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Socio-economic
evaluation of the
Prophet River and

Final Report

SOCIO-ECONOMIC EVALUATION OF THE PROPHET RIVER AND SIKANNI CHIEF OLD GROWTH AREAS

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B.C. Ministry of Forests**

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1.0 Introduction

The following report discusses the socio-economic implications of permanently deferring timber harvesting in the designated old growth areas of the Prophet River and the Sikanni Chief River respectively, both of which are located in north-eastern B.C. just south of the town of Fort Nelson. The report is based on information assembled through interviews with Ministry of Forests and other resource agency officials, with area timber licensees, and with other area user groups, carried out in a four week period in July of 1992. This included visits to the respective bases of operations in Fort Nelson and Fort St. John. The analysis was generally carried out according to Ministry approved multiple account guidelines, in particular with reference to the guidelines followed in the Ministry's May 1992 socio-economic assessment of the Kispiox TSA Resource Management Plan.

Due to the compressed time frame, the usual caveats apply to the exhaustiveness of the analysis, and to the data limitations that had to be adhered to. It should also be noted that some uncertainty still applies to the alternative area management options that should be considered, and that the options evaluated below may not exactly reflect what are finally chosen. The report does however contain the essential information and decision criteria necessary to that choice.

The two proposed deferral areas are evaluated in sequence, with the Prophet River area being covered in Sections 2.0 through 4.0, and the Sikanni Chief area covered in Sections 5.0 through 7.0. Because of substantial areas of overlap between the two, the Sikanni Chief discussion is more abbreviated, with references as appropriate to the relevant discussion in Sections 2.0 through 4.0.

2.0 Prophet River

2.1 Study Area

The proposed deferral area lies within an 80 kilometre stretch of the Prophet River plain, from where the Prophet River drains into the Muskwa River in the north, to a point approximately 80 kilometres upstream at the junction with Jackknife Creek. The town of Fort Nelson is situated at the northern end, while the Indian Reserve of Prophet River is about 10 kilometres to the south of the deferral area. The deferral area comprises 3,583 hectares of old growth spruce and cottonwood stands, that are contained within a larger 9,000 hectare river-flat planning area. The river itself extends upstream for about another 70 kilometres due south. The area to the west slopes gradually up toward the foothills of the Rocky Mountain chain, while the Alaska Highway parallels the river about 10 kilometres to the east. The only road access to the area is from the eastern, Alaska Highway side. Dozens of streams and smaller rivers drain into the Prophet, which links up to the Muskwa and Fort Nelson rivers which then flow into the Liard. The area falls within the of the Ecosