BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 44

Issued to MacMillan Bloedel Limited

Rationale for Allowable Annual Cut (AAC) Determination

Effective January 1, 1998

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Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 44. This document also identifies where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 44 is held by MacMillan Bloedel Limited and is administered by the South Island Forest District, which is part of the Vancouver Forest Region. It consists of eight separate supply blocks on west-central Vancouver Island, located in the vicinity of Port Alberni, Tofino, Ucluelet and Bamfield. It extends from Strathcona Park in the north to Walbran Creek in the south, including land from the Pacific Ocean east to the Beaufort Mountain Range and to Mount Arrowsmith. The administration of the TFL spans three of the licensee's working divisions:

Division	Supply Blocks
Franklin Woodlands	Blocks 1 and 2
Alberni West	Block 3; Block 4; and Part of Block 5
Clayoquot	Most of Block 5; and Blocks 6, 7 and 8

A reorganization of operations at the beginning of 1997 resulted in the formation of the Alberni West and Clayoquot Divisions, in areas previously managed as the Sproat Lake and Kennedy-Estevan operations.

The total area of TFL 44 is 452 826 hectares. This includes 42 219 hectares designated as protected areas or parks from: the Government's Clayoquot Sound Land Use Decision of April 1993; the Vancouver Island Land Use Plan (VILUP)—Bill 53, 1995; and areas designated as Goal 2 parks under the Protected Areas Strategy (PAS) of the VILUP (1996-97). Of the remaining 410 607 hectares, 82 percent or 337 259 hectares are considered productive forest land. Of this, 18 percent is privately held forest land, 17 percent is in Timber Licences, and 65 percent is Crown land.

A significant portion of TFL 44—101 009 hectares or approximately 22 percent (excluding parks and protected areas)—is located within Clayoquot Sound, a 265 000-hectare area on the west coast of Vancouver Island bounded by the provincial Government's 1993 Clayoquot Sound Land Use Decision (CSLUD). This area is covered by an Interim Measures Agreement between the provincial government and hereditary chiefs of the Nuu-chah-nulth Central Region Tribes. Management of the area is to be in accordance with the recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. In view of the unique forest management history of the Clayoquot Sound area, I have considered it separately in this determination under the section entitled "Clayoquot Sound."

There are 11 First Nations whose traditional territories overlap with the geographic area that includes TFL 44. They include approximately 6340 members (to August 1997).

History of the AAC

Harvesting and sawmilling have occurred for over a century in the area now covered by TFL 44. In 1955, Forest Management Licences (FML) No. 20 (Tofino) and 21 (Alberni) were awarded to MacMillan Bloedel Limited's predecessor companies. The Crown-granted properties included in these FMLs were certified as Tree Farms (TFs) 13 and 14 respectively. FMLs were later renamed TFLs and TFs became Managed Forest Units.

In 1984, the two TFLs were combined as TFL 44, and the two TFs were combined to form Managed Forest Unit 74.

The AAC set for Management Plan (MP) No. 1 for TFL 44 in 1985 was 2.838 million cubic metres. On December 31, 1991, the chief forester determined an AAC for TFL 44, for the period January 1, 1991, to December 31, 1995, of 2.42 million cubic metres. MacMillan Bloedel Limited appealed this AAC determination to an appeal board which, by majority, varied the chief forester's determination and set the AAC for the period January 1, 1991, to December 31, 1993, at 2.68 million cubic metres. The Ministry of Forests' appeal of this decision to the British Columbia Supreme Court was heard in July 1993, and a decision upholding the board's decision was rendered on December 22, 1993.

The expiry on December 31, 1993, of the AAC set by the appeal board required the chief forester to determine an AAC for TFL 44 for a period beginning January 1, 1994. At that time, for practical purposes, the chief forester chose to determine the AAC for the duration of Management Plan No. 2, and also extended the period of Management Plan No. 2 for one year in order to allow the incorporation of recommendations resulting from the Clayoquot Sound Scientific Panel (the Panel) and interagency planning teams for the special management areas in Clayoquot Sound. The chief forester determined an AAC of 2.45 million cubic metres, effective January 1, 1994.

In June 1994 the AAC was temporarily reduced under Part 15 [now Part 13] of the *Forest Act* to 2.228 million cubic metres to reflect the timber supply impacts of Government's Clayoquot Sound Land Use Decision of April 1993. This included protected areas and the designation of special management zones, and attempted to account for anticipated changes to management practices within Clayoquot Sound. This temporary reduction expired on December 31, 1997.

The AAC is currently partitioned (under Section 8(5) of the *Forest Act*) by working circle and by operability class as follows:

Partitioning in the current AAC:

(cubic metres)

		Operability			
Working Circle (see table below, p. 13)	Conventional	Non-conventional	Sub-totals	Marginally economic*	Total
Alberni East	1 145 000	23 000	1 168 000		
Alberni West	485 000	86 000	571 000		
Ucluelet	34 000	0	34 000		
Clayoquot	595 000	32 000	627 000		
Totals	**2 259 000**	**141 000**	**2 400 000**	**50 000**	**2 450 000**
Part 15 reduction (Clayoquot)					**222 000**
AAC					**2 228 000**

*The marginally economic component is not partitioned by working circle

New AAC determination

Effective January 1, 1998, the new AAC for TFL 44, including Schedule A private land, and all Schedule B land including the Small Business Forest Enterprise Program, will be 1 890 000 cubic metres, an overall decrease of 15.2 percent. Of the total AAC, a maximum of 130 000 cubic metres are attributable to harvesting in accordance with local planning in Clayoquot Sound, and at least 40 000 cubic metres are attributable to marginally economic stands outside Clayoquot Sound. There are no other partitions for the working circles outside Clayoquot Sound or for other operability classes.

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

Having now determined a new AAC for TFL 44 under Section 8 of the *Forest Act*, the temporary AAC reduction previously ordered for TFL 44 under Part 15 (now Part 13) of the *Forest Act*, related to Orders-in-Council Nos. 718 and 719, is no longer required, and I note that these OICs expired on December 31, 1997.

Information sources used in the AAC determination

Information considered in determining the AAC for TFL 44 includes the following:

- Tree Farm Licence No. 44, Draft Management Plan No. 3, January 1998 to December 2002, dated July 31, 1997, prepared by MacMillan Bloedel Limited;
- Statement of Management Objectives Options and Procedures (SMOOP) for Management Plan No. 3, TFL No. 44, February 1997;
- Timber Supply Analysis Report: TFL 44, Management Plan No. 3, dated July 1997, prepared by MacMillan Bloedel Limited;
- TFL 44, Management Plan No. 3, Report of Twenty-Year Harvest Plan, 1997 to 1016, dated July 1997, prepared by MacMillan Bloedel Limited;
- Public input solicited by the licensee regarding the contents of Management Plan No. 3;
- Approval letter for Management Plan No. 2 for TFL 44, dated December 31, 1991;
- 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 Minister of Forests to the chief forester dated September 17, 1996, stating the Crown's economic and social objectives for Clayoquot Sound;
- 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;
- Letter from the Vancouver Forest Regional Manager to licensees dated May 22, 1996, providing direction on landscape-level biodiversity strategies;
- Memo from the Vancouver Forest Regional Manager dated December 15, 1997, to district managers and regional team leaders, regarding wildlife tree patch implementation;
- Letter from the Central Region Board to the chief forester dated November 10, 1997;
- Technical information provided through correspondence and communication among staff from the British Columbia Forest Service (BCFS) and the Ministry of Environment, Lands and Parks (MELP);
- Technical information provided through a meeting between the chief forester, BCFS staff and MacMillan Bloedel Limited on September 30, 1997;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS and MELP staff, including the AAC determination meeting held in Victoria on November 5 and 6, 1997;
- Technical information from a meeting between the chief forester, BCFS staff, and the Huu-ay-aht First Nation on November 19, 1997;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations*, April 1995;
- *Forest Practices Code of British Columbia* Guidebooks, BCFS and MELP; and
- *Forest Practices Code Timber Supply Analysis*, BCFS and MELP.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires me as 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 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 the complete answer or solution to forest management problems such as AAC determination. 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 I must consider in AAC determinations.

In making the AAC determination for TFL 44, 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 (TSAs) and tree farm licences. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

It should be noted that the following guiding principles apply to all areas in TFL 44 outside Clayoquot Sound, while a unique set of guiding principles is included in the "Clayoquot Sound" section for that portion of the determination.

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. 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 (the Code).

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

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors.

In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The impact on the timber supply of land-use decisions resulting from planning processes such as the Commission on Resources and Environment (CORE) process for sub-regional plans, the Protected Areas Strategy or the Land and Resource Management Planning (LRMP) process is a matter often raised in discussions of AAC determinations. In determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been taken by government. Thus I do not consider the 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 land-use decisions, it may not always be possible to analyze the full timber supply impact in AAC determinations. In most cases, government's land-use decision must be followed by 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 is impossible to fully assess the overall impact of the land-use decision. Where specific protected areas have been designated by legislation or by order in council, these areas are no longer considered to contribute to timber supply. The legislated requirement for five–year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

TFL 44 falls within the purview of two land use decisions—the Vancouver Island Land Use Plan (VILUP) and the CSLUD.

The VILUP provides regional guidance in managing the forest resources on Vancouver Island. Under this plan, protected areas have been designated and are fully accounted for in the determination. Other components of the VILUP which may have a bearing on operational planning, such as proposed resource management zones and associated objectives, are currently under public review. While proposed objectives may be declared a higher level plan under the Code in the future, the timber supply implications of the VILUP will remain uncertain and cannot be taken fully into account until the process is completed and the associated implementation decisions have been taken.

In the case of the CSLUD, the provincial government subsequently accepted the recommendations in the report by the *Scientific Panel for Sustainable Forest Practices in Clayoquot Sound*. In accordance with the Minister of Forests' stated social and economic objectives of the Crown for the Clayoquot Sound area (see Appendix 5), I view the ongoing implementation of the Scientific Panel's recommendations as a matter for inclusion in my considerations under section 8 of the *Forest Act*. Many aspects of the Scientific Panel's recommendations are not known with precision and thus it is very difficult to determine the associated timber supply implications. But as far as possible in AAC determinations I will consider such decisions as have been made through the implementation process with the aim of ensuring the allowable harvest level does not compromise the implementation of the Panel's recommendations. To help attain this goal, as noted above I have prepared a set of guiding principles unique to AAC determinations for areas of Clayoquot Sound. These principles apply only to the Clayoquot Sound portions of the three management units which include land within Clayoquot Sound (i.e. TFL 54, the Arrowsmith Timber Supply Area and TFL 44) and are presented in the "Clayoquot Sound" section of this document.

Forest Renewal British Columbia is funding 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 superior to those available in the past, and will undoubtedly provide for more reliable determinations.

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

With respect to First Nations' issues, I am aware of the Crown's legal obligations regarding aboriginal rights resulting from recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations regarding aboriginal rights 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 44. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 8(7) of the *Forest Act* and will be respected in the administration of the AAC determined. In the special case of Clayoquot Sound, it is expected that First Nations' concerns will be taken into account in the local planning and management of Crown forest lands by the participation of First Nations on the Clayoquot Sound Central Region Board.

I am also aware that there are implications for aboriginal title from the recent Supreme Court of Canada Delgamuukw decision. At this date the manner in which the Province will implement measures related to aboriginal title remains uncertain. However, with regard in particular to future treaty decisions, as with other land-use decisions it would be inappropriate for me 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 (MOF) 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 TFLs, the analysis work is carried out by licensees.

For each AAC determination 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, timber supply forecasts are produced. These include sensitivity analyses to assess the timber supply effects of uncertainties or changes in various assumptions around a baseline option, normally referred to as the "base case" forecast.

The base case forecast may incorporate information about which there is some uncertainty. Its validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer model 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 judgement, using current information available 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 Forest Practices 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 judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that may in part be based on uncertain information are essentially qualitative in nature and, as such, 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.

As noted previously, the Clayoquot Sound portion of TFL 44 is addressed separately in this AAC determination and rationale document. A description of the separate base case analysis used for that portion of the TFL is provided under "Timber Supply Analysis for Clayoquot Sound" and "Clayoquot Sound Timber Supply Analysis Base Case Projection".

For the TFL area outside Clayoquot Sound, a separate base case analysis was conducted for each of the three working circles (Alberni East, Alberni West and Ucluelet). These projections were combined to form a base case projection (referred to throughout this document as the "base case") for the whole of the TFL area outside Clayoquot Sound. This projection indicated an initial harvest rate of 1 760 000 cubic metres per year. This level, which is 2.5 percent lower than the 1 806 000

cubic metres currently attributable to this portion of the TFL, is consistent with the licensee's strategy of proposing a series of gradual adjustments to harvest levels in a managed transition toward the licensee's best estimate of the long-term harvest level for TFL 44. In the base case, the harvest level declined by an average of seven percent per decade for the first twenty-five years, to a mid-term-lowest level of 1 464 000 cubic metres, rising over the next decade to slightly less than the long-term level of 1 571 000 cubic metres, which is reached 100 years from now.

The base case short-term projection of 1 760 000 cubic metres for TFL 44 outside Clayoquot Sound combined with the base case for Clayoquot Sound of 130 000 cubic metres gave a combined harvest level for TFL 44 of 1 890 000 cubic metres, an overall reduction (from the previous, temporarily reduced AAC of 2 228 000 cubic metres) of 15.2 percent. As discussed below, the majority of this decrease is attributable to current planning and operating conditions in the Clayoquot Sound portion of the TFL.

Timber supply analysis (outside Clayoquot Sound)

The timber supply analysis for TFL 44 was prepared by the licensee and submitted to the Ministry of Forests in July 1997. TFL 44 was separated into four working circles. Each working circle was modelled separately. The working circles are:

Working Circle	Description
Alberni East	Blocks 1 and 2
Alberni West	Block 3 (except Compartment 10E) and Block 4
Clayoquot	As defined by the Clayoquot Sound planning process: Blocks 6, 7 and 8, a major portion of Block 5 and Compartment 10E (Upper Kennedy River) of Block 3
Ucluelet	Remainder of Block 5

This section of my rationale statement will focus only on the three working circles of Alberni East, Alberni West and Ucluelet.

The licensee used its Forest Estate Model (FEM), an inventory projection simulation model which includes provision for and examination of forest cover requirements at different levels, for the Alberni East, Alberni West and Ucluelet working circles. Based on previous experience in examining results from this model, I am satisfied that it is capable of providing a reasonable projection of timber supply.

In the licensee's timber supply analysis, Option 2 is intended to reflect current procedures for TFL 44 under Management Plan No. 3. This option represents the base case which is discussed above under "The role of the base case" and forms the basis for comparison with other management options and sensitivity analyses. It also forms the basis of the licensee's recommendation for an AAC of 1.76 million cubic metres for working circles Alberni East, Alberni West and Ucluelet.

Sensitivity analyses were provided with the timber supply analysis 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*

What follows under "Consideration of Factors as Required by Section 8 of the *Forest Act*" refers in the main to the TFL 44 Working Circles of Alberni East, Alberni West and Ucluelet, although some information—the procedure for deriving the net timber harvesting land base, and the condition of the inventory for instance—is also pertinent to the separately treated Clayoquot Sound area. The explicit guidance and evaluation which pertain only to the determination of a suitable harvest level for the Clayoquot Sound part of TFL 44 are documented in the Section "Clayoquot Sound".

Section 8 (7)

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

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

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

Land base contributing to timber harvest

- *general comments*

The area of TFL 44, excluding protected areas (42 219 hectares) and the Clayoquot Sound portion of TFL 44 (101 009 hectares), as reported in the timber supply analysis, is 309 598 hectares. Non-forest and non-productive areas account for 36 517 and 13 059 hectares respectively, leaving a total productive forest land base of 260 022 hectares (139 342 hectares in Alberni East, 110 839 hectares in Alberni West, and 9 841 hectares in Ucluelet).

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 harvesting—a series of deductions were made from the productive forest land base. These deductions accounted for the factors which operate to reduce the productive forest area, for economic or ecological reasons. 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. These factors are described in detail below.

In reviewing this process I am aware that some areas may have more than one classification—e.g. environmentally sensitive areas (ESAs) may also lie in 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 for timber supply analysis purposes. Hence, the deduction reported in the analysis or the AAC rationale in respect of a given factor may also overlap other sensitive sites.

The productive land base is further reduced for the construction of roads, trails and landings required to access and harvest timber. Following deductions for existing and future roads, trails and landings, the long-term timber harvesting land base is estimated to be 172 943 hectares, or 56 percent of the total area, with contributions of 97 168 hectares from Alberni East, 68 983 hectares from

Alberni West and 6 792 hectares from Ucluelet. That is, from the TFL area of 309 598 hectares (i.e. excluding parks and Clayoquot Sound), a total of 136 655 hectares were excluded from contributing to the timber harvest, as detailed in the following sections.

In assessing the land base deductions outlined below, I have been mindful of a sensitivity analysis provided by the licensee which showed that if the timber harvesting land base were reduced by a further five percent, the initial harvest level projected in the base case would be reduced by two percent, although the base case initial level could still be achieved by permitting a slight increase in the rate of decline toward the long-term harvest level (see also below, "Alternative harvest flows"). I have also considered this sensitivity analysis in my "Reasons for Decision".

- *non-forest areas*

Included in non-forest areas are alpine, rock, water, swamp and existing roads. In total 36 517 hectares were deducted from the land base.

- *non-productive and low-productivity forest areas*

Approximately 13 059 hectares were classified as non-productive forest, defined as having mature (i.e. 120 years or over) inventory volumes of less than 211 cubic metres per hectare, and were excluded from contributing to the timber harvesting land base.

In the timber supply analysis, low-productivity sites were not specifically identified and deducted from the land base. However, using inventory site indices, only 71 hectares of site index class 10 and less were identified in the productive land base, and it is likely that these were excluded through overlap with areas that are currently uneconomic to harvest. In any case, the area concerned is small enough that its inclusion in the timber harvesting land base, in whole or in part, would have negligible impact on the timber supply. I note also that the licensee includes harvesting operations in lower-productivity sites roughly in proportion to their occurrence in on the timber harvesting land base. I am therefore satisfied that no adjustment to the base case projection is required with respect to low productivity sites.

- *economic and physical operability*

The size of the timber harvesting land base in TFL 44 identified by the licensee is limited by physical and economic constraints, mapping for both of which was completed in TFL 44 in 1993 and accepted by the British Columbia Forest Service (BCFS) for use in the timber supply analysis on January 4, 1996.

In the timber supply analysis for TFL 44, 8606 hectares, with 5 048 000 cubic metres of timber, were deducted from the productive forest area to account for areas classified as physically inoperable for harvesting by current methods—i.e. where the land is too steep or rocky or both, where trees may not be safely felled or yarded, or where harvesting activities would result in damage to, or unrecoverability of, a significant portion of the timber volume.

Similarly, 5920 hectares with 1 795 000 cubic metres of mature timber were excluded from the timber harvesting land base as currently uneconomic to harvest.

Based on my review of the assumptions incorporated in the analysis and my knowledge of the TFL area, combined with the fact that the South Island Forest District supports the operability as mapped, I accept the current estimates of economic and physical operability as a reasonable approximation of the total operable land base in TFL 44.

The current AAC includes a partition of 50 000 cubic metres attributable to marginally economic stands throughout the TFL, including Clayoquot Sound. This would imply a proportionally lower volume, reasonably in the range of 30 000 to 40 000 cubic metres, attributable to the area of the TFL outside Clayoquot Sound. Draft Management Plan No. 3 identifies the three-year average volume (1994-96) harvested annually in these stands outside the Clayoquot Sound area as 41 000 cubic metres.

In the licensee's base case analysis the harvest level projection was based on contributions from conventionally operable, non-conventionally operable and marginally economically operable stands in proportion to their actual distribution of these three categories of operability on the TFL landscape, i.e. 80.6 percent, 15.2 percent and 4.2 percent respectively.

Assuming proportional harvesting of this operability profile would imply an initial harvest level for the marginally economic stands of 4.2 percent of the projected initial harvest level of 1 760 000 cubic metres annually. This amounts to 73 900 cubic metres annually. The licensee's 20-year plan also assumes this level of harvesting in the marginally economic stands. However, the licensee's management plan proposes a harvest at this time of just 30 000 cubic metres annually in the marginally economic stands.

I am concerned that if harvesting in the marginally economic stands were to proceed at the level of 30 000 cubic metres as proposed in Management Plan No. 3, while a contribution of 73 900 cubic metres is incorporated in the analysis and the 20-year plan, in the future these stands will come to comprise an ever-increasing proportion in the distribution of operability classes on the TFL landscape. This would introduce a growing risk of economic uncertainty in an AAC that would be predicated on an increasing proportion of the harvest coming from stands of low economic viability.

Therefore, in order to move the harvest level in these stands toward a better approximation of their current proportional occurrence on the landscape and their corresponding representation in the timber supply analysis and the 20-year plan, I have concluded to establish the partition for harvesting attributable to marginally economic stands outside Clayoquot Sound at this time at a level of a minimum of 40 000 cubic metres, as noted below under "Partitioned component of the harvest" and "Reasons for decision". This level will still require a proportionally greater harvest from these stands in the future, but will also provide the licensee with some lead time to accommodate their inclusion as an increasing fraction in its operations.

Given the importance of harvesting in this component, I am also concerned that it be administered in such a way that the partitions, as described, are accurately classified and that accurate recording of depletion within the partitions is achieved. In view of the need to account for unique operational considerations, I generally leave the details of administering partitions to operational staff.

Therefore, the district manager, in approving harvesting within the marginally economic partition, has the prerogative to ensure that cutblocks are substantially in stands which meet the criteria in the Management Plan. However, in doing this, I expect the district manager to consider field examinations and new cruise information, not merely the broad forest cover typing in the inventory. I am advised that the district manager, regardless of the classification on the forest cover maps, intends to assess performance within the partition against the criteria, not the mapping classification, and in my view this is an acceptable approach. Should significant discrepancies become apparent, the licensee should revisit the classification before the next analysis.

- *environmentally sensitive areas (ESAs)*

Based on the licensee's various non-timber resource inventories and accounting for overlaps, 45 676 hectares were identified in the TFL as environmentally sensitive and were removed from the productive forest land base in the analysis. These environmentally sensitive areas include: sensitive soils and avalanche areas; riparian reserves; reserves for wildlife areas—including areas for deer, elk, and marbled murrelet; reductions for community watersheds; and reserves for recreation areas.

Consideration of sensitive soils and avalanche areas follows immediately below, and sensitive site categories relating to integrated resource management—e.g. riparian management areas, community watersheds, wildlife areas, and visual quality objectives—are considered later in the section entitled, "Integrated Resource Management Objectives".

- *sensitive terrain/soils and avalanche run-out areas*

The licensee identified three issues related to soil management for TFL 44:

- potentially unstable terrain where landslides can occur;
- surface soil erosion; and
- soil disturbance from road building and yarding activities.

For this timber supply analysis, the licensee accounted for sensitive soils by extrapolating the results of five-class terrain stability mapping where it was available to areas where this inventory has not yet been completed. Seven broad 'zones' for the TFL were delineated on the basis of geographic boundaries and similar biogeoclimatic characteristics. Each broad "zone" contains areas for which terrain stability mapping was available. Soils information from these areas was then used to calibrate the land base reduction factors for the soils ESA inventory on areas where terrain stability mapping was not available. Using this method, a total of 13 946 hectares were removed from the productive operable land base for areas identified as sensitive soils, which includes overlaps with other sensitive sites. This alternative procedure was accepted for use in this timber supply analysis by BCFS regional staff on May 9, 1996.

Mapped avalanche areas amount to a total of 672 hectares of forested area. Twenty percent of this area, which amounted to 74 hectares of the productive operable area, was excluded from contributing to the timber harvesting land base. This was also accepted for use in the timber supply analysis by BCFS regional staff on May 9, 1996.

From my review of the methodology applied, and on the basis of the acceptance by the BCFS of the estimates for terrain sensitive soils and avalanche considerations used in the timber supply analysis, I consider these estimates to be appropriate and acceptable for use in this determination.

- *deciduous forest types*

In the analysis, all stands comprised primarily of deciduous tree species—1986 hectares—were deducted from the productive forest land base. There has been very little conversion of deciduous to coniferous stands in recent years; hence this deciduous area is excluded.

Given that there have been and currently are no plans to utilize deciduous species, I am satisfied that the deductions for deciduous forest types are appropriately applied in the derivation of the timber harvesting land base.

- *forest ecosystem networks*

Policy and practice for attaining objectives for biodiversity at the landscape level on forest lands are evolving and currently incorporate a number of elements and strategies. Contributions to the necessary distribution of forest cover and other attributes on the landscape are made through existing protected areas, ecological reserves and wilderness areas, riparian management areas, lakeshore management areas, wildlife habitat areas, terrain sensitive areas, recreation areas, visually sensitive areas, inoperable areas and areas that provide habitat for threatened or endangered species. Forest Ecosystem Networks (FENs) are intended to provide links for a contiguous network of old-growth and mature forests, some of which provide forest interior habitat conditions, delineated in a managed landscape. FENs aim to meet the needs of native species and ecological processes, and also serve to maintain or restore the natural connectivity within a landscape unit.

During the period of Management Plan No. 1, biodiversity guidelines were developed specifically for TFLs 44, 46 and 54. Consistent with these guidelines and with the expressed expectation of the chief forester in his approval letter for Management Plan No. 2, dated December 31, 1991, the licensee mapped FENs and planned operations accordingly. On May 22, 1996, the Vancouver Forest Regional Manager sent a letter to licensees to assist them in planning operations in view of the Forest Practices Code, the associated Guidebooks, and the *Forest Practices Code Timber Supply Analysis*. The letter stated that the BCFS would recognize mapped FENs in 1996 Forest Development Planning. Following this letter and advice from BCFS specialists the licensee deducted all areas mapped as FEN linkages—a total of 19 002 hectares—from the land base used in the timber supply analysis.

In reviewing the appropriateness of this deduction for draft FEN links, I have considered that: the draft FEN links were established consistent with specifically developed guidelines and with an expressed expectation of the chief forester; that there is ongoing work between MELP, BCFS and licensee staff to refine and improve on the location and boundaries of FEN links; and that the Vancouver Forest Regional Manager's May 22, 1996, directive provided licensees with expectations for the management of biodiversity at the landscape level on an interim basis until landscape-level strategies are developed. This directive included interim recognition of FEN links, and is consistent with the Vancouver Forest Regional Manager's subsequent letter of December 15, 1997, to all Vancouver Forest Region District Managers regarding wildlife tree patch implementation.

I am also aware that the regional landscape unit planning strategy (RLUPS) has been developed for the district and region, and that as part of this exercise, Biodiversity Emphasis Options (BEOs) have been recommended.

From this I acknowledge that the existing draft FEN links are currently being used as an interim measure until the ongoing work is completed and landscape-level biodiversity requirements are known. As these are currently incorporated into operational practice, I consider it reasonable to rely on the draft FEN links to help in assessing the timber supply implications of landscape-level biodiversity, at least until the landscape-level biodiversity strategies are implemented by the district manager.

Since the licensee has modelled draft FEN links as a netdown in the timber supply analysis based on the assumption that draft FEN links will exist until the landscape-level biodiversity strategies are

developed, and since this modelling reflects current operational procedures, I conclude that no adjustment to the projected timber supply is required at this time on this account. However, I am aware that the interim management strategy may be subject to change as the landscape unit planning process proceeds, and that the draft FEN links as currently delineated may or may not become integrated into the final landscape unit plans.

- *additional old-growth reserves*

The *Biodiversity Guidebook* recommends minimum areas for retention of old-growth on the landscape. In the TFL 44 timber supply analysis, old-growth areas reserved in all land base reductions were compiled by draft biodiversity landscape unit and biogeoclimatic variant. In variants where the minimum requirements were not met by this method, they were achieved by further reducing the timber harvesting land base in the appropriate variants. Where sufficient areas of old-growth were not available to meet these requirements, areas of the oldest second growth were excluded in deriving the timber harvesting land base. These additional reductions amounted to 1775 hectares of mature timber.

As noted below, in *landscape-level biodiversity*, due to the lack of detail in the delineation of natural disturbance types (NDTs), if the landscape units that are eventually approved are consistent with the draft units as modelled, then technically this figure should have been 1239 hectares. However, the correct analytical procedures were applied, and to the extent that any adjustment in the analysis is required, this can be made most appropriately when the landscape units have been approved, at which time any difference from the draft units can also be taken into account. For this determination I am prepared to accept the applied deduction as a reasonable approximation. I note that this and the FEN deduction discussed above contribute to the provision of old-growth reserves on the landscape, a subject of public concern in the review of the draft management plan for TFL 44.

- *estimates for current and future roads, trails and landings*

Current road reductions are accounted for in the “non-forest areas” reduction above. This includes 8264 hectares of road area which amount to approximately 6 percent of stands aged 60 years and younger.

In the timber supply analysis, to account for future roads, trails and landings in areas harvestable by conventional systems, a 7-percent area reduction was applied to mature stands. No reduction was applied to stands harvested with non-conventional harvest systems as the licensee expects these to be accessed from adjacent areas harvested with conventional systems. For future roads in forests established prior to 1940, the productive area was reduced by 5 percent after the initial harvest. These estimates led to a combined 4114-hectare, or 2.3-percent reduction from the initial timber harvesting land base. I note that these reductions are reasonably consistent with adjacent areas (3 percent for TFL 54) and that South Island Forest District staff agree with the reductions applied. I have therefore considered this estimate to be reasonable for use in this determination.

<u>Existing forest inventory</u>

-age of the inventory

The first forest inventory for areas now comprising TFL 44 was conducted in 1956. This has been maintained and improved with cruises of both the mature and immature forest. The inventory is updated every year to reflect areas and volumes logged. For the purposes of the timber supply analysis, stand ages and heights, as well as changes in land base, ownership, logging, fire and reforestation, were updated and are current to December 31, 1995.

Upgrades of the inventory since 1956 include a reinventory conducted between 1973 and 1977, the addition of operational cruise information on 63 500 hectares in 1987 to improve the less intensive original inventory on these areas, and at the same time, recalculation of average volume lines to reflect the samples remaining after harvesting. Furthermore, since 1977, 15 000 hectares of second-growth stands were reinventoried and added to the database as part of the licensee's reinventory program aimed at pole-sized stands (i.e. generally aged between 20 and 35 years).

In 1995, the licensee started a program to test or audit the accuracy of the TFL 44 mature inventory. The first test, carried out under BCFS supervision, was on Block 2 (Franklin River Division). This area covers 34 percent of the total mature inventory for TFL 44 (less Clayoquot Sound). It showed no significant difference between the test plot volumes and the inventory. More recently, Block 3 (Sproat Lake) and Block 4 (Henderson Lake) were tested. Again, the inventory and audit volumes were not significantly different. The licensee plans to audit the remaining 10 000 hectares of mature inventory located in Block 1 (Cameron River) in 1998.

Since the last timber supply analysis, the main change in the inventory was the declaration of the 1995 *Park Amendment Act* (Bill 53) which protected the following area within TFL 44 (outside Clayoquot Sound):

Working Circle	Total Area (hectares)	Productive Forest Area (hectares)	Mature Volume (cubic metres)
Alberni West	3 335	1 886	886 000
Alberni East	5 753	5 606	4 827 000
Total	9 088	7 472	5 713 000

In addition, Goal 2 areas were protected in 1996. This resulted in the removal of a further 187 hectares or 159 000 cubic metres of mature volume.

Currently 43 824 000 cubic metres of mature timber volume (in stands greater than 120 years old) exist on the timber harvesting land base of TFL 44 (excluding Clayoquot Sound).

I note that the inventory has been kept up to date and that the licensee has taken the initiative of testing the accuracy of the inventory in order to provide me with reliable information. I accept the inventory data as the best available information and, as such, suitable for the purposes of my determination.

In Management Plan No. 3, the licensee has committed to recompiling the inventory, including the addition of operational cruises completed since 1987, recompiling the 1970's inventory to exclude logged samples and samples in operationally cruised areas, and using the latest Kozak 4.0 taper equations. The results of the inventory recompilation should be completed for the next determination.

- *age-class distribution*

Approximately 33 percent of the timber harvesting land base is covered by stands more than 250 years old, only 1 percent by stands between 150 to 250 years old, approximately 4 percent in stands between 70 to 150 years old, 26 percent in stands between 30 to 70 years old, and 36 percent in stands between 0 to 30 years old.

- *species profile*

The TFL 44 timber harvesting land base consists mainly of stands comprised primarily of hemlock, Douglas-fir and cedar. Less common are stands dominated by balsam (true firs), spruce and pine.

Approximately 38.5 percent of the timber harvesting land base is covered by the Douglas-fir "species association" as defined by the licensee (see below, *aggregation procedures*). This includes Douglas-fir, cypress and lodgepole-pine-leading stands. A further 11.6 percent is covered by the western redcedar association and 49.9 percent by the western hemlock species association. This latter association includes western hemlock, mountain hemlock, Sitka spruce, and true-fir leading species.

- *volume estimates for existing stands*

For existing mature stands, maturity was defined at the time of the inventory in 1977 as stands that were aged 100 years. For the purposes of the timber supply analysis they are therefore currently approximately 120 years old. The licensee assumes volumes are constant over time in these stands. In the model, until they are harvested, the volumes are projected using average volume lines.

For existing cruised second growth, stocking information (basal area or volume estimates) obtained during the inventory of pole-sized stands (generally aged 20 to 35 years) was used in assigning yield tables. Yield tables were generated that reflect the range of stocking within the existing inventory.

The licensee provided a sensitivity analysis for mature stands that shows the impact on timber supply of increasing and decreasing the average volume line estimates by 10 percent. This analysis indicated a resultant increase of 3 percent, and a decrease of 4 percent, respectively, in the short-term timber supply, and medium-term impacts that are reasonably proportionate to the change in average volume line. As discussed briefly above, under *age of the inventory*, in 1995 the licensee started a program to test, or audit, the accuracy of the mature inventory in TFL 44. Again, I note that audit results to date show no significant difference between the test plot volumes and the inventory. Therefore, I accept the volume estimates for existing stands used in the timber supply analysis as suitable for use in this determination.

<u>Expected rate of growth</u>

- *site productivity estimates*

Inventory data includes estimates, for each stand, of site productivity expressed in terms of a site index. A site index is based on the height, as a function of the age, of a particular stand of trees. The productivity of a site largely determines how quickly trees will grow, and therefore affects the time seedlings will take to reach green-up conditions, the volumes of timber that will grow, and the age at which stands will satisfy mature forest cover requirements and reach a merchantable size or minimum harvestable age.

Generally, stands between 30 and 150 years of age provide the most accurate measurement of site productivity. Site indices determined from both young stands (less than 30 years old), and old stands (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 other areas of the province where studies suggest that site indices may be higher than indicated by existing data from mature forests.

To provide a more accurate estimate of site index the licensee has developed an alternative method for estimating site indices for regenerating stands that replace currently mature stands upon harvest. This method relates a known series of site indices measured from the licensee's extensive second-growth inventory of sample plots, cruise plots and research plots to biophysical attributes such as species, location, elevation, slope, aspect, and biogeoclimatic variant. Using these relationships, site indices were estimated for all stands in the forest based on each stand's specific biophysical site factors.

This biophysical method—the "biophysical decision tree "—was reviewed by BCFS Research Branch staff and the Forest Productivity Council of British Columbia who directed the licensee to address certain concerns. Among other issues, it was felt that additional variables such as soil moisture and nutrient regime should be added to obtain an accurate prediction of site index and that more validation and testing of this method were required. The licensee did improve some aspects of the decision tree method, but some of the requested improvements were not possible as the necessary information had not been gathered during the inventory. Nevertheless, on the recommendation of BCFS Research Branch, the information was accepted on April 11, 1995, by BCFS Timber Supply Branch staff as the best current information for use in the timber supply analysis base case for stands up to 20 years breast-height age and for stands 120 years breast-height age and older.

The licensee plans to improve on this method by adding additional variables to the site index relationships. I am aware that there is still some outstanding uncertainty with this approach which the licensee will need to address if this method continues to be used in future timber supply analyses. The licensee should continue to consult with BCFS staff regarding acceptable methods for adjusting site indices.

In the base case, measured site indices were assigned to 58 000 hectares of older second-growth stands (22 percent of the productive forest) for stands aged between 20 and 121 years at the time of inventory. Site indices derived using the decision-tree approach were assigned to the remainder of the inventory.

The licensee provided sensitivity analysis showing the harvest forecast if the current inventory site indices were applied unadjusted. This analysis showed that if the site index assigned in the inventory were correct (i.e. if no adjustment were required), the long-term harvest level in Alberni East would be reduced by 21 percent, in Alberni West by 17 percent, in Ucluelet by 35 percent, and in all three working circles combined by 20 percent. In addition, to maintain a rate of decline in the short- and medium-term harvest forecast of ten percent per decade or less, the initial harvest level would have to be reduced by 67 000 cubic metres per year on the three working circles combined.

I note that the methodology used in assigning site indices for managed stands has been accepted by the BCFS Timber Supply Branch for use in the timber supply analysis following detailed consultation with Research Branch specialists. In addition, as I noted above, province-wide studies are indicating that site indices in old stands are often underestimated. I conclude that the assumptions used by the licensee for site productivity are reasonable, reflective of the best currently available information, and acceptable for use in this timber supply analysis.

- *aggregation procedures*

For this timber supply analysis, the inventory for TFL 44 was aggregated into forest regeneration types which were defined based on species association, biogeoclimatic grouping, and broad site index class.

"Species associations" were defined by the licensee to permit yield projection for tree species for which specific growth information is lacking, by associating them with other species for which information is available. In TFL 44 the licensee defined three such species associations—Douglas-fir, western hemlock and cedar. The Douglas-fir species association included yellow cedar and coastal lodgepole pine, whose growth was projected using Douglas-fir yield tables. The western hemlock species association included amabilis fir and Sitka spruce whose growth was projected using western hemlock yield tables. A cedar species association was developed at the request of the BCFS, to account for factors affecting growth on these sites, including brush encroachment and slash accumulations.

Within each forest regeneration type conditions may occur that result in a certain amount of natural fill-in of seedlings, brush encroachment, and varying levels of slash remaining after harvesting. These conditions influence the management regime that will be employed to ensure these areas are properly regenerated. The licensee calls these management regimes "regeneration models." While it was intended that regeneration models specific to each species association would be assigned to regeneration types, in fact the regeneration models specific to the hemlock species association were assigned to the cedar species association. The licensee provided an analysis correcting this misassignment, which indicated no difference from the base case in the short term, and only negligible difference in the medium and long terms.

I have reviewed this approach by the licensee in both its TFLs (TFLs 44 and 39), and I find it to be very detailed and aimed at reflecting operational conditions accurately. In the absence of clear species-based information, noting that the procedure was not disputed by staff of the BCFS Research Branch, and recognizing that the misassignment of the cedar species association to hemlock regeneration types had virtually no impact on the base case forecast, I consider the licensee's aggregation procedures using forest regeneration types and models to be acceptable and reasonable.

