

**BRITISH COLUMBIA
MINISTRY OF FORESTS AND RANGE**

**Tree Farm Licence 48
Canadian Forest Products Ltd.**

**Rationale for
Allowable Annual Cut (AAC)
Determination**

Effective May 25, 2007

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Deputy 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 in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence 48. This document also identifies where new or better information is needed for incorporation in future determinations.

Description of Tree Farm Licence 48

Tree Farm Licence (TFL) 48, also known as the Chetwynd TFL, is held by Canadian Forest Products Limited (Canfor or “the licensee”). The TFL consists of five supply blocks in the southwest portion of the Peace Forest District. The Peace Forest District office is based in Dawson Creek; the district is one of nine located in the Northern Interior Forest Region of the Ministry of Forests and Range (BC Forest Service or BCFS).

Most of the TFL borders the Dawson Creek Timber Supply Area (TSA), but portions also share boundaries with the Mackenzie and Fort St. John TSAs.

The easternmost part of the TFL is characterized by flat or gently rolling terrain, while the southern and western parts are more rugged lying within the Rocky Mountains. The four biogeoclimatic zones located in the TFL are the Boreal White and Black Spruce (BWBS), Sub-Boreal Spruce (SBS), Engelmann Spruce-Subalpine Fir (ESSF) and Alpine Tundra (AT).

The diversity of terrain and climate has led to considerable variation in tree species and productivity. The principal commercial species are white spruce, lodgepole pine, subalpine fir (also called balsam fir), trembling aspen and cottonwood. A large proportion of these species exist in mixed-wood stands comprising two or more different species. Tree species such as larch, white birch and black spruce also occur in the TFL but offer no commercial value at present.

The West Moberly (WMFN), Sauleau (SFN) and Halfway River (HRFN) First Nations, and McLeod Lake Indian Band (MLIB) are signatories to Treaty 8, and have treaty lands that overlap with portions of TFL 48. The WMFN and SFN have reserves that are directly adjacent to the TFL.

Local communities within the vicinity of the TFL include Chetwynd, Tumbler Ridge, Hudson’s Hope, Moberly Lake and Sauleau. Of these, Chetwynd, the site of the licensee’s sawmill, is the most economically dependent upon harvesting in TFL 48. Other economic activities in the area include oil and gas exploration and development, mining, hydro-electric power generation, agriculture, wind farms, trapping, guide outfitting, tourism and outdoor recreation.

The general TFL 48 area is 643 239 hectares of which 566 394 hectares (88 percent) are covered by productive forest. In the base case, 356 756 hectares (64 percent) of the productive forest land base were estimated to contribute to the long-term timber harvesting land base.

History of the AAC

Prior to 1988, the licensee held a forest licence under which it operated in much of the area now covered by TFL 48. In 1988, the forest licence was replaced with a TFL with an associated AAC of 410 000 cubic metres.

The AAC was increased to 514 000 cubic metres effective December 31, 1996, and was further increased to 580 000 cubic metres in the last determination effective September 20, 2001. The last determination attributed 55 000 cubic metres to deciduous and coniferous trees within deciduous-leading stands and the balance to coniferous and deciduous trees in coniferous-leading stands.

The minister apportioned 58 630 cubic metres to BC Timber Sales and 55 000 cubic metres for other purposes.

New AAC determination

Effective May 25, 2007, in response to the need to address the mountain pine beetle epidemic and in consideration of information obtained since the last determination, the new AAC for TFL 48 will be 900 000 cubic metres. This AAC is intended to help address salvage harvesting of lodgepole pine-leading stands that are, or are highly susceptible to being, attacked by the mountain pine beetle. I attribute, under section 8(5) of the *Forest Act*, 100 000 cubic metres to deciduous and coniferous trees within deciduous-leading stands, and the balance to coniferous and deciduous trees within coniferous-leading stands.

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

Information sources used in the AAC determination

Key information sources used in this determination include:

- TFL 48 Timber Supply Analysis Report. Canfor. Submitted August 8, 2006 and accepted by the BCFS on August 31, 2006 (referred to as the “2006 analysis” or the “analysis” in this document);
- TFL 48 Timber Supply Analysis Information Package. Canfor. Submitted March 17, 2006 and accepted by the BCFS on April 25, 2006;
- Sustainable Forest Management Plan No. 4 for TFL 48. Canfor. Submitted September 26, 2006 for BCFS approval;
- TFL 48 Public Input Summaries. Canfor. Submitted August 15, 2006 and accepted by the BCFS on August 31, 2006;
- TFL 48 Twenty-year Plan. Canfor. Submitted September 27, 2006 and accepted by the BCFS on October 12, 2006;
- Vegetation Resource Inventory Statistical Adjustment Report for TFL 48. Prepared by J. S. Thrower and Associates for Canfor. Submitted March 15, 2005 to BCFS Forest Analysis and Inventory Branch;
- Existing stand yields used in timber supply analysis. Canfor. Submitted March 17, 2006 and accepted by the BCFS Forest Analysis and Inventory Branch on April 24, 2006;

- Managed stand yields used in timber supply analysis. Canfor. Submitted March 17, 2006 and accepted by the BCFS Research Branch on March 27, 2006;
- Guidance on Landscape- and Stand-level Structural Retention in Large-Scale Mountain Pine Beetle Salvage Operations. Jim Snetsinger, Chief Forester, BCFS. December 2005;
- Chief Forester's response to MPB and potential 2007 flooding. Jim Snetsinger, Chief Forester, BCFS. March 16, 2007;
- The Effect of Mountain Pine Beetle Attack and Salvage Harvesting on Streamflows. Forest Practices Board. March 2007;
- Dawson Creek Land and Resource Management Plan. Province of BC. March 30, 1999;
- Dunlevy Creek Management Plan. BC Ministry of Sustainable Resource Management. January 24, 2002;
- Tree Farm Licence 48 Rationale for Allowable Annual Cut (AAC) Determination Effective September 20, 2001. Ken Baker, Deputy Chief Forester. September 20, 2001;
- Timber Supply Analysis Report: TFL 48. Canfor. 2001 (referred to as the "2001 analysis" in this document);
- Letter from the Minister of Forests and Range to the chief forester, dated July 4, 2006, stating the Crown's economic and social objectives for the province (see Appendix 3);
- Forest and Range Practices Act, 2002 and amendments;
- Forest and Range Practices Regulations, 2004 and amendments;
- Forest Practices Code of British Columbia Act, 1995, and amendments;
- Forest Practices Code of British Columbia Act Regulations, 1995, and amendments;
- Ministry of Forests and Range Act (consolidated to March 30, 2006);
- Riparian Management Area Guidebook, Province of BC, December 1995;
- Biodiversity Guidebook, Province of BC, September 1995;
- Order Establishing Provincial Non-Spatial Old Growth Objectives. Minister of Sustainable Resource Management. 2004;
- Natural Disturbance Units of the Prince George Forest Region: Guidance for Sustainable Forest Management. Craig DeLong, BCFS, Prince George. 2002;
- Natural Disturbance Unit Guidance and Planning. Ray Schultz, BCFS Regional Manager and Phil Zacharatos, Ministry of Sustainable Resource Management Regional Director. April 29, 2002 letter;
- Managing Identified Wildlife: Procedures and Measures. Volume 1. 1999. BC Ministry of Forests. Province of British Columbia;
- The Identified Wildlife Management Strategy (IWMS) Version 2004: Procedures for Managing Identified Wildlife and Accounts and Measures for Managing Identified Wildlife;
- Input received from First Nations through information sharing initiated by the licensee as part of the review of proposed Management Plan No. 4, and consultation by the BCFS regarding the 2006 analysis, timber supply review and AAC determination process;

- Tour of TFL 48 and associated discussions among Canfor staff, the deputy chief forester and BCFS district, regional and branch staff on October 24-25, 2006;
- Consideration of factors required by Section 8 of the *Forest Act* for TFL 48 by the deputy chief forester with BCFS operations and branch staff at the AAC determination meeting held on December 13, 2006, and follow-up meeting held March 27, 2007.

Role and limitations of the technical information used

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

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

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

In determining the AAC for TFL 48, 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 TSAs and TFLs. Section 8 of the Act is reproduced in full as Appendix 1.

In accordance with Section 23(3) of the *Interpretation Act*, the deputy chief forester is expressly authorized to carry out the functions of the chief forester, which include those required under Section 8 of the *Forest Act*.

Guiding principles for AAC determinations

The chief forester has expressed the importance of consistency of judgement in making AAC determinations. I also recognize the need for consistency of approach, and I am familiar with the guiding principles that the chief forester has employed in making

AAC determinations. I find these principles to be reasonable and appropriate and I have adopted them as described below in making my AAC determination for TFL 48.

Rapid changes in social values and in our understanding and management of complex forest ecosystems will affect our interpretation of the information used in AAC determinations or our weighing of it. In making the large number of periodic determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. In any specific circumstance where I may consider it necessary to deviate from these principles, I will explain my reasoning in detail.

Two important ways of dealing with uncertainty are:

- (i) minimizing risk, in respect of which in making AAC determinations, I consider particular uncertainties associated with the information before me, and attempt to assess and address the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and
- (ii) redetermining AACs frequently, 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 the chief forester to take into account in determining AACs, I intend to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to *increase* the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to *reduce* the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia* (Code) – which is now in transition to the *Forest and Range Practices Act* (FRPA).

In many areas, the timber supply implications of some legislative provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination the chief forester takes this uncertainty into account to the extent possible in the context of the best available information. In making my determination for TFL 48, as deputy chief forester, I have followed the same approach.

As British Columbia progresses toward completion of strategic land-use plans, in some cases the eventual timber supply impacts associated with the land-use decisions resulting from the various regional and sub-regional planning processes remain subject to some uncertainty before formal approval by government. In determining AACs, I will not speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government.

In February 2007, The BC Energy Plan: A Vision for Clean Energy Leadership stated that the province will begin the second-stage discussion with First Nations, Alberta and stakeholders on the advancement of Site C, a third dam on the Peace River. This does not commit the Province to building the project, only to explore further the possibility of it. The Site C project, if built, would affect portions of TFL 48. In keeping with my guiding principles, I will not speculate on decisions not yet made by government.

In some cases, even where government has made a formal land-use decision, it is not necessarily possible to analyze and account for the full timber supply impact in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring, for instance, the establishment of resource management zones and resource management objectives and strategies for those zones. Until such implementation decisions are made it would be impossible to assess in full the overall impacts of land-use decisions. In such cases, the legislated requirement for frequent AAC reviews will ensure that future determinations address ongoing plan implementation decisions. Whenever specific protected areas have been designated by legislation or order-in-council, these areas are deducted from the timber harvesting land base and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting resource management objectives such as biodiversity.

TFL 48 lies within the area covered by the Dawson Creek Land and Resource Management Plan (LRMP) approved by government in 1999, and the Dunlevy Creek Management Plan approved in 2002. These plans have clarified many aspects of land and resource management and I refer to the plans where applicable in various components of this document.

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

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

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from decisions in recent years made by the Supreme Court of Canada. I am aware of the Crown's legal obligation to consult with First Nations. I am also aware that TFL 48 overlaps with treaty lands of First Nations who are signatories to Treaty 8. In regard to the foregoing, I will consider any information brought forward respecting First Nations' treaty rights, including operational plans that describe forest practices to address First Nations' treaty rights. As I am able, within the scope of my authority under section 8 of the *Forest Act*, I will address those treaty rights. When treaty rights are raised that are outside of the scope of my authority, I will endeavour to forward this information to other decision-makers for consideration.

The AAC that I determine should not be construed as limiting the Crown's obligations under the Court's decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 48. It is also independent of any decisions by the Minister of Forests and Range with respect to subsequent allocation of wood supply.

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

Because the new regulations of the *Forest and Range Practices Act* are designed to maintain the integrity of British Columbia's forest stewardship under responsible forest practices, it is not expected that the implementation of the legislative changes will significantly affect current timber supply projections made using the Code as a basis for the definition of current practice.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in this AAC determination, I am assisted by timber supply forecasts provided to me by the licensee as part of the BCFS Timber Supply Review program.

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, a series of timber supply forecasts is 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 reliability 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 judgment, using current information available about forest management, which may well have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans.

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

Timber supply analysis

The 2006 timber supply analysis for TFL 48 was prepared by Industrial Forestry Service Ltd. under the direction of licensee staff. The analysis was modelled using the Remsoft Spatial Planning System that includes the Woodstock v2006.1.1 component used for the optimization of timber supply projections and the Stanley v5 component that provided the spatial modelling used to prepare the twenty-year plan. Based on my staff's experience examining analyses prepared with the Remsoft model, I am satisfied that it is capable of providing reasonable projections of timber supply.

The base case in the timber supply analysis incorporates a number of changes in input data and methodology from the base case generated in the previous 2001 timber supply analysis that supported the AAC determination effective September 20, 2001. Due to these and other changes, the current and previous base case projections are not directly comparable in some respects. Comprehensive details of the assumptions made in representing current forest management in TFL 48 in the base case are provided in the 2006 information package and many are also discussed in relevant sections of this rationale.

In the base case, the harvest flow objective was to identify the maximum non-declining harvest level. This reflected the harvest flow objective selected in the Sustainable Forest Management Plan No. 4 for the TFL in consultation with the public.

The resulting base case forecast indicates that an initial harvest level of 737 000 cubic metres per year can be sustained indefinitely. This initial harvest level is considerably higher (27 percent) than the current AAC of 580 000 cubic metres. The base case harvest level consists of 642 800 cubic metres per year of coniferous-leading stands and 94 200 cubic metres per year of deciduous-leading stands — both of which are projected in the analysis to be sustained indefinitely.

The Vegetation Resources Inventory (VRI) phase 1 photo-interpreted inventory was completed in support of the 2001 analysis. The primary reason for the substantially higher harvest level projected in this analysis compared to the 2001 analysis is the

application of the recently completed VRI phase 2. Relative to the information used in the 2001 analysis, applying this phase of the VRI process resulted in:

- a 15 percent gain in the size of the timber harvesting land base primarily through a reduction in the estimated area of problem forest types (which are defined based on minimum volumes for mature stands); and
- a 47 percent increase in the growing stock for the TFL through a combined increase in estimated volumes and the increase in the timber harvesting land base. The growing stock increased by 26 million cubic metres from 55 million to 81 million cubic metres of volume.

From my review of the timber supply analysis, including discussions with BCFS analysts, I am satisfied that the base case forecast provides a suitable basis of reference for use in my considerations in this determination. In addition to the base case forecast, I was provided with alternative harvest flows and a number of sensitivity analyses carried out using the base case as a reference. A number of mountain pine beetle-related harvest flow scenarios were also provided for my consideration. All of these analyses, and others as noted below, have been helpful in the considerations and reasoning leading to my determination, which are documented below.

A detailed accounting of the assumptions is given in the 2006 timber supply analysis and supporting information package. Where my consideration of the information has identified a factor for which I believe an adjustment is required, or the factor otherwise in my estimation requires discussion in this document, I have described it below.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

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

- (a) **the rate of timber production that may be sustained on the area, taking into account**
 - (i) **the composition of the forest and its expected rate of growth on the area**

Land base contributing to timber harvest

- general comments

The TFL 48 area is estimated to be 643 239 hectares. About 76 845 hectares (12 percent) include vegetated non-forest land (such as alpine tundra and wetlands), non-vegetated land (such as exposed bedrock and icefields), existing roads, mines sites and water. These deductions leave a total productive forest land area of 566 394 hectares (88 percent) within the perimeter of the TFL that was included in the analysis.

About 203 029 hectares (36 percent) of the Crown productive forest land area within the TFL was assumed to be unavailable for timber harvesting in the base case. The current area estimated in the base case to be economically and environmentally suitable for harvesting—the ‘timber harvesting land base’ (THLB)—therefore covers 363 365 hectares (64 percent of the productive forest). Accounting for predicted future

roads from forest activities led to an estimated 356 756 hectare future timber harvesting land base.

Forests within the areas excluded from the THLB do not contribute to timber supply but do contribute in the analysis to meeting a variety of non-timber resource objectives such as wildlife habitat, visual quality and biodiversity.

A sensitivity analysis examined the effect on timber supply of increasing or decreasing the THLB by five percent. A five percent decrease caused a corresponding 5.4 and 5.0 percent decrease in coniferous- and deciduous-leading harvest levels, respectively. Increasing the land base by five percent resulted in a modest 1.2 and 0.7 percent increase in the coniferous- and deciduous-leading harvest levels.

Deriving the THLB includes making a series of deductions from the productive forest land area to account for factors that effectively reduce the suitability or availability for harvesting of 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 to derive the THLB.

The “total area” or “gross area” deducted in the discussions that follow refers to the entire area of the factor deducted from the timber harvesting land base without consideration to overlapping land base reductions. The “net area” refers to deductions made after accounting for preceding overlapping area exclusions in the analysis (therefore the order of the land base reductions affects the estimates of the “net area” for each factor).

- mine sites

A total area of 2236 hectares of existing and proposed mine sites was deducted from the THLB. This included 479 hectares of treed area (with greater than 5 percent forest cover) in proposed mines sites. The removal of the proposed mines sites was an inadvertent error in the analysis. A sensitivity analysis showed restoring the proposed mines sites had a negligible impact on the base case. Since there has been no example of a mine site reclaimed to a forested condition within TFL 48 all mine sites were assumed permanently excluded from the THLB.

BCFS staff advised me that between 2005 and 2006, there were 29 proposed mine sites in the Peace Forest District including proposed sites within TFL 48. It is very difficult to predict the location or level of future mining activity due to these or other proposals.

For the purposes of this determination, I am satisfied that removing the existing mine sites from the THLB was appropriate and that the inadvertent removal of proposed mine sites does not consequentially impact the base case given the very small area involved. Subsequent determinations can account for future impacts on timber supply due to mining activity.

- existing roads and oil and gas activities

All existing roads were buffered by their average width based on road class. The buffered area was identified as a road polygon in the current VRI. The road polygons, totaling 5567 hectares, were then removed from the THLB.

Since the 2001 determination, the licensee developed a process of tracking all oil and gas activities such as well sites, camps, sumps, road access, borrow pits and seismic exploration lines. The information used for the analysis is current to the end of 2004. A seven-metre buffer was applied to 'cat cut' seismic exploration lines and these buffer areas, along with other development activities, were excluded from the THLB. According to the licensee about 2132 hectares of oil and gas development has occurred in the TFL as of 2004 (about 0.6 percent of the THLB); these areas were removed from the THLB as non-forest or 'existing roads' in the VRI update. Areas affected by the more current practice of 'avoidance/low impact cut' lines or 'hand cut' seismic lines were not excluded from the THLB.

BCFS staff shared with me similar information about oil and gas activities in the neighbouring Dawson Creek TSA as well as the Fort St. John and Fort Nelson TSAs. The spatially recorded oil and gas activity in these three TSAs affect about 0.8 percent of the THLB. It affects about 0.7 percent in the neighbouring Dawson Creek TSA. I therefore find the results compiled by the licensee reasonable by comparison.

The licensee deserves credit for trying to capture all oil and gas activity in the TFL. The accounting of this information explicitly in the base case reduces uncertainty in this factor for the purposes of this determination. I address future oil and gas activities below.

- protected areas

The Sukunka Falls, Bock Peak, Butler Ridge, Pine/LeMoray and Gwillim Lake parks, and the Klin-se-za (Twin Sisters) protected area, occur within the outer boundary of the TFL and were excluded from the land base in the analysis. Also excluded was the Peace River/Boudreau Lake area established under the *Environment and Land Use Act*. These areas led to an 18 814 hectare gross area being deducted from the land base. As with other deductions, the forested areas contribute to resource management objectives in the analysis such as biodiversity.

All of the protected areas have been legally established and I am therefore satisfied that they were appropriately excluded from the THLB.

- inoperable

The majority of harvesting takes place using conventional, ground-based equipment given the favorable operating conditions for most of the TFL. Relatively minor portions of the TFL have potentially unstable slopes. Terrain stability mapping was undertaken in the TFL through bio-terrain mapping. Using a combination of slope and terrain stability rating, all areas of the TFL were classified by suitable harvest system (conventional, cable, mixed, and aerial) or as inoperable. In the analysis, all coniferous-leading forests identified as aerial or inoperable were excluded from the THLB since aerial harvesting is not currently practiced. In addition, only the 'conventional' harvest system areas were included in the THLB for deciduous-leading forests since other systems are not utilized when harvesting these stands. This led to a gross area deduction of 34 038 hectares from the THLB due to inoperability.

In reviewing this factor with BCFS staff, I am satisfied that the licensee has appropriately accounted for inoperable areas and terrain stability in the analysis.

- archaeological sites

Archaeological investigations in the TFL and surrounding area include work undertaken in 1977-78 in a report filed with the Archaeology Branch entitled *Heritage Resources of the Northeast Coal Study*. Based on currently available information, all known cultural heritage resources on the TFL were provided by the Archaeology Branch now with the Ministry of Tourism, Sport and the Arts. Twenty archaeological site locations were mapped by the licensee and a 56-metre circular buffer was applied that provided a reserve of about one hectare for each site for the purposes of timber supply analysis.

The McLeod Lake Indian Band previously identified that a heritage trail likely exists in a portion of the TFL and its potential existence was recognized in the previous 2001 rationale. The trail is believed to occur between Mt. Reynolds and the Burnt River. The exact location of the trail, however, was not known and therefore it was not accounted for in the analysis. The SFMP No. 4 and Analysis Report indicated that the timber supply analysis would not account for the trail since its location was unknown. The SFMP and analysis report were provided to First Nations through the information sharing and consultation process. No specific comments were received from First Nations regarding the heritage trail during the information sharing and consultation process.

I am satisfied that, given the lack of information about the location of the heritage trail, that it was appropriate for the analysis to not account for the trail. If new information about the location and management of the trail arises, this can be accounted for in subsequent determinations. I am satisfied that the known archaeological sites were adequately modelled for this determination. If during the process of operational planning the licensee receives advice from the Archaeology Branch of the Ministry of Tourism, Sport and Arts that the buffers around the archaeological sites must be greater or less than the buffers modelled in the base case, this can be accounted for in a future determination.

- riparian management

Since 1995, the licensee has conducted fish and fish habitat inventories to government standard. In the time since the last determination in 2001, the licensee has completed these inventories for the entire TFL. A stream classification tool was used to predict stream classes for more than 30 000 stream reaches in the TFL for strategic planning purposes such as timber supply analysis. Based on the licensee's field verifications, predicted stream classes area are about 90 percent accurate. Operational fish and stream classification inventories continue to take place in support of site plans for cutblocks and roads.

The riparian reserve zone (RRZ) around each stream was removed from the THLB by applying a buffer following the widths specified for each stream class in the Riparian Management Area Guidebook. To represent the variable retention management practiced by the licensee in the riparian management zone (RMZ), a portion of the RMZ was excluded from the THLB by further buffering each stream class. The RMZ buffer widths were based on current operational practice of retaining forest along the stream to account

for factors such as terrain stability or wildlife habitat. Based on RRZs and additional RMZ buffers, a total area of 31 082 hectares was excluded from the THLB to account for riparian management along rivers and streams in the analysis.

Following the Riparian Management Area Guidebook, a 30-metre RRZ was applied to all lakes between five and 1000 hectares in size resulting in 28 hectares removed from the THLB. A 10-metre RRZ and a RMZ were placed around wetlands five hectares or larger in size removing 1882 hectares from the THLB. In addition, all forested wetlands, totalling 4001 hectares in area, were also removed from the THLB.

The reserve removals are consistent with current legislative requirements under the *Forest and Range Practices Act (FRPA)* and the additional buffers in RMZs are based on current practice. The approach taken in the analysis represents the best available information which I accept for this determination.

- low productivity sites

Low productivity sites were identified by the minimum site index required by a stand to achieve a volume at a specified minimum age. The volume and age criteria varied by stand leading species. The minimum site index limits were calculated based on the growth rates of existing unmanaged stands estimated using the Variable Density Yield Prediction (VDYP) model. The approach to define low productivity sites followed methods similar to that used in the previous 2001 timber supply analysis. A total forest area of 72 618 hectares was excluded from the THLB due this factor.

In the 2001 determination, the deputy chief forester was concerned that the area excluded for deciduous-leading stands may be too large due to the high minimum site index criteria used. Lower site index limits were used for the neighbouring Dawson Creek TSA analysis. The deputy chief forester requested in the 2001 rationale that the licensee monitor harvesting performance in these stands.

Due to the lack of new information, the low productivity site index limits used for deciduous-leading stands in this analysis were the same as used in the 2001 analysis. BCFS staff remain concerned that the 16.1 metres minimum site index used for aspen is too high. If the limit was reduced to 14 metres, 6822 hectares total area of aspen-leading stands would not have been removed from the THLB in the current analysis.

The Tembec-owned pulp mill in Chetwynd, the primary deciduous manufacturing facility, was closed for a significant period of time since 2001 and consequently there was no harvesting of deciduous-leading stands. Therefore, the licensee was not able to respond to the deputy chief forester's request to monitor deciduous harvest. The pulp mill has recently re-opened and this is expected to increase deciduous harvest on the TFL.

Having reviewed and discussed the information regarding low productivity sites, I see no reason at this time to account in my decision for uncertainty in assumptions used for low productivity deciduous stands. However, similar to the request in the 2001 determination, I request under 'Implementation' that the licensee monitor harvest performance in deciduous-leading stands so that the assumptions made in this analysis can be verified or refined in support of the next determination.

- problem forest types

Mature stands were considered problem forest types and excluded from the THLB if they fell below a combination of specified height, age, stocking and merchantable volume limits. For this analysis a total area of 62 497 hectares was excluded from the THLB due to this factor.

Although the approach to define problem forest types was the same used in the 2001 analysis, a substantially smaller area was deducted from the land base in this analysis. This is because the VRI was adjusted to account for phase 2 ground sampling work and destructive sampling undertaken since 2001 which indicate that actual volumes are much higher than had been previously estimated in the phase 1 inventory based on photo-interpretation alone. Therefore, with the adjusted inventory, far more stands now exceed the criteria used to define problem forest types.

During my field tour of the TFL, I viewed a stand that had previously been defined as a problem forest type that is now considered part of the THLB and found its inclusion to be reasonable. Nevertheless, given the importance of this factor in defining the THLB, under 'Implementation', I request that the licensee provide information on harvest performance in stands that had been previously excluded as a problem forest type but are now included in the THLB in this analysis.

- future roads and subsurface resource activity

The licensee used pre-2001 mapping of the predicted road network in the TFL to estimate the amount of area that will be required for future road construction. For the 2001 analysis, future roads were buffered with their expected widths and the resulting area was expressed as a percentage of the current THLB. This percentage was adjusted for the current analysis to reflect the larger THLB. The resulting 1.9 percent was applied in the Remsoft model as a one-time reduction upon harvest to natural stands in the current THLB. As a result 6609 hectares were excluded in the analysis due to future roads.

The licensee believes that future seismic lines will not have a measurable impact on the future THLB due to increased focus on lower-impact seismic practices. Also, future roads that may be needed for mineral exploration and development are not expected to have a significant impact on the future land base beyond the licensee's predicted future road network. Therefore, no attempt to account for this was made in the analysis.

BCFS district staff are working with the Oil and Gas Commission (OGC), the Ministry of Energy, Mines and Petroleum Resources (MEMPR), and the Integrated Land Management Bureau (ILMB) in an effort to more readily update the forest inventory to account for oil and gas activities such as roads and seismic lines.

In the meantime, I acknowledge that there is some uncertainty due to future oil and gas activities in the TFL such as seismic lines, well sites, transmission lines and roads, and given the demand for oil and gas, and minerals, these activities could increase. As noted earlier, I credit the licensee for keeping track of as-built oil and gas activities as part of the inventory. Under 'Implementation', I encourage the licensee to continue to track these activities and to undertake a retrospective assessment of the rate of development

between this determination and the next timber supply analysis. This kind of assessment would then allow for an estimate of the future rate of loss of THLB due to these activities so that they can be better accounted for in subsequent determinations.

Existing forest inventory

A Vegetation Resource Inventory (VRI) is the current provincial standard for forest inventory and this has been completed for TFL 48. The licensee initially completed the phase 1 photo-interpreted inventory which was used in the 2001 analysis. Phase 2 of the inventory involved measuring 128 ground sample plots that were established in the time since the last determination. The results of the phase 2 ground sampling were used to adjust the height, age and volume attributes in the inventory. The consultant hired by the licensee reported that the phase 2 adjustment resulted in a:

- five percent increase in the average stand height;
- seven percent decrease in the average stand age; and
- 34 percent increase in net merchantable volume.

The increase in stand height and decrease in stand age results in a substantial increase in site index which is derived from these attributes.

Subsequent to preparing the base case an error was noted in the implementation of the phase 2 adjustments in the analysis. Correcting this error resulted in a net merchantable volume increase of 37.6 percent (up from 34 percent noted above). A sensitivity analysis that increased stand yields by 10 percent resulted in about a three percent increase in timber supply, consequently the 3.6 percent increase in merchantable volume due to correcting the coding error will only likely increase timber supply by about one percent. I discuss this further in 'Reasons for Decision'.

The phase 2 sampling plan stratified the TFL based on the probability of a stand being included in the timber harvesting land base. Stands most likely to contribute to the timber supply were assigned a high priority. The sampling effort allocated the majority of the plots to high priority sites (86 plots) with correspondingly fewer samples on moderate (21 plots) and lower priority sites (20 plots). Therefore there is less confidence in the adjustments made for moderate and low priority sites. Based on the completed sampling, the percent volume increase was much higher for low and moderate priority sites than for high sites. This has significant implications with respect to estimating the timber harvesting land base since low priority sites are near the margin that defines merchantability.

BCFS inventory staff recommended that more sampling is needed for low and moderate sites before the adjustment is suitable for inclusion in the provincial inventory database. BCFS inventory staff also subsequently confirmed that the adjustments made in the analysis to account for the sampling that was undertaken is adequate for the purposes of modelling timber supply.

Although I acknowledge that more sampling is needed to improve the reliability of the adjustments for low and moderate priority sites, I accept the adjustments made to the inventory in the analysis for the purposes of this determination as it is based on the best available information. Under 'Implementation', I urge the licensee to undertake

additional sampling and analysis on the low and moderate sites that address the concerns raised by BCFS inventory staff.

- aggregation procedures

Analysis units were assigned based on species percent composition and site index.

Analysis units were further subdivided by age if significant amounts of area existed in both immature and over-mature components.

BCFS staff advise that the aggregation procedures used to support the analysis are reasonable and I accept this conclusion.

- volume estimates for existing natural stands

Estimates of timber volumes in existing natural (unmanaged) stands were projected using the Variable Density Yield Prediction (VDYP) model version 6.6d. Yield tables were generated for every natural stand. The stands were then assigned to analysis units and the yield tables were area-weighted to produce an average table for each analysis unit. The natural stand yield curves were reviewed and approved by Forest Analysis and Inventory Branch staff. I have reviewed this factor with BCFS staff and I accept the approach taken in the analysis for the purposes of this determination.

