

## **APPENDIX V**

### **TIMBER SUPPLY ANALYSIS**

- V.1 Timber Supply Information Package**
- V.2 Timber Supply Analysis Report**
- V.3 Chief Foresters Rationale  
For AAC Determination**

## **APPENDIX V**

### **V.1 Timber Supply Information Package**



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January 13, 1999

Doug Lang  
Pope and Talbot Ltd  
PO Box 2000  
Nakusp, BC V0G 1R0

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VICTORIA, BC

CK

Dear Doug:

Enclosed please find the amended version of the Timber Supply Analysis Information Package for Pope and Talbot Ltd., Arrow Lakes ~~Forest Licence~~ **Forest Licence 23, Management Plan #9**. This supercedes the version dated September, 1998. It contains the following amendments:

1. Addition of Schedule A information to Table 6.1

The total Schedule A area (6838 hectares) was determined from the updated GIS coverage for TFL 23. This is 506 hectares less than the area reported in Management Plan 8. The latter was based on tabular records held by Pope and Talbot. After review by Pope and Talbot staff the current GIS areas were deemed to be an accurate representation of Schedule A lands.

2. Corrections to VDYP volumes (Tables 6.1, 6.4, 6.5, 6.6, 6.8, 6.9)

The original tabular values reported in these tables did not include larch volumes. These have been corrected. These corrections have no impact on the timber supply analysis, as the VDYP yield curves employed in the analysis included all merchantable species.

3. Completion of Table 6.9 (Riparian Management Areas)

The breakdown of these areas by classification was not completed at the time the original Information Package was prepared. This summary has since been completed.

As Appendices 1 and 2 (Yield Tables) remain unchanged, the appendices were not included in this amended report.

Sincerely,  
TIMBERLINE FOREST INVENTORY CONSULTANTS LTD.

A handwritten signature in black ink, appearing to read "Erik Wang".

Erik Wang, RPF

cc: Greg Lawrence  
MoF, Timber Supply Branch  
✓ Charlie Klassen  
MoF, Resource Tenures and Engineering Branch  
Pat Field  
MoF, Arrow Forest District

**POPE & TALBOT LTD.  
ARROW LAKES TREE FARM LICENCE 23  
MANAGEMENT PLAN #9**

**TIMBER SUPPLY ANALYSIS  
INFORMATION PACKAGE  
(Amended Version)**

This version includes the following amendments:

- Addition of Schedule A information to Table 6.1;
- Corrections to VDYP volumes (Tables 6.1, 6.4, 6.5, 6.6, 6.8, 6.9); and
- Completion of Table 6.9 (Riparian Management Areas).

Appendices 1 & 2 (Yield Tables) remain unchanged and were therefore not included.

Prepared by:

Pope & Talbot Ltd.  
&  
Timberline Forest Inventory Consultants Ltd.

December 1998

Reference: 9740014.3.1

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## **List of Appendices**

Appendix 1: VDYP Natural Stand Yield Tables

Appendix 2: TIPSYS Managed Stand Yield Tables



## 1.0 INTRODUCTION

This Information Package has been prepared on behalf of Pope & Talbot Ltd. (P&T) as a source document prior to the completion of the Timber Supply Analysis for TFL 23 Management Plan #9 (MP #9). It serves as a summary of the inputs and assumptions made in preparing for the analysis. The analysis process is a dynamic one and inputs and assumptions may change. Included are inventory and landbase summaries, growth and yield information and management assumptions for timber and non-timber resources related to timber supply. This package follows the suggested format of the Timber Supply Analysis Information Packages for Tree Farm Licensees Version 2.0 (MoF, February 1997).

The analysis includes two options, one of which was identified in the Statement of Management Objectives Options and Procedures (SMOOP), dated May 30, 1997.

Of the several options originally identified in the SMOOP, only the Current Management (Base Case) Option will be analyzed. This will incorporate assumptions associated with the latest Kootenay-Boundary Land Use Plan (KBLUP) Implementation Strategy and the *1998 Forest Development Plan Memorandum of Understanding* (MOU) dated October 30, 1997. As well, key landscape management guidelines identified in the Revelstoke and Area Land Use Planning Minister's Advisory Committee Draft Report will be applied to the portion of the TFL falling within the Columbia Forest District. Therefore, the KBLUP Option also identified in the SMOOP is no longer necessary. As well, the Enhanced Forest Development Option will not be included due to a lack of background information related to targets and guidelines. The Current Management less Shelter Bay Option will be conducted as a sensitivity analysis within the Current Management Option. A calculation of the theoretical timber supply will replace the Gross Operable Landbase Option.

In addition to the Current Management Option, a second option will be included in the analysis. This option employs all of the base case inputs, with the exception of the definition of caribou management zones. In the base case, the zones were those employed in the KBLUP implementation strategy. However, Pope and Talbot have been redefining caribou habitat mapping and range definition using five years of telemetry data and field inventory studies. These redefined zones will be employed in Option 2.

Analysis inputs have been designed to reflect current management practices for TFL 23 and correspond to the approval date of the SMOOP. Management guidelines reflecting Forest Practices Code (FPC) requirements will be included in the Base Case.

Analysis of options will use CASH6, Timberline's proprietary forest estate simulation model. CASH6 is capable of explicitly simulating integrated resource management by regulating forest cover. Spatial resolution may be achieved by using information from the GIS that provides specific information about the location of each component of the landbase with respect to all of its neighbors. Forest cover requirements are applied within various landbase aggregates to reflect adjacency and old growth requirements. The degree of spatial resolution is dependent on the data available and the objectives of the timber supply analysis. This allows an "Integrated Resource Land Base" approach with appropriate contribution of the non-timber resource values of the entire productive forest.

Upon acceptance by the MoF Timber Supply Analyst, the assumptions and methodology provided in this Information Package will be used by P&T to prepare and submit a timber supply analysis to the Timber Supply Analyst and a 20 Year Spatial Feasibility Analysis to the District Manager. A number of alternative harvest flows will be evaluated within the various options and sensitivity analyses in order to gain a complete understanding of the factors that influence timber supply on TFL 23. All analysis results will be provided to the Chief Forester of British Columbia for the allowable annual cut determination.

## **2.0 PROCESS**

Following acceptance, this Information Package will be included as an Appendix to the Timber Supply Analysis Report of TFL 23 MP #9.

The contents of this Information Package reflect inputs from the previous Management Plan (MP #8) process, from public and resource agency review of MP #8 and the SMOOP for MP #9 as outlined in the Management Plan Review Strategy.

Forest inventory and landbase information has been collected in a series of recent field projects and associated mapping updates. This information is maintained in P&T's GIS database. This database has been used to prepare summaries for the Information Package and inputs to the timber supply analysis.

Technical details submitted in this Information Package will be reviewed by MoF Timber Supply, Resources Inventory, and Research Branch staff. In addition, Arrow Forest District, Columbia Forest District and Nelson Forest Region staff, as well as Ministry of the Environment, Lands and Parks (MoELP), will evaluate the assumptions in this Package. Some review has already taken place.

The Information Package has been prepared in consultation with the designated MoF Timber Supply Analyst to ensure that all information necessary to evaluate the timber supply situation of TFL 23 is available to the Chief Forester of B.C.

## 2.1 Additional Information

Descriptions of any sensitivity analyses not considered this far will be provided in the Timber Supply Analysis Report.

## 3.0 TIMBER SUPPLY OPTIONS

This section describes the analysis option, or scenario, that will be presented in the Timber Supply Analysis Report.

### 3.1 Current Management (Base Case) Option

The Current Management or Base Case Option will include:

- Management activity as defined by current operations with emphasis on the last 5 years;
- Implementation of the Forest Practices Code (FPC) as it is being interpreted at the date of SMOOP approval, August 28, 1997;
- Recommended Landscape Units (LUs) defined for TFL 23 with biodiversity emphasis assignments to address landscape level biodiversity;
- A recently updated (December 31, 1997) forest cover inventory;
- VDYP natural stand yields for natural unmanaged stands (> 25 years old);
- TIPSYP managed stand yields for all existing (1 – 25 years old) and future managed stands;
- Current close utilization standards;
- Basic silviculture on all sites;
- Genetic gains from tree improvement;
- New Park Areas from KBLUP;
- Special management for important wildlife including mountain caribou;
- Visual quality requirements;
- Consideration for sensitive areas based on recent inventories including terrain (soils) and regeneration problems;
- Revised operability which defines areas requiring aerial harvesting systems;
- inclusion of provincial and federal park lands to height of land for contribution to seral stage requirements; and
- Consideration of uneconomic forest stands and forest health.

Background information used to prepare this Information Package includes:

- Forest Practices Code of British Columbia;
- Biodiversity Guidebook;
- Riparian Management Area Guidebook;
- Memorandum from the Deputy Ministers of MoF and MoELP entitled *Achieving Acceptable Biodiversity Timber Impacts* (97.08.25);
- Memorandum from the Director of MoF Timber Supply Branch entitled *Incorporating Biodiversity and Landscape Units in the Timber Supply Review* (97.12.01);

- *Memorandum of Understanding Between Ministry of Forests and Ministry of Environment Lands and Parks, Regarding Instruction for the Preparation of 1998 Forest Development Plans, (97.10.02);*
- *Kootenay/Boundary Land Use Plan Implementation Strategy (97.06.01); and*
- *Revelstoke and Area Land Use Planning Minister's Advisory Committee Draft Recommendations (97.10.01).*

### 3.2 Sensitivity Analyses

Sensitivity runs for this option will address any issues that have significant uncertainty associated with them. Sensitivity analyses are grouped into three categories:

- Landbase revisions;
- Growth and yield inputs; and
- Management considerations and forest cover objectives.

Table 3.1 lists proposed sensitivity analyses for the Current Management Option.

**Table 3.1 - Current Management Sensitivity Analyses**

| Issue                                               | Sensitivity Levels to be Tested                                                       |
|-----------------------------------------------------|---------------------------------------------------------------------------------------|
| Landbase revisions                                  | remove Shelter Bay block                                                              |
|                                                     | add marginally economic stands                                                        |
|                                                     | remove aerial operable areas                                                          |
|                                                     | adjust timber harvesting landbase by +/- 10%                                          |
|                                                     | remove stands with SI50 < 9 m                                                         |
| Growth and yield inputs                             | Apply OGSi adjustments to managed yields                                              |
|                                                     | adjust existing stand yields by +/- 10%                                               |
|                                                     | adjust future managed stand yields by +/- 10%                                         |
|                                                     | adjust managed stand minimum harvest ages by +/- 10 years                             |
|                                                     | increase and decrease regeneration delay                                              |
| Management considerations & forest cover objectives | alter maximum disturbance constraints in IRM, caribou and ungulate winter range zones |
|                                                     | alter caribou thermal and old-growth cover constraints                                |
|                                                     | alter ungulate winter range thermal constraint                                        |
|                                                     | alter VQO disturbance constraints                                                     |
|                                                     | employ full biodiversity constraints in low emphasis landscape units                  |

Section 11.0 provides complete details for each sensitivity analysis for the Current Management Option.

## 4.0 MODEL

The proprietary simulation model CASH6 (Critical Analysis by Simulation of Harvesting) Version 6 will be used to develop harvest schedules for all options and sensitivity analyses included in the MP #9 timber supply analysis. The model uses a geographic approach to landbase and inventory in order to adhere as closely as possible to the intent of forest cover requirements on harvesting. Maximum disturbance and minimum old growth retention requirements on forest cover and biodiversity seral stage requirements are explicitly implemented.

A variable degree of spatial resolution is available depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to the periodic harvest can be included to better model forest structure and disturbance levels.

In their current implementation forest cover objectives require a control area over which to operate. Common sense indicates that the control area for a constraint set should correspond to a realistic element in the landscape. For example, the requirements associated with visual quality objectives are designed to operate on the scene visible from discrete sets of viewpoints. Pseudo-geography may be employed to translate spatial constraints on harvesting into forest cover and static access constraints. The objective is to identify the “natural” constituency for forest cover constraints. CASH6 contains a hierarchical landbase organization to assist in implementing control areas. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime. Forest cover constraints can be applied at all levels.

CASH6 will be used to determine harvest schedules that incorporate all integrated resource management considerations. The model has functionality that allows age or height-based green-up using analysis units yield information.

CASH6 will also be employed to model the 20-Year Spatial Feasibility Analysis. This component of MP #9 will be completed as a separate process from the remainder of the timber supply analysis.

## **5.0 FOREST INVENTORY**

All spatial information is controlled to the Terrain Resource Inventory Mapping (TRIM), North American Datum (NAD) 83, base. The updated TFL 23 inventory includes updated forest cover attributes in a digital and spatial format compatible with the provincial inventory database.

The forest cover inventory is updated for disturbance to December 31, 1997. Inventory data has been prepared using ARC/INFO GIS. Use of GIS ensures that spatial relationships between the various inventory attributes are maintained throughout the analysis process. For example existing roads and streams will be buffered to provide specific area reductions from the net harvesting landbase. For analysis purposes the inventory will be assigned to 10-year age classes.

## **6.0 DESCRIPTION OF LAND BASE**

This Section describes the TFL 23 landbase and the methodology used to determine the way in which land contributes to the analysis. Some portions of the productive landbase, while not contributing to harvest, may be available to meet other resource needs.

### **6.1 Timber Harvesting Land Base Determination**

Table 6.1 presents the results of the netdown process to identify the timber harvesting or net operable landbase. For each item in the netdown process, this table lists the total area in the inventory with the netdown item characteristic, as well as the actual area and volume removed in the netdown step. Individual areas may have several netdown attributes. For example, stands within riparian boundaries might also exhibit problem forest type attributes. These areas would have been removed on the basis of this latter attribute, prior to the riparian netdown. Therefore in most cases, the net reduction will be less than the total area in the inventory.

Table 6.1 - Timber Harvesting Landbase Determination – Current Management

| Land Classification           | Total Area (ha) | Net Reduction   |     |            |       | Net Remainder   |      |            |                    |
|-------------------------------|-----------------|-----------------|-----|------------|-------|-----------------|------|------------|--------------------|
|                               |                 | Schedule A Area | Vol | Total Area | Vol   | Schedule A Area | Vol  | Total Area | Vol (= Sch. A + B) |
| <b>Total Area</b>             | <b>556897</b>   |                 |     |            |       |                 |      |            |                    |
| Glacier Park                  | 508             |                 |     | 508        |       | 6838            | 1360 | 556897     | 77907              |
| <b>TFL 23</b>                 |                 |                 |     |            |       | 6838            | 1360 | 556389     | 77907              |
| Non-prod/non forest           | 184555          | 528 ✓           | 0   | 184555     | 0     |                 |      |            |                    |
| <b>Productive Forest</b>      |                 |                 |     |            |       | 6310 ✓          | 1360 | 371834     | 77907              |
| Productive reductions:        |                 |                 |     |            |       |                 |      |            |                    |
| New parks                     | 4643            | 0               | 0   | 2083       | 338   |                 |      |            |                    |
| Non-comm (NCBr)               | 198             | 0               | 0   | 198        | 0     |                 |      |            |                    |
| Inoperable                    | 274550          | 31 ✓            | 5   | 100719     | 22797 |                 |      |            |                    |
| <b>Operable</b>               |                 |                 |     |            |       |                 |      |            |                    |
| Conventional                  |                 |                 |     |            |       |                 |      | 244640     | 48316              |
| Aerial                        |                 |                 |     |            |       |                 |      | 24194      | 6456               |
| Total                         |                 |                 |     |            |       | 6279 ✓          | 1355 | 268834     | 54772              |
| Soils (Terrain IV, V)         | 25228           | 91 ✓            | 34  | 4764       | 1392  |                 |      |            |                    |
| Existing roads                | 5715            | 142 ✓           | 21  | 5333       | 706   |                 |      |            |                    |
| Trails and landings           | 3118            | 90 ✓            | 1   | 2936       | 37    |                 |      |            |                    |
| Low productivity              | 180338          | 22 ✓            | 0   | 1680       | 141   |                 |      |            |                    |
| Unmerchantable                | 28024           | 2 ✓             | 1   | 4071       | 1449  |                 |      |            |                    |
| Deciduous                     | 7407            | 301 ✓           | 0   | 5845       | 0     |                 |      |            |                    |
| Riparian (RRZ, MZ)            | 34901           | 453             | 99  | 16343      | 3624  |                 |      |            |                    |
| Parkland                      | 74244           | 0               | 0   | 223        | 52    |                 |      |            |                    |
| ESA                           | 53684           | 19              | 2   | 2937       | 621   |                 |      |            |                    |
| NSR                           | 11312           | 158             | 0   | 6165       | 0     |                 |      |            |                    |
| Total Reductions              |                 | 1278 ✓          | 158 | 50297      | 8022  |                 |      |            |                    |
| <b>Reduced Landbase</b>       |                 |                 |     |            |       | 5001 ✓          | 1197 | 218537     | 46750              |
| Additions of NSR              |                 | 158 ✓           | 0   | 6165       | 0     |                 |      |            |                    |
| <b>Current Net Landbase</b>   |                 |                 |     |            |       |                 |      |            |                    |
| Conventional                  |                 |                 |     |            |       |                 |      | 205198     | 41511              |
| Aerial                        |                 |                 |     |            |       |                 |      | 19504      | 5239               |
| Total                         |                 |                 |     |            |       | 5159 ✓ = Sch. A |      | 224702     | 46750              |
| Less future roads             |                 | 34 ✓            | 0   | 1560       | 0     |                 |      |            |                    |
| <b>Long-term Net Landbase</b> |                 |                 |     |            |       |                 |      |            |                    |
| Conventional                  |                 |                 |     |            |       |                 |      | 203638     |                    |
| Aerial                        |                 |                 |     |            |       |                 |      | 19504      |                    |
| Total                         |                 |                 |     |            |       | 5125            |      | 223142     |                    |

$$\begin{array}{r} 224702 \\ - 5159 \\ \hline 219543 \text{ Sch. B} \end{array}$$

$$\begin{array}{r} 219543 \\ \hline 224702 = 0.977 \\ \hline \text{Sch. B} \\ \text{prorate} \end{array}$$

## 6.2 Total Area

The total area of TFL 23 is 556,389 ha. Some of the areas reported above differ from those included in the MP #8 timber supply analysis. A significant number of revisions and additions have been made to the TFL 23 inventory database over the period of MP #8. The majority of the differences can be attributed to the following:

- Revised operability into conventional, aerial and inaccessible types;
- Revised assessment of uneconomic forest types;
- New riparian areas based on additional stream inventories;
- Revised sensitive soils classification (terrain classification);
- New site productivity information; and
- Minor changes to the digital definition of the TFL boundary.

### 6.3 Non-productive & Non-forest

All land classified as non-forest or non-productive such as lakes, swamps, rock, alpine, *etc.* or non-classified (coded type-identity 8 in the inventory) is excluded from the timber harvesting landbase. Table 6.2 summarizes the non-productive and non-forest land removed from the landbase for the timber supply analysis

Table 6.2 - Non-Productive & Non-Forest Reductions

| Classification |                      | Area (ha) |
|----------------|----------------------|-----------|
| A              | Alpine               | 105012    |
| AF             | Alpine forest        | 5697      |
| C              | Cultivated           | 74        |
| CL             | Claybank             | 1         |
| G              | Gravel bar           | 28        |
| GR             | Gravel pit           | 1         |
| L              | Lake                 | 3109      |
| M              | Meadow               | 80        |
| MUD            | Mud                  | 5         |
| NP             | Non-productive       | 16829     |
| NPBR           | Non-productive brush | 34975     |
| NPBU           | Non-productive burn  | 4293      |
| R              | Rock                 | 11913     |
| RIV            | River                | 494       |
| SWAMP          | Swamp                | 1287      |
| U              | Urban                | 757       |
| Total          |                      | 184555    |

While not included in this analysis, some of the subalpine and non-commercial forest, could be considered to contribute to forest cover and/or biodiversity requirements. Table 6.3 summarizes these areas by leading species.

Table 6.3 - Subalpine & Non-Commercial Forest Supporting Forest Cover

| Leading Species    | Area (ha) |
|--------------------|-----------|
| Balsam             | 12310     |
| Western redcedar   | 98        |
| Douglas-fir        | 5740      |
| Western hemlock    | 480       |
| Western larch      | 579       |
| Lodgepole pine     | 1142      |
| Western white pine | 15        |
| Spruce             | 1382      |
| Hardwood           | 118       |
| Aspen              | 59        |
| Total              | 21923     |



#### 6.4 New Parks

The KBLUP identified a number of new parks (protected areas) within TFL 23 that will no longer be available for timber harvesting. A list of the new parks and associated netdown areas is summarized in Table 6.4.

**Table 6.4 - New Park Reductions**

| New Park  | Gross Area (ha) |            | Park Reduction |                                |
|-----------|-----------------|------------|----------------|--------------------------------|
|           | Total           | Productive | Net Area (ha)  | Volume (1000s m <sup>3</sup> ) |
| Gladstone | 1321            | 338        | 338            | 70                             |
| Syringa   | 2561            | 1696       | 1696           | 258                            |
| Valhalla  | 761             | 50         | 50             | 10                             |
| Total     | 4643            | 2084       | 2084           | 338                            |

These new parks will be included in the analysis data set to address landscape level biodiversity and some other non-timber concerns including wildlife. These areas will never contribute to the periodic harvest or be included in the assessment of maximum disturbance for a given area.

#### 6.5 Non-commercial Brush

Land classified as being occupied by non-commercial species (coded type identity 5 in the inventory) is excluded. Non-commercial exclusions total 198 ha for TFL 23.

#### 6.6 Operability

A review of the operability classification was undertaken during the period of MP #8. As a result, a more refined classification is now in place. Three classes are now used to define operability on TFL 23:

- Conventional – areas accessible by road that will be harvested using ground-based or conventional yarding equipment;
- Aerial – areas having reduced access that will be harvested with helicopter or long-line yarding equipment; and
- Inaccessible – areas not accessible for harvesting under any of the aforementioned methods due to either economic or physical limitations. Under different economic conditions, some of the timber currently designated inaccessible may be reclassified as aerial. For example many overmature hemlock-balsam stands were not included in the aerial category although there are no physical limitations that would prevent them from being harvested.

All areas classified as inaccessible are removed from the harvestable landbase. Table 6.5 summarizes the distribution of the operability classes on TFL 23 and the reductions associated with inaccessible areas for this option of the analysis.

**Table 6.5 - Operability Classification & Reductions**

| Operability Category | Gross Area (ha) |            | Operability Reductions <sup>(1)</sup> |           |                                |
|----------------------|-----------------|------------|---------------------------------------|-----------|--------------------------------|
|                      | Total           | Productive | % Reduction                           | Area (ha) | Volume (1000s m <sup>3</sup> ) |
| Conventional         | 256369          | 245981     | 0                                     | 0         | 0                              |
| Aerial               | 25469           | 24285      | 0                                     | 0         | 0                              |
| Subtotal (operable)  | 281838          | 270266     | 0                                     | 0         | 0                              |
| Inoperable           | 274550          | 101569     | 100                                   | 100719    | 22797                          |
| Total                | 556388          | 371835     |                                       | 100719    | 22797                          |

<sup>(1)</sup> Reductions for this stage of the netdown process, excluding productive areas removed in previous steps.

### 6.7 Soils (Terrain IV and V)

ESAs are designated based on a number of inventory attributes having special management requirements. In the context of timber supply analysis, management constraints are reflected in the designation of high sensitivity ESAs as non-contributing to harvest. Possible high ESA designations considered for TFL 23 include:

- Areas with significant avalanche concerns;
- Actual or potential sensitive or unstable soils; and
- Severe regeneration problems caused by geoclimatic factors.

In TFL 23, sensitive/unstable soil ESAs and sites with regeneration problems have been removed from the timber harvesting landbase. Avalanche concerns are being addressed through operational planning.

Soils reductions are based on the recent terrain classification exercise. Regeneration difficulties are typically encountered on sites at higher elevation and sites with excessively shallow soils. Areas with potentially sensitive or unstable soils were identified as having a Terrain classification of IV or V and slopes greater than 75%. These are summarized in Table 6.6.

**Table 6.6 - ESA Distribution & Reductions**

| ESA Description                             | Gross Area (ha) |            | ESA Reductions <sup>(1)</sup> |           |                                |
|---------------------------------------------|-----------------|------------|-------------------------------|-----------|--------------------------------|
|                                             | Total           | Productive | % Reduction                   | Area (ha) | Volume (1000s m <sup>3</sup> ) |
| Soils (terrain class IV and V, slope > 75%) | 25228           | 14044      | 100                           | 4764      | 1392                           |
| Regeneration (ESAp)                         | 53684           | 32583      | 100                           | 2937      | 621                            |
| Total                                       | 78912           | 46627      |                               | 7701      | 2013                           |

<sup>(1)</sup> Reductions for this stage of the netdown process, excluding productive areas removed in previous steps.

## 6.8 Roads, Trails & Landings

### 6.8.1 Existing Roads

Existing roads were captured as line features in the GIS data to determine area reductions from the operable landbase. These represent permanent access road areas that will not be returned to productive forest based on current practices. As a full classification of all current roads was not available, a weighted-average road width was developed using the distribution of road classes documented in the previous management plan #8. This average road width was then used in the GIS to generate buffers around the current road line features, in order to arrive at a total area reduction for existing roads. The detailed breakdown of this existing road allowance compilation is included in Table 6.7.

Table 6.7 - Existing Roads

| Road Classification & R/W Width (m) |    | Total km (MP#8) | Weighted average width (m) | Area reduction (ha) <sup>(1)</sup> |      |
|-------------------------------------|----|-----------------|----------------------------|------------------------------------|------|
|                                     |    |                 |                            | productive                         | Net  |
| 2 – lane gravel                     | 14 | 137             |                            |                                    |      |
| 1 – lane gravel                     | 10 | 2845            |                            |                                    |      |
| Unimproved logging spur             | 10 | 311             |                            |                                    |      |
| Total                               |    | 3293            | 10.2                       | 5715                               | 5333 |

<sup>(1)</sup> Reductions for this stage of the netdown process, excluding productive areas removed in previous steps.

Some roads, landings and other road-related disturbance (gravel pits) have also been removed as non-productive areas. Fill slopes are typically classified as productive and are reforested after road development and harvesting. No reduction for these areas is necessary.

### 6.8.2 Existing Trails and Landings

Based on current forest practices on TFL 23, skid trails and landings are considered temporary access structures to be brought back into production, and therefore maintain their productive contribution to produce timber. Future trails are rehabilitated after harvesting and either planted or regenerated artificially. Therefore no additional losses are attributed to these future disturbances. In addition, the increased use of cable and aerial harvesting systems has reduced the number of skid trails constructed during harvesting operations.

Existing trails and landings are often too small to be captured in the GIS data and are removed by making landbase reductions to areas where harvesting has taken place. To reflect legacy landing and trail areas that will not be returned to productive status, 4% of the total area harvested in the past was removed from the productive forest landbase. For the Current Management Option the area reduction associated with these areas is 2,936 ha.

### 6.8.3 Future Roads

The roads proposed in the existing 20-year strategic development plan will complete development of the access network for TFL 23. The total length of the proposed roads within the harvestable landbase is 1,493 km. Based on the average width of 10.2 metres developed for existing roads, a total of 1,553 ha of area should be removed to account for this future reduction in harvestable area. This was accomplished in the CASH6 analysis by removing 4% of the area harvested in the first 20 years of the analysis. Using this mechanism, a total of 1,560 ha were removed.

### 6.9 Uneconomic & Low Productivity Forest

Sites may have low productivity either because of inherent site factors (nutrient availability, exposure, moisture, etc.) or because they are insufficiently stocked with merchantable tree species. Sites that are currently occupied by non-merchantable stands may be productive with other species or following silviculture treatments.

Uneconomic and low productivity stands are defined as follows:

- Leading deciduous;
- Overmature hemlock stands on slopes > 50%
- Overmature balsam stands;
- Any sites with an inventoried site index less than 8.0.

Table 6.8 summarizes the area, by leading species, removed as low productivity and uneconomic forest types.

Table 6.8 - Uneconomic & Low Productivity Forest Stands

| Leading Species  | Gross Productive |                                | Reductions <sup>(1)</sup> |                                |
|------------------|------------------|--------------------------------|---------------------------|--------------------------------|
|                  | Area (ha)        | Volume (1000s m <sup>3</sup> ) | Area (ha)                 | Volume (1000s m <sup>3</sup> ) |
| Cottonwood       | 1611             | 0                              | 1562                      | 0                              |
| Aspen            | 873              | 0                              | 862                       | 0                              |
| Hardwood         | 3529             | 0                              | 3424                      | 0                              |
| Balsam           | 3115             | 775                            | 3106                      | 776                            |
| Western redcedar | 175              | 0                              | 168                       | 0                              |
| Douglas-fir      | 94               | .5                             | 91                        | .6                             |
| Western hemlock  | 1796             | 719                            | 1790                      | 723                            |
| Larch            | 14               | 0                              | 14                        | 0                              |
| White pine       | 27               | .5                             | 26                        | 1.0                            |
| Lodgepole pine   | 76               | 2.5                            | 76                        | 2.4                            |
| Spruce           | 476              | 87                             | 475                       | 87                             |
| Total            | 11786            | 1584.5                         | 11594                     | 1590                           |

<sup>(1)</sup> Reductions for this stage of the netdown process, excluding productive areas removed in previous steps.

### 6.10 Riparian Reserve & Management Zones (RRZs & RMZs)

Forest Practices Code stream, lake and wetland classifications were used to establish riparian reserve and management zone widths. Formal stream inventories have been undertaken on roughly one-quarter of TFL 23. The balance has not been inventoried. A methodology was established to:

- determine an estimate of Riparian Reserve areas on surveyed streams, and
- determine an estimate of Riparian Reserve areas on un-surveyed streams.

In the GIS data set all inventoried streams, lakes and wetland features were buffered the appropriate width using 100 percent of the riparian reserve zone width and 50 percent of the riparian management zone width. Once all inventoried streams were buffered, an average buffer width of 39 metres for classes S1-S4 was calculated.

For unclassified streams, polygons of slopes up to 20 percent were created. Based on Forest Practices Code definition, streams contained within these 20% polygons were assumed to be fish-bearing. These streams were given a 39 metre buffer and the area reserved from harvest.

**Table 6.9 - Riparian Management Area Reductions**

| RMA Classification | Width (m)<br>(RRZ+RMZ) | Length<br>(m) | Gross Area (ha) |            | RMA Reductions <sup>(1)</sup> |                                   |
|--------------------|------------------------|---------------|-----------------|------------|-------------------------------|-----------------------------------|
|                    |                        |               | Total           | Productive | Area<br>(ha)                  | Volume<br>(1000s m <sup>3</sup> ) |
| Streams            |                        |               |                 |            |                               |                                   |
| S1 (20 – 100m)     | 60                     |               | 63              | 46         | 33                            | 7                                 |
| S2                 | 40                     |               | 1427            | 766        | 552                           | 123                               |
| S3                 | 30                     |               | 170             | 119        | 86                            | 19                                |
| S4                 | 15                     |               | 1               | 0          | 0                             | 0                                 |
| S5                 | 0                      |               | 0               | 0          | 0                             | 0                                 |
| S6                 | 0                      |               | 0               | 0          | 0                             | 0                                 |
| Unclassified       | 39                     |               | 28223           | 18475      | 13328                         | 2958                              |
| Wetlands           |                        |               |                 |            |                               |                                   |
| W1                 | 30                     |               | 404             | 300        | 216                           | 48                                |
| Lakes              |                        |               |                 |            |                               |                                   |
| L1                 | 30                     |               | 1393            | 989        | 714                           | 159                               |
| L3                 | 15                     |               | 357             | 113        | 82                            | 18                                |
| Designated         |                        |               | 2785            | 1823       | 1315                          | 292                               |
| Total              |                        |               | 34825           | 22631      | 16326                         | 3624                              |

### 6.11 Wildlife Tree Patches

After other netdowns are complete additional reductions to the productive forest may be required to provide sufficient reserves of productive timber for wildlife at the site-specific level. These small reserves are also referred to as wildlife tree patches (WTPs). In order to identify the net harvestable area requiring WTP reserves, all areas removed from the productive forest landbase were identified in

the GIS. All of these forest components were then given a 250-metre buffer to reflect half of the maximum acceptable distance between wildlife tree patches according to FPC Biodiversity Guidebook. Harvestable areas not included within these buffers were deemed to be subject to WTP reserves. Table 6.10 summarizes percentage reservations based on Table 20(a) of the Biodiversity Handbook.

Table 6.10 - Wildlife Tree Patch Reductions

| luno                       | beclabel    | prod.<br>area<br>(ha) | net<br>area<br>(ha) | net<br>logged<br>(ha) | % of net<br>that is<br>logged | % of<br>prod that<br>is net | net><br>250 m | ratio<br>net250<br>/ net | Gros<br>s | WTP (%)<br>net |
|----------------------------|-------------|-----------------------|---------------------|-----------------------|-------------------------------|-----------------------------|---------------|--------------------------|-----------|----------------|
| 1 (Ledge) Total            | 1 ESSFwc 4  | 4606                  | 871                 | 301                   | 35                            | 19                          | 87            | 0.10                     | 2.4       | 0.2            |
|                            | 1 ICH mw 2  | 5812                  | 4660                | 1731                  | 37                            | 80                          | 2051          | 0.44                     | 8.7       | 3.8            |
|                            | 1 ICH mw 3  | 245                   | 177                 | 113                   | 64                            | 72                          | 58            | 0.33                     | 10.6      | 3.5            |
|                            | 1 ICH wk 1  | 3194                  | 2015                | 1148                  | 57                            | 63                          | 504           | 0.25                     | 9.0       | 2.3            |
|                            |             | 13856                 | 7724                | 3293                  | 43                            | 56                          | 2700          | 0.35                     | 6.8       | 2.4            |
| 2 (Bannock) Total          | 2 ESSFwc 4  | 4416                  | 1922                | 686                   | 36                            | 44                          | 442           | 0.23                     | 4.9       | 1.1            |
|                            | 2 ICH mw 2  | 2126                  | 1368                | 401                   | 29                            | 64                          | 342           | 0.25                     | 6.4       | 1.6            |
|                            | 2 ICH mw 3  | 9117                  | 6727                | 3664                  | 54                            | 74                          | 2893          | 0.43                     | 9.8       | 4.2            |
|                            | 2 ICH wk 1  | 1279                  | 638                 | 432                   | 68                            | 50                          | 134           | 0.21                     | 8.8       | 1.8            |
|                            |             | 16938                 | 10655               | 5184                  | 49                            | 63                          | 3811          | 0.36                     | 8.2       | 2.9            |
| 4 (Blanket) Total          | 4 ESSFwc 4  | 3154                  | 599                 | 7                     | 1                             | 19                          | 30            | 0.05                     | 0.0       | 0.0            |
|                            | 4 ICH mw 3  | 4761                  | 3812                | 849                   | 22                            | 80                          | 1487          | 0.39                     | 7.2       | 2.8            |
|                            | 4 ICH wk 1  | 1549                  | 46                  | 0                     | 0                             | 3                           | 0             | 0.01                     | 0.0       | 0.0            |
|                            |             | 9464                  | 4457                | 856                   | 19                            | 47                          | 1517          | 0.34                     | 3.6       | 1.2            |
|                            |             | 4427                  | 3772                | 743                   | 20                            | 85                          | 1697          | 0.45                     | 7.5       | 3.4            |
| 10 (Johnson) Total         | 10 ESSFwc 4 | 4433                  | 3255                | 401                   | 12                            | 73                          | 1074          | 0.33                     | 5.6       | 1.8            |
|                            | 10 ICH dw   | 13742                 | 8594                | 745                   | 9                             | 63                          | 1117          | 0.13                     | 4.1       | 0.5            |
|                            | 10 ICH mw 2 | 10079                 | 7792                | 1160                  | 15                            | 77                          | 1792          | 0.23                     | 6.2       | 1.4            |
|                            |             | 32681                 | 23412               | 3050                  | 13                            | 72                          | 5681          | 0.24                     | 5.5       | 1.3            |
|                            |             | 2388                  | 1861                | 454                   | 24                            | 78                          | 577           | 0.31                     | 7.2       | 2.2            |
| 11 (Cayuse) Total          | 11 ESSFwc 4 | 3076                  | 2214                | 611                   | 28                            | 72                          | 554           | 0.25                     | 7.0       | 1.7            |
|                            | 11 ICH dw   | 5006                  | 3560                | 266                   | 7                             | 71                          | 819           | 0.23                     | 4.9       | 1.1            |
|                            | 11 ICH mw 2 | 4173                  | 2644                | 717                   | 27                            | 63                          | 634           | 0.24                     | 6.0       | 1.5            |
|                            | 11 IDF unn  | 727                   | 363                 | 121                   | 33                            | 50                          | 58            | 0.16                     | 5.3       | 0.9            |
|                            |             | 15370                 | 10643               | 2170                  | 20                            | 69                          | 2642          | 0.25                     | 6.0       | 1.5            |
| 18 (Gladstone) Total       | 18 ESSFwc 1 | 3274                  | 1833                | 293                   | 16                            | 56                          | 422           | 0.23                     | 4.2       | 1.0            |
|                            | 18 ESSFwc 4 | 8720                  | 2775                | 179                   | 6                             | 32                          | 361           | 0.13                     | 0.8       | 0.1            |
|                            | 18 ICH dw   | 5725                  | 3547                | 522                   | 15                            | 62                          | 674           | 0.19                     | 4.7       | 0.9            |
|                            | 18 ICH mw 2 | 9624                  | 7066                | 1243                  | 18                            | 73                          | 1908          | 0.27                     | 6.1       | 1.6            |
|                            |             | 27343                 | 15220               | 2237                  | 15                            | 56                          | 3364          | 0.22                     | 4.0       | 0.9            |
| 20 (Barnes-Whatshan) Total | 20 ESSFwc 1 | 7428                  | 5441                | 2732                  | 50                            | 73                          | 1143          | 0.21                     | 9.3       | 2.0            |
|                            | 20 ESSFwc 4 | 11434                 | 6474                | 2347                  | 36                            | 57                          | 1036          | 0.16                     | 6.3       | 1.0            |
|                            | 20 ICH dw   | 1014                  | 779                 | 100                   | 13                            | 77                          | 413           | 0.53                     | 6.0       | 3.2            |
|                            | 20 ICH mw 2 | 26493                 | 20244               | 5496                  | 27                            | 76                          | 4656          | 0.23                     | 7.4       | 1.7            |
|                            | 20 ICH wk 1 | 798                   | 567                 | 111                   | 20                            | 71                          | 176           | 0.31                     | 6.1       | 1.9            |
| 21 (Woden) Total           |             | 47168                 | 33504               | 10787                 | 32                            | 71                          | 7423          | 0.22                     | 7.3       | 1.6            |
|                            | 21 ESSFwc 1 | 2929                  | 1816                | 265                   | 15                            | 62                          | 345           | 0.19                     | 4.7       | 0.9            |
|                            | 21 ESSFwc 4 | 6762                  | 2509                | 312                   | 12                            | 37                          | 351           | 0.14                     | 2.0       | 0.3            |
|                            | 21 ICH mw 2 | 8987                  | 6563                | 502                   | 8                             | 73                          | 1575          | 0.24                     | 5.1       | 1.2            |
|                            |             | 18678                 | 10888               | 1079                  | 10                            | 58                          | 2271          | 0.21                     | 3.8       | 0.8            |
| 26 (Vipond) Total          | 26 ESSFwc 1 | 1409                  | 829                 | 362                   | 44                            | 59                          | 108           | 0.13                     | 7.3       | 0.9            |
|                            | 26 ESSFwc 4 | 1830                  | 464                 | 41                    | 9                             | 25                          | 9             | 0.02                     | 0.4       | 0.0            |
|                            | 26 ICH mw 2 | 28870                 | 22160               | 6684                  | 30                            | 77                          | 6870          | 0.31                     | 7.7       | 2.4            |
|                            |             | 32109                 | 23453               | 7086                  | 30                            | 73                          | 6987          | 0.30                     | 7.3       | 2.2            |
|                            | 27 ESSFwc 1 | 5475                  | 3931                | 1388                  | 35                            | 72                          | 1219          | 0.31                     | 7.7       | 2.4            |
| 27 (Fosthall) Total        | 27 ESSFwc 4 | 10440                 | 4640                | 1098                  | 24                            | 44                          | 696           | 0.15                     | 3.8       | 0.6            |
|                            | 27 ICH mw 2 | 19947                 | 15414               | 5286                  | 34                            | 77                          | 5857          | 0.38                     | 8.2       | 3.1            |
|                            | 27 ICH wk 1 | 6619                  | 4133                | 1503                  | 36                            | 62                          | 1033          | 0.25                     | 6.9       | 1.7            |
|                            |             | 42480                 | 28117               | 9275                  | 33                            | 66                          | 8805          | 0.31                     | 6.9       | 2.2            |
|                            | 29 ESSFwc 1 | 6613                  | 2229                | 178                   | 8                             | 34                          | 424           | 0.19                     | 1.2       | 0.2            |
| 29 (Halfway) Total         | 29 ESSFwc 4 | 14408                 | 1797                | 69                    | 4                             | 12                          | 180           | 0.10                     | 0.0       | 0.0            |
|                            | 29 ICH mw 2 | 22552                 | 16944               | 3307                  | 20                            | 75                          | 4575          | 0.27                     | 6.5       | 1.7            |
|                            | 29 ICH wk 1 | 9645                  | 4871                | 771                   | 16                            | 51                          | 1120          | 0.23                     | 3.6       | 0.8            |
|                            |             | 53218                 | 25842               | 4325                  | 17                            | 49                          | 6299          | 0.24                     | 3.5       | 0.9            |

Table 6.10 (continued)

| Luño             |    | beclabel | prod.<br>area<br>(ha) | net<br>area<br>(ha) | net<br>logged<br>(ha) | % of net<br>that is<br>logged | % of<br>prod that<br>is net | net><br>250 m | Ratio<br>net250<br>/ net | WTP (%)<br>gross<br>net |     |
|------------------|----|----------|-----------------------|---------------------|-----------------------|-------------------------------|-----------------------------|---------------|--------------------------|-------------------------|-----|
| 30 (Trout) Total | 30 | ESSFwc 1 | 4675                  | 2259                | 171                   | 8                             | 48                          | 429           | 0.19                     | 2.6                     | 0.5 |
|                  | 30 | ESSFwc 4 | 9466                  | 1685                | 35                    | 2                             | 18                          | 118           | 0.07                     | 0.0                     | 0.0 |
|                  | 30 | ICH mw 2 | 4063                  | 3369                | 1413                  | 42                            | 83                          | 977           | 0.29                     | 9.5                     | 2.8 |
|                  | 30 | ICH vk 1 | 2281                  | 1311                | 318                   | 24                            | 57                          | 315           | 0.24                     | 5.2                     | 1.2 |
|                  | 30 | ICH wk 1 | 11223                 | 7619                | 1935                  | 25                            | 68                          | 1524          | 0.20                     | 6.3                     | 1.3 |
|                  |    |          | 31709                 | 16244               | 3873                  | 24                            | 51                          | 3363          | 0.21                     | 4.5                     | 0.9 |
|                  | 31 | ESSFvc   | 665                   | 3                   | 0                     | 0                             | 0                           | 0             | 0.00                     | 0.0                     | 0.0 |
|                  | 31 | ESSFwc 1 | 2579                  | 1005                | 137                   | 14                            | 39                          | 151           | 0.15                     | 2.3                     | 0.3 |
|                  | 31 | ESSFwc 4 | 6741                  | 972                 | 59                    | 6                             | 14                          | 39            | 0.04                     | 0.0                     | 0.0 |
|                  | 31 | ICH mw 2 | 1498                  | 1067                | 494                   | 46                            | 71                          | 213           | 0.20                     | 8.7                     | 1.7 |
| 31 (Fish) Total  | 31 | ICH vk 1 | 8352                  | 3712                | 853                   | 23                            | 44                          | 965           | 0.26                     | 3.7                     | 1.0 |
|                  | 31 | ICH wk 1 | 3829                  | 1619                | 173                   | 11                            | 42                          | 178           | 0.11                     | 2.3                     | 0.3 |
|                  |    |          | 23664                 | 8377                | 1715                  | 20                            | 35                          | 1546          | 0.18                     | 2.6                     | 0.5 |
| Grand Total      |    |          | 364678                | 218537              | 54929                 | 25                            | 60                          | 56408         | 0.26                     | 5.5                     | 1.4 |

- Column 3. Total productive area  
 Column 4. Net harvestable area  
 Column 5. Net harvestable area with logging history  
 Column 6. % of available (harvestable) area which has been logged  
 Column 7. % of productive area which is available (harvestable)  
 Column 8. Net area > 250 metres from unharvestable stands  
 Column 9. Ratio of net area > 250 m / total net area  
 Column 10. Gross WTP area from Table 20(a) based on Columns 6 and 7  
 Column 11. Net WTP area (reduced by Column 9 ratio)

Overall, the summary indicates that it will be necessary to leave approximately 1.4% of stand volumes in cutblocks, to provide for wildlife tree patches. The balance can be accommodated outside of the harvestable landbase. In the analysis, all of the yield tables were reduced by 1.4% to account for this.

