber Supply Analysis Information Package: TFL 18*, MP No. 9, Slocan Forest Products Ltd., (prepared by Hugh Hamilton Limited) accepted May 4, 1999;
- Existing stand yield tables for TFL 18, accepted by BCFS Resources Inventory Branch, May 11, 1999;
- Managed stand yield tables and site index assignments, accepted by BCFS Research Branch, May 17, 1999;
- *Timber Supply Analysis: TFL 18*, MP No. 9, Slocan Forest Products Ltd., (prepared by Hugh Hamilton Limited) accepted August 4, 2000;
- *Proposed MP No. 9: TFL 18*, Slocan Forest Products Ltd., submitted January 25, 2000; accepted September 28, 2000;
- *TFL 18, Twenty-Year Plan*, Slocan Forest Products Ltd., accepted April 14, 2000;
- Summary of public input solicited by the licensee regarding contents of proposed MP No. 9 (MP No. 9, Section 12);
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources;
- Letter from the Deputy Ministers of Forests, and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts of biodiversity management on timber supply;
- Memorandum from the Director of the Timber Supply Branch of the Ministry of Forests, dated December 1, 1997, entitled *Incorporating Biodiversity and Landscape Units in the Timber Supply Review*;
- *Forest Practices Code of British Columbia Act*, (as amended);
- *Forest Practices Code of British Columbia Act Regulations*, (as amended);
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP;
- *Forest Practices Code Timber Supply Analysis*, 1996;
- *Landscape Unit Planning Guide*, BCFS and MELP, March 1999;

- *Kamloops Land and Resource Management Plan* (as amended);
- Letters from the District Manager, Clearwater Forest District, dated November 24, 1997 and August 12, 1999 to licensees regarding the *Kamloops Land and Resource Management Plan*, biodiversity emphasis and old growth targets;
- *Clearwater District Lakeshore Management Guidelines*, April 1993;
- *Kamloops Timber Supply Area Timber Supply Analysis*. Ministry of Forests, May 1995;
- *TFL 18 Rationale for AAC determination*, BCFS, October 1, 1995;
- *TFL 18 Inventory Audit Report*, Resources Inventory Branch, June 1997;
- *Procedures for Factoring Visual Resources into Timber Supply Analyses,* BCFS, March 1998;
- FSOS benchmarking report: *A comparison of FSOS and FSSIM results for timber supply analysis using a benchmark dataset*, Hugh Hamilton Ltd. August 14, 1998;
- Technical information provided through correspondence and communication among staff from the BCFS and MELP;
- Field review of TFL 18 operating conditions and the associated discussions among Slocan staff, the deputy chief forester and BCFS regional, district and branch staff, December 1, 1999;
- Presentation made by staff from Slocan Forest Products Ltd. to the Chief Forester in Victoria on March 17, 2000;
- Field review of TFL 18 operating conditions and the associated discussions among the chief forester, Slocan staff, BCFS district and regional staff, September 15, 2000.

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 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. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although 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 social, cultural and economic factors that are relevant 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 TFL 18, 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 AACs 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 consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is 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:

(i) 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

(ii) 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 to 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 of British Columbia Act* and its associated regulations (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 Forest Practices Code has been fully implemented since 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.

For TFL 18, clarification has been provided on many aspects of land and resource use through government's approval in 1995 of the *Kamloops Land and Resource Management Plan* (LRMP). Moreover, the Kamloops LRMP has been declared a higher level plan under the *Forest Practices Code of British Columbia Act* and it is therefore required that this AAC determination consider and reflect that declaration.

Forest Renewal BC funds a number of intensive silviculture activities that 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 redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improved from 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 judgment 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 court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those 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 TFL 18. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government.

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 or TFL, a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, a series of timber supply forecasts is 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 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 is maintained. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

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

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

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

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgments 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 attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis

The timber supply analysis for TFL 18 was prepared by the forestry consulting firm Hugh Hamilton Ltd. in conjunction with the Vavenby Division staff of Slocan Forest Products Ltd. Hugh Hamilton used its proprietary timber supply model Forest Simulation and

Optimization System (FSOS) to conduct the analysis and develop the associated 20-year plan.

FSOS is a spatially-explicit computer model that can operate as both a *simulation* model and an *optimization* model. Spatially explicit in this case means that the interaction among specific forest stands can be tracked and evaluated over the forecast horizon. While simulation and optimization approaches both have comparable information requirements, there are some significant differences.

Simulation models project the outcome of a specific schedule of management activities, constraints and assumptions. During the analysis process, model outputs such as harvest level, the volume of growing stock, and age-class distribution are examined to determine the extent to which a specific harvest projection meets the specified management objectives. This process is repeated by the analyst to gain an understanding of how specific management, land base and yield parameters affect outcomes. Slocan used the simulation function of FSOS to generate the base case harvest forecast.

In a simulation approach to timber supply modelling, the timber supply analyst determines an acceptable harvest forecast by trial and evaluation. When used as an optimization model, FSOS employs a mathematical algorithm to find a near optimal harvest forecast based on specific objectives, constraints and data. The approach uses a series of resource weightings of various target objectives and indicators to evaluate the relative success of each potential solution generated by the model. Each optimization harvest forecast consists of numerous iterations; one iteration representing one of many possible solutions. The best solution is one that produces the highest *objective function* value over the entire planning horizon. In the timber supply analysis for TFL 18, Slocan used the optimization function of FSOS to develop the 20-year plan as well as several proposed management options (discussed later under "Proposed management options").

Hugh Hamilton conducted a benchmarking study in order to validate FSOS for use as a timber supply model. Using a standard data set, the consultant compared results of FSOS simulation forecasts with those generated using the BCFS timber supply model Forest Service Simulator (FSSIM).

Based on the results of the benchmarking study, a review by BCFS staff as well as my previous experience reviewing results from this model, I am satisfied that it is capable of providing a reasonable projection of timber supply. I am also mindful of the differences between the optimization and simulation approaches to timber supply analysis and have concluded that the licensee's base case forecast suitably reflects current management practices and therefore represents the base case as discussed above under "The role of the base case".

The base harvest forecast maintains an initial harvest level of 187 158 cubic metres for five years, then declines by approximately 14 percent to 160 450 cubic metres during the subsequent five year period. The harvest forecast then declines approximately 10 percent per decade to a medium-term level of 123 847 cubic metres in decade four. The forecast

harvest level then rises beginning in decade 11, and eventually achieves a long-term harvest forecast of 151 639 cubic metres.

In the timber supply analysis, sensitivity analyses were provided to assess the risk to timber supply resulting from uncertainty in data assumptions and estimates, and these have assisted me in considering the factors leading to my 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 harvesting

- *general comments*

The gross area of TFL 18, as estimated from the licensee's inventory file, is 74 622 hectares. Over 92 percent of this area is classified as productive forest.

As part of the process used to define the timber harvesting land base (i.e., the land base estimated to be economically and biologically available for timber harvesting), a series of deductions was made from the gross land base. These deductions account for economic or ecological factors which operate to reduce the forest area available for harvesting.

In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors prior to quantifying appropriate areas to be deducted from the productive forest area in order to derive the timber harvesting land base. In reviewing these deductions I am aware that some areas may have more than one classification—e.g., environmentally sensitive areas (ESAs) may also lie within riparian areas.

To ensure the accuracy of the timber harvesting land base calculation, it is imperative that no deduction be made more than once in respect of the same area of land, by virtue of it or of some part of it coming under more than one classification. Hence, a specific deduction for a given factor reported in the analysis or the AAC rationale does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification. For TFL 18, I acknowledge that the above approach was used in the licensee's timber supply analysis to appropriately determine the timber harvesting land base and find the results to be reasonable.

My consideration of the deductions applied in the derivation of the timber harvesting land base is presented in the following sections of this rationale.

- *non-forested and non-productive areas*

Non-forested areas on TFL 18 include swamp, alpine areas, lakes, rock and other non-productive areas. To account for these areas, the licensee deducted 5806 hectares from the total TFL 18 land base. The licensee also identified an additional 13 hectares of non-commercial cover (brush) and appropriately excluded them from contributing to the timber harvesting land base.

- *economic and physical operability*

Terrain characteristics and access typically affect the area potentially available for harvesting operations. The terrain of TFL 18 is gently rolling with a modest elevation range of 800 metres. As a result, timber harvesting within the TFL is largely unrestricted by operability considerations such as adverse terrain. According to the licensee, 90 percent of slopes are less than 30 percent, permitting access via conventional skidder based forwarding systems on most of the TFL. The licensee states that cable or helicopter yarding systems will be employed to access timber on steeper slopes.

Clearwater District staff concur that there are no significant physical limitations to timber harvesting on TFL 18. Having reviewed the reasoning and assumptions used by the licensee to assess physical operability, I am satisfied that this factor has been modelled appropriately and therefore find the information used suitable for this determination.

- *estimates for roads, trails and landings*

In timber supply analysis, a percentage of the productive forest was removed to account for the losses resulting from the construction of roads, trails and landings. Separate estimates were made for existing roads, trails and landings, and for future roads, trails and landings, to reflect both current access and anticipated network requirements over time.

To account for existing roads and trails the licensee used a geographic information system (GIS) to identify the length and classification of existing roads and trails on the TFL. To determine the associated area, Slocan surveyed existing roads and trails and applied estimates of average road width to each road class in the GIS file. In total, 947 hectares were excluded from the timber harvesting land base to account for existing roads and trails. District staff have reviewed the methodology and the deductions and find them representative of current conditions on the TFL.

The licensee used a similar GIS-based methodology to account for roads and trails proposed in the currently-approved (five-year) forest development plan and excluded 162 hectares from the timber harvesting land base.

The licensee also assessed future road and trail requirements beyond the currently-approved development plan period. Using a GIS, Slocan assessed future access requirements beyond the current and proposed networks and excluded a further 118 hectares from the timber harvesting land base. In the analysis, this reduction was

applied as a percentage area reduction to stands currently older than 40 years after they were harvested in the model for the first time.

For productivity losses associated with landings, Slocan estimated the area of "backlog" landings on TFL 18 and reviewed the annual requirement for permanent and temporary landings. In total, the licensee excluded an additional 81 hectares from the timber harvesting land base to account for existing and proposed landing construction.

According to the licensee, all temporary landings are rehabilitated within two years. Because harvest operations typically cause soil disturbance and compaction, the licensee expects that the productivity on rehabilitated landings will be lower than in the adjacent harvested areas. Therefore in the analysis the licensee assumed a 10 percent volume reduction to stands associated with landing areas. Because landings occupy approximately three percent of each harvested area Slocan applied this as a 0.3 percent reduction to the volume of stands less than age 40 years and to stands regenerated in the future. The reduction to future harvested areas was applied after they were harvested in the model for the first time.

During review of the timber supply analysis assumptions, the Kamloops regional pedologist recommended that a 20 percent volume reduction be applied to account for productivity losses associated with compaction and disturbance, rather than the 10 percent assumed in the analysis. The recommendations of the Kamloops regional pedologist are based on field studies conducted within the Okanagan Timber Supply Area. No specific studies were provided by the licensee to support the 10 percent volume reduction assumed in the analysis.

I have reviewed the methodology and assumptions employed by the licensee to account for roads, trails and landings. I acknowledge the detailed spatial technique used to estimate the area associated with existing and future roads and trails and find that the approach is consistent with current management.

For landings, I have also reviewed the recommendations of the regional pedologist regarding the expected productivity losses associated with soil compaction and disturbance. While I acknowledge that it is uncertain if the results of his field studies are applicable to TFL 18, the licensee did not provide any specific information to support the 10 percent reduction in productivity assumed in the analysis. However, I note that the effective difference between the Kamloops regional pedologist's recommendations and the assumptions used in the analysis is relatively small. Having reviewed the information, I consider that long-term timber supply in the base case projection may be overestimated by approximately 0.3 percent and have discussed this in my "Reasons for decision".

I acknowledge the licensee's commitment to rehabilitate all temporary roads, trails and landings noting that this helps to maximize the area available for timber production. I encourage the licensee to further examine productivity losses associated with landings.

Any new information specific to the TFL can be incorporated in the next timber supply analysis.

- *non-merchantable and low productivity stands*

In the timber supply analysis, several classes of stands were excluded from the timber harvesting land base to account for low productivity and non-merchantable stands that are not typically harvested.

In the timber supply analysis, the licensee used inventory information on the leading species and site index of stands to identify sites with low timber growing potential. After accounting for previous deductions, 969 hectares of areas with low timber growing potential were excluded from the timber harvesting land base.

To account for low volume and low productivity stands that exceed the classification of low productivity but are currently deemed uneconomical to harvest, Slocan applied criteria used in the 1995 Kamloops TSA Timber Supply Review. An additional 2779 hectares including 586 hectares of deciduous-leading stands were excluded from the timber harvesting land base.

I have examined the criteria used in the base case and discussed them with district staff. I have also reviewed a map showing the physical location of the areas excluded from the timber harvesting land base. While the criteria used to account for low productivity and non-merchantable stands are broadly consistent with current practice, I note that the criteria excluded a number of stands with a previous harvesting history.

Although the precise area of these stands is uncertain, I find it unlikely that stands that have been previously harvested will not support a subsequent crop of merchantable timber. I have therefore concluded that medium-term timber supply projected in the base case harvest forecast may be under-estimated by a small amount—likely less than one percent based on an assessment of the total area involved. I have considered this below in my "Reasons for decision".

- *environmentally sensitive areas*

An environmentally sensitive area (ESA) is an area identified during a forest inventory that is sensitive to disturbance and/or is significantly valuable for resources other than timber. ESA information is used to identify land to exclude from the timber harvesting land base where more specific or detailed information is not available about a particular forest resource.

For the TFL 18 analysis, ESA information was derived from the most recent inventory completed in 1992. ESA reductions were predominantly areas with regeneration difficulties and sensitive soils. In deriving the timber harvesting land base, the licensee excluded 90 percent of the area of stands associated with class one ESAs (highly sensitive) and 40 percent of the area associated with Class 2 ESAs (moderately sensitive). The reduction factors were based on assumptions used in the 1995 timber supply analysis

of the adjacent Kamloops TSA. No data were available to derive reduction factors specific to the TFL. Accounting for previous deductions, 1715 hectares of ESAs were excluded from the timber harvesting land base. The licensee also provided a sensitivity analysis to show the impact of excluding 100 percent of class one ESAs and no reduction of class two ESAs. Modifying the assumptions increased timber supply during periods 2 to 7 of the forecast horizon by 2.5 percent compared to the base case projection; long–term timber supply increased by 1.5 percent.

Having reviewed and discussed the ESA reductions with district staff, I have concluded that the assumptions used in the base case provide a reasonable approximation of the area unavailable for harvesting because of environmental sensitivity. I acknowledge that the licensee has initiated terrain stability mapping on TFL 18 and note that this information should provide greater clarity on soil stability issues within the licensee area. Any new information can be used in subsequent timber supply analyses.

Existing forest inventory

- *current forest inventory*

A re-inventory of TFL 18 was completed in 1992 to BCFS standards. The re-inventory upgraded the previous 1974/75 inventory using aerial photography and field sampling. For the analysis, the forest cover inventory was updated to December 31, 1997 to account for growth, disturbances such as harvesting and fire, and for silvicultural treatments.

BCFS Resources Inventory Branch completed an inventory audit of TFL 18 in 1997. The audit found no statistical differences between the ground-based and audit volume estimates of mature stands (defined as forest stands older than 60 years). Audit results for the immature component of the inventory also suggested that the site index assignments for young stands were acceptable. The audit assessment of the non-forest classification showed that the 1992 TFL 18 re-inventory did not meet provincial standards. However, the results of the audit indicated that the inaccuracies in the non-forest classification had no effect on the forested area available for timber harvesting.

Having reviewed the information I find that the forest cover inventory used in the base case is the best available information and therefore appropriate for this determination. I acknowledge that Slocan has participated in the development of a Vegetation Resources Inventory (VRI) sampling plan and note that this initiative will contribute to refinements in the TFL 18 inventory. Any new information can be used in subsequent timber supply analyses.

- *age-class distribution and species profile*

The majority of TFL 18 is covered by stands of predominantly spruce (48 percent of the timber harvesting land base). Pine-, balsam-, Douglas-fir dominated stands comprise a further 26, 20 and five percent of the timber harvesting land base respectively. The balance of the TFL (one percent) is composed of cedar/hemlock-leading stands.

The age class structure on TFL 18 is largely a reflection of the harvesting history as well as natural disturbances. Approximately six percent of the timber harvesting land base is covered by stands more than 260 years old and 27 percent of stands on the timber harvesting land base are between 140 and 260 years old. About 24 percent of stands are between 80 and 140 years old, 12 percent are between 40 and 80 years old, and approximately 31 percent are younger than 40 years.

Spruce and pine-leading stands comprise the majority of older stands as well as the very youngest stands (i.e., less than 20 years old). Balsam-leading stands comprise the majority of stands between 20 and 60 years old, largely as a result of previous intermediate utilization harvesting practices that were employed on the TFL during the 1940s through 1970s.

I have reviewed age class distribution and species profile information for TFL 18 and note the relatively high proportion of juvenile stands on the timber harvesting land base.

- *volume estimates for existing stands*

The licensee used the BCFS Variable Density Yield Projection (VDYP) growth and yield model to generate volume estimates for all existing unmanaged (natural) stands. Unmanaged stands were assumed to be those stands aged 40 years and older as well all balsam stands that were previously harvested to intermediate utilization standards (residual balsam stands). VDYP is based on information gathered from a large number of sample plots throughout the province, and is generally accepted in British Columbia as an adequate model for projecting volumes in existing natural stands. As a general rule in making AAC determinations, and in the absence of statistically valid contradictory evidence for a particular area, I rely on VDYP estimates for existing natural stands.

I note that the deciduous component of coniferous stands is not typically recovered during the licensee's harvesting operations. In the analysis, volumes attributable to hardwood species were therefore appropriately excluded from stands composed of predominately coniferous species.

As discussed above under *general comments*, the BCFS completed an inventory audit in 1997 to determine the overall accuracy of the TFL 18 inventory. The audit found no statistically significant differences between the volumes measured in the audit and those of the current inventory.

Volume estimates for existing unmanaged stands were reviewed and approved for use in the analysis by BCFS Resources Inventory Branch staff. Having reviewed the information and assumptions used in the analysis as well as the results of the inventory audit, I acknowledge that the licensee followed acceptable procedures, and I therefore accept the estimates used for this determination

Expected rate of growth

- *aggregation procedures*

In the timber supply analysis, the inventory for TFL 18 was aggregated into 46analysis units based on inventory type group (leading species) and site productivity class. Biogeoclimatic unit and elevation were used to further refine spruce-leading analysis units. Existing and managed stand yield tables were generated for each analysis unit.

Separate analysis units were identified to identify the reduced productivity of those balsam stands with a history of intermediate utilization (discussed below under Residual balsam stands).

I have reviewed the approach used by the licensee and consider the analysis unit definitions and aggregation procedures to adequately capture the productivity of this unit.

- *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, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, in British Columbia, site indices 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 subject to management of 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 has been verified in several areas of the province where studies—known as the old-growth site index or OGSI project—suggest that actual site indices may be higher than those indicated by existing data from old-growth forests. Studies include those known as 'paired-plot'—where plot samples from an old-growth stand and the adjacent second growth stand are compared—and a provincial veteran study. 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 stands.

For the TFL 18 base case, site index values based on leading species, age and height were assigned to natural stand polygons using standard BCFS site index curves. The licensee applied an area-weighted average of these site indices to generate the corresponding yield table for each analysis unit. BCFS site index conversion equations were used to calculate the site index of regenerated stands where species conversions through planting were

assumed in the model. No old growth site index adjustments were applied in the base case. However, the licensee provided a sensitivity analysis to show the impact on timber supply of applying general provincial OGSI adjustments to all stands older than 140 years. Applying OGSI adjustments increased long-term timber supply by 11 percent compared to the base case harvest forecast. The sensitivity analysis showed no impact on short- or medium-term timber supply.

Having reviewed the information including the findings of OGSI studies and given the trends in old growth site index observed elsewhere in the province, I accept that there is a high likelihood that future stand yields on TFL 18 may be significantly underestimated. I have considered the implications of this uncertainty in my "Reasons for decision". I acknowledge Slocan's terrain ecosystem mapping (TEM) project and note that phase 3 of this project should supply useful local data that can be used to refine site index assignments. Any new information from this project can be incorporated into future timber supply analyses.

- *volume estimates for managed stands*

With the exception of residual balsam stands, Slocan developed volume estimates for all existing stands less than 40 years old, and all future regenerated stands using the Table Interpolation Program for Stand Yields (TIPSY). As discussed previously under *volume estimates for existing stands,* yields for residual balsam stands were generated using VDYP. Future stands were assumed to regenerate to specific species combinations that are consistent with management objectives using standard procedures. For stands involving species conversions, standard BCFS site index conversion equations were applied during the first rotation following harvest of existing stands.

Managed stand yield tables (MSYTs) for TFL 18 were reviewed and accepted for use in the analysis by BCFS Research Branch staff.

The licensee provided a sensitivity analysis to show the impacts of varying regenerated stand yields by 10 percent. The analysis showed that long-term timber supply is proportionately sensitive to changes in regenerated stand yield estimates. While there is uncertainty in the estimates of site productivity (as discussed in the previous section), I am satisfied that the methods and assumptions regarding regenerated stands used in the base case adequately represent past, current and foreseeable future management, and are based on suitable growth models. I therefore find them acceptable for use in this determination.

- *operational adjustment factors*

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. Operational adjustment factors (OAFs) are applied to account for losses of timber volume due to stand openings for unproductive areas like small swamps and rock outcrops

(OAF1), as well as for age-dependent factors such as pests, disease, decay, waste and breakage (OAF2).

In the analysis, Slocan applied a standard provincial volume reduction of 15 percent for OAF1. For OAF2, the licensee varied the reduction by leading species. Slocan applied a 15 percent reduction to managed spruce- and Douglas-fir-leading stands and a 14 percent reduction to lodgepole-pine-leading stands. MSYTs for all other leading species were generated using the standard OAF2 value of five percent. According to the licensee, OAF2s for spruce, Douglas-fir and lodgepole-pine-leading stands were increased to better reflect local conditions.

I have reviewed the information regarding OAFs and note that the OAF2 is higher than the five percent typically used in other units. BCFS Research Branch staff accepted the OAFs applied in the analysis noting that the increased OAF2 allowance may result in conservative yield estimates. I agree with their assessment and acknowledge that the precise magnitude of OAFs is uncertain and requires further investigation. While no sensitivity analyses specific to OAFs were conducted, the licensee's sensitivity analysis which evaluated the timber supply impacts of increasing and decreasing managed stand yields by 10 percent demonstrates that uncertainty in the OAFs affects long-term supply.

For the purposes of this determination, and in the absence of better information, I accept the licensee's assumptions regarding OAFs. I also request that the licensee further examine and refine the OAFs before the next analysis.

- *minimum harvestable ages*

For the purposes of timber supply analysis, a minimum harvestable age is an estimate of the earliest age at which a forest stand has reached a harvestable condition, that is, has met minimum merchantability criteria. The minimum harvestable age assumption largely affects when second growth stands will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of timber harvest may be maintained. In practice, many forest stands will be harvested at much older ages than the minimum harvestable age, due to economic considerations and constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the TFL 18 timber supply analysis, minimum harvestable ages were based on the age at which stands attained a minimum acceptable volume. Slocan assumed a minimum acceptable volume of 150 cubic metres per hectare for all analysis units, except for lodepole pine-leading stands in which a 120 cubic metre per hectare volume was assumed. In the analysis, the corresponding minimum harvestable ages of stands ranged from 80 to 150 years.

Slocan provided a sensitivity analysis to show the impact on timber supply of varying minimum harvestable age. The results showed that reducing the minimum harvestable age by 10 percent increases medium-term timber supply by six percent compared to the

base case projection. Increasing the minimum harvestable age by 10 percent reduces medium-term timber supply by approximately nine percent.

I have reviewed the assumptions used to model minimum harvestable age on TFL 18. I acknowledge that predicting the age at which stands may be harvested in the future is difficult and subject to considerable uncertainty. Having considered the methodology applied in the analysis, I accept the minimum harvestable ages modelled in the base case as satisfactory for use in this determination. However, I note that the impact of varying minimum harvestable ages on medium-term timber supply is significant. I recommend the licensee review the assumptions concerning the minimum harvestable age giving due consideration to operational practice including volume and value criteria. Any results should be incorporated into future determinations.

- *harvest profile and sequencing*

The timber supply model FSOS can accommodate a preferred harvest profile during the simulation period. Harvest rules are used in timber supply analysis to define parameters to direct the model—when presented with a number of stands meeting the criteria for harvest—to the stands that should be selected first for harvest.

In the base case, Slocan assumed that stands identified in the first two years of the current forest development plan would be harvested first. Thereafter, stand selection was determined using an oldest first harvest rule.

I have reviewed the assumptions applied in the analysis and have discussed them with BCFS Clearwater district staff. While I find the method used to model the harvest profile adequately reflects current practices, I am concerned by the limited harvesting performance in, and considerable uncertainty associated with, the residual balsam stands and their impact on the future harvest profile of TFL 18. I have discussed this further below under Residual balsam stands.

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

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In timber supply analysis, regeneration delay is used to determine the starting point of tree growth for the yield curves which project volumes over time.

In the timber supply analysis, the licensee assigned a regeneration delay of two years to all future stands based on an assessment of recent performance. Stands were assumed to be regenerated with a mix of coniferous species through a combination of planting and natural regeneration. The relative weighting of regenerated species in each analysis unit was derived from the licensee's silviculture records. Initial stocking was set at

1600 stems per hectare to account for some natural ingress over and above the 1420 stems per hectare that were assumed to be planted.

District staff reviewed the regeneration delays and confirm that they adequately reflect current practice. Having reviewed the assumptions used in the analysis and discussed them with BCFS staff, I accept the estimates of regeneration delay as suitable for this determination.

Not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those areas 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. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is 'backlog' NSR. All other NSR is considered 'current' NSR.

According to the licensee's forest cover inventory there are approximately 1317 hectares of NSR areas on TFL 18. About 363 hectares are classified as backlog NSR and the balance (954 hectares) is considered current NSR. In the analysis the licensee assumed that the NSR would be restocked at a rate of 520 hectares per year commencing in 1999.

District staff agree with the estimate of current NSR and find that the restocking schedule reasonably reflects current practice. Having reviewed the information with staff, I accept that NSR has been appropriately modelled in the analysis and therefore suitable for this determination.

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

Silvicultural systems

The predominant silvicultural systems currently in use on TFL 18 are clearcutting and clearcutting with reserves. According to the licensee, partial harvesting of some stands is also employed on the TFL to a limited extent.

In the timber supply analysis, even-aged management was assumed in the base case. In addition, some aspects of partial harvesting were addressed in the timber supply analysis by assuming a proportionate volume reduction as discussed below under *riparian areas*.

Having reviewed the information and discussed the assumptions with BCFS and MELP staff, I am satisfied that the assumptions used in the analysis are suitable for use in this determination. I note that the licensee also accounted for wildlife tree patches in the analysis and I have discussed this below under *stand-level biodiversity*.

Incremental silviculture

Incremental silviculture activities include commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement that are beyond the silviculture activities required

to establish a free-growing forest stand. I will discuss these under their appropriate sections.

- *genetic improvement*

Genetically-improved planting stock for many commercial tree species is currently being used across the province. The aim of tree improvement is to breed trees with increased growth rates, improved wood properties and greater resistance to insect pests and diseases. On TFL 18 the licensee uses a significant amount of improved interior spruce seed for reforestation and has committed to further increase its use in future reforestation plans.

To account for the use of improved seed, Slocan derived an area-weighted genetic gain of 9.6 percent based on the indicated genetic worth of the various seedlots currently used for reforestation. The indicated genetic gain was applied as a volume increase to future planted spruce stands.

The licensee expects that genetically-improved planting stock for lodgepole pine, Douglas-fir, western larch and white pine will be available soon. While no definitive volume gains were available at the time of the analysis, the licensee assumed a three percent increase in volume of all future stands planted with these species. No genetic gain was assumed for western redcedar, balsam or western hemlock. BCFS Research Branch staff have reviewed the assumptions applied for genetically-improved regeneration and accept the volume gains as modelled.

I acknowledge the licensee's intention to expand the use of genetically-improved seed and am satisfied that the assumptions used in the timber supply analysis are consistent with current practice and broadly reflect provincial seed production plans. I therefore accept the assumptions for use in this determination.

- *fertilization*

No areas of TFL 18 have been fertilized and currently no areas are planned for treatment. Therefore Slocan did not account for fertilization in the timber supply analysis. I acknowledge that the licensee has conducted foliar sampling on the TFL to identify potential nutrient deficiencies. If and when any fertilization treatments are planned and implemented operationally, I will consider the associated impacts in future AAC determinations.

- *juvenile spacing*

Juvenile spacing is the removal of undesirable trees within a young stand to reduce competition among the residual trees for water, nutrients and sunlight. Spacing can be used as a management tool to help meet biodiversity or wildlife habitat objectives, maintain or enhance forest health, manage species composition and stand structure, increase stand value or offer employment opportunities.

Slocan conducts juvenile spacing as part of its silviculture program for TFL 18. Approximately 400 hectares of previous spacing were accounted for in the development of yield curves for the base case. I note that the licensee has proposed about 250 hectares of juvenile spacing during the next five years.

Having reviewed the information regarding juvenile spacing with BCFS District staff, I find the assumptions used in the timber supply analysis reflect current practice. I therefore find them suitable for this determination.

- *pruning*

According to the licensee, pruning treatments on TFL 18 are limited to only the most productive sites on TFL 18 in Douglas-fir and lodgepole pine-leading stands where large branch size is of concern. Slocan proposes approximately 300 hectares of pruning treatments during 2000-2004. In the timber supply analysis, the licensee did not explicitly account for pruning treatments.

I note that the area of pruning treatments has been relatively small and the amount of future treatments is uncertain and subject to external funding sources. In addition, pruning treatments, while increasing timber value, do not as a general rule impact stand volume. The licensee appropriately did not include any volume adjustment for pruning treatments in the timber supply analysis and on this account, I accept the base case as modelled

- *commercial thinning*

Commercial thinning is the harvesting, in a maturing stand, of trees large enough to be considered a commercial product. While I note that single-entry commercial thinning regimes do not generally increase the yield of specific stands, they can provide opportunities to harvest timber in areas where harvesting would otherwise be limited in order to meet a variety of other resource objectives.

I acknowledge that the licensee is investigating opportunities for commercial thinning in selected stands. However, no commercial thinning operations have been completed to date and there are currently no specific plans to initiate a program on TFL 18.

Commercial thinning was therefore appropriately not modelled in the timber supply analysis. I acknowledge that the timber supply analysis reflects current operational practice and thus have made no associated adjustment relative to the base case harvest projection for this determination.

(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 harvested and removed from an area during harvesting operations. In the TFL 18 timber supply analysis, the utilization standards assumed for most species were a minimum 17.5-centimetre diameter at breast height (dbh), a 30-centimetre maximum stump height and a minimum 10-centimetre top diameter inside bark. For lodgepole pine, a minimum dbh of 12.5 centimetres was assumed.

BCFS Kamloops regional staff indicate that, with one minor exception, the assumptions used in the analysis reflect current interior utilization standards and current practice. For western redcedar stands older than 140 years, the utilization standard for minimum top diameter inside bark is actually 15 centimetres, not 10 centimetres as was assumed in the analysis. A review of the yield implications resulting from minor differences in utilization standards has shown that the impact on timber supply is negligible.