- *volume estimates for regenerated stands*

Staff of the BCFS Research and Resources Inventory Branches indicated that the yield projections generated by the licensee's yield model, Y-XENO, for hemlock and Douglas-fir stands required adjustment in order to be acceptable for use in the base case harvest forecast assumptions. In response, the licensee reduced its yield projections for pure Douglas-fir stands by 10 to 17 percent. In addition, at the request of the BCFS, the licensee reduced its projections for older second-growth stands to better reflect natural stocking and distribution. The adjusted yield projections were accepted by Research and Resources Inventory Branches on February 3 and March 6, 1997, respectively.

The licensee provided a sensitivity analysis for regenerated stand yields showing the impact on timber supply of both increasing and decreasing the yields projected in the base case by 10 percent, and of using its unadjusted Y-XENO projections. Each of these changes produced only very slight changes in the short-term timber supply. Therefore, and since the regenerated stand yields were adjusted to BCFS specifications, I am satisfied that the assumptions used in the base case to estimate regenerated stand volumes are reasonable and acceptable for use in this determination.

- operational adjustment factors (OAFs)

To account for the loss of timber volume due to particular operational conditions, Operational Adjustment Factors (OAFs) were applied to the yield projections for regenerated stands used in the timber supply analysis. OAF 1 was applied for unmappable non-productive land, and OAF 2 was applied to account for decay and for waste and breakage during harvest.

For OAF 1 a reduction of 6 percent was applied in Alberni West and Ucluelet, and 4 percent in Alberni East. For OAF 2, the licensee used the 1976 BCFS decay, waste and breakage factors of 5 percent for Douglas-fir and 6.5 percent for Western hemlock.

The licensee's OAFs are lower than those used by the BCFS in other coastal units. However, the licensee states that some OAFs are already included in the development of Y-XENO yield tables and regeneration models, as the licensee's permanent sample plots (PSPs) that were used to develop Y-XENO account to some extent for wind, snow, pests and *Phellinus weirii* root rot (with some of these PSPs having been measured over a 60 year period). In addition, the licensee's regeneration model recognizes differences in stocking and impacts of brush competition on growth.

Staff of BCFS Research Branch have reviewed the licensee's OAFs and consider them to be well documented. Therefore, and for the above reasons, I am prepared to accept the licensee's assumptions regarding operational adjustment factors as appropriate for use in this determination.

- off-site Douglas-fir

A concern was raised by South Island Forest District staff that some areas were planted with Douglas-fir when this was not the species most ecologically suited to the site. The estimated area affected may be as large as 2000 hectares within the Ucluelet working circle. To date, there is little empirical evidence that stand growth is indeed reduced on these areas. However, South Island Forest District staff are concerned that, based on their general experience, growth in off-site Douglas-fir may become affected. In view of this concern, I expect the licensee to monitor the growth of these stands and report on this issue in the next management plan.

- minimum harvestable ages

A minimum harvestable age is an estimate of the earliest age at which a stand has grown to a harvestable condition. Changing the minimum harvestable age mainly affects when second growth will be available for harvest and, accordingly, how quickly existing stands may be harvested. In practice, many forest stands will be harvested at much older ages than the minimum, due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the timber supply analysis, minimum harvestable ages were established using two criteria. The first criterion was the age at which a stand's annual growth is within 0.2 cubic metres per hectare per year of its culmination of mean annual increment (CMAI). This is the point that the stand is at or very close to the age at which its average annual volume growth is at its greatest. The second criterion is that the stand volume must be at least 250 cubic metres per hectare with the trees that

make up the stand having, on average, a minimum diameter at breast height of 25 centimetres. These criteria result in an average minimum harvestable age for TFL 44 of 78 years, based on average ages for each working circle (74 years for Alberni East, 83 years for Alberni West and 84 years for Ucluelet).

The licensee provided sensitivity analysis showing the impact of increasing and decreasing minimum harvestable age by ten years. The results indicate that short- and medium-term supplies for the TFL are substantially affected by a ten-year increase or decrease. However, the minimum harvestable ages used in the base case are reasonable and comparable to other coastal units.

The licensee expressed a concern that prior to the Forest Practices Code, cutblocks were larger in size, more contiguous and less fragmented. Now with the requirements for smaller cutblocks, green-up and adjacency, visual quality, biodiversity and other forest values, cutblock placement is more difficult and results in a more dispersed distribution over the landscape. Since the amount of harvestable old growth is decreasing and substantial areas of second growth are reaching merchantable age, the licensee has proposed a strategy of developing more harvesting opportunities in second-growth stands.

South Island Forest District staff support this strategy in that it would offset operational pressures on the remaining old-growth in the TFL and increase options for cutblock placement now and in the future, to accommodate other resource values.

To test the strategy, sensitivity analysis was conducted examining the implications of changes to minimum harvestable ages from those assumed in the base harvest forecast for TFL 44. In this analysis, minimum harvestable ages based on financial rotations were assigned to 25 percent of the area currently in second growth and above site index 18. The harvest flow strategy was to use the same initial harvest levels as in the base case, to fill in the lower mid-term harvest levels projected in the base case for Alberni West and Ucluelet, and to reduce the decline in Alberni East. This particular harvest flow resulted in a reduced medium-term timber supply deficit, but in doing so incurred a protracted shortfall in the longer term. The second-growth harvesting strategy should ultimately be more balanced by setting a harvest flow that avoids increasing short- to medium-term harvest levels at the expense of longer term levels.

Two factors suggest advantages to an early commencement of harvesting in second-growth stands. First, in the base case, the licensee has included the harvesting of a second-growth component in the short and medium terms, reflecting the current availability of these stands to contribute to the timber supply and associated operational flexibility referred to above. I note that the licensee included harvesting of second-growth stands in the 20-year plan. Second, sensitivity analysis shows that the short- and medium-term impact of increasing the minimum harvestable age by ten years is substantial, which indicates that in the medium term the forecast is reliant on stands being harvested at or close to the base case minimum harvest age. This indicates that unless harvesting in second-growth stands proceeds at rates comparable to those projected in the base case, uncertainty will be introduced into the achievability of the base case forecast. In this respect, I expect the licensee to submit annually a second-growth harvest volume performance summary to the district manager, and I have noted this below, under “Implementation”.

In conclusion, I have accepted the minimum harvestable ages modelled in the base case as reasonable, although I have noted a strategic concern which the licensee should address—the need to begin harvesting in second growth.

(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. The timber supply analysis assumed an average two-year regeneration delay for all recently regenerated stands (i.e. planted, natural and combinations). Establishment of the new stand (for growth estimation purposes) occurs two years following the year of harvest.

The current area that is not satisfactorily restocked (see below, "Not-satisfactorily-restocked (NSR) areas") amounts to the area covered by approximately 2.5 years' of harvesting. The licensee asserts that at the time of surveying and declaring a stand to be restocked, the seedlings are typically one year old. This implies that the seedlings were germinated two years after harvesting. Thus the estimate for the average regeneration delay period is two years. I agree with the licensee's reasoning and I have made no further adjustments for this factor in this determination.

Impediments to prompt regeneration

The licensee's ESA inventories carried out in the early 1990s included an investigation for areas where stand regeneration would be difficult or impossible, but none were identified. (I note there are some problems with brush and salal which are accounted for below under *prescribed burning/brush treatments/salal*.) However, South Island Forest District staff have indicated that colluvial sites that may be difficult to regenerate cover a small area of TFL 44, with regeneration delays potentially in the order of 20 years.

In view of the small area involved, I do not view this as a significant issue from an AAC determination perspective. However, from a management perspective, I am concerned about operating on sites which cannot be successfully regenerated over a 20-year period. Therefore I am requesting the licensee, over the course of Management Plan No. 3, to gain a better understanding of the extent and distribution of these colluvial sites and any associated regeneration problems, and ultimately to clarify the management objectives for these sites, for use in the next timber supply analysis. I am satisfied that no adjustment to the base case is required on this account at this time.

Not-satisfactorily-restocked (NSR) areas

The total area of NSR on TFL 44 (updated to 1995) as identified in the inventory for the timber supply analysis was 5201 hectares. Of this, 148 hectares were backlog NSR (areas harvested prior to 1987 and not yet satisfactorily reforested). During the three-year period 1994 to 1996, 5704 hectares were harvested, an average of 1901 hectares per year. At the end of 1996, NSR areas covered 4668 hectares. For this period, this amounts to 2.5 years of harvesting, which approximates reasonably well to the modelled average two-year regeneration delay plus one year for the age of the seedling. I

also note that South Island Forest District staff concur with the licensee's accounting for NSR. Thus I am satisfied that the timber supply analysis provides a reliable accounting of NSR for use in this determination.

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

Silvicultural systems

The predominant silvicultural system in use on TFL 44 outside Clayoquot Sound is clearcutting, and the licensee expects this to continue. However, the licensee proposes an increase in use of the many variations to this system, such as retaining individual trees, or patches where these would serve to enhance or protect non-timber values.

Public concern was expressed that for the TFL as a whole, there should be an increase in the use of alternative silvicultural systems to harvest old-growth forests. The licensee has indicated that other silvicultural systems will be applied on a trial basis in TFL 44, and has undertaken trials including a shelterwood trial on visible landscapes adjacent to Great Central Lake. Other likely locations for this system identified by the licensee include visible areas near Sproat Lake, the Alberni Canal, and Nahmint Lake. The licensee expects to expand the use of this system as experience is gained and the benefits are demonstrated. The licensee also plans to undertake limited trials with the selection harvesting system where conditions permit. I strongly encourage the continued exploration of alternative silvicultural systems.

Silvicultural treatments

Basic silviculture on TFL 44 includes site preparation, planting of suitable species, and treatments to ensure that regenerated areas achieve free-growing status within a specified time. Logged areas are replanted with conifers, although some ingress of deciduous growth is expected. As described above, under *aggregation procedures*, the licensee used a detailed approach to model silviculture management regimes, which I have considered to represent current operational practice.

Intensive silviculture

In general, intensive silviculture activities include commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement. I will discuss these treatments below under their appropriate sections.

The licensee examined possible implications of applying more intensive silvicultural management on timber supply through its 'Enhanced Silviculture Option'. For this option, 1182 hectares of deciduous-leading stands that had been deducted from the land base in the base case were included and converted to coniferous stands over the first twenty years of the harvest forecast. In addition, medium-productivity Douglas-fir sites were assumed to be fertilized ten years before harvest, with the effect of the treatment being modelled as a two-percent increase in harvest volume, to commence in the year 2006. Further, in order to model the licensee's increased emphasis on increasing early height growth—through prompt planting, better matching of stock types to sites and fertilization of some sites at the time of planting—regeneration delays were reduced to zero. The results of this analysis showed a mid-to-long-term increase in timber supply of nearly 4.5 percent over the base case.

I acknowledge the licensee's interest in exploring the potential for increasing timber supply by applying more intensive silvicultural treatments. While these opportunities may be realized in the future, without a comprehensive strategy or proven application of these activities in the TFL, I cannot account for any potential increase in timber supply on this account in this determination. If and when these potential treatments become current practice their implications will be reviewed in future AAC determinations.

- *prescribed burning/brush treatments/salal*

Prescribed burning is a silvicultural treatment used to meet land management objectives by removing excessive surface fuels, preparing the site for planting, improving domestic range or wildlife habitat, and serving to control insects and diseases. On TFL 44, prescribed burning is primarily used for preparing sites for planting.

In the base case it was assumed that prescribed burning will occur on approximately five percent of all areas—primarily roadsides and landings—except where cedar is the leading species, where 25 percent of the harvested areas were assumed to be burned. The growth and yield implications of burning are based on improved distribution and a greater amount of natural regeneration, improved distribution of planted trees, and reduced growth delay from brush competition.

In the base case, of the 31 percent of the timber harvesting land base identified as having brush problems, two percent were assumed to be left untreated and were modelled using a 15-year growth delay—by assuming an 85-year period to attain a 70-year yield table volume and using a minimum harvestable age increased by 15 years. Treated areas were modelled using a 4-year delay to account for growth already lost or missed.

On TFL 44, salal has been observed to impact the growth of young trees on drier sites and cedar sites. In the base case, of the 8.3 percent of the timber harvesting land base with an identified salal

problem—most of which is in the cedar species association—it was assumed that approximately 75 percent is treated. The salal-prone sites that were not treated were modelled using a 5-year growth delay; growth delays for treated areas were modelled at 2 years. Currently, the licensee emphasizes careful selection of planting stock and fertilization at the time of planting to manage this problem.

I note that the licensee has taken a sophisticated approach to modelling its regeneration objectives. I accept these as a reasonable representation of current operational practices, and I see no reason to adjust the base case harvest projection on this account.

- *commercial thinning*

Commercial thinning is the harvesting, in a maturing stand, of trees large enough to be considered a commercial product. While single-entry commercial thinning regimes do not generally increase volume yields on a specific site, they can provide opportunities to harvest timber in areas where harvesting is limited to meet a variety of other resource objectives.

The licensee's second-growth harvest strategy described in Management Plan No. 3 plans for future commercial thinning, and acknowledges that commercial thinning will contribute towards achieving management objectives. The licensee identifies two circumstances where commercial thinning may be economically beneficial, however, at present, no commercial thinning is being undertaken on TFL 44. As no commercial thinning was assumed in the timber supply analysis and this is reflective of current practice, I have made no adjustment to the base case projection for the present determination.

- *juvenile spacing*

In the timber supply analysis, 3.9 percent of the timber harvesting land base, consisting mainly of naturally regenerated dense western hemlock stands (1600 to 9000 stems per hectare) and some naturally regenerated dense western redcedar stands, are projected to be spaced. I note that South Island Forest District staff are satisfied with these assumptions as used in the base case.

Recently, the licensee analyzed its 2500 permanent sample plots and concluded that, on balance, conventional spacing strategies reduce merchantable volume without improvements in stand value. Nevertheless, it has committed to carrying out spacing operations using available public funding and to cooperating with provincial initiatives to provide opportunities for spacing investments directed towards non-timber resources—such as providing for wildlife habitat—and for social objectives.

I recognize the differing views within the professional community regarding the overall economic efficiency of juvenile spacing. Furthermore, I recognize that there may be immediate social or other forest management reasons for the practice and that any timber supply implications of the licensee reassessing its spacing policy will not affect the timber supply projections in the base case for the short term. Therefore, noting that what was modelled in the timber supply analysis reflects current practice, I accept the base case projection in this respect.

- *genetic improvement*

The licensee's seed-procurement strategy includes maintaining an inventory of genetically improved seed supplied both from the licensee's own seed orchards and purchases from orchards on the Coast. In the base case, gains in volume and growth from planting genetically improved seedlings were incorporated in the projection of regenerated stand yields.

In the timber supply analysis, the licensee estimated an average yield gain of three percent for improved seed for Douglas-fir from 1990 onwards and for western hemlock from 1995 onwards. The average is based on the 5 percent agreed to by the Tree Improvement Council in 1995, with a reduction of 40 percent to account for the proportion of seedlings developed from wild seed. South Island Forest District staff agree with the licensee's assessment of the availability of genetically improved seed.

In the analysis, volume gains were applied to those areas planted with 600 stems or more per hectare—with the exception of the naturally regenerated stands and currently existing second-growth stands. BCFS results show that seedlings from first generation orchard seed exhibit faster early-height growth than seedlings from wild seed—the time to reach visual green-up, or 5 metres being reduced on average by one year. The licensee applied a 0.6 year reduction—to account for wild seed as described above—in the visually effective green-up ages required to grow trees 5 metres tall. I will discuss this further below in the section titled *green-up and forest cover requirements*.

The licensee states that second-generation progeny selection may increase yields from 10 to 15 percent, and expects seed to be available within 15 years for Douglas-fir and western hemlock. However, this was not modelled in the timber supply analysis.

I acknowledge the licensee's tree improvement program and the fact that the average yield gains modelled appear to be low compared to currently experienced yield gains using seed produced by seed orchards. Further, I am aware that second-generation progeny trials show even higher results—in the 10 to 15 percent range. I therefore accept the gains as modelled in the timber supply analysis, and acknowledge that in the future, average yield gains may be higher than those modelled. When the results from second generation progeny are quantified, their impact on timber supply can be examined in future AAC determinations for TFL 44.

- *fertilization*

Management Plan No. 3 indicates that since 1994 substantial areas in TFL 44 have been fertilized at the time of planting. The licensee states that the objectives of the fertilization program are to provide young trees with enhanced early height growth on poor and brush-prone sites. This will increase harvest opportunities in the medium term (i.e. the next 10 to 20 years) by reducing the time necessary to achieve free-growing status and visual recovery. In addition, as discussed under silviculture above, the licensee has identified gains from fertilization of Douglas-fir stands 10 years before harvest. Benefits from fertilizing cedar/salal sites were also identified. Management Plan No. 3 also commits the licensee to continuing to fertilize selected sites at the time of planting.

While fertilization of selected cedar/salal sites at the time of planting is current practice, the growth implications of this practice are not fully quantified, and the licensee has not modelled this in the timber supply analysis.

I note that research is being undertaken and early results indicate that there are significant benefits to fertilizing Douglas-fir stands 10 years before harvest and Cedar/salal sites. If plans for these practices continue, leading to their implementation, and if research results indicate that they increase the harvestable volume, this can be examined in future AAC determinations.

For the next timber supply analysis, it would be useful if fertilization was examined more fully and if the licensee were to model current practice. I am aware that in this timber supply analysis the modelling of fertilization does not fully reflect current practice. I have taken this into consideration in my determination, as discussed under "Reasons for Decision."

(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. These standards were incorporated in the analysis to estimate minimum merchantable stand volume. In the timber supply analysis for TFL 44, for mature stands aged 120 years and older, the utilization standards used were a 22.5 centimetre minimum diameter at breast height (dbh) with a 30-centimetre stump and 15-centimetre top inside bark. Utilization standards used in the base case for regenerating stands were 17.5-centimetre minimum dbh with a 30-centimetre stump and 10-centimetre top inside bark.

South Island Forest District Staff note that a 17.5-centimetre minimum dbh is used in cutting permits for mature stands (versus the 22.5-centimetre minimum dbh used in the base case). Therefore, the value modelled in the timber supply analysis is not fully consistent with current utilization standards. BCFS Resources Inventory Branch staff have reviewed this factor and concluded that the difference in harvestable volume between the 17.5-centimetre minimum dbh used in cutting permits for mature stands versus the 22.5-centimetre minimum dbh used in the timber supply analysis would amount to something less than one percent. This means the base case assumptions regarding old-growth utilization standards have led to an underestimation of less than one percent in the timber supply throughout the short and medium terms, and I have taken this into account as discussed below, under "Reasons for decision."

In the timber supply analysis, the licensee indicated that base case second-growth utilization levels are conservative, noting that higher utilization is currently occurring in its second-growth operations on the east side of Vancouver Island. The licensee also noted that a 12.5-centimetre minimum dbh is used in cutting permits for second-growth stands (versus the 17.5-centimetre minimum dbh used in the base case). I note that the licensee has some capacity to utilize material below contractual utilization limits, subject to market conditions, and that this implies a potential increase in the future timber supply on this account. When this becomes current practice, it can be considered in future AAC determinations for TFL 44.

Decay, waste and breakage

The timber supply analysis assumes an average volume loss to decay, waste and breakage of 6.73 percent for all stands. This percentage was derived from waste survey results from 1985 to 1989 and

was reviewed and accepted for use in this timber supply analysis by staff of the Resources Inventory Branch, BCFS. I consider the estimates for decay, waste and breakage used in the timber supply analysis to be appropriate and reflective of the best currently available information.

(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.

- green-up and adjacency

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

To account for green-up requirements in the licensee's base case, a forest cover constraint was applied that permitted a maximum of 25 percent of the integrated resource management (IRM) zone to be under cover of stands that are less than 3 metres tall, i.e. under 10 years old. An exception to this was the Nahmint watershed, where the Nahmint Local Resource Use Plan had specified a 5-metre green-up requirement; the constraint applied for the Nahmint was that no more than 25 percent of the IRM area could be younger than 15 years old.

I note that the adjacency constraints used in the licensee's base case are comparable to those commonly used in other coastal management units, and I consider this to be an acceptable method for modelling these requirements.

- visually sensitive areas

Careful management of scenic areas near recreational sites and highways is an important IRM objective and is part of the BCFS mandate to manage the recreation resource. "Recreation resource" is defined in the Forest Practices Code to include a "scenic or wilderness feature or setting that has recreational significance or value." In order to manage such scenic features, visual landscape foresters in British Columbia, in collaboration with specialists in other parts of the world, have developed procedures for identifying and managing visually sensitive areas. These procedures incorporate both biophysical and social factors—including visual sensitivity ratings based on topography, slope and other biophysical factors, and social factors such as numbers of viewers and

their perceptions—and provide recommended visual quality objectives (VQO) for these visually sensitive areas. The objectives limit the amount of visible disturbance that is acceptable in these areas.

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

The visual landscape inventory for TFL 44 was updated to 1993 and accepted by the Vancouver Forest Regional Manager on June 19, 1996. The inventory covers areas where visual quality is of potential significance. In the analysis, the licensee applied BCFS standard procedures for calculating allowable alteration percent and green-up ages for all VQOs in the inventory. Visually effective green-up was assumed to occur at 5-metre site height. As noted above, in *genetic improvement*, the time to achieve this height was reduced by 0.6 years to account for increased growth rates at young ages resulting from genetic improvement.

The Minister of Forests has expressed provincial socio-economic objectives concerning visual resources to ensure an appropriate balance between protecting visual resources and minimizing the impact of such protection measures on timber supplies. His objectives recognize that protecting visual resources may overlap with other objectives now required under the Forest Practices Code (see Appendix 4). Consideration of this objective is required to ensure consistency between this AAC determination and other Forest Practices Code requirements.

The licensee provided sensitivity analysis showing the impact on timber supply of both increasing and decreasing the green-up ages by 4 years, and of both increasing and decreasing allowable alteration by 5 percent. The sensitivity analysis demonstrated that when either the extent of allowable alteration or the specifications for visually effective green-up were relaxed, the amount of timber available for harvesting in the medium term notably increased. The license indicated that increasing allowable alteration by 5 percent increased the harvest during the first 50 years by an average of 67 000 cubic metres per year over the base case. It is evident that a significant amount of TFL 44 is affected by VQOs and that the harvest forecast is sensitive to changes in VQO specifications.

I note that in order to help to meet the social and economic objectives of the Crown as expressed by the Minister of Forests in his memorandum of February 26, 1996, regarding VQOs (attached as Appendix 4) the BCFS will soon be releasing a policy aimed at giving practitioners guidance in achieving VQOs in a manner that is less constraining to the province's timber supply—ranging from better landscape design techniques, to the potential benefits of fertilization in reducing green-up ages**.**

I also note that neither scenic nor visually sensitive areas have yet been formally established in TFL 44, and that by December 31, 1998, the licensee plans to review and update inventories and VQO

recommendations. The licensee also plans to incorporate principles of landscape design and apply silvicultural strategies that will reduce the time to achieve visually effective green-up.

These forthcoming actions are consistent with the minister's memorandum of February 26, 1996, and in my judgement are likely to result in the meeting of VQOs in TFL 44 with less, rather than more, restriction on the timber supply than was modelled in the base case. However, at the present time it is not possible to quantify any potential consequent timber supply impacts. Therefore, in this determination I have taken this factor into account only in a very general way, in association with other factors, as discussed in "Reasons for Decision".

As noted below in "Implementation", in view of the Minister's memo of February 26, 1996, I hold the licensee to its commitment to review and update landscape inventories and VQO recommendations prior to the next timber supply analysis, for consideration in the next AAC determination.

- *wildlife habitat*

Southern Vancouver Island, where the TFL is located, contains a great diversity of fish and wildlife species and habitats. Native mammals include black-tailed deer, Roosevelt elk, black bear, wolf, cougar, Vancouver Island marmot, beaver, pine marten, wolverine and many other species. Native birds associated with older forests include marbled murrelets, Queen Charlotte goshawks (a sub-species of the Northern goshawk), great blue herons and pileated woodpeckers. The Forest Practices Code defines "wildlife" to include vertebrates (mammals, birds, reptiles and amphibians), fish, crustaceans and molluscs, and threatened or vulnerable plant or animal species, and includes the eggs and juvenile stages of these vertebrates and invertebrates. Public concern has been expressed regarding the impact of logging on both old-growth and non-old-growth-dependent species in TFL 44.

The biodiversity and riparian provisions of the Forest Practices Code are intended to provide for the needs of most wildlife species. However, some wildlife species "at risk" require special management practices. The Identified Wildlife Management Strategy, now released for public review, will provide direction for managing critical habitat for identified wildlife species (usually red- or blue-listed). This strategy includes two Guidebooks: *"Species and Plant Community Accounts for Identified Wildlife";* and *"Procedures for Establishing Wildlife Habitat Areas"*. Also included is the document entitled "General Wildlife Measures for Identified Wildlife" which will outline the requirements for practices within wildlife habitat areas. Approximately 20 species associated with forest habitat on the Identified Wildlife Candidate lists (volumes one and two) are present in TFL 44.

Many wildlife issues have been accounted for in the timber supply analysis through the protection of habitat for large mammals and endangered or threatened birds, and through implementation of biodiversity strategies. Wildlife inventories were accepted by MELP for use in the timber supply analysis on February 13, 1996.

Included in the inventory are deer and elk winter ranges, deer and elk zones (broad areas classified as having high wildlife habitat potential but needing ground inspections to delineate definitive boundaries) and marbled murrelet nesting habitat. The licensee has raised a particular concern that

some areas set aside for marbled murrelet nesting may not be used, while other areas that are used are not identified in the current inventory.

In the base case, marbled murrelet areas and critical elk and deer winter ranges were netted down at 100 percent, low elevation deer winter ranges at 50 percent, and deer and elk zones at an average of 73 percent. As a result, 9409 hectares (including overlapping areas) were removed from the land base.

I am satisfied the licensee used the best wildlife habitat inventory data available at the time the information package was prepared for the timber supply analysis. However, some further wildlife areas have since been identified. Specifically, three nest sites for Queen Charlotte goshawks, which are dependent on old growth, have been identified in Alberni East and West, and according to MELP it is likely that more nesting sites will be found. MELP has also requested the deferral of harvesting in some areas proposed for deer winter range. While it is expected that additional area will be required as inventories continue to be updated and the location and habitat requirements of "species at risk" are determined, it is also anticipated that mitigation strategies will be developed to minimize the timber supply impacts. For example, while the recent identification of the three Queen Charlotte goshawk nesting sites had a small immediate impact on the land base of TFL 44, strategies which overlap Queen Charlotte goshawk forage areas with deer winter ranges, where appropriate, will help to decrease the impact of this species. MELP has indicated that when a regional strategy to protect these red- and blue-listed and regionally dependent species is in place, this will help to prioritize and limit the number of wildlife habitat areas to be set aside for each species.

The Huu-ay-aht First Nation expressed concern that wildlife species within TFL 44 are not well catalogued and also advised me that wildlife habitat studies and the cataloguing of species were currently being undertaken within their traditional territory. Improved wildlife habitat inventories and related studies will allow more explicit consideration of wildlife values in future determinations.

The licensee has attempted in the timber supply analysis to provide a realistic accounting for mapped sites of known significant important wildlife habitat on TFL 44. The size of the reduction applied in the analysis reflects this attempt. However, in the base case the management of red- and blue-listed species, as well as regionally significant species, has not been explicitly quantified and analyzed because the specific wildlife habitat areas for some of these species are not presently mapped. I expect that these wildlife habitat areas will overlap with other key resource considerations such as riparian zones, FEN links and wildlife tree patches, and that coarse woody debris requirements will address some habitat needs. The impact of managing red- and blue-listed and regionally significant species will also be lessened on TFL 44 by shifting some deer or elk winter range zones where reasonable and appropriate.

In conclusion, I accept that there are uncertainties regarding the total area that will eventually be required to protect wildlife habitat on TFL 44. At this time it is impossible to quantify the extent of the total area required, but I note that government has made a commitment to limit the impacts of managing identified wildlife species to one percent of the provincial timber supply. Taking this into account, as well as other characteristics of the timber supply projection for TFL 44 (i.e. land base sensitivity analysis, interdecadal decline rates, and VQO and FEN objectives etc.), as discussed in "Reasons for Decision" I am satisfied that potential timber supply impacts associated with this factor can be accommodated for the duration of the effective period of this AAC within the initial harvest

level projected in the base case analysis and without introducing unacceptable levels of risk to the management of important wildlife habitats.

In this determination I have therefore made no further adjustment to the projected timber supply on this account. As the province clarifies its strategy for the management of regionally significant and threatened and endangered species, I expect the implications to be reflected in future timber supply analyses for TFL 44, and these will be taken into account in future AAC determinations.

- *riparian habitat*

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian management reserves that exclude timber harvesting, and riparian management zones that restrict timber harvesting in order to protect riparian and aquatic habitats.

The timber supply analysis includes assumptions that account for the protection of riparian and aquatic resources. For the three working circles, a total forested area of 43 807 hectares was classified as riparian management area. Of this, 17 021 hectares (including overlaps), representing 6.5 percent of the productive forest land base, were removed from the timber harvesting land base.

The licensee used its GIS database information on streams, lakes and wetlands to approximate the land base reductions to be applied for riparian areas. Their data is based on 1:20 000 scale mapping and includes information on hydrologic stream order, fish streams and community watersheds. Because stream width information was not available, the licensee used hydrological order to approximate stream width. Buffers were created adjacent to the streams in accordance with the Riparian Management Guidebook. However, the licensee reduced the management zone areas by 60 percent of the maximum average values in the *Riparian Management Guidebook*. MELP staff disagree with this approach and maintain that 100-percent reductions should be applied. MELP and BCFS staff estimate that the impact of applying a 100-percent reduction would amount to an additional land-base reduction of up to 3600 hectares, or 2 percent of the timber harvesting land base.

In accordance with the local resource use plan (LRUP) for the Nahmint area, the licensee used a 60-metre reserve zone, and a 30-metre management zone for the Nahmint River. However, the land-base reduction applied for the management zone was 30 percent while the LRUP requires a 90-percent reduction. Similarly, for the Nahmint and Gracie Lakes a reserve zone of 60 metres and a management zone of 60 metres were applied as required by the LRUP. However, again, the land base reduction applied was 30 percent rather than the 90 percent as required by the land use plan. I recognize that this resulted in a slight overestimation of the amount of timber available for harvesting.

During the review of the 20-year plan, the licensee's staff found that they had mis-classified some streams on TFL 44 as fish bearing when they were not. As a result, many streams were classified as S4—fish bearing—when in fact they belonged to a lesser classification. The licensee provided an estimate of the impact on the timber harvesting land base resulting from this error. Using the maximum percentage reductions for the riparian management zone, 15 283 hectares should have been deducted from the land base rather than the 17 021 hectares deducted in the base case—a

difference of 1738 hectares. However, MELP also raised concerns that while some streams were overly constrained in the analysis, the total number of S6 and S4 streams were likely underestimated since the 1:20 000 map scale used is too broad for the identification of all small streams. MELP contends that this problem is exacerbated in community watersheds where small non-fish streams (usually S6) are automatically upgraded to an S4 status, a class which requires greater percent retention in a larger riparian management zone.

The Huu-ay-aht First Nation also expressed a concern regarding stream mis-classification within their traditional territory. For instance they reported identifying adult Steelhead in the upper reaches of the south Sarita River, which is currently classified as not bearing anadromous fish.

I am aware that in its analysis the licensee modelled a lower level of retention of riparian habitat than suggested by MELP. The *Riparian Management Area Guidebook* does allow for varying levels of retention in riparian management zones, and to the extent that MELP's assessment is correct, this would indicate an underestimation of the area that should be retained in management zones in the TFL. However, until more experience is gained on the TFL in managing riparian areas in accordance with the guidebook, the associated timber supply impacts will remain uncertain. Also, in its analysis the licensee has overestimated the extent of fish bearing streams, resulting in an excessive reduction of the timber harvesting land base on that account, although the magnitude of this overestimation is uncertain, given MELP's concern regarding the low number of identified S6 and S4 streams.

I have considered all of these factors, and I note that they work to both increase and decrease the timber supply, to uncertain degrees. However, the 6.5 percent land base reduction applied in the analysis is reasonable in comparison to other coastal management units. Therefore, in the absence of more definitive information, I am prepared to accept the riparian/fisheries constraints as modelled. However, I note that over the term of Management Plan No. 3 the licensee has made a commitment to undertake further analysis of riparian impacts to provide a better understanding of actual riparian requirements for Management Plan No. 4. I hold the licensee to this commitment.

- *community watershed considerations*

TFL 44 contains several community watersheds where the protection of water quality and quantity is a concern. These community watersheds are identified on maps and are designated as Community Watersheds under the Forest Practices Code. The forested area above the "point of diversion,"—which is the location on the stream where the water intake, for human consumption, is positioned—in community watersheds is 18 588 hectares in the Alberni East working circle, 25 832 hectares in Alberni West and 1368 hectares in Ucluelet.

A total of 1965 hectares of the productive, operable area, identified in earlier inventories as hydrologically sensitive were deducted from the land base. This area includes 797 hectares of the timber harvesting land base within community watersheds that were misclassified (as Eh 1) and inadvertently deducted from the land base, instead of being subject to forest cover constraints as discussed below. In the timber supply analysis, riparian reductions consistent with stream classes 1 to 4 were applied in community watersheds. However, while this procedure was accepted by MELP staff on November 9, 1995, MELP has subsequently noted concerns with the reductions applied to riparian management zones, as noted above under *riparian habitat*, which would offset to some degree the misclassification of the 797 hectares of community watershed.

The Forest Practices Code requires the assessment of watersheds to establish their susceptibility to adverse effects on water values due to forest practices. These assessments, known as Coastal Watershed Assessment Procedures (CWAPs) involve the development of a set of environmental and harvesting-related indicators. CWAPs are currently being undertaken on a priority basis in the South Island Forest District. No formal instruction under the *Operational Planning Regulation* has been issued to undertake CWAPs on TFL 44. Nevertheless, the licensee has completed the assessment of six high priority watersheds. Four of these resulted in harvest restrictions. At the time the information package was prepared, no CWAP information was available and the licensee applied a forest cover requirement on the community watersheds, allowing no more than 5 percent of the forested area to be covered by trees less than 5 years old at any time. This is consistent with the *Community Watershed Guidebook* and is intended to address any restrictions that may arise through the watershed assessment procedures.

From this, I am satisfied that significant forest cover constraints have been applied to areas designated as community watersheds as a proxy for managing hydrological stability. In the absence of definitive information obtained from CWAPs, for the purposes of this determination I accept this as a reasonable accounting of the constraints that will eventually result from these assessments.

The Huu-ay-aht First Nation expressed concern regarding the future of the quality and supply of water within their traditional territory. Further, they noted the necessity for ensuring that a stable supply of high quality water be available so that they are able to achieve their future community development plans. They request that the BCFS ensure reviews are undertaken to assess terrain stability and also to identify areas within their traditional territory that may have surface erosion problems. These concerns will be considered by the district manager in the application of the operational planning regulations.

- *cultural heritage*

Cultural heritage values include archaeological values that pre-date European influence and more recent historic values. Cultural heritage resources are defined in the *Forest Act* and include archaeological sites, traditional use sites and culturally modified trees (CMTs). Archaeological sites and CMTs that predate 1846 are protected under the *Heritage Conservation Act.* The nature and extent of the protection of archaeological sites is detailed under this legislation.

Sites of archaeological or traditional use are located throughout TFL 44, and small areas within the TFL have been reserved, primarily around CMTs. Archaeological Impact Assessments (AIAs) are ongoing on many areas of the TFL to assist in operational planning. In addition, I am also aware that some First Nations are undertaking detailed Traditional Use Studies (TUSs) within their traditional territories. However, no specific accounting for these areas was included in the licensee's timber supply analysis.

Vancouver Forest Regional staff have estimated the impact on the timber harvesting land base that might be expected from protecting cultural heritage sites, in particular CMTs. These estimates were based on information provided by the consulting archaeologist working for the licensee, and on maps provided by the licensee, for the Alberni East working circle. BCFS staff considered two approaches in estimating archaeological impacts.

In the first approach, data was reviewed from surveyed old-growth blocks within the Alberni East working circle. From this the licensee's consulting archaeologist found that out of 87 blocks surveyed in 1996, 53 blocks (60 percent) had potential to contain CMTs or archaeological sites. Of these, it was determined that 38 percent did contain sites. The archaeologist suggested that on average, 15 percent of a block would need to be reserved to protect these resources. This information suggested that 3.4 percent of the old growth area—or 1231 hectares—would be reserved for archaeological sites or CMTs in Alberni East. This amounts to 1.2 percent of the net timber harvesting land base.

Vancouver Forest Region staff noted that extrapolation of this percentage to Alberni West and Ucluelet should be considered with caution, as the distribution of cultural heritage sites may differ there due to less remaining old growth and steeper terrain than in Alberni East. In addition, they point out that the level of surveying has not been as intensive as for Alberni East. I am also mindful that inventory work is now identifying CMTs at higher elevations.

The second approach considered that the licensee's mapped information showed that most of these sites were located below 300 metres in elevation. The mapped sample indicated that out of 53 blocks surveyed, 23 percent contained sites. In this case, 10 percent of each affected block was assumed to be reserved to protect these resources. This information suggested that 437 hectares, or 0.75 percent of the old growth remaining in the timber harvesting land base of the three working circles, needed to be reserved.

The Huu-ay-aht First Nation is currently conducting a detailed TUS within its traditional territory. I would like to recognize the Huu-ay-aht for the extensive and detailed work which has gone into this TUS; this type of research will provide more complete information for consideration by decision makers and First Nations. Results to date indicate that Huu-ay-aht traditional territory has an abundance of archaeological sites—such as middens, CMTs, fishing trails, and spiritual sites, e.g. 'Sacred Mountain' which contains burial caves, bathing pools and solitary prayer sites—which represent cultural heritage features under both the Forest Practices Code and the *Heritage Conservation Act.* I note that the Forest Practices Code Preamble specifically acknowledges the spiritual values of forests. In addition to significant numbers of archaeological sites, many areas historically used by the Huu-ay-aht have been identified through oral history provided by Huu-ay-aht elders.

As noted above, in "Guiding Principles...", I fully expect that areas of cultural or archaeological significance and traditional uses will be considered by the district manager in his administration of the AAC determined for TFL 44. In this respect, the detailed information gathered for the TUS may provide information over the term of Management Plan No. 3 that will guide operations on the TFL. This will also permit more accurate assessment, in the next timber supply analysis, of the impacts on timber supply of protecting cultural heritage resources.

For the present determination, I am mindful that historically there has been extensive use throughout the TFL by First Nations, and as a result, archaeological features are abundant throughout the TFL. It is also likely that further undiscovered archaeological sites will be encountered. I recognize there will likely be timber supply impacts from protecting the areas around CMTs and other archaeological sites. Since the analysis made no accounting at all for cultural heritage sites, I have

considered it reasonable to allow for an associated additional constraint on timber supply in the upper range of the findings presented. The licensee provided a sensitivity analysis showing that if mature volumes were reduced by 10 percent, the initial harvest level was reduced by 4.4 percent. From this it may be derived that the withdrawal of 3.4 percent of the old growth in the timber harvesting land base would reduce the projected initial harvest level by approximately 1.5 percent, and in my determination I have allowed for an overestimation in the base case harvest level of up to 1.5 percent on the short-, medium- and possibly long-term timber supplies, as noted in "Reasons for Decision." I am mindful that in some instances, archaeological sites, or CMTs will overlap with wildlife tree patches and riparian management zones that would result in a smaller overall impact to the timber supply. As inventories are completed, a better accounting of land base impacts will be available for consideration in future AAC determinations.

- *recreation areas*

The recreation inventory was accepted for use in this timber supply analysis by the Vancouver Forest Regional Manager on June 19, 1996. In the timber supply analysis, a total of 2501 hectares of highly sensitive recreation areas (Er1) and 25 882 hectares of moderately sensitive recreation areas (Er2) were identified on the forested land base of the three working circles. Of this, 100 percent of Er1 and 50 percent of Er2 areas were removed from the land base for a total reduction of 12 143 hectares.

In the analysis the older recreation classification C1-b was used to represent moderately significant recreation areas—usually covering large areas that are visually sensitive or important for extensive activities such as hunting and berry picking. This C1-b classification is separate from the Er1 and Er2 classifications. To account for recreation concerns on these areas, a forest cover requirement was applied allowing a maximum of 20 percent of the forested area to be covered by stands less than 20 years old. In total, 12 225 hectares of C1-b areas were identified on the timber harvesting land base.

I note that the licensee has mapped recreational areas on TFL 44 to a standard acceptable to the regional manager and that the licensee has applied reasonable land base deductions and forest cover constraints on this account in the timber supply analysis. I therefore accept that the recreation assumptions applied in the base case adequately represent current practice and are acceptable for use in this determination.

I note that in Management Plan No. 3 the licensee commits to completing a recreation analysis and to revise and update the recreation inventory by December 31, 2000. I hold the licensee to this commitment.

- *biodiversity*

Biological diversity, or 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 the stand and landscape levels.

Public concern has been expressed regarding biodiversity, stating that it was an important value to maintain on TFL 44**.**

- *stand-level biodiversity*

Stand-level biodiversity is managed by retaining reserves of mature timber or wildlife tree patches within cutblocks to provide structural diversity and wildlife habitat. In the timber supply analysis, a 2-percent reduction was applied to stand yields to account for stand-level biodiversity. This reduction was derived using interim measures to be applied for wildlife tree patches, in accordance with the Vancouver Forest Regional Manager's letter to licensees of May 22, 1996. In this letter, the Regional Manager directed that, until landscape-level biodiversity strategies are in place, if FENs are in place, then 7 percent of the cutblock area must be retained in wildlife tree patches, with 75 percent of this requirement assumed to be available from stands adjacent to the cutblock that are reserved from harvesting for other reasons. This methodology remains consistent with the Vancouver Forest Regional Manager's letter of December 15, 1997, to Vancouver Forest Region District Managers providing additional guidance on wildlife tree patch implementation.

The assumptions used in the base case for wildlife tree patches, in addition to conforming with the Regional Manager's letter, are consistent with the *Biodiversity Guidebook* and the *Forest Practices Code Timber Supply Analysis*, and I have accepted them as appropriate for use in this determination.

- *landscape-level biodiversity*

Landscape-level biodiversity objectives involve maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures across a variety of ecosystems and landscapes. The *Biodiversity Guidebook* is based in part on the principle that this, together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions, will provide for the habitat needs of most forest and range organisms.

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and appropriately located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

Although some general forest and range management practices can broadly accommodate the needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved. Natural disturbance patterns vary from frequent wildfires in the dry interior regions to rare events in the wetter coastal regions.

The delineation and formal designation of "landscape units" is a key component of a subregional biodiversity management strategy. Any of a range of biodiversity emphasis options may be employed when establishing biodiversity management objectives for a landscape unit. The *Biodiversity Guidebook* outlines three biodiversity emphasis options—lower, intermediate and higher. Each option is designed to provide a different level of natural biodiversity and a different risk of losing elements of natural biodiversity when compromises between biodiversity and timber supply are considered in setting objectives for a landscape unit.

For areas where landscape units have not yet been formally established, or an emphasis option has not been assigned for a landscape unit, in accordance with the *Biodiversity Guidebook* the lower biodiversity emphasis option is used as a default to guide operations. In addition, government policy direction that is intended to balance social and economic impacts against risk to biodiversity stipulates that within a sub-regional planning unit approximately 45 percent of the area should fall within the lower, approximately 45 percent within intermediate, and approximately 10 percent within the higher biodiversity emphasis options.

The establishment of landscape units for TFL 44 has not been completed. However, the Regional Landscape Unit Planning Strategy (RLUPS) was recently completed. This strategy delineates draft landscape units and recommends biodiversity emphasis options within the Vancouver Forest Region, which includes TFL 44. It also sets the stage for formal designation for the landscape units and assigning of biodiversity objectives.

In the timber supply analysis, draft landscape units current to February, 1997, were used as the basis for modelling landscape-level biodiversity. While I have accepted these as an interim tool for assessing the potential timber supply implications of managing for landscape-level biodiversity, I am aware that the landscape unit boundaries and objectives have not yet been declared. A total of 12 draft landscape units were identified in Alberni East, 11 in Alberni West and 2 in Ucluelet. In the base case, lower emphasis biodiversity was modelled for all but the Nahmint draft landscape units —there, the higher emphasis biodiversity option was modelled, as noted below, under "Vancouver Island Land Use Plan".

For landscape units where old seral forest is in short supply but the economic and social consequences of halting its harvesting immediately are deemed to be unacceptable, the *Biodiversity Guidebook* allows additional harvesting flexibility. In these cases a minimum of one third of the old seral forest retention objective noted in the *Biodiversity Guidebook* must be retained and the shortfall recruited over time so that the intended old seral forest retention objective is in place within three rotations. In the analysis for TFL 44, the entire old-seral retention objectives in the *Biodiversity Guidebook* were assumed to apply immediately. In effect, this approach resulted in the application of the intermediate biodiversity emphasis option objectives for all but the Nahmint landscape unit.

In developing the constraints for modelling landscape-level biodiversity in the analysis, the licensee determined the Natural Disturbance Type (NDT) for areas of the TFL using the small-scale map in the *Biodiversity Guidebook*. Old seral forest retention objectives were assigned to the biogeoclimatic variants in these areas based on these assumed NDTs. Using this method some variants were assumed to be in NDTs which were subsequently found to be at variance with those listed in detail in Appendix 3 of the *Biodiversity Guidebook*. This led to the application of incorrect old seral forest retention objectives for these areas. To test the impact of this difference, the area-weighted average old-growth retention percentage over the three working circles applied in the base case was calculated (12.67 percent) and compared to the area-weighted average percentage using the correct assignment of the variants to NDTs (12.20 percent). Thus, the base case is marginally more constrained due to landscape-level biodiversity than the licensee intended.

Landscape-level biodiversity was modelled by first determining how much old seral forest area for each biogeoclimatic variant was present in the forested non-timber-harvesting land base in each landscape unit. This area was compared to the old seral forest targets for the area. As noted above,

under *additional old-growth reserves*, any shortfall compared to the minimum objective was compensated for by further reducing the timber harvesting land base in the appropriate variants. Where old-growth was not available, the oldest second growth was reserved. Some recently established parks, totaling 4863 hectares in forested area, were included as contributing toward old seral forest objectives. Most of this area is in the Walbran and Upper Carmanah drainages and only contributed to the draft landscape units within which the parks occur. In the base case, the additional area removed from the timber harvesting land base to satisfy old seral forest objectives totaled 1775 hectares, whereas using the corrected NDTs with the associated old seral forest targets described above, the area deducted would have been only 1239 hectares. This provides more flexibility in meeting biodiversity objectives than was assumed in the base case.

MELP expressed concern that it may not be appropriate to consider some portions of the non-timber harvesting land base as contributing to the old seral forest target because these areas may include avalanche tracks, rock outcrops or scrub. In addition MELP staff note that where land base reductions involve a percentage reduction, the area remaining in old seral forest may not be configured to provide adequate forest interior conditions. They state that this could lead to the need to protect more old seral forest than was modelled in the base case, to maintain 25 percent, and 50 percent respectively, of the old seral forest in forest interior conditions, for the lower, and intermediate or higher biodiversity emphasis options, in accordance with the objectives in the *Biodiversity Guidebook*. However, I note that the landscape unit boundaries and objectives are yet to be formalized, and until this is complete the timber supply implications will remain uncertain. Nevertheless, in view of the large land base deduction already applied for FEN links, and in view of the sensitivity analysis indicating that the initial harvest level in the base case could be maintained with the timber harvesting land base reduced by five percent, I am satisfied that no adjustment to the initial harvest level is required to account for the maintenance of forest interior conditions.

The licensee provided a sensitivity analysis which shows the impact on timber supply of applying early, and mature plus old seral stage objectives and draft biodiversity emphasis options from a 1997 draft of landscape units covering TFL 44—three were assigned to higher, 14 to intermediate, and 7 to lower biodiversity emphasis. In addition, in this analysis, the licensee assumed that more adjacent park areas would contribute to satisfying seral stage objectives than was assumed in the base case (an additional 19 949 hectares of forest in parks were assumed to contribute to seral stage objectives). This analysis showed that application of the early seral stage objective in particular resulted in a substantial reduction in harvest over the first thirty years compared to the base case. According to the licensee's Socio-Economic Report, managing to the level of biodiversity modelled in this sensitivity analysis would reduce the average annual harvest projected in the base case by 172 000 cubic metres per year over the next 50 years. However, this level of management would be inconsistent with the 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 biodiversity timber impacts.

BCFS staff calculated the area-weighted average percentage of the forested area that would be required to satisfy old seral forest objectives if the government policy direction stipulating a distribution on the sub-regional planning unit of 45 percent lower, 45 percent intermediate, and 10 percent higher biodiversity emphasis were applied. The result was 12.35 percent, which amounts to 889 hectares less old seral forest area requiring to be reserved than was assumed in the base case. If, in the landscape units in which lower-emphasis biodiversity was assumed, the old seral forest

inventory were drawn down to the allowed minimum one-third of the objectives recommended in the *Biodiversity Guidebook*, 8.79 percent of the forested area, or 10 784 hectares less old seral forest area than assumed in the base case would need to be reserved in the short term.

In consideration of the foregoing, I believe that landscape-level biodiversity concerns have been comprehensively addressed in the timber supply analysis. In addition, I consider the risk to be low that the eventual outcome of the landscape unit planning process will be any more constraining to timber supply than the assumptions modelled in the base case. In fact there may be more flexibility than portrayed in the analysis; however, this will only become clear when the planning process is completed. For this determination I accept the landscape level biodiversity assumptions as modelled.

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

Vancouver Island Land-Use Plan

As noted under "Guiding Principles", protected areas in the Vancouver Island Land-Use Plan (VILUP) have been designated and in the timber supply analysis did not contribute to the timber harvesting land base. However, implementation decisions for various land-use zones are not yet complete, and their eventual timber supply implications cannot yet be fully accounted for. Through the Vancouver Island Resource Targets (VIRT) project, general and enhanced resource management zones and their objectives have been developed and released for public review, but have not yet been approved.

Boundaries have been approved for special management zones (SMZs formerly known as "low intensity areas" or LIAs) and while the objectives for these zones are not finalized, I note that in Management Plan No. 3 the special requirements for SMZs are being incorporated in forest development plans as information becomes available and decisions are reached. While I cannot take this into account directly until the VILUP process is complete and associated decisions have been implemented, in effect some accounting for the impacts of the SMZs has been incorporated in the timber supply analysis in a general way by virtue of constraints applied in recognition of other forest values. For example, the Nahmint watershed was modelled in accordance with the objectives of the Local Resource Use Plan (LRUP) completed in 1975 and reviewed in 1991. In addition, higher biodiversity emphasis was assumed to reflect the objectives of the LRUP, the Regional Landscape Unit Planning Strategy and the 1995 Low Intensity Area Review Committee Report. The licensee's analysis also accounts for a large area of FEN links and restrictive visual quality objectives, and I note that a sensitivity analysis in which the timber harvesting land base was reduced by five-percent showed that the base case initial harvest level could still be met, if a slightly steeper decline to the long-term level were permitted.

Based on the above, although the overall timber supply implications of the VILUP for TFL 44 cannot be known with certainty and taken fully into account at this time, I am satisfied that, given the constraints applied in the analysis, the AAC I determine will be achievable through its effective period. However, if at any time I am informed by the district manager that the objectives of the VILUP and the AAC are incompatible, I may decide to revisit the determination earlier than the legally required five-year period.

The final technical recommendations on boundaries and objectives for the Enhanced and General Resource Management Zones on Vancouver Island were released on December 4, 1997, for public review and comment. Based on the recommendations and on the public comments received, final government approval of the land-use plan is expected in the late spring or early summer of 1998.

Twenty-Year plan

The purpose of the 20-year plan is to show whether or not the volume projected for harvest in the base case over the next 20 years can be appropriately configured in specific areas on the landscape. For TFL 44, a 20-year plan was prepared for the Alberni East and Alberni West working circles; the plan did not include Clayoquot Sound or the Ucluelet working circle, as the licensee is waiting for clarification of future management objectives for these areas.

On October 31, 1997, the South Island Forest District Manager conditionally accepted the licensee's 20-year plan. While several concerns were identified, the district manager noted that sufficient flexibility exists in the plan for the licensee to overcome potential problems in appropriately locating cutblocks to support the harvest level proposed for the period of Management Plan No. 3.

The Huu-ay-aht First Nation expressed a concern that planned timber harvesting is not evenly dispersed throughout the entire TFL, but rather is concentrated within the Alberni East Working Circle in general, and their traditional territory in particular. In addition, the Huu-ay-aht First Nation pointed out that in their view the harvest level proposed in the 20-year plan is overly optimistic, does not consider landscape level impacts on watersheds, and will continue to impact fisheries habitat, fragment wildlife and old-growth corridors, affect the genetic diversity of the forests, and compromise their aboriginal rights. However, the district manager considers that there is sufficient flexibility to reconfigure cutblocks where necessary for the 20-year plan. This indicates an even higher level of flexibility in the first five years of the plan. In view of this, and for reasons expressed in "Reasons for Decision", I expect that for the period of Management Plan No. 3, the concerns expressed by the Huu-ay-aht First Nation will be accommodated in operational planning for the administration of the AAC. I also expect that more information will be available to appropriately address First Nations' issues in the next AAC determination.

I recognize that it may be difficult for the licensee to locate the harvest exactly as configured in the 20-year plan. However, I am mindful that the 20-year plan is not an operational plan and provides just one alternative for the distribution of harvest over time. I am satisfied that for the first five-year period, the initial harvest level in the base case can be located on the land base and if necessary adjustments can be made as required over the term of Management Plan No. 3. Determination of my AAC for TFL 44 for the next five year period is not conditional on acceptance of the cutblocks as displayed in the 20-year plan.

Partitioned component of the harvest

The *Forest Act* provides for portions of an AAC to be specified as attributable to different types of timber and terrain in different parts of a TFL. Partitioning an AAC in this way is effective in ensuring that harvesting is appropriately distributed in forest types, operability classes, or distinct

areas. The AAC for TFL 44 is currently partitioned by working circle and operability class, as shown above in “History of the AAC”.

The current AAC includes a partition for marginally economic stands, which is not subdivided by working circle. Franklin Forest Products Limited relies on this marginally economic timber to satisfy its mill requirements. This is outlined below in “Timber processing facilities”. Under a Job Protection Commissioner mediation plan, Franklin Forest Products Limited has access to 30 000 cubic metres of marginally economic timber annually until 1999. As noted above in *economic and physical operability*, in order to avoid a progressive reliance in the AAC on marginally economic stands, I have decided at this time to set a partition of 40 000 cubic metres annually for marginally economic stands.

In this determination, to provide management flexibility across operations, I have decided to remove the partitions for the three working circles and for the conventional and non-conventional operability classes. However, I expect that operations will continue to be reasonably balanced across the land base, across age and species classifications, between conventional and non-conventional operability classes, and in consideration of the spectrum of all other management objectives outlined in Management Plan No. 3. I expect the distribution of performance to be monitored and outlined at the time of submitting the information package for the next timber supply analysis. Also if it becomes apparent at the end of the period for Management Plan No. 3 that operations have not been adequately distributed, I may need to consider re-establishing appropriate partitions.

First Nations' Old-Growth Cedar Requirements

The Huu-ay-aht expressed concern regarding the amount of old-growth cedar remaining within their traditional territory in relation to the volumes and area currently scheduled for future harvest. They view old-growth cedar as a rapidly declining resource and outlined to me their concerns that in the future they will not be able to meet their aboriginal right to access clear (knot-free) old-growth cedar for traditional purposes such as canoe building or bark stripping. These traditional practices require a specific size and other distinguishing characteristics to make the tree suitable.

It may be that there is an aboriginal right associated with access to clear old-growth cedar. I am mindful of this; however, to the extent that such a right does exist, it is unquantified as to its extent and nature. The Crown may very well have an obligation to reserve some clear old-growth cedar, but how much and where are impossible to ascertain in this determination from the information provided. However, I note that the inventory indicates that TFL 44 (outside Clayoquot) still contains about 20 million cubic metres of mature western redcedar and 4 million cubic metres of yellow cedar or cypress; the Alberni East Working Circle currently supports 13.6 million cubic metres of mature western redcedar and one million cubic metres of cypress. I am satisfied that, over the five-year term of this AAC, the harvest level has enough operational flexibility to maintain significant volumes of clear old-growth cedar. It is my intention that while there will likely be some harvesting of this specific resource, the opportunity for this aboriginal right to continue to be exercised will not be eliminated.

The Crown is obligated to avoid unjustifiably infringing on the aboriginal rights of First Nations. If, during the operational consultations conducted to obtain information in order to make a determination on an infringement, it becomes clear that a proposal to harvest cedar will impact on a traditional use, then the district manager may well decide not to approve the proposed cutblock. The consultation that I am referring to will occur at the operational planning level, including public review and comment on Forest Development Plans (FDPs), Silviculture Prescriptions (SPs) and all other information inputs accommodated at the operational level.

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

Alternative harvest flows

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 forests often permits harvesting above long-term levels without jeopardizing future timber supply.

The most notable feature of the harvest projections for TFL 44 is that the initial level is relatively insensitive to changing many of the assumptions in the base case, particularly if the decline per decade is allowed to increase above the licensee's harvest flow policy for the analysis which was to constrain future harvest level declines for the three working circles to no more than 10 percent per decade. In the base case, this and other conditions resulted in an average rate of decline in the harvest level of 7 percent per decade over the first 25 years.

In addition to the base case forecast, the licensee provided two alternative harvest flow projections which allowed maximum decline rates per decade of 10 percent, and 15 percent. These harvest flow projections demonstrated that with either a 10- or 15-percent-per-decade decline a higher initial harvest level is possible. This flexibility in the choice of an initial harvest level indicates that to any extent that the assumptions in the base case may not have adequately accounted for specific factors, such as cultural heritage or habitat for identified wildlife, these can be accommodated within acceptable rates of decline. I have been mindful of this flexibility in making my determination.

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

Timber processing facilities

The majority of the timber harvested is manufactured within the vicinity of Port Alberni and Clayoquot Sound. Of the current volumes harvested in TFL 44, on average 600 000 cubic metres are transported to the licensee's other mills on Vancouver Island and the mainland, or traded or sold. This is partially offset by more than 200 000 cubic metres that are delivered to the Alberni mills from the licensee's other logging divisions or from market purchases. Approximately 1.74 million cubic metres are manufactured locally.

The Alberni Pacific and Somass lumber mills and the Alberni Specialties pulp and paper mill are fully dependent on timber supplies from TFL 44. Together these mills, with an annual capacity of 1 676 800 cubic metres, employ approximately 2000 people. In addition, the Island Phoenix lumber mill, the licensee's Chemainus sawmill and the licensee's chipmill located in Deerholme are significantly dependent on TFL 44. Together these mills have an annual capacity of 1 003 400 cubic metres and employ 529 people.

As noted under "Partitioned component of the harvest," an agreement authorized by the Job Protection Commissioner gives Franklin Forest Products Limited access to 30 000 cubic metres per year of marginally economic timber on TFL 44 until 1999. Franklin Forest Products Limited is the owner of an independent sawmill and shake-and-shingle facility located near Port Alberni. This facility employs between 22 to 40 people with another 15 in its woodlands division. The annual capacity of this facility is estimated at approximately 50 000 cubic metres.

(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

Minister's letters and memorandum

The Minister has expressed the economic and social objectives of the Crown in three documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3), a memorandum dated February 26, 1996, (attached as Appendix 4), and a letter dated September 17, 1996, stating the economic and social objectives regarding Clayoquot Sound (Appendix 5). The objectives for Clayoquot Sound will be discussed below in the section titled "Clayoquot Sound."

These letters and memoranda are consistent with the objectives stated in the Forest Renewal Plan and include 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.

I have reviewed the opportunities for commercial thinning, and, as discussed under *commercial thinning*, the licensee currently has no plans to include this in its operations. I have also reviewed opportunities for harvesting in previously uneconomical areas, and have concluded that it is appropriate at this time to include in my determination a partition for marginally economic timber, as discussed above under "Partitioned component of the harvest."

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I have discussed this above under "*Visually sensitive areas*," where I noted that there is the potential to increase timber availability relative to that projected in the base case harvest forecast resulting from minor changes when allowable alteration or visually effective green-up specifications are relaxed.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. The licensee advises that it took a number of steps to provide opportunities for public review of information included in Management Plan No. 3, by:

- advertising in local newspapers both the initiation of the Management Plan and of the draft statement of management objectives, options and procedures (SMOOP);

- making the draft management plan available for public viewing, and
- notifying licenced users of TFL 44, adjacent landowners and other parties, in writing, of the preparation of Management Plan No. 3.

The most common public responses expressed the need for alternative silviculture techniques, maintenance of biodiversity and landscape aesthetics, community and workforce stability, harvesting in second growth stands and over the need for progress in sustainable forest management.

Where possible, I have attempted in this rationale to respond briefly to the views expressed, and consideration of this input has been an important component of this determination.

First Nations

The Uchucklesaht First Nation provided detailed comments to the licensee regarding silviculture methods, old-growth harvest areas, the consultation process and general integrated resource management concerns. The Hupacasath First Nation provided advice on pesticide and herbicide use within its traditional territory. In addition, the Huu-ay-aht First Nation presented their concerns regarding forest management in TFL 44 within their traditional territory.

First Nations' concerns are presented and addressed in appropriate sections throughout this document.

The licensee is involved in discussions with First Nations with respect to partnerships for Forest Renewal BC projects, silviculture contracting, and timber harvesting opportunities.

(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 regenerated forests, a number of parasites, fungi or plants can kill trees or degrade log quality and value. Currently, the principal parasitic fungi or plants on TFL 44 which pose the most serious threats to forest health include hemlock dwarf mistletoe and laminated root rot.

Recent observations on the TFL indicate that the balsam woolly adelgid is more widespread than previously thought and the area infested is likely to continue to increase. The licensee noted that tree mortality is occurring in the eastern part of the licence area, south and west of Mt. Arrowsmith. Mortality is generally found on dryer sites of advanced and old-growth stands of amabilis fir and sub-alpine fir.

For this determination, harvest volumes were reduced by 0.75 percent to account for any losses incurred. In addition, as discussed under *operational adjustment factors (OAFs*), the licensee states that pests and diseases (in particular *phellinus weirii*) are accounted for in the development of Y-XENO yield tables and OAFs.

South Island Forest District staff have reviewed the assumptions used in the base case analysis and agree that these reflect the licensee's efforts to salvage damaged timber in the TFL. I therefore accept these assumptions and have made no adjustment on this account in this determination.

Clayoquot Sound

Description of the Clayoquot Sound Area

Clayoquot Sound is a complex of mountains, valleys, ocean inlets, lakes, rivers, islands and forests on the west coast of Vancouver Island. The area supports industries which include forestry, fishing, fish processing, mining, and tourism—particularly recreational activities associated with Pacific Rim National Park. In the late 1980s to early 1990s, the question of how to integrate various forms and levels of resource development with natural values in the Clayoquot Sound area aroused high levels of public debate and participation in comprehensive planning processes. This led to the government's 1993 Clayoquot Sound Land Use Decision (CSLUD), and to the establishment of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound to define forest practices for the area. The CSLUD designated portions of TFL 44 for protected areas, special management areas and general integrated management areas. The 1993 CSLUD established 33 000 hectares of new protected areas in TFL 44 and identified a substantial forest area in special management areas for scenic corridors, wildlife and recreation.

Clayoquot Sound has an extensive First Nations cultural history, and TFL 44 includes traditional territories claimed by several First Nations as noted in the section "Description of the TFL". The Clayoquot Sound portion of TFL 44 is covered by the Interim Measures Agreement of March 1994, extended in April 1996, (Clayoquot Sound Interim Measures Extension Agreement to April 1999) between the government of British Columbia and hereditary chiefs of the Nuu-Chah-Nulth Central Region Tribes. This agreement established the joint First Nations-provincial Central Region Board ('the Board') to oversee development in the Clayoquot Sound area; planning of operations in the Clayoquot Sound portion of the TFL must now be reviewed by the Board.

Guiding principles for AAC determinations for areas including portions of Clayoquot Sound

The inclusion of nearly 25 percent of TFL 44 in the area covered by the CSLUD is an important consideration in determining an appropriate AAC for the TFL.

In recent years, plans to integrate resource use with conservation of natural values in the area have attracted international attention. At the World Conservation Congress in Montreal in October, 1996, the World Conservation Union passed a resolution supporting the designation of Clayoquot Sound as an International Biosphere Reserve (IBR) under the "Man and the Biosphere' program of the United Nations Educational Scientific and Cultural Organization (UNESCO). The provincial government has expressed conditional support for this designation, noting that many of the land-use and management components already established for Clayoquot Sound also satisfy the requirements of an UN IBR designation. Public discussions sponsored by the Board and supported by the provincial government are underway, but it is not yet possible to assess whether the IBR status will be confirmed. However, it appears likely that such a designation would include full recognition of the new forest management

practices currently planned for the area. These currently planned practices have been derived under the following circumstances.

After many years of public participation and consultation regarding land and resource use in the area, the government's 1993 CSLUD assigned particular areas of Clayoquot Sound to three land-use categories—protected areas, special management areas, and general integrated management areas. Details of these areas as defined by the CSLUD are documented elsewhere, as for instance in *Clayoquot Sound Land Use Decision—Key Elements*, April 1993, Province of British Columbia.

On October 22, 1993, with the objective of defining “sustainable”, “world-class” forest practices for the area, the provincial government announced the formation of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.

In the interim, before any of the Panel's findings could become available, to account in a general way for the estimated impact of the CSLUD on the timber supply in TFL 44, in June 1994, the chief forester determined a temporary AAC reduction for TFL 44 of 220 000 cubic metres under what was then Part 15, now revised to Part 13 of the *Forest Act*, as noted above in "History of the AAC". The rescindment date for the orders in council related to this temporary reduction was January 1, 1998.

On May 30, 1995, the Panel submitted to government a three-volume report containing more than 120 recommendations on forest practices and First Nations issues. On July 6, 1995, the provincial government issued a joint news release between the BCFS and MELP, announcing acceptance of the Panel's report and government's intention to fully implement the report's recommendations.

In a letter to me as chief forester on September 17, 1996 (see Appendix 5) , the Minister of Forests, recognizing the unique and complex history of forest management in the Clayoquot Sound area, expressed as an economic and social objective of the Crown a confirmation of government's intention that timber harvesting continue to be a forest management objective for the Clayoquot Sound area and that this management be carried out in accordance with the Forest Practices Code and the recommendations of the Panel.

In considering my approach to the AAC determination for TFL 44, which I also applied to TFL 54 and the Arrowsmith TSA since these areas also include land within the CSLUD, I have noted the Panel's recommendation R7.1 in *Report 5* (pp. 153 and 246), which reads as follows:

> "Adopt an ecosystem approach to planning, in which the primary planning objective is to sustain the productivity and natural diversity of the Clayoquot Sound region. The flow of forest products must be determined in a manner consistent with objectives for ecosystem sustainability. This entails abandoning the specification of AAC as an input to local planning."

and recommendation R7.10 (page 247), which reads:

> "Recognize that the rate (percentage of area cut per unit time) and geographical distribution of timber harvesting are more important determinants than is the volume removed when wood harvest is planned. *After* analysis of resources and development of area-based plans, determine the anticipated annual volumes of timber to be cut for watershed planning units."

The July 6, 1995, government news release includes the following response:

> "harvesting levels will be based on watershed planning, rather than on a predetermined annual allowable cut".

With respect to the Panel's recommendation for "abandoning the specification of AACs as an input to local planning", in British Columbia wherever possible AACs are already intended to be outcomes of, rather than inputs to, local planning. Nevertheless, this recommendation has been interpreted by some to mean that no AAC at all should be determined for areas managed according to the Panel's recommendations. However, recommendations R7.1 and R7.10 do contemplate determining a flow of timber products and anticipated annual volumes of timber to be cut for watershed planning units, *after* the analysis of resources and development of area-based plans.

I understand these recommendations to mean that the flow of timber or rate of harvest should be ecosystem-based and I agree that it will be much easier to determine the appropriate rate after more resource information is gathered and watershed-level planning is complete. In this respect, the AAC will become, in time, a reflection of the planning process. However, acknowledging and respecting the Scientific Panel's report and the ongoing implementation of its recommendations, I must also comply with provincial legislation which requires the timely determination of AACs for all TFLs and TSAs.

In determining the AAC for TFL 44, I am required by section 8 of the *Forest Act* to consider the timber supply from the *whole* land base, including the appropriate areas of Clayoquot Sound (but excluding protected areas). Thus my current AAC determination must include assessment of a harvest level for the entire TFL including the portion which lies within Clayoquot Sound.

However, as discussed further below, the harvest level determined is not a substitute for local planning in Clayoquot Sound; rather it identifies a maximum level of harvesting activity to help provide confirmation of sustainability for harvesting in the TFL. The timing and placement of the harvest will be subject to detailed watershed plans which have yet to be developed, as well as to the implementation of numerous other recommendations by the Panel as overseen by the Clayoquot Sound Planning Committee.

In view of my obligation to consider the contribution to the timber supply from the Clayoquot Sound area in determining AACs for TFLs 44 and 54, and the Arrowsmith TSA, in view of the Panel's recommendation identified above, and in view of the ongoing work in implementing the CSLUD and the Panel's recommendations, I and my staff discussed this situation in detail with the Central Region Board. My aim in this was to investigate how the legal requirement for AAC determinations for the Arrowsmith TSA and TFLs 54 and 44, including establishing harvest levels for areas in Clayoquot Sound, could best be reconciled with the ongoing processes in Clayoquot Sound. It is my intention in my determinations to acknowledge and respect the CSLUD and the Panel's recommendations without prejudice to future decisions respecting management and implementation in the area.

Following discussions with the board, I identified procedures for assessing the timber supply that may reasonably be expected to result from my interpretation of certain of the Panel's recommendations, in order to satisfy my obligations under section 8 to determine the necessary AACs. It is acknowledged that while the method used does not model the results of fully implementing the Panel's recommendations—which would clearly not be possible at this still early

date—it does provide figures which I believe more closely represent the outcome of forest management in Clayoquot Sound than would a regular timber supply analysis that did not attempt to take the Panel's recommendations into account.

During discussions, the Board was concerned that even if I could find a reasonable means for determining an anticipated level of timber harvesting in Clayoquot Sound, such a level should not become a target on which to base forest planning or management in the Clayoquot Sound area. In establishing allowable harvest levels in the Clayoquot Sound area it is my intent that the levels determined should be viewed as upper limits, and I recognize that the *actual* harvest levels attained on the ground are expected to continue to be defined through appropriate planning and consultation, as recommended by the Panel. As with all AACs, I do not expect the harvest level determined by me for TFL 44 to be used as an *input* to planning. To this end, as noted below in "Implementation of decision", I have instructed the licensee and BCFS district staff to continue to work closely with the Board to ensure that within the AAC I have determined, all timber harvesting in the Clayoquot Sound area is a result of, and conforms to, appropriate local planning and forest practices as recommended by the Panel.

In assessing the timber supply capability of the Clayoquot Sound area, I note that the extensive recommendations in the Panel's report represent a complex and significantly different approach to forest management for the area. At this time many details remain uncertain regarding the interpretation, in operational activities, of the forest management principles underlying the Panel's recommendations. While the full implications for timber supply in the area are therefore also uncertain and difficult or impossible to predict by conventional modelling, it is nevertheless possible to arrive at a reasonable *calculated estimate* of the available timber supply based on my generalized interpretation of certain of the Panel's recommendations.

There are two recommendations by the Panel which I have found most relevant to such an assessment. The first is R3.1 (page 81-82 and 237 of *Report 5*), which specifies that in any watershed larger than 500 hectares in total area, the area cut in a five-year period should be limited to no more than 5 percent of the watershed area, and that for primary watersheds of 200 to 500 hectares in total area, the area cut should be limited to no more than 10 percent of the watershed area within a 10-year period. Page 62 of *Report 5* discusses a one-percent watershed-based rate of cut as follows:

> "A watershed-based rate-of-cut of 1% per year, while not unequivocally supported by data, appears to meet the needs of ecosystem management with regard to hydrology, habitat, and long-term sustainable wood supply. The rate of 1% per year appears appropriate as derived from hydrological considerations above, but also incorporates concerns about temporal distribution of seral stages for biological diversity and temporal distribution of wood supply for socio-economic stability. The rate is consistent with the ecological desirability of ensuring harvested areas support a range of seral stages with a variety of different-aged forest habitats for wildlife, plants, and other organisms. It also is consistent with principles of sustainable ecosystem management where the intent is to provide a level of harvestable products that can be sustained over the long term (the sustainable long-term timber supply will be lower than historical annual cut levels in Clayoquot Sound)."

The second recommendation, noted at pp 63 and 170-171 of *Report 5*, specifies that at least 40 percent of the forest in a watershed-level planning unit (i.e. all reserves plus forest retained in harvestable areas) should be in age classes 8 and 9 (i.e. 141 years or older).

Taking these recommendations and the other considerations specified in R3.1 into account, it is possible to establish an estimate of the annually harvestable area in the Clayoquot Sound portion of TFL 44, based on the assumption of limiting the harvest to one percent per year of the area while ensuring maintenance of at least 40 percent of the forest land in each watershed at 141 years or older. By assuming an average volume of timber per hectare, the annually harvestable area so derived may then be converted into an annually harvestable volume of timber.

The appropriateness of using my assumptions regarding the Panel's recommendations as a guide in this determination was discussed with the Central Region Board in 1996, prior to making an AAC determination for TFL 54 and the Arrowsmith TSA. With the acknowledgement that this approach does not model the results of fully implementing the Panel's recommendations, and with the reservation noted above concerning the use of harvest levels in planning, the Board advised me that they believe these assumptions provide a more reasonable basis for my assessment of the timber supply in the Clayoquot Sound area than would a conventional timber supply analysis that did not take into account the Panel's recommendations. The Board has advised me by recent letter that this remains the case for TFL 44, in the absence of a legislative change recognizing the unique circumstances of Clayoquot Sound, which would be the Board's preferred option in dealing with the assessment of timber supply in the area.

Application of the Scientific Panel's Recommendations in Timber Supply Analysis

As in TFL 54 and the Arrowsmith TSA, the Scientific Panel's recommendation R3.1 referred to in the "Guiding Principles for AAC Determinations for Areas Including Portions of Clayoquot Sound" could be interpreted in several ways—i.e. as permitting the harvesting of one percent of: (a) the total area; (b) the productive forest area; or (c) the timber harvesting land base, totalled by watershed.

Two factors were persuasive in my decision to adopt (c) the timber harvesting land base, rather than the productive forest or the entire gross land base in each watershed, as a basis for calculating the harvestable area in TFL 54 and the Arrowsmith TSA.

First, the timber harvesting land base is the only alternative that takes into account some of the historic environmental and economic limitations on harvesting. While it is not possible to account for all of the Panel's recommendations at this time I am aware that many of the recommendations will result in significant limitations on the amount of timber that can be harvested in any year. In particular the traditional timber harvesting land base will likely be smaller than that assumed under previous management guidelines. Thus, while the Panel recommendations on the rate of cut by watershed appear to apply to the total area in the watershed I believe that the combined impacts of the many recommendations of the Panel will result in a much smaller harvest level than would be indicated by 1 percent of the total area.

Second, at the time of determining the AAC for TFL 54 in December 1996, it was ascertained that applying the rate of cut recommendations to either (a) or (b) in the case of that TFL would lead to the derivation of a harvest level *higher* than the then current AAC for the TFL, which had not been met for a number of years. This derived harvest level would not only have been higher than the AAC at the time, it would also have been higher than the harvest level that had been projected, for the same area, in the licensee's *conventional* analysis based on management assumptions in place *prior* to the Panel's recommendations. As noted in the rationale for TFL 54, I considered such a derived harvest

level to be inconsistent with the principles underlying the Panel's recommendations—particularly in view of the Panel's statement (p.62 of *Report 5*) that "the sustainable long-term timber supply will be lower than historical annual cut levels in Clayoquot Sound".

In contrast, application of the one-percent-rate-of-cut recommendations to (c) the timber harvesting land base in each watershed resulted in a harvest level that avoided these inconsistencies with the Panel's recommendations. I therefore decided to use one percent of the timber harvesting land base in each watershed as a basis for assessing the timber supply for all areas in Clayoquot Sound.

Before the AAC determinations for TFL 54 and the Arrowsmith TSA, BCFS staff discussed the three interpretations with the Board, and the Board agreed with my view that the application of the one-percent limit to (c) the timber harvesting land base best reflected the overall intent of the Panel's recommendations. This interpretation was used for TFL 54 and the Arrowsmith TSA, and I have now applied the identical interpretation and methodology in determining a harvest level for TFL 44.

I note that in addition to the harvest level calculation based on these principles, the licensee has also suggested and provided for my consideration two alternative methods for deriving the harvest level for TFL 44. I have considered these in the section below entitled "Alternative rates of harvest". For the reasons identified there I have concluded that the method used in TFL 54 and the Arrowsmith TSA is more appropriate for use in determining a harvest level for the Clayoquot Sound portion of TFL 44 for the term of this AAC.

It must be noted that in both TFL 54 and the Arrowsmith TSA all the merchantable timber on the timber harvesting land base that was harvestable within the one-percent area limit was entirely comprised of mature timber. In TFL 44, the licensee has identified a relatively small amount of second-growth timber as available for harvest during the term of this AAC, and I have taken this into consideration. Considering the availability of this second-growth timber does not in any way affect the applicability of the one-percent area limit in the harvest level calculation. However, the timber harvested within the one-percent area limit may comprise a mix of mainly mature and a relatively small amount of second-growth timber. Second-growth timber is only considered in the calculations for those watersheds in which there is insufficient mature timber to make up the allowed one percent.

Timber Supply Analysis for Clayoquot Sound

As noted in the previous section, for the Clayoquot Sound portion of the AAC determination for TFL 44 the conventional timber supply analysis was replaced by an area-based calculation predicated on assumptions interpreted from recommendations by the Panel. In deriving the timber harvesting land base for use in this calculation, the same land-base-deduction procedures were applied as in the remainder of the TFL.

As with conventional base case analyses prepared for consideration in section 8 AAC determinations, I have considered the area-based, watershed-level analysis for the Clayoquot Sound area as a point of reference against which to test a number of assumptions in determining the timber supply contribution from the Clayoquot Sound area of TFL 44.

A base case forecast typically represents only one of a number of theoretical forecasts and may incorporate information about which there is some uncertainty. Its validity—as with all the other

forecasts provided—depends on the validity of the data and assumptions incorporated into the analysis used to generate it. Therefore, much of what is typically found in the considerations outlined in rationale statements for conventional AAC determinations under section 8, 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. In this AAC determination, this principle has been applied in examining the assumptions used in the area-based analysis.

To the extent possible, and as I have considered it appropriate, this area-based analysis has functioned in this portion of the determination as a "base case" harvest level against which to test certain assumptions about forest management. The methodology for the area-based analysis is described in the following section.

Clayoquot Sound Timber Supply Analysis Base Case Projection

As discussed above, the analysis which provided a basis for the assessment of timber supply in the Clayoquot Sound portion of TFL 44 differed substantially from that which is conventionally employed in timber supply analyses in other areas of British Columbia, in that it was designed specifically for use with requirements interpreted from certain of the Panel's recommendations for Clayoquot Sound.

A base case analysis for TFL 44 was carried out by the licensee using methodology completely consistent with that applied by the Ministry of Forests, at my recommendation, for areas of Clayoquot Sound in TFL 54 and the Arrowsmith TSA, as follows.

As a basis for the analysis, the watersheds in TFL 44 lying within the CSLUD area were identified by BCFS hydrologists—this amounted to all or part of 160 watersheds. Areas normally excluded from harvesting for reasons such as inoperability, environmental sensitivity and riparian reserves etc., were then deducted from the productive forest, to derive the timber harvesting land base.

From a GIS-based overlay, the forested area in each watershed was assigned to ten-year age classes, based on stand age, and the area in the timber harvesting land base in each watershed was determined.

Based on my assumptions about the Panel's recommendations, a calculation was applied to the timber harvesting land base as follows.

Old-growth forests (older than 140 years) were required to cover 40 percent of the total forested area of each watershed at all times. In some cases this requirement could be met completely from outside the timber harvesting land base. In other cases, a contribution was required from the timber harvesting land base in addition to areas already excluded from harvesting for other reasons. Where there was insufficient old growth in a watershed to meet the 40-percent retention requirement, a complementary area of the oldest available forest in the watershed was reserved. (These reductions to the timber harvesting land base are discussed below, under *additional old-growth reserves*.)

One percent of the remaining timber harvesting land base area was then calculated. To account for the influence of the last ten years of harvesting, it was assumed that the area less than ten years old

was evenly distributed in ten one-year age classes. Ten percent of the area in the watershed with forest cover less than ten years old was then subtracted from the one-percent area calculation. As I note below in "Alternative rates of timber harvesting", this latter step accounts to some extent for anticipated delays in harvesting in watersheds which first require, in accordance with recommendation R3.1, completion of a "watershed sensitivity analysis and stream channel audit", or in which "significant hydrological disturbance, substantial or chronic increase in sediment yield, or significant deterioration in aquatic habitat" are identified.

The total area of TFL 44 inside the CSLUD area is 101 009 hectares. After various land base deductions as discussed below, 38 713 hectares or 38 percent of the total area are currently considered to be in the TFL's timber harvesting land base.

Applying the one-percent-per-year harvestable area on a watershed basis, reduced by ten percent of the area less than ten years old in each watershed, in conjunction with the minimum 40-percent old-growth forest cover requirement, results in a figure of 193 hectares that could be harvested annually. This figure was comprised of 177 hectares of original mature forest (aged 120 years and over), and 16 hectares of second-growth forest (aged 40 to 119 years).

In order to convert these area figures into an annually harvestable volume, an area-weighted average volume per hectare was calculated for the old-growth—and second-growth where applicable—component(s) of the timber harvesting land base in each watershed. The average volume per hectare for each watershed (averaging for all watersheds 700.6 cubic metres for old growth and 400 cubic metres for second growth) was multiplied by the annually harvestable area for each watershed (totalling 177 hectares for old growth and 16 hectares for second growth). This produced figures for the total annually harvestable volume of old growth and second growth, respectively, of 124 000 cubic metres and 6000 cubic metres, for a total annually harvestable volume of 130 000 cubic metres.

This analysis by the licensee is consistent with the procedure adopted for the Clayoquot Sound area lying in TFL 54 and the Arrowsmith TSA, and I am satisfied that the information generated is capable of providing a reasonable projection of a maximum permissible harvest level for the area in Clayoquot Sound at this time. As noted above, the licensee also provided alternative analyses which I have discussed below under "Alternative rates of harvest".

Consideration of section 8 factors as applied in Clayoquot Sound

Where the consideration of a factor applies both inside and outside Clayoquot Sound but does not directly affect the harvest level calculation for and is presented elsewhere in this rationale (e.g. *timber processing facilities*) it is either omitted or treated only briefly in this section. Considerations specific to the area-based harvest-level calculation for the Clayoquot Sound area are presented in detail.

Derivation of the timber harvesting land base for use in the area-based calculation

In deriving the timber harvesting land base for the Clayoquot Sound area for use in the area-based calculation, the licensee used information and inventories similar to those used on the other three working circles to estimate the necessary land base deductions, and I am satisfied through the

following considerations that the timber harvesting land base so derived is appropriate for use in this determination.

- *Land base deductions*

Land base deductions were made for: Meares Island; non-forest areas; non-productive forest; physically inoperable areas; sensitive sites and non-timber values; deciduous forest; currently uneconomic areas; forest ecosystem network connectivity; and additional reserves of timber aged 140 years or older as needed to meet the Panel's recommendation to retain 40-percent of each watershed in trees aged 141 years or older.

- *Meares Island*

Meares Island was not included in the provincial government's 1993 Clayoquot Sound Land Use decision. Since 1985, Meares Island has been subject to a court injunction preventing all timber harvesting on the island. In 1994, the court action was adjourned indefinitely with the injunction in force.

My guiding principles for AAC determinations indicate that in the absence of any formal designation of protection such an area would usually be considered to contribute to timber supply. However, in view of the longevity of this injunction, in this AAC determination I have assumed no timber supply contribution from Meares Island portion of TFL 44 in order to ensure that the continued avoidance of harvesting on the island will not result in an increased rate of harvesting anywhere else in the TFL. For the purposes of this determination the exclusion of Meares Island results in a reduction of 3613 hectares.

- *non forest areas*

Land base deductions totalling 11 992 hectares were applied for non-forest areas including alpine, rock, water, swamp and roads.

- *non-productive forest*

A total of 8167 hectares were classified with inventory volumes of less than 211 cubic metres per hectare and were deducted from the land base. It is reasonable to assume that some sites of "low" productivity would also be deducted under this classification, and that other "low-sites" would be netted out in reductions for currently economically inoperable areas.

- *physical inoperability*

7907 hectares were deducted (after other overlapping deductions) for physical inoperability.

- *sensitive sites and non-timber resources*

Deductions in the following hectare amounts were made for:

Avalanche areas—156; soil instability—9352; difficult regeneration—199; riparian stream reserves—3672; riparian management zones for streams, lakes and wetlands—1599; deer habitat 714; recreation—4915. After accounting for overlaps, a total land base deduction of 17 917 was applied for these factors.

- *deciduous forest*

After other overlapping deductions, 32 hectares were deducted specifically for stands of primarily deciduous species.

- *currently uneconomic*

3676 hectares were excluded from the timber harvesting land base as currently uneconomic for harvesting.

- *forest ecosystem networks*

A total of 4261 hectares (supporting 2 437 000 cubic metres of mature timber) were removed from the land base to account for areas not already removed in previous reductions to provide for the FEN links included in the draft forest ecosystem networks that are already mapped for the whole TFL and are committed to in the management plan as representing current practice. (The FEN links are discussed in detail in my considerations for the TFL outside Clayoquot Sound.)

- *additional old-growth reserves*

To meet the Panel's recommendation for 40-percent retained old-growth cover in each watershed (see above, "Guiding principles for AAC determinations for areas including portions of Clayoquot Sound"), after accounting for appropriate contributions from protected areas and from areas removed for other purposes, the timber harvesting land base was reduced by a further 4732 hectares.

- *roads, trails and landings*

These are removed from the land base as part of the 'non-forest' deduction above; 1357 hectares are classified as industrial road.

- *newly protected areas*

A total of 33 000 hectares in the TFL were protected in the 1993 CSLUD. In this AAC determination, I have assumed no contribution to the timber supply from any protected area. However, in the applicable watersheds, these areas did contribute to the 40-percent-old-growth-retention requirement.

Inventory

The condition of the forest inventory for the Clayoquot Sound area is similar to that for all of TFL 44 and has been updated regularly. It was updated for growth to December 31, 1995, and for depletion to the end of 1997 (based for 1997 on plans available at the time of analysis). No sampling has been conducted to assess the accuracy of the inventory, but all of the Clayoquot Sound area is currently undergoing a re-inventory, coordinated by the Clayoquot Sound Planning Committee, to the standards of the federal-provincial Resources Inventory Committee.

- *mature volumes*

Estimates of mature volumes in the inventory were found to be within acceptable limits when compared to test samples on portions of the TFL outside Clayoquot Sound. From these inventory estimates an area-weighted average volume per hectare was calculated for each watershed. The overall average volume per hectare for mature stands in the timber harvesting land base in the Clayoquot Sound area of TFL 44 was found to be 700.6 cubic metres.

- *second-growth stands*

In six watersheds the timber available under the one-percent area calculation includes stands of second-growth 40 years and older which the licensee considers to be harvestable. The total area of second-growth under consideration is 16 hectares. To derive the harvestable volume on this area, the licensee used an average volume per hectare in these stands of 400 cubic metres (slightly lower than the projected weighted average of 434 cubic metres). From recent personal field experience in reviewing the productivity of second growth stands in TFL 44, I am satisfied that the licensee's estimate is within a reasonable range. At this level of productivity, the 16 hectares would contribute approximately 6000 cubic metres per year, and I have allowed for this in determining a maximum harvest level from the Clayoquot Sound area of TFL 44.

Regeneration delay, not-satisfactorily-restocked (NSR) areas, regeneration impediments

Detailed considerations of regeneration delay (which in conventional analysis could affect the short-term timber supply through adjacency constraints) do not affect the application of the one-per-cent by area rate of cut calculation for each watershed.

I note that the licensee's current policy is to apply the same stand establishment policy to the Clayoquot Sound area as to the rest of the TFL; thus the approximately 693 hectares classified as NSR in 1995 may reasonably be expected to be regenerated in an appropriate time frame, and are assumed to contribute to the timber harvesting land base.

Difficult regeneration has been identified for 199 hectares of forest stands, and 90 percent of this area was deducted in deriving the timber harvesting land base.

There appear to be no current reasons to anticipate conflict between regeneration practices in the TFL and the Panel's area-based harvesting requirements, and this factor has not affected my assessment of either the area expected to be available for harvest or the average timber volume per hectare.

Silvicultural treatments

Considerations related to spacing, fertilization, pruning and the genetic improvement of seed primarily affect the timber supply over the longer term and for the next five years do not affect the assessment of either the harvestable area in the TFL or the volume of mature timber per hectare; thus they have not influenced the area-based analysis used in the present AAC determination.

Utilization standards

The inventory information used for the Clayoquot Sound area incorporated the same utilization standards as those assumed for the rest of TFL 44, including the minimum 22.5-centimetre diameter at breast height (dbh) for mature stands. As noted earlier in this rationale, because cutting permits require utilization to a minimum of 17.5-centimetre dbh, the base case analysis for the three working circles outside Clayoquot Sound slightly underestimated the available timber supply and the same is true in respect of the weighted average volumes per hectare of mature timber available in each watershed in the area-based harvest-level calculation for Clayoquot Sound. The implication for timber supply, however, is likely to be very small in relation to the overwhelming constraining influence of the local planning process, and I have not adjusted the calculated harvest level on this account at this time.

Cultural heritage

A three-year inventory is underway to identify archaeological resources. Results to date in the second year indicate extensive archaeological features in Clayoquot Sound, focussed mostly on the shoreline. At this time the overall implications for timber supply are uncertain due to the potential for overlapping objectives with the variable retention silvicultural system, and the possibility of different patterns of use between shoreline and inland areas. In this determination, recognizing the Interim Measures Agreement Extension to April 26, 1999, I have assumed that the planning processes underway in Clayoquot Sound will continue to accommodate objectives for these resources, and that this will be feasible within the one-percent watershed harvesting restriction.

Partitioned component of the harvest

Section 8 (5) of the *Forest Act* provides for the attribution of portions of an allowable annual cut to different types of timber and terrain in different parts of Crown or private land within a TFL or TSA. As with TFL 54 and the Arrowsmith TSA, management under the Panel's recommendations implies a reduction from previous allowable harvests in the area. In fact, although the AAC associated with Management Plan No 2 for TFL 44 permitted a harvest of 405 000 cubic metres per year from the Clayoquot Sound working circle (after the Part 15 temporary AAC reduction), from 1994 to 1996 the actual harvest averaged approximately 154 000 cubic metres, with just 44 000 cubic metres being harvested in 1996.

In recognition of this, and in order to ensure appropriate levels of harvesting in TFL 44 both inside and outside the Clayoquot Sound area, I have decided to continue a partition within the AAC for that part of the harvest which is attributable to the Clayoquot Sound area. This will mean that if the ongoing planning process in Clayoquot Sound does not result in the identification for harvest of an annual volume equal to that which I have determined in advance to be available, such a shortfall will not be harvestable from elsewhere in the TFL.

Planning in the Clayoquot Sound area

I am advised that the Clayoquot Sound Planning Committee, consisting of representatives from the Central Region Board and from four provincial government agencies, is now established, is carrying

out watershed inventories, and is beginning to prepare plans according to the Panel's recommendations. I expect the watershed inventory information generated by this committee, and subsequent plans, will be considered in any future harvest-level determination for Clayoquot Sound as part of the AAC for TFL 44.

Alternative rate-of-harvest calculations

As discussed above in "Application of the Scientific Panel's Recommendations in Timber Supply Analysis", for the purposes of this determination the Panel's recommended one-percent harvesting restriction was applied to the conventionally derived *timber harvesting land base* in each watershed. The licensee also provided analyses showing harvest levels if the restriction was applied instead to either the *total area* in each watershed, or to the *productive forest area* in each watershed.

The results (combining both mature and second-growth areas, and volumes which were originally submitted in separate analyses) were as follows:

Land base in each watershed used in calculation	harvestable area/year (hectares)	harvestable volume/year (cubic metres)
total area	666	453 000
productive forest	482	330 000
timber harvesting land base	193	130 000

My reasons for considering the application of the one-percent harvesting restriction to the timber harvesting land base to be the most reasonable of these three options are presented in the "Application..." section referred to above.

The licensee also provided alternative analyses relying on two different basic methodologies.

In the first of these the harvestable areas were derived by applying the one-percent harvesting restriction in turn, as before, to the total watershed area, the productive forest, and the timber harvesting land base. However, in this alternative, this was done without any accounting for the recent harvesting history (which was represented in the base case by subtracting, from the calculated one-percent of the timber harvesting land base, ten percent of the area in the watershed with forest cover less than ten years old).

In the second alternative analysis, recent harvesting history was accounted for in each watershed by dividing by ten any amount of harvested area that has been incurred over the last ten years which is in excess of 10 percent of the total area of the timber harvesting land base, then subtracting this from the calculated one-percent of the timber harvesting land base.

I have considered carefully the two methodologies used in these alternative analyses. I have concluded for the following reasons that neither approach produces an interpretation of the Panel's recommendations for use in calculating the harvestable area in Clayoquot Sound that is more reasonable than that provided by the method used in the AAC determinations for TFL 54 and the Arrowsmith TSA and in the "Clayoquot Sound base case" for TFL 44.

The Panel's Recommendation R3.1 includes:

> In any watershed larger than 500 ha in total area, and primary watersheds of 200-500 ha in total area in which harvest has exceeded 20% of the watershed area in the most recent 10 years, allow no further harvest until the watershed conforms with the specified rate of cut.

and:

> In any watershed specified in the previous recommendations and in which the recent harvest is greater than 5% in the last five years, but less than 20% in the last 10 years, allow no further cutting until a watershed sensitivity analysis and stream channel audit have been completed. If these assessments indicate significant hydrological disturbance, substantial or chronic increase in sediment yield, or significant deterioration in aquatic habitat, cease harvesting until undesirable conditions are relieved. Otherwise harvest may continue at a rate which will bring the drainage unit within the recommended rate-of-cut limits within five years.

Any reasonable method of calculating the harvestable area in Clayoquot Sound must account for the Panel's recommended prohibition, in the short term, of harvesting in watersheds referred to in the first of these two paragraphs, i.e. where the harvest has exceeded 20 percent in the last 10 years. The first of the licensee's alternative analyses noted above makes no allowance at all for previous harvesting and therefore cannot be considered as a reasonable interpretation of Recommendation R3.1.

It is also evident from the second paragraph of R3.1 cited here that some additional accounting must be made for prohibitions and delays in harvesting in watersheds with less than 20 percent disturbance in the last ten years (where this is greater than five percent in the last five years) pending the noted assessments and audits. These in turn must then be followed up by the necessary planning, roadbuilding and operational readiness before harvesting may begin. I am advised that the Clayoquot Sound Planning Committee has been undertaking the necessary inventory work in watersheds, but actual watershed planning is just about to commence in a small number of watershed units. In view of the large number of watersheds involved and the complexity of the terrain and harvesting history, I consider it likely that the time required to complete necessary watershed plans will preclude harvesting in a significant number of watersheds for much if not all of the effective period of the AAC currently under determination. It was in recognition of these real but unquantifiable additional harvesting restrictions that the original harvest area calculation methodology presented to the Central Region Board for TFL 54 and the Arrowsmith TSA included the deduction of ten percent of the area in each watershed with forest cover less than ten years old from the one-percent area calculation.

The second of the licensee's alternative analyses, described above, also accounts to some extent for past harvesting. The method used, however, is less constraining than that applied in TFL 54 and the Arrowsmith TSA, and results in a higher harvest level than the TFL 44 Clayoquot Sound base case. This might be acceptable if there were reasons to anticipate that short-term planning and inventory delays in TFL 44 would be less constraining than those for the other two management units, but I have no evidence that this is the case. Thus, while more information from planning and harvesting experience gained under management following the Panel's recommendations may eventually justify a less constraining analysis such as that used in this second alternative provided by the licensee, I have concluded that for the effective period of the AAC currently under determination, the most reasonable, fair and consistent method for calculating harvest levels at this time in all three

management units that include portions of Clayoquot Sound is to continue to apply the same calculation as applied in the two previous cases.

As noted, this calculation produced for the Clayoquot Sound section of TFL 44 an annually harvestable area of 193 hectares with a harvestable volume of 130 000 cubic metres.

Social and Economic Objectives of the Crown for Clayoquot Sound

Minister's letters and memo

As noted above the Minister of Forests has expressed the social and economic objectives of the Crown for the *province* in two documents addressed to the chief forester: a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum February 26, 1996, (attached as Appendix 4). The Minister has also expressed the social and economic objectives of the Crown for the *Clayoquot Sound area* in a letter to me as chief forester dated September 17, 1996, (attached as Appendix 5). In my considerations for this AAC determination for the Clayoquot Sound portion of TFL 44, I have been mindful of the information in each of these documents. However, in view of the more specific nature of the objectives for Clayoquot Sound as expressed in the Minister's most recent letter, I have placed more weight on these specific objectives than on the more general expressions for the province in the other two documents.

In particular, as noted elsewhere in this rationale document, in his recent memo the Minister has stated that government recognizes the complex and unique circumstances and history surrounding the development of forest management policy for the Clayoquot Sound, and has accepted the recommendations of the report of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. The Minister confirmed government's intentions that timber harvesting continue to be one of the forest management objectives for the Clayoquot Sound area and that management of the area be carried out in accordance with both the Forest Practices Code and the recommendations of the Scientific Panel. The Minister specifically expressed the Crown's intention that these objectives should be taken into consideration in AAC determinations for areas including Clayoquot Sound.

For this reason the methodology for obtaining a "base-case" analysis of the timber supply in Clayoquot Sound has differed from that for all other management units in the province to date. Instead of a computer-generated, volume-based projection of timber supply over time based on data from a range of inputs, the base case analysis for the Clayoquot Sound portion of TFL 44 was produced from an area-based, watershed-level interpretation of specific recommendations by the Scientific Panel, as discussed in "Application of the Scientific Panel's Recommendations in Timber Supply Analysis" and "Clayoquot Sound Timber Supply Analysis Base Case Projection". While the harvest level so obtained is not a representation of the result of a complete modelling of all the Panel's recommendations—which would not be possible in the current absence of operational experience—the result does more closely represent forest management in accordance with the Panel's recommendations than would a conventional, volume-based analysis. In this way I have attempted to consider as fully as possible government's objective regarding the Panel's recommendations.

The Minister's memorandum addressed the effects of visual resource management on timber supply, and asked that the pre-Code constraints that were 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 when considered in conjunction with other Code requirements. Again, all planning, including visually sensitive areas, will be reviewed by the Central Region Board.

- *local objectives*

Both the Minister's letter and memorandum encouraged the chief forester to consider important local social and economic objectives that may be derived from the public input. In the case of the Clayoquot Sound portion of TFL 44, I note the long history of public participation in local planning processes which preceded government's 1993 Clayoquot Sound Land Use Decision, and the now ongoing public representation in planning through the Central Region Board.

- *First Nations*

In April, 1997, the licensee and the local Nuu-Chah-Nulth First Nations signed a joint venture agreement for the northern part of the Clayoquot Sound area of TFL 44. The licensee's draft Management Plan No. 3 states that a First Nations' priority is to "change forest management and planning processes to provide more protection for environment and cultural values associated with the forest of Clayoquot Sound". Operation of the joint venture company will focus first on planning and training consistent with the recommendations of the Panel report.

Reasons for Decision

In reaching my AAC determination for TFL 44, I have considered all of the factors presented above and have reasoned as follows.

For the reasons stated in "Timber supply analysis" and "Timber supply analysis for Clayoquot Sound", and from reviewing the considerations recorded above, I accept the licensee's base case for the TFL area outside Clayoquot Sound (combined, as noted, from the base cases for each of the three working circles of Alberni East, Alberni West and Ucluelet), and the base case for Clayoquot Sound, as adequate bases from which to assess the timber supply in TFL 44 for the purposes of this AAC determination.

TFL 44 (outside Clayoquot Sound)

The timber supply analysis base case projected an initial harvest level of 1 760 000 cubic metres per year, 2.5 percent below the harvest level of 1 806 000 cubic metres per year currently partitioned to this portion of the TFL.

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 determination. These latter factors are accounted for in determinations in more general terms.

For TFL 44 outside Clayoquot Sound, the following factor is identified as a reason why the timber supply projected in the base case may have been *over*estimated to a degree that may be quantified:

- Cultural heritage resources: The base case included no explicit accounting for CMTs or other archaeological sites. As I have noted, there are likely to be timber supply impacts from protecting areas around CMTs and other archaeological sites, which would reduce the timber supply projected in the base case for the short, medium and possibly long terms by up to an estimated 1.5 percent. In some instances these sites may overlap with wildlife tree patches and riparian management zones, reducing to some extent the associated impacts on timber supply. (As noted, as inventories are completed a better accounting of land base impacts will be available for consideration in future AAC determinations.)

The following factor is identified as a reason why the timber supply may have been *under*estimated in the base case to a degree that may be quantified:

- Old-growth utilization standards: In the base case analysis, mature stands (aged 120 years and older) were modelled using 22.5-centimetre minimum dbh with a 30-centimetre stump and 15-centimetre top-inside-bark diameter, whereas cutting permits specify 17.5-centimetres minimum dbh with a 30-centimetre stump and 10-centimetre top-inside-bark diameter. The base case has underestimated the timber supply on this account for the short- and medium terms by less than 1 percent.

The following factor is identified as indicative of a potential overestimation of the timber supply to a degree that currently cannot be quantified with accuracy.

- Wildlife habitat*:* The licensee has made a significant attempt to account in the base case for mapped sites of known significant wildlife habitat. However, due to a lack of specific habitat mapping for red- and blue-listed species, as well as regionally significant species, in some cases these are likely to have been inadequately addressed (e.g. Queen Charlotte goshawk). However, I have noted key resource overlaps such as riparian zones, FENs and wildlife tree patches, as well as the potential for shifting deer or elk winter range zones where reasonable and appropriate, and I have also considered government's commitment to limit impacts from identified wildlife to one percent of the provincial timber supply. From this, and based on the other considerations listed below, I have concluded that wildlife habitat requirements can be accommodated within the initial harvest level projected in the base case during the period of this AAC.

The following factor is identified as indicative of a potential underestimation of the timber supply to a degree that currently cannot be quantified with accuracy.

- Fertilization: I have noted that the base case included no accounting for fertilization of seedlings upon planting, although this is current practice on the TFL.

In reviewing the above-noted factors indicating an overestimation or underestimation of the timber supply in the base case projection, it is reasonable to assume that adjusting the timber supply to account correctly for old-growth utilization standards would partially but not completely offset the impacts of cultural heritage resources, leaving approximately a 0.5-percent overestimation on that account in the projected timber supply.

In considering whether this overestimation indicates the need for an adjustment to the projected timber supply that must be reflected in the AAC under determination, the overestimation must be assessed in conjunction with the identified uncertainties associated with consideration for wildlife habitat, with the unaccounted-for fertilization of seedlings, and with certain features of the timber supply projection itself.

As detailed below, I have made such an assessment and for the following reasons I have not considered it necessary or appropriate at this time to determine a harvest level for this portion of the TFL that is lower than the initial harvest level projected in the base case.

1. The timber supply analysis has made very significant provisions for forest values other than timber in two important respects—(a) in the large amount of land assumed not to contribute to timber supply by virtue of providing for FEN links, and (b) in the extent of consideration given to visual quality objectives (VQOs). While I have not assumed any directly associated quantitative contributions to the timber supply at this time, I do expect these factors to provide additional support to the projected timber supply, as follows.

   (a) FEN links: In the base case, 19 002 hectares were mapped as FEN links and deducted from the land base. This area is about 11 percent as large as the long-term timber harvesting land base of the TFL. In my considerations (see *forest ecosystem networks*) I have discussed my acceptance of the exclusion of this extensive area from the timber harvesting land base as representing a valid interim strategy for the management of biodiversity until formal

landscape-level strategies are developed. However, as I noted, the interim management strategy based on this land base exclusion may be subject to change as the landscape unit planning process proceeds, and the draft FEN links as currently delineated may or may not become integrated into the final landscape unit plans.

Based on the strategies for attaining landscape-level biodiversity objectives under the Forest Practices Code as described in the *Biodiversity Guidebook*, and on the subsequent policy direction by the deputy ministers of the Ministries of Forests, and of Environment Lands and Parks, in their letter of August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts of biodiversity management on timber supply, I consider it unlikely that no harvesting will ever take place in the entirety of the large area excluded for FEN-links, as was assumed in the analysis. To any extent that harvesting does subsequently take place in these areas, this will increase the attainability of the base case harvest forecast that was made on the assumption of no harvesting.

(b) Visual Quality Objectives: Significant portions of TFL 44 were identified in the visual landscape inventory as areas where visual quality is of *potential* significance. For *all* of these areas, based on the VQO classifications contained in the inventory, in the timber supply analysis the licensee applied standard BCFS procedures for calculating allowable alteration percentages and green-up ages (with an adjustment for genetic improvement). However, for the following reasons it is appropriate to consider alternatives to this approach. The Minister of Forests has expressed the provincial socio-economic objective of ensuring an appropriate balance between protecting visual resources and minimizing the impact of this protection on timber supplies. The BCFS will soon release policy guidance for achieving VQOs in a manner less constraining to the province's timber supply, ranging from improved landscape design techniques to potential benefits from fertilization in reducing green-up ages. The licensee plans to review and update inventories and VQO recommendations by December 31, 1998, incorporating principles of landscape design and applying silvicultural strategies that will reduce the time to achieve visually effective green-up.

Both scenic and visually sensitive areas are yet to be formally established in TFL 44, and the achievement of VQOs in a less constraining manner than that modelled in the analysis is already under active consideration and planning. Thus, particularly in view of the Minister's expressed objectives, VQOs are likely to be met in TFL 44 with less, rather than more, restriction on the timber supply than was assumed in the base case. Sensitivity analysis for TFL 44 shows that when either the extent of allowable alteration or the specifications for visually effective green-up are relaxed, the amount of timber available for harvesting notably increases. While this additional timber was assumed in the analysis to fill the projected mid-term supply gap, it could also provide additional support to the projected short-term timber supply.

2. Sensitivity analysis shows that even with a five-percent reduction in the timber harvesting land base (and assuming no additional contribution to the timber supply from the measures noted in (1) immediately above) acceptable adjustments to the per-decade decline rate permit the projected initial harvest level to be maintained. The total timber supply overestimation in the base case (approximately 0.5 percent by volume) represents a volume reduction substantially less than would be associated with the removal of five percent of the timber harvesting land base.

The projected short-term harvest level is thus stable against this overestimation for at least the five-year effective period of this AAC, with a considerable margin of flexibility remaining to accommodate any potential land base changes associated with the management of identified wildlife species, the overall provincial timber supply impacts of which, as noted, have been limited by government to one percent.

3. As noted in "Alternative harvest flows", sensitivity analyses show that by adjusting the average rate of decline in harvest levels projected in the base case from approximately 7 percent per decade to 10 or 15 percent, the initial harvest level could be increased. This shows that by adjusting the decline rate within acceptable limits, there is flexibility to maintain the initial harvest level projected in the base case while accommodating constraints on timber supply in addition to those incorporated in the base case.

I have also noted that the district manager considers there to be sufficient flexibility to reconfigure cutblocks where necessary for the 20-year plan, indicating a higher level of operational flexibility in the first five years of the plan.

The fertilization of seedlings may provide a small and uncertain additional contribution to the timber supply, which may be accounted for in a future determination, but without requisite data for the present determination I have not assumed any contribution from this source.

For all of the reasons listed above I am satisfied that the initial harvest level projected in the base case for this portion of the TFL is adequately supported by the timber supply and that for the period of Management Plan No 3, non-timber forest values including cultural heritage resources and biodiversity, including First Nations' concerns regarding the location of cutblocks, can be accommodated in operational planning for the administration of an AAC determined consistent with this projected initial harvest level.

I acknowledge the ongoing Traditional Use Studies and Archaeological Impact Assessments in the TFL, and the urgent need to update our knowledge of cultural and archaeological factors within the TFL. I have noted that I expect more information to be available to appropriately address First Nations' issues in the next AAC determination.

To assist in providing operational flexibility, particularly in managing the variety of non-timber forest values identified in TFL 44, I have decided not to maintain the partitions attributing specific harvest levels to each of the working circles outside Clayoquot Sound and to the various operability classes. The only partition that I will be establishing outside Clayoquot Sound will be a partition for marginally economic stands. However, I expect operations to continue to be reasonably balanced across the land base, across age and species classifications, between conventional and non-conventional operability classes, and in consideration of the spectrum of all other management objectives outlined in Management Plan No. 3. If, at the conclusion of Management Plan No. 3 it becomes apparent that operations have not been adequately distributed, this will be addressed in the next AAC determination.

The 20-year plan assumes that 73 900 cubic metres annually will be harvested from marginally economic stands. Management Plan No. 3 proposed 30 000 cubic metres of these stands for harvesting annually. As noted in my considerations, I have concluded to establish the partition for harvesting attributable to marginally economic stands at a level of at least 40 000 cubic metres per year. This level

will still require a proportionally greater harvest from these stands in the future, but will also provide lead time to accommodate their inclusion as an increasing component of the licensee's operations.

In conclusion I must emphasize that achieving an AAC of 1 760 000 cubic metres for the three working circles is only possible if harvesting is distributed throughout the timber harvesting land base.

Clayoquot Sound

To ensure that the level of harvesting in the Clayoquot Sound portion of the TFL does not affect harvesting levels outside Clayoquot Sound, I am attributing a partitioned component of the AAC for the TFL to the Clayoquot Sound area.

The provincial government's July 6, 1995, acceptance of, and commitment to fully implement, the Scientific Panel's recommendations for sustainable forest management in Clayoquot Sound, were subsequently confirmed to me in the Minister of Forests' letter of September 17, 1996, as a formal expression of social and economic objectives of the Crown. Given these clear expressions of the Crown's objectives I have placed significant weight in this portion of my determination on the Crown's stated objective that the Clayoquot Sound area be managed according to the recommendations of the Scientific Panel.

As a direct result, the methodology used for this portion of the determination is fundamentally different from that applied in AAC determinations for all other management units in the province outside the Clayoquot Sound area, including the remainder of TFL 44. While I have examined in detail all those factors required by section 8 of the *Forest Act* to be considered, I have not done so by testing the current validity of a computer-generated timber supply projected over a period of hundreds of years, as is the conventional approach to AAC determinations in this province. Rather, I have used a methodology for examining timber supply which is as consistent as possible, given currently available information, with specific recommendations of the Panel which bear a direct relationship with the amount of timber that may be harvested from watershed areas within Clayoquot Sound.

In employing this methodology, I have attempted to reconcile the provincially legislated requirement to determine an AAC for TFL 44 under section 8 of the *Forest Act* with government's expressed intention to implement the Scientific Panel's recommendations for the area, given that these include the recommendation to "determine the anticipated annual volumes of timber to be cut for watershed planning units", "*after* analysis of resources and development of area-based plans"(from recommendation R7.10).

I acknowledge from the outset that this determination is being made *before*, rather than after, completion of local planning for the area, expressly in order to meet the legal requirements of section 8. For that reason I have noted in my considerations that the AAC I determine is intended to provide an indication of the maximum harvest level that might be attained in accordance with my interpretation of certain of the Panel's recommendations, understanding that the actual harvest level achieved in the area will result from planning processes currently underway in Clayoquot Sound.

As noted in "Application of the Scientific Panel's recommendations in timber supply analysis" and "Timber supply analysis base case", the area-based analysis of the harvestable area by watershed was based on an interpretation of the harvesting restrictions prescribed in the Panel's recommendations. I noted there that it would have been possible to interpret these restrictions as applying to the gross area in

each watershed, the productive forest in each watershed, or the net operable timber harvesting land base in each watershed. I also explained my reasoning for deciding to apply the restrictions to, and base the harvest calculation on, the net operable timber harvesting land base, consistent with the methodology applied for the Clayoquot Sound portions of the Arrowsmith TSA and TFL 54. I also considered alternative methods proposed by the licensee for calculating the harvest forecast for the Clayoquot Sound, and have provided my reasons for relying on the method applied in TFL 54 and the Arrowsmith TSA.

From all the foregoing considerations and reasoning, I am satisfied that the area-based, watershed-level analysis as applied in TFL 44 provides a reasonable means of deriving the annually harvestable area, the average volume per hectare, and thus an annually harvestable volume for the Clayoquot Sound portion of TFL 44 under the described interpretation of the Panel's recommendations. My considerations have identified no reason to vary the results of the analysis, and I therefore find the resulting annual volume of 130 000 cubic metres to be a suitable harvest level attributable to the Clayoquot Sound portion of TFL 44 at this time. This harvest level should not be construed as an input to local planning processes, which are intended to identify the specific harvestable areas on which the actual harvest level achieved in Clayoquot Sound will depend.

Determination

Having considered and reviewed all the factors as documented above, and taking into account the risks and uncertainty of the information provided, it is my determination that timber harvest levels that accommodate objectives for all forest resources during the next five years, that reflect the socio-economic objectives of the Crown for the area, that ensure longer-term integrated resource management objectives can be met, and that reflect current management practices, can be best achieved in the TFL at this time by establishing an AAC of 1 890 000 cubic metres, which includes partitions of at least 40 000 cubic metres attributable to marginally economic stands outside Clayoquot Sound, and a maximum of 130 000 cubic metres for harvesting in accordance with local planning in Clayoquot Sound, effective January 1, 1998.

Having now determined under section 8 of the *Forest Act* a new AAC for TFL 44 which has excluded designated protected areas and has accounted in a general way for new management practices in Clayoquot Sound, the temporary AAC reduction previously ordered for TFL 44 under Part 15 (now Part 13), related to Orders-in-Council Nos. 718 and 719 is no longer required and I note that these OICs expired on December 31, 1997.

Implementation

This determination is effective January 1, 1998, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination. In the period following this determination and leading to the subsequent determination I expect the licensee to perform the following:

- In consultation with the district manager, establish procedures for:

  monitoring and reporting the performance for the TFL (outside Clayoquot Sound) to evaluate the relative distribution of harvesting across the land base, age and species classifications and conventional and non-conventional operability classes;

monitoring and reporting harvesting performance on marginally economic stands; and

reporting annually to the district manager, a summary of the second-growth volume harvested.

- Recompile the inventory, by adding operational cruises completed since 1987, recompiling the 1970's inventory to exclude logged samples and samples in operationally cruised areas, and using the latest Kozak 4.0 taper equations.

- Investigate and assess, in cooperation with South Island Forest District staff, the extent of the colluvial areas on the TFL that are difficult to regenerate.

- Complete assessments of riparian requirements on the TFL for Management Plan No. 4.

- Complete CWAPs on a priority basis, in cooperation with South Island Forest District staff.

- Complete inventory and develop management prescriptions for cultural heritage resources to assess impacts on the land base and the degree to which these resources are located within other constrained areas (e.g. wildlife tree patches).

- Fulfill the commitment to review and update landscape inventories and VQO recommendations prior to the next timber supply analysis.

In addition, during the term of Management Plan No. 3, BCFS staff and the licensee should continue to work closely with the Clayoquot Sound Planning Committee and the Central Region Board to ensure that all timber harvesting in the Clayoquot Sound area is a result of, and conforms to, appropriate local planning and forest practices as recommended by the Scientific Panel.

Larry Pedersen
Chief Forester

January 22, 1998

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act* reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut before December 31, 1996, and after that determination 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 and woodlot licence areas, and
(b) each tree farm licence area.

(2) If, after October 1, 1992, 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),

then, with respect to that timber supply area or tree farm licence area, as the case may be, the chief forester is not required to make the determination under subsection (1) of this section before December 31, 1996, or within 5 years after the last determination, but is required to make the determination

(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 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) or (2) 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 this section 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,
(b) different types of timber and terrain in different parts of private land within a tree farm licence area, and
(c) gains in timber production on Crown land that are attributable to silviculture treatments funded by the government of British Columbia, the federal government, or both.

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

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

(i) the composition of the forest and its expected rate of growth on the area,
(ii) the expected time that it will take the forest to become re-established on the area following denudation,
(iii) silvicultural treatments to be applied to the area,
(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,
(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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

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

Purposes and functions of ministry

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

(a) encourage maximum productivity of the forest and range resources in the Province;
(b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;
(c) plan the use of the forest and range resources of the Crown, 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 Crown and with the private sector;
(d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
(e) assert the financial interest of the Crown in its forest and range resources in a systematic and equitable manner.

Documents attached:

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

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

Appendix 5: Minister of Forests' memo of September 17, 1996