## 7.0 INVENTORY ORGANIZATION

In order to reduce the complexity of the forest description for the purposes of timber supply analysis simulation, aggregation of individual forest stands is necessary. However, it is critical that this aggregation does not obscure either the biological differences in forest stand productivity or differences in management objectives and prescriptions. It is important to note that aggregation of the landbase will be consistent in all options and sensitivity analyses. This is to ensure that differences in results reflect differences in management decisions and not inventory aggregation.

Grouping stands into analysis units on the basis of similar species composition, site productivity and silviculture regime captures similarities in growth and response to silvicultural treatments.

Unique management characteristics are modeled by grouping areas into two CASH6 forest cover groups:

- Landscape level biodiversity will be modeled on the KBLUP recommended LU-BEC/NDT (LandscapeUnit-BiogeoclimaticClassification/NDT) aggregates. Old growth requirements (based on biodiversity emphasis assignments) from the FPC Biodiversity Guidebook will be assigned to each LU-BEC/NDT in order to address landscape level biodiversity. Old growth seral stage modeling details are outlined in the recent correspondence from MoF/MoELP (Appendix IV).
- Resource emphasis areas (REAs) are aggregates of area with similar non-timber resource concerns. These include visual sensitivity, wildlife habitat, community and domestic watersheds, and timber emphasis areas. Maximum disturbance (based on green-up requirements), minimum mature and old growth forest cover objectives will be assigned to each REA forest cover group to address needs of the resource.

REAs are aggregated within each landscape unit to reflect operational management of the resource. Where REA classifications overlap, areas must meet all overlapping forest cover objectives before harvesting.

### 7.1 Landscape Units

Landscape units for TFL 23 have been recommended as part of the ongoing KBLUP process. Based on discussions with MoF district staff, several minor Landscape Units were aggregated with neighboring units to simplify the analysis. 13 resultant LUs are associated with the TFL. BEC/NDT is based on MoELP-Nelson Region 1:250,000 Biogeoclimatic mapping and NDT definitions provided in the FPC Biodiversity Guidebook. Seral stage objectives applied at the LU-BEC/NDT level are intended to address biodiversity (seral stage) representation and ensure that an acceptable distribution of age classes is maintained. Table 7.1 summarizes the distribution of LU-BEC/NDTs on TFL 23, including KBLUP biodiversity emphasis assignments for LUs 10-31, which fall within the Arrow District. As biodiversity emphasis assignments have not been finalized for the Columbia District (LUs 1-4) weighted average biodiversity seral stage requirements were employed for these areas, assuming the following deployment:

|                        |     |
|------------------------|-----|
| high emphasis:         | 10% |
| intermediate emphasis: | 45% |
| low emphasis:          | 45% |



Table 7.1 - LU - BEC/NDTs

| Landscape Unit              |    | BEC      | NDT | Biodiversity Emphasis <sup>1</sup> | Area (ha) |                  |              |
|-----------------------------|----|----------|-----|------------------------------------|-----------|------------------|--------------|
|                             |    |          |     |                                    | Total     | Gross Productive | Net Operable |
|                             | 1  | AT p     | 5   | average                            | 462       | 0                | 0            |
|                             | 1  | ESSFwc 1 | 1   | average                            | 52        | 0                | 0            |
|                             | 1  | ESSFwc 4 | 1   | average                            | 4606      | 1244             | 871          |
|                             | 1  | ESSFwcp4 | 5   | average                            | 2         | 0                | 0            |
|                             | 1  | ICH mw 2 | 2   | average                            | 5812      | 5214             | 4660         |
|                             | 1  | ICH mw 3 | 3   | average                            | 245       | 231              | 177          |
|                             | 1  | ICH wk 1 | 1   | average                            | 3194      | 2695             | 2015         |
| <b>1 (Ledge) Total</b>      |    |          |     |                                    | 14373     | 9384             | 7724         |
|                             | 2  | AT p     | 5   | average                            | 199       | 0                | 0            |
|                             | 2  | ESSFwc 4 | 1   | average                            | 4416      | 2554             | 1922         |
|                             | 2  | ICH mw 2 | 2   | average                            | 2126      | 1697             | 1368         |
|                             | 2  | ICH mw 3 | 3   | average                            | 9117      | 8503             | 6727         |
|                             | 2  | ICH wk 1 | 1   | average                            | 1279      | 924              | 638          |
|                             |    |          |     |                                    | 17137     | 13678            | 10655        |
| <b>2 (Bannock) Total</b>    |    |          |     |                                    |           |                  |              |
|                             | 4  | AT p     | 5   | average                            | 882       | 0                | 0            |
|                             | 4  | ESSFwc 4 | 1   | average                            | 3154      | 712              | 599          |
|                             | 4  | ICH mw 3 | 3   | average                            | 4761      | 4232             | 3812         |
|                             | 4  | ICH wk 1 | 1   | average                            | 1549      | 48               | 46           |
| <b>4 (Blanket) Total</b>    |    |          |     |                                    | 10346     | 4992             | 4457         |
|                             | 10 | ESSFwc 1 | 1   | int                                | 4427      | 4153             | 3772         |
|                             | 10 | ESSFwc 4 | 1   | int                                | 4433      | 3647             | 3255         |
|                             | 10 | ICH dw   | 3   | int                                | 13742     | 10311            | 8594         |
|                             | 10 | ICH mw 2 | 2   | int                                | 10079     | 8896             | 7792         |
|                             |    |          |     |                                    | 32681     | 27007            | 23412        |
| <b>10 (Johnson) Total</b>   |    |          |     |                                    |           |                  |              |
|                             | 11 | ESSFwc 1 | 1   | int                                | 2388      | 2121             | 1861         |
|                             | 11 | ESSFwc 4 | 1   | int                                | 3076      | 2655             | 2214         |
|                             | 11 | ESSFwcp4 | 5   | int                                | 67        | 10               | 0            |
|                             | 11 | ICH dw   | 3   | int                                | 5006      | 4069             | 3560         |
|                             | 11 | ICH mw 2 | 2   | int                                | 4173      | 3221             | 2644         |
|                             | 11 | IDF unn  | 4   | int                                | 727       | 495              | 363          |
|                             |    |          |     |                                    | 15437     | 12570            | 10643        |
| <b>11 (Cayuse) Total</b>    |    |          |     |                                    |           |                  |              |
|                             | 18 | ESSFwc 1 | 1   | low                                | 3274      | 2117             | 1833         |
|                             | 18 | ESSFwc 4 | 1   | low                                | 8720      | 3295             | 2775         |
|                             | 18 | ESSFwcp4 | 5   | low                                | 532       | 34               | 0            |
|                             | 18 | ICH dw   | 3   | low                                | 5725      | 4033             | 3547         |
|                             | 18 | ICH mw 2 | 2   | low                                | 9624      | 7840             | 7066         |
| <b>18 (Gladstone) Total</b> |    |          |     |                                    | 27875     | 17320            | 15220        |

Table 7.1 (continued)

| Landscape Unit             | BEC         | NDT | Biodiversity Emphasis <sup>1</sup> | Area (ha) |                  |              |
|----------------------------|-------------|-----|------------------------------------|-----------|------------------|--------------|
|                            |             |     |                                    | Total     | Gross Productive | Net Operable |
| 20 (Barnes-Whatshan)       | 20 ESSFwc 1 | 1   | Int                                | 7428      | 7041             | 5441         |
|                            | 20 ESSFwc 4 | 1   | int                                | 11434     | 8936             | 6474         |
|                            | 20 ESSFwcp4 | 5   | int                                | 297       | 101              | 0            |
|                            | 20 ICH dw   | 3   | low                                | 1014      | 1004             | 779          |
|                            | 20 ICH mw 2 | 2   | low                                | 26493     | 25275            | 20244        |
|                            | 20 ICH wk 1 | 1   | low                                | 798       | 667              | 567          |
| 20 (Barnes-Whatshan) Total |             |     |                                    | 47465     | 43025            | 33504        |
| 21 (Woden)                 | 21 ESSFwc 1 | 1   | int                                | 2929      | 2034             | 1816         |
|                            | 21 ESSFwc 4 | 1   | int                                | 6762      | 2841             | 2509         |
|                            | 21 ESSFwcp4 | 5   | int                                | 177       | 0                | 0            |
|                            | 21 ICH mw 2 | 2   | int                                | 8987      | 7937             | 6563         |
|                            | 21 ICH wk 1 | 1   | low                                | 18855     | 12812            | 10888        |
| 21 (Woden) Total           |             |     |                                    | 18855     | 12812            | 10888        |
| 26 (Vipond)                | 26 ESSFwc 1 | 1   | low                                | 1409      | 937              | 829          |
|                            | 26 ESSFwc 4 | 1   | low                                | 1830      | 524              | 464          |
|                            | 26 ESSFwcp4 | 5   | low                                | 22        | 0                | 0            |
|                            | 26 ICH mw 2 | 2   | low                                | 28870     | 27155            | 22160        |
|                            | 26 ICH wk 1 | 1   | low                                | 32131     | 28616            | 23453        |
| 26 (Vipond) Total          |             |     |                                    | 32131     | 28616            | 23453        |
| 27 (Fosthall)              | 27 ESSFwc 1 | 1   | int                                | 5475      | 4756             | 3931         |
|                            | 27 ESSFwc 4 | 1   | int                                | 10440     | 6388             | 4640         |
|                            | 27 ESSFwcp4 | 5   | int                                | 39        | 0                | 0            |
|                            | 27 ICH mw 2 | 2   | low                                | 19947     | 19588            | 15414        |
|                            | 27 ICH wk 1 | 1   | low                                | 6619      | 5208             | 4133         |
| 27 (Fosthall) Total        |             |     |                                    | 42519     | 35939            | 28117        |
| 29 (Halfway)               | 29 ESSFwc 1 | 1   | high                               | 6613      | 2805             | 2229         |
|                            | 29 ESSFwc 4 | 1   | high                               | 14408     | 2400             | 1797         |
|                            | 29 ESSFwcp4 | 5   | high                               | 1206      | 22               | 0            |
|                            | 29 ICH mw 2 | 2   | int                                | 22552     | 20779            | 16944        |
|                            | 29 ICH wk 1 | 1   | int                                | 9645      | 6727             | 4871         |
| 29 (Halfway) Total         |             |     |                                    | 54424     | 32733            | 25842        |
| 30 (Trout)                 | 30 ESSFwc 1 | 1   | high                               | 4675      | 2725             | 2259         |
|                            | 30 ESSFwc 4 | 1   | high                               | 9466      | 2327             | 1685         |
|                            | 30 ESSFwcp4 | 5   | high                               | 2456      | 74               | 0            |
|                            | 30 ICH mw 2 | 2   | high                               | 4063      | 3943             | 3369         |
|                            | 30 ICH vk 1 | 1   | high                               | 2281      | 1591             | 1311         |
| 30 (Trout) Total           |             |     |                                    | 11223     | 9294             | 7619         |
| 31 (Fish)                  | 31 ESSFvc   | 1   | low                                | 665       | 3                | 3            |
|                            | 31 ESSFvcp  | 5   | low                                | 44        | 0                | 0            |
|                            | 31 ESSFwc 1 | 1   | low                                | 2579      | 1095             | 1005         |
|                            | 31 ESSFwc 4 | 1   | low                                | 6741      | 1103             | 972          |
|                            | 31 ESSFwcp4 | 5   | low                                | 718       | 9                | 0            |
| 31 (Fish) Total            |             |     |                                    | 1498      | 1348             | 1067         |
| Total                      | 31 ICH mw 2 | 2   | low                                | 8352      | 4871             | 3712         |
|                            | 31 ICH vk 1 | 1   | low                                | 3829      | 2377             | 1619         |
|                            | 31 ICH wk 1 | 1   | low                                | 24426     | 10805            | 8377         |
|                            | 31 ICH wk 1 | 1   | low                                | 371834    | 268834           | 218537       |
|                            | 31 ICH wk 1 | 1   | low                                |           |                  |              |

To address landscape level biodiversity, parks within TFL 23 will be included in the assessment of seral stage distributions within the appropriate LU-BEC/NDT. Only areas that are within the recommended LUs for TFL 23 will contribute to landscape level biodiversity. These park areas will not contribute to the green-up requirements of timber emphasis areas but may contribute to the mature and old growth requirements for wildlife habitat.

## 7.2 Resource Emphasis Areas

The use of forest cover requirements allows management objectives for non-timber resources to be included in timber supply analysis simulations. For forest level modeling purposes, areas requiring the same management regime, that is having the same forest cover objectives, are grouped into REAs. Within an REA, specific forest cover rules are implemented. REAs defined for the TFL are based on forest management to address timber and non-timber resources. Within each REA, measures are required to protect certain values. REAs are based on VQOs, critical wildlife habitat, community and domestic watersheds and IRM resource emphasis. A number of instances of a given REA may occur in different locations throughout the TFL. However, for analysis purposes, REA areas of the same classification are grouped by landscape unit, but are separated from similar classifications in other landscape units. REAs are summarized in Tables 7.2 (a-g).

Table 7.2(a) - Resource Emphasis Areas – Caribou

| Landscape Unit | BEC  | Area (ha)  |          |       |
|----------------|------|------------|----------|-------|
|                |      | Productive | Operable | Net   |
| 29 Halfway     | ESSF | 20803      | 5103     | 3959  |
| 29 Halfway     | ICH  | 15155      | 11986    | 9303  |
| 30 Trout       | ESSF | 15074      | 4970     | 3908  |
| 30 Trout       | ICH  | 15265      | 13282    | 11100 |
| 31 Fish        | ESSF | 2735       | 1101     | 974   |
| 31 Fish        | ICH  | 684        | 439      | 398   |
|                |      | 69716      | 36881    | 29642 |

Table 7.2(b) - Resource Emphasis Areas – Caribou – Operable <sup>(1)</sup>

| Landscape Unit | Area (ha)  |          |      |
|----------------|------------|----------|------|
|                | Productive | Operable | Net  |
| 29 Halfway     | 22921      | 4055     | 3472 |
| 30 Trout       | 15661      | 3594     | 2853 |
| 31 Fish        | 2355       | 476      | 400  |
|                | 40937      | 8125     | 6725 |

<sup>(1)</sup> This zone incorporates productive forest areas which lie outside the 1994 operability line. In these areas, at least 70% of the productive forest must be maintained in age classes 8 and 9. The rationale for this is explained in Section 10.2.1.3.

**Table 7.2(c)- Resource Emphasis Areas – VQO**

| Landscape Unit     | Area (ha)  |          |       |
|--------------------|------------|----------|-------|
|                    | Productive | Operable | Net   |
| 18 Gladstone       | 1347       | 1347     | 1241  |
| 20 Barnes-Whatshan | 1330       | 1269     | 1060  |
| 21 Woden           | 1273       | 913      | 751   |
| 26 Vipone          | 13763      | 11105    | 9012  |
| 27 Fosthall        | 1766       | 1750     | 1468  |
| 29 Halfway         | 5670       | 4470     | 3600  |
|                    | 25149      | 20854    | 17132 |

**Table 7.2(d) - Resource Emphasis Areas – Community Watershed**

| Landscape Unit | Area (ha)  |          |      |
|----------------|------------|----------|------|
|                | Productive | Operable | Net  |
| 11 Cayuse      | 192        | 165      | 118  |
| 18 Gladstone   | 1845       | 1324     | 1136 |
| 29 Halfway     | 116        | 116      | 99   |
| 30 Trout       | 533        | 343      | 272  |
|                | 2686       | 1948     | 1625 |

**Table 7.2(e) - Resource Emphasis Areas – Domestic Watershed**

| Landscape Unit     | Area (ha)  |          |       |
|--------------------|------------|----------|-------|
|                    | Productive | Operable | Net   |
| 2 Bannock          | 932        | 889      | 698   |
| 4 Blanket          | 1677       | 287      | 273   |
| 10 Johnson         | 12754      | 11636    | 10210 |
| 11 Cayuse          | 8158       | 7683     | 6465  |
| 18 Gladstone       | 7814       | 4000     | 3554  |
| 20 Barnes-Whatshan | 398        | 397      | 331   |
| 21 Woden           | 820        | 584      | 490   |
| 26 Vipond          | 2484       | 1762     | 1485  |
| 29 Halfway         | 7476       | 5231     | 4283  |
| 30 Trout           | 3331       | 2203     | 1980  |
| 31 Fish            | 1163       | 767      | 680   |
|                    | 47007      | 35439    | 30449 |

**Table 7.2(f) - Resource Emphasis Areas – Ungulate Winter Range**

| Landscape Unit     | BEC | Area (ha)  |          |       |
|--------------------|-----|------------|----------|-------|
|                    |     | Productive | Operable | Net   |
| 1 Ledge            | ICH | 3508       | 3329     | 2944  |
| 2 Bannock          | ICH | 6863       | 6379     | 5234  |
| 4 Blanket          | ICH | 1853       | 1616     | 1424  |
| 10 Johnson         | ICH | 4662       | 3340     | 2751  |
| 11 Cayuse          | ICH | 4335       | 3488     | 3059  |
| 11 Cayuse          | IDF | 714        | 483      | 358   |
| 18 Gladstone       | ICH | 4111       | 3308     | 2953  |
| 20 Barnes-Whatshan | ICH | 1096       | 1048     | 837   |
| 21 Woden           | ICH | 135        | 131      | 50    |
| 26 Vipond          | ICH | 5602       | 4902     | 3623  |
| 27 Fosthall        | ICH | 355        | 336      | 256   |
| 29 Halfway         | ICH | 2719       | 2690     | 2138  |
| 31 Fish            | ICH | 89         | 89       | 84    |
|                    |     | 36042      | 31139    | 25711 |

**Table 7.2(g) - Resource Emphasis Areas – IRM**

| Landscape Unit     | Area (ha)  |          |        |
|--------------------|------------|----------|--------|
|                    | Productive | Operable | Net    |
| 1 Ledge            | 10866      | 6055     | 4779   |
| 2 Bannock          | 10107      | 7151     | 5289   |
| 4 Blanket          | 7011       | 3195     | 2859   |
| 10 Johnson         | 16035      | 12580    | 10932  |
| 11 Cayuse          | 3821       | 2458     | 2028   |
| 18 Gladstone       | 15071      | 9398     | 8204   |
| 20 Barnes-Whatshan | 45298      | 40919    | 31792  |
| 21 Woden           | 17004      | 11400    | 9673   |
| 26 Vipond          | 15132      | 14328    | 11940  |
| 27 Fosthall        | 40741      | 34182    | 26642  |
| 29 Halfway         | 8603       | 6973     | 5589   |
| 30 Trout           | 3093       | 1154     | 728    |
| 31 Fish            | 20385      | 8665     | 6489   |
|                    | 213167     | 158458   | 126944 |

### 7.3 Analysis Units

Aggregation of forest stands is necessary to facilitate forest level modeling and reporting. Stands with similar biological (species composition and site productivity), management and silviculture regimes are grouped to reduce complexity. This must be balanced with creating small enough groups to allow accurate modeling of stand yields. It is also important to ensure that analysis units are consistent between various options of the timber supply analysis so that aggregation is not the reason for differences between analysis results.

#### 7.3.1 Analysis Units 1 - 39 (VDYP Natural Stands)

Analysis units 1 – 39 describe existing immature and mature stands that will be assigned to VDYP natural stand yield tables in the analysis. A standard approach of aggregating stands into species groups based on inventory type group (ITG) was used. Aggregation of ITGs is based upon similarity in species growth and silvics.

Site index breakpoints for the site classes defined for analysis units 1-79 are provided in Table 7.3. These break points are chosen to balance the area in each class while keeping the spread in site index in each class to a minimum. This is of concern since the relationship between site index and volume is not linear. Table 7.3 summarizes the stand attribute definitions for natural stands that will be modeled on VDYP NSYTs. Analysis units 1-39 represent stands between the ages of 26 and 140. Analysis units 41-79 represent stands greater than age 140. This separation was made to facilitate the application of site index adjustments for old growth stands.

Table 7.3(a) - VDYP Analysis Unit Descriptions – Thrifty (age 26-140)

| Analysis Unit |        | Net Area | Avg. SI50 | CC | Species Composition | ITG            | SI50 Range |
|---------------|--------|----------|-----------|----|---------------------|----------------|------------|
| 1             | FDCW-G | 3155     | 23.4      | 59 | Fd69 Cw14 Pl12 Lw5  | 1,2,4,5,6,8    | >21        |
| 2             | FDCW-M | 10719    | 18.5      | 58 | Df69 Cw12 Pl11 Lw8  | 1,2,4,5,6,8    | 15-21      |
| 3             | FDCW-P | 1583     | 13.6      | 59 | Fd76 Cw10 P9 Lw5    | 1,2,4,5,6,8    | <15        |
| 4             | FDHW-G | 2473     | 22.9      | 63 | Fd58 Hw27 Cw11 Lw4  | 3              | >21        |
| 5             | FDHW-M | 7041     | 18.1      | 57 | Fd56 Hw28 Cw11 Lw5  | 3              | 15-21      |
| 6             | FDHW-P | 568      | 13.8      | 69 | Fd65 Hw29 Cw4 Lw2   | 3              | <15        |
| 7             | FDLW-G | 2726     | 23.2      | 63 | Fd57 Lw30 Pw8 Pl5   | 7              | >21        |
| 8             | FDLW-M | 11336    | 18.2      | 60 | Fd58 Lw32 Pw6 Pl4   | 7              | 15-21      |
| 9             | FDLW-P | 561      | 13.9      | 59 | Fd61 Lw26 Pw9 Pl4   | 7              | <21        |
| 10            | CWHW-G | 320      | 24.1      | 66 | Cw59 Hw22 Fd14 Se5  | 9,10,11        | >22        |
| 11            | CWHW-M | 3212     | 19.1      | 45 | Cw54 Hw28 Fd15 Pw3  | 9,10,11        | 17-22      |
| 12            | CWHW-P | 1222     | 14.5      | 59 | Cw62 Hw19 Fd13 Bl6  | 9,10,11        | <17        |
| 13            | HWBL-G | 369      | 22.5      | 67 | Hw65 Ep14 Bl12 Se9  | 12,15,16,17    | >20        |
| 14            | HWBL-M | 1172     | 16.9      | 51 | Hw70 Se11 Bl11 Cw8  | 12,15,16,17    | 15-20      |
| 15            | HWBL-P | 190      | 13.0      | 60 | Hw87 Bl6 Se5 Pw2    | 12,15,16,17    | <15        |
| 16            | HWFD-G | 1966     | 21.1      | 65 | Hw55 Fd24 Cw12 Lw9  | 13             | >19        |
| 17            | HWFD-M | 4576     | 17.5      | 67 | Hw52 Fd28 Cw11 Lw9  | 13             | 16-19      |
| 18            | HWFD-P | 2554     | 13.8      | 71 | Hw53 Fd24 Lw13 Pw10 | 13             | <16        |
| 19            | HWCW-G | 1833     | 21.3      | 67 | Hw60 Cw31 Fd7 Lw2   | 14             | >19        |
| 20            | HWCW-M | 7015     | 17.8      | 36 | Hw51 Cw36 Fd6 Se7   | 14             | 16-19      |
| 21            | HWCW-P | 2749     | 12.9      | 60 | Bl56 Cw34 Pw5 Fd5   | 14             | <19        |
| 22            | BLSE-G | 2090     | 19.7      | 53 | Bl63 Se30 Pl4 Lw3   | 18,19,20       | >17        |
| 23            | BLSE-M | 5755     | 15.0      | 42 | Bl66 Se29 Hw2 Pl3   | 18,19,20       | 12-17      |
| 24            | BLSE-P | 1268     | 10.4      | 64 | Bl75 Se19 Ep4 Pl2   | 18,19,20       | <12        |
| 25            | SECW-G | 206      | 25.2      | 59 | Se63 Hw18 Cw16 Pl3  | 21,22,23,25,26 | >21        |
| 26            | SECW-M | 931      | 17.1      | 48 | Se77 Hw9 Cw8 Bl6    | 21,22,23,25,26 | 15-21      |
| 27            | SECW-P | 226      | 12.2      | 45 | Se67 Pl16 Hw9 Bl8   | 21,22,23,25,26 | <15        |
| 28            | SEBL-G | 474      | 22.8      | 53 | Se62 Bl35 Lw1 Hw2   | 24             | >20        |
| 29            | SEBL-M | 1815     | 16.5      | 40 | Se58 Bl38 Cw2 Pl2   | 24             | 17-20      |
| 30            | SEBL-P | 298      | 11.6      | 53 | Se56 Bl40 Pl3 Pw1   | 24             | <17        |
| 31            | PLLW-G | 1138     | 21.5      | 63 | Pl93 Fd3 Lw2 Bl2    | 28,30,31,32    | >20        |
| 32            | PLLW-M | 3728     | 18.4      | 62 | Pl93 Fd3 Bl2 Lw2    | 28,30,31,32    | 17-20      |
| 33            | PLLW-P | 1955     | 15.2      | 63 | Pl90 Bl5 Fd3 Lw2    | 28,30,31,32    | <17        |
| 34            | PLFD-G | 4050     | 22.6      | 62 | Pl53 Fd20 Lw17 Pw10 | 27,29          | >20        |
| 35            | PLFD-M | 5774     | 18.6      | 61 | Pl62 Fd20 Lw17 Pw1  | 27,29          | 17-20      |
| 36            | PLFD-P | 3141     | 15.2      | 57 | Pl62 Fd18 Lw17 Pw3  | 27,29          | <17        |
| 37            | LWFD-G | 3672     | 23.0      | 62 | Lw59 Fd24 Pl11 Hw6  | 33,34          | >21        |
| 38            | LWFD-M | 6306     | 18.9      | 61 | Lw62 Fd25 Pl9 Hw4   | 33,34          | 17-21      |
| 39            | LWFD-P | 2411     | 15.0      | 62 | Lw60 Fd27 Pl9 Hw4   | 33,34          | <17        |
| Total         |        | 112578   |           |    |                     |                |            |

Table 7.3(b) - VDYP Analysis Unit Descriptions – Mature (age 141+)

| Analysis Unit |        | Net Area | Avg. SI50 | CC | Species Composition | ITG            | SI50 Range |
|---------------|--------|----------|-----------|----|---------------------|----------------|------------|
| 41            | FDCWXG | 46       | 22.3      | 63 | Fd57 Cw18 Lw13 Se12 | 1,2,4,5,6,8    | >21        |
| 42            | FDCWXM | 1776     | 18.2      | 63 | Fd83 Cw8 Pl6 Lw3    | 1,2,4,5,6,8    | 15-21      |
| 43            | FDCWXP | 3457     | 12.7      | 56 | Fd85 Cw7 Pl6 Lw2    | 1,2,4,5,6,8    | <15        |
| 44            | FDHWXG | 127      | 21.8      | 57 | Fd51 Hw29 Pw11 Cw9  | 3              | >21        |
| 45            | FDHWXM | 886      | 17.4      | 66 | Fd54 Hw34 Lw7 Cw5   | 3              | 15-21      |
| 46            | FDHWXP | 1509     | 13.0      | 62 | Fd60 Hw33 Cw5 Bl2   | 3              | <15        |
| 47            | FDLWXG | 42       | 21.5      | 62 | Fd58 Lw23 Pw14 Hw5  | 7              | >21        |
| 48            | FDLWXM | 2062     | 18.4      | 59 | Fd61 Lw30 Pw6 Hw3   | 7              | 15-21      |
| 49            | FDLWXP | 1692     | 13.2      | 60 | Fd63 Lw29 Pw7 Pl1   | 7              | <15        |
| 50            | CWHWXG | 7        | 22.2      | 68 | Cw69 Hw31           | 9,10,11        | >22        |
| 51            | CWHWXM | 1671     | 19.3      | 59 | Cw65 Hw26 Se7 Bl2   | 9,10,11        | 17-22      |
| 52            | CWHWXP | 6823     | 15.5      | 57 | Cw64 Hw27 Fd5 Se4   | 9,10,11        | <17        |
| 53            | HWBLXG | 9        | 20.7      | 65 | Hw75 Fd13 Se12      | 12,15,16,17    | >20        |
| 54            | HWBLXM | 2283     | 15.6      | 55 | Hw73 Bl13 Se11 Cw3  | 12,15,16,17    | 15-20      |
| 55            | HWBLXP | 2141     | 11.8      | 57 | Hw78 Bl12 Se6 Cw4   | 12,15,16,17    | <15        |
| 56            | HWFDXG | 16       | 19.9      | 47 | Hw50 Fd30 Cw20      | 13             | >19        |
| 57            | HWFDXM | 288      | 17.6      | 62 | Hw60 Fd23 Cw9 Lw8   | 13             | 16-19      |
| 58            | HWFDXP | 3005     | 13.4      | 62 | Hw60 Fd25 Pw9 Cw6   | 13             | <16        |
| 59            | HWCWXG | 579      | 20.0      | 46 | Hw57 Cw36 Se6 Bl1   | 14             | >19        |
| 60            | HWCWXM | 685      | 17.4      | 63 | Hw62 Cw31 Se5 Fd2   | 14             | 16-19      |
| 61            | HWCWXP | 10210    | 13.6      | 61 | Hw61 Cw36 Se2 Pd1   | 14             | <16        |
| 62            | BLSEXG | 310      | 19.0      | 58 | Bl56 Se35 Hw9       | 18,19,20       | >17        |
| 63            | BLSEXM | 2695     | 14.1      | 50 | Bl61 Se37 Cw1 Hw1   | 18,19,20       | 12-17      |
| 64            | BLSEXP | 4872     | 10.9      | 44 | Bl60 Se38 Pl2       | 18,19,20       | <12        |
| 65            | SECWXG | 982      | 23.8      | 46 | Se77 Cw14 Hw8 Bl1   | 21,22,23,25,26 | >21        |
| 66            | SECWXM | 744      | 15.2      | 50 | Se73 Cw12 Hw11 Fd4  | 21,22,23,25,26 | 15-21      |
| 67            | SECWXP | 1581     | 11.8      | 51 | Se71 Cw13 Hw12 Bl4  | 21,22,23,25,26 | <15        |
| 68            | SEBLXG | 1671     | 24.2      | 42 | Se59 Bl38 Cw2 Hw1   | 24             | >20        |
| 69            | SEBLXM | 7013     | 13.8      | 42 | Se60 Bl39 Hw1       | 24             | 17-20      |
| 70            | SEBLXP | 7231     | 9.1       | 47 | Se60 Bl39 Hw1       | 24             | <17        |
| 71            | PLLWXG | 10       | 24.1      | 70 | Pl80 Se10 Bl10      | 28,30,31,32    | >20        |
| 72            | PLLWXM | 8        | 17.8      | 80 | Pl50 Bl40 Hw10      | 28,30,31,32    | 17-20      |
| 73            | PLLWXP | 304      | 13.9      | 62 | Pl82 Se9 Py6 Bl3    | 28,30,31,32    | <17        |
| 74            | PLFDXG | 55       | 21.4      | 75 | Pl34 Pl29 Lw20 Hw17 | 27,29          | >20        |
| 75            | PLFDXM | 9        | 17.2      | 70 | Pl70 Lw20 Fd10      | 27,29          | 17-20      |
| 76            | PLFDXP | 189      | 14.0      | 64 | Pl37 Pw30 Fd23 Lw10 | 27,29          | <17        |
| 77            | LWFDXG | 172      | 24.9      | 60 | Lw57 Fd22 Hw13 Cw8  | 33,34          | >21        |
| 78            | LWFDXM | 527      | 19.0      | 50 | Lw71 Fd19 Cw5 Pw5   | 33,34          | 17-21      |
| 79            | LWFDXP | 704      | 13.9      | 59 | Lw71 Fd19 Hw6 Cw4   | 33,34          | <17        |
| Total         |        | 68391    |           |    |                     |                |            |

### 7.3.2 Analysis Units 101 – 121, 201-269, 301-321 (TIPSY Managed Stands)

These analysis units define managed stands that will be modeled using BATCHTIPSY managed stand yield tables (MSYTs). These stands have been managed since establishment and include all artificially regenerated sites. MSYTs



for existing managed stands are listed in Table 7.4. Analysis units 101-121 represent MSYTs for the current species mix, determined from the existing forest cover descriptions. Analysis units 301-321 represent MSYTs for these areas following harvest and stand reestablishment. In this case the species mix represents current silviculture objectives for the TFL. A list of the areas associated with each of the MSYTs, subdivided into existing and future areas is provided in Tables 7.4 and 7.5.

Note: Where the leading species in the MSYT differs from the existing leading species, the following site index conversion relationships were employed:

$$SI_{Fdi} = -.690 + 0.983 * SI_{Lw}$$

$$SI_{Fdi} = 4.56 + 0.887 * SI_{Hw}$$

$$SI_{Sw} = -1.95 + 1.160 * SI_B$$

**Table 7.4(a) - TIPSy (existing) Analysis Unit Descriptions**

| Existing Analysis Unit |        | Net Area | Avg. SI50 | Existing Modeled Species Composition | Future Analysis Unit |           | SI50 | Future Modeled Species Composition |
|------------------------|--------|----------|-----------|--------------------------------------|----------------------|-----------|------|------------------------------------|
| 101                    | DFIR-G | 151      | 24.4      | Fd57 Cw16 Hw14 S13                   | 301                  | Fd/oth -G | 24.4 | Fd80 PI20                          |
| 102                    | DFIR-M | 4664     | 17.9      | Fd67 Pw11 Cw11 PI11                  | 302                  | Fd/oth-M  | 17.9 | Fd80 PI20                          |
| 103                    | DFIR-P | 601      | 12.0      | Fd73 Cw11 Pw8 Hw8                    | 303                  | Fd/oth-P  | 12.0 | Fd60 PI40                          |
| 104                    | CEDR-G | 22       | 23.7      | Cw58 Hw29 Fd13                       | 304                  | SeCw-G    | 23.7 | Fd70 S20 Cw10                      |
| 105                    | CEDR-M | 2377     | 19.6      | Cw53 Hw28 Fd11 S8                    | 305                  | SeCw-M    | 19.6 | Fd70 S20 Cw10                      |
| 106                    | CEDR-P | 577      | 13.1      | Cw51Hw28 Fd12 Pw9                    | 306                  | SeCw-P    | 13.1 | Fd70 S20 Cw10                      |
| 107                    | HEML-G | 1101     | 21.1      | Hw69 Cw21 Fd10                       | 307                  | FdHw-G    | 23.3 | Fd80 PI10 S10                      |
| 108                    | HEML-M | 5329     | 17.9      | Hw56 Cw26 Pw10 Fd8                   | 308                  | FdHw-M    | 20.4 | Fd80 PI10 S10                      |
| 109                    | HEML-P | 1185     | 12.0      | Hw58 Cw28 Fd7 Pw7                    | 309                  | FdHw-P    | 15.2 | Fd70 PI30                          |
| 110                    | BALS-G | 301      | 18.8      | Hw64 S29 Cw7                         | 310                  | SeHw-G    | 19.9 | S70 PI20 Hw10                      |
| 111                    | BALS-M | 2815     | 15.1      | Hw70 S26 PI4                         | 311                  | SeHw-M    | 15.6 | S60 PI30 Hw10                      |
| 112                    | BALS-P | 526      | 11.0      | Hw65 S30 Cw5                         | 312                  | SeHw-P    | 10.8 | S50 PI40 Hw10                      |
| 113                    | SPRU-G | 51       | 22.8      | S62PI20 Hw9 Cw9                      | 313                  | SeHw-G    | 22.8 | S70 PI20 Hw10                      |
| 114                    | SPRU-M | 10113    | 16.1      | S77 Hw14 PI5 Cw4                     | 314                  | SeHw-M    | 16.1 | S60 PI30 Hw10                      |
| 115                    | SPRU-P | 1282     | 10.1      | S78 Hw10 PI8 Cw4                     | 315                  | SeHw-P    | 10.1 | S50 PI40 Hw10                      |
| 116                    | PINE-G | 845      | 23.5      | Fd63 <sup>(1)</sup> PI20 Hw17        | 316                  | PI Lw-G   | 23.5 | Fd60 PI40                          |
| 117                    | PINE-M | 642      | 19.4      | PI60 Fd40 <sup>(1)</sup>             | 317                  | PI Lw-M   | 19.4 | Fd50 PI50                          |
| 118                    | PINE-P | 3746     | 14.6      | PI73 Fd27 <sup>(1)</sup>             | 318                  | PI Lw-P   | 14.6 | PI60 Fd40                          |
| 119                    | LARC-G | 259      | 24.5      | Fd74 <sup>(1)</sup> PI26             | 319                  | Fd/oth -G | 23.4 | Fd80 PI20                          |
| 120                    | LARC-M | 225      | 19.5      | Fd77 <sup>(1)</sup> PI23             | 320                  | Fd/oth-M  | 18.5 | Fd80 PI20                          |
| 121                    | LARC-P | 756      | 13.7      | Fd73 <sup>(1)</sup> Hw14 PI13        | 321                  | Fd/oth-P  | 12.8 | Fd60 PI40                          |
| Total                  |        | 37568    |           |                                      |                      |           |      |                                    |

(1) Includes white pine and larch which in TIPSy are modeled as Douglas-fir

Table 7.5 lists attributes for existing natural stands, following harvest.

Table 7.5(a) - TIPSy (future) Analysis Unit Descriptions

| Existing Natural (Thrifty) |        |          |           | Future Managed |             |      |                             |
|----------------------------|--------|----------|-----------|----------------|-------------|------|-----------------------------|
| Analysis Unit              |        | Net Area | Avg. SI50 | Analysis Unit  |             | SI50 | Modeled Species Composition |
| 1                          | FDCW-G | 3155     | 23.4      | 201            | Fd/other -G | 23.4 | Fd80 PI20                   |
| 2                          | FDCW-M | 10719    | 18.5      | 202            | Fd/other-M  | 18.5 | Fd80 PI20                   |
| 3                          | FDCW-P | 1583     | 13.6      | 203            | Fd/other-P  | 13.6 | Fd60 PI40                   |
| 4                          | FDHW-G | 2473     | 22.9      | 204            | Fd/other -G | 22.9 | Fd80 PI20                   |
| 5                          | FDHW-M | 7041     | 18.1      | 205            | Fd/other-M  | 18.1 | Fd80 PI20                   |
| 6                          | FDHW-P | 568      | 13.8      | 206            | Fd/other-P  | 13.8 | Fd60 PI40                   |
| 7                          | FDLW-G | 2726     | 23.2      | 207            | Fd/other -G | 23.2 | Fd80 PI20                   |
| 8                          | FDLW-M | 11336    | 18.2      | 208            | Fd/other-M  | 18.2 | Fd80 PI20                   |
| 9                          | FDLW-P | 561      | 13.9      | 209            | Fd/other-P  | 13.9 | Fd60 PI40                   |
| 10                         | CWHW-G | 320      | 24.1      | 210            | SeCw-G      | 24.1 | Fd70 S20 Cw10               |
| 11                         | CWHW-M | 3212     | 19.1      | 211            | SeCw-M      | 19.1 | Fd70 S20 Cw10               |
| 12                         | CWHW-P | 1222     | 14.5      | 212            | SeCw-P      | 14.5 | Fd70 S20 Cw10               |
| 13                         | HWBL-G | 369      | 22.5      | 213            | FdHw-G      | 24.5 | Fd80 PI10 S10               |
| 14                         | HWBL-M | 1172     | 16.9      | 214            | FdHw-M      | 19.6 | Fd80 PI10 S10               |
| 15                         | HWBL-P | 190      | 12.9      | 215            | FdHw-P      | 16.1 | Fd70 PI30                   |
| 16                         | HWFD-G | 1966     | 21.1      | 216            | FdHw-G      | 23.3 | Fd80 PI10 S10               |
| 17                         | HWFD-M | 4576     | 17.5      | 217            | FdHw-M      | 20.1 | Fd80 PI10 S10               |
| 18                         | HWFD-P | 2554     | 13.8      | 218            | FdHw-P      | 16.8 | Fd70 PI30                   |
| 19                         | HWCW-G | 1833     | 21.3      | 219            | FdHw-G      | 23.4 | Fd80 PI10 S10               |
| 20                         | HWCW-M | 7015     | 17.8      | 220            | FdHw-M      | 20.4 | Fd80 PI10 S10               |
| 21                         | HWCW-P | 2749     | 13.0      | 221            | FdHw-P      | 16.1 | Fd70 PI30                   |
| 22                         | BLSE-G | 2090     | 19.7      | 222            | SeHw-G      | 20.9 | S70 PI20 Hw10               |
| 23                         | BLSE-M | 5755     | 15.0      | 223            | SeHw-M      | 15.4 | S60 PI30 Hw10               |
| 24                         | BLSE-P | 1268     | 10.4      | 224            | SeHw-P      | 10.1 | S50 PI40 Hw10               |
| 25                         | SECW-G | 206      | 25.2      | 225            | SeHw-G      | 25.2 | S70 PI20 Hw10               |
| 26                         | SECW-M | 931      | 17.1      | 226            | SeHw-M      | 17.1 | S60 PI30 Hw10               |
| 27                         | SECW-P | 226      | 12.2      | 227            | SeHw-P      | 12.2 | S50 PI40 Hw10               |
| 28                         | SEBL-G | 474      | 22.8      | 228            | SeHw-G      | 22.8 | S70 PI20 Hw10               |
| 29                         | SEBL-M | 1815     | 16.5      | 229            | SeHw-M      | 16.5 | S60 PI30 Hw10               |
| 30                         | SEBL-P | 298      | 11.6      | 230            | SeHw-P      | 11.6 | S50 PI40 Hw10               |
| 31                         | PLLW-G | 1138     | 21.5      | 231            | PIlw-G      | 21.5 | Fd60 PI40                   |
| 32                         | PLLW-M | 3728     | 18.4      | 232            | PIlw-M      | 18.4 | Fd50 PI50                   |
| 33                         | PLLW-P | 1955     | 15.2      | 233            | PIlw-P      | 15.2 | PI60 Fd40                   |
| 34                         | PLFD-G | 4050     | 22.6      | 234            | PIlw-G      | 22.6 | Fd60 PI40                   |
| 35                         | PLFD-M | 5774     | 18.6      | 235            | PIlw-M      | 18.6 | Fd50 PI50                   |
| 36                         | PLFD-P | 3141     | 15.2      | 236            | PIlw-P      | 15.2 | PI60 Fd40                   |
| 37                         | LWFD-G | 3672     | 23.0      | 237            | Fd/other -G | 22.0 | Fd80 PI20                   |
| 38                         | LWFD-M | 6306     | 18.9      | 238            | Fd/other-M  | 17.9 | Fd80 PI20                   |
| 39                         | LWFD-P | 2411     | 15.0      | 239            | Fd/other-P  | 14.1 | Fd60 PI40                   |
| Total                      |        | 112578   |           |                |             |      |                             |

## 8.0 GROWTH AND YIELD

This section outlines the methodologies used to develop yield tables that will be included in the timber supply analysis and the volume information that is reported in this Information Package. Growth and yield modeling will be modified compared with techniques employed in support of MWP #8. Key changes are as follows:

- Revised forest cover inventory data
- Use of new SI50 values from the MoF OGSI adjustment equations for managed stands that will apply to existing old growth (sensitivity analysis)
- Allowance for genetic gain

### 8.1 Site Index

The most recent MoF site index curves embedded in VDYP Version 6.4 have been used to assign existing site index (SI50) to existing natural stands based on inventory age and height. This site value has been used to assign stands to the appropriate analysis unit (VDYP AUs 1–39, 101–139 and 201–239) for modeling. Table 8.1 lists the site index curve reference for each species present in VDYP Version 6.4

**Table 8.1 - Source of Site Index Equations**

| Species              | Site Index Reference            |
|----------------------|---------------------------------|
| Trembling aspen      | Goudie (1982)                   |
| Subalpine fir        | Kurucz (1982)                   |
| Western redcedar     | Kurucz (1985)                   |
| Paper birch          | Goudie (1982)                   |
| Interior Douglas-fir | Thrower & Goudie (1992)         |
| Western hemlock      | Wiley (1978)                    |
| Western larch        | Milner (1992)                   |
| Lodgepole pine       | Goudie (1984)                   |
| Ponderosa pine       | Han & Scrivini (1986)           |
| Western white pine   | Curtis, Diaz & Clendenen (1990) |
| Interior spruce      | Goudie (1984), natural stands   |

Analysis unit site index is derived as the area-weighted average of the polygon site indices in that analysis unit (pooled species group and site class). Analysis units are assigned to site classes good (G), medium (M) and poor (P) based on the site index ranges specified in Table 7.3. These classes are a general description of the relative productivity of the stands but are not related to the old MoF G, M, and P classification.

In the base case, no OGSI adjustments are applied to the Managed stand assignment for sites currently occupied by old growth (age class 8 & 9). However, a sensitivity analysis will be performed using adjustments based on

MoF OGSi adjustment equations from the report *Interim Old Growth Site Index Adjustment Equations and Application Guidelines*, MoF Research Branch 97.1.25. The SI50 values assigned to the old growth stands (based on inventory age and height) that will be used to develop the VDYP yield tables will be adjusted for developing managed stand yield tables. The site index adjustment equations for the species found on TFL 23 are listed in Table 8.2. Existing managed (1–25 years) and natural thrifty (26–140 years) stands will use the inventory SI50 for developing all yield tables.

**Table 8.2 - Old Growth Site Index Adjustment Equations**

| Old Growth Species    | Adjustment Equation                   | SI <sub>OG</sub> Range | ITG                  |
|-----------------------|---------------------------------------|------------------------|----------------------|
| Subalpine fir (Bl)    | $SI_{SG} = 8.824 + 0.5682 * SI_{OG}$  | 4.5 – 22.0             | 18-20 <sup>(1)</sup> |
| Western redcedar (Cw) | $SI_{SG} = 20.69$                     | 11.6 – 22.0            |                      |
| Douglas-fir (Fd)      | $SI_{SG} = 8.215 + 0.6211 * SI_{OG}$  | 6.4 – 25.2             | 1-8 <sup>(1)</sup>   |
| Western hemlock (Hw)  | $SI_{SG} = 11.42 + 0.5430 * SI_{OG}$  | 4.7 – 17.5             | 12-17 <sup>(1)</sup> |
| Western larch (Lw)    | $SI_{SG} = 22.08$                     | 11.0 – 28.3            |                      |
| Lodgepole pine (Pl)   | $SI_{SG} = 15.554 + 0.2929 * SI_{OG}$ | 7.3 – 23.7             | 28-31 <sup>(1)</sup> |
| Ponderosa pine (Py)   | $SI_{SG} = 8.311 + 0.6081 * SI_{OG}$  | 4.3 – 19.2             |                      |
| White spruce (Sw)     | $SI_{SG} = 18.208 + 0.1593 * SI_{OG}$ | 5.8 – 25.4             | 21-26 <sup>(1)</sup> |

<sup>(1)</sup> Adjustments will be applied to these inventory type groups (prjage >= 140).

The equations listed above will only apply to the SI50 for managed stands using the guidelines provided in the MoF report. A summary of the unadjusted and adjusted values is provided in Table 8.3.

**Table 8.3 - TIPSy (future) Analysis Unit Descriptions**

| A. unit |      | Base case SI50 | OGSI Adjustment |      | Species Conversion |      |
|---------|------|----------------|-----------------|------|--------------------|------|
| base    | ogsi |                | species         | SI50 | species            | SI50 |
| 241     | 341  | 22.3           | Fd              | 22.1 |                    | n.a  |
| 242     | 342  | 18.2           | Fd              | 19.5 |                    | n.a  |
| 243     | 343  | 12.7           | Fd              | 16.1 |                    | n.a  |
| 244     | 344  | 21.8           | Fd              | 21.8 |                    | n.a  |
| 245     | 345  | 17.4           | Fd              | 19.0 |                    | n.a  |
| 246     | 346  | 13.0           | Fd              | 16.3 |                    | n.a  |
| 247     | 347  | 21.5           | Fd              | 21.6 |                    | n.a  |
| 248     | 348  | 18.4           | Fd              | 19.6 |                    | n.a  |
| 249     | 349  | 13.2           | Fd              | 16.4 |                    | n.a  |
| 250     | 350  | 22.2           | Cw              | n.a  |                    | n.a  |
| 251     | 351  | 19.3           | Cw              | n.a  |                    | n.a  |
| 252     | 352  | 15.4           | Cw              | n.a  |                    | n.a  |
| 253     | 353  | 20.7           | Hw              | 22.7 | Fd                 | 24.7 |
| 254     | 354  | 15.5           | Hw              | 19.8 | Fd                 | 22.1 |
| 255     | 355  | 11.8           | Hw              | 17.8 | Fd                 | 20.3 |
| 256     | 356  | 19.9           | Hw              | 22.2 | Fd                 | 24.3 |
| 257     | 357  | 17.6           | Hw              | 21.0 | Fd                 | 23.2 |
| 258     | 358  | 13.4           | Hw              | 18.7 | Fd                 | 21.1 |
| 259     | 359  | 20.0           | Hw              | 22.3 | Fd                 | 24.3 |
| 260     | 360  | 17.4           | Hw              | 20.9 | Fd                 | 23.1 |
| 261     | 361  | 13.6           | Hw              | 18.8 | Fd                 | 21.2 |

based on P&T silviculture planning. Table 8.5 describes the regeneration strategies currently in place on TFL 23.

**Table 8.5 - Regeneration Strategies & Analysis Units**

| Managed Stand AU | Existing Natural Stands | Operational Species Composition | Modeled Species Composition <sup>(1)</sup> | Density <sup>2</sup> |
|------------------|-------------------------|---------------------------------|--------------------------------------------|----------------------|
| Fd/Other-G       | 1,4,7,37                | Fd30 Pw30 Lw20 Pl20             | Fd80 Pl20                                  | 1600                 |
| Fd/Other-M       | 2,5,8,38                | Fd30 Pw30 Lw20 Pl20             | Fd80 Pl20                                  | 1600                 |
| Fd/Other-P       | 3,6,9,39                | Pl40 Fd30 Pw20 Lw10             | Fd60 Pl40                                  | 1600                 |
| SeCW-G           | 10                      | Pw40 Fd30 Se20 Cw10             | Fd70 S20 Cw10                              | 1600                 |
| SeCW-M           | 11                      | Pw40 Fd30 Se20 Cw10             | Fd70 S20 Cw10                              | 1600                 |
| SeCW-P           | 12                      | Pw30 Fd20 Se20 Cw20 Pl10        | Fd70 S20 Cw10                              | 1600                 |
| FdHw-G           | 13,16,19                | Fd30 Pw30 Lw20 Pl10 Se10        | Fd80 Pl10 S10                              | 1600                 |
| FdHw-M           | 14,17,20                | Fd30 Pw30 Lw20 Pl10 Se10        | Fd80 Pl10 S10                              | 1600                 |
| FdHw-G           | 15,18,21                | Fd30 Pw30 Pl30 Lw10             | Fd70 Pl30                                  | 1600                 |
| SeHw-G           | 22,25,28                | Se70 Pl20 Bl10                  | S70 Pl20 Hw10                              | 1600                 |
| SeHw-M           | 23,26,29                | Se60 Pl30 Bl10                  | S60 Pl30 Hw10                              | 1600                 |
| SeHw-P           | 24,27,30                | Se50 Pl40 Bl10                  | S50 Pl40 Hw10                              | 1600                 |
| PlLw-G           | 31,34                   | Lw60 Pl40                       | Fd60 Pl40                                  | 1600                 |
| PlLw-M           | 32,35                   | Lw50 Pl50                       | Fd50 Pl50                                  | 1600                 |
| PlLw-P           | 33,36                   | Pl60 Lw40                       | Pl60 Fd40                                  | 1600                 |

<sup>(1)</sup> Lw and Pw are modeled as Fd in BatchTIPSY

Bl is modeled as Hw in BatchTIPSY

<sup>2</sup> Includes ingress

All managed stands will regenerate to the same MSYT after harvest in the timber supply analysis simulations.

### 8.7.2 Aggregated Yield Tables for Managed Stands

All managed stands will be assigned to the set of MSYTs described in the previous section. All stands regenerated since 1972 (both natural and planted) will be assigned to managed stand yields for the analysis. This reflects the silviculture history on the license. P&T has maintained recommended stocking standards on these areas.

Managed stand yields were developed using MoF BatchTIPSY. BatchTIPSY incorporates the following inputs to derive a yield curve for each analysis unit:

- Leading species;
- Initial density - based on current stocking objectives, including ingress;
- Treatments;
- Site index;
- Operational adjustment factors (OAF1 15%, OAF2 5%); and
- Regeneration delay - 0 (delays are incorporated in forest level analysis).

The guidelines for assigning existing natural stands to future MSYTs are provided in Table 8.4. Appendix II provides a full list of the BatchTIPSY yield tables for

managed stands. Table 10.5 summarizes the minimum harvest age attributes for the MSYTs.

### 8.7.3 Regeneration Delay

Silviculture prescriptions and past performance indicate a regeneration delay of two years. Some harvested areas have regeneration in place within the same year on TFL 23. For the timber supply analysis all harvested areas will be assigned a 2-year regeneration delay.

### 8.7.4 Genetic Gain Allowances

Based on the existing tree improvement program, it is reasonable to expect yield gains for stands originating from genetically improved planting stock. In the absence of specific information, a factor of 3% was used to increase the yields of all future managed stands. This allowance is well within provincial expectations for yield increases associated within genetic improvement.

## 8.8 Silviculture History

### 8.8.1 Existing Managed Immature Stands

A summary of the existing managed immature inventory and analysis unit assignment for those stands is provided in Table 7.4. This component of the inventory includes all stands established since 1967 (25 years old and younger).

Table 8.6 - Age Distribution – Existing Managed Stands

| 1-5  | 6-10  | 11-15 | 16-20 | 21-25 | Total |
|------|-------|-------|-------|-------|-------|
| 4845 | 10235 | 4953  | 5713  | 11821 | 37567 |

### 8.8.2 Non-Satisfactorily Restocked

The recent forest re-inventory identified 6,165 net ha of potentially non-satisfactorily restocked (NSR) lands on TFL 23. In the analysis, these areas will be regenerated according to the strategies outlined in Table 8.5. Table 8.7 summarizes the regeneration plans for the NSR that will be modeled.

Table 8.7 - NSR Regeneration Strategy

| Current Thrifty Distribution |                       |         | NSR Assignment |               |
|------------------------------|-----------------------|---------|----------------|---------------|
| Species Group                | Existing Thrifty (ha) | percent | Area           | Analysis Unit |
| FDCW                         | 15616                 | 47%     | 2898           | 207           |
| FDHW                         | 10124                 |         |                |               |
| FDLW                         | 14819                 |         |                |               |
| LWFD                         | 12412                 | 4%      | 246            | 211           |
| CWHW                         | 4770                  |         |                |               |
| HWBL                         | 1732                  |         |                |               |
| HWFD                         | 9107                  | 20%     | 1233           | 217           |
| HWCW                         | 11614                 |         |                |               |
| BLSE                         | 9187                  |         |                |               |
| SECW                         | 1403                  | 12%     | 740            | 229           |
| SEBL                         | 2623                  |         |                |               |
| PLLW                         | 6882                  |         |                |               |
| PLFD                         | 13025                 | 17%     | 1048           | 235           |
| Total                        | 113314                |         |                |               |
|                              |                       | 100     | 6165           |               |

### ***10.1.2 Recreation and Landscape***

Recreation and Landscape inventories were updated in 1994. Both inventories were completed to MoF standards for the entire TFL area. Visual sensitivity classes defined in the Landscape inventory will be used to identify management zones in which visual management will be emphasized.

### ***10.1.3 Landscape Units***

Landscape units for TFL 23 were recommended in the most recent MOU for the KBLUP. MoF/MoELP provided a digital file of the LU boundaries. These areas are intended to be broad contiguous areas over which objectives related to natural resources are to be met. For the purposes of this analysis, landscape level biodiversity targets will be assigned at the LU-BEC/NDT level.

### ***10.1.4 Streams, Lakes and Wetlands Classification***

The creek classification is being updated for the entire TFL to FPC standards. Approximately 25% of the re-classification is complete for use in the MP #9 timber supply analysis.

Classification to FPC standards allows identification of riparian reserve and management zones (RRZs and RMZs) for the timber supply analysis. Local knowledge has been used in FPC updates of the TRIM creeks. Operationally, streams are classified based on field data.

Wetlands and lakes were classified using GIS queries on lakes and wetland size as per the FPC Riparian Management Area Guidebook.

### ***10.1.5 Wildlife***

Ungulate winter range is based on KBLUP linework (KBLUP Implementation Strategy 97.06.01). Caribou habitat mapping was completed for the TFL in 1997 using telemetry survey results.

### ***10.1.6 Cultural Heritage***

MoF completed an archaeological overview assessment in 1995 for the Arrow Forest District, including TFL 23. This assessment included an inventory of all archaeological sites reported for the West Kootenays.

## **10.2 Forest Cover Requirements**

The analysis will apply forest cover objectives to model wildlife habitat guidelines, biodiversity, hydrologic green-up, silvicultural green-up and visual quality objectives. Forest cover objectives place maximum and minimum limits on the amount of young second growth and/or old growth found in landbase aggregates (LU-BEC/NDTs and REAs).

Timberline's proprietary simulation model CASH6 has the option of using a pseudo-geographic or full spatial approach to modelling timber availability, giving considerable flexibility depending on data structure and analysis objectives. This

allows the analysis to mirror, as closely as possible, the intent of forest cover objectives on harvesting in operations.

Maximum depletion and minimum old growth objectives on forest cover are explicitly implemented. Productive forest stands such as inoperable and uneconomic forest types which have been excluded from the timber harvesting landbase may be included to better model forest structure and disturbance levels. These non-harvesting areas are referred to as non-contributing forest.

Any number of forest cover groups may be used to aggregate forest stands for the purpose of modelling forest cover objectives. For example, a forest cover group will be created to model caribou habitat within a specific region of the TFL and this will be overlapped with landscape level biodiversity requirements for Landscape Unit-BEC/NDT.

There are three forest cover constraint classes available for modeling within each forest cover group:

- Disturbance - the maximum area that can be younger than a specified age or shorter than a specified height. This is intended to model cutblock adjacency and green-up requirements.
- Mature Retention - the minimum proportion of area that must be retained over a lower retention age. This is intended to model thermal cover for wildlife or mature biodiversity requirements. Mature and old growth retention forest cover objectives overlap and area that qualifies for both is counted in both.
- Old growth Retention - the minimum area that must be older than, or as old as, a specified age. This is intended to model both retention of cover and retention of old growth.

The use of forest cover objectives as described above improves forest management modeling by ensuring that the non-timber resources are given appropriate consideration.

Forest cover objectives to be applied to the forest cover groups representing REAs are presented in Table 10.2. REA requirements are based on those used in the KBLUP and from MoELP.



Table 8.3 (continued)

| A. unit |      | Base<br>case<br>SI50 | OGSI<br>Adjustment |      | Species<br>Conversion |      |
|---------|------|----------------------|--------------------|------|-----------------------|------|
| base    | ogsi |                      | species            | SI50 | species               | SI50 |
| 262     | 362  | 19.0                 | Bl                 | 19.6 | Sw                    | 20.8 |
| 263     | 363  | 14.1                 | Bl                 | 16.8 | Sw                    | 17.5 |
| 264     | 364  | 10.9                 | Bl                 | 15.0 | Sw                    | 15.4 |
| 265     | 365  | 23.8                 | Sw                 | 22.0 |                       | n.a  |
| 266     | 366  | 15.2                 | Sw                 | 20.6 |                       | n.a  |
| 267     | 367  | 11.8                 | Sw                 | 20.1 |                       | n.a  |
| 268     | 368  | 24.2                 | Sw                 | 22.1 |                       | n.a  |
| 269     | 369  | 13.8                 | Sw                 | 20.4 |                       | n.a  |
| 270     | 370  | 9.1                  | Sw                 | 19.7 |                       | n.a  |
| 271     | 371  | 24.1                 | Pl                 | 22.6 |                       | n.a  |
| 272     | 372  | 17.8                 | Pl                 | 20.8 |                       | n.a  |
| 273     | 373  | 13.9                 | Pl                 | 19.6 |                       | n.a  |
| 274     | 374  | 21.4                 | Pl                 | 21.8 |                       | n.a  |
| 275     | 375  | 17.2                 | Pl                 | 20.6 |                       | n.a  |
| 276     | 376  | 14.0                 | Pl                 | 19.7 |                       | n.a  |
| 277     | 377  | 24.9                 | Lw                 | n.a  | Fd                    | 23.8 |
| 278     | 378  | 19.0                 | Lw                 | n.a  | Fd                    | 18.0 |
| 279     | 379  | 13.9                 | Lw                 | n.a  | Fd                    | 13.0 |

## 8.2 Utilization Levels

Standard close utilization levels will be used in the development of the yield tables as documented in Table 8.4.

Table 8.4 - Utilization Levels

| Stand Types                 | Utilization      |                   |              |
|-----------------------------|------------------|-------------------|--------------|
|                             | Minimum DBH (cm) | Stump Height (cm) | Top DIB (cm) |
| Managed stands (TIPSY)      | 12.5             | 30.0              | 10.0         |
| Natural stands (VDYP)-PL    | 12.5             | 30.0              | 10.0         |
| Natural stands (VDYP)-other | 17.5             | 30.0              | 10.0         |

## 8.3 Decay, Waste and Breakage

VDYP generated volumes (for both current polygon volumes and VDYP yield tables) are net DWB using forest inventory zone (FIZ) G and loss factors for special cruise 128 (Nakusp PSYU/TFL 23).

## 8.4 Operational Adjustment Factors

Deductions for DWB are inherent in VDYP forecasts based on the DWB factors for the assigned FIZ and PSYU. BATCHTIPSY incorporates operational adjustment factors (OAFs) to adjust gross volumes:

- OAF1 – for unmapped stand openings, 15% for all TIPSY yield tables; and
- OAF2 – for age-related losses in volume, 5% for all TIPSY yield tables.

OAFs are based on standard MoF values for developing MSYTs. However, silviculture surveys and operational mapping indicate that OAF1 of 15% may be

too high. A sensitivity analysis of managed stand yields will evaluate the impacts of different OAF1 values by increasing and decreasing MSYT volumes.

## **8.5 Volume Deductions**

Volume deductions are made by reducing stand volume if a component of a stand is unmerchantable but the remainder of the stand is large enough, and of acceptable quality, to be merchantable. All stand volumes are reduced by the DWB factors included in VDYP and OAF1 and OAF2 noted above. In addition, all analysis unit and polygon volumes reported are conifer only. No deciduous volumes are included.

## **8.6 Yields for Unmanaged Stands**

### **8.6.1 Current Inventory Volumes**

Volumes reported in this information package were developed with VDYP Version 6.4 (BATCHPROCESS). Appropriate DWB factors and utilization levels were included in the development of these polygon volumes.

### **8.6.2 Yield Tables for Unmanaged Stands**

Inventory type group and site index were used to define analysis units for the older immature and mature component (age >25 years) of the inventory that will be modeled on VDYP NSYTs. Table 7.3, Section 7.3.1 summarizes the analysis unit definitions for this subset of the inventory.

The VDYP natural stand yields at the analysis unit level were developed with the following methods:

- Each polygon in the net landbase was assigned to an analysis unit on the basis of inventory type group and site index.
- Area-weighted average species composition, crown closure and site index were extracted for each analysis unit.
- These attributes, in addition to DWB factors associated with forest inventory zone G and special cruise 128 were used to drive VDYP.
- Yields are compiled to 17.5 cm dbh (12.5 cm for Lodgepole pine), 10.0 cm top and 30.0 cm stump.

Inputs to VDYP are presented in Table 7.3. Yield tables developed with VDYP that will be used in modeling the existing natural forest are presented in Appendix I. A summary of minimum harvest age attributes for the VDYP yield tables is presented in Table 10.4

## **8.7 Yields for Managed Stands**

### **8.7.1 Silviculture Management Regimes**

The following section describes regeneration plans for the TFL and the link between existing and regeneration analysis units. In the TFL 23 analysis all cut-over sites will be planted after harvest. Regeneration delays are not inherent in the yield curves, but are assigned in forest estate modeling. All regeneration is

Table 7.5(b) - TIPSy (future) Analysis Unit Descriptions

| Existing Natural (Mature) |        |          |           | Future Managed |             |                             |
|---------------------------|--------|----------|-----------|----------------|-------------|-----------------------------|
| Analysis Unit             |        | Net Area | Avg. SI50 | Analysis Unit  |             | Modeled Species Composition |
| 41                        | FDCWXG | 46       | 22.3      | 241            | Fd/other -G | Fd80 PI20                   |
| 42                        | FDCWXM | 1776     | 18.2      | 242            | Fd/other-M  | Fd80 PI20                   |
| 43                        | FDCWXP | 3457     | 12.7      | 243            | Fd/other-P  | Fd60 PI40                   |
| 44                        | FDHWXG | 127      | 21.8      | 244            | Fd/other -G | Fd80 PI20                   |
| 45                        | FDHWXM | 886      | 17.4      | 245            | Fd/other-M  | Fd80 PI20                   |
| 46                        | FDHWXP | 1509     | 13.0      | 246            | Fd/other-P  | Fd60 PI40                   |
| 47                        | FDLWXG | 42       | 21.5      | 247            | Fd/other -G | Fd80 PI20                   |
| 48                        | FDLWXM | 2062     | 18.4      | 248            | Fd/other-M  | Fd80 PI20                   |
| 49                        | FDLWXP | 1692     | 13.2      | 249            | Fd/other-P  | Fd60 PI40                   |
| 50                        | CWHWXG | 7        | 22.2      | 250            | SeCw-G      | Fd70 S20 Cw10               |
| 51                        | CWHWXM | 1671     | 19.3      | 251            | SeCw-M      | Fd70 S20 Cw10               |
| 52                        | CWHWXP | 6823     | 15.4      | 252            | SeCw-P      | Fd70 S20 Cw10               |
| 53                        | HWBLXG | 9        | 20.7      | 253            | FdHw-G      | Fd80 PI10 S10               |
| 54                        | HWBLXM | 2283     | 15.5      | 254            | FdHw-M      | Fd80 PI10 S10               |
| 55                        | HWBLXP | 2141     | 11.8      | 255            | FdHw-P      | Fd70 PI30                   |
| 56                        | HWFDXG | 16       | 19.9      | 256            | FdHw-G      | Fd80 PI10 S10               |
| 57                        | HWFDXM | 288      | 17.6      | 257            | FdHw-M      | Fd80 PI10 S10               |
| 58                        | HWFDXP | 3005     | 13.4      | 258            | FdHw-P      | Fd70 PI30                   |
| 59                        | HWCWXG | 579      | 20.0      | 259            | FdHw-G      | Fd80 PI10 S10               |
| 60                        | HWCWXM | 685      | 17.4      | 260            | FdHw-M      | Fd80 PI10 S10               |
| 61                        | HWCWXP | 10210    | 13.6      | 261            | FdHw-P      | Fd70 PI30                   |
| 62                        | BLSEXG | 310      | 19.0      | 262            | SeHw-G      | S70 PI20 Hw10               |
| 63                        | BLSEXM | 2695     | 14.1      | 263            | SeHw-M      | S60 PI30 Hw10               |
| 64                        | BLSEXP | 4872     | 10.9      | 264            | SeHw-P      | S50 PI40 Hw10               |
| 65                        | SECWXG | 982      | 23.8      | 265            | SeHw-G      | S70 PI20 Hw10               |
| 66                        | SECWXM | 744      | 15.2      | 266            | SeHw-M      | S60 PI30 Hw10               |
| 67                        | SECWXP | 1581     | 11.8      | 267            | SeHw-P      | S50 PI40 Hw10               |
| 68                        | SEBLXG | 1671     | 24.2      | 268            | SeHw-G      | S70 PI20 Hw10               |
| 69                        | SEBLXM | 7013     | 13.8      | 269            | SeHw-M      | S60 PI30 Hw10               |
| 70                        | SEBLXP | 7231     | 9.1       | 270            | SeHw-P      | S50 PI40 Hw10               |
| 71                        | PLLWXG | 10       | 24.1      | 271            | PIlw-G      | Fd60 PI40                   |
| 72                        | PLLWXM | 8        | 17.8      | 272            | PIlw-M      | Fd50 PI50                   |
| 73                        | PLLWXP | 304      | 13.9      | 273            | PIlw-P      | PI60 Fd40                   |
| 74                        | PLFDXG | 55       | 21.4      | 274            | PIlw-G      | Fd60 PI40                   |
| 75                        | PLFDXM | 9        | 17.2      | 275            | PIlw-M      | Fd50 PI50                   |
| 76                        | PLFDXP | 189      | 14.0      | 276            | PIlw-P      | PI60 Fd40                   |
| 77                        | LWFDXG | 172      | 24.9      | 277            | Fd/other -G | Fd80 PI20                   |
| 78                        | LWFDXM | 527      | 19.0      | 278            | Fd/other-M  | Fd80 PI20                   |
| 79                        | LWFDXP | 704      | 13.9      | 279            | Fd/other-P  | Fd60 PI40                   |
| Total                     |        | 68391    |           |                |             |                             |

#### 7.4 Age Class Distribution

Tables 7.6 and 7.7 summarize the distribution of area and volume (net decay, waste and breakage (DWB)) by age class (age in 20s) for the productive, operable and net operable (timber harvesting) components of the TFL 23 forest inventory. All ages are projected to December 31, 1997.

**Table 7.6 - Area by Age Class**

| Age Class    | Area by Age Classification (ha) |               |                    |
|--------------|---------------------------------|---------------|--------------------|
|              | Productive                      | Operable      | Net <sup>(1)</sup> |
| NSR          | 11313                           | 7631          | 0                  |
| 0 (NCBr)     | 197                             | 0             | 0                  |
| 1-20         | 34373                           | 33652         | 25747              |
| 21-40        | 41848                           | 36619         | 29958              |
| 41-60        | 16187                           | 11648         | 10205              |
| 61-80        | 30552                           | 22823         | 20487              |
| 81-100       | 33107                           | 25790         | 22640              |
| 101-120      | 37954                           | 31543         | 28586              |
| 121-140      | 16723                           | 13998         | 12521              |
| 141-250      | 132864                          | 74540         | 60238              |
| 251+         | 16716                           | 10591         | 8155               |
| <b>Total</b> | <b>371834</b>                   | <b>268835</b> | <b>218537</b>      |

<sup>(1)</sup> Based on Current Management Option netdowns

**Table 7.7 - Volume by Age Class**

| Age Class    | Volume by Age Classification (1000 m <sup>3</sup> ) <sup>(1)</sup> |              |                    |
|--------------|--------------------------------------------------------------------|--------------|--------------------|
|              | Productive                                                         | Operable     | Net <sup>(2)</sup> |
| 21-40        | 167                                                                | 159          | 153                |
| 41-60        | 1370                                                               | 985          | 1086               |
| 61-80        | 3856                                                               | 2946         | 3307               |
| 81-100       | 5741                                                               | 4602         | 5171               |
| 101-120      | 8329                                                               | 7043         | 7777               |
| 121-140      | 4095                                                               | 3497         | 3811               |
| 141-250      | 41684                                                              | 25740        | 21931              |
| 251+         | 6593                                                               | 4505         | 3514               |
| <b>Total</b> | <b>71835</b>                                                       | <b>49477</b> | <b>46750</b>       |

<sup>(1)</sup> Volumes are based on VDYP

<sup>(2)</sup> Based on Current Management Option netdowns

Volumes are based on VDYPbatch Version 6.4. This provides a reasonable estimate of volume for the TFL 23 inventory. Only volumes for stands > age 25 are included. The contribution to standing inventory of stands < age 25 would be negligible.

## 9.0 NON-RECOVERABLE LOSSES

Fire, insects, disease and other natural factors can cause catastrophic losses of whole stands of trees. Over the long-term the probability of losses to natural causes can be predicted. Where losses occur in merchantable stands some of the dead or dying timber may be salvageable. When modeling the timber supply, the non-recoverable losses (NRLs) are added to the desired harvest target and then subtracted from the forecast upon completion of the modeling to determine the net timber harvest. Table 9.1 summarizes the estimated NRLs for TFL 23.

**Table 9.1 - Annual Non-Recoverable Losses**

| Category    | Losses to Hazards (m <sup>3</sup> /year) |         |          |
|-------------|------------------------------------------|---------|----------|
|             | Gross                                    | Salvage | Net Loss |
| Fire        | 18,700                                   | 11,600  | 7,100    |
| Insects     | 18,000                                   | 5,000   | 13,000   |
| Disease     |                                          |         |          |
| Year 1 – 99 | 5,780                                    | 2,890   | 2,890    |
| Year 100+   | 5,780                                    | 5,780   | 0        |
| Wind        | 7,500                                    | 4,500   | 3,000    |
| Total       | 49,980                                   |         |          |
| Year 1 – 99 |                                          | 23,990  | 25,990   |
| Year 100+   |                                          | 26,880  | 23,100   |

- *Fire losses* are based on fire records from 1986-1992.
- *Insect losses* include losses to mountain pine and spruce bark beetles in the operable land base.
- *Blowdown losses* account for edge losses, normal stand blowdown, and for blowdown associated with 10-year storm events.
- *Disease losses* are those associated with white pine blister rust. The losses are at a maximum at present and are expected to fall to zero over the next 100 years. The rationale for this expected decline in impact is two-fold. First, the age at which stands with a white pine component are being attacked is, and will continue to be, lower than the original stands which were attacked when the white pine blister rust was originally introduced into the region. Therefore, future stands will have a longer period to replace lost volumes prior to harvest. Second, only rust resistant seed will be used wherever possible.

The present inventory suggests that no more than 2.5% of the net operable mature volume is white pine. The Arrow TSA white pine survey completed in the fall of 1992 suggests that the standing volume in attacked mature white pine stands is 66% of that for similar undisturbed stands.

Based on the above, unsalvaged disease losses were calculated as follows:

- The contribution of white pine to the AAC was calculated as:  
680,000 (AAC) \* 0.025 (Pw component) = 17,000 cubic metres
- The annual loss was calculated as:  
17,000 \* .34 (% remaining) = 5,780 cubic metres.
- This loss was assumed to be 50% salvageable.

## 10.0 INTEGRATED RESOURCE MANAGEMENT

This Section provides details on how modeling methodology will address non-timber resource requirements.

### 10.1 Forest Resource Inventories

This section documents the status of all non-timber resource inventories. Approximate dates of completion and approvals are presented in Table 10.1.

**Table 10.1 - Non-Timber Resource Inventory Status**

| Inventory Category      | Data Source    | Mapping Scale | Date of Completion | Date of Acceptance | Authority                    |
|-------------------------|----------------|---------------|--------------------|--------------------|------------------------------|
| Terrain Hazard          | Terratech      | 1:20,000      | Completed 95.09.30 | 97.03.30           | MoF District                 |
| Biogeoclimatic Zones    | MoF - Arrow    | 1:250,000     | Received 98.02.23  | 98.02.23           | MoF Region                   |
| Caribou habitat – P&T   | Nanuq          | 1:250,000     | Completed 97.10.31 | Draft              |                              |
| Caribou habitat – KBLUP | MoELP - Nelson | 1:250,000     | 97.06              | 97.06              | IAMC                         |
| Ungulate winter range   | MoF - Columbia | 1:250,000     | Received 97.06.31  | 97.06.30           | MELP                         |
| Ungulate winter range   | KBLUP - Arrow  | 1:50,000      | Received 97.06.30  | 1991               | MELP                         |
| Community watersheds    | MoELP - Nelson | 1:20,000      | Received 98.01.01  | 98.01.01           | MELP                         |
| Domestic watersheds     | MoELP - Nelson | 1:20,000      | Received 98.01.01  | 98.01.01           | MELP                         |
| Riparian Classification | Pope & Talbot  | 1:20,000      | 97.12.30           | 97.12.30           | MELP                         |
| Operability             | Pope & Talbot  | 1:20,000      | 97.07.30           | 97.07.30           | MoF District                 |
| Landscape Units – Draft | MoF - Columbia | 1:250,000     | 1996/1997          | Draft              | Ministers Advisory Committee |
| Landscape Units         | MoF - Arrow    | 1:250,000     | Received 98.02.01  | 98.04.08           | MoF District Manager         |
| Recreation & Landscape  | Pope & Talbot  | 1:20,000      | Completed 94.02.01 | 94.05.27           | MoF Region                   |

#### 10.1.1 Terrain Mapping

A terrain classification project to level D was completed in 1995. This classification will replace the Es<sub>1</sub> classification used in previous timber supply analyses.

**Table 10.2 - REA Forest Cover Objectives**

| Resource Emphasis Area         | Forest Cover Objective |                          |                                                              |
|--------------------------------|------------------------|--------------------------|--------------------------------------------------------------|
|                                | Maximum Disturbance    | Minimum Mature Retention | Minimum Old Growth Retention                                 |
| Caribou habitat – ESSF         | 25% < 2m               | 30% > 140 years          | 10% > 250 years <sup>(1)</sup>                               |
| Caribou habitat – ICH          | 25% < 2m               | 40% > 140 years          | 10% > 250 years <sup>(1)</sup>                               |
| Caribou – operable             |                        |                          | 70% > 140 years <sup>(2)</sup>                               |
| Visual Class II-PR (west side) | 25% < 5m               |                          |                                                              |
| Visual Class II-PR (east side) | 15% < 5m               |                          |                                                              |
| Community watershed            | 20% < 9m               |                          |                                                              |
| Domestic watershed             | 25% < 6m               |                          |                                                              |
| Ungulate WR – ESSF             | 25% < 2m               | 40% > 120 years          |                                                              |
| Ungulate WR – ICH              | 25% < 2m               | 40% > 120 years          |                                                              |
| Ungulate WR – IDF (NDT 4)      | 25% < 2m               | 25% > 120 years          |                                                              |
| Timber emphasis                | 25% < 2m               |                          |                                                              |
| Contributing components        | all harvestable        | all operable             | <sup>(1)</sup> all operable<br><sup>(2)</sup> all productive |

Areas with insufficient mature or old growth forest to meet the prescribed forest cover objectives may still be able to contribute to the periodic harvest. A component of the forest is put into a reserve with the expectation that these stands will eventually overcome the mature or old growth deficiency. If there is still forest area older than minimum harvest age beyond this reserve component harvesting will continue in the REA.

### **10.2.1 Forest Cover Objectives – Rationale**

Forest cover requirements for REAs listed in Table 10.2 are based on a number of sources that are discussed in the following sections.

#### **10.2.1.1 Visual Quality Objectives**

Visual quality is based on an intersection of P&T's recent landscape inventory and the KBLUP scenic area inventory. P&T's information identified visually sensitive areas using VQO attributes (PR, M, etc.). The KBLUP inventory designated visual sensitivity classes for the Nelson Region.

The visual REAs defined for the analysis include:

- Visual PR (east side) – visually sensitive areas visible from the main highway on the east side of Arrow Lake from Galena Bay to Fauquier;
- Visual PR (west side) – visually sensitive areas on the west side of Arrow Lake contained within Landscape Unit 26; and
- Visual Class II & III -Design - KBLUP Class II & III visually sensitive.

Within the Visual PR areas on the east side of Arrow Lake P&T's VQO designation will dictate the forest cover constraints imposed in the analysis. Visual PR areas on the west side of Arrow Lake (Vipond Landscape Unit) will be permitted to exceed standard VQO disturbance limits by 10% over the next 20 years to allow for visual rehabilitation of existing cutblocks. Visual Class II & III Design REAs will use visual cutblock design operationally and do not require any additional forest cover constraints to address visual quality.

#### *10.2.1.2 Adjacent Cutblock Green-up*

Silvicultural green-up is required on all areas of the TFL prior to harvesting adjacent areas. This is not modeled explicitly in the timber supply analysis. Instead, the disturbance thresholds outlined in Table 10.2 for each REA are assumed to account for this adjacency requirement

#### *10.2.1.3 Management for Identified Wildlife*

Recently, inventories and research have been carried out on TFL 23 for Mountain Caribou. The areas identified as important caribou habitat and associated forest conditions that are necessary to ensure the maintenance of this habitat will be included in the analysis.

Caribou and ungulate winter range REAs will allow all operable, including non-harvestable forest areas to affect mature and old growth forest cover requirements. However, only the net harvestable landbase will be used in the determination of maximum disturbance levels. The caribou operable forest cover constraint incorporates productive forest areas which lie outside the 1994 operability line. In these areas, at least 70% of the productive forest must be maintained in age classes 8 and 9. Therefore, all productive forest components within this zone affect the forest cover constraint.

#### *10.2.1.4 Landscape Level Biodiversity*

The Arrow District Manager has recommended Landscape Units for the portion of TFL 23 within the Arrow District. Landscape Unit recommendations for the Columbia District are still in draft form. These units, along with the appropriate BEC/NDT designation, will be the base areas over which landscape level biodiversity will be monitored in the Current Management Option.

MoF/MoELP correspondence *Achieving Acceptable Biodiversity Timber Impacts* (97.08.25) and *Incorporating Biodiversity and Landscape Units in the Timber Supply Review* (97.12.01) were used to develop landscape level mature+old and old growth seral stage requirements for TFL 23. Tables 10.3 and 10.4 summarize the forest cover objectives that will be modeled for each LU-BEC/NDT in order to achieve the desired mature+old and old growth seral stage objectives in the forest. Minimum percentages are dependant upon the biodiversity emphasis assigned to a specific landscape unit.



Early seral requirements are not required for the NDTs in TFL 23. Mature+old and Old growth percentages listed in Table 10.3 are based on the Biodiversity Guidebook values for low intermediate and high biodiversity emphasis. Within the Arrow District (LUs10-31), these assignments are based on the KBLUP. Within the Columbia District (LUs 1-4), biodiversity emphasis assignments are currently in draft form only. Therefore, only weighted average seral stage percentages are employed in the Current Management Option for these LUs. Handbook values are weighted 45% low, 45% intermediate and 10% high to arrive at the weighted average figures in Table 10.3.

**Table 10.3 - BEC/NDT Seral Stage Requirements (minimum percent)**

| Emphasis            | NDT | Mature + Old |     |     | Old  |     |     |
|---------------------|-----|--------------|-----|-----|------|-----|-----|
|                     |     | ESSF         | ICH | IDF | ESSF | ICH | IDF |
| Low                 | 1,5 | 19           | 17  |     | 6    | 4   |     |
|                     | 2   | 14           | 15  |     | 3    | 3   |     |
|                     | 3   | 14           | 14  |     | 5    | 5   |     |
|                     | 4   |              | 17  | 17  |      | 4   | 4   |
| Intermediate        | 1,5 | 36           | 34  |     | 19   | 13  |     |
|                     | 2   | 28           | 31  |     | 9    | 9   |     |
|                     | 3   | 23           | 23  |     | 14   | 14  |     |
|                     | 4   |              | 34  | 34  |      | 13  | 13  |
| High                | 1,5 | 54           | 51  |     | 28   | 19  |     |
|                     | 2   | 42           | 46  |     | 13   | 13  |     |
|                     | 3   | 34           | 34  |     | 21   | 21  |     |
|                     | 4   |              | 51  | 51  |      | 19  | 19  |
| Weighted<br>Average | 1,5 | 30           | 28  |     | 14   | 10  |     |
|                     | 2   | 23           | 25  |     | 7    | 7   |     |
|                     | 3   | 20           | 20  |     | 11   | 11  |     |
|                     | 4   |              | 28  | 28  |      | 10  | 10  |

**Table 10.4 - BEC/NDT Seral Stage Requirements (minimum age)**

| NDT | Mature + Old |     |     | Old  |     |     |
|-----|--------------|-----|-----|------|-----|-----|
|     | ESSF         | ICH | IDF | ESSF | ICH | IDF |
| 1,5 | 120          | 100 |     | 250  | 250 |     |
| 2   | 120          | 100 |     | 250  | 250 |     |
| 3   | 120          | 100 |     | 140  | 140 |     |
| 4   |              | 100 | 100 |      | 250 | 250 |

#### *10.2.1.5 Reductions to Reflect Volume Retention in Cutblocks*

Volume is retained in cutblocks by means of a number of landbase removals outlined in Section 6 of this report. In addition, P&T engineers and biologists have identified specific areas within the net landbase that should be reserved as wildlife trees patches. P&T currently has a project that will identify old growth management areas (OGMAs).

Productive forest landbase reductions occur all across the landbase as shown in the summary tables for LU-BEC/NDTs. Each productive forest area excluded from timber harvesting measuring at least 0.25 ha in size was buffered with a 250-metre radius. A review of unbuffered areas within the timber harvesting landbase was made and additional reserves were identified to ensure that all productive forest reserves were not more than 250 metres apart. The Biodiversity Guidebook indicates that this is a maximum acceptable distance between productive forest or wildlife tree reserves. Reserve areas for each REA are summarized in Table 7.3.

Riparian reserve zones (RRZs) and riparian management zones (RMZs) have been addressed by imposing landbase netdowns. Section 6.7, Table 6.7 outlines the details of these reductions. P&T will manage these areas by reserving a component of the RMZ adjacent to the existing RRZ. The remainder of the RMZ will be included in harvesting as per the prescription for the overall cutblock.

#### *10.2.1.6 Land Use Plans*

The Kootenay Boundary Land Use Plan has been developed for the Nelson Forest Region which includes TFL 23. New parks have been established as part of the Plan. Recommended LUs and recommended biodiversity emphases are under continuing review. Assumptions associated with these aspects of the Plan will be included in the timber supply analysis.

### **10.3 Timber Harvesting**

#### ***10.3.1 Minimum Merchantability Standards***

Minimum merchantability is assessed for each yield table based on volume, diameter and/or age at which culmination of mean annual increment is reached (MAI). From this assessment the minimum age required for harvesting has been determined for each analysis unit yield table. Culmination age for VDYP natural stand yield tables and TIPSy managed stand yield tables was assigned to the age when volume less DWB is maximized to one decimal place (*ie.* further increases in MAI would be less than 0.05 m<sup>3</sup>/ha/year). This is a reasonable approach to avoid excessively high culmination ages resulting from small increases in MAI. Culmination of MAI was used to determine minimum harvest age for managed stand yield tables. Summaries of the minimum harvest age attributes for the natural and managed stand yield tables are presented in Tables 10.4 – 10.6.

Table 10.5(a) - Minimum Harvest Age Attributes for VDYP NSYTs - Thrifty

| VDYP Natural Stand AU | Net Area (ha) | Minimum Harvest Age Attributes |      |        |        |     |
|-----------------------|---------------|--------------------------------|------|--------|--------|-----|
|                       |               | Age                            | Dbh  | Height | Volume | MAI |
| FDCW-G                | 3155          | 100                            | 34.2 | 33.7   | 415.1  | 4.2 |
| FDCW-M                | 10719         | 120                            | 33.9 | 29.4   | 333.3  | 2.8 |
| FDCW-P                | 1583          | 140                            | 31.2 | 23.3   | 204.8  | 1.5 |
| FDHW-G                | 2473          | 90                             | 31.3 | 31     | 348.5  | 3.9 |
| FDHW-M                | 7041          | 110                            | 32.3 | 27.5   | 296.9  | 2.7 |
| FDHW-P                | 568           | 120                            | 29   | 21.9   | 201.8  | 1.7 |
| FDLW-G                | 2726          | 90                             | 32.3 | 31.4   | 303.4  | 3.4 |
| FDLW-M                | 11336         | 110                            | 32.3 | 27.6   | 241.2  | 2.2 |
| FDLW-P                | 561           | 130                            | 31.1 | 23     | 177.4  | 1.4 |
| CWHW-G                | 320           | 80                             | 31.9 | 30     | 300.5  | 3.8 |
| CWHW-M                | 3212          | 80                             | 31.2 | 23.7   | 248.9  | 3.1 |
| CWHW-P                | 1222          | 90                             | 27.6 | 19.3   | 185    | 2.1 |
| HWBL-G                | 369           | 80                             | 29   | 29.3   | 310.4  | 3.9 |
| HWBL-M                | 1172          | 90                             | 30.1 | 24     | 315.2  | 3.5 |
| HWBL-P                | 190           | 110                            | 29   | 21.2   | 237.9  | 2.2 |
| HWFD-G                | 1966          | 80                             | 30.5 | 27.5   | 312    | 3.9 |
| HWFD-M                | 4576          | 90                             | 30.6 | 24.8   | 286.1  | 3.2 |
| HWFD-P                | 2554          | 90                             | 26.8 | 19.7   | 194    | 2.2 |
| HWCW-G                | 1833          | 80                             | 29.6 | 27.7   | 306.7  | 3.8 |
| HWCW-M                | 7015          | 90                             | 31.8 | 25.2   | 274.6  | 3.1 |
| HWCW-P                | 2749          | 130                            | 32   | 23.2   | 254.6  | 2.0 |
| BLSE-G                | 2090          | 80                             | 29.4 | 24.7   | 237.6  | 3.0 |
| BLSE-M                | 5755          | 90                             | 28.1 | 20.3   | 168.4  | 1.9 |
| BLSE-P                | 1268          | 150                            | 28.1 | 20.2   | 172.5  | 1.2 |
| SECW-G                | 206           | 80                             | 30.4 | 30.3   | 386    | 4.8 |
| SECW-M                | 931           | 100                            | 30.6 | 25.2   | 290.2  | 2.9 |
| SECW-P                | 226           | 150                            | 32.6 | 25.7   | 293.8  | 2.0 |
| SEBL-G                | 474           | 80                             | 29.3 | 27.6   | 267.6  | 3.3 |
| SEBL-M                | 1815          | 100                            | 30   | 24.5   | 217.1  | 2.2 |
| SEBL-P                | 298           | 150                            | 30.9 | 24.9   | 233.2  | 1.6 |
| PLLW-G                | 1138          | 70                             | 21.6 | 24     | 263    | 3.8 |
| PLLW-M                | 3728          | 80                             | 21.4 | 22.2   | 237.5  | 3.0 |
| PLLW-P                | 1955          | 90                             | 20.7 | 19.8   | 203.1  | 2.3 |
| PLFD-G                | 4050          | 70                             | 22.7 | 25.1   | 249.5  | 3.6 |
| PLFD-M                | 5774          | 70                             | 20.7 | 20.9   | 179.6  | 2.6 |
| PLFD-P                | 3141          | 110                            | 23.3 | 21.7   | 214.8  | 2.0 |
| LWFD-G                | 3672          | 100                            | 31.4 | 32.9   | 300.7  | 3.0 |
| LWFD-M                | 6306          | 120                            | 31.6 | 30.5   | 270.8  | 2.3 |
| LWFD-P                | 2411          | 120                            | 28.8 | 25.5   | 190.2  | 1.6 |

Table 10.5(b) - Minimum Harvest Age Attributes for VDYP NSYTs - Mature

| VDYP Natural Stand AU | Net Area (ha) | Minimum Harvest Age Attributes |      |        |        |     |
|-----------------------|---------------|--------------------------------|------|--------|--------|-----|
|                       |               | Age                            | Dbh  | Height | Volume | MAI |
| FDCWXG                | 46            | 100                            | 32.6 | 32.1   | 362.5  | 3.6 |
| FDCWXM                | 1776          | 130                            | 37.6 | 30.1   | 319.2  | 2.5 |
| FDCWXP                | 3457          | 120                            | 29.2 | 20.1   | 127.5  | 1.1 |
| FDHWXG                | 127           | 100                            | 32.7 | 31.4   | 359.4  | 3.6 |
| FDHWXM                | 886           | 110                            | 30.8 | 26.4   | 286.9  | 2.6 |
| FDHWXP                | 1509          | 120                            | 28.4 | 20.6   | 174.6  | 1.5 |
| FDLWXG                | 42            | 100                            | 33.4 | 31     | 305.8  | 3.1 |
| FDLWXM                | 2062          | 130                            | 36.1 | 30.4   | 292.6  | 2.3 |
| FDLWXP                | 1692          | 130                            | 30   | 21.8   | 152.6  | 1.2 |
| CWHWXG                | 7             | 80                             | 31.8 | 27.6   | 302.8  | 3.8 |
| CWHWXM                | 1671          | 80                             | 31.2 | 23.9   | 277.8  | 3.5 |
| CWHWXP                | 6823          | 90                             | 28.8 | 20.5   | 213.3  | 2.4 |
| HWBLXG                | 9             | 70                             | 26.9 | 24.5   | 276.9  | 4.0 |
| HWBLXM                | 2283          | 90                             | 27.9 | 22     | 292.9  | 3.3 |
| HWBLXP                | 2141          | 130                            | 30.7 | 21.3   | 254.6  | 2.0 |
| HWFDXG                | 16            | 80                             | 31.8 | 26     | 300.1  | 3.8 |
| HWFDXM                | 288           | 80                             | 28.5 | 23     | 252.5  | 3.2 |
| HWFDXP                | 3005          | 100                            | 28.9 | 20.5   | 219.3  | 2.2 |
| HWCWXG                | 579           | 80                             | 30.7 | 26.1   | 305.9  | 3.8 |
| HWCWXM                | 685           | 90                             | 29.7 | 24.7   | 286    | 3.2 |
| HWCWXP                | 10210         | 100                            | 28   | 20.8   | 217.1  | 2.2 |
| BLSEXG                | 310           | 80                             | 28.8 | 23.7   | 238.4  | 3.0 |
| BLSEXM                | 2695          | 100                            | 28.3 | 20.6   | 177.4  | 1.8 |
| BLSEXP                | 4872          | 130                            | 28.8 | 19.2   | 151.1  | 1.2 |
| SECWXG                | 982           | 80                             | 31.1 | 28.8   | 342.3  | 4.3 |
| SECWXM                | 744           | 110                            | 30.7 | 24.5   | 296.8  | 2.7 |
| SECWXP                | 1581          | 130                            | 30.5 | 22.8   | 269.6  | 2.1 |
| SEBLXG                | 1671          | 80                             | 30.4 | 29.2   | 271.1  | 3.4 |
| SEBLXM                | 7013          | 110                            | 29.3 | 22.7   | 193.5  | 1.8 |
| SEBLXP                | 7231          | 150                            | 28.9 | 21.1   | 172.9  | 1.2 |
| PLLWXG                | 10            | 60                             | 21.2 | 24.7   | 270.9  | 4.5 |
| PLLWXM                | 8             | 80                             | 21.2 | 21.5   | 261.2  | 3.3 |
| PLLWXP                | 304           | 90                             | 20.3 | 18.3   | 176.3  | 2.0 |
| PLFDXG                | 55            | 80                             | 27.1 | 28.1   | 300.2  | 3.8 |
| PLFDXM                | 9             | 80                             | 20.6 | 20.9   | 196.5  | 2.5 |
| PLFDXP                | 189           | 80                             | 20   | 17.3   | 149.4  | 1.9 |
| LWFDXG                | 172           | 100                            | 33.1 | 35.3   | 326    | 3.3 |
| LWFDXM                | 527           | 120                            | 32.4 | 30.6   | 248.2  | 2.1 |
| LWFDXP                | 704           | 140                            | 30.3 | 26     | 203.6  | 1.5 |

**Table 10.6 - Minimum Harvest Age Attributes for TYPsy MSYTs (existing)**

| Managed Stand<br>AU | Minimum Harvest Age Attributes |      |        |        |     |
|---------------------|--------------------------------|------|--------|--------|-----|
|                     | Age                            | Dbh  | Height | Volume | MAI |
| 101                 | 80                             | 27.4 | 31.2   | 504.4  | 6.3 |
| 102                 | 100                            | 22.2 | 25.9   | 320.8  | 3.2 |
| 103                 | 120                            | 17.3 | 18.8   | 152.4  | 1.3 |
| 104                 | 100                            | 32.2 | 34.4   | 766.3  | 7.7 |
| 105                 | 100                            | 27.3 | 28.8   | 536.4  | 5.4 |
| 106                 | 110                            | 20.8 | 20.6   | 259.2  | 2.4 |
| 107                 | 80                             | 26.5 | 27.9   | 485    | 6.1 |
| 108                 | 90                             | 24.6 | 26     | 410.3  | 4.6 |
| 109                 | 120                            | 21.5 | 21.5   | 273.9  | 2.3 |
| 110                 | 80                             | 24.2 | 24.9   | 389.5  | 4.9 |
| 111                 | 100                            | 23.4 | 23.7   | 346.9  | 3.5 |
| 112                 | 130                            | 22   | 21.6   | 283    | 2.2 |
| 113                 | 70                             | 25.6 | 26.6   | 428.9  | 6.1 |
| 114                 | 100                            | 24.2 | 24.9   | 377.8  | 3.8 |
| 115                 | 150                            | 22.6 | 22.7   | 307.8  | 2.1 |
| 116                 | 80                             | 25.8 | 29.4   | 427.3  | 5.3 |
| 117                 | 70                             | 21   | 22     | 260.7  | 3.7 |
| 118                 | 90                             | 19.8 | 19.4   | 207    | 2.3 |
| 119                 | 70                             | 24.7 | 28.7   | 390.4  | 5.6 |
| 120                 | 80                             | 21.4 | 24.7   | 285.6  | 3.6 |
| 121                 | 110                            | 18.6 | 20.3   | 185.4  | 1.7 |
| 301                 | 80                             | 26.5 | 31     | 446.1  | 5.6 |
| 302                 | 100                            | 22   | 25.8   | 305.9  | 3.1 |
| 303                 | 100                            | 17.2 | 17.3   | 135.1  | 1.4 |
| 304                 | 80                             | 26.4 | 30.7   | 456.8  | 5.7 |
| 305                 | 90                             | 23.4 | 27.1   | 360.6  | 4.0 |
| 306                 | 130                            | 19.8 | 22     | 230.2  | 1.8 |
| 307                 | 80                             | 25.4 | 29.9   | 413.2  | 5.2 |
| 308                 | 90                             | 23.8 | 28.1   | 364.5  | 4.1 |
| 309                 | 90                             | 19   | 20.6   | 199.2  | 2.2 |
| 310                 | 80                             | 24.7 | 25.5   | 394    | 4.9 |
| 311                 | 100                            | 23.4 | 23.7   | 342.8  | 3.4 |
| 312                 | 140                            | 22.2 | 21.8   | 287.3  | 2.1 |
| 313                 | 60                             | 23.6 | 23.9   | 357    | 6.0 |
| 314                 | 90                             | 22.8 | 22.9   | 321.1  | 3.6 |
| 315                 | 150                            | 22.1 | 21.7   | 282.2  | 1.9 |
| 316                 | 70                             | 24.1 | 27.4   | 368.9  | 5.3 |
| 317                 | 70                             | 21   | 22.6   | 265.6  | 3.8 |
| 318                 | 90                             | 19.4 | 19.4   | 197.2  | 2.2 |
| 319                 | 80                             | 25.4 | 29.7   | 411.9  | 5.1 |
| 320                 | 100                            | 22.7 | 26.6   | 326.7  | 3.3 |
| 321                 | 110                            | 18.5 | 19.2   | 175    | 1.6 |

**Table 10.7(a) - Minimum Harvest Age Attributes for TIPSY MSYTs (future)**

| Managed Stand<br>AU | Minimum Harvest Age Attributes |      |        |        |     |
|---------------------|--------------------------------|------|--------|--------|-----|
|                     | Age                            | Dbh  | Height | Volume | MAI |
| 201                 | 80                             | 25.4 | 29.7   | 411.9  | 5.1 |
| 202                 | 90                             | 21.5 | 25     | 288.2  | 3.2 |
| 203                 | 110                            | 19.3 | 20.5   | 204.3  | 1.9 |
| 204                 | 90                             | 26.6 | 31     | 446.6  | 5.0 |
| 205                 | 90                             | 21.2 | 24.6   | 277.9  | 3.1 |
| 206                 | 100                            | 18.9 | 19.8   | 189.8  | 1.9 |
| 207                 | 80                             | 25.1 | 29.5   | 404.9  | 5.1 |
| 208                 | 100                            | 22.3 | 26.2   | 316.3  | 3.2 |
| 209                 | 90                             | 18.2 | 18.8   | 167.6  | 1.9 |
| 210                 | 80                             | 26.8 | 31.2   | 470.6  | 5.9 |
| 211                 | 90                             | 22.8 | 26.4   | 342.7  | 3.8 |
| 212                 | 110                            | 20   | 22.3   | 238.6  | 2.2 |
| 213                 | 70                             | 24.5 | 29     | 389.9  | 5.6 |
| 214                 | 90                             | 22.8 | 26.9   | 334.5  | 3.7 |
| 215                 | 90                             | 19.7 | 21.8   | 224.3  | 2.5 |
| 216                 | 80                             | 25.4 | 29.9   | 413.2  | 5.2 |
| 217                 | 90                             | 23.4 | 27.5   | 351    | 3.9 |
| 218                 | 80                             | 19.4 | 21.2   | 213.8  | 2.7 |
| 219                 | 80                             | 25.5 | 30     | 416.7  | 5.2 |
| 220                 | 80                             | 22.2 | 26.1   | 317.2  | 4.0 |
| 221                 | 90                             | 19.7 | 21.8   | 224.3  | 2.5 |
| 222                 | 70                             | 24   | 24.5   | 371.4  | 5.3 |
| 223                 | 100                            | 23.3 | 23.5   | 339.8  | 3.4 |
| 224                 | 150                            | 22.1 | 21.7   | 282.2  | 1.9 |
| 225                 | 60                             | 25.5 | 26.5   | 421.6  | 7.0 |
| 226                 | 90                             | 23.8 | 24.2   | 357.3  | 4.0 |
| 227                 | 110                            | 21.4 | 20.8   | 259.8  | 2.4 |
| 228                 | 60                             | 23.6 | 23.9   | 357    | 6.0 |
| 229                 | 90                             | 23.1 | 23.2   | 331.7  | 3.7 |
| 230                 | 130                            | 22.3 | 22     | 292.7  | 2.3 |
| 231                 | 70                             | 22.4 | 25.1   | 314.2  | 4.5 |
| 232                 | 80                             | 21.4 | 23.2   | 276.7  | 3.5 |
| 233                 | 90                             | 19.9 | 20.1   | 215.5  | 2.4 |
| 234                 | 80                             | 25.2 | 28.5   | 396.7  | 5.0 |
| 235                 | 70                             | 20.4 | 21.7   | 244.1  | 3.5 |
| 236                 | 90                             | 19.9 | 20.1   | 215.5  | 2.4 |
| 237                 | 90                             | 25.5 | 29.8   | 414.2  | 4.6 |
| 238                 | 100                            | 22.0 | 25.8   | 337.2  | 3.1 |
| 239                 | 100                            | 19.1 | 20.2   | 199.3  | 2.0 |

Table 10.7(b) - Minimum Harvest Age Attributes for TIPSY MSYTs (future)

| Managed Stand<br>AU | Minimum Harvest Age Attributes |      |        |        |     |
|---------------------|--------------------------------|------|--------|--------|-----|
|                     | Age                            | Dbh  | Height | Volume | MAI |
| 241                 | 80                             | 24.1 | 28.3   | 373.4  | 4.7 |
| 242                 | 100                            | 22.3 | 26.2   | 316.3  | 3.2 |
| 243                 | 110                            | 18.4 | 19.1   | 171.7  | 1.6 |
| 244                 | 80                             | 23.5 | 27.7   | 356.2  | 4.5 |
| 245                 | 100                            | 21.5 | 25     | 288.2  | 2.9 |
| 246                 | 110                            | 18.8 | 19.7   | 185.1  | 1.7 |
| 247                 | 90                             | 24.9 | 29.2   | 396    | 4.4 |
| 248                 | 90                             | 21.5 | 25     | 288.2  | 3.2 |
| 249                 | 100                            | 18.3 | 19     | 170.2  | 1.7 |
| 250                 | 90                             | 26.5 | 30.7   | 457.5  | 5.1 |
| 251                 | 90                             | 23.1 | 26.6   | 349.9  | 3.9 |
| 252                 | 110                            | 21   | 23.7   | 272.7  | 2.5 |
| 253                 | 80                             | 24.9 | 29.4   | 399.3  | 5.0 |
| 254                 | 90                             | 21.6 | 25.2   | 293.9  | 3.3 |
| 255                 | 90                             | 18.8 | 20.3   | 193.7  | 2.2 |
| 256                 | 80                             | 24.1 | 28.4   | 375    | 4.7 |
| 257                 | 90                             | 23.6 | 27.8   | 357.6  | 4.0 |
| 258                 | 90                             | 20   | 22.2   | 233.2  | 2.6 |
| 259                 | 90                             | 26   | 30.6   | 430.2  | 4.8 |
| 260                 | 90                             | 23.2 | 27.4   | 347.7  | 3.9 |
| 261                 | 90                             | 20.1 | 22.5   | 239.1  | 2.7 |
| 262                 | 80                             | 24.8 | 25.7   | 399.8  | 5.0 |
| 263                 | 110                            | 23.4 | 23.7   | 340.8  | 3.1 |
| 264                 | 140                            | 22   | 21.6   | 279    | 2.0 |
| 265                 | 60                             | 24.3 | 25     | 385.4  | 6.4 |
| 266                 | 100                            | 23.1 | 23.3   | 333.1  | 3.3 |
| 267                 | 120                            | 21.8 | 21.3   | 271.8  | 2.3 |
| 268                 | 60                             | 24.6 | 25.4   | 396.3  | 6.6 |
| 269                 | 110                            | 22.9 | 22.9   | 320.4  | 2.9 |
| 270                 | 150                            | 21.1 | 20.3   | 239.5  | 1.6 |
| 271                 | 70                             | 24.9 | 28.2   | 389.6  | 5.6 |
| 272                 | 70                             | 19.8 | 20.7   | 223.1  | 3.2 |
| 273                 | 90                             | 18.9 | 18.7   | 178.7  | 2.0 |
| 274                 | 80                             | 23.8 | 27     | 358.5  | 4.5 |
| 275                 | 70                             | 19.4 | 20     | 207.4  | 3.0 |
| 276                 | 90                             | 18.8 | 18.5   | 175.6  | 2.0 |
| 277                 | 80                             | 25.8 | 30.2   | 425.6  | 5.3 |
| 278                 | 90                             | 21.1 | 24.4   | 274.5  | 3.1 |
| 279                 | 110                            | 18.8 | 19.7   | 185.1  | 1.7 |

Table 10.7(c) - Minimum Harvest Age Attributes for TIPSYS MSYTs (future)

| Managed Stand<br>AU | Minimum Harvest Age Attributes |      |        |        |     |
|---------------------|--------------------------------|------|--------|--------|-----|
|                     | Age                            | Dbh  | Height | Volume | MAI |
| 341                 | 80                             | 23.9 | 28     | 366.3  | 4.6 |
| 342                 | 90                             | 22.6 | 26.5   | 325.1  | 3.6 |
| 343                 | 90                             | 20.1 | 21.8   | 232.6  | 2.6 |
| 344                 | 90                             | 25.1 | 29.4   | 403.4  | 4.5 |
| 345                 | 90                             | 22.1 | 25.8   | 308.5  | 3.4 |
| 346                 | 90                             | 20.2 | 22     | 238.5  | 2.7 |
| 347                 | 80                             | 23.3 | 27.4   | 349.8  | 4.4 |
| 348                 | 90                             | 22.7 | 26.6   | 328.5  | 3.7 |
| 349                 | 90                             | 20.3 | 22.2   | 241.5  | 2.7 |
| 350                 | 90                             | 26.5 | 30.7   | 457.5  | 5.1 |
| 351                 | 90                             | 23.1 | 26.6   | 349.9  | 3.9 |
| 352                 | 90                             | 19.2 | 21     | 211.5  | 2.4 |
| 353                 | 70                             | 24.7 | 29.2   | 396.4  | 5.7 |
| 354                 | 80                             | 24.1 | 28.4   | 375    | 4.7 |
| 355                 | 80                             | 22.5 | 25.8   | 320.1  | 4.0 |
| 356                 | 80                             | 26.5 | 31.2   | 447.1  | 5.6 |
| 357                 | 80                             | 25.2 | 29.7   | 409.7  | 5.1 |
| 358                 | 80                             | 23.2 | 26.7   | 341.8  | 4.3 |
| 359                 | 80                             | 26.5 | 31.2   | 447.1  | 5.6 |
| 360                 | 80                             | 25.1 | 29.6   | 406.3  | 5.1 |
| 361                 | 80                             | 23.3 | 26.8   | 344.9  | 4.3 |
| 362                 | 70                             | 23.8 | 24.3   | 365.6  | 5.2 |
| 363                 | 90                             | 24.1 | 24.6   | 369.3  | 4.1 |
| 364                 | 90                             | 22.2 | 21.9   | 293.2  | 3.3 |
| 365                 | 70                             | 24.9 | 25.7   | 402.3  | 5.7 |
| 366                 | 70                             | 23.7 | 24.1   | 360.6  | 5.2 |
| 367                 | 70                             | 23.3 | 23.5   | 343    | 4.9 |
| 368                 | 70                             | 24.9 | 25.8   | 405.1  | 5.8 |
| 369                 | 70                             | 23.6 | 23.9   | 354.7  | 5.1 |
| 370                 | 80                             | 24.5 | 25.1   | 383    | 4.8 |
| 371                 | 80                             | 25.2 | 28.5   | 396.7  | 5.0 |
| 372                 | 80                             | 23.6 | 26.2   | 348.4  | 4.4 |
| 373                 | 70                             | 20.9 | 21.8   | 255.7  | 3.7 |
| 374                 | 80                             | 24   | 27.2   | 364.6  | 4.6 |
| 375                 | 70                             | 22   | 24.1   | 298.6  | 4.3 |
| 376                 | 80                             | 20   | 20.4   | 221.9  | 2.8 |
| 377                 | 80                             | 25.8 | 30.2   | 425.6  | 5.3 |
| 378                 | 90                             | 21.1 | 24.4   | 274.5  | 3.1 |
| 379                 | 110                            | 18.8 | 19.7   | 185.1  | 1.7 |

It should be recognized that the application of forest cover objectives in some LU-BEC/NDTs and REAs might delay stand entry well beyond the minimum ages provided in Tables 10.4 and 10.5. This delay will result in long-term harvest levels below the theoretical Long Run Sustained Yield (LRSY) which is based on harvesting all stands at culmination age.

### 10.3.2 Initial Harvest Rate

The initial harvest rate for the Current Management and other options will be the current AAC for TFL 23 plus non-recoverable losses. The harvest rate is broken down as follows:

- P&T – 599,300m<sup>3</sup>/year
- SBFEP – 80,700m<sup>3</sup>/year
- Total harvest – 680,000m<sup>3</sup>/year
- Non-recoverable losses – 26,000m<sup>3</sup>/year



Therefore, the total annual volume requirement for TFL 23 is 706,000m<sup>3</sup>/year. This will form the initial harvest rate for the Current Management Option. At year 100 of the simulation the NRL component will be reduced to 23,000m<sup>3</sup>/year.

In the TFL 23 MP#9, no partitioned cut is being proposed. Over the past 5 years, harvesting within aerial operability zones and in problem forest types has been documented in the annual reports submitted by the licensee.

#### ***10.3.3 Harvest Rules***

Harvest rules are included in the simulation model to rank stands for harvest. The general rule is oldest first. With this rule in place older stands are queued for harvest ahead of younger stands. Harvest rules interact with forest cover requirements to determine the actual order of harvesting within the model. If a higher ranked stand is constrained within a forest cover group then the model will select the next highest-ranking stand that is eligible for harvest. Thus, while the oldest first rule is employed, the imposition of forest cover constraints results in a distribution of harvest ages between absolute oldest and minimum harvest age.

#### ***10.3.4 Harvest Profile***

At present the harvest profile within TFL 23 is based mainly on the existing mature species profile, modified by forest cover and seral stage objectives which, to varying degrees, control harvesting within specific landscape units. No specific harvest species profile parameters will be employed in the analysis. However, the distribution of harvest by leading species group will be presented in the analysis report.

#### ***10.3.5 Harvest Flow Objectives***

In all phases of the analysis the harvest flow objectives will be to:

- Sustain the current harvest level for as long as possible;
- Decrease the periodic harvest rate in acceptable steps during the periods when declines are required to meet all objectives associated with the various resources on TFL 23;
- Do not permit the mid-term harvest to fall below a level reflecting basic maintenance of the productive capacity of the TFL.
- Achieve an essentially even-flow long-term sustainable supply with consideration for forest cover requirements; and
- Take advantage of opportunities to increase the harvest rate by implementing management programs while maintaining the requirements of non-timber resources.

A number of alternative harvest flows will be evaluated for the Current Management Option in order to gain a complete understanding of the factors that influence timber supply on TFL 23.

## 11.0 SENSITIVITY ANALYSIS

This section provides detailed descriptions of the sensitivity analyses that will be performed on the Current Management Option. The sensitivities attempt to reflect alternative management or potential changes to mandated forest practices.

### 11.1 Landbase Revisions

Three landbase revisions will be made to the netdowns described in Section 6.1. All forest areas removed from the timber harvesting landbase in the following sensitivities will still contribute to forest cover objectives and landscape level biodiversity requirements where appropriate.

#### 11.1.1 Exclude Shelter Bay Block

This scenario will evaluate the assumptions outlined in the Current Management Option without the landbase associated with the Shelter Bay Block. Shelter Bay is part of the Columbia Forest District. In this sensitivity analysis 24,476 ha of net operable area will be excluded from the landbase. This area represents 4,700,000m<sup>3</sup> of coniferous timber. The revised current net operable landbase is 200,226 ha and the long-term net operable landbase is 198,666 ha.

#### 11.1.2 Addition of Marginally Economic Stands

Marginally economic stands are typically hemlock and balsam pulpwood stands that are only available under optimal market conditions. In this sensitivity analysis 3,660 ha of marginally economic mature stands will be added to the timber harvesting landbase. This area represents 1,300,000m<sup>3</sup> of coniferous timber. The revised current net operable landbase is 228,362 ha and the long-term net operable landbase is 226,802 ha.

#### 11.1.3 Remove Aerial Areas

In this scenario 19,504 ha of forest requiring aerial harvesting methods will be excluded from the timber harvesting landbase. This assumes that these areas will not be available for timber supply at any time. This area represents 3,500,000m<sup>3</sup> of coniferous timber. The revised current net operable landbase is 205,198 ha and the long-term net operable landbase is 203,638 ha.

#### 11.1.4 Adjust Timber Harvesting Landbase

In this scenario, the timber harvesting landbase will be adjusted by +/- 10%. The non-harvestable landbase will be adjusted accordingly, to maintain the total forested area.

#### 11.1.5 Remove Stands with SI50 < 9.0 metre

MoF has expressed concern regarding the operational feasibility of accessing these stands. Therefore, an analysis will be performed in which these stands will be removed from the timber harvesting landbase.

## **11.2 Growth and Yield**

A number of alternative growth and yield inputs will be used in individual sensitivity analyses to evaluate their impact on timber supply.

### ***11.2.1 OGSi Adjustment to Managed Stand SI50***

P&T recently completed an OGSi to determine site index potential under managed stand conditions for sites currently occupied by old growth. The results were comparable to recent MoF draft OGSi adjustments. MoF OGSi adjustments will be employed in a sensitivity analysis. Section 8.1 provides the MoF site index adjustment equations.

In this sensitivity analysis any adjustment in stand volume associated with the OGSi equations will be excluded. The managed stand yields in this scenario will be based on the unadjusted site index associated with old growth natural stands, which may be up to one third less than the adjusted value.

### ***11.2.2 Adjust Natural and Managed Stand Yields***

To test the overall sensitivity of the results to variation in yield expectations, separate analyses will be performed in which the NSYT and MSYT values are varied by +/- 10%.

### ***11.2.3 Altered Minimum Harvest Age***

Minimum harvest ages for managed stands will be altered by 10 years.

### ***11.2.4 Regeneration Delay***

Regeneration delay will be increased to 5 years and reduced to 0 years in this series of analyses.

## **11.3 Forest Cover Objectives**

### ***11.3.1 Resource Emphasis Area Maximum Disturbance***

In a series of sensitivity analyses, the following forest cover objectives will be altered systematically, in order to test the effect upon timber supply:

- alter maximum disturbance constraint in IRM, caribou and ungulate winter range zones;
- alter caribou thermal and old-growth cover constraints;
- alter ungulate winter range thermal constraint;
- alter VQO disturbance constraints; and
- employ full biodiversity constraints in low emphasis landscape units.

## **APPENDIX V**

### **V.2 Timber Supply Analysis Report**

**POPE & TALBOT LTD.  
ARROW LAKES TREE FARM LICENCE 23  
MANAGEMENT PLAN #9**

**TIMBER SUPPLY ANALYSIS REPORT  
(AMENDED VERSION)**

Prepared by:

**Pope & Talbot Ltd.  
&  
Timberline Forest Inventory Consultants Ltd.**

September, 1998

Reference: 9740014



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## Executive Summary

A timber supply analysis has been completed as a component of Management Plan #9 for Pope and Talbot (P&T) Tree Farm License (TFL) 23. A timber supply model was employed to forecast long-term timber availability under a variety of scenarios. The information generated through this analysis will ultimately be used by the provincial Chief Forester in determining the Allowable Annual Cut (AAC) for TFL 23 for the next five years (1999-2003). The current AAC for the TFL is set at 680,000 cubic metres.

While the AAC represents the harvest level in the short term, there is an associated harvest flow which represents the expected timber availability over the next 250 years. Four concurrent timber flow objectives were established for TFL 23: 1) maintain the current AAC for as long as possible, 2) limit the rate of decadal decline to a maximum of 10%, 3) maintain a mid-term harvest level tied to the basic productivity of the landbase, and 4) achieve a long-term steady harvest level that reflects continuation of the current level of management on the TFL.

The inventory information used to define the resource characteristics for TFL 23 incorporates a number of recent updates to account for past disturbances, new operability definitions, environmentally sensitive areas, and updated definitions of non-timber resources such as recreation, wildlife and visual quality values.

While approximately 371,800 hectares were determined to be productive forest, only approximately 224,700 hectares (60%) of this area was considered as part of the net timber harvesting landbase, the balance having been classified as inoperable, or reserved for other purposes.

The productive forest was subdivided into 13 landscape units for the purpose of establishing mature and old growth biodiversity seral stage objectives. In addition, a number of overlapping management zones were established. Specific forest cover objectives were set for each zone, based on its management objectives. Both seral stage and management zone forest cover objectives were incorporated into the timber supply analysis procedure.

A base case scenario was analyzed. Using the same base case inputs, three alternative timber flow patterns were explored. A base case timber flow pattern was selected from these alternatives, taking into consideration the timber flow policy stated above. This timber flow scenario results in the maintenance of the existing AAC of 680,000 cubic metres for a period of 40 years.

Based on this outcome, a series of sensitivity analyses was completed to test the impact of changing specific input assumptions. Over the next 80 years, the timber supply is constrained by two major factors. Disturbance levels (*i.e.* the maximum amount of area below green-up height) are at critical levels over the next 20 years. Therefore, if the maximum levels permitted are lowered there will be a significant negative impact on timber supply. Specifically, the time horizon over which the current AAC can be maintained will be shortened.

In addition, the supply of timber above minimum harvest age reaches a critical level at decade 8. Therefore, unforeseen delays in the availability of timber from second growth stands will have a negative impact on timber supply, as the supply from existing mature volumes must be stretched over a longer time horizon.

Equally important however, it should be noted that timber supply in the short and medium terms can also be significantly enhanced, if in fact disturbance requirements can be relaxed, and/or the availability of second growth timber can be accelerated.

Short and mid-term levels are also sensitive to wildlife thermal forest cover objectives, specifically caribou and ungulate winter range requirements. Refined caribou habitat mapping has already indicated a lessening of this impact. Further assessment of these and other management zone definitions will further improve the reliability of future timber supply forecasts.

With the exception of several sensitivity scenarios which entailed the removal of a significant component of the harvestable landbase, the first decade AAC level of 680,000 cubic metres can be maintained within the sensitivity ranges tested.

In the base case, the long-term harvest level was determined to be 634,000 cubic metres/year (net of non-recoverable losses (NRLs)). However, this was based on managed stand yield curves developed using existing site index estimates from old growth stands. These site indices are known to underestimate the true productivity of the managed stands which are regenerated following harvest. After adjusting for this negative bias, the long-term harvest level was forecasted to be 709,000 cubic metres/year, an increase of approximately 12% over the base case. Forecasted long-term levels are approximately 8% below the theoretical long run sustainable yield (LRSY). The latter is calculated based on harvesting all stands at culmination of mean annual increment (MAI). Given the imposition of conflicting forest cover and harvest scheduling objectives, the realized long-term level will always be less than the calculated LRSY.