I therefore accept the assumptions employed in the base case as a reasonable accounting of utilization standards and have made no further adjustments.

Decay, waste and breakage

To account for decay, waste and breakage, the licensee generated natural stand yield tables using standard factors for forest inventory zone (FIZ) G as well as loss factors from special cruise #318. This approach was reviewed and accepted for use in the timber supply analysis by BCFS Resources Inventory Branch staff.

I consider the estimates for decay, waste and breakage used in the timber supply analysis to reflect the best available information and suitable for use in this determination.

(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.

- *non-timber resource inventories and assessments*

Non-timber resource inventories have been reviewed and accepted by BCFS regional and district staff and MELP staff. These inventories were used in developing data assumptions for the timber supply analysis as further discussed below under the appropriate sections.

- *cultural heritage resources*

TFL 18 falls within traditional territories claimed by the North Thompson and Canim Lake Indian Bands. Cultural values on TFL 18 include archaeological and historical sites as well as areas of traditional hunting, gathering or spiritual significance.

An archaeological overview assessment (AOA) was completed for *the Kamloops Land and Resource Management Plan* (LRMP) area including the area of TFL 18. To date, no specific areas on TFL 18 have been identified as requiring protection for cultural heritage or archaeological resources.

However, additional assessments may be completed before the next timber supply analysis. I note that both First Nations bands have initiated traditional use studies. If the results of these assessments indicate a need to exclude areas from the timber harvesting land base, the impact on timber supply will be considered in future AAC determinations

- *recreation features*

Recreational opportunities on TFL 18 include boating, summer and winter angling, camping, hunting, cross country skiing and snowmobiling. Recreation features and opportunity spectrum inventories have been completed and accepted by the BCFS regional staff. Much of the recreational use in TFL 18 is associated with the numerous lakes. There are 21 recreational sites established at 19 of these lakes. In addition Moose Camp, a popular fishing camp, is situated in the middle of the TFL.

Recreation sites are not permanently excluded from timber harvesting and the licensee appropriately made no deductions to specifically account for recreation. BCFS staff indicate that recreation values have been adequately accounted for in the analysis and I am satisfied that the base case timber supply projection appropriately reflects current management of the recreation resource. I note that visual resources are an important feature related to the recreation resource and have discussed this below under *visually sensitive areas*.

- *range*

There are three cattle grazing licenses associated with TFL 18. In the timber supply analysis, no specific assumptions were applied to account for range values. I note that the licensee has committed to work with range tenure holders and coordinate harvesting and livestock movements to minimize conflicts.

I am satisfied that there are no implications to timber supply as a result of not explicitly factoring any range requirements into the base case.

- *green-up and adjacency*

Green-up refers to the period following harvesting that is necessary for a regenerating stand to attain a specified condition, expressed in terms of stand height and stocking. Current harvesting practices limit the size and shape of cutblocks, and establish minimum green-up conditions as a means of moderating the effect of additional harvesting in adjacent stands. Adjacency and green-up requirements create a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

In the timber supply analysis, Slocan modelled adjacency using the spatially-explicit functionality of FSOS. Harvesting in the model is directed by a computer-generated blocking pattern. Existing polygons are aggregated into cutblocks of a specified size distribution. The licensee contends that this provides a more realistic representation of current and future limitations on timber supply. In the base case, the licensee assumed a green-up height of three metres, attained in 15 years.

The licensee provided sensitivity analyses to show the impact of varying the green-up assumptions used in the base case. Increasing green-up age from 15 to 20 years reduced short-term timber supply by approximately 19 percent compared to the base case forecast. By contrast, decreasing green-up age from 15 years to 10 years increased short-term timber supply by six percent compared to the base case projection.

The licensee also analysed the impact of a non-spatial approach to adjacency, similar to the approach used in the 1994 timber supply analysis, by applying a forest cover constraint to the Integrated Resources Management zone. Under this scenario, the initial base case harvest level of 187 158 cubic metres per year was maintained for an additional two periods (10 years) compared to the base case, before declining eight percent to 171 804 cubic metres in period four.

The licensee also provided several harvest forecasts using the optimization function of the timber supply model FSOS, as part of its proposed management options. A major feature of these options was Slocan's use of a patch management strategy rather than strict adjacency which was employed in the base case. I have discussed aspects of patch management and its implications on the timber supply of TFL 18 in more detail below under Proposed management options.

I have reviewed and discussed the techniques used to model adjacency with BCFS staff and note that short-term timber supply is sensitive to increasing green-up age. I also note that the the flexibility of future harvesting opportunities on TFL 18 is limited in the short-term; the analysis results reflect the limitations depicted by the current age class distribution of the unit. Having considered the above information, I accept the licensee's assumptions regarding green-up and adjacency for this determination.

- *visually sensitive areas*

Careful management of scenic areas near recreational sites, highways and lakes is an important IRM objective and is part of the BCFS mandate. Procedures which incorporate both biophysical (e.g., slope, topography) and social factors have been developed to determined visual sensitivity and recommend visual quality objectives (VQOs). Recommended VQOs specify the amount of visible disturbance that is considered to be socially acceptable for a given area.

To meet these objectives, constraints must be placed on timber harvesting, road building and other forest practices in visually sensitive areas. The constraints are based on research, experience and on public acceptance of degrees of alteration of visual landscapes. The constraints are normally expressed in terms of forest cover requirements that relate to the maximum allowable percentage of a viewshed that may be disturbed at any one time, and to "visually effective green-up"—that is, the stage at which regeneration has been shown to be visually acceptable to the public.

A visual landscape inventory for TFL 18 was completed in 1996 using accepted BCFS procedures. The inventory identified 13 906 hectares of visually sensitive areas. The majority of the visually sensitive areas are associated with the many lakes on TFL 18.

In the base case, the licensee used BCFS procedures to determine the proportion of allowable disturbance for each of four visual quality classes—modification, partial retention, retention and preservation. The licensee applied percent denudation levels within the ranges recommended in the *Procedures for Factoring Visual Resources into Timber Supply Analyses* for each visual quality class. Visually effective green-up was derived using accepted BCFS procedures and was assumed to occur when stands achieved an average height of 4.2 metres.

In the base case projection, the existing visual condition in each visual quality class exceeds the corresponding forest cover requirement. However, the minimum target for each VQO zone was achieved within 25 years and remained above the target throughout the forecast period.

The licensee provided a sensitivity analysis to demonstrate the impact of changing the allowable percent disturbance in visually sensitive areas. Increasing the allowable disturbance in each unit by five percent significantly increased short- and long-term timber supply compared to the base case projection. Conversely, decreasing the allowable disturbance produced a significant reduction to timber supply throughout the planning horizon.

I note that while visually sensitive areas have been identified and are known under the Forest Practices Code, VQOs have not been established for TFL 18. In addition, visually sensitive areas on TFL 18 are not shown on the *Kamloops LRMP* map of visually sensitive areas. However, I acknowledge that current practice on the TFL includes

managing for VQOs, and this is reflected in the base case assumptions and is consistent with commitments in the licensee's management plan.

There have been discussions between the licensee and district staff on the management of visually sensitive areas on TFL 18. Slocan staff indicate that operationally, visually sensitive area may not be as restrictive as reflected in the base case projection. The licensee suggests that the relatively gentle topography of the TFL provides significant flexibility in achieving recommended VQOs.

I acknowledge that many factors such as slope, viewing angle, distance, existing stand characteristics and silvicultural system influence the appropriate allowable alteration for each recommended VQO. I also note that the *Kamloops LRMP* provides guidance on the acceptable allowable alteration limits for specific VQOs within the LRMP area and that this guidance provides additional flexibility in the allowable alteration depending on the silvicultural system applied.

Given the relatively gentle topography of the TFL, it is possible that the allowable alteration in each recommended VQO may be greater than what was modelled in the base case projection. However, no information is available to confirm if the values assumed in the base case are more restrictive than actual practice.

Having reviewed the information and related sensitivity analysis with BCFS staff, and subject to my consideration of the statutory requirements of visually sensitive areas, I have concluded that short- to medium-term timber supply depicted in the base case may be under-estimated on account of this factor. The sensitivity analysis suggests that if the allowable denudation were increased, the initial harvest level depicted in the base case could be maintained for up to one additional 5-year period. I have discussed this further below in my "Reasons for decision".

I encourage the licensee in cooperation with BCFS district and regional staff to review the recommended VQOs and identify where current practices fit within the allowable disturbance ranges recommended in the *Kamloops LRMP*. Any new information can be incorporated into the next analysis.

- *water resources*

TFL 18 includes a complex network of streams, lakes and wetlands. Maintaining water quality and quantity are important to the health of aquatic and terrestrial ecosystems. Current management of water resources also recognizes downstream agricultural uses including the provision of water for irrigation and livestock.

For planning purposes, TFL 18 has been divided into 14 watersheds which are either fully or partly within the licence area. Initial assessments have been conducted on all watersheds and priorities for further assessments have been established using procedures outlined in the 1995 *Interior Watershed Assessment Procedure Guidebook* (IWAP).

The *Kamloops LRMP* affords special resource management status to the 832 hectare Gill Creek watershed for community watershed values. The watershed was once used to supply drinking water to the Sunshine Valley Improvement District. However, a new water supply system was installed and the improvement district no longer depends on the watershed as a source of drinking water. As a result, the Gill Creek watershed was de-registered as a community watershed in July 1999 and the *Kamloops LRMP* will be amended accordingly.

In the base case the licensee assumed that the Gill Creek watershed was a community watershed and applied a forest cover requirement, consistent with the LRMP and *Community Watershed Guidebook.* In the analysis, the timber supply model is able to model Equivalent Clearcut Area (ECA)—a measure of assessing hydrologic impact—by applying a hydrological recovery curve and factors identified in the IWAP. Sensitivity analysis conducted by the licensee showed that relaxing the allowable ECA or returning the watershed to the IRM zone had no impact on timber supply over the forecast horizon.

While not a community watershed, the 26 017 hectare Mann Creek watershed has important fisheries values. In the base case the licensee examined the potential risk to timber supply of more stringent management requirements within the watershed. Using information from the base case harvest projection, the licensee showed that the ECA in this watershed is maintained at a reasonable level over the forecast period. Therefore on this account, there are no significant implications to timber supply affecting this determination.

Having reviewed the above information and assumptions, I accept the licensee's base case projection as suitable for this determination. While I acknowledge that de-designation of the Gill Creek watershed has not been officially completed, sensitivity analysis showed that the eventual de-designation does not affect timber supply. I also acknowledge the progress made in completing assessments of watersheds of TFL 18. Any new information resulting from these assessments can be incorporated into the next analysis.