Expected rate of growth

- site productivity estimates

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

The most accurate estimates of site productivity come from stands between 30 and 150 years of age. The growth history of stands less than 30 years of age is often not long enough to give accurate measurements of site productivity. Estimates derived from older stands underestimate site productivity as these stands are often well past the age of maximum height growth and have often been affected by disease, insects and top damage as they reach advanced age. The underestimate of site productivity based on forest inventory estimates for older stands have been verified in several studies (e.g. Old-Growth Site Index or OGSi study) in the province. These studies have confirmed that when old stands are harvested and regenerated, site productivity realized is generally higher than what inventory-based site index estimates of older stands would predict.

The licensee has undertaken Predictive Ecosystem Mapping (PEM) of site series using the Biogeoclimatic Ecosystem Classification (BEC). PEM can be used to apply 'Site Index correlated to BEC', or SIBEC, to assign site index estimates to mapped site series. This method provides improved estimates of the growth potential of managed stands without the old growth underestimate resulting from site index derived using existing inventory height and age attributes for natural stands. Since the PEM work has not yet

been formally approved, the licensee applied the more conservative inventory site index for 'future' managed stands (stands harvested since 1995 and in the future). Site index values for 'existing' managed stands were assigned using SIBEC (as their site series had been determined through silviculture surveys) or growth intercept data.

A sensitivity analysis was undertaken to assess the impact of using SIBEC-based estimates for future managed stand productivity. Coniferous-leading harvest levels increased to 742 900 cubic metres which is a 16 percent increase relative to the base case. Deciduous-leading harvest levels increased to 100 850 cubic metres which is a seven percent increase relative to the base case.

The sensitivity analysis clearly shows that estimates of long-term site productivity have a direct impact on short-term harvest levels particularly given the even-flow forecast applied in the base case.

In considering this factor, I am mindful of the site productivity work that has been undertaken in the province and the evidence from this work that the inventory-based site index estimates for older stands are lower than the realized site index for regenerating stands. Even though the PEM work has not been approved, I consider the site productivity estimates from this work to be more representative of actual managed stand productivity than the estimates provided in the inventory. I therefore consider the base case to represent an underestimate of timber supply in the order of 100 000 cubic metres for coniferous-leading stands and 7000 cubic metres for deciduous-leading stands. I will discuss this further in 'Reasons for Decision'.

- volume estimates for regenerated managed stands

In the analysis, the standard BCFS growth and yield model Table Interpolation Program for Stand Yields or TIPSYP (version 3.2b) was used to estimate the timber volumes for coniferous species in regenerated managed stands. Natural stand yield curves using VDYP were applied to deciduous species in regenerated managed stands. All harvested stands were assumed to regenerate to managed stands. The yield curves applied to managed stands were reviewed and approved by BCFS research staff.

The TIPSYP projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition. However, certain operational conditions, such as a less-than-ideal distribution of trees, the presence of small non-productive areas, endemic pests and diseases, or age-dependent factors such as decay, waste and breakage, may cause yields to be reduced over time. Two operational adjustment factors (OAFs) are therefore applied to yields generated using TIPSYP, to account for losses of timber volume resulting from these operational conditions. OAF 1 is designed to account for factors affecting the yield curve across all ages, including small stand openings, uneven tree distribution, endemic pests and other factors. OAF 2 accounts for factors whose impacts tend to increase over time such as decay, and waste and breakage.

In the timber supply analysis for TFL 48 the licensee applied the standard provincial reductions of 15 percent for OAF 1 and five percent for OAF 2. An additional five percent OAF reduction was applied to shelterwood stands to reflect their reduced growth from canopy shading.

The use of TIPS Y with standard OAF reductions that was applied in the analysis for most stands reflects the use of best available information. I also find the use of VDYP for deciduous species and a further OAF reduction for shelterwood stands to be reasonable. For this determination, I accept the volume estimates for regenerated managed stands as applied in the base case.

- *genetic worth*

Use of select seed with improved genetic traits can increase timber volumes of managed stands in the long term and quicken the time for a stand to reach a green-up height or reach minimum harvestable age. The quantity and quality (genetic worth leading to volume gain) of select seed available in the province has increased in the past decade, and is projected to increase further. Licensees are required to use select seed when available.

The licensee has used, and continues to use, available select seed for spruce within the TFL. Consequently, its use was modelled in the analysis through a 19 percent volume gain applied to the spruce component of all ‘future’ managed stands (stands harvested after 1995) within the Prince George seed planning unit where the seed is available.

In reviewing this factor with BCFS staff, I am satisfied that for this determination the analysis has reasonably accounted for the expected use of select seed.

- *minimum harvestable ages*

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

Minimum harvestable ages assumed in the base case were set for each analysis unit at the culmination age or, if the stand volume had not attained 140 cubic metres per hectare at that age, the age at which this minimum economic volume threshold had been attained. Using this approach, the minimum harvestable ages ranged from 70 to 255 years of age depending on analysis unit and whether the stand was unmanaged or managed.

The licensee provided a sensitivity analysis to test the effect on timber supply of increasing and decreasing minimum harvestable ages by 10 years. Increasing the age led to a 2.5 and 1.8 percent drop in harvest levels for coniferous and deciduous-leading stands, respectively. Decreasing the age led to a 1.9 and 1.1 percent increase in harvest levels for coniferous- and deciduous-leading stands, respectively. The analyses therefore suggest that some uncertainty in this factor does not appear to cause a significant impact to timber supply.

In reviewing the minimum harvestable ages with BCFS staff, the assumed ages used in the analysis appear high. Under ‘Implementation’, I request that the licensee review the minimum harvestable age assumptions used relative to those used in the analysis for the

neighbouring Dawson Creek TSA, and confirm or revise these assumptions in support of the next determination. In the meantime, I am not aware of any better information and accept the assumptions employed for this determination.

- (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. A regeneration delay of two years was modelled in the base case except for shelterwood harvesting where no regeneration delay was assumed due to the presence of existing regeneration.

BCFS district staff consider the regeneration delays assumed in the base case as reasonable and I accept their use for this determination.

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

Regeneration

To maintain the current deciduous component in the TFL, deciduous and mixed-wood stands were assumed to regenerate to their original proportions of deciduous and coniferous trees in the analysis. The assumed percent species mix, regeneration method (natural or planted) and regeneration density for each analysis unit was provided for review in support of the timber supply analysis.

BCFS district staff consider the regeneration methods assumed in the base case as reasonable and I accept their use for this determination.

Silvicultural systems

The silvicultural harvest system predominately used on TFL 48 is clearcut with reserves, and this was modelled in the analysis.

About 9.4 percent of the timber harvesting land base was modelled to represent the two-layered stands following shelterwood harvesting. The resulting multi-layer stands provide in-stand retention that contributes to non-timber values and the licensee reports these stands are easier to regenerate. The licensee has received positive recognition from the public for its innovative use of shelterwood systems in appropriate stands. I inspected a stand harvested using the shelterwood system during my field tour of the TFL. I noticed suitable regeneration including good performance from spruce planted on skid trails.

The modelling assumptions used for shelterwood systems, including growth and yield and OAFs as previously discussed, were reviewed and approved by BCFS staff. I am satisfied these assumptions are suitable for use in support of this determination, and also recognize the innovative approach being taken by the licensee for shelterwood stands.

Incremental silviculture

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing and fertilization that are not part of the basic silviculture obligations

required to establish a free-growing forest stand following timber harvesting. The licensee is not currently undertaking nor has any plans for incremental silvicultural activities on the TFL, and none were assumed in the analysis. I am therefore satisfied that this factor was appropriately addressed in the base case.

- (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 are harvested and removed from an area during harvesting operations. In the analysis, a 30-centimetre maximum stump height and 10-centimetre minimum top diameter was assumed for all species. In addition, for lodgepole pine and deciduous species, a 12.5 centimetre minimum diameter at breast height (DBH), and for all other species, a 17.5 centimetre DBH was assumed. These assumptions reflect current performance in the TFL and are standard utilization levels. I therefore am satisfied that utilization standards were appropriately modelled in the timber supply analysis.

Decay, waste and breakage

The VDYP model used in the timber supply analysis to project volumes for existing unmanaged stands incorporates estimates of volume of wood lost to decay, waste and breakage. These estimates of losses have been developed for different areas of the province based on field samples. For TFL 48, Forest Inventory Zone (FIZ) L and Special Cruise 474 default factors were used in the analysis. I am satisfied that appropriate procedures were followed to account for decay, waste and breakage in the base case.

- (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 and Range is required under the *Ministry of Forests and Range 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 co-ordinated 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.

The analysis for TFL 48 has addressed some IRM objectives through reductions in the THLB. I have accounted for these factors in ‘Land base contributing to timber harvesting.’ In this section, I account for IRM objectives where the land base normally continues to contribute to timber supply but various forest cover and adjacency constraints, or yield reductions are applied. I review in this section the assumptions made in the base case to account for these values.

- *cutblock adjacency, forest cover and green-up*

To manage for resources such as water, wildlife and visual quality, and to avoid concentrating harvesting-related disturbance in particular areas, operational 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. Adjacency, green-up and forest cover objectives guide harvesting practices to provide for a distribution of harvested areas and retained forest cover in a variety of age classes across the landscape.

In the analysis for TFL 48, in order to represent the desired conditions necessary to meet the various objectives in different areas consistent with the Dawson Creek LRMP, the TFL was zoned for different values such as visual quality and wildlife where varying forest cover requirements apply. These are discussed later for each of these values.

For the general IRM zone in the timber supply analysis, the licensee assumed no more than 33 percent of the stands can be less than three metres in height throughout the 250-year forecast period. A sensitivity analysis examined the impact of increasing or decreasing the time it takes for the three-metre green-up height to be reached by 10 years; the results showed these changes had a negligible impact on timber supply (less than 0.3 percent).

Having reviewed this information with BCFS staff, I am satisfied that the base case appropriately accounted for green-up and adjacency in the IRM zone.

- visual quality

In 2005, BCFS staff consolidated all visual landscape inventories within the TFL and Dawson Creek TSA. The licensee used the 2005 consolidated inventory for established visual quality objectives (VQOs) to support the current analysis.

All areas with an established VQO of preservation were effectively removed from the THLB as no timber harvesting is assumed. Established VQOs of retention, partial retention, modification and maximum modification classes were modelled in the analysis based on the maximum percent allowed to be disturbed in each class and the years required to reach visually effective green-up height.

A sensitivity analysis assessed the impact of adjusting the established VQO up or down one VQO class. Adjusting the VQO up and down one class resulted in the coniferous-leading harvest levels decreasing and increasing by 5.3 percent, respectively. Raising VQOs one class decreased deciduous-leading harvest levels by 0.4 percent, while lowering the class caused a more substantive 8.3 percent increase in deciduous-leading harvest levels.

The 2005 consolidated inventory also notes recommended VQOs which were not included in the base case since discussions are underway between the BCFS and the licensee for refining these areas. A second sensitivity analysis examined the impact of including the recommended VQOs. This resulted in an insignificant change in harvest levels.

The analysis used the latest inventory information for established VQOs and I accept how this factor was addressed in the analysis. I recognize based on the sensitivity analysis that uncertainty regarding the recommended VQOs appears to pose little risk to timber supply.

- *identified wildlife*

The province's Identified Wildlife Management Strategy (IWMS) addresses plant communities and species at risk (e.g., red- and blue-listed species), and regionally significant species. "Identified wildlife" are those wildlife species and plant communities that have been established as requiring special management. Identified wildlife can be protected through the establishment of wildlife habitat areas (WHAs) with objectives or general wildlife measures. The objectives or general wildlife measures may preclude or constrain timber harvesting activity depending on the requirements of individual identified wildlife species or communities.

The only identified wildlife species with habitat modelled in the analysis was bull trout. All critical bull trout habitat, totalling 105 hectares, were removed from the timber harvesting land base. Proposed caribou WHAs have been identified in the TFL that overlap with recently established caribou ungulate winter ranges and I address these areas in *ungulate winter range* below.

Other vertebrate species of potential management concern being tracked by the licensee include red- and blue-listed species identified by the BC Conservation Data Centre. This includes five mammal (woodland caribou, grizzly bear, wolverine, fisher and northern long-eared myotis) and six bird species. The yellow-listed western toad is also being tracked. Since management strategies for these species are being developed by the licensee, no specific forest cover constraints were applied in the analysis.

For the purposes of this determination, I am satisfied that this factor was adequately addressed in the base case. Future decisions regarding the management of identified wildlife and species at risk can be accounted for in subsequent determinations.

- *ungulate winter range*

Ungulate winter ranges (UWRs) were modelled in the analysis through deductions to the timber harvesting land base and through seral retention constraints. In the Dunlevy special management zone, consistent with the Dunlevy Creek Management Plan, 4480 hectares of the forested area in three UWRs were excluded from the timber harvesting land base to account for the winter habitat needs of mule deer, whitetail deer, Rocky Mountain elk, Stone's sheep and caribou. The Sukunka Graveyard UWR for elk and mule deer, covering 2637 hectares, was addressed in the analysis by modelling two constraints: a maximum area of 20 percent can be covered with trees less than three metres in height, and a minimum of 50 percent of stands must be greater than 100 years of age. The Ministry of Environment is working to establish these UWRs under FRPA.

The analysis did not account for caribou and mountain goat UWRs within TFL 48 that were legally established in October 2006. These recently established UWRs encompass a gross area of 67 817 hectares within the TFL. Based on an assessment by the licensee, the timber supply impact of implementing the General Wildlife Measures for these UWRs is equivalent to removing 2689 hectares (about 0.7 percent) of the THLB. These UWRs encompass some of the new WHA proposal for caribou.

Although the UWRs that were accounted for in the analysis have not been legally established, I am satisfied that they reflect current practice in the TFL as described in the licensee's SFMP No. 4. As UWRs are established, those decisions can be accounted for in subsequent determinations. The UWRs that have been recently established and were not accounted for in the analysis represent a small overestimate of the THLB and I discuss this further in 'Reasons for Decision'.

- watershed management

Limiting the amount of area disturbed in a watershed can help prevent excessively high peak flows in a drainage basin. Equivalent clearcut area (ECA) describes a regenerating stand in terms of its hydrologic equivalent as a clearcut. As regeneration develops, the hydrologic impact on a site is reduced. ECA is a measure of the site hazard for peak flows in a cutblock.

While not specifically required by the *Forest and Range Practices Act*, to meet certification objectives contained in its Sustainable Forest Management Plan No. 4, in the analysis the licensee modelled watershed management by assigning a maximum ECA for watersheds. ECA was defined as the disturbed area under green-up height of three metres. The maximum ECA ranged from 25 to 40 percent by watershed.

BCFS staff believe the base case adequately accounted for this factor since the ECA constraints appear reasonable and reflect current practice. I am therefore satisfied this factor has been appropriately addressed in the analysis for the purposes of this determination.

- landscape-level biodiversity

Old forest retention is a key consideration in the conservation of landscape-level biodiversity. The Dawson Creek LRMP deferred the establishment of old forest retention objectives to landscape unit planning. Landscape unit planning processes identified ten discrete landscape units in the TFL. Old forest retention requirements for each landscape unit are provided in the 2004 Provincial Non-Spatial Old Growth Order. In the Provincial Order, which reflects advice provided in the 1995 Biodiversity Guidebook, minimum old forest retention requirements are specified by natural disturbance type and biogeoclimatic zone for low, intermediate and high biodiversity emphasis landscape units.

Rather than using current legal requirements in the Provincial Order, the landscape level old forest retention constraints used in the analysis employed the most current science-based approach using Natural Disturbance Units (NDUs). A letter dated April 29, 2002 from the then BCFS regional manager and the Ministry of Sustainable Resource Management regional director encouraged district managers and forest licensees to use the NDU approach as reflecting best available information. ILMB has prepared a draft old growth order for the Dawson Creek TSA that reflects the NDU approach and, when established, will replace the Provincial Order in the TSA. The opportunity to undertake a similar NDU-based order in the TFL exists.

The NDUs are designed to reflect the larger scale disturbances of northern forests and shorter life span of northern tree species. The NDU old forest constraints used the

minimum natural range of variation for stands greater than 140 years of age (and 100 years for deciduous stands in Boreal Plains and Boreal Foothills-Valley).

The licensee was concerned that the large size of the NDUs could result in poor representation of old growth by BEC variant. To meet forest certification objectives, the licensee included additional NDU/BEC variant old forest targets in the analysis.

The use of the NDU approach was accepted by the BCFS for use in the analysis provided that the current legal Provincial Non-Spatial Old Growth Order retention objectives were modelled through a sensitivity analysis.

The sensitivity analysis indicated that using the existing legal Order instead of the NDU approach modelled in the analysis increased coniferous-leading harvest levels by 9.7 percent with a very minor decrease in deciduous-leading harvest levels of 0.2 percent.

Landscape-level biodiversity was modelled in the analysis using the best science-based information available to the licensee. Assurance was provided through the sensitivity analysis that using this approach also enabled current legal obligations to be met. In reviewing this information with BCFS staff, I am satisfied that the base case has adequately addressed this factor in support of this determination.

- stand-level biodiversity

Stand-level biodiversity was modelled in the analysis through the retention of wildlife tree patches (WTPs). WTPs were spatially mapped by the licensee prior to the 2001 determination, but that mapping has not been updated since that time.

WTPs were not spatially identified for the analysis; rather they were accounted for through yield reductions. The yield reduction factor was derived based on WTP mapping conducted prior to 2001 where it was determined that 55 percent of the WTPs were inside the timber harvesting land base. The licensee assumed that eight percent of cutblocks are retained as WTPs which is in compliance with legal requirements under FRPA. Based on the previous mapping, the proportional impact on the THLB was calculated as a 4.4 percent reduction applied to natural stand yields.

I accept as appropriate the accounting for this factor in the analysis. Under 'Implementation', I encourage the licensee to update the spatial mapping of WTPs so that this factor can be accounted using current information in support of the next determination.

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

Other information

- harvest sequencing

In timber supply analysis, the order in which eligible stands are assumed to be harvested can affect the projected timber supply in a number of ways. Any difference between the modelling assumptions made and the order in which stands are actually harvested in operational practice must be examined and accounted for.

In the base case for TFL 48, the harvest scheduling rule modelled in the analysis was to obtain the highest maximum volume in support of the even-flow harvest flow objective. I am unaware of any information to suggest the harvest scheduling rule applied in the analysis is not appropriate for use in the determination.

- log grades

In 2006, new log grades were implemented for the Interior of BC. Under the previous grade system, a log was assessed according to whether the tree it came from was alive or dead at the time of harvest. Logs derived from dead trees (grade 3 and 5) were not charged to the AAC. Under the new system, grades are based on the log's size and quality at the time it is scaled or assessed without regard to whether it was derived from a dead tree or not at the time of harvest. To better account for all harvested volumes through AAC cut control provisions, logs that were previously graded 3 and 5 will now be charged to the AAC. Therefore this volume should be taken into account in AAC determinations.

Estimates of timber volume in the base case did not include sawlogs that could be potentially derived from dead trees. The best data source regarding this potential is the VRI phase 2 ground samples for the TFL. Data from the ground samples suggest that volumes potentially derived from dead trees represents about 10.5 percent of volumes that could be derived from live trees over 60 years of age. However, not all of the volume from dead trees can be economically recovered. Data from the harvest billing system for the period between 1995 and 2004 showed that about 3.6 percent of the volume harvested was logs taken from dead trees.

Based on this information, there is the potential for an increase in timber supply given the log grade changes that have taken place in the Interior. Several policy issues likely need to be addressed given these changes and how they explicitly link to the AAC, stand-level retention practices and revenue collection. In the meantime, I do not feel it is necessary to adjust the base case given these uncertainties. However, under 'Implementation', I request that the licensee monitor its use of logs from dead trees so that this information can be factored into the next determination.

- stand mortality

In the base case, a model function was included that set a maximum age for different stand types. For example, aspen-leading stands could not exceed 200 years of age, and spruce-leading stands could not exceed 460 years of age in the analysis. The maximum ages were defined as 10 years older than the oldest stands for each species in the inventory. When stands reached the maximum age, the model assumed the stand would die and revert to age zero.

The purpose of applying a maximum age is to prevent stands outside of the timber harvesting land base from aging indefinitely in the analysis. The maximum ages were intended to address natural stand mortality due to aging. The model does not account for natural disturbances such as fires that are random and disturb stands at any age. The mortality function applied in the analysis impacts timber supply since areas outside the THLB contribute to forest management objectives such as old forest retention requirements.

Although the approach taken by the licensee only emulates natural stand mortality due to aging, it is an improvement over a timber supply analysis that continuously ages forests outside of the timber harvest land base. I commend the licensee for taking initial steps in their analysis to address this concern, and support further efforts to refine the approach so that natural disturbances can be better accounted for in future analyses.

- Dawson Creek Land and Resource Management Plan

Strategic plans provide context and direction for forest operational planning by setting objectives for the management of various forest resources. The Dawson Creek LRMP was approved in 1999 and applies to TFL 48 and the Dawson Creek TSA. LRMP implementation is enabled through legislation and policy.

The licensee developed its Sustainable Forest Management Plan (SFMP) No. 4 to be consistent with the direction provided in the LRMP. The assumptions made in the timber supply analysis, in turn, are consistent with the SFMP. Accordingly, I am satisfied that the direction and guidance provided by the Dawson Creek LRMP is satisfactorily reflected in the base case that I am considering in support of this determination.

- Dunlevy Creek Management Plan

Under the direction of the LRMP, a planning process for the Dunlevy Creek Special Management Zone was initiated in 2000. The area has outstanding wildlife and wilderness recreation values. The Dunlevy Creek Management Plan was completed in 2001 by the then Ministry of Sustainable Resource Management with the support of various resource agencies including the BCFS. The Plan was officially endorsed by government in January 2002. I addressed how various wildlife values in the Dunlevy were factored into the analysis in *ungulate winter ranges*.

In addition, the Plan divides the Dunlevy into six compartments and identifies specific operational guidelines for harvesting. In order to model these guidelines, harvest area targets were applied to each compartment over time.

BCFS staff believe the analysis has adequately accounted for the Dunlevy Creek Management Plan. After reviewing this factor with staff, I agree with that conclusion.

- Sustainable Forest Management Plan No. 4

In the preparation of Sustainable Forest Management Plan (SFMP) No. 4, the licensee sought public input through its Chetwynd Public Advisory Committee (PAC) which was formed in 2000. PAC meetings are led by an independent facilitator. The objective of the PAC is to help ensure that sustainable forest management decisions are made as a result of informed, inclusive, and fair consultation with local people who are directly affected by or have an interest in forest management decisions within the TFL.

The PAC participants were selected to represent local communities, environmental conservation, forest workers, independent forest operators, oil and gas, recreation, and First Nations. Advisors to the PAC include the BCFS, Ministry of Agriculture and Lands, Ministry of Environment, Tembec, and Louisiana-Pacific. Representatives of the public have included faculty and students from Northern Lights College in Chetwynd.

Members of the public are welcome to attend each PAC meeting, and provisions are made for public comment at the meetings. Notices of PAC meetings are advertised in local papers and to members of the public who have expressed an interest to be involved.

The SFMP is supported by public consultation which is required by the licensee's forest certification efforts. Recently, BC Timber Sales has partnered with the licensee for certification within the TFL. I commend the licensee for its efforts to proactively obtain public comments following the consultation model in the Canadian Standards Association's forest certification process.

Public input from the PAC and other sources was taken into account in the SFMP which was submitted on September 26, 2006 for BCFS approval. I will be reviewing this plan carefully and will make a separate decision on that plan following this AAC determination.

- twenty-year plan

The licensee prepared a twenty-year plan in support of the SFMP No. 4 for TFL 48. The twenty-year plan was reviewed and accepted by BCFS district staff, and demonstrates that the base case harvest level is spatially feasible for the first two decades.

The harvesting design modelled in the plan meets the licensee's certification objectives and is consistent with the SFMP's objective to reduce forest fragmentation. An issue of potential public concern has been raised regarding the large size of some of the cutblocks that exceed 900 hectares. The plan was also prepared prior to the current mountain pine beetle epidemic (see below) and BCFS staff and the licensee believe more pine stands will now need to be targeted within the next 10 years than was shown on the plan.

Although I recognize that actual harvesting over the next 20 years may differ from that shown in the plan, the twenty-year plan does demonstrate that base case harvest levels are spatially feasible in the short term.

- First Nations considerations

First Nations interests in the TFL include exercise of their treaty rights under Treaty 8 as well as cultural heritage and archaeological values. I discussed how the analysis addressed *archaeological sites* above. An area of particular cultural heritage interest to First Nations that was recognized in the Dawson Creek LRMP is the Twin Sisters area. The approval of the LRMP included the designation of the Klin-se-za protected area which conserves the twin-peaked mountain, also known as Twin Sisters, which is of profound spiritual significance to First Nations. This area was excluded from contributing to timber supply in the analysis as noted under *protected areas*.

Surrounding the protected area is a special management zone (SMZ) which helps to further conserve the spiritual values in the Twin Sisters area. The SMZ contains small areas of timber harvesting land base and harvesting is heavily constrained due to visual quality objectives (see *visual quality*). Due to these constraints, no additional forest cover constraints were considered necessary for the purposes of the timber supply analysis. There has been no harvesting activity within the TFL portion of the SMZ to date.

TFL 48 falls within the area covered by Treaty 8. The West Moberly (WMFN), Sauleau (SFN), and Halfway River (HRFN) First Nations, and the McLeod Lake Indian Band (MLIB) are signatories to this treaty. The WMFN and SFN have reserves that are directly adjacent to the TFL.

A portion of TFL 48 lies within the Peace Moberly Tract, an area of land identified within the draft Peace Moberly Tract Sustainable Resource Management Plan (SRMP). The tract was identified by the SFN and WMFN as an area of special interest given its close proximity to First Nations communities for cultural activities and for hunting, trapping and fishing as recognized under Treaty 8. A draft SRMP was completed in July 2006. When the SRMP is completed, the findings can be reflected in subsequent timber supply analyses.

In August 2005, the licensee initiated information sharing on the SFMP No. 4 with a first draft plan provided to the WMFN, SFN and MLIB. A copy was inadvertently not provided to the HRFN at that time.

The licensee used a variety of methods to share information with First Nations about both the SFMP and the timber supply review (TSR) for the TFL as the two processes are closely related and were not usually discussed in isolation. Quite often conversations about the SFMP would lead to questions about the timber supply review (TSR).

As previously discussed, the licensee has a Public Advisory Committee (PAC) which includes First Nations representatives. The SFMP and related TSR issues were reviewed at many of the PAC meetings in the fall of 2005, to which the WMFN, SFN and MLIB were invited. Opportunities were also given to meet privately before public meetings to discuss First Nations concerns. The public and First Nation review of the SFMP ended on December 21, 2005. The TFL 48 Timber Supply Analysis Report was then prepared in 2006.

The BCFS formally initiated consultation with First Nations regarding the SFMP No. 4 for TFL 48 on March 15, 2006 in a letter from the regional executive director to the WMFN, SFN, MLIB and HRFN. Comments were invited on the SFMP and information was provided on the TSR process. A follow-up letter from the district office on April 20, 2006 invited comments on the SFMP by May 12, 2006. No comments were received from First Nations in response to these two letters.

In November 2006, Peace Forest District staff began reviewing the consultation records and noted that the HRFN had not been contacted by the licensee through the information sharing process on the SFMP. When notified of this oversight, the licensee described the SFMP process in a letter to HRFN on December 1, 2006, attached the analysis report, and asked for a meeting with the HRFN. Comments were requested by January 31, 2007. The licensee made subsequent attempts through e-mails and phone messages to set up a meeting with the HRFN but were unsuccessful.

District staff sent letters to the four First Nations (WMFN, SFN, MLIB and HRFN) on December 12, 2006 describing both the SFMP and AAC determination process, including a TSR backgrounder. In the letters the First Nations were asked for information

regarding their treaty rights and how these rights may be affected by SFMP No. 4 and the AAC determination for TFL 48. The First Nations were also informed in the letter that their input would be brought to the attention of the deputy chief forester so that he could consider their treaty rights and where appropriate, how these treaty rights may be addressed. In the letter, BCFS staff offered to meet with the First Nations to discuss information on their treaty rights and how they might be incorporated in the management plan and the AAC determination process. A copy of the analysis report was provided to WMFN, SFN and MLIB as it had not been completed when they received previous copies of the SFMP from the licensee. HRFN were provided a copy of the analysis report by the licensee in their letter dated December 1, 2006. A follow-up letter was sent by district staff on February 1, 2007 requesting comments on either the SFMP or the TSR before the AAC determination by the deputy chief forester which was expected to be made (which was noted at that time to be March 2007). An offer was again made to meet or answer any questions.

A meeting was held on February 23, 2007 at the WMFN land office with a BCFS representative and the licensee. The discussions centred on capacity issues and a possible increase in the AAC. The TSR process and determination was explained and the discussion moved on to other issues of concern to the First Nation. Earlier in February 2007, the WMFN met with the licensee where technical questions and issues were discussed.

One First Nation provided comments in response to TSR, and three First Nations attended meetings at which the SFMP and related TSR issues were discussed. All four First Nations were provided multiple opportunities to meet and provide comment by the licensee and the BCFS. No site-specific comments were provided by First Nations as they relate to the TSR.

Having reviewed this information with BCFS staff, I am satisfied that BCFS staff have made reasonable efforts to identify where these First Nation may practice their treaty rights and the effects on the First Nations' treaty rights the AAC determination for TFL 48 may have. I believe the timber supply analysis has appropriately accounted for First Nations treaty rights, and archaeological and cultural heritage values including areas of known spiritual significance. If new information that significantly varies from the assumptions made in this determination becomes available for any of the First Nations with treaty rights covering portions of TFL 48, I am prepared to revisit this determination sooner than the five years required by legislation.

(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 keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be regularly determined to ensure that short-term harvest levels are compatible with a smooth transition to medium and long-term levels. Timber supplies

need to remain sufficiently stable so that there are no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

In the base case, the harvest flow objective was to identify the highest non-declining harvest level.

Alternative rates of harvest were examined through sensitivity analysis. The highest possible initial harvest level was tested with an initial harvest level of 1 113 000 cubic metres. The harvest flow followed a step down decline of 10 percent per decade to a long-term sustainable harvest level. This alternative harvest flow increased initial coniferous- and deciduous-leading harvest levels by 51 and 52 percent, respectively, with minimal impacts on mid- to long-term timber supply.

Another alternative harvest flow assessed the highest initial harvest levels that could be maintained for 30 years before starting to decline to a long-term sustainable harvest level. This alternative increased initial coniferous- and deciduous-leading harvest levels to 905 900 cubic metres (23 percent) for both stand types with minimal impacts on mid- to long-term timber supply.

The result of these sensitivity analyses suggests that timber supply is very robust in the short term. The short-term harvest level in the base case is only limited by the selected non-declining even-flow harvest objective. I have considered the base case forecast and these alternative harvest flows in my determination.

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

This section of the *Forest Act* was repealed in 2003. [2003-31-2 (B.C. Reg. 401/2003)]

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

Minister's letter

The Minister has expressed the economic and social objectives of the Crown in a letter dated July 4, 2006 to the chief forester (attached as Appendix 3).

The Minister stresses in the letter the importance of a stable timber supply while being mindful of other forest values. The letter also highlights objectives in British Columbia's Mountain Pine Beetle Action Plan that are applicable now to areas of the Peace Forest District including TFL 48 that have recently been experiencing the impacts of the epidemic. The Action Plan encourages long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans. In that regard, as noted previously, the Dawson Creek LRMP and Dunlevy Creek Management Plan were used in the analysis when accounting for resource values in the TFL.

The Minister also asks in the letter for a realistic assessment of timber volumes that can be utilized economically in mountain pine beetle affected areas. He also requests that

I examine factors that affect the demand for timber and products manufactured from beetle- affected forests, the time period over which timber can be salvaged, and consider ways to maintain or enhance the mid-term timber supply. I have taken these considerations into account when addressing the *mountain pine beetle epidemic* below.

Local objectives

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

Local objectives for land and resource use in TFL 48 are largely captured in the government approved Dawson Creek LRMP and Dunlevy Creek Management Plan. I have accounted for these objectives as they relate to the various factors that I have considered in my determination.

The licensee has also addressed local objectives through its Public Advisory Committee process that supported the development of SFMP No. 4. The SFMP was designed to be consistent with the government approved LRMP and Dunlevy Creek Management Plan. The assumptions in the analysis were, in turn, consistent with the SFMP.

District staff shared with me the consultation process with First Nations that I discussed earlier under *First Nations considerations*. I have taken this process and feedback into account in my determination.

Based on this, I believe my accounting for local objectives and First Nations information has appropriately addressed the Minister's request.

- (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 such agents as fire, insects/diseases, windthrow and other natural causes, that are not either recovered through salvage operations, accounted for in growth and yield estimates, or in the inventory. The unsalvaged losses of 56 146 cubic metres per year assumed in the base case were similar to those used in the previous 2001 analysis and accepted in the previous determination.

The licensee estimated over the last five years that unsalvaged losses have been significantly less than those modelled in the analysis. The licensee estimates unsalvaged losses to be 4395 cubic metres per year. However, in consideration of the current mountain pine beetle outbreak now facing the TFL, the licensee opted to not refine the estimate of unsalvaged losses at this time. Therefore, the unsalvaged losses identified are exclusive of losses associated with the current mountain pine beetle infestation.

I address the *mountain pine beetle epidemic* below. Notwithstanding this epidemic, I concur with the licensee's approach and accept previous estimates for unsalvaged losses as being appropriate for use in support of this determination.

Mountain pine beetle epidemic

Mountain pine beetles (MPB) are part of the natural processes within lodgepole pine ecosystems. However, the current provincial outbreak has reached an unprecedented level in BC's history of recording such events. The 2006 annual aerial overview survey indicates that about 9.2 million hectares of the province are affected including about 3.9 million hectares in the Northern Interior Forest Region. The MPB has now crossed the Rocky Mountains and has spread into the Peace Forest District including TFL 48.

To investigate the potential to control or salvage the MPB outbreak on the TFL, several scenarios were developed based on various assumed levels of infestation. 'Pine stands at risk' were defined as stands greater than 60 years of age that are either pine-leading or spruce-leading with 40 percent or more pine.

To investigate the potential to control or salvage the MPB outbreak on the TFL, several scenarios were developed based on various assumed levels of infestation. 'Pine stands at risk' were defined as stands greater than 60 years of age that are either pine-leading or spruce-leading with 40 percent or more pine. In the scenarios it was assumed that these at risk stands would be attacked and killed over the next 10 years and the economic shelf life of killed stands would be five years. The gross mature pine volume at risk is 26.8 million cubic metres.

In three MPB scenarios, 385 200 cubic metres per year, about 60 percent of the base case conifer harvest level, were targeted to at risk pine stands. Scenarios 1, 2 and 3 assumed a 40, 50, and 80 percent mortality level, respectively. The analysis results showed that unsalvaged pine losses in pine stands at risk varied greatly from 0.7, 2.6, and 9.4 million cubic metres for scenarios 1, 2 and 3, respectively.

In another four scenarios, the conifer harvest for the first decade was increased to 884 300 cubic metres per year of which 615 510 cubic metres per year (about 70 percent) was directed to pine stands at risk. Scenarios 4, 5, 6 and 7 assumed a 40, 50, 70 and 80 percent mortality level, respectively. In these scenarios, the analysis results revealed that unsalvaged pine losses in pine stands at risk varied greatly from 0.15, 1.5, 5.9 and 8.2 million cubic metres for scenarios 4, 5, 6 and 7, respectively.

Given this information, and the prevailing view that an 80 percent mortality level will most likely occur, the licensee prepared a preferred scenario. In the licensee preferred scenario, the following changes were made relative to the base case:

- SIBEC site productivity estimates were assumed for both existing and future managed stands;
- Recommended VQOs were used; and
- At least 70 percent of the coniferous-leading harvesting was targeted to pine-leading stands during the first 10 years modelled.

The preferred scenario resulted in an 845 300 cubic metres per year even-flow harvest level which is a significant increase over the base case harvest level. This represents a 16 percent increase for coniferous-leading stands to 744 000 cubic metres per year, and an eight percent increase for deciduous-leading stands to 101 300 cubic metres per year.

The large increase in the base case is primarily attributable to the use of SIBEC based site productivity estimates. The licensee tested the preferred scenario with the spatial model and found that the harvest levels are spatially feasible.

In light of the current MPB outbreak, the licensee is currently targeting harvest in stands with at least 70 percent pine. Assuming that the harvest of these targeted stands are older than 80 years of age (age class five and greater), there is about 18.4 million cubic metres of total volume in these stands including about 15.7 million cubic metres of pine volume located within 119 417 hectares – about one-third of the THLB. This is equivalent to about 25 years of harvesting under the base case coniferous harvest levels.

Based on harvest levels in the licensee preferred scenario, directing the entire 744 000 cubic metres per year of harvest in coniferous-leading stands to mature stands with at least 70 percent pine over a five year period (i.e., to reflect the estimated shelf life) would result in the harvest of 3.7 million cubic metres including 3.2 million cubic metres of pine volume. A very substantial 12.5 million cubic metres of pine volume in stands with at least 70 percent pine, however, would not be harvested and would constitute unsalvaged losses to the TFL's growing stock. Another 9.8 million cubic metres of pine volume in stands with less than 70 percent pine would also be unsalvaged.

The licensee preferred scenario makes no accounting for the substantial unsalvaged losses due to the MPB. The current volume in the TFL of stands over 80 years of age is about 70.3 million cubic metres including 44.8 million cubic metres of non-pine (64 percent) and 25.5 million cubic metres of pine (36 percent). After year five, about 44.3 million cubic metres of non-pine volume are expected to remain in the TFL (assuming all mature pine volumes have been killed and are no longer salvageable). This includes 2.2 million cubic metres of non-pine species in stands that included a component of at least 70 percent pine before it was lost to the MPB. This volume may not be economically harvestable after the loss of the pine. If so, this would leave 42.1 million cubic metres of available volume in the TFL in year six – which is 40 percent less than the current mature growing stock. Although this loss is substantial, it is less catastrophic than in other management units where pine represents an even larger portion of the timber harvesting land base. That said I expect that there will be mid-term reductions in timber supply following salvage harvesting given the magnitude of the pine volume loss.

Raising harvest levels significantly beyond the preferred scenario would capture more of the substantial unsalvaged losses, but the Chetwynd sawmill owned by the licensee does not have the existing capacity to process harvest volume much higher than the preferred scenario. The preferred scenario contributes 744 000 cubic metres towards the 900 000 cubic metres maximum annual capacity of the sawmill. The licensee typically also buys about 100 000 cubic metres per year from BC Timber Sales. There is potential to modestly increase the harvest level from the preferred scenario to 800 000 cubic metres per year for coniferous-leading stands. Unless the licensee increases the capacity of the Chetwynd sawmill, increasing the AAC beyond 800 000 cubic metres would potentially result in allowable harvest levels that could not be realistically utilized.

Given the substantial losses in volume in the TFL due to the MPB, and in consideration of mill capacity, I support a harvest level that is slightly higher than the licensee preferred scenario that reflects mill capacity, and this is reflected in my 'Reasons for Decision'. In order to protect mid-term timber supply in the TFL, I have predicated my decision on the licensee harvesting stands with at least 70 percent pine and request under 'Implementation' that harvest performance be tracked in this regard. I further urge the licensee to direct its deciduous-leading harvesting in stands with a significant pine component where possible in order to salvage these volumes before their economic shelf life has expired.

There is considerable opportunity to recover additional pine volume losses should mill capacity increase. I encourage the licensee to explore current mill capacity limitations to increasing salvage efforts including partnerships with other licensees. If capacity issues can be addressed, I am prepared to revisit this decision.

Increased harvesting operations related to an increase in the AAC can lead to an increased risk to biodiversity, habitat, riparian resources, and watershed integrity. This highlights the need for increased levels of retention to reduce the negative impacts on these values that may be associated with a greater rate of harvesting. In 2005, the chief forester provided *Guidance on Landscape and Stand Level Structural Retention on Large-Scale Operations Associated with Mountain Pine Beetle Killed Timber*. The guidance is intended to assist forest professionals in the planning and implementation of salvage operations. In this document, the recommended proportion of stand-level retention based on opening size is provided. I encourage the licensee to consider this guidance when harvesting the higher AAC that I have determined for this TFL. I reflect on the importance for this retention further in my 'Reasons for Decision'. Under 'Implementation', I request that the licensee report on the extent to which they were able to follow those guidelines prior to the next determination.

In 2007 the chief forester prepared a letter entitled *Chief Forester's response to MPB and potential 2007 flooding* to address the higher than normal snow pack in the central interior and the potential effects that the MPB epidemic and accelerated salvage harvesting may have on the hydrology of local watersheds. The letter lists guidance documents available to resource professionals regarding MPB salvage and watershed hydrology. In addition to the equivalent clearcut area (ECA) constraints adopted by the licensee for the purposes of watershed management, I encourage the licensee to consider this letter and the noted guidance documents as they undertake salvage operations in the TFL. The importance of considering hydrologic effects is further underscored by the Forest Practices Board recent (March 2007) special investigation on *The Effect of Mountain Pine Beetle Attack and Salvage Harvesting on Streamflows*.

A number of pine stands at risk will not be harvested given my AAC decision. The careful selection of stands to harvest, and stands to be left for the mid term, should be strongly influenced by the status of advance regeneration in these stands. Stands with reasonably well stocked advance regeneration may be better left unharvested in the short term so that existing regeneration can provide volumes in the mid term. Other strategies may exist where the stand is harvested in a manner that protects advance regeneration. Prior to the next determination, I request under 'Implementation' that the

licensee assess the extent of advance regeneration in unharvested pine stands and to report on efforts to protect advance regeneration in these stands so that these efforts can be factored into the next analysis.

Reasons for Decision

I have considered the information discussed throughout this document, and I have reasoned as follows.

The 2006 timber supply analysis base case projection indicates an initial harvest level of 737 000 cubic metres per year can be sustained indefinitely. This initial harvest level is about 27 percent higher than the current AAC of 580 000 cubic metres. The base case annual harvest level consists of 642 800 cubic metres of coniferous-leading stands and 94 200 cubic metres of deciduous-leading stands – both of which are projected in the analysis to be sustained indefinitely.

In determining AACs, my considerations typically identify factors which, considered separately, indicate reasons why the timber supply may be either greater or less than the harvest levels projected for various periods in the base case. Some of these factors can be quantified and their implications assessed with reliability. Others may influence the assessment of the timber supply by introducing an element of risk or uncertainty, but cannot be quantified reliably at the time of the determination and must be accounted for in more general terms.

In my considerations, I have noted a small over-estimate in timber supply of about 0.7 percent due to recently established ungulate winter ranges that were not accounted for in the base case. I also noted an estimated one percent increase in timber supply attributable to a coding error noted in the implementation of the phase 2 adjustments in the analysis. I consider these two factors to be effectively offsetting, and I will consider their effects no further in this determination. I also noted that I consider the site productivity estimates derived from the PEM work that is currently pending approval to be more representative of actual managed stand productivity than the estimates provided in the inventory. I therefore consider the base case to represent an underestimate of timber supply in the order of 100 000 cubic metres for coniferous-leading stands and 7000 cubic metres for deciduous-leading stands over the forecast period.

In making this determination, I am particularly mindful of the potential impact of the mountain pine beetle epidemic on susceptible pine-leading stands. About 25.5 million cubic metres of mature pine volume, which is about 36 percent of the entire mature volume in the TFL, are at risk due to the MPB. Under the licensee's preferred scenario, the harvest level of 845 300 cubic metres includes 744 000 cubic metres for coniferous-leading stands. If all that coniferous-leading harvest over the next five years was directed to stands with at least 70 percent pine, only 3.2 million cubic metres (about 13 percent) of the total mature pine volume at risk could be salvaged leaving a substantial 22.3 million cubic metres of unsalvaged pine losses.

Raising the AAC slightly above the preferred scenario would enable more expected pine losses to be salvaged, while being within the existing sawmill capacity. The sawmill capacity for coniferous volume is 900 000 cubic metres per year which includes 100 000 cubic metres per year purchased from BC Timber Sales. Therefore, there is

capacity to annually harvest 800 000 cubic metres of coniferous volume within the TFL, and potentially an additional 100 000 cubic metres of deciduous volume.

After carefully considering all the available information, I have therefore reasoned that an AAC of 900 000 cubic metres is appropriate. This includes 800 000 cubic metres attributed to volumes in coniferous-leading stands that allow for salvaging pine-leading stands attacked by the mountain pine beetle. This harvest level will still enable other forest management objectives to be attained consistent with approved land use plans. Salvage harvesting of attacked stands in a timely manner not only enables the economic utilization of dead wood but also regenerates stands to faster growing managed stands that will be an important supply of timber in the future.

There is considerable opportunity to recover additional pine volume losses should mill capacity increase. I encourage the licensee to explore current mill capacity limitations to increasing salvage efforts including partnerships with other licensees. If capacity issues can be addressed, I am prepared to revisit this decision.

In order to protect mid-term timber supply in the TFL, I have predicated my decision on the licensee harvesting stands with at least 70 percent pine and request under 'Implementation' that harvest performance be tracked in this regard.

In my considerations above, I am concerned that a higher harvest level can increase risk to watershed hydrology, biodiversity, habitat and other non-timber values. I therefore strongly encourage the licensee to consider the chief forester's recent guidance on the retention strategies related to large-scale salvage operations and to report on the extent to which they were able to follow those guidelines prior to the next determination.

I have also noted the importance of considering advance regeneration in pine-attacked stands. The careful selection of stands to harvest, and stands to be left for the mid term, should be strongly influenced by the status of advance regeneration. Stands with reasonably well stocked advance regeneration may be better left unharvested in the short term so that existing regeneration can provide volumes in the mid term. Other strategies may exist where the stand is harvested in a manner that protects advance regeneration.

In the previous determination, the deputy chief forester attributed the AAC to deciduous and coniferous trees within deciduous-leading stands, and to coniferous and deciduous trees within coniferous-leading stands. I believe a similar tracking is necessary for this determination given uncertainty regarding the use of deciduous-leading stands.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties in the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years that reflects current management practices as well as the socio-economic objectives of the Crown, and addresses the mountain pine beetle epidemic can be best achieved on TFL 48 by establishing an AAC of 900 000 cubic metres.

I attribute, under section 8(5) of the *Forest Act*, 100 000 cubic metres to deciduous and coniferous trees within deciduous-leading stands, and the balance to coniferous and deciduous trees within coniferous-leading stands.

This determination is effective May 25, 2007, and will remain in effect until a new AAC is determined, which normally must take place within five years of the effective date of this determination.

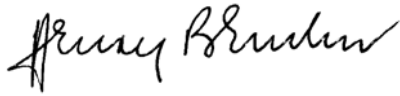
If significant new information is made available to me, major changes occur in the management assumptions upon which I have predicated this decision, or the mountain pine beetle outbreak progresses substantially differently than assumed in support of this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage the licensee to undertake the tasks and studies noted below that I have also described further in the appropriate sections of this rationale document. These projects are important to help reduce the risk and uncertainty associated with key factors that affect the future timber supply in TFL 48. I therefore request that before the next determination:

- *Low productivity sites*: that harvest performance in deciduous-leading stands be monitored so that assumptions made regarding minimum site index can be verified or refined.
- *Problem forest types*: harvest performance information be provided on cutblocks that were previously excluded from the land base as a problem forest type but are now included in the THLB in this analysis.
- *Future roads and oil and gas activity*: that the licensee continue to track as-built oil and gas activities including roads, transmission lines and well sites, and to undertake a retrospective assessment of the rate of development between this determination and the next timber supply analysis. Similar tracking of mining activity is also needed. This kind of assessment would then allow for improved accounting of the future rate of development due to subsurface resource industries in subsequent determinations.
- *Existing forest inventory*: that additional VRI phase 2 ground sampling targeted to low and moderate priority sites be undertaken in order to address the concerns raised by BCFS inventory staff.
- *Minimum harvestable ages*: assumptions in this factor in the TFL be reviewed relative to the surrounding management units, and that minimum harvestable ages assumed in the analysis be confirmed or revised.
- *Stand-level biodiversity*: the spatial mapping of wildlife tree patches be updated.
- *Log grades*: the use of logs from dead trees be monitored and reported.

- *Mountain pine beetle epidemic*: coniferous-leading harvest follows my expectation that stands with at least 70 percent pine will be targeted over the next five years and that harvest performance be monitored relative to this expectation.
- *Mountain pine beetle epidemic*: the extent to which the chief forester's retention guidelines for large-scale salvage operations are followed be reported.
- *Mountain pine beetle epidemic*: the extent of advance regeneration be assessed in unharvested pine stands and efforts to protect advance regeneration be reported so that these efforts can be factored into the next analysis.



Henry Benskin
Deputy Chief Forester

May 25, 2007



Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157
Consolidated to October 21, 2004, reads as follows:

Allowable annual cut

- 8** (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for
- (a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and
 - (b) each tree farm licence area.
- (2) If the minister
- (a) makes an order under section 7 (b) respecting a timber supply area, or
 - (b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (2) or (3),
- the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area
- (c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and
 - (d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.
- (3) If
- (a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and
 - (b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,
- the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).
- (3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester
- (a) by written order may postpone the next determination under subsection (1) to a date that is up to 10 years after the date of the relevant last determination, and
 - (b) must give written reasons for the postponement.
- (3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

- (a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and
 - (b) must give written reasons for setting the earlier date.
- (4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).
- (5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to
- (a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and
 - (b) different types of timber and terrain in different parts of private land within a tree farm licence area,
 - (c) [Repealed 1999-10-1.]
- (6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.
- (7) The regional manager or the regional manager's designate must determine a an allowable annual cut for each community forest agreement area, in accordance with
- (a) the community forest agreement, and
 - (b) any directions of the chief forester.
- (8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider
- (a) the rate of timber production that may be sustained on the area, taking into account
 - (i) the composition of the forest and its expected rate of growth on the area,
 - (ii) the expected time that it will take the forest to become re-established on the area following denudation,
 - (iii) silviculture treatments to be applied to the area,
 - (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
 - (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
 - (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,
 - (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
 - (c) Repealed [2003-31-02]

- (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
- (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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

Section 4 of the *Ministry of Forests and Range Act* (consolidated 2006) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to
 - (a) encourage maximum productivity of the forest and range resources in British Columbia;
 - (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;
 - (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;
 - (d) encourage a vigorous, efficient and world competitive (i) timber processing industry, and (ii) ranching sector in British Columbia;
 - (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Document attached:

Appendix 3: Minister's letter of July 24, 2006



JUL 04 2006

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

Dear Jim:

Re: Economic and Social Objectives of the Crown

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

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

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

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**Minister of
Forests and Range
and Minister Responsible
for Housing**

Office of the
Minister

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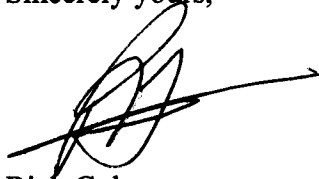
Jim Snetsinger

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

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

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

Sincerely yours,

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

Rich Coleman
Minister