A second option has also been analyzed. This option employs all of the base case inputs, with the exception of the definition of caribou management zones. In the base case, caribou management zones were those defined in the Kootenay-Boundary Land Use Plan (KBLUP) Implementation Strategy. However, Pope and Talbot has been redefining caribou habitat mapping and definition of habitat range using five years of telemetry data and field inventory studies. These refined zones were employed in Option 2. Analysis of this second option indicates that the Pope and Talbot caribou habitat definition is less constraining in the mid-term, providing an opportunity either to extend the current AAC for an additional decade, or reduce the mid-term stepdown in harvest. Alternative harvest flows were analyzed to determine the immediate impact of managing caribou to the KBLUP line work, vs Pope and Talbot's refined line work. This impact was determined to be 19,000 cubic metres/year, which equates to 27 direct jobs and 47 indirect jobs.

In addition to these long-term analyses, a spatial feasibility assessment has also been completed. As laid out in the MoF guidelines for the preparation of the 20 year plan, the spatial plan sets out a hypothetical sequence of harvesting over a period of at least 20 years. The 20 year plan utilizes a spatial harvest block layout strategy, developed with little or no field information, to test achievement of a harvest level that conforms to current standards and practices as defined for the

base case in the Timber Supply Analysis Information Package. The TFL 23 20 year spatial feasibility analysis was prepared with these objectives in mind. It is not designed to be an operational plan, but a test of timber availability given the current structural characteristics and spatial distribution of components of the resource, and the structural and spatial management objectives associated with KBLUP and the Forest Practices Code. The outcome of the analysis for TFL 23 demonstrated that the base case AAC of 680,000 cubic metres could be achieved given the spatial objectives imposed in the analysis. The results of this spatial analysis are being reported under separate cover.

Based on the outcome of these analyses, it is proposed that the AAC for TFL 23 be set at 680,000 cubic metres for the period January 1, 1999 to December 31, 2003. This harvest is maintainable for a period of 40 years. It is then reduced by 10% in the fifth decade, and then by 6.5% in the sixth decade to a minimum mid-term level of 572,000 cubic metres. Based on application of MoF-approved site index adjustments, the long-term level rises to 709,000 cubic metres by decade 10.

The proposed AAC is supported by five critical factors: 1) The base case analysis demonstrates that this level is sustainable for four decades, 2) Mid-term reductions are reasonable given the productivity of the landbase, 3) Long-term productivity is maintained within 8% of the productivity of the landbase, 4) sensitivity analyses demonstrate that the first decade harvest is attainable, even under significant downward pressures, and 5) a 20-year spatial analysis has demonstrated that the AAC is spatially attainable over the 20 year analysis period.

## 1. Introduction

A timber supply analysis has been completed as a component of Management Plan #9 (MP #9) for Pope & Talbot's (P&T) Tree Farm License (TFL) 23. The analytical methodology employs a forest level simulation model, which is used to forecast the long-term development of the forest given:

- a description of the initial forest conditions,
- expected patterns of stand growth,
- a specified set of rules for harvesting and regenerating the forest,
- a specified set of forest structural characteristics, and
- consideration of non-timber values.

The process enables forest managers to evaluate timber availability under a range of alternative scenarios. This information is ultimately used by the provincial Chief Forester in determining the allowable annual cut (AAC) for the TFL.

Because of the changing nature of resource management objectives, as well as the dynamic nature of forest inventories, the timber supply predictions generated by these analyses are not viewed as static. For this reason, TFL licensees are required to re-evaluate timber supply for each successive management plan, incorporating new sources of information and any changes to management objectives. This adaptive management process ensures that harvest strategies remain sustainable in the long term, even in the face of changing circumstances.

Two options have been identified for analysis. Specifically these are:

- Base case incorporating the Kootenay-Boundary Land Use Plan (KBLUP) caribou habitat definition, and
- Base case inputs with the substitution of the Pope and Talbot caribou habitat definition.

These options have been reviewed and evaluated, and an AAC has been selected and submitted for acceptance by the Chief Forester.

## 2. General Description of the Landbase

The Arrow Tree Farm License (TFL 23) is located in the south-eastern corner of the province, extending from Valhalla National Park in the east to Monashee National Park in the west. It is situated along the Arrow Lakes south of Glacier National Park.

During the period of Management and Working Plan #7, TFL 23 was divided into two new TFLs. The larger, southern portion was retained by Pope & Talbot Limited. Pope & Talbot purchased this license agreement from Westar Timber Limited.

The total area is approximately 556,897 hectares, 67% of which is capable of supporting productive forest stands. Included in this are approximately 6,800 hectares of Schedule A land. Approximately 32% of the operable forest area is mature forest (> age 140) dominated by western hemlock, balsam and Douglas fir.

Continuous harvesting and forest management activities have occurred on the TFL since the mid 1950's. Since that time, approximately 50,000 hectares of second growth forest have been established. The area harvested since 1970 has been intensively managed. The current AAC is set at 680,000 cubic metres per year. The Small Business Forest Enterprise Program (SBFEP) cut is 80,700 cubic metres attributed to Schedule B lands.

### 3. Timber Flow Objectives

Forest cover objectives and the biological capacity of the net harvestable landbase will dictate the harvest level. In this analysis, the harvest flow reflects a balance of the following objectives:

- 1) maintain the current AAC for as long as possible,
- 2) limit the rate of decadal decline to a maximum of 10%,
- 3) maintain a mid-term harvest level that represents the basic productivity of the landbase, and
- 4) achieve a long-term harvest level that reflects continuation of the current level of management on the TFL.

### 4. Forest Information

A complete description of the information used in the TFL 23 timber supply analysis is contained in the document "Timber Supply Analysis Information Package for Tree Farm License #23 Final Version", dated September, 1998. This document has been reviewed and accepted by the Ministry of Forests (MoF) Timber Supply Branch (TSB) staff. The following is a brief summary of the contents of that report.

#### 4.1 Growth and Yield

##### 4.1.1 Natural stands (age > 25)

Natural stand yield tables (NSYT) for the timber supply analysis were developed using the batch version of the Ministry of Forests (MoF) program VDYP (Variable Density Yield Prediction Version 6.4a). Separate yield curves were developed for thrifty (age 26-140) and mature (age 141+) stands, to facilitate the application of old growth site index (OGSI) adjustments for sensitivity analysis purposes.

##### 4.1.2 Managed stands (age < 26)

Managed stand yield tables (MSYT) were modeled using BATCHTIPSY (Version 2, Beta 5). These stands have been managed since establishment and include both natural and artificially regenerated sites. Separate tables were developed for existing managed stands (< age 26) and all

future managed stands established following the harvest of existing natural stands.

Figure 1 provides an example of VDYP and TIPSy curves for medium site Douglas fir types in the 41-140 (thrifty) age class. The VDYP curve is applied to existing stands, while the TIPSy curve is used to model the post-harvest managed yield. Figure 2 provides an example of yield expectations for medium site Douglas fir stands in the mature (141+) age class. In Figure 2, managed curves are presented both with and without the OGSi adjustment.

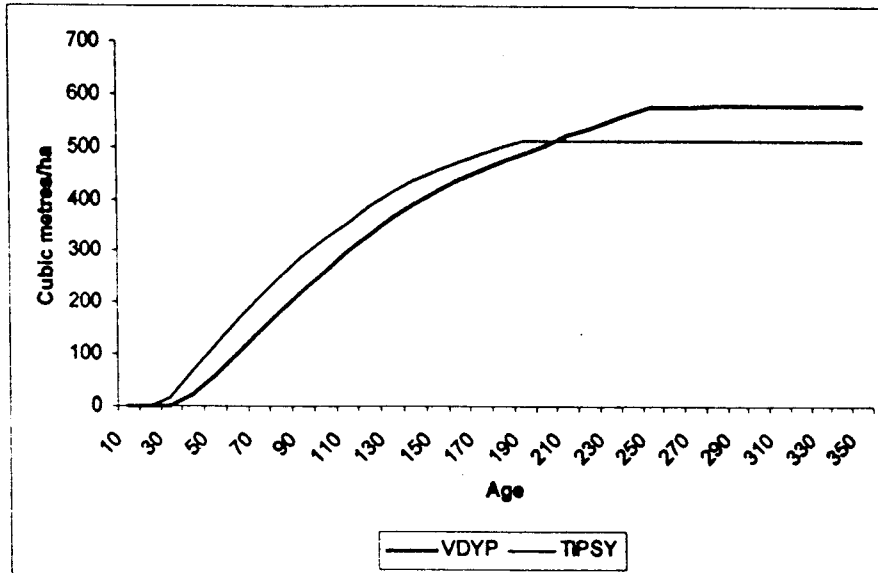


Figure 1. Douglas fir yield curves – medium site class – thrifty

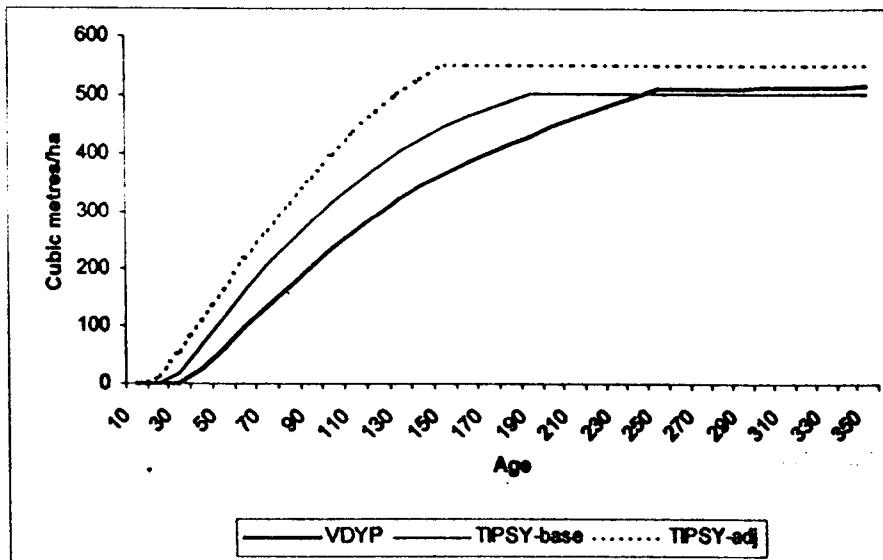


Figure 2. Douglas fir yield curves – medium site class – mature

## 4.2 Net Timber Harvesting Landbase

Land is removed from the total TFL 23 area for three principle reasons:

- it is unproductive for forest management purposes,
- it is or will become inoperable under the assumptions of the analysis, or
- it is scheduled to be withdrawn for other purposes.

The area netdown is presented in Figures 3 and 4. The total harvestable landbase of 224,702 hectares includes 6,165 hectares of NSR lands, scheduled to be restocked. It represents harvestable area in both conventional and aerial operability classes.

Note: In Figure 4, the unharvestable component includes unmerchantable types, low site removals, deciduous leading types, soils (Terrain IV and V or slopes > 75%), and ESAs.

## 4.3 Inventory Aggregation

In order to reduce the complexity of the forest description for the purposes of timber supply simulation, considerable aggregation of individual stands is necessary. However, it is critical that this aggregation not obscure either biological differences in forest stand productivity, or differences in management objectives and prescriptions. Management differences are recognized by grouping stands into landscape units and management zones on the basis of similarity of management objectives. Biological similarity is captured by grouping stands into analysis units on the basis of similar species and site productivity.

### 4.3.1 Landscape Units

For planning purposes, TFL 23 has been subdivided into 13 landscape units. In the timber supply analysis, all forest cover and biodiversity seral stage requirements must be met within the boundaries of these landscape units. Figures 5 and 6 summarize the distribution of productive area by landscape unit and BEC/NDT zone.

### 4.3.2 Management Zones

The landbase has also been segregated into resource emphasis areas (REAs) to facilitate the application of management criteria. These include:

- Caribou management,
- Partial retention visual quality objectives (VQO),
- Community watersheds (ComH2O),
- Domestic watersheds (DomH2O),
- Ungulate winter range (UWR), and
- Integrated resource management (IRM).

Figure 7 provides a summary of the area within each Resource Emphasis Area. It should be noted that, as these zones in many cases overlap, the areas are not additive.

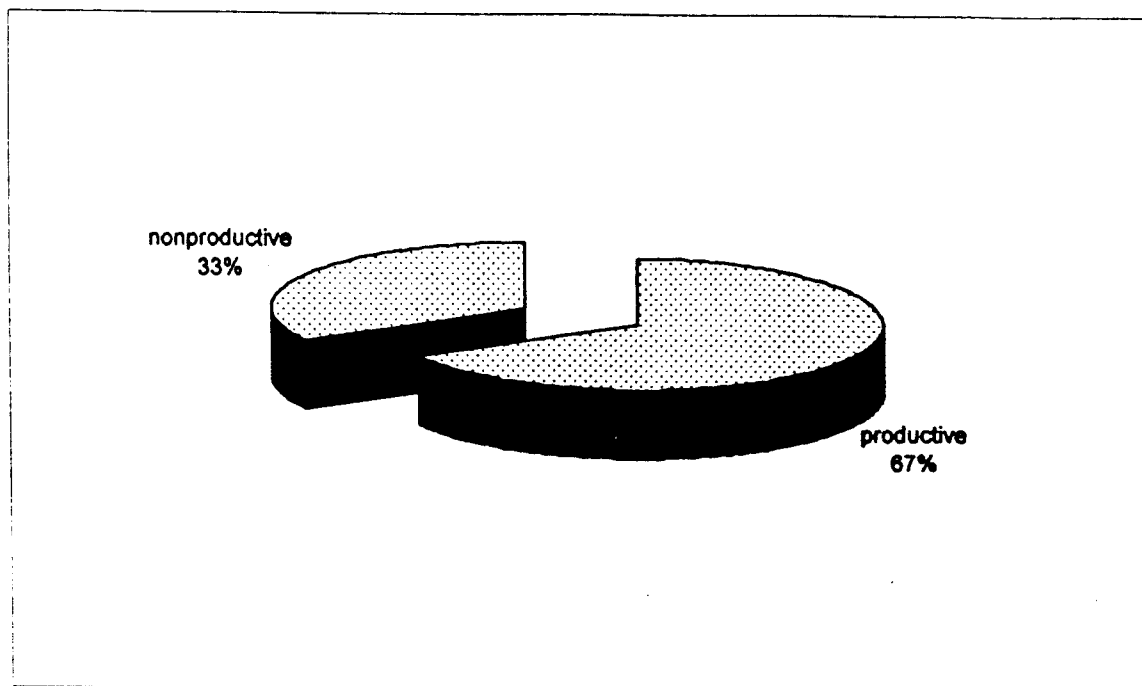


Figure 3. Distribution of total area (556,897 ha)

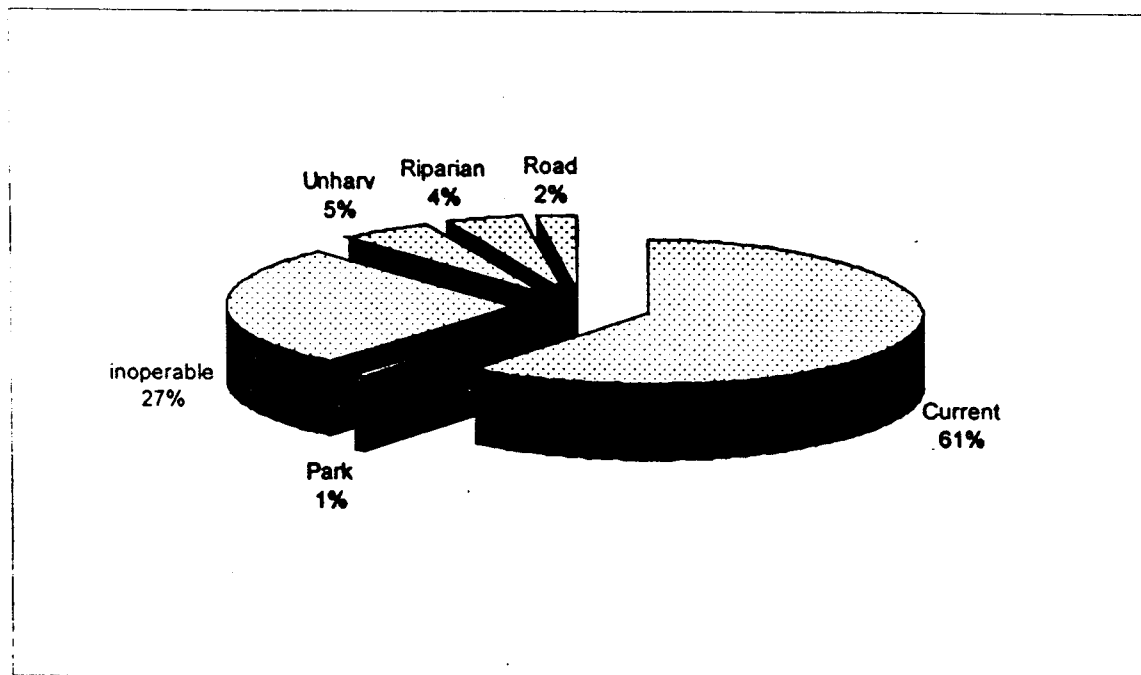


Figure 4. Distribution of productive area (371,834 ha)



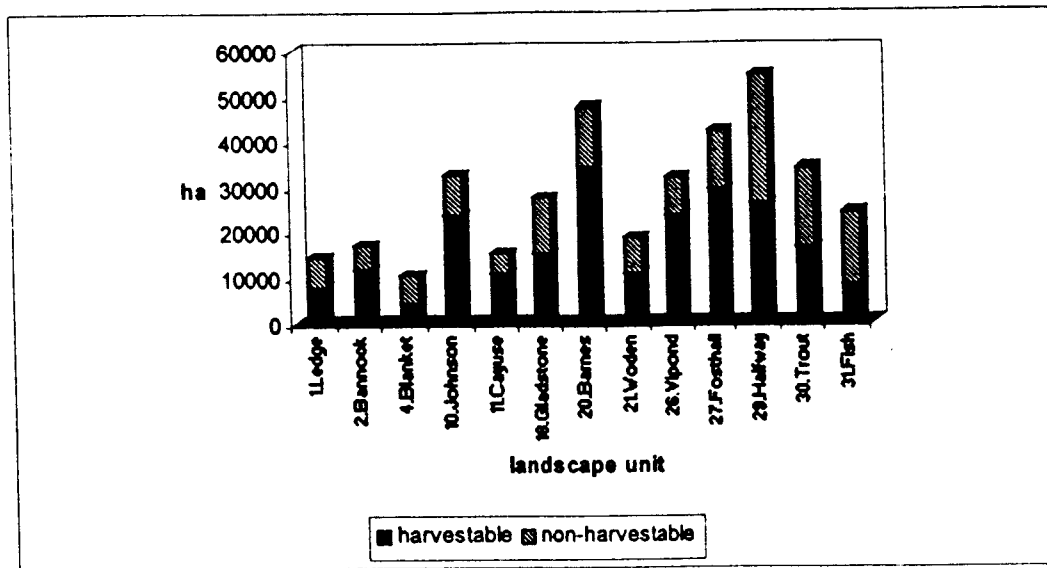


Figure 5. Distribution of productive area by landscape unit

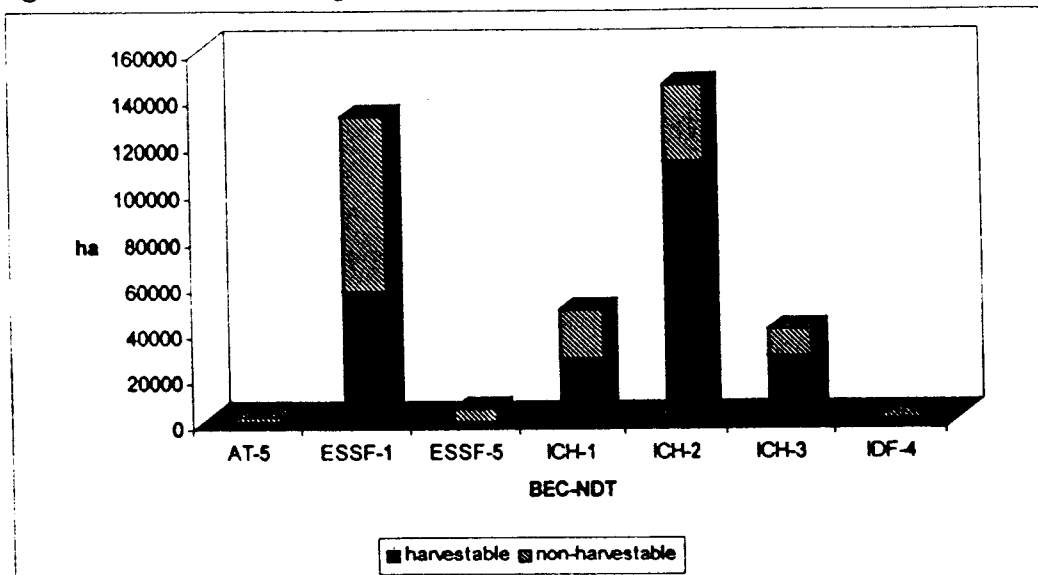


Figure 6. Distribution of productive area by BEC/NDT

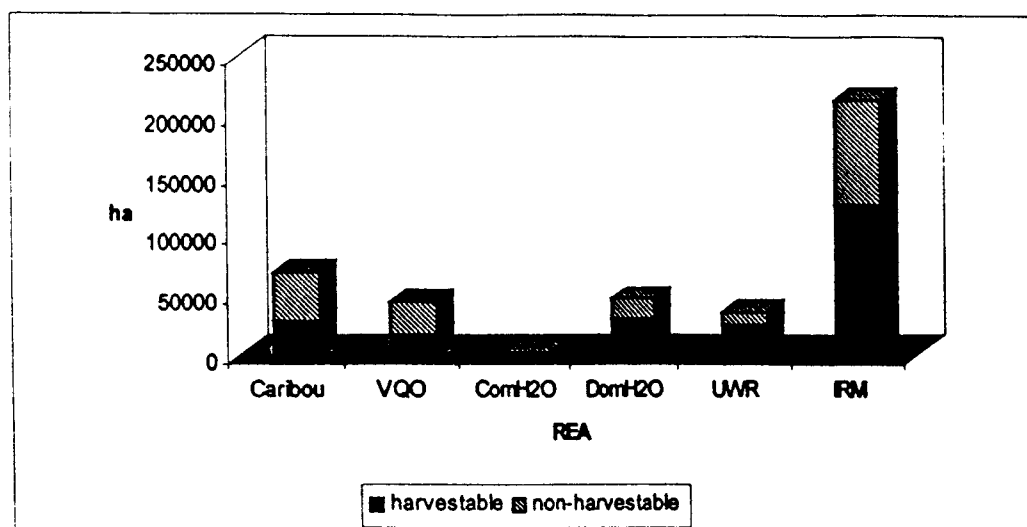


Figure 7. Distribution of productive area by Resource Emphasis Area

#### 4.3.3 Analysis units

To capture biological similarity, the inventory has been assembled and aggregated into analysis units on the basis of:

- inventory type groups,
- maturity, and
- site index range.

The distribution of area by inventory type groupings is shown in Figure 8.

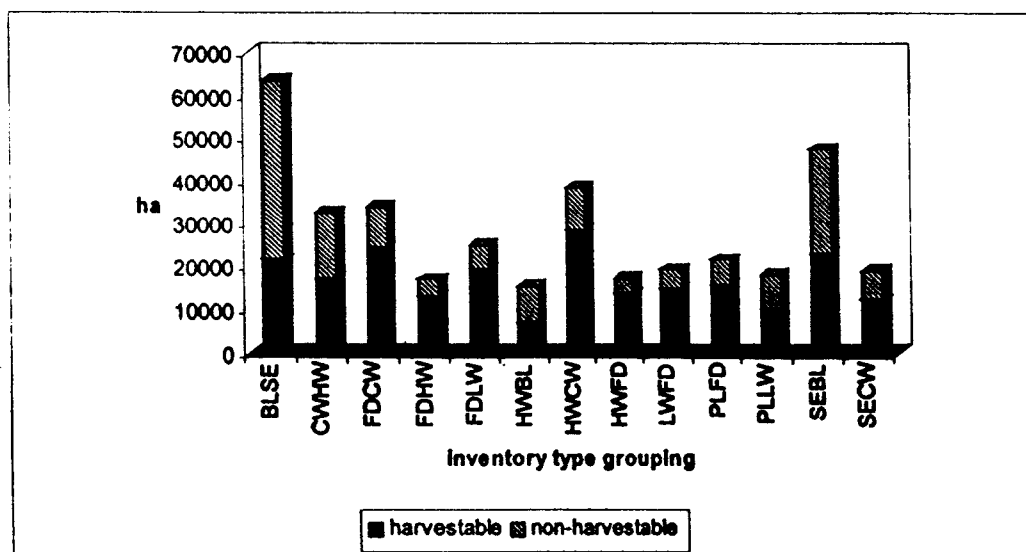


Figure 8. Distribution of productive area by species (inventory type grouping)

Site index stratification is independent of any subsequent site index modifications. Figures 9 (a-b) show the distribution of productive area by broad site productivity classification, both before and after the application of old growth site index adjustments.

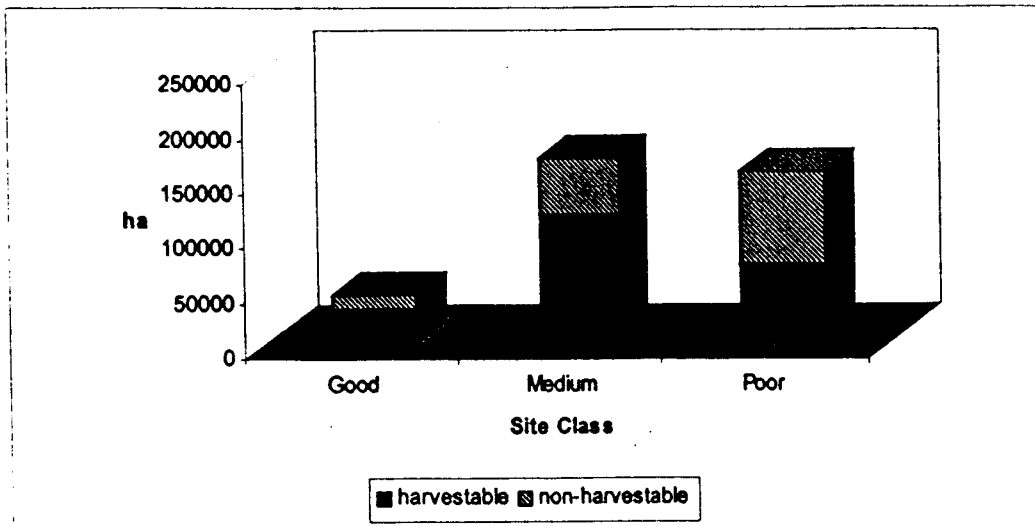


Figure 9a. Distribution of productive area by site class (without OGSi adjustment)

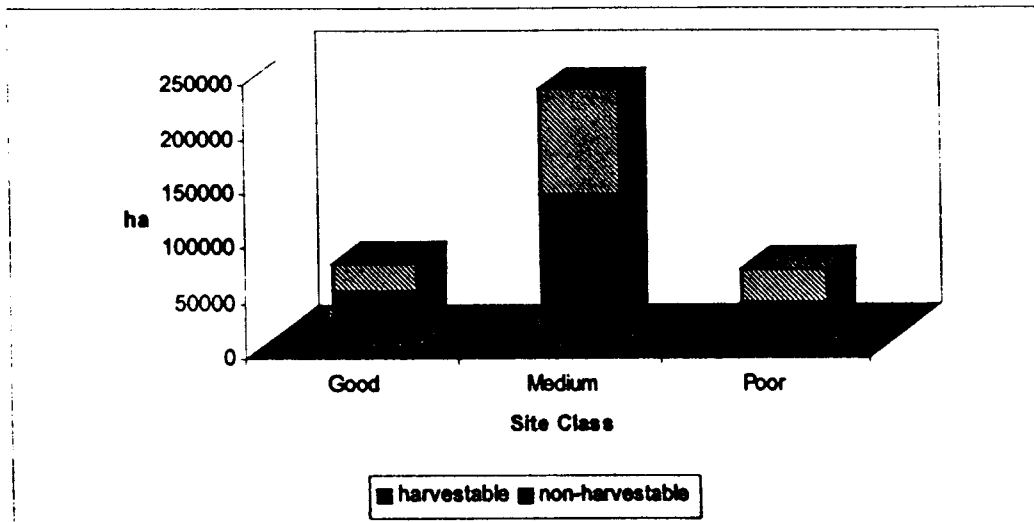


Figure 9b. Distribution of productive area by site class (with OGSi adjustment)

## 5. Timber Supply Analysis Methods

Timberline's proprietary simulation model CASH6 (Critical Analysis by Simulation of Harvesting) Version 6 was used to develop harvest schedules for all options and sensitivity analyses included in the MP #9 timber supply analysis. The model uses a geographic approach to landbase and inventory definition in order to adhere as closely as possible to the intent of forest cover requirements on harvesting.

CASH6 can simulate the imposition of overlapping forest cover objectives on timber harvesting and resultant forest development. These objectives are addressed by placing restrictions on the distribution of age classes, defining maximum or minimum limits on the amount of area in young and old age classes respectively found in specified components of the forest. Objectives are of two types:

### *1. Disturbance (below green-up)*

The disturbance category is defined as the total area below a specified green-up age. This disturbed area is to be maintained below a specified maximum percent. The effect is to ensure that at no time will harvesting cause the disturbed area to exceed this maximum percent. This category is typically used to model adjacency, visual, wildlife or hydrological green-up requirements in resource emphasis areas, and early seral stage requirements at the landscape unit level.

### *2. Retention (old growth)*

The retention category is defined as the total area above a specified old growth age. This retention area is to be maintained above a specified minimum percent. The effect is to ensure that at no time will harvesting cause the retention area to drop below this minimum percent. This category is typically used to model thermal cover and/or old growth requirements in wildlife management resource emphasis areas, and mature and old growth seral stage requirements at the landscape unit level.

The model projects the development of a forest, allowing the analyst to impose different harvesting/silviculture strategies on its development, in order to determine the impact of each strategy on long-term resource management objectives.

CASH6 was used to determine harvest schedules that incorporate all integrated resource management considerations. CASH6 was also employed to model the 20-Year Spatial Feasibility Analysis. This component of MP #9 was completed as a separate process from the remainder of the timber supply analysis, and is reported under separate cover.

In these analyses, timber availability is forecasted in decadal time steps (periods). The main output from each analysis is a projection of the amount of future growing stock, given a set of growth and yield assumptions, and planned levels of harvest and silviculture activities. Growing stock is characterized in terms of total and merchantable volume, as well as volume above minimum harvest age.

A 250 year time horizon was employed in these analyses, to ensure that long-term growing stock stability is not compromised. Also, harvest levels included allowances for non-recoverable losses. Harvest figures reported here exclude this amount.

Over the next rotation (90 years) it will be necessary to reduce harvest levels prior to achieving the long-term level. Unless otherwise stated, in the timber supply forecasts which follow, the decadal rate of decline was limited to 10%, and the mid-term harvest level was not permitted to drop below a minimum target level. The long-term steady harvest level will always be slightly below the theoretical long-term level, attainable only if all stands are harvested at the age when mean annual increment (MAI) maximizes. This is due to the imposition of minimum harvest ages and forest cover requirements, which alter time of harvest.

## 6. Option 1: Base Case – KBLUP Caribou Habitat Option

### 6.1 Introduction

This option incorporates:

- Management activity as defined by current operations with emphasis on the last 5 years;
- Implementation of the Forest Practices Code (FPC) as it was interpreted at the date of Statement of Management Objectives, Options and Procedures (SMOOP) approval, August 28, 1997;
- Recommended Landscape Units (LUs) defined for TFL 23 with biodiversity emphasis assignments to address landscape level biodiversity;
- A recently updated (December 31, 1997) forest cover inventory;
- VDYP natural stand yields for natural unmanaged stands (> 25 years old);
- TIPSYP managed stand yields for all existing (1 – 25 years old) and future managed stands;
- Current close utilization standards;
- Basic silviculture on all sites;
- Genetic gains from tree improvement;
- New Park Areas from KBLUP;
- Special management for important wildlife including KBLUP caribou habitat definitions ;
- Visual quality requirements;
- Consideration of sensitive areas based on recent inventories including terrain (soils) and regeneration problems;
- Revised operability which defines areas requiring aerial harvesting systems;
- inclusion of provincial and federal park lands to height of land for contribution to seral stage requirements; and
- Consideration of uneconomic forest stands and forest health.

As directed by MoF Timber Supply Branch (TSB) staff, this base case utilizes regenerating stand yield curves which employ the existing site index estimates. However, it is recognized that these existing estimates are low when based on height/age estimates in old growth stands.

Three alternative flow scenarios associated with the base case assumptions were initially tested:

1. Increase initial harvest level by 5%, subject to a mid-term minimum harvest objective,
2. Maximize the mid-term level, subject to meeting the current AAC in the first decade, and
3. Maintain the existing AAC as long as possible, subject to the mid-term minimum level.

The results are presented in Table 1 and Figure 10.

Table 1. Net harvest levels – base case

| Decade | Scenario 1 | Scenario 2 | Scenario 3 |
|--------|------------|------------|------------|
| 1      | 714000     | 680000     | 680000     |
| 2      | 714000     | 621000     | 680000     |
| 3      | 670000     | 621000     | 680000     |
| 4      | 612000     | 621000     | 680000     |
| 5      | 612000     | 621000     | 612000     |
| 6      | 572000     | 621000     | 572000     |
| 7      | 572000     | 621000     | 572000     |
| 8      | 572000     | 621000     | 572000     |
| 9      | 572000     | 621000     | 572000     |
| 10     | 634000     | 634000     | 634000     |
| 11     | 634000     | 634000     | 634000     |
| 12+    | 634000     | 634000     | 634000     |

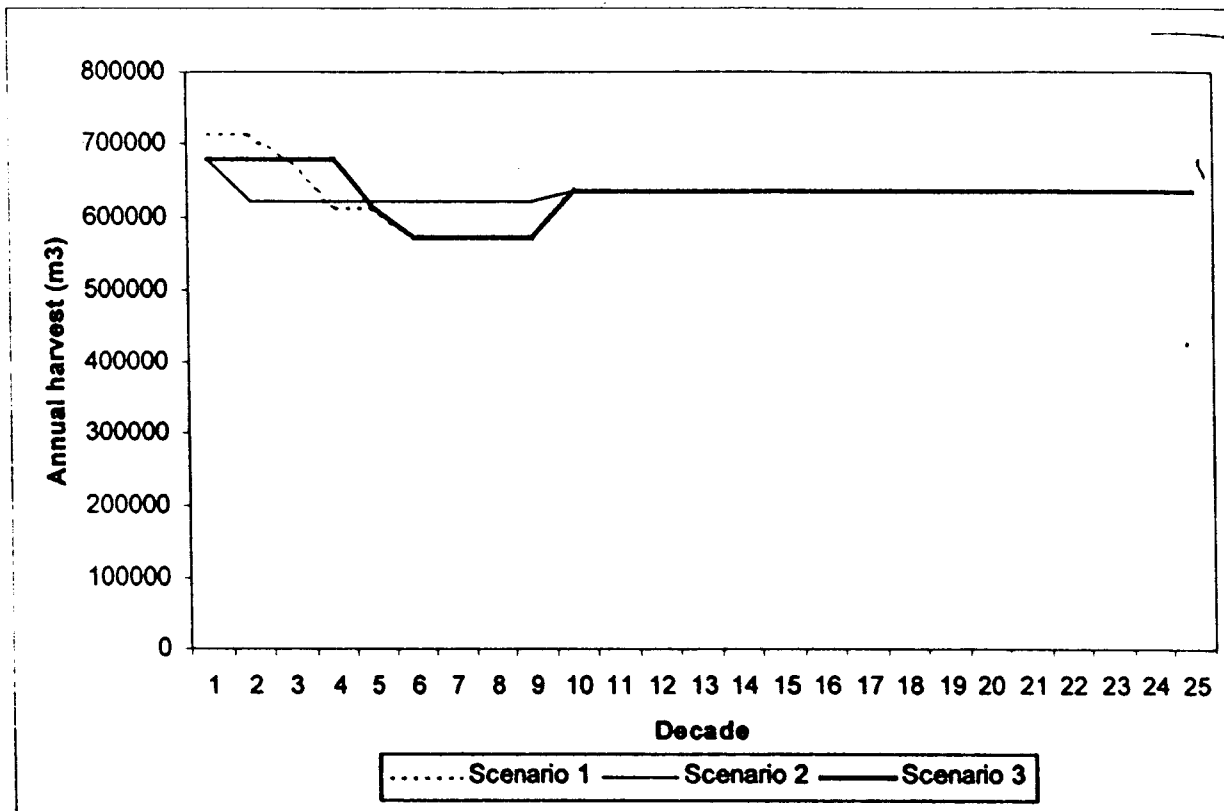


Figure 10. Net harvest levels – base case

Scenarios 1 and 2 represent departures from the harvest flow policy. They are included to demonstrate opportunities to alter the short and medium term harvest, without compromising long-term objectives. Scenario 3 was selected as the basis for sensitivity analysis, as it adheres to the harvest flow policy adopted by Pope & Talbot (Section 3). In scenario 3, the initial harvest level is set at 680,000 cubic metres/year, (the current AAC), and maintained for 4 decades. A drop of 10% in the fifth decade and a further drop of 6.5% in the sixth decade are necessary to avoid unacceptably low mid-term levels. The long term steady level is 634,000 cubic metres, which is approximately 8% below the theoretical long term level (690,900 cubic metres) based on maximizing MAI. This difference results from the downward pressures associated with conflicting forest cover and harvest scheduling objectives.

Figure 11 displays the 250 year growing stock profile associated with this scenario. Growing stock within the harvestable landbase declines steadily for 8 decades at which point harvesting emphasis shifts from existing mature types to second growth. Beyond this point, growth and harvest rates equalize, and growing stock remains stable to the end of the simulation period. Available growing stock (volume above minimum harvest age) minimizes at decade 8. The harvest flow over decades 1-9 is largely controlled by this minimum. Further increases prior to decade 9 would result in the harvest at decade 9 falling below the mid-term minimum, which is contrary to the harvest flow policy adopted in these analyses.

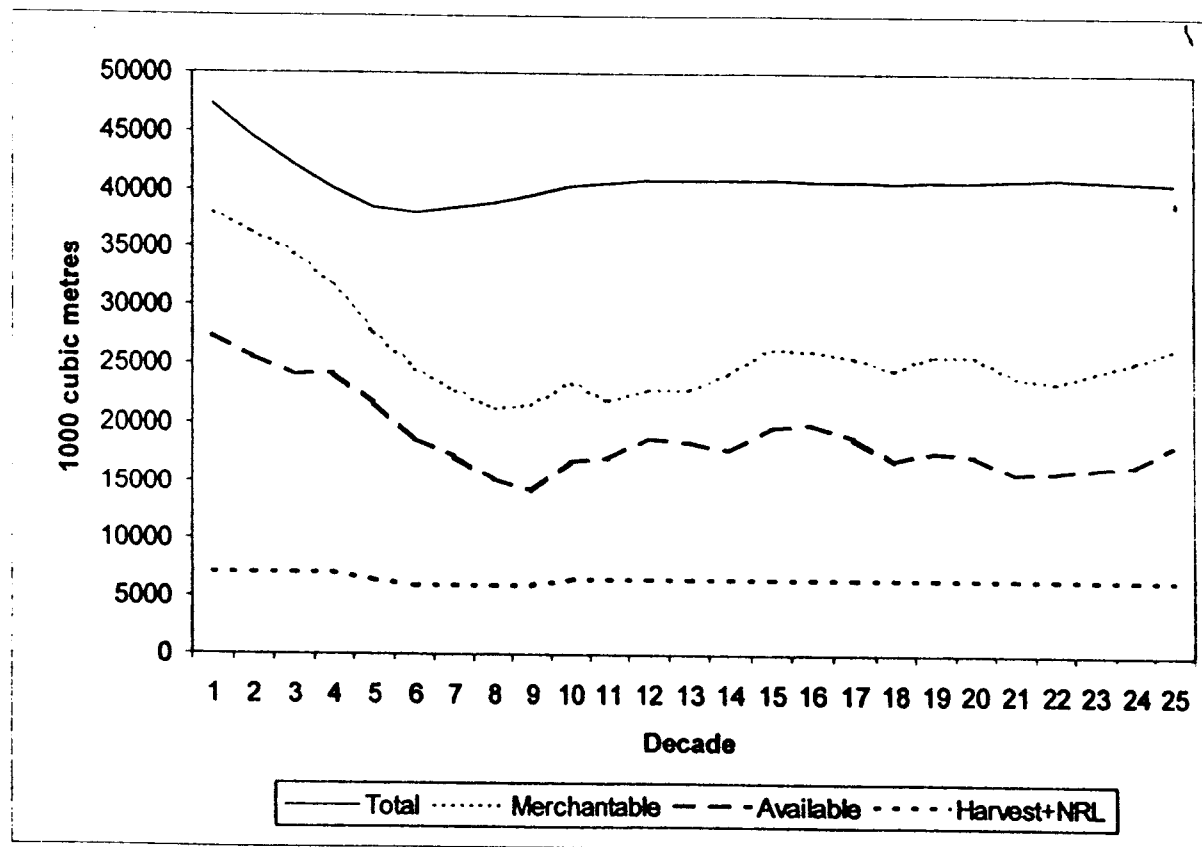


Figure 11. Growing stock profile – base case



Figures 12 and 13 show harvested volume/hectare and area harvested/year for the base case.

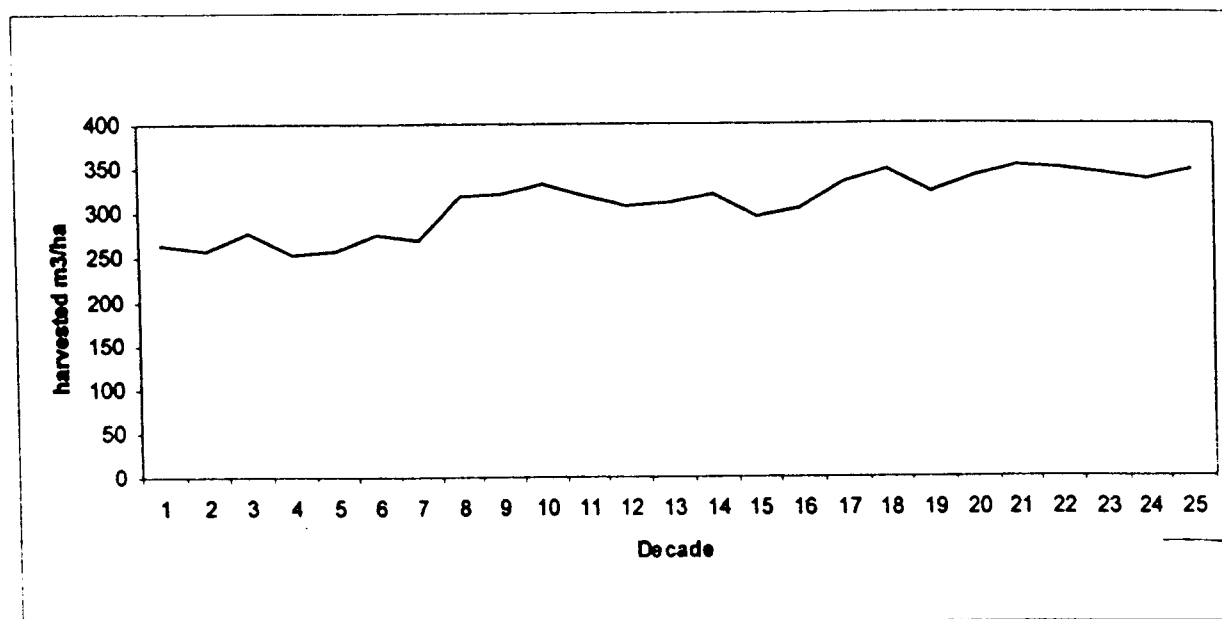


Figure 12. Harvested volume/ha – base case

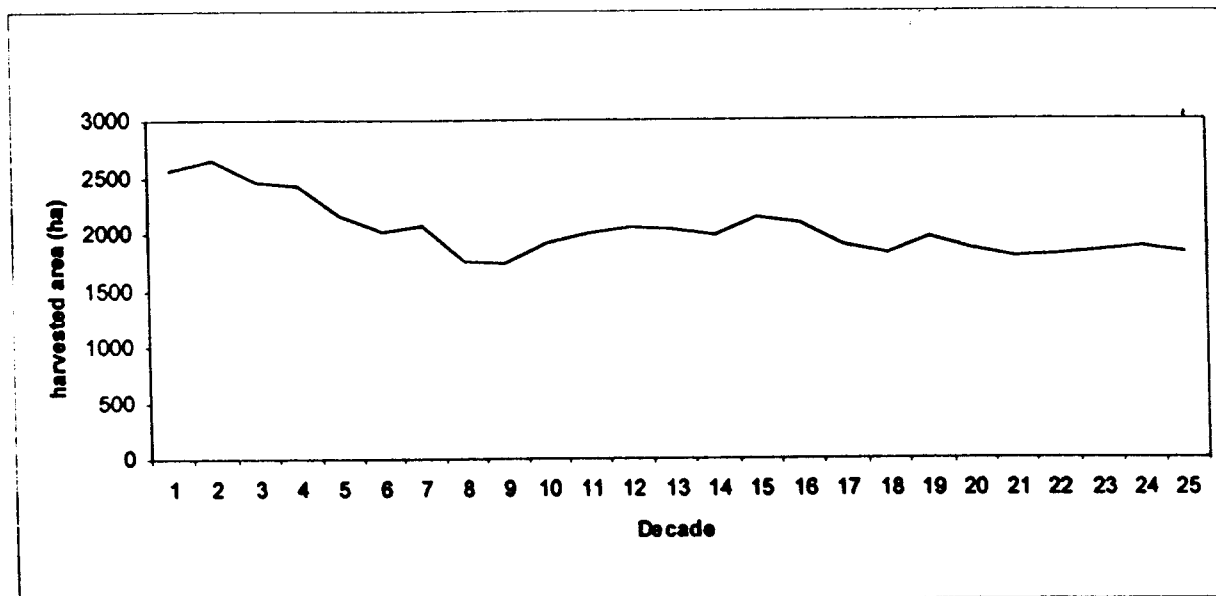


Figure 13. Harvested area – base case

Figures 14-18 show the changes in forest structure over time. Each figure indicates the residual structure of the total productive forest, including the unharvestable components.

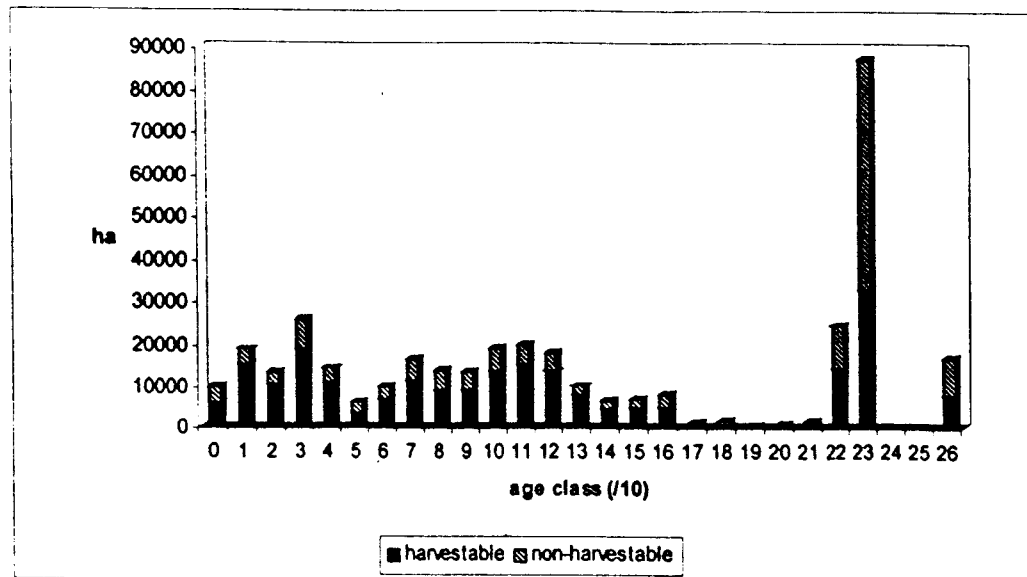


Figure 14. Age structure – end of period 1

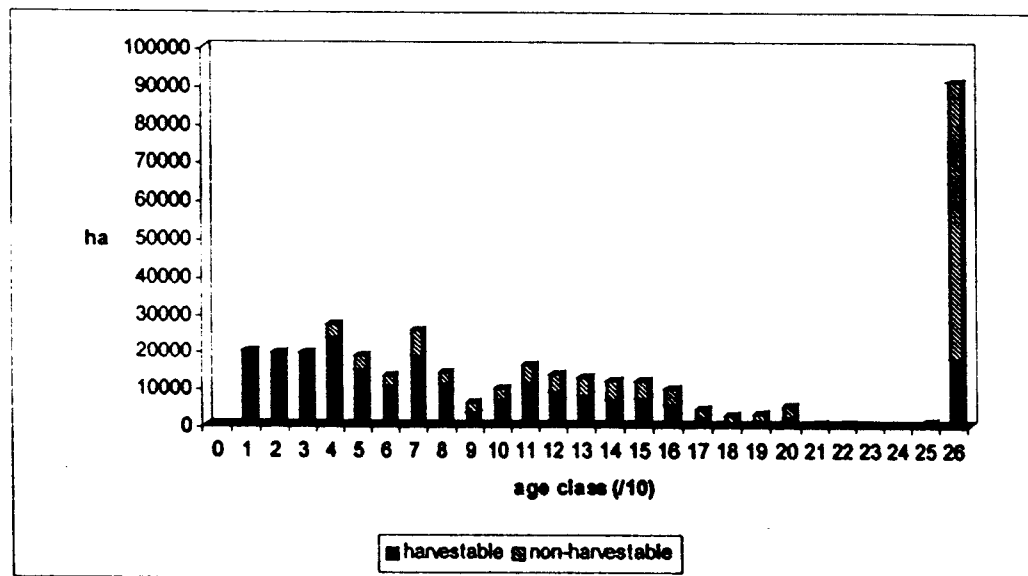


Figure 15. Age structure – end of period 5

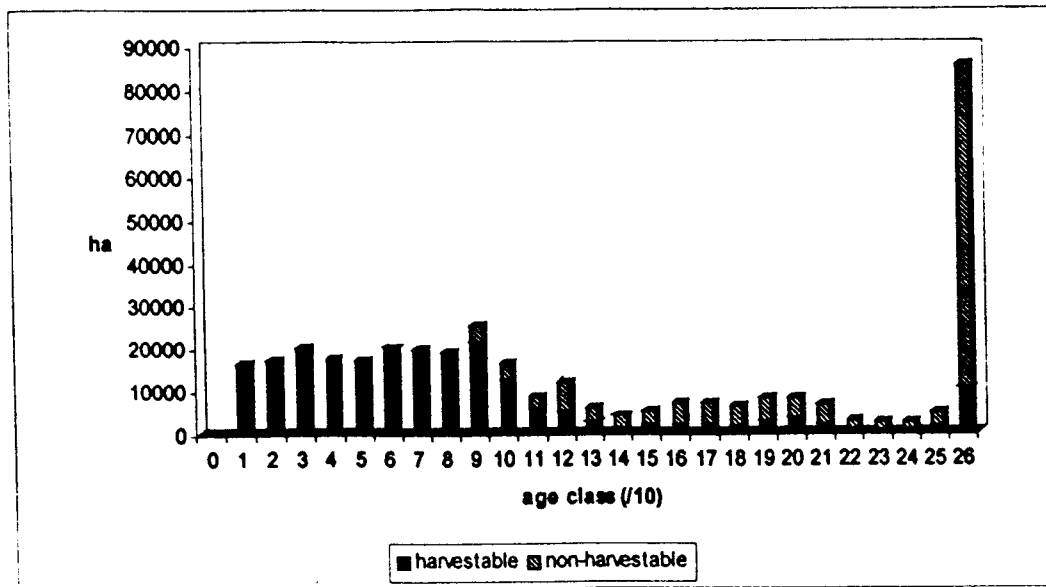


Figure 16 Age structure – end of period 10

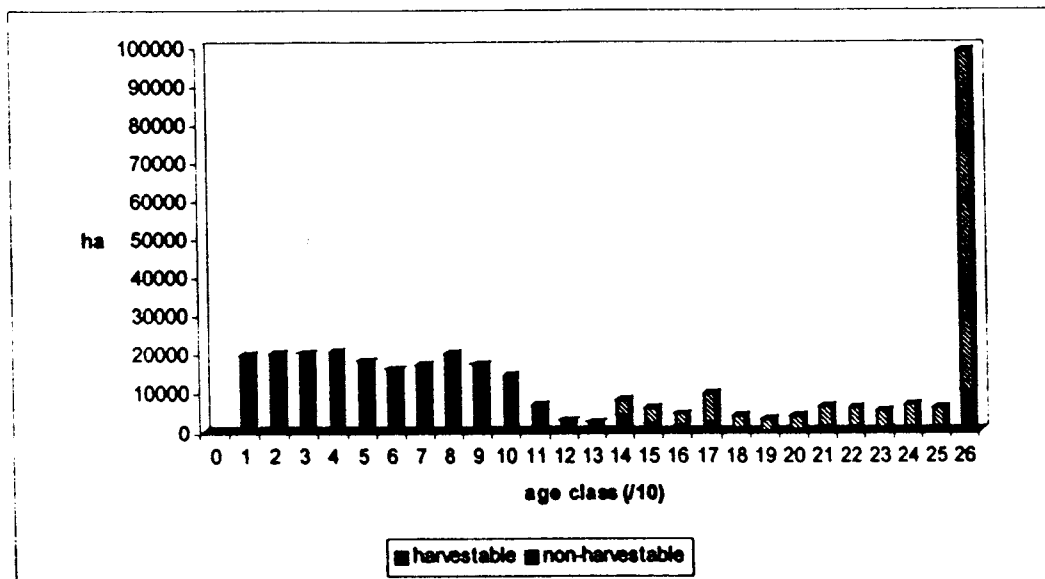


Figure 17 Age structure – end of period 15

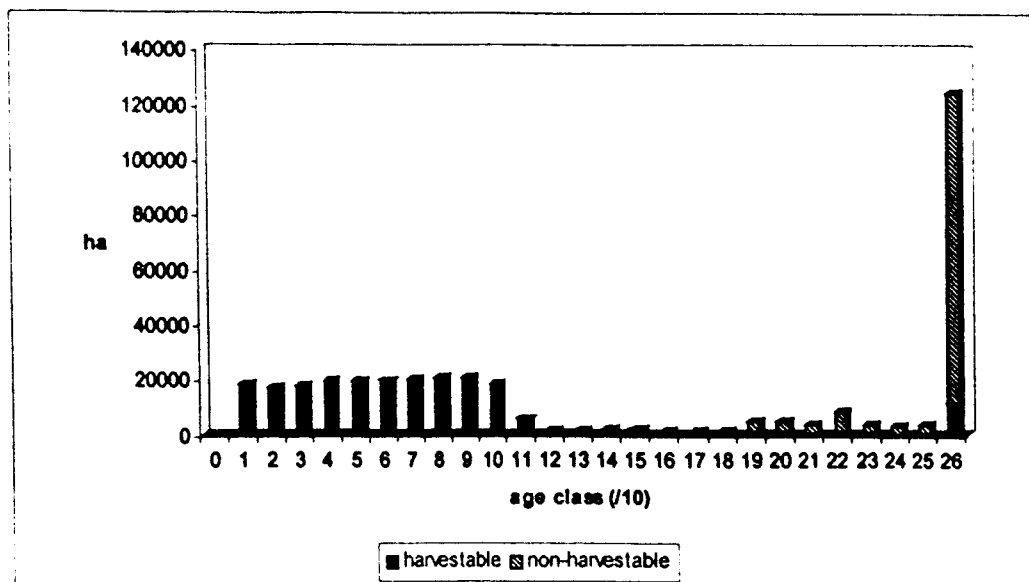


Figure 18 Age structure – end of period 20

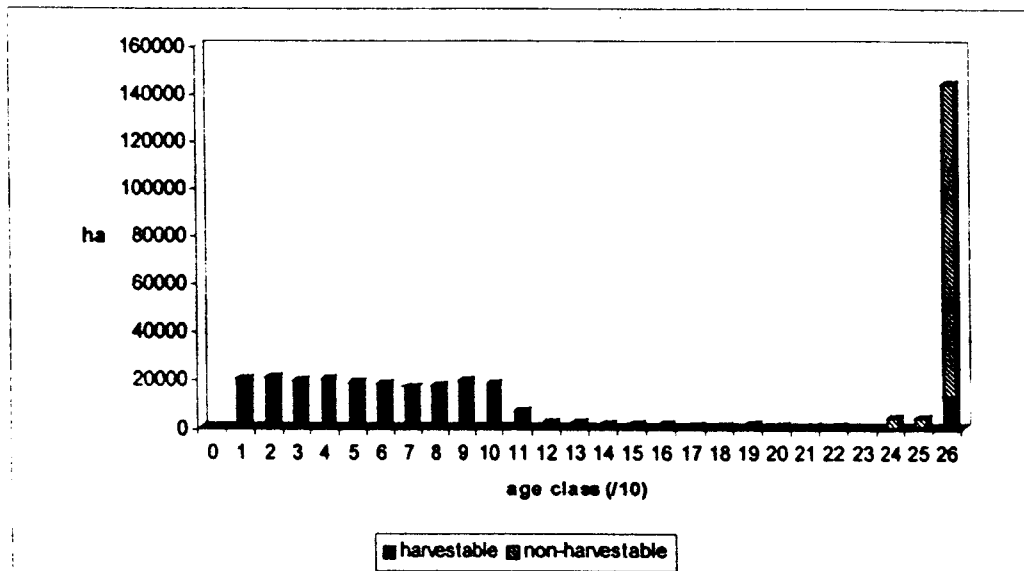


Figure 19 Age structure – end of period 25

While the harvestable old growth inevitably declines in the future, the total productive area greater than age 250 increases steadily over time, reaching approximately 86,900 hectares by the end of decade 10, and 153,500 hectares by the end of decade 25. In other words, fully 23% of the productive forest is above age 250 by the end of the first rotation, and 41% by the end of the second rotation. This has very positive implications with respect to old growth biodiversity objectives for the TFL.

Seral stage objectives are modeled at the Landscape Unit/BEC Variant level, and forest cover objectives are modeled at the Landscape Unit/REA level. Periodic results for the base case are presented in Appendix 1 of this report.

## 6.2 Summary – Base Case

The base case scenario provides for an initial harvest level of 680,000 cubic metres. However, the timber flow policy adopted for Management Plan #9 necessitates a reduction of 10% in decade 5, and 6.5% in decade 6. A long-term level of 634,000 cubic metres is achieved in decade 10.

Short and medium term harvest levels are largely dictated by the availability of harvestable regenerating stands. Timber availability is particularly constrained in decade 9. Therefore, any changes to inventory information, growth and yield expectations or silviculture treatment scenarios that affect the harvestable age of second growth stands can have a significant impact on short and medium term timber supplies.

The long-term harvest level is driven by the productive capacity of the harvestable landbase. The theoretical capacity is measured by the average mean annual increment (MAI) for second growth managed stands. The calculations (rounded) for the base case are shown below:

|                                         |           |
|-----------------------------------------|-----------|
| Net current landbase (including NSR)    | 224 700   |
| - future roads                          | - 2 500   |
| = net long-term landbase                | = 223 100 |
| X average MAI                           | x 3.2     |
| = theoretical gross long-term (rounded) | = 713 900 |
| - non-recoverable losses (NRLs)         | -23 000   |
| = theoretical net long-term (rounded)   | = 690 900 |

In the base case, the theoretical long-term harvest level of 690,900 cubic metres could be attained if all stands were harvested at MAI culmination age. The realized long term net level of 634,000 cubic metres is approximately 8% lower, as stands cannot always be harvested at this age due to harvest scheduling requirements conflicting with forest cover objectives.

Sensitivity issues that can affect the base case harvest flow are explored in the next section.

## 7. Option 1. Base Case – Sensitivity Analysis

Sensitivity analysis provides a measure of the upper and lower bounds of the base case harvest forecast, reflecting the uncertainty of assumptions made in the base case. The magnitude of the change in the sensitivity variable(s) reflects the degree of uncertainty surrounding the assumption associated with that variable. By developing and testing a number of sensitivity issues, it is possible to determine which variables most affect results. This in turn facilitates the management decisions which must be made in the face of uncertainty.

To allow meaningful comparison of sensitivity analyses, they are usually performed using the base case option and varying only the assumption being evaluated. All other assumptions remain unchanged. Sensitivity issues are summarized in Table 2. The timber supply impacts are illustrated in Sections 7.1 - 7.15.

Table 2. Sensitivity analysis levels – Current Management Option

| Issue                                               | Sensitivity Levels to be Tested                                                                   | Section |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------|---------|
| Landbase revisions                                  | Remove Shelter Bay block to assess the contribution of the Columbia District to the AAC of TFL 23 | 7.1     |
|                                                     | Add marginally economic stands                                                                    | 7.2     |
|                                                     | Remove aerial operable areas                                                                      | 7.3     |
|                                                     | Adjust timber harvesting landbase by +/- 10%                                                      | 7.4     |
|                                                     | Remove stands with SI50 < 9 m                                                                     | 7.5     |
| Growth and yield inputs                             | Apply OGSI adjustments to managed stands                                                          | 7.6     |
|                                                     | Adjust existing stand yields by +/- 10%                                                           | 7.7     |
|                                                     | Adjust future managed stand yields by +/- 10%                                                     | 7.8     |
|                                                     | Adjust managed stand minimum harvest ages by +/- 10 years                                         | 7.9     |
|                                                     | Increase and decrease regeneration delay                                                          | 7.10    |
| Management considerations & forest cover objectives | Alter maximum disturbance levels in caribou, ungulate winter range and IRM zones                  | 7.11    |
|                                                     | Alter caribou thermal and old growth objectives                                                   | 7.12    |
|                                                     | Alter thermal cover objectives in ungulate winter range                                           | 7.13    |
|                                                     | Alter VQO maximum disturbance levels                                                              | 7.14    |
|                                                     | Employ full biodiversity objectives in low emphasis LUs                                           | 7.15    |

### 7.1 Remove Shelter Bay Block

The Shelter Bay block represents a total of 40,692 hectares of productive area, 24,476 hectares of which are within the net harvestable landbase. This represents 11 % of the net harvestable area incorporated into the base case analysis. As shown in Table 3 and Figure 20, removal of this area results in a 10% reduction in harvest levels in the first 100 years, and 11% in the long term.

Table 3. Net harvest levels – Remove Shelter Bay block

| Decade | Base case | Remove block |
|--------|-----------|--------------|
| 1      | 680000    | 612000       |
| 2      | 680000    | 612000       |
| 3      | 680000    | 612000       |
| 4      | 680000    | 612000       |
| 5      | 612000    | 551000       |
| 6-9    | 572000    | 517000       |
| 10+    | 634000    | 563000       |

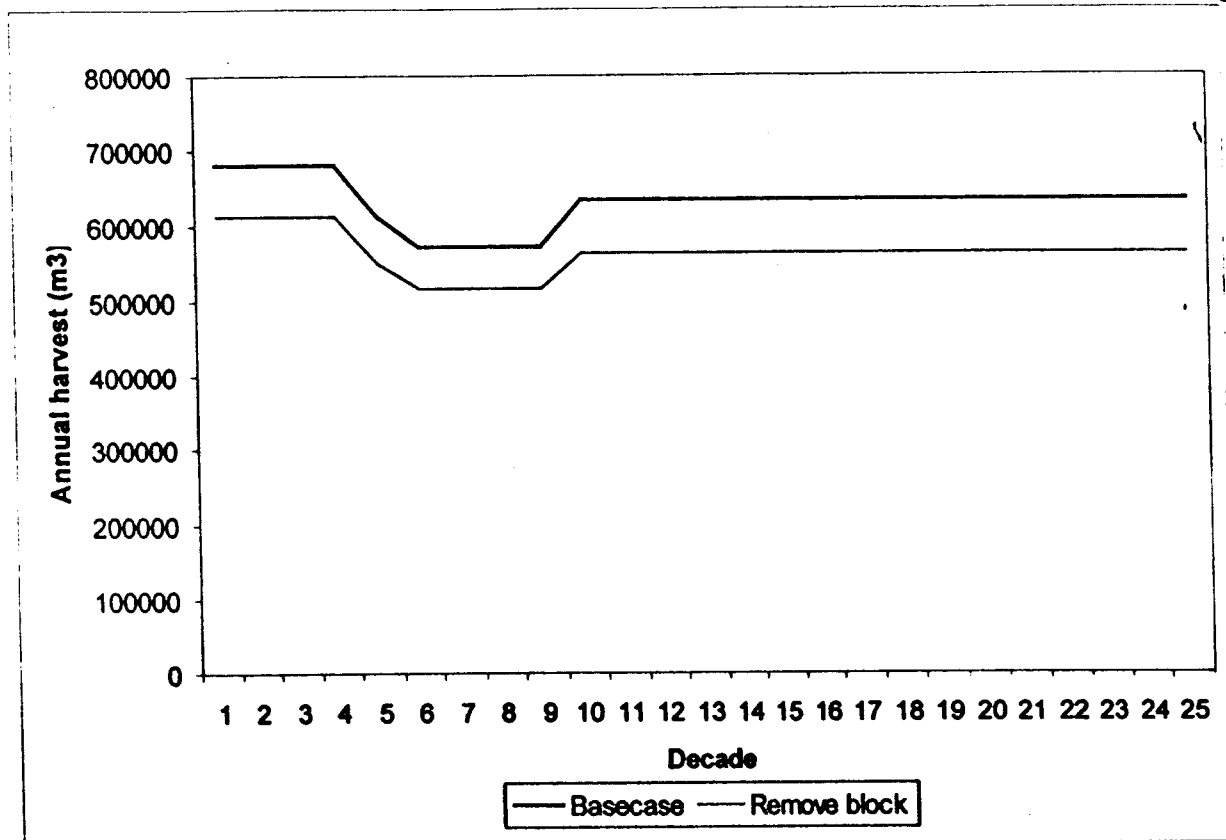


Figure 20. Net harvest levels – Remove Shelter Bay block

## 7.2 Add Marginally Economic Stands

Approximately 4,071 hectares of overmature hemlock and balsam leading types were excluded from the net harvestable landbase. While some of this area would also be removed for other reasons, primarily riparian zones, a total of 3,660 hectares could be added back to the net harvestable landbase, if they could be economically accessed. This represents an increase of 1.6% in the size of the harvestable landbase. The impact of incorporating these stands into the annual timber supply amounts to 1% over the time horizon of the analysis. This is summarized in Table 4 and Figure 21.

Table 4. Net harvest levels – Add marginally economic stands

| Decade | Base case | Add stands |
|--------|-----------|------------|
| 1      | 680000    | 680000     |
| 2      | 680000    | 680000     |
| 3      | 680000    | 680000     |
| 4      | 680000    | 680000     |
| 5      | 612000    | 620000     |
| 6-9    | 572000    | 582000     |
| 10+    | 634000    | 640000     |

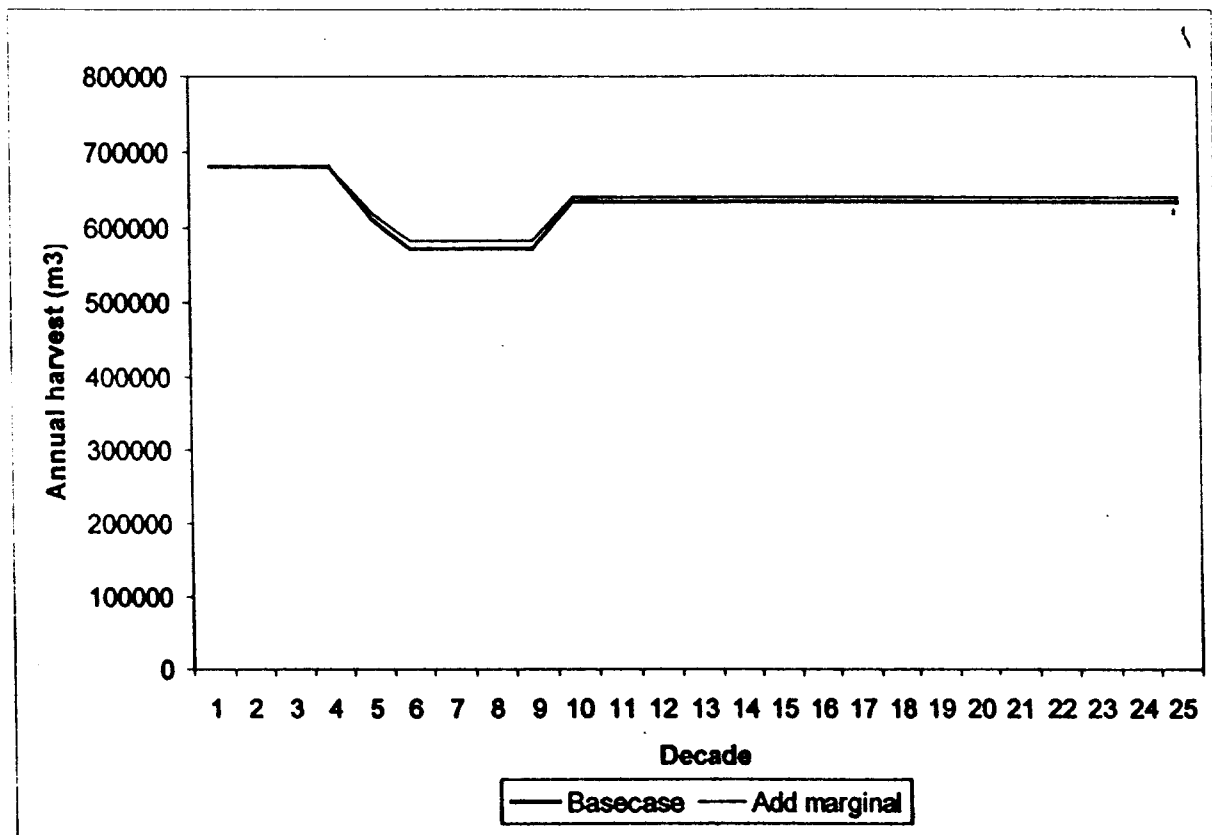


Figure 21. Net harvest levels – Add marginally economic stands



### 7.3 Remove Aerial Operable Area

The new Pope and Talbot operability classification identified a total of 24,194 hectares of productive area which is accessible using aerial harvesting methods, including long line and helicopter forwarding. 19,504 hectares of this area are within the net harvestable landbase. This represents approximately 9% of the net harvestable area. To estimate the contribution of these areas to the timber supply of TFL 23, these areas were removed from the harvestable landbase. They were however, assumed to contribute to forest cover and seral stage objectives. The results are presented in Table 5 and Figure 22. A 56,000 cubic metre/year reduction in harvest is required over the total time horizon of the analysis. This reflects the current AAC aerial partition of 50,000 cubic metres of aerial volume, plus 6,000 cubic metres attributed to the small business program.

Table 5. Net harvest levels – Remove aerial operable stands

| Decade | Base case | Remove aerial |
|--------|-----------|---------------|
| 1-4    | 680000    | 624000        |
| 5      | 612000    | 556000        |
| 6-9    | 572000    | 516000        |
| 10+    | 634000    | 578000        |

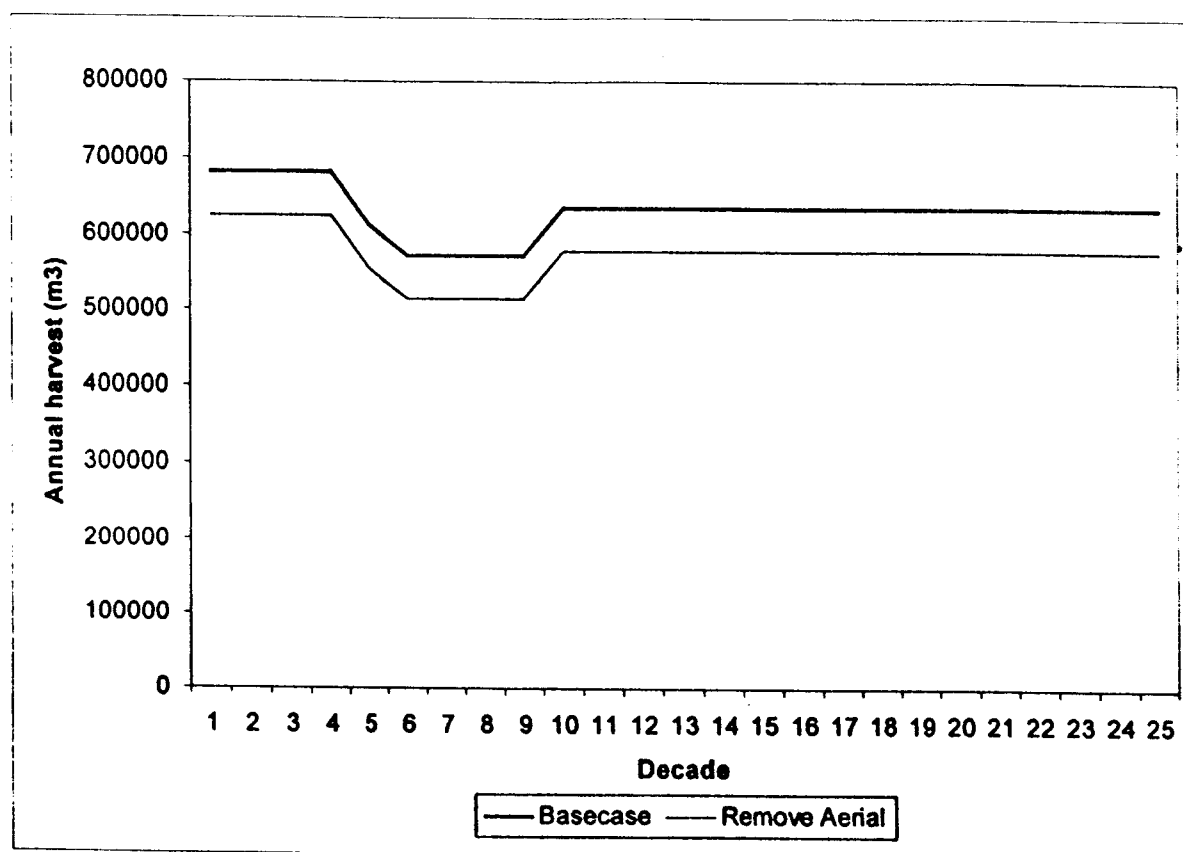


Figure 22. Net harvest levels – Remove aerial operable areas

#### 7.4 Adjust Timber Harvesting Landbase

In order to further assess the sensitivity of the timber supply to changes in the harvestable landbase, the net landbase was arbitrarily adjusted by +/-10% (22,470 ha). In order to maintain the same total productive forest area, the non-harvestable landbase was adjusted accordingly. Predictably, these changes had a proportional impact on short and long-term timber supply, as shown in Table 6 and Figure 23.

Table 6. Net harvest levels – Adjust timber harvesting landbase

| Decade | Area - 10 % | Base case | Area + 10 % |
|--------|-------------|-----------|-------------|
| 1      | 612000      | 680000    | 748000      |
| 2      | 612000      | 680000    | 748000      |
| 3      | 612000      | 680000    | 748000      |
| 4      | 612000      | 680000    | 748000      |
| 5      | 551000      | 612000    | 748000      |
| 6-9    | 515000      | 572000    | 629000      |
| 10+    | 571000      | 634000    | 697000      |

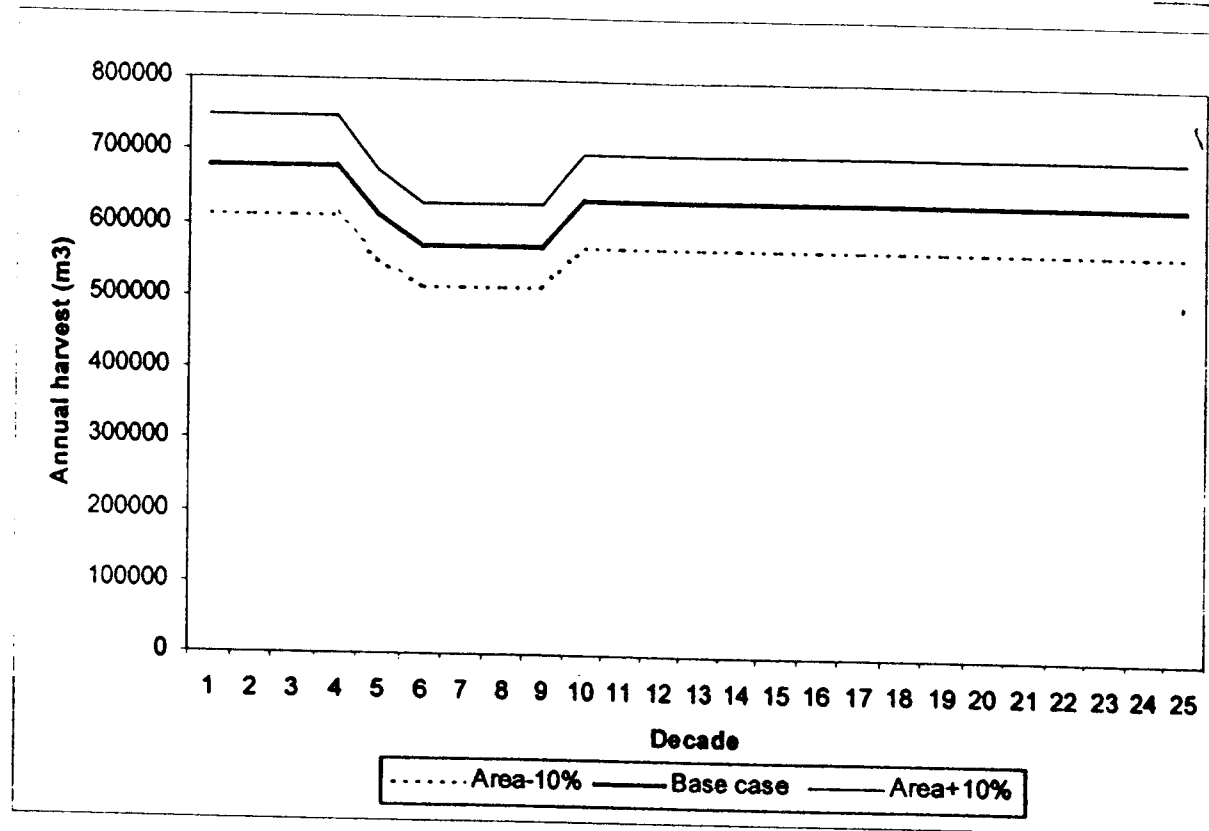


Figure 23. Net harvest levels – Adjust timber harvesting landbase

### 7.5 Remove Stands with Site Index < 9.0 metres

4,461 hectares of harvestable forest area are currently assigned site index values between 8.0 and 8.9, although most of these stands are spruce and balsam types greater than age 140, and therefore affected by old growth site index biases. In this analysis, these areas were removed from the harvestable landbase, although retained in the productive landbase for biodiversity contribution. This resulted in a reduction of 4,361 hectares (2%) in the net harvestable landbase. Yield curves for the affected analysis units were reconstructed to reflect this removal. As shown in Table 7 and Figure 24, the impact was to reduce harvest levels in the short and medium term by approximately 2%, while long-term levels were reduced by 1 %. The impact on timber supply was less than proportional to the landbase removal, as these stands are at the low end of the productivity spectrum.

Table 7. Net harvest levels – Remove stands with SI50 < 9.0 metres

| Decade | Base case | Remove stands |
|--------|-----------|---------------|
| 1-3    | 680000    | 680000        |
| 4      | 680000    | 662000        |
| 5      | 612000    | 596000        |
| 6-9    | 572000    | 556000        |
| 10+    | 634000    | 629000        |

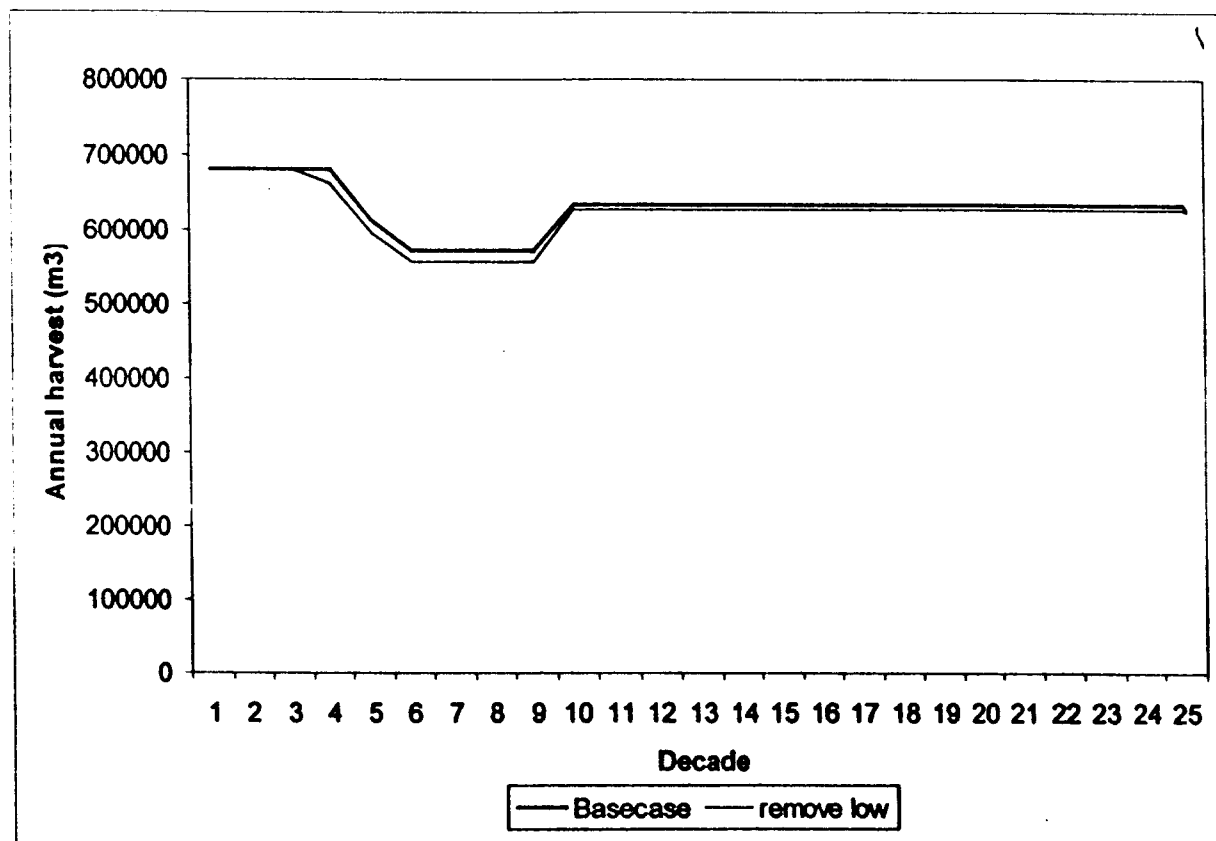


Figure 24. Net harvest levels – Remove stands with SI50 < 9.0 metres

## 7.6 Apply OGSi Adjustments

As outlined in the data package, the base case analysis incorporates managed stand yield curves which are derived from existing site index data for thrifty (age < 141) and old growth (age > 140) types. The latter are known to incorporate a negative bias. In this analysis, adjusted managed yield forecasts and green-up ages were substituted, using the MoF approved interim OGSi adjustment factors described in the data package. The results are presented in Table 8 and Figure 25. The impact is realised primarily in the long term, when these second growth stands become available for harvest. This impact (12%) is proportional to the increase in MAI of the forest, which is 3.2 cubic metres/hectare/year in the base case, and 3.6 cubic metres/hectare/year in the OGSi scenario.

Table 8. Net harvest levels – Apply OGSi adjustments

| Decade | Base case | OGSi   |
|--------|-----------|--------|
| 1      | 680000    | 680000 |
| 2      | 680000    | 680000 |
| 3      | 680000    | 680000 |
| 4      | 680000    | 680000 |
| 5      | 612000    | 612000 |
| 6-8    | 572000    | 608000 |
| 9      | 572000    | 709000 |
| 10+    | 634000    | 709000 |

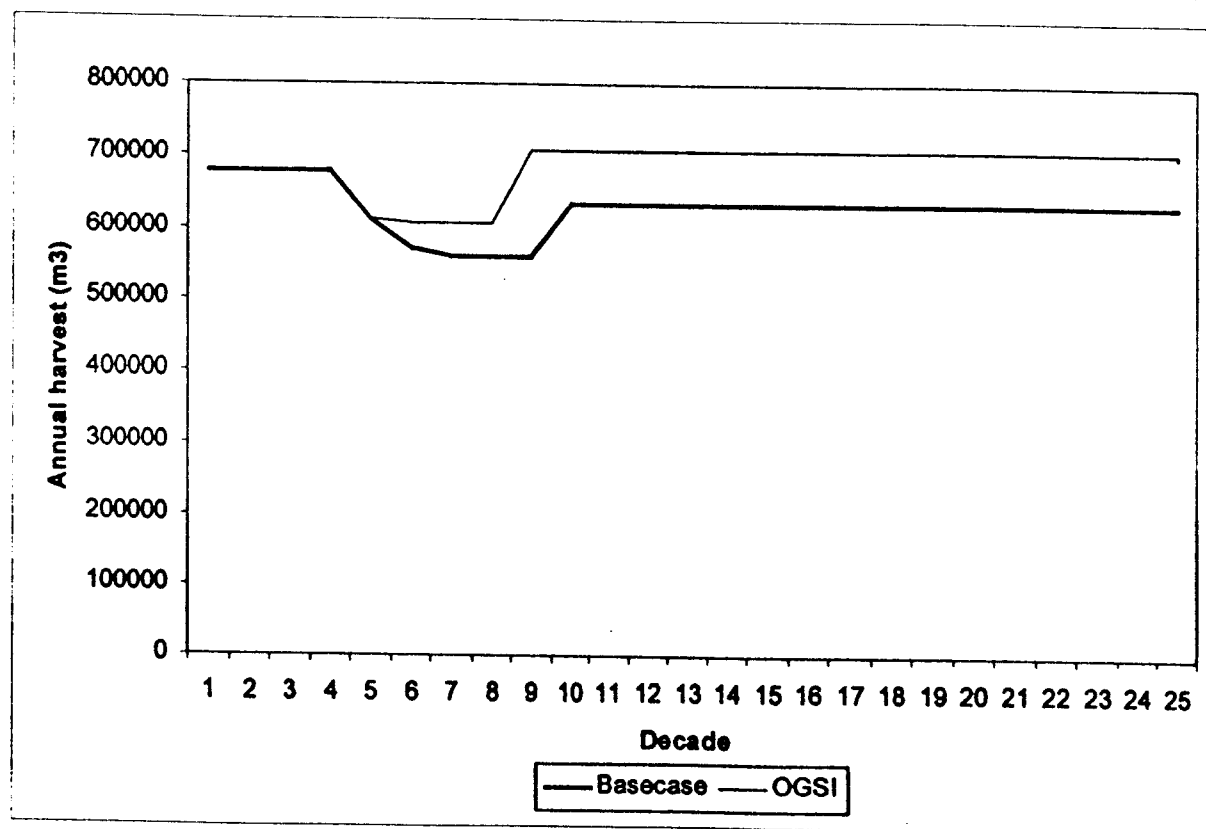


Figure 25. Net harvest levels – Apply OGSi adjustments

### 7.7 Adjust Existing Stand Yields

A test of the sensitivity of the timber supply to changes in natural stand yield table (NSYT) forecasts was completed. In this case, no changes were made to yield forecasts for existing or future managed stands. Overall, changing NSYT expectations by +/- 10% has a proportional impact on timber supply over the next 80 years, as shown in Table 9 and Figure 26. Beyond this point the impact diminishes, as the managed stand yield forecasts were not adjusted.

Table 9. Net harvest levels – Adjust existing stand yields

| Decade | Yield - 10 % | Base case | Yield + 10 % |
|--------|--------------|-----------|--------------|
| 1      | 680000       | 680000    | 680000       |
| 2      | 680000       | 680000    | 680000       |
| 3      | 612000       | 680000    | 680000       |
| 4      | 550000       | 680000    | 680000       |
| 5      | 502000       | 612000    | 680000       |
| 6-9    | 502000       | 572000    | 680000       |
| 10     | 502000       | 634000    | 680000       |
| 11+    | 634000       | 634000    | 634000       |

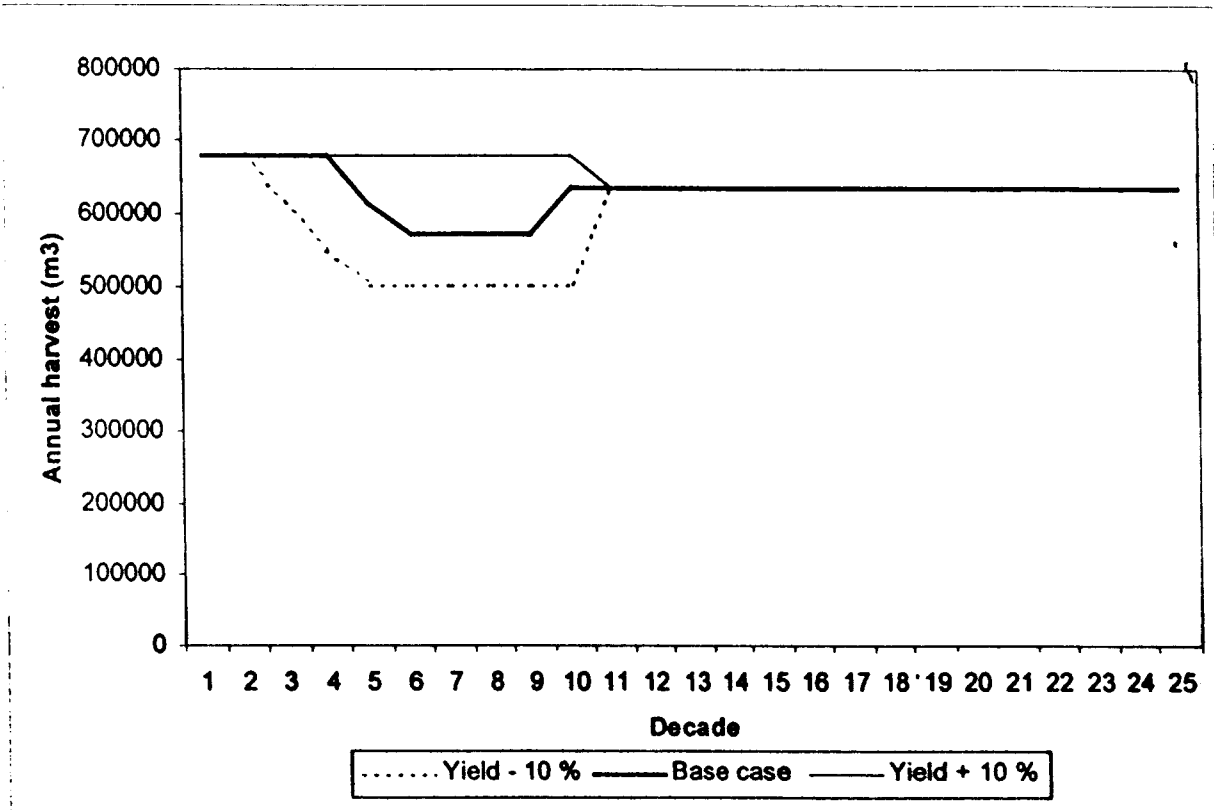


Figure 26. Net harvest levels – Adjust existing stand yields

### 7.8 Adjust Managed Stand Yields

A test of the sensitivity of the timber supply to changes in managed stand yield table (MSYT) forecasts was also completed. In this case, no changes were made to yield forecasts for existing natural stands. Overall, changing MSYT expectations by +/- 10% has a proportional impact on timber supply after 100 years, as shown in Table 10, Figure 27. Predictably, the impact prior to this point is insignificant.

Table 10. Net harvest levels – Adjust managed stand yields

| Decade | Yield - 10 % | Base case | Yield + 10 % |
|--------|--------------|-----------|--------------|
| 1      | 680000       | 680000    | 680000       |
| 2      | 680000       | 680000    | 680000       |
| 3      | 680000       | 680000    | 680000       |
| 4      | 680000       | 680000    | 680000       |
| 5      | 612000       | 612000    | 612000       |
| 6-9    | 564000       | 572000    | 579000       |
| 10+    | 575000       | 634000    | 697000       |

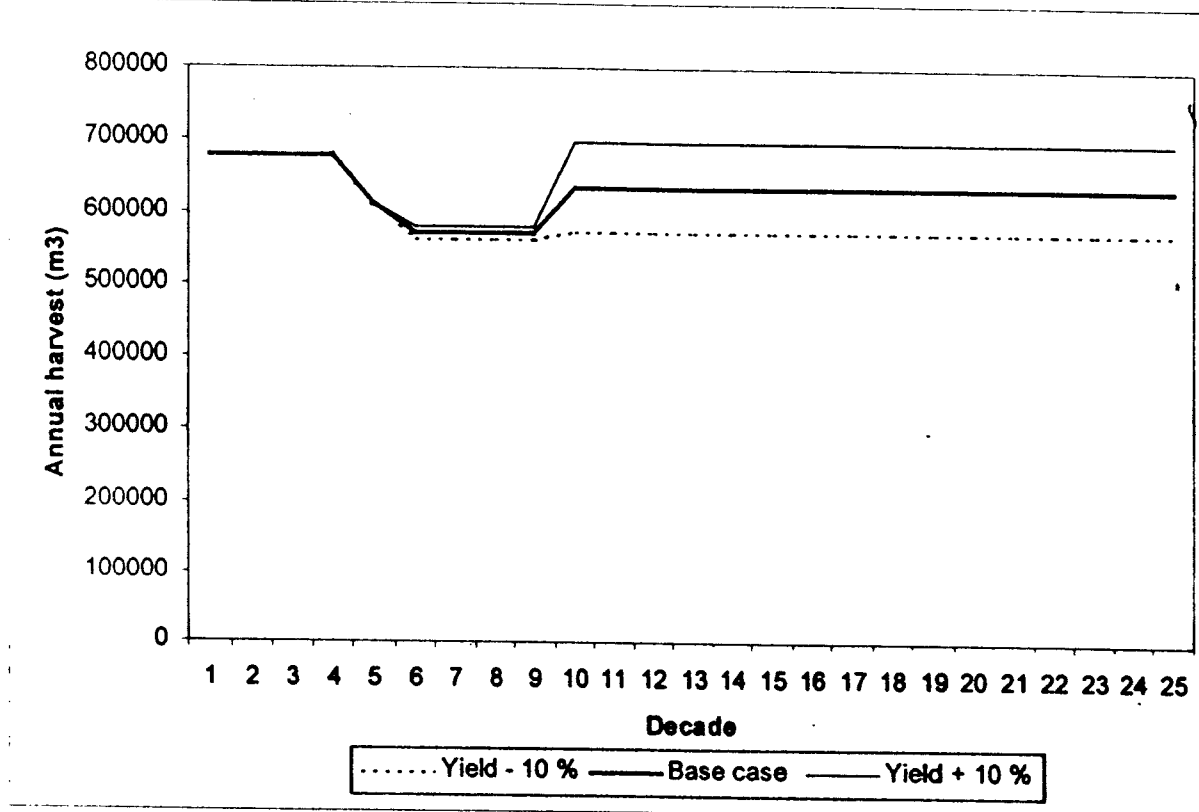


Figure 27. Net harvest levels – Adjust managed stand yields

### 7.9 Adjust Minimum Harvest Ages (managed stands)

Minimum harvest ages in the base case were established to coincide with the age at which mean annual increment (MAI) in volume culminates. This is an arbitrary approach, representing a conservative estimate of this age; *i.e.* in some cases it is reasonable to expect to harvest stands at an earlier age. The sensitivity to this assumption was tested by arbitrarily adjusting these ages by +/- 10 years. The results are presented in Table 11 and Figure 28. As the base case timber supply is primarily constrained by the availability of second growth timber in decade 8, the timber supply is sensitive to changes in this availability.

Table 11. Net harvest levels – Adjust minimum harvest ages (managed stands)

| Decade | Age + 10 years | Base case | Age – 10 years |
|--------|----------------|-----------|----------------|
| 1      | 680000         | 680000    | 680000         |
| 2      | 680000         | 680000    | 680000         |
| 3      | 612000         | 680000    | 680000         |
| 4      | 559000         | 680000    | 680000         |
| 5      | 559000         | 612000    | 680000         |
| 6      | 559000         | 572000    | 680000         |
| 7-8    | 559000         | 572000    | 612000         |
| 9      | 559000         | 572000    | 612000         |
| 10+    | 634000         | 634000    | 634000         |

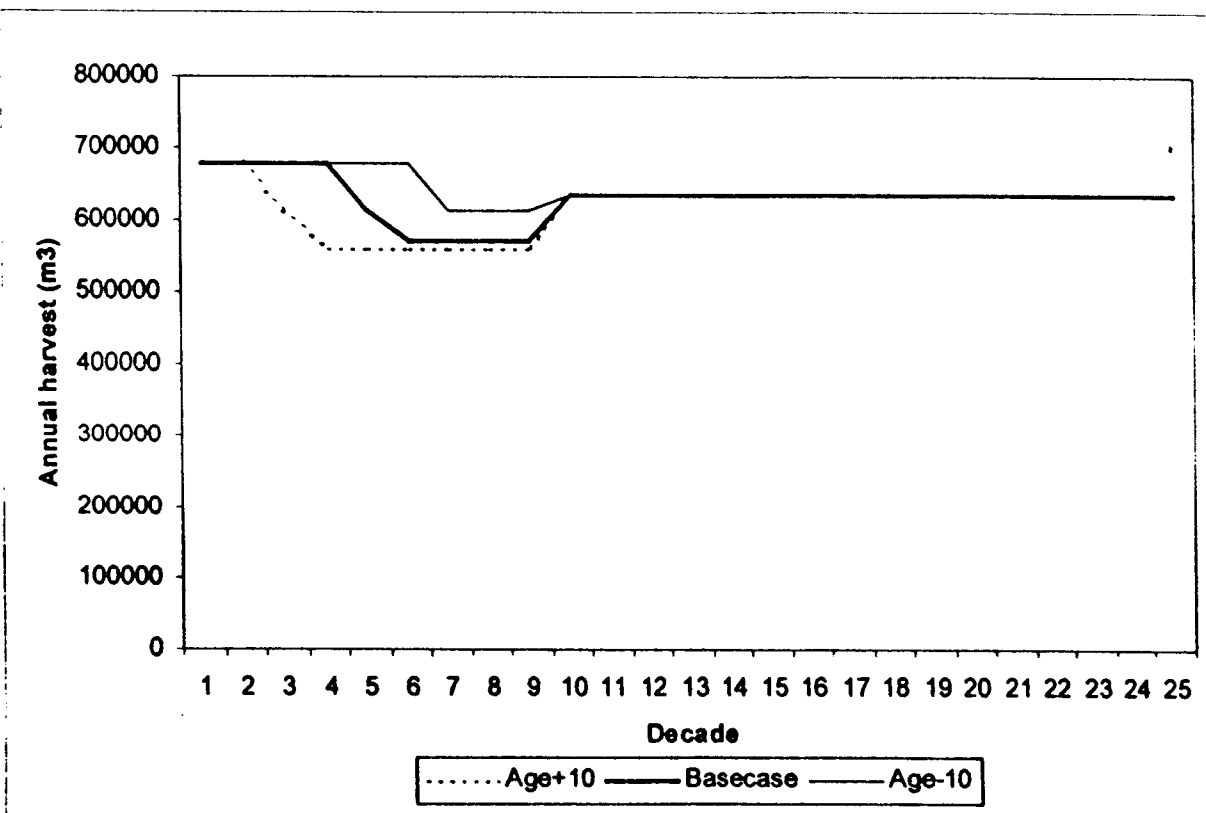


Figure 28. Net harvest levels – Adjust minimum harvest ages

### 7.10 Alter Regeneration Delay

The base case employs an average regeneration delay of two years, representing the average time between harvest and stand establishment. While this is deemed to be a reasonable expectation for TFL 23, a test was done to determine the sensitivity of the results to a change of +/- one year. As shown in Table 12 and Figure 29, a reduction in the delay increases timber availability by 1-2% in the short and medium terms.

Table 12. Net harvest levels – Alter regeneration delay

| Decade | 3 year delay | Base case | 1 year delay |
|--------|--------------|-----------|--------------|
| 1      | no impact    | 680000    | 680000       |
| 2      |              | 680000    | 680000       |
| 3      |              | 680000    | 680000       |
| 4      |              | 680000    | 680000       |
| 5      |              | 612000    | 634000       |
| 6      |              | 572000    | 612000       |
| 7-9    |              | 572000    | 579000       |
| 10+    |              | 634000    | 637000       |

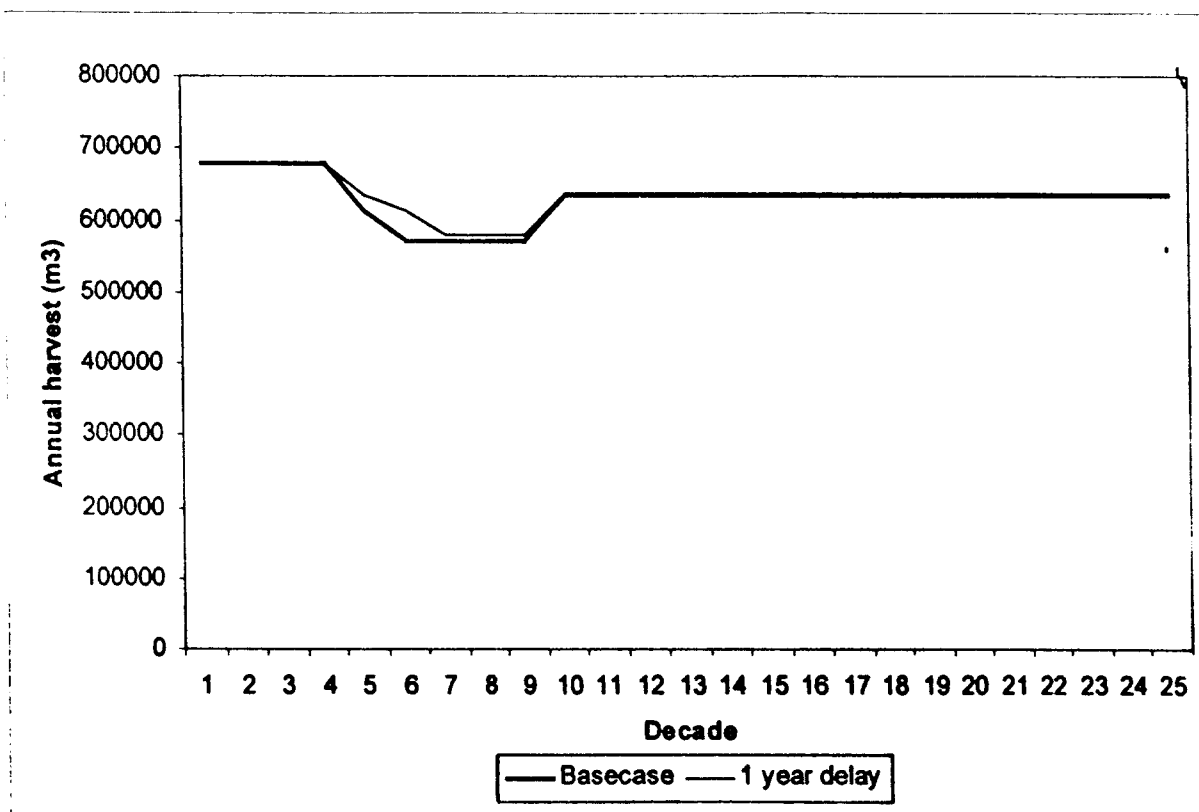


Figure 29. Net harvest levels – Alter regeneration delay



### 7.11 Alter Maximum Disturbance Levels – IRM, Caribou and Ungulate Winter Range

In the base case, maximum disturbance levels for these zones are set at 25%; *i.e.* the amount of area in the net harvestable landbase below green-up cannot exceed 25%. As shown in Table 13 and Figure 30, the timber supply is sensitive to changes in this objective, as timber supply is particularly limited in the second decade.

Table 13. Net harvest levels – Alter maximum disturbance levels – IRM, Caribou, UWR

| Decade | -5%    | Base case | + 5 %  |
|--------|--------|-----------|--------|
| 1      | 680000 | 680000    | 680000 |
| 2      | 574000 | 680000    | 680000 |
| 3      | 680000 | 680000    | 680000 |
| 4      | 654000 | 680000    | 680000 |
| 5      | 612000 | 612000    | 640000 |
| 6      | 572000 | 572000    | 612000 |
| 7-9    | 572000 | 572000    | 572000 |
| 10+    | 634000 | 634000    | 634000 |

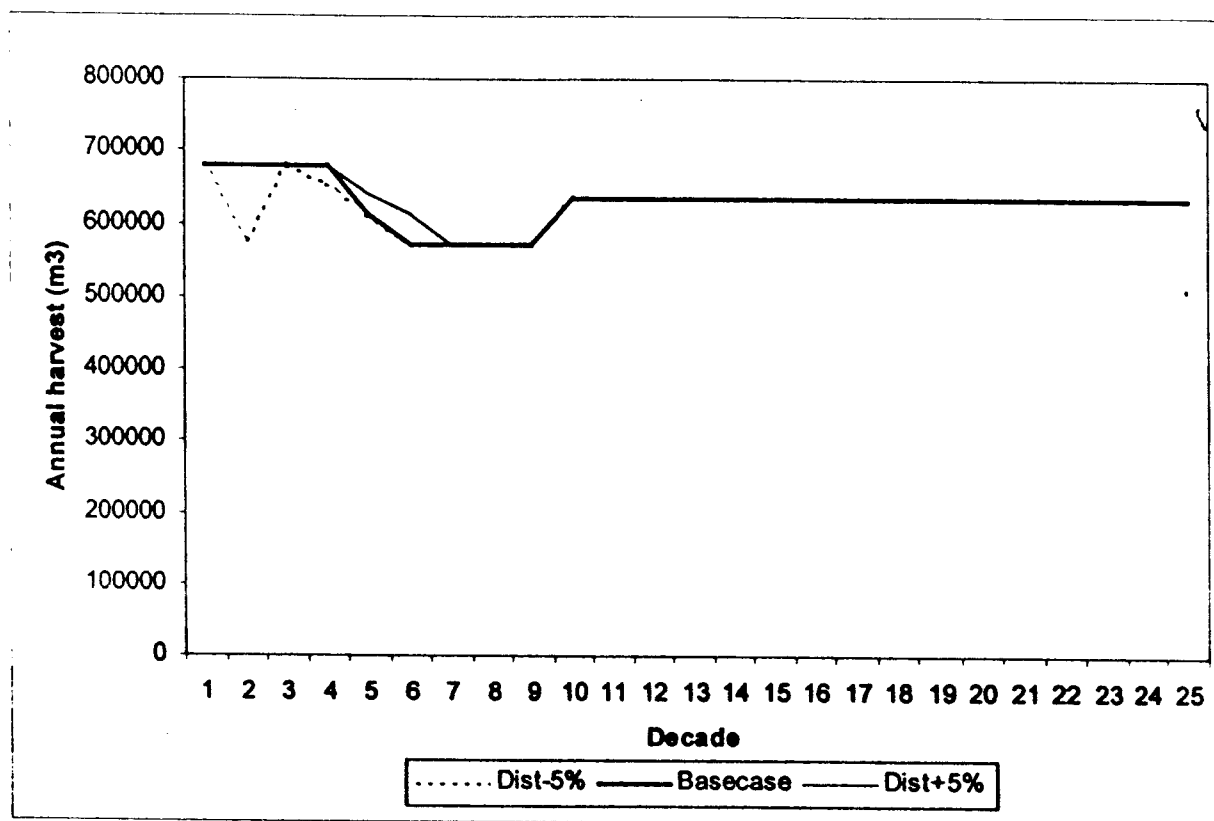


Figure 30. Net harvest levels – Alter maximum disturbance levels

### 7.12 Alter Caribou Thermal and Old Growth Objectives

Sensitivity tests were performed on the impacts of changing both the thermal and old growth objectives which control minimum levels of forest cover above specified ages. While the timber supply is insensitive to changes in the old growth objective established for caribou management zones, the mid-term supply is significantly impacted if the thermal objectives are altered by +/- 5%. This is shown in Table 14, and Figure 31.

Table 14. Net harvest levels – Alter caribou thermal cover objectives

| Decade | +5%    | Base case | -5 %   |
|--------|--------|-----------|--------|
| 1      | 680000 | 680000    | 680000 |
| 2      | 680000 | 680000    | 680000 |
| 3      | 680000 | 680000    | 680000 |
| 4      | 612000 | 680000    | 680000 |
| 5      | 585000 | 612000    | 616000 |
| 6      | 585000 | 572000    | 612000 |
| 7-9    | 585000 | 572000    | 572000 |
| 10+    | 632000 | 634000    | 637000 |

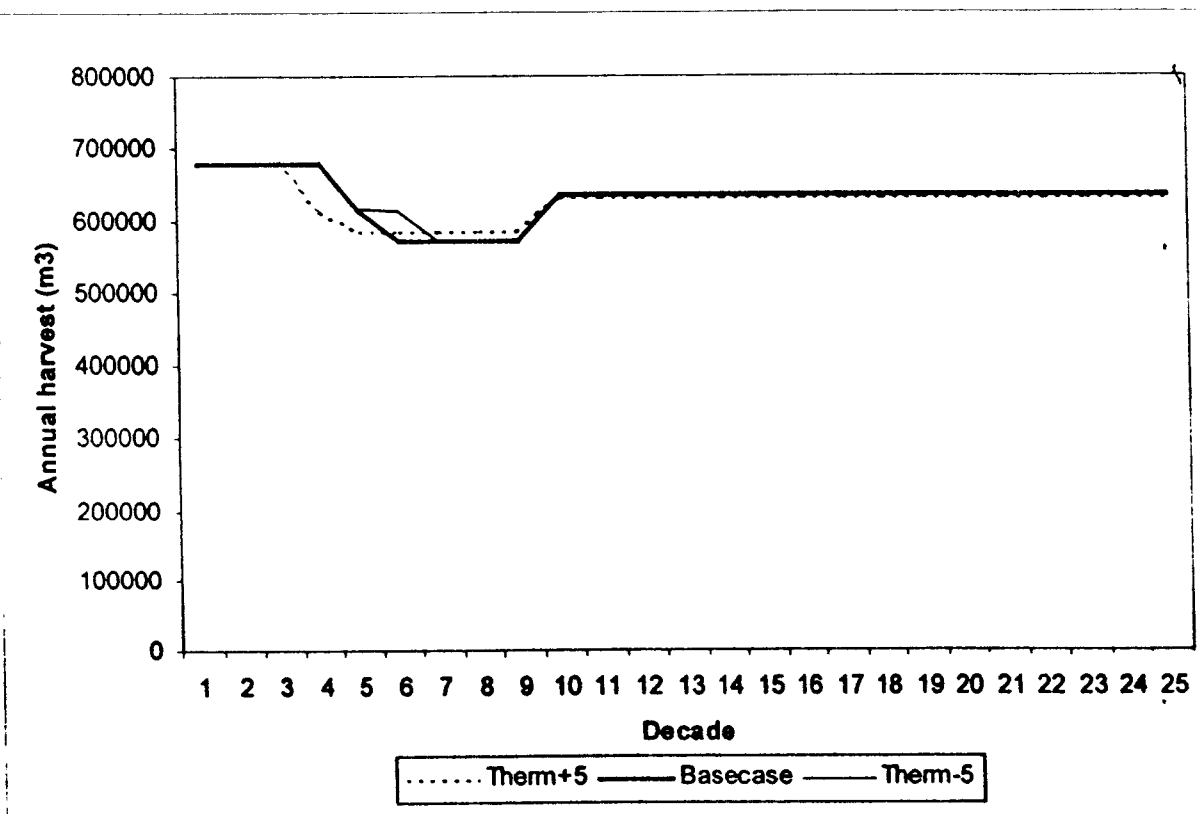


Figure 31. Net harvest levels – Alter caribou thermal cover objectives

### 7.13 Alter Ungulate Winter Range Thermal Objectives

A sensitivity test was also performed to test the impact of changing the thermal objective in the ungulate winter range zones. As was the case with the caribou zone analysis, the supply is significantly impacted if the thermal objectives are altered by +/- 5%. This is shown in Table 15 and Figure 32.

Table 15. Net harvest levels – Alter ungulate winter range thermal cover objectives

| Decade | +5%    | Base case | -5 %   |
|--------|--------|-----------|--------|
| 1      | 680000 | 680000    | 680000 |
| 2      | 680000 | 680000    | 680000 |
| 3      | 680000 | 680000    | 680000 |
| 4      | 663000 | 680000    | 680000 |
| 5      | 602000 | 612000    | 636000 |
| 6      | 572000 | 572000    | 584000 |
| 7-9    | 572000 | 572000    | 572000 |
| 10+    | 631000 | 634000    | 637000 |

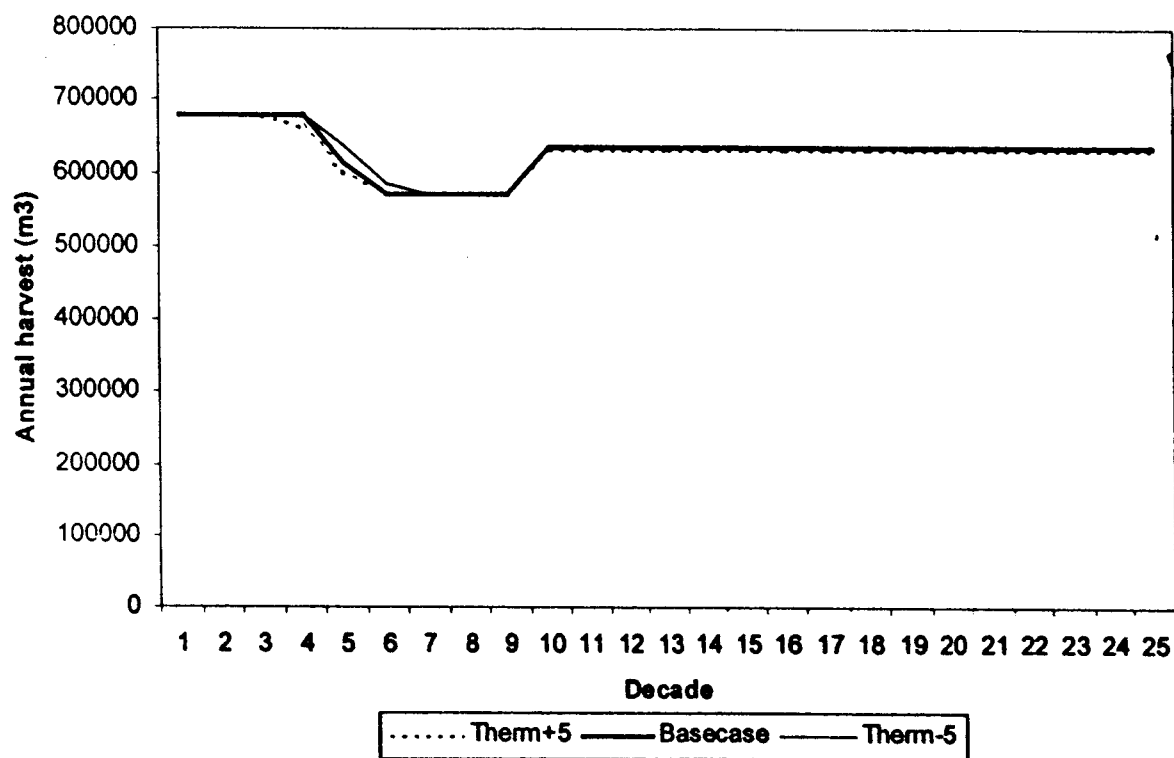


Figure 32. Net harvest levels – Alter ungulate winter range thermal cover objectives

#### 7.14 Alter Maximum Disturbance Levels – VQO

When the VQO objectives established in the base case were altered by +/- 5%, the timber supply was significantly impacted, as shown in Table 16, and Figure 33. Again, as was the case in Section 7.10, this can be explained by the fact that the base case timber supply is constrained by the level of disturbance predicted for decade 2.

Table 16. Net harvest levels – Alter disturbance objectives – VQO

| Decade | -5%    | Base case | +5 %   |
|--------|--------|-----------|--------|
| 1      | 680000 | 680000    | 680000 |
| 2      | 680000 | 680000    | 680000 |
| 3      | 646000 | 680000    | 680000 |
| 4      | 612000 | 680000    | 680000 |
| 5      | 572000 | 612000    | 666000 |
| 6      | 572000 | 572000    | 596000 |
| 7-9    | 559000 | 572000    | 572000 |
| 10+    | 632000 | 634000    | 637000 |

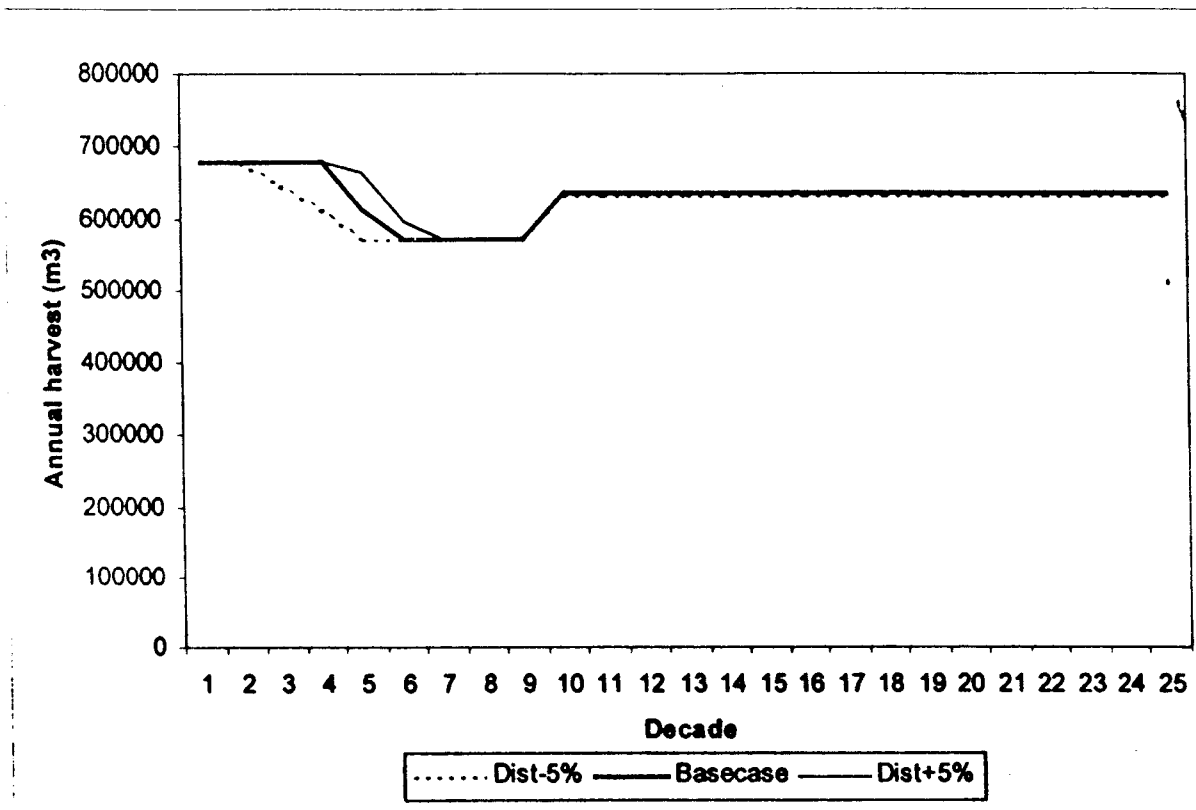


Figure 33. Net harvest levels – Alter disturbance objectives – VQO

### 7.15 Full Biodiversity Objectives in Low Emphasis Landscape Units

In the base case, only one-third of the old growth seral stage requirements were used initially for low emphasis biodiversity deployment landscape units. The objective sought was to meet the full biodiversity requirements over three rotations (240 years). The results were monitored to ensure that this in fact occurred in the analysis (Appendix 1). In this sensitivity analysis the full requirement was implemented immediately to determine if this would be constraining on timber supply. The results, as shown in Table 17 and Figure 34, indicate that this is clearly the case.

Table 17. Net harvest levels – Full biodiversity objectives in low emphasis

| Decade | Base case | Full low emphasis |
|--------|-----------|-------------------|
| 1      | 680000    | 680000            |
| 2      | 680000    | 680000            |
| 3      | 680000    | 612000            |
| 4      | 680000    | 612000            |
| 5      | 612000    | 572000            |
| 6-9    | 572000    | 572000            |
| 10+    | 634000    | 634000            |

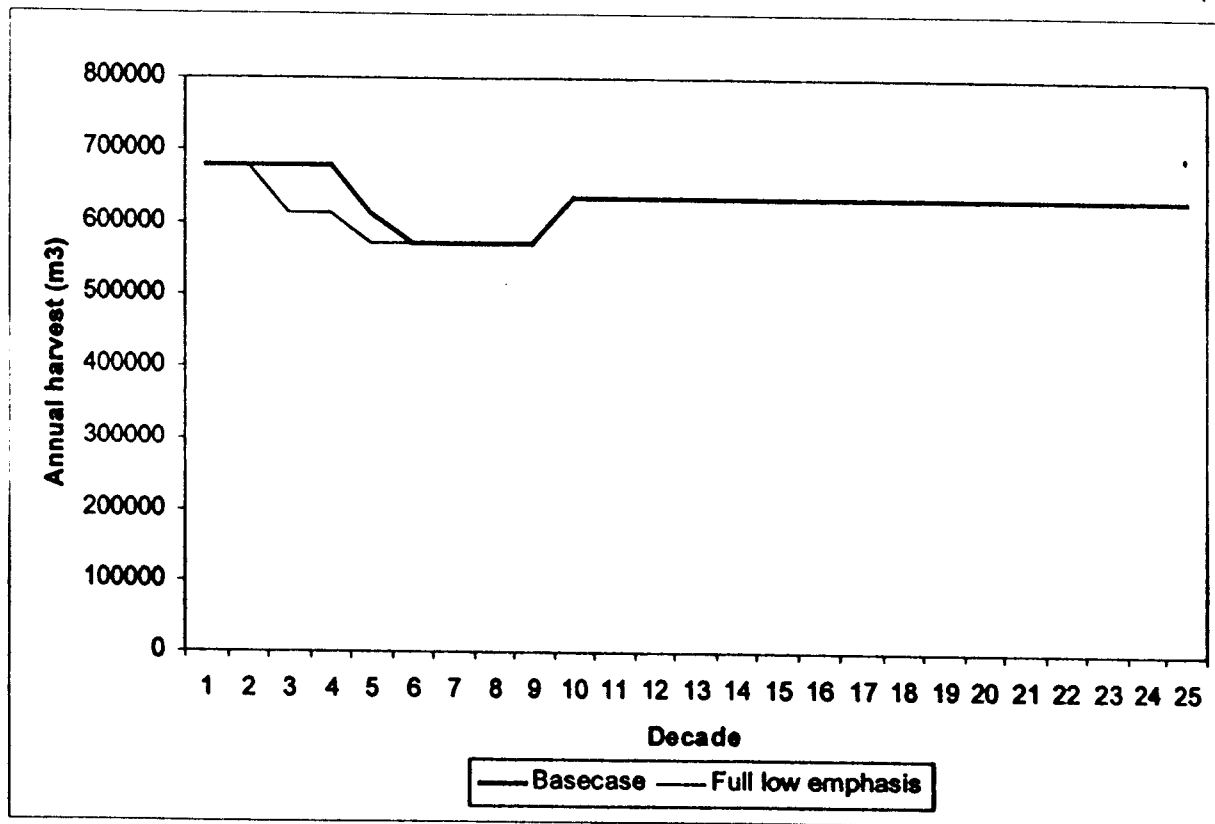


Figure 34. Full biodiversity objectives in low emphasis

## 7.16 Summary of Sensitivity Issues

Table 18 provides a summary of the impacts of the sensitivity issues explored in this section. Impacts (%) are only listed where the results differed from the base case by more than .5%. Impacts shown represent aggregate differences over the periods indicated, and are rounded to the nearest percentage value.

Table 18. Sensitivity analyses – summary

|                                                 |                                                 | Harvest level                  |                                |                        |
|-------------------------------------------------|-------------------------------------------------|--------------------------------|--------------------------------|------------------------|
|                                                 |                                                 | Decades 1-4<br>(40 year total) | Decades 5-9<br>(50 year total) | Long-term<br>(decadal) |
| Base Case Harvest (cubic metres) =              |                                                 | 27200000                       | 29000000                       | 6340000                |
| Issue tested                                    | Change from base case                           |                                |                                |                        |
| Shelter Bay block                               | remove 24 500 ha                                |                                | -10%                           | -11%                   |
| Marginal type contribution                      | shift 3,660 ha to harvestable status            |                                | +2%                            | 1%                     |
| Aerial operability cont.                        | Shift 19 504 ha to non-harvestable status       | -9%                            | -9%                            | -9%                    |
| Harvestable landbase                            | remove 10%                                      | -10%                           | -10%                           | -10%                   |
|                                                 | add 10%                                         | +10%                           | +10%                           | +10%                   |
| Low SI50 removal                                | Shift 4,360 ha (SI<9) to non-harvestable status | -1                             | -3                             | -1%                    |
| OGSI adjustments                                | increase regenerating yields                    |                                | +8%                            | +12%                   |
| Natural stand yield tables                      | yield – 10%                                     | -7%                            | -13%                           |                        |
|                                                 | yield + 10%                                     | +3%                            | +17%                           |                        |
| Managed stand yield tables                      | yield – 10%                                     |                                | -1%                            | -10%                   |
|                                                 | yield + 10%                                     |                                | +1%                            | +10%                   |
| Minimum harvest ages<br>(managed stands)        | +10 years                                       | -7%                            | -4%                            |                        |
|                                                 | -10 years                                       |                                | +10%                           |                        |
| Regeneration delay                              | 3 years                                         |                                |                                |                        |
|                                                 | 1 year                                          |                                | +3%                            |                        |
| Disturbance levels (IRM,<br>caribou, ungulates) | -5%                                             | -5%                            |                                |                        |
|                                                 | +5%                                             |                                | +2%                            |                        |
| Thermal cover objectives<br>(caribou)           | +5%                                             | -3%                            |                                |                        |
|                                                 | -5%                                             |                                | +2%                            |                        |
| Thermal cover objectives<br>(ungulates)         | +5%                                             | -1%                            |                                | -1%                    |
|                                                 | -5%                                             |                                | +1%                            | +1%                    |
| VQO disturbance objectives                      | -5%                                             | -4%                            | -3%                            |                        |
|                                                 | +5%                                             |                                | +3%                            |                        |
| Low emphasis biodiversity                       | Full guidebook values                           | -5%                            | -2%                            |                        |

Predictably, changes to the net harvestable landbase result in corresponding proportional changes to timber supply. While of interest, these changes are not anticipated to occur on TFL 23. Similarly, arbitrary changes in natural and managed stand yield forecasts have corresponding impacts on respectively short and long-term timber supplies. In terms of yield expectations, the OGSI adjustment impacts represent realistic expectations for increases in long-term yield, although they have not been incorporated into the base case, following the direction given by the Ministry of Forests.

Timber supply is very sensitive to changes in minimum harvest ages. Given the conservative nature of the minimum harvest ages employed in the base case, this represents a significant opportunity to enhance mid-term timber supplies, if earlier harvest age estimates can be substantiated.

The sensitivity of timber supply to changes in maximum disturbance levels is of concern, given the current state of flux with respect to these policies. Policy changes which result in more restrictive disturbance levels will result in significant downward pressure on the short-term timber supply on TFL 23. On the other hand, intensive landscape level planning efforts could result in significant improvement in short-term timber supplies. For example, although the current VQO maximum disturbance levels significantly impact on timber availability in the first 40 years, relaxation of these requirements in specific landscape units could enable harvesting activities specifically designed to lessen existing visual impacts.

The existing wildlife objectives also exert significant downward pressure on timber availability over the next 40 years. Pope and Talbot has undertaken an extensive re-valuation of caribou habitat requirements on TFL 23. The result has been a redefinition of the boundaries of identified caribou management areas. The impact of this change is explored in the next section.

## 8. Option 2. Pope and Talbot Caribou Habitat Option

A second option has also been analyzed. This option employs all of the base case inputs, with the exception of the definition of caribou management zones. In the base case, caribou management zones were those defined in the Kootenay-Boundary Land Use Plan (KBLUP) Implementation Strategy. However, Pope and Talbot has been redefining caribou habitat mapping and definition of habitat range using five years of telemetry data and field inventory studies. The resultant habitat zones encompass less area than was mapped for the KBLUP strategy, and have not at this time been fully accepted by the Ministry of Environment, Lands and Parks (MoELP). These refined zones were employed in Option 2.

The timber supply scenario associated with this option is presented in Table 19 and Figure 35. This analysis should be viewed as preliminary, as the full integration of the refined linework into the timber supply analysis database was not complete at the time of analysis. To evaluate this option, an earlier stage of the database was employed. This database included all of the themes incorporated into the final dataset, with the exception of existing and future road allowances. A relative impact was derived from this database by comparing the impacts of employing KBLUP vs. Pope and Talbot caribou linework. This relative impact (+19,000 cubic metres/year) was then applied to the base case results.

Table 19. Net harvest levels – Pope and Talbot Caribou option

| Decade | Base case | Caribou option |
|--------|-----------|----------------|
| 1      | 680000    | 699000         |
| 2      | 680000    | 699000         |
| 3      | 680000    | 699000         |
| 4      | 680000    | 699000         |
| 5      | 612000    | 631000         |
| 6-9    | 572000    | 591000         |
| 10+    | 634000    | 634000         |

The results of this analysis indicate that the Pope and Talbot caribou habitat definition is significantly less restrictive, making it possible to increase the annual harvest by approximately 19,000 cubic metres/year for the first 9 decades. While this analysis is preliminary in nature, owing to limitations on data readiness at time of analysis, it serves to demonstrate significant potential to mitigate impacts on timber supply associated with the protection of caribou habitat.

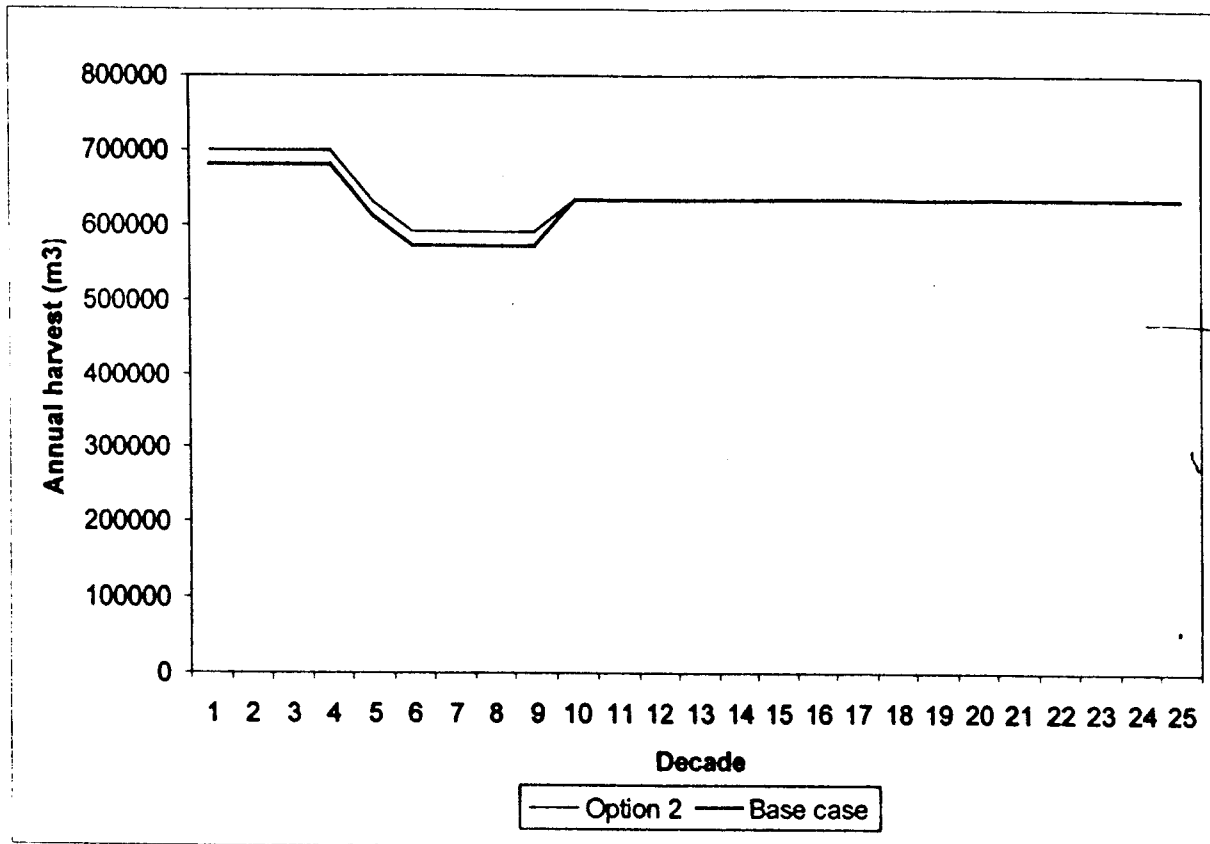


Figure 35. Pope and Talbot caribou option



## 9. Recommendations

Based on the results presented in this report, the following recommendations are put forward.

### 9.1 Allowable Annual Cut

It is proposed that the AAC for TFL 23 be set at 680,000 cubic metres for the period January 1, 1999 to December 31, 2003. This harvest is maintainable for a period of 40 years. It is then reduced by 10% in the fifth decade, and by 6.5% in the sixth decade to a minimum level of 572,000 cubic metres. The long-term level of 634,000 cubic metres is attained in decade 10.

This proposal is supported by the following analysis results:

1. The sustainability of the proposed AAC over a forty year period is clearly demonstrated.
2. Mid-term reductions are modest, and reasonable given the productive capacity of the landbase.
3. Long-term productivity is maintained within 8% of the theoretical maximum productivity of the landbase.
4. Sensitivity analyses demonstrate that the first decade harvest level is attainable, even under significant downward pressures.
5. The attendant 20-year spatial analysis demonstrates that, under a spatially explicit assessment of cut block adjacency requirements, the recommended AAC is in fact attainable over the 20 year spatial time frame.

### 9.2 Timber Supply Uncertainties

#### 9.2.1 Availability of Second Growth Volumes

Harvest volumes for the first 7 decades originate largely from existing mature and thrifty stands. Beyond this point, the harvest relies mainly on volume availability from regenerating managed stands. Timber availability is most constrained in decade 9, and further increases in supply are limited by this availability. Significant opportunities exist to extend the current AAC beyond the fourth decade if earlier minimum harvest ages can be achieved in second growth types.

#### 9.2.2 Impact of Maximum Disturbance Levels on Timber Supply

While the analysis demonstrates that the recommended AAC is attainable even with tightened disturbance requirements, forest cover disturbance levels are very close to the maximum levels during the first two decades. However, the disturbance levels defined in the analyses are surrogates for spatial objectives, which relate to the desirability of achieving specific forest structural patterns across the landscape. While the 20 year spatial feasibility analysis demonstrates feasibility under the terms of reference of the analysis, further opportunities to enhance timber supply are expected through additional landscape-level spatial analyses.

### 9.2.3 Impact of Wildlife Objectives on Timber Supply

Wildlife objectives, particularly caribou habitat requirements, exert significant downward pressure on timber supply, particularly in the mid-term. As demonstrated in Option 2, a more specific definition of habitat, resulting in smaller management zones, lessens this pressure significantly. Therefore, significant mid-term timber supply opportunities can be realized through application of these improved habitat definitions.

From the perspective of regional economic benefits, the incremental improvement in timber supply associated with the Pope and Talbot option 2 is significant. Based on an analysis prepared by the Interior Lumber Manufacturer's Association (ILMA) in 1996 for the Nelson Forest Region, it is estimated that each 1000 cubic metres of timber harvested equates to 1.43 direct jobs and 2.5 indirect and induced jobs, for a total of 3.93 jobs. Each job represents approximately 9 months of employment. Therefore, the additional 19,000 cubic metres of annual harvest available under Option 2 equates to 27 additional direct jobs and 47 additional indirect jobs.

## Appendix 1. Base Case Seral Stage and Forest Cover Summaries

Tables A1-A5 provide summaries of the seral stage and resource emphasis status by landscape unit. The target levels are presented, along with the actual percentages for specific periods in the simulation.

If disturbance maximums are initially exceeded, harvesting cannot occur until sufficient area has reached green-up age to reduce the disturbance percentage below the maximum. Once the maximum disturbance level has been reached within a management zone, the model will not permit the disturbed area to again exceed the maximum.

If seral stage, thermal or old growth minimum percentages are not met within a seral stage zone or management zone, the model will reserve from harvest sufficient area in the oldest ages below the target age, to make up the deficit. If surplus harvestable area still is available after this reservation, it can be scheduled for harvest.

Note: Occasionally the values reported in Tables A1-A5 will drop below the minimums or increase above the maximums by 1 percentage point. These reflect rounding errors.

Table A1. Seral stage percentages – base case – mature+old

| LU | Variant  | NDT | BEO      | Target | Achieved by period |     |     |     |     |     |
|----|----------|-----|----------|--------|--------------------|-----|-----|-----|-----|-----|
|    |          |     |          |        | Initial            | 5   | 10  | 15  | 20  | 25  |
| 1  | AT p     | 5   | average  | 30     | 94                 | 98  | 98  | 100 | 100 | 100 |
| 1  | ESSFwc 1 | 1   | average  | 30     | 14                 | 14  | 14  | 100 | 100 | 100 |
| 1  | ESSFwc 4 | 1   | average  | 30     | 79                 | 70  | 72  | 78  | 77  | 78  |
| 1  | ESSFwcp4 | 5   | average  | 30     | 100                | 100 | 100 | 100 | 100 | 100 |
| 1  | ICH mw 2 | 2   | average  | 25     | 65                 | 35  | 42  | 36  | 34  | 35  |
| 1  | ICH mw 3 | 3   | average  | 20     | 33                 | 20  | 20  | 17  | 16  | 19  |
| 1  | ICH wk 1 | 1   | average  | 28     | 42                 | 28  | 30  | 29  | 29  | 30  |
| 2  | AT p     | 5   | average  | 30     | 96                 | 96  | 96  | 100 | 100 | 100 |
| 2  | ESSFwc 4 | 1   | average  | 30     | 72                 | 44  | 46  | 49  | 46  | 48  |
| 2  | ICH mw 2 | 2   | average  | 25     | 56                 | 65  | 53  | 39  | 42  | 40  |
| 2  | ICH mw 3 | 3   | average  | 20     | 29                 | 29  | 41  | 32  | 33  | 32  |
| 2  | ICH wk 1 | 1   | average  | 28     | 40                 | 28  | 37  | 38  | 41  | 37  |
| 4  | AT p     | 5   | average  | 30     | 97                 | 98  | 98  | 100 | 100 | 100 |
| 4  | ESSFwc 4 | 1   | average  | 30     | 93                 | 79  | 78  | 82  | 80  | 80  |
| 4  | ICH mw 3 | 3   | average  | 28     | 70                 | 31  | 31  | 28  | 28  | 29  |
| 4  | ICH wk 1 | 1   | average  | 28     | 81                 | 81  | 97  | 97  | 97  | 97  |
| 10 | ESSFwc 1 | 1   | intermed | 36     | 32                 | 36  | 34  | 36  | 33  | 36  |
| 10 | ESSFwc 4 | 1   | intermed | 36     | 41                 | 35  | 36  | 35  | 36  | 36  |
| 10 | ICH dw   | 3   | intermed | 23     | 29                 | 60  | 47  | 43  | 45  | 45  |
| 10 | ICH mw 2 | 2   | intermed | 31     | 30                 | 51  | 31  | 31  | 30  | 30  |
| 11 | ESSFwc 1 | 1   | intermed | 36     | 24                 | 36  | 35  | 35  | 36  | 35  |
| 11 | ESSFwc 4 | 1   | intermed | 36     | 47                 | 36  | 34  | 35  | 35  | 36  |
| 11 | ESSFwcp4 | 5   | intermed | 36     | 94                 | 94  | 94  | 100 | 100 | 100 |
| 11 | ICH dw   | 3   | intermed | 23     | 38                 | 67  | 44  | 47  | 43  | 45  |
| 11 | ICH mw 2 | 2   | intermed | 31     | 26                 | 47  | 37  | 31  | 31  | 31  |
| 11 | IDF unn  | 4   | intermed | 34     | 25                 | 63  | 41  | 41  | 39  | 39  |
| 18 | ESSFwc 1 | 1   | low      | 19     | 21                 | 27  | 40  | 46  | 45  | 45  |
| 18 | ESSFwc 4 | 1   | low      | 19     | 46                 | 44  | 64  | 70  | 68  | 69  |
| 18 | ESSFwcp4 | 5   | low      | 19     | 69                 | 83  | 87  | 100 | 100 | 100 |
| 18 | ICH dw   | 3   | low      | 14     | 57                 | 52  | 47  | 47  | 49  | 56  |
| 18 | ICH mw 2 | 2   | low      | 15     | 45                 | 42  | 34  | 34  | 35  | 34  |
| 20 | ESSFwc 1 | 1   | intermed | 36     | 32                 | 36  | 36  | 36  | 36  | 34  |
| 20 | ESSFwc 4 | 1   | intermed | 36     | 62                 | 37  | 39  | 44  | 41  | 43  |
| 20 | ESSFwcp4 | 5   | intermed | 36     | 91                 | 91  | 91  | 100 | 100 | 100 |
| 20 | ICH dw   | 3   | low      | 14     | 37                 | 39  | 41  | 50  | 34  | 26  |
| 20 | ICH mw 2 | 2   | low      | 15     | 44                 | 24  | 21  | 20  | 20  | 21  |
| 20 | ICH wk 1 | 1   | low      | 17     | 66                 | 23  | 25  | 28  | 26  | 25  |
| 21 | ESSFwc 1 | 1   | intermed | 36     | 32                 | 53  | 45  | 44  | 37  | 37  |
| 21 | ESSFwc 4 | 1   | intermed | 36     | 42                 | 55  | 60  | 64  | 62  | 62  |
| 21 | ESSFwcp4 | 5   | intermed | 36     | 64                 | 82  | 97  | 100 | 100 | 100 |
| 21 | ICH mw 2 | 2   | intermed | 31     | 66                 | 49  | 36  | 31  | 31  | 32  |
| 26 | ESSFwc 1 | 1   | low      | 19     | 43                 | 30  | 37  | 51  | 56  | 41  |
| 26 | ESSFwc 4 | 1   | low      | 19     | 81                 | 69  | 70  | 88  | 92  | 76  |
| 26 | ESSFwcp4 | 5   | low      | 19     | 100                | 100 | 100 | 100 | 100 | 100 |
| 26 | ICH mw 2 | 2   | low      | 15     | 47                 | 32  | 38  | 34  | 34  | 36  |
| 27 | ESSFwc 1 | 1   | intermed | 36     | 58                 | 35  | 36  | 35  | 32  | 36  |
| 27 | ESSFwc 4 | 1   | intermed | 36     | 75                 | 47  | 47  | 56  | 53  | 53  |
| 27 | ESSFwcp4 | 5   | intermed | 36     | 100                | 100 | 100 | 100 | 100 | 100 |
| 27 | ICH mw 2 | 2   | low      | 15     | 50                 | 17  | 19  | 20  | 20  | 20  |
| 27 | ICH wk 1 | 1   | low      | 17     | 57                 | 27  | 32  | 36  | 38  | 36  |
| 29 | ESSFwc 1 | 1   | high     | 54     | 79                 | 60  | 64  | 69  | 67  | 67  |
| 29 | ESSFwc 4 | 1   | high     | 54     | 85                 | 78  | 81  | 91  | 89  | 89  |
| 29 | ESSFwcp4 | 5   | high     | 54     | 83                 | 83  | 88  | 100 | 100 | 100 |
| 29 | ICH mw 2 | 2   | intermed | 31     | 57                 | 43  | 38  | 36  | 38  | 37  |
| 29 | ICH wk 1 | 1   | intermed | 34     | 74                 | 54  | 61  | 61  | 59  | 58  |
| 30 | ESSFwc 1 | 1   | high     | 54     | 81                 | 54  | 54  | 59  | 54  | 55  |
| 30 | ESSFwc 4 | 1   | high     | 54     | 82                 | 72  | 72  | 85  | 87  | 85  |
| 30 | ESSFwcp4 | 5   | high     | 54     | 81                 | 83  | 84  | 100 | 100 | 100 |
| 30 | ICH mw 2 | 2   | high     | 46     | 55                 | 45  | 46  | 45  | 46  | 44  |
| 30 | ICH wk 1 | 1   | high     | 51     | 82                 | 55  | 57  | 55  | 53  | 54  |
| 30 | ICH wk 1 | 1   | high     | 51     | 68                 | 51  | 55  | 50  | 51  | 50  |
| 31 | ESSFvc   | 1   | low      | 19     | 97                 | 97  | 99  | 99  | 99  | 99  |
| 31 | ESSFwcp  | 5   | low      | 19     | 95                 | 95  | 95  | 100 | 100 | 100 |
| 31 | ESSFwc 1 | 1   | low      | 19     | 84                 | 57  | 55  | 61  | 64  | 64  |
| 31 | ESSFwc 4 | 1   | low      | 19     | 85                 | 77  | 79  | 88  | 88  | 87  |
| 31 | ESSFwcp4 | 5   | low      | 19     | 72                 | 74  | 82  | 100 | 100 | 100 |
| 31 | ICH mw 2 | 2   | low      | 15     | 39                 | 33  | 25  | 26  | 26  | 26  |
| 31 | ICH wk 1 | 1   | low      | 17     | 70                 | 43  | 83  | 56  | 54  | 57  |
| 31 | ICH wk 1 | 1   | low      | 17     | 68                 | 58  | 59  | 64  | 65  | 64  |

Table A2. Seral stage percentages – base case – old

| LU | Variant  | NDT | BEO      | Target | Achieved by period |     |     |     |     |     |
|----|----------|-----|----------|--------|--------------------|-----|-----|-----|-----|-----|
|    |          |     |          |        | Initial            | 5   | 10  | 15  | 20  | 25  |
| 1  | AT p     | 5   | average  | 14     | 0                  | 94  | 94  | 94  | 98  | 99  |
| 1  | ESSFwc 1 | 1   | average  | 14     | 0                  | 14  | 14  | 14  | 14  | 92  |
| 1  | ESSFwc 4 | 1   | average  | 14     | 3                  | 68  | 68  | 69  | 71  | 74  |
| 1  | ESSFwcp4 | 5   | average  | 14     | 0                  | 100 | 100 | 100 | 100 | 100 |
| 1  | ICH mw 2 | 2   | average  | 3      | 1                  | 7   | 7   | 25  | 32  | 34  |
| 1  | ICH mw 3 | 3   | average  | 5      | 33                 | 20  | 10  | 15  | 11  | 11  |
| 1  | ICH wk 1 | 1   | average  | 4      | 6                  | 26  | 21  | 17  | 19  | 25  |
| 2  | AT p     | 5   | average  | 14     | 0                  | 96  | 96  | 96  | 96  | 100 |
| 2  | ESSFwc 4 | 1   | average  | 14     | 0                  | 43  | 43  | 44  | 45  | 46  |
| 2  | ICH mw 2 | 2   | average  | 3      | 0                  | 8   | 7   | 19  | 26  | 38  |
| 2  | ICH mw 3 | 3   | average  | 5      | 28                 | 15  | 19  | 31  | 31  | 31  |
| 2  | ICH wk 1 | 1   | average  | 4      | 1                  | 22  | 22  | 23  | 28  | 36  |
| 4  | AT p     | 5   | average  | 14     | 0                  | 97  | 97  | 97  | 98  | 100 |
| 4  | ESSFwc 4 | 1   | average  | 14     | 2                  | 76  | 74  | 76  | 77  | 80  |
| 4  | ICH mw 3 | 3   | average  | 5      | 34                 | 25  | 25  | 27  | 27  | 27  |
| 4  | ICH wk 1 | 1   | average  | 4      | 14                 | 73  | 73  | 75  | 80  | 97  |
| 10 | ESSFwc 1 | 1   | intermed | 19     | 2                  | 19  | 18  | 19  | 21  | 23  |
| 10 | ESSFwc 4 | 1   | intermed | 19     | 0                  | 20  | 18  | 18  | 25  | 24  |
| 10 | ICH dw   | 3   | intermed | 14     | 17                 | 17  | 42  | 41  | 41  | 41  |
| 10 | ICH mw 2 | 2   | intermed | 9      | 2                  | 9   | 8   | 9   | 17  | 19  |
| 11 | ESSFwc 1 | 1   | intermed | 19     | 0                  | 13  | 16  | 19  | 23  | 28  |
| 11 | ESSFwc 4 | 1   | intermed | 19     | 0                  | 23  | 17  | 19  | 20  | 25  |
| 11 | ESSFwcp4 | 5   | intermed | 19     | 0                  | 88  | 88  | 94  | 94  | 94  |
| 11 | ICH dw   | 3   | intermed | 14     | 15                 | 16  | 41  | 43  | 43  | 43  |
| 11 | ICH mw 2 | 2   | intermed | 9      | 0                  | 0   | 0   | 9   | 20  | 27  |
| 11 | IDF unn  | 4   | intermed | 13     | 0                  | 0   | 4   | 8   | 38  | 39  |
| 18 | ESSFwc 1 | 1   | low      | 6      | 0                  | 7   | 6   | 12  | 31  | 42  |
| 18 | ESSFwc 4 | 1   | low      | 6      | 0                  | 19  | 22  | 35  | 53  | 67  |
| 18 | ESSFwcp4 | 5   | low      | 6      | 0                  | 40  | 55  | 77  | 83  | 96  |
| 18 | ICH dw   | 3   | low      | 5      | 28                 | 26  | 41  | 47  | 47  | 48  |
| 18 | ICH mw 2 | 2   | low      | 3      | 0                  | 3   | 3   | 7   | 20  | 26  |
| 20 | ESSFwc 1 | 1   | intermed | 19     | 2                  | 19  | 18  | 18  | 19  | 23  |
| 20 | ESSFwc 4 | 1   | intermed | 19     | 1                  | 32  | 29  | 31  | 33  | 38  |
| 20 | ESSFwcp4 | 5   | intermed | 19     | 2                  | 88  | 88  | 91  | 91  | 92  |
| 20 | ICH dw   | 3   | low      | 5      | 12                 | 6   | 29  | 38  | 33  | 26  |
| 20 | ICH mw 2 | 2   | low      | 3      | 2                  | 3   | 2   | 5   | 11  | 18  |
| 20 | ICH wk 1 | 1   | low      | 4      | 37                 | 11  | 11  | 13  | 19  | 21  |
| 21 | ESSFwc 1 | 1   | intermed | 19     | 2                  | 18  | 18  | 18  | 31  | 36  |
| 21 | ESSFwc 4 | 1   | intermed | 19     | 0                  | 19  | 20  | 27  | 55  | 62  |
| 21 | ESSFwcp4 | 5   | intermed | 19     | 0                  | 63  | 64  | 64  | 90  | 100 |
| 21 | ICH mw 2 | 2   | intermed | 9      | 2                  | 5   | 6   | 13  | 21  | 27  |
| 26 | ESSFwc 1 | 1   | low      | 6      | 0                  | 17  | 17  | 25  | 29  | 35  |
| 26 | ESSFwc 4 | 1   | low      | 6      | 0                  | 58  | 58  | 64  | 68  | 72  |
| 26 | ESSFwcp4 | 5   | low      | 6      | 0                  | 96  | 96  | 100 | 100 | 100 |
| 26 | ICH mw 2 | 2   | low      | 3      | 1                  | 3   | 3   | 7   | 11  | 18  |
| 27 | ESSFwc 1 | 1   | intermed | 19     | 6                  | 29  | 28  | 21  | 19  | 23  |
| 27 | ESSFwc 4 | 1   | intermed | 19     | 4                  | 44  | 44  | 45  | 46  | 49  |
| 27 | ESSFwcp4 | 5   | intermed | 19     | 0                  | 100 | 100 | 100 | 100 | 100 |
| 27 | ICH mw 2 | 2   | low      | 3      | 3                  | 4   | 4   | 8   | 9   | 15  |
| 27 | ICH wk 1 | 1   | low      | 4      | 7                  | 12  | 12  | 20  | 26  | 30  |
| 29 | ESSFwc 1 | 1   | high     | 28     | 13                 | 44  | 45  | 54  | 57  | 63  |
| 29 | ESSFwc 4 | 1   | high     | 28     | 7                  | 68  | 69  | 75  | 77  | 81  |
| 29 | ESSFwcp4 | 5   | high     | 28     | 3                  | 80  | 80  | 83  | 85  | 90  |
| 29 | ICH mw 2 | 2   | intermed | 9      | 3                  | 12  | 13  | 19  | 24  | 29  |
| 29 | ICH wk 1 | 1   | intermed | 13     | 21                 | 37  | 37  | 46  | 49  | 56  |
| 30 | ESSFwc 1 | 1   | high     | 28     | 6                  | 46  | 45  | 45  | 41  | 46  |
| 30 | ESSFwc 4 | 1   | high     | 28     | 3                  | 67  | 64  | 67  | 69  | 73  |
| 30 | ESSFwcp4 | 5   | high     | 28     | 1                  | 80  | 80  | 83  | 83  | 87  |
| 30 | ICH mw 2 | 2   | high     | 13     | 3                  | 22  | 18  | 27  | 36  | 40  |
| 30 | ICH wk 1 | 1   | high     | 19     | 10                 | 37  | 36  | 52  | 51  | 52  |
| 30 | ICH wk 1 | 1   | high     | 19     | 16                 | 40  | 37  | 36  | 39  | 47  |
| 31 | ESSFwc   | 1   | low      | 6      | 2                  | 97  | 97  | 97  | 99  | 99  |
| 31 | ESSFwcp  | 5   | low      | 6      | 0                  | 95  | 95  | 95  | 95  | 100 |
| 31 | ESSFwc 1 | 1   | low      | 6      | 17                 | 54  | 51  | 51  | 52  | 59  |
| 31 | ESSFwc 4 | 1   | low      | 6      | 9                  | 74  | 74  | 75  | 75  | 83  |
| 31 | ESSFwcp4 | 5   | low      | 6      | 6                  | 72  | 72  | 72  | 75  | 94  |
| 31 | ICH mw 2 | 2   | low      | 3      | 3                  | 5   | 5   | 11  | 20  | 25  |
| 31 | ICH wk 1 | 1   | low      | 4      | 23                 | 35  | 35  | 38  | 41  | 52  |
| 31 | ICH wk 1 | 1   | low      | 4      | 12                 | 28  | 27  | 33  | 49  | 59  |

Table A3. REA disturbance percentages – base case

| LU | REA      | Age | Target | Achieved by period |    |    |    |    |    |
|----|----------|-----|--------|--------------------|----|----|----|----|----|
|    |          |     |        | Initial            | 5  | 10 | 15 | 20 | 25 |
| 1  | Uwr-ich  | 15  | 25     | 3                  | 5  | 18 | 5  | 22 | 8  |
| 1  | IRM      | 15  | 25     | 15                 | 11 | 24 | 14 | 24 | 17 |
| 2  | Dom-H20  | 27  | 25     | 28                 | 3  | 24 | 15 | 24 | 17 |
| 2  | Uwr-ich  | 15  | 25     | 4                  | 0  | 24 | 1  | 22 | 3  |
| 2  | IRM      | 15  | 25     | 27                 | 16 | 24 | 10 | 24 | 13 |
| 4  | Dom-H20  | 27  | 25     | 0                  | 24 | 10 | 24 | 24 | 24 |
| 4  | Uwr-ich  | 15  | 25     | 3                  | 17 | 8  | 16 | 8  | 21 |
| 4  | IRM      | 15  | 25     | 4                  | 24 | 16 | 24 | 15 | 24 |
| 10 | Dom-H20  | 27  | 25     | 14                 | 13 | 25 | 24 | 24 | 25 |
| 10 | Uwr-ich  | 15  | 25     | 1                  | 17 | 10 | 17 | 14 | 14 |
| 10 | IRM      | 15  | 25     | 4                  | 19 | 11 | 17 | 13 | 18 |
| 11 | Com-H20  | 36  | 20     | 0                  | 5  | 9  | 11 | 10 | 10 |
| 11 | Dom-H20  | 27  | 25     | 17                 | 16 | 24 | 19 | 24 | 22 |
| 11 | Uwr-ich  | 15  | 25     | 1                  | 24 | 5  | 22 | 4  | 18 |
| 11 | Uwr-idf  | 15  | 25     | 9                  | 21 | 18 | 17 | 18 | 18 |
| 11 | IRM      | 15  | 25     | 3                  | 11 | 16 | 9  | 12 | 16 |
| 18 | VQO-east | 24  | 15     | 0                  | 14 | 14 | 14 | 14 | 14 |
| 18 | Com-H20  | 36  | 20     | 16                 | 19 | 19 | 20 | 20 | 19 |
| 18 | Dom-H20  | 27  | 25     | 1                  | 25 | 23 | 24 | 24 | 25 |
| 18 | Uwr-ich  | 15  | 25     | 1                  | 18 | 10 | 22 | 8  | 24 |
| 18 | IRM      | 15  | 25     | 6                  | 18 | 11 | 21 | 15 | 23 |
| 20 | VQO-east | 24  | 15     | 10                 | 14 | 14 | 14 | 14 | 14 |
| 20 | Dom-H20  | 27  | 25     | 2                  | 24 | 24 | 16 | 24 | 23 |
| 20 | Uwr-ich  | 15  | 25     | 0                  | 24 | 7  | 24 | 7  | 16 |
| 20 | IRM      | 15  | 25     | 7                  | 18 | 14 | 19 | 16 | 16 |
| 21 | VQO-east | 24  | 15     | 0                  | 14 | 14 | 14 | 14 | 14 |
| 21 | Dom-H20  | 27  | 25     | 21                 | 24 | 24 | 24 | 24 | 24 |
| 21 | Uwr-ich  | 15  | 25     | 0                  | 0  | 7  | 20 | 0  | 20 |
| 21 | IRM      | 15  | 25     | 8                  | 25 | 8  | 24 | 9  | 24 |
| 26 | VQO-west | 24  | 15     | 14                 | 14 | 15 | 15 | 15 | 15 |
| 26 | Dom-H20  | 27  | 25     | 14                 | 12 | 24 | 12 | 13 | 14 |
| 26 | Uwr-ich  | 15  | 25     | 9                  | 10 | 12 | 16 | 12 | 23 |
| 26 | IRM      | 15  | 25     | 4                  | 20 | 20 | 21 | 21 | 22 |
| 27 | VQO-east | 24  | 15     | 12                 | 14 | 14 | 14 | 14 | 14 |
| 27 | Uwr-ich  | 15  | 25     | 11                 | 9  | 15 | 7  | 11 | 0  |
| 27 | IRM      | 15  | 25     | 15                 | 22 | 20 | 22 | 24 | 22 |
| 29 | Car-essf | 15  | 25     | 3                  | 24 | 8  | 24 | 17 | 23 |
| 29 | Car-ich  | 15  | 25     | 8                  | 10 | 12 | 14 | 12 | 15 |
| 29 | VQO-east | 24  | 15     | 7                  | 14 | 14 | 14 | 14 | 14 |
| 29 | Com-H20  | 36  | 20     | 36                 | 8  | 18 | 18 | 16 | 17 |
| 29 | Dom-H20  | 27  | 25     | 13                 | 25 | 21 | 25 | 24 | 24 |
| 29 | Uwr-ich  | 15  | 25     | 4                  | 19 | 8  | 14 | 7  | 17 |
| 29 | IRM      | 15  | 25     | 7                  | 24 | 13 | 24 | 13 | 24 |
| 30 | Car-essf | 15  | 25     | 7                  | 24 | 9  | 24 | 17 | 15 |
| 30 | Car-ich  | 15  | 25     | 5                  | 3  | 19 | 6  | 19 | 7  |
| 30 | Com-H20  | 36  | 20     | 31                 | 19 | 19 | 13 | 18 | 19 |
| 30 | Dom-H20  | 27  | 25     | 11                 | 13 | 23 | 18 | 24 | 18 |
| 30 | IRM      | 15  | 25     | 3                  | 3  | 24 | 16 | 24 | 16 |
| 31 | Car-essf | 15  | 25     | 0                  | 23 | 2  | 22 | 16 | 17 |
| 31 | Car-ich  | 15  | 25     | 0                  | 8  | 1  | 19 | 2  | 18 |
| 31 | Dom-H20  | 27  | 25     | 2                  | 24 | 12 | 19 | 24 | 20 |
| 31 | Uwr-ich  | 15  | 25     | 0                  | 18 | 0  | 18 | 0  | 13 |
| 31 | IRM      | 15  | 25     | 16                 | 24 | 23 | 24 | 24 | 24 |

Table A4. REA thermal percentages – base case

| LU | REA      | Age | Target | Achieved by period |    |    |    |    |    |
|----|----------|-----|--------|--------------------|----|----|----|----|----|
|    |          |     |        | Initial            | 5  | 10 | 15 | 20 | 25 |
| 1  | Uwr-ich  | 120 | 40     | 44                 | 40 | 40 | 40 | 40 | 40 |
| 2  | Uwr-ich  | 120 | 40     | 20                 | 37 | 40 | 40 | 40 | 40 |
| 4  | Uwr-ich  | 120 | 40     | 31                 | 40 | 40 | 40 | 40 | 40 |
| 10 | Uwr-ich  | 120 | 40     | 25                 | 40 | 40 | 40 | 40 | 40 |
| 11 | Uwr-ich  | 120 | 40     | 18                 | 45 | 39 | 39 | 39 | 39 |
| 11 | Uwr-idf  | 120 | 25     | 6                  | 30 | 27 | 27 | 24 | 24 |
| 18 | Uwr-ich  | 120 | 40     | 44                 | 39 | 39 | 39 | 39 | 39 |
| 20 | Uwr-ich  | 120 | 40     | 21                 | 46 | 40 | 42 | 40 | 40 |
| 21 | Uwr-ich  | 120 | 40     | 0                  | 40 | 40 | 79 | 71 | 71 |
| 26 | Uwr-ich  | 120 | 40     | 22                 | 39 | 39 | 39 | 39 | 39 |
| 27 | Uwr-ich  | 120 | 40     | 15                 | 76 | 45 | 53 | 67 | 64 |
| 29 | Car-essf | 140 | 30     | 82                 | 31 | 29 | 34 | 29 | 29 |
| 29 | Car-ich  | 140 | 40     | 48                 | 40 | 40 | 40 | 40 | 40 |
| 29 | Uwr-ich  | 120 | 40     | 52                 | 40 | 40 | 40 | 40 | 40 |
| 30 | Car-essf | 140 | 30     | 82                 | 33 | 29 | 29 | 29 | 29 |
| 30 | Car-ich  | 140 | 40     | 59                 | 40 | 40 | 39 | 39 | 39 |
| 31 | Car-essf | 140 | 30     | 97                 | 36 | 30 | 30 | 30 | 30 |
| 31 | Car-ich  | 140 | 40     | 96                 | 51 | 47 | 47 | 47 | 47 |
| 31 | Uwr-ich  | 120 | 40     | 4                  | 56 | 81 | 81 | 81 | 81 |

Table A5. REA old growth percentages – base case

| LU | REA      | Age | Target | Achieved by period |    |    |    |    |    |
|----|----------|-----|--------|--------------------|----|----|----|----|----|
|    |          |     |        | Initial            | 5  | 10 | 15 | 20 | 25 |
| 29 | Car-essf | 250 | 10     | 8                  | 15 | 16 | 24 | 18 | 19 |
| 29 | Car-ich  | 250 | 10     | 14                 | 28 | 29 | 34 | 36 | 39 |
| 29 | Car-oper | 140 | 70     | 77                 | 74 | 80 | 89 | 88 | 88 |
| 30 | Car-essf | 250 | 10     | 6                  | 28 | 23 | 21 | 16 | 16 |
| 30 | Car-ich  | 250 | 10     | 13                 | 30 | 28 | 30 | 34 | 38 |
| 30 | Car-oper | 140 | 70     | 79                 | 71 | 72 | 86 | 84 | 85 |
| 31 | Car-essf | 250 | 10     | 2                  | 36 | 29 | 27 | 17 | 14 |
| 31 | Car-ich  | 250 | 10     | 14                 | 50 | 46 | 47 | 47 | 47 |
| 31 | Car-oper | 140 | 70     | 89                 | 82 | 86 | 87 | 86 | 86 |

## **APPENDIX V**

### **V.3 Chief Forester's Rationale For AAC Determination**