- *riparian habitat*

Riparian habitats occur along streams and around lakes and wetlands. The *Forest Practices Code* requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting in order to protect riparian and aquatic habitats. For each stream, lake or wetland, the RMZ and RRZ make up the entire riparian management area. Stream riparian classes (S1 to S6) are defined in the *Riparian Management Area Guidebook* based on stream channel width, the occurrence of fish, and presence of community watersheds. The stream class determines the acceptable management regimes and appropriate width of the RRZ and RMZ for a given stream. Similar criteria are used to classify the RRZ and RMZ associated with lakes and wetlands.

A classification of riparian areas was completed for TFL 18 in 1996 through the combined efforts of the licensee, MELP and BCFS Clearwater district staff.

In the timber supply analysis, the licensee determined the area of RRZs and RMZs associated with *streams* using GIS-based techniques and the appropriate buffer widths specified in the *Riparian Management Area Guidebook.* Consistent with the guidebook, Slocan excluded 100 percent of the resulting RRZ area (989 hectares after previous deductions) from the timber harvesting land base. To simulate partial retention within RMZs, the licensee applied a 60 percent volume reduction to stands within the RMZs adjacent to S1-S3 streams. In RMZs adjacent to S4-S6 streams, all merchantable timber was assumed to be available for harvesting.

Similarly, for classified lakes and wetlands, the areas of associated RRZs and lakeshore and wetland management zones (LMZs and WMZs) were generated using a GIS. RRZs as well as LMZs adjacent to Class A lakes were appropriately excluded from the timber harvesting land base. For the corresponding LMZs and WMZs other than those adjacent to Class A lakes, 30 to 50 percent of the volume of stands was removed to simulate partial retention. Unclassified lakes and unclassified wetlands were defaulted to the nearest stream class in the GIS file and assigned the appropriate RRZ and RMZ widths.

District staff have reviewed the information and assumptions for riparian areas and support the methodology and deductions applied in the analysis to account for RRZs associated with streams. However, for RMZs, district staff note that the basal area retention levels assumed in the analysis are inconsistent with current district policy. For S1-S3, S4-S5, and S6 stream classes, current district policy recommends retention levels of 50, 25, and five percent respectively. In the analysis, a 60 percent retention level was modelled adjacent to S1-S3 streams, with no retention adjacent to S4-S6 streams. In addition, staff note that a local Lakes Resource Use Plan (LRUP) establishes a 200-metre wide LMZ for L1 lakes, whereas in the analysis no LMZ was assumed for L1 lakes.

I have examined and considered the modelling assumptions used to represent riparian areas on TFL 18 and acknowledge the licensee's inventory of riparian areas represents the best available information. While I accept the deductions made for RRZs, I note that the assumptions used in the base case to model basal area retention within RMZs, are not entirely consistent with current district policy. Some of these differences may act to marginally decrease timber supply by a negligible amount while others may act to marginally increase timber supply compared to the base case harvest projection.

Having reviewed the information provided by BCFS staff, I have considered that these differences are likely to be mutually offsetting and unlikely to significantly impact the base case harvest projection. I have therefore concluded that the accounting of riparian management areas is adequate for the purposes of this determination and have made no further adjustments. I note that regardless of the assumptions made in the analysis, the licensee is required to meet the standards of the *Forest Practices Code* and *Kamloops LRMP* during operations in riparian areas.

I also note that as part of the ongoing LRUP process, the classification of additional lakes within TFL 18 is expected to be completed by 2001. I encourage the licensee to continue to refine the riparian inventory and classification. Any new information can be incorporated into the next analysis

- *wildlife habitat*

TFL 18 is known to support large mammal species including mule deer, moose, black bear, as well as a variety of smaller mammals, numerous birds, fish and invertebrate species. In the analysis, the habitat requirements of most wildlife species are assumed to be addressed through the seral stage distribution and management practices described below under *landscape-level biodiversity*

The *Kamloops LRMP* includes objectives that recognize regionally and provincially sensitive wildlife habitat. The plan identifies areas of critical moose winter range—including a portion of TFL 18—and includes strategies for maintaining moose habitat within the General Resource Management zone of the LRMP planning area. Because no specific management regimes have been established, the licensee did not explicitly account for critical moose winter range in the analysis. In the absence of better information and given the small proportion of the area that is located within the TFL, MELP staff supported this approach.

Wildlife potentially occurring within or adjacent to TFL 18 also include numerous *identified wildlife* species. These include the Northern Goshawk, American Bittern, Great Blue Heron, Sandhill Crane and fisher. *Identified wildlife* refers to species at risk (red- and blue-listed) as well as regionally significant species which are potentially affected by forest management activities and which have not been adequately accounted for through existing management strategies. While the biodiversity and riparian provisions of the Forest Practices Code are intended to provide for the needs of most wildlife species, some species that are considered to be "at risk" require special management practices. The Province's *Identified Wildlife Management Strategy* (IWMS)—released in February 1999—provides mechanisms for managing critical habitat for identified wildlife species including Wildlife Habitat Areas (WHAs), General Wildlife Measures (GWMs) and higher level plan recommendations.

With the exception of critical moose winter range identified in the *Kamloops LRMP* (described above), no specific mechanisms affecting TFL 18 have yet been established. As a result, no explicit measures were applied in the base case to account for identified wildlife.

For this determination, it is not possible to specify the exact location or precise amount of WHAs that will be required within the timber harvesting land base to implement the IWMS. However, I note that government has limited the impact of management for identified wildlife over the next two years to a maximum of one percent of the harvest level for the province. Given the Province's commitment to implementing the IWMS, and given the policy decisions and projected one-percent impact—and noting the

expected occurrence of identified wildlife within TFL 18—it is necessary and appropriate to account for an expected but not fully quantified impact on the timber supply. I have therefore concluded that timber supply may be up to one percent lower than projected in the base case and have considered this below in "Reasons for decision".

As the Province implements its strategy for the management of species at risk, I expect the specific implications to be reflected in future timber supply analyses for TFL 18 and these will be taken into account in future AAC determinations.

I acknowledge that the licensee has initiated a terrestrial ecosystem mapping project for TFL and note that this will assist the licensee in establishing the location of important wildlife habitats. I encourage the licensee, in cooperation with MELP staff, to complete this work as well as additional identification, inventory and mapping of critical wildlife habitats including those for identified wildlife species. Such information will reduce uncertainty in the management of these species and provide a more accurate assessment of the implications of wildlife management in future timber supply analyses.

- *biodiversity*

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and 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 both the stand and landscape levels.

1) stand-level biodiversity

Stand-level biodiversity is managed by retaining reserves of mature timber, or wildlife tree patches, within cutblocks and in adjacent inoperable and other retained areas to provide structural diversity and wildlife habitat. The *Biodiversity Guidebook* outlines procedures and makes recommendations on the proportion of a cutblock that is required in wildlife tree retention (WTR).

In the base case for TFL 18, Slocan appropriately assumed that forested areas outside of the timber harvesting land base may contribute to stand-level biodiversity requirements. To simulate the requirements of the *Biodiversity Guidebook*, the licensee used a GIS-based approach to determine which areas within the timber harvesting land base were more than 250 metres from productive forest areas outside the timber harvesting land base. The licensee then applied procedures in table 20(a) of the guidebook to estimate the additional area required for wildlife tree retention. The licensee accounted for this additional area indirectly by applying an average volume reduction of 0.87 percent to the yield tables of all analysis units. BCFS district staff support the assumptions and method used in the analysis.

Having reviewed the analysis and the findings of staff, I accept the assumptions used to account for stand-level biodiversity as modelled and have made no further adjustments. I

acknowledge the licensee's intention to develop coarse woody debris strategies to further provide stand-level biodiversity measures. The associated impact of these strategies, to the extent that they may affect timber supply can be incorporated into future timber supply analyses.

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 this—together with other provisions in the Forest Practices Code, such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout this document—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 appropriately-located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests. Although some general forest management practices can broadly accommodate the needs of most species, more often a variety of practices is needed to represent the different natural disturbance patterns under which specific ecosystems have evolved. Natural disturbance types (NDTs) vary from frequent wildfires in the dry interior regions to rare stand-initiating events (e.g., wind) in the wetter coastal regions.

The *Kamloops LRMP* (further discussed in the following section) provides strategic direction for managing sub-regional landscape unit level biodiversity. The LRMP—approved as a higher level plan under the Code in 1996—identifies landscape units and preliminary biodiversity emphasis options (BEOs) as well as associated objectives and strategies for the LRMP area which including TFL 18. Objectives include following direction provided in the *Biodiversity Guidebook* to conserve the diversity and abundance of native species and habitats. Associated strategies include limiting the impact of landscape unit BEOs to no more than four percent of timber harvesting in the LRMP area over the short- and long-terms.

Unlike many TFLs in the province where a TFL extends over several landscape units, the entire area of TFL 18 makes up a portion (about 59 percent) of a single landscape unit—the Clearwater landscape unit. The balance of the Clearwater landscape unit consists of two forest licence chart areas (held by Slocan and Weyerhaeuser), other Crown forest, and provincial park. In the *Kamloops LRMP* this landscape unit was assigned a preliminary BEO of low.

Management objectives practised within the landscape unit and outside the TFL by other licensees and agencies may affect the ability of Slocan to meet its management targets for biodiversity. However, there is no clear direction which assumptions should be applied to distribute any landscape-level biodiversity related timber supply impacts among the various licences encompassed by the landscape unit. Therefore, as an interim measure, in

the timber supply analysis the licensee assumed that a proportionate amount of the landscape-level biodiversity requirements would be met solely within the boundaries of TFL 18.

The *Biodiversity Guidebook* includes provisions for phasing in the old seral retention objectives specified in the guidebook in landscape units where the objectives cannot initially be met because of previous harvesting or natural disturbance. According to the guidebook, old seral forest must then be recruited over time so that the full retention objective is in place by the end of three rotations (210 years).

In the analysis, in biogeoclimatic variants which did not initially meet the old seral retention objectives, Slocan applied a linear function which gradually recruited old growth to meet the full requirements within three rotations. The analysis showed that within all NDT 3 variants, the minimum old seral requirements specified in the guidebook were initially met and maintained over the entire planning horizon. However, in both NDTs 1 and 2, the current old seral forest comprised approximately one half the objectives specified in the guidebook. In the model, the full requirements were achieved in approximately 170 years (NDT 1) and 130 years (NDT 2). For mature-plus-old seral objectives, no formal analysis was conducted. However, a review of the age class distribution of NDT 3 stands suggests that existing mature-plus-old forest exceeded the retention objectives specified in the guidebook.

On August 12, 1999, the district manager provided licensees with interim direction for managing old seral targets. According to this direction, "for the interim period prior to TSR2 timber supply results and subsequent reviews by agencies and the *Kamloops LRMP* monitoring table, it is the district manager's intent to try to meet three thirds of all old growth targets, as well as three thirds of mature targets in NDTs 3 and 4 only, immediately". I am advised by BCFS staff that this is consistent with the current interpretation of the LRMP.

The licensee provided several sensitivity analyses to show the impact of varying assumptions for landscape-level biodiversity. Immediate recruitment of the full old seral requirement caused a substantial reduction to short-term timber supply compared to the base case projection. In year six of the forecast, timber supply decreased by 37 percent to 118 444 cubic metres per year compared to the 14 percent reduction (to 160 450 cubic metres per year) depicted in the base case projection.

The licensee also provided a sensitivity analysis to demonstrate the impact of establishing the current draft Old Growth Management Areas (OGMAs) on timber supply. Reserving draft OGMAs for the first 40 years of the planning horizon resulted in a significant reduction to short-term timber supply. In year six, timber supply decreased by 25 percent compared to the 14 percent reduction depicted in the base case.

I have examined and discussed the above information with BCFS and MELP staff and have considered as follows:

The existing proportions of old seral forest within the NDT 1 and NDT 2 variants of TFL 18 are below the old seral retention targets described in the *Biodiversity Guidebook*. In the analysis the licensee recognized this and modelled landscape-level biodiversity using a recruitment strategy whereby the full requirement was achieved within three rotations. I note that the NDT 1 variant comprises almost 40 percent of the productive area of TFL 18, while NDT 2 covers less than two percent. Because of the relative area involved, the NDT 1 old seral requirement, in particular, restricts timber supply in the short-term on the unit.

I acknowledge that the approach used to model landscape unit biodiversity—specifically the assumptions applied to recruit old growth in the model—is not entirely consistent with the current intepretation of the of the *Kamloops LRMP* and the Clearwater district manager's direction on achieving old growth targets. The intent of the district manager's interim direction is to try to meet old seral targets immediately.

I note that one of the LRMP strategies is "to minimize the impacts of landscape unit BEOs to no more than four percent of the level of timber harvesting in the *Kamloops LRMP* over the short and long term". In addition, preliminary landscape unit BEOs for the LRMP area have not yet been established and may be subject to change. Until the LRMP-level analysis is completed, it would therefore be inappropriate for me to attempt to speculate on the precise timber supply impacts on TFL 18 of the eventual outcome of these planning process. In addition, it is also uncertain how the refinement of the draft OGMAs (discussed above) will impact the timber supply of TFL 18. The uncertainty respecting the eventual BEOs, recruitment strategies and OGMAs is also evidenced by the district manager's interim direction. This direction instructs MOF, MELP and other potentially affected licensees to negotiate harvest proposals and biodiversity needs prior to approval of operational plans. Negotiation includes the options of identifying alternate locations or mitigating practices.

I am aware that TFL 18 contains the majority of the NDT 1 variant within the Clearwater landscape unit—the largest variant within TFL 18 and the primary variant within the TFL where old seral is in relatively short supply. Parks within the landscape unit do not contribute significantly to overall old seral objectives in NDT 1. I also acknowledge that a large proportion of the available old seral forest of this variant is associated with the TFL 18 timber harvesting land base. As a result, the draft OGMAs identified on TFL 18 also contain a high proportion of old seral forest that would otherwise contribute to timber supply.

Having reviewed the analysis and the district manager's direction, I acknowledge there may be an opportunity to moderate the impact of the draft OGMAs on timber supply by further refining the boundaries and/or by recruiting mature stands with old growth attributes. However, I note that there is a limit to the extent to which this can occur on TFL 18 by virtue of the high proportion of old seral forest within the timber harvesting land base of TFL 18 and the relative shortage of old seral NDT 1 outside the TFL.

I have considered the above information, and although the precise impact is unquantifiable, I find that the licensee's sensitivity analyses provide compelling evidence that timber supply may be over-estimated in the base case on account of landscape-level biodiversity. While I acknowledged that the current interpretation of the *Kamloops LRMP* requires immediate recruitment of old seral forest, as noted above, the district manager's willingness to negotiate harvest proposals and biodiversity needs suggests that the impacts of landscape-level biodiversity may be less severe than those indicated in the sensitivity analyses. I have further discussed the implications on timber supply in my "Reasons for decision".

I note that the *Kamloops LRMP* Monitoring Table will be reviewing the landscape-unit BEOs and associated resource impacts in the near future. I also encourage Clearwater forest district and MELP staff to work with the licensee and other interests to finalize the recruitment strategies and refine the location of the OGMAs. This new information and any associated recommendations will be considered in the next determination.

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

Kamloops Land and Resource Management Plan

In addition to the *Ministry of Forests Act* and the *Forest Practices Code of B.C.* Act, the *Kamloops Land and Resource Management Plan* (LRMP) provides regional planning guidance to the management of forest and range resources in the region.

Currently the LRMP area covers approximately 2.7 million hectares of Crown land and was approved by government in July 1995. The plan was legally established as a higher level plan, under the Forest Practices Code in January, 1996. This designation requires that all operational plans be consistent with the management strategies and objectives contained within the *Kamloops LRMP*.

The plan identifies specific objectives and strategies for seven resource management zones within the LRMP area. Approximately 99 percent of the TFL is covered by the General Resource Management zone. In addition, the plan identifies 21 new protected areas of which one (Taweel) was located partially within the boundaries of the original TFL 18. The 4393 hectare Taweel Provincial Park has since been legally described, mapped and established under the Park Act. In the base case, 228 hectares were appropriately excluded from contributing to timber supply to account for the small component of the park located within the original boundaries of the TFL.

Implementation of the *Kamloops LRMP* is ongoing and is the responsibility of the Kamloops Interagency Management Committee. I note Slocan's commitment to the goals of the *Kamloops LRMP* and the objectives and strategies for each resource management zone.

Overall in making my determination, I have been mindful of the land use planning decisions affecting TFL 18 and acknowledge that future determinations will reflect ongoing confirmation and clarification of the *Kamloops LRMP*.

Alternative rates of harvest

The nature of the transition from harvesting old-growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older forest often permits harvesting above the 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 sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

In addition to the base case harvest forecast, the licensee presented four alternative harvest flow projections. In one alternative, the licensee reduced the initial harvest level represented in the base case (187 158 cubic metres per year) by approximately 10 percent. In this alternative a harvest level of about 170 000 cubic metres per year was maintained for 15 years before declining approximately 10 percent per decade to a medium-term harvest level of approximately 124 000 cubic metres per year. Despite the reduction in the initial harvest level, no increase in medium-term timber supply compared to the base case projection was observed.

In a second alternative, the licensee reduced the initial harvest level projected in the base case by approximately 20 percent to 148 000 cubic metres. The alternative forecast then followed a one-step reduction in year six to achieve a medium-term harvest forecast of about 134 000 cubic metres per year.

A third alternative projected a non-declining harvest forecast of approximately 138 000 cubic metres per year for 110 years before attaining a long-term harvest level of 152 0000 cubic metres in 125 years.

Slocan's fourth alternative projected short- and medium-term harvest levels that were similar to those depicted in the base case. The long-term harvest level was achieved in 110 years, compared to 125 years in the base case projection. Achieving the long-term harvest level 15 years earlier resulted in a two percent decrease in long-term timber supply compared to the base case.

I have reviewed the alternative forecasts presented by Slocan and observe that the dynamics of timber supply in this unit demonstrate little flexibility in the short- and

medium-terms. Medium-term harvest level is not increased without a severe reduction in the initial harvest level.

To the extent that uncertainty in the assumptions used in the analysis introduce risk to the base case timber supply forecast, I have been mindful of this lack of flexibility in making my determination and have considered this in my 'Reasons for decision'.

Proposed Management Options

In addition to the base case harvest projection and alternative forecasts described above under Alternative rates of harvest, Slocan developed several management options using the optimization function of the timber supply model FSOS.

The assumptions used to develop the management options were different than those used to generate the base case in several ways. In the proposed management options deductions to account for ESAs were modified as follows: 100 percent of highly sensitive ESAs were excluded from contributing to timber supply while all moderately sensitive ESAs were assumed to contribute to timber supply. In addition, the visual quality objectives assumed in the base case (discussed under *visually sensitive areas)* were relaxed by five percent and provincial OGSI adjustments (discussed above under *site productivity estimates*) were applied to all stands older than 140 years upon regeneration.

According to the licensee, a major theme in developing these options was the application of a patch management strategy. A patch is a stand of similarly-aged forest that typically differs in age from the adjacent forest by more than 20 years. The optimization function of FSOS creates a patch management strategy over time and employs a target-oriented approach to harvest forecasting whereby the model seeks to best meet a desired set of management objectives. The model employs weightings of various target objectives and evaluates the relative success of potential solutions generated by the model. For the proposed management options, the licensee applied weightings to old seral, patch, timber, cutbock size and harvest flow objectives. Near optimal solutions typically achieve highly weighted targets quickly over the planning horizon to minimize the total "penalty".

To develop the licensee's proposed timber supply option (Proposed Option 1), Slocan first generated a harvest forecast that provided high relative weightings to cutblock size and old seral objectives. The high relative weightings ensured that these objectives were strictly adhered to in the model throughout the planning horizon. The resulting forecast was used to develop the licensee's twenty-year plan to demonstrate the operational feasibility of the proposed harvest forecast (discussed below under Twenty-year plan). Once operational feasibility over the first 20-year period was established, the licensee lowered the relative weightings in relation to timber flow objectives in order to focus on achieving a better strategic harvest forecast over the 200-year planning horizon. According to the licensee, seral stage and patch management remained an integral part of Proposed Option 1 throughout the planning horizon.

The forecast projects an initial harvest level of approximately 187 000 cubic metres per year for 15 years, followed by a 10 percent per decade decline to a medium-term harvest level of about 147 000 cubic metres per year. The projected harvest level then increases beginning in 85 years and achieves a long-term harvest level of 188 000 cubic metres in 150 years.

As part of the analysis, the licensee provided reports that track the projected condition of various timber and non-timber resources throughout the planning horizon. I have examined and discussed them with BCFS and MELP staff and have concluded as follows:

In developing their proposed timber supply option, Slocan has applied a number of different management assumptions and adopted a different modelling philosophy than was used in the base case. The optimization function of FSOS employs a patch management, target-based approach to generating timber supply forecasts and this results in a pattern of harvesting and cut block orientation that is quite different than that projected in the base case. Using this sophisticated technique, the licensee has been able to significantly increase short- and medium-term timber supply compared to the base case.

I acknowledge that patch size distribution is an important consideration in managing for biodiversity and note that provincial planning and assessment procedures are currently being developed. Patch management is a recognized element of the *Biodiversity Guidebook*. However, no specific objectives regarding patch management for TFL 18 have yet been developed. In addition, BCFS and MELP staff indicate that patch management does not presently represent current management on TFL 18 nor is it currently an approved management strategy in the *Kamloops LRMP*.

Nevertheless, I find that objectives for patch size are broadly consistent with the direction of landscape unit planning and management of biodiversity. As specific objectives for patch management are developed, adopted and implemented operationally, they will be considered in future timber supply analyses. For this determination I have therefore considered the likelihood that timber supply may be underestimated by an uncertain amount on account of this factor, and have discussed this further in my "Reasons for decision".

However, I also note that while this provides some optimism for improved short-term timber supply, I view the licensee's projection with caution noting that it indicates that a prolonged decline is still anticipated after 15 years. The projection is also supported by other uncertain assumptions around ESAs and VQOs and the need to have a practices regime that tracks the sophisticated assumptions of the optimization modelling technique.

Twenty-year plan

The main purpose of the 20-year plan is to show if the harvest volume projected in the base case can be spatially configured in specific areas on the landscape over the next 20 years.

For TFL 18 the licensee used the optimization function of the timber supply model FSOS, to develop the 20-year plan. Areas proposed for harvest in the existing forest development plan were included in the first five-year period of the plan. The 20-year plan was based on the assumption that old seral stage requirements will be met by the end of three rotations. The plan indicated that the harvest level projected in the base case could be supported over the 20-year period.

The 20-year plan was conditionally accepted by the Clearwater district manager for use in the timber supply analysis. The district manager raised concerns over the low level of harvesting and rehabilitation in the residual balsam stands over the duration of the plan. Concerns were also expressed that the proposed harvest pattern and analysis assumptions used to develop the 20-year plan were inconsistent with the *Kamloops LRMP* and interim district policy on managing old-seral requirements.

I have reviewed the 20-year plan and have discussed the concerns with the Clearwater district manager. I have considered the low level of harvesting and rehabilitation in the residual balsam stands and have discussed the associated implications on the base case in the following section. I concur that the assumptions used to generate the 20-year plan are not entirely consistent with those used in the base case projection. As discussed under Kamloops Land and Resource Management Plan, the *Kamloops LRMP* describes strategies for achieving biodiversity emphasis objectives. I acknowledge that implementation of this strategy will likely require an LRMP–level analysis to determine how best to apply these objectives on TFL 18. However, until this analysis is completed, the precise impacts of LRMP-level old seral recruitment strategies on the timber supply of TFL 18 are uncertain.

In summary, I recognize that it may be difficult for the licensee to distribute the proposed harvest exactly as configured in the 20-year plan. While there is some uncertainty associated with the implications of the *Kamloops LRMP*, I am also mindful that the 20-year plan is not an operational plan. I recognize that it provides just one alternative distribution of the proposed harvest over time. As a result, I am satisfied that given available information, Slocan has demonstrated that for at least the first five-year period, the initial harvest level in the base case can be achieved.

I therefore find the 20-year plan acceptable for use in this determination, and acknowledge the licensee's initiative in applying this modelling technology.

Residual balsam stands

TFL 18 contains significant areas of residual balsam stands resulting from historic intermediate utilization (IU) logging. During the 1940s through 1960s, timber harvesting activities incorporated IU standards, whereby smaller, undesirable species and stems less than a specific diameter were left, leaving residual stands composed largely of smaller diameter and suppressed balsam and spruce stems. At the time, it was generally assumed that the areas would fill in naturally with coniferous species, and that the regeneration, in combination with the residual balsam and spruce stems would develop into a merchantable future crop. However, residual stems in stands with a history of IU harvesting have typically remained suppressed, resulting in stands composed of a poor quality overstory of balsam and spruce, interspersed with clumpy regeneration in a variety of conditions.

In the timber supply analysis for TFL 18, approximately 6433 hectares—11 percent of the timber harvesting land base—are comprised of residual balsam stands. In the previous determination for TFL 18, I expressed concern over the licensee's limited harvesting performance in residual balsam stands and suggested that the AAC may need to be revisited or partitioning considered. Slocan developed a total chance plan (TCP) for the mid-east side of the TFL—the general area where the majority of residual stands are located—and also included commitments to harvest and treat residual stands.

In MP No. 9 Slocan reports that approximately 55 000 cubic metres of undisturbed stands have been harvested from the TCP area with an additional 54 000 cubic metres identified in cutting permits or approved plans. Photo interpretation and field checking of these areas by Slocan suggest that many of these stands identified as undisturbed actually have a previous harvesting history. As a result the licensee is reconsidering the feasibility of harvesting these areas.

I have reviewed the timber supply analysis including the assumptions regarding residual balsam stands. I note that the first decade of the base case harvest forecast identifies 40 783 cubic metres (133 ha) from residual balsam stands, or approximately 2 percent of the total volume harvested. I am mindful that prolonged avoidance of the residual balsam stands effectively concentrates harvesting on the remainder of the timber harvesting land base.

At present the licensee intends to defer harvest in the majority of these stands and continue to monitor and measure growth, and investigate management options. While this strategy is broadly consistent with the harvest pattern generated in the base case projection, I remain concerned by the variable productivity of these stands and the assumption that they contribute to the timber harvesting land base of the TFL.

Approximately 1830 hectares of very low productivity residual balsam stands contribute to the timber harvesting land base assumed in the base case. I have reviewed some of these stands in the field and acknowledge their high variability and productivity range. While the site productivity limits used to stratify the low productivity residual stands are

within acceptable limits, because of their current condition, harvesting history and uncertain growth trajectory, I remain mindful of the risk this uncertainty introduces to timber supply. I cannot say with certainty that the low productivity residual stands should be excluded from the timber harvesting land base but am concerned about the risk of assuming that these stands will assume a normal growth pattern.

I acknowledge that Slocan is continuing to collect and analyze data to better understand the dynamics of these stands. The dilemma and difficult choice I face is whether to regard these stands as part of the timber harvesting land base while the licensee continues to collect and analyze data. If the additional data demonstrates a problem or opportunity in the future, then I could account for it more precisely then. Alternatively, I could account for the risk now and then use further data and analysis to remove the uncertainty later. Having reviewed the above information and discussed it with BCFS staff, I have considered as follows:

There is uncertainty in the future volume projections, site productivity and merchantability of the residual layer of these stands, particularly those in the low productivity stratum identified in the timber supply analysis. The base case projection suggests that a significant downward trend in timber supply may occur within five years. Given the considerable uncertainty associated with the residual balsam stands and other significant factors (e.g., landscape-level biodiversity), I have concluded that I must account for the risk to timber supply immediately. To assess the risk I have used the conceptual exclusion of those residual balsam stands classified as low productivity as a proxy for all the uncertainty associated with the residual balsam stands.

These are atypical stands and I feel obligated to consider the uncertainty and risk to timber supply this introduces, particularly in combination with the uncertainty in other factors such as landscape biodiversity.

Because of the significant area of TFL 18 that is occupied by the low productivity component of the residual balsam stands (approximately three percent of the timber harvesting land base), I have concluded that there is a considerable risk to the timber supply projected in the base case. I have discussed this further below in my "Reasons for decision". I encourage the licensee to continue to collect and analyze data on the growth and yield of these stands. Any new information will be considered in future determinations.

Landscape unit level analysis

TFL 18 represents one of several administrative areas that make up the Clearwater landscape unit. Management activities within these individual components can affect attainment of landscape-level objectives of the landscape unit as a whole. In recognition of this, Slocan provided an initial landscape unit-level analysis to explore landscape-level issues and encourage coordination of planning among licensees, the MOF and MELP . The licensee intends to refine this information and integrate it with the MOF landscape unit planning process.

I have reviewed the licensee's landscape unit-level analysis and have discussed it with BCFS staff. While the Clearwater landscape unit is not a timber supply unit, I note that the management activities and strategies in areas outside of the TFL may affect the achievement of timber and non-timber objectives on TFL 18, including those for landscape-level biodiversity. I encourage the licensee to continue to coordinate its efforts with the appropriate resource agencies, licensees and other interests to support development of an overall landscape unit plan.

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

Timber processing facilities

The majority of logs harvested from TFL 18 are directed to the licensee's Vavenby operation. Facilities include a sawmill, an upgraded planer and three dry kilns. The mill produces dimension lumber and specializes in long length lumber of predominantly spruce, pine, Douglas-fir, and balsam species.

The total processing capacity of the Vavenby sawmill is approximately 660 000 cubic metres per year. TFL 18 contributes approximately 25 percent of the volume requirements of the Vavenby operation. The balance originates from the company's local forest licence as well as significant purchases from other operators in the region. Slocan is one of the province's largest forest products companies, with timber production facilities located throughout the B.C. interior as well as a remanufacturing facility in Chilliwack, near Vancouver.

I note the contribution of the TFL 18 timber harvest to the licensee's local and provincial operations is significant and have considered this in my determination.

(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;

Minister's letter and memorandum

The Minister 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).

This 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 placed particular emphasis on 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.

As discussed above under *commercial thinning*, Slocan does not currently have plans for commercial thinning on TFL 18. I have also reviewed the potential for harvesting in previously uneconomical areas and have not identified a need to partition the AAC at this time.

The Minister's memorandum addressed the effects of visual resource management on timber supply. In it the Minister 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*, I noted that short- to medium-term timber supply on TFL 18 is relatively sensitive to VQOs and have discussed the implications to timber supply in my "Reasons for decision".

Community dependence

TFL 18 lies within the North Thompson region of the Thompson-Nicola Regional District. Local communities near TFL 18 include Clearwater, Vavenby, Little Fort, Birch Island, and Avola. Slocan's Vavenby division, including the sawmill, planer mill and woodlands operation, support over 190 full-time employees, the majority of whom reside in Vavenby and Clearwater. In addition, Slocan operations support approximately 300 part- and full-time contractors and consultants.

I acknowledge the importance of the TFL 18 timber supply to the local economy and have considered this in my AAC determination.

Public Involvement

The Minister's letter of July 28, 1994, states 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.

The licensee provided opportunities for public review of the draft statement of management objectives, options, and procedures (SMOOP) and draft MP No. 9 by advertising in local and regional newspapers, conducting an open house and making the documents available for public viewing. As discussed below, the licensee also met with local First Nations groups during the preparation of MP No. 9.

Having reviewed and discussed the public involvement process with BCFS Clearwater district staff, I find that the licensee made suitable efforts to encourage and collect public input. While no written public responses were received, I have considered the general employment and community stability implications of TFL 18 in my AAC determination.

First Nations

TFL 18 falls within the traditional territories claimed by the North Thompson and Canim Lake Indian Bands. As described previously under *archaeological sites*, both bands have initiated traditional use studies on their areas of interest.

Slocan met with representatives of both First Nations bands to discuss draft MP No. 9 and a conceptual plan of the 2000-2004 forest development plan. General comments and discussion concerned old growth, coarse woody debris, hunting access, forest health, archaeological assessments, use of terrain ecosystem mapping, berry production, yew protection, campsites for Band use and employment.

I acknowledge Slocan's commitment to consult with First Nations as part of regular operations and am not aware of any specific concerns affecting timber supply. Should future studies or discussions with First Nations groups provide new information, any impacts will be reflected in future determinations to the extent that they may affect timber supply.

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

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged by natural causes such as fire and disease, but not recovered through salvage operations.

In the base case, Slocan derived estimates of unsalvaged losses on TFL 18 using information from the 1995 Kamloops TSA timber supply analysis and local information. Losses to insects and disease were estimated to be 900 cubic metres per year. Additional losses due to fire and windthrow were estimated to be 300 and 200 cubic metres per year respectively. The licensee maintains that the extensive and accessible road network contributes to minimizing losses by facilitating efficient salvage operations.

BCFS staff have reviewed the approach and assumptions used in the base case and find the estimates for unsalvaged losses to reasonably reflect current conditions. For this determination, in the absence of better information, I accept the accounting of unsalvaged losses as modelled.

Reasons for decision

In reaching my decision on an AAC for TFL 18, I have considered all the factors presented above and have reasoned as follows:

For the reasons stated in "Timber supply analysis", and from reviewing the considerations as recorded above, I accept the licensee's base case as an adequate basis from which to assess timber supply for this AAC determination.

In determining AACs, my considerations typically identify factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Some of these factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at the time of the determination. These latter factors are accounted for in determinations in more general terms.

The following factors have been identified as reasons why the timber supply projected in the base case may have been *overestimated*:

- *landing rehabilitation:* To account for reduced productivity of landings, the Kamloops regional pedologist recommended that, based on his studies, a 20 percent reduction to stand volume should be applied rather than the 10 percent reduction that was assumed in the base case. In the absence of supporting data specific to the TFL, I accepted the pedologist's recommendation and concluded that long-term timber supply may be overestimated by approximately 0.3 percent compared to the base case projection.

- *identified wildlife:* To account for the impact of implementing the Identified Wildlife Management Strategy, and in accordance with provincial direction, I have accepted an overestimation of up to one percent of the timber supply throughout the forecast horizon. In using this approximation, I acknowledge that wildlife habitat areas and associated practices have not yet been implemented on TFL 18, and I cannot know with certainty their precise impact on timber supply.

- *landscape-level biodiversity*: In NDTs 1 and 2 the proportion of old seral forest is currently below the level recommended in the *Biodiversity Guidebook*. In the base case the licensee assumed that the full old seral requirement would be phased in within three rotations rather than be recruited immediately. I concluded that this approach is inconsistent with the current interpretation of the biodiversity strategies identified in the *Kamloops LRMP* and district manager direction on old growth management. I therefore considered that short-term timber supply may be negatively impacted on this account by a significant but unquantified amount compared to the base case harvest forecast.

- *residual balsam stands:* In the timber supply analysis over 6000 hectares of stands with an intermediate utilization (IU) harvesting history were assumed to contribute to timber supply. Based on current performance and my review of the dynamics of and risk associated with these stands types, I considered the likelihood that up to 1830 hectares of these stands may not contribute to timber supply. I concluded that short- to long-term timber supply may be overestimated by up to three percent.

In the determination for TFL 18 I also identified several factors as possible indications that the timber supply projected in the base case is *underestimated,* although none is certain:

- *low site and problem forest types:* a review of maps showing the location of areas excluded from contributing to the timber harvesting land base suggested that a number of previously harvested areas may have been misclassified or incorrectly deducted from the timber harvesting land base. Because of their largely juvenile status, I concluded that medium- to long-term timber supply may have been underestimated by a small amount, likely less than one percent.

- *site productivity estimates:* Based on provincial old growth site index (OGSI) studies and their effect on timber supply as projected in the sensitivity analyses, I concluded that future yields of regenerating stands and hence timber supply may be underestimated in the base case projection by up to 11 percent.

- *patch management:* By incorporating principles of patch management and an alternative modelling technique, the licensee was able to maintain the current harvest level for an additional 10 years compared to the base case projection. I considered the possibility that the duration of the initial harvest level depicted in the base case could potentially be extended by up to 10 years.

- *visually sensitive areas:* I noted that while visually sensitive areas have been identified and are known, VQOs for TFL 18 have not yet been established under the Forest Practices Code. In addition, the *Kamloops LRMP* provides for more flexible allowable alteration limits than were modelled in the base case. I therefore considered that the base case forecast may be slightly more constraining than necessary. Based on sensitivity analyses, I concluded that the initial harvest level depicted in the base case could possibly be maintained for up to one additional 5-year period.

In assessing the above factors, I have considered that the impact of two factors (landing rehabilitation, low site and problem forest types) are relatively small by order of magnitude. In addition, they tend to counteract one another primarily in the medium to long term.

The remaining downward factors (identified wildlife, residual balsam stands, landscape-level biodiversity) indicate that timber supply may be overestimated and all potentially impact the short to medium term. The licensee's analysis shows that it is during this period (short to medium term) that timber supply is potentially at greatest risk. In the base case, timber supply is projected to decrease by 14 percent within five years and 10 percent per decade thereafter for up to three decades.

Two of these factors (residual balsam stands and landscape-level biodiversity) are potentially very significant. I acknowledge the guidance provided by the *Kamloops LRMP*. While the LRMP-level analysis of biodiversity is incomplete and therefore the eventual requirement for old seral forest on each administrative unit within the LRMP area is still uncertain, the analysis demonstrated that more aggressive recruitment of old seral forest could potentially result in a significant reduction in timber supply beginning as early as year six of the forecast horizon.

Compounding the risk this confers to short-term timber supply are the assumptions associated with the residual balsam stands. Having examined site productivity classes and growth and yield characteristics, I considered the risk that a proportion of these stands may in fact not contribute to timber supply. I conceptually excluded approximately 1830 hectares to account for the uncertainty associated with the viability of residual balsam stands. By conceptually exclude, I mean to imply that I am using the implication of their exclusion as a proxy for accounting for the uncertainty associated with the residual balsam stands and the risk this introduces into the decision. However, it does not imply that these stands should now be excluded from forest management on the TFL. To the contrary, and as proposed by the licensee, these sites should continue to be assessed, studied and treated.

The impact of identified wildlife on timber supply in combination with the above factors works to further exacerbate the potential of a precipitous decline in short-term timber supply.

Working to counteract the downward pressures are factors that suggest a risk that timber supply may be underestimated compared to the base case. As noted previously in this document, short-term timber supply on TFL 18 is sensitive to VQOs. As such the potential for less constraining VQOs may work to offset potential declines in timber supply and stabilize medium-term levels earlier in the forecast horizon. While this may buffer some of the uncertainty associated with old seral recruitment and residual balsam stands, by order of magnitude, I do not consider it sufficient to counteract the prevailing downward trend depicted in the base case.

The licensee provided several proposed harvest forecasts using the optimization function of the timber supply model FSOS. Using detailed and innovative analysis techniques, the licensee demonstrated a potentially feasible harvest projection which maintained the current harvest level for an additional 15 years. The modelling technique and harvest forecast relies heavily on a patch management strategy rather than using strict constraints to account for forest resource values. I acknowledged that patch management is a recognized element of both the *Kamloops LRMP* and the *Biodiversity Guidebook* and observe that establishing and implementing objectives for patch size will help reduce the landscape fragmentation that is often associated with historical patterns of harvesting. However, the assumptions are not fully consistent with current management on TFL 18 nor have objectives or strategies regarding patch management yet been established. While I find the results of the proposed management options cause for considerable optimism, I find it unlikely that this will sufficiently buffer the combined impact of other uncertainties affecting this determination.

When evaluating timber supply, I typically assess the natural productivity of the land base by estimating the hypothetical long-term harvest level represented by VDYP-generated yields. In a declining timber supply projection, I consider that in general, medium-term timber supply should not decline below the natural productivity of the land base. For TFL 18 I have examined the base case projection and note that consistent with this principle, medium-term timber supply does not fall below the inherent productivity of the

land base. However, it does closely approach this threshold and provides me with further evidence that there is considerable risk associated with maintaining the AAC at its current level.

Drawing on the licensee's sensitivity analyses, I am left with a complex array of information to draw upon and from which to assess the likely impacts that all the previous information in this section implies for the AAC. In reviewing this information, I am also mindful that at its most optimistic level of projection, (the licensee's proposed management option), timber supply is still projected to decline significantly in the near future—within 15 years.

I have concluded that after weighing all of the information in this decision, there is a resultant, net downward influence on timber supply along with considerable risk to the maintenance of future timber supply. Noting the very high sensitivity of this unit to changes in the land base and noting the base case projects a decline of over 14 percent beginning in year six, it is my determination that the AAC should be reduced by five percent at this time. This accounts for the uncertain state of information, acknowledges the declining forecast under a variety of scenarios or assumptions, better accounts for a more even rate of inter-decadal decline, and leaves room for the completion of VQO strategies, biodiversity strategies and ongoing assessments of the IU balsam stands.

Finally, regarding the *Kamloops LRMP*, ongoing confirmation and clarification of management guidelines including those for old growth management will reduce the uncertainty in the factors affecting timber supply in the *Kamloops LRMP* area, including TFL 18. I encourage the licensee to participate fully in these ongoing discussions. Any new information or revised strategies can be accommodated in future analyses.

Determination

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects the socio-economic objectives of the Crown for the area, that ensures longer-term IRM objectives can be met, that reflects current management practices, can best be achieved in TFL 18 at this time by establishing an AAC of 177 650 cubic metres.

Implementation

This determination is effective October 25, 2000 and will remain in effect until a new AAC is determined, which must take place within five years of this determination. In the period following this determination and leading to the subsequent determination, I expect the licensee to:

- further investigate the growth and yield and stand dynamics of residual balsam stands that are proposed to be managed as future crops;

- review and refine operational adjustment factors (OAFs);

- in cooperation with district and regional staff, clarify management practices and modelling assumptions for visually sensitive areas;
- review assumptions for minimum harvest age.

Larry Pedersen
Chief Forester
October 25, 2000

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 a volume of timber to be harvested from each woodlot licence area during each year or other period of the term of the woodlot licence, according to the licence.

(7) The regional manager or the regional manager's designate must determine a volume of timber to be harvested from each community forest agreement area during each year or other period, 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) silviculture treatments to be applied to the area,

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

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

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

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

(c) 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.

- - - - - -

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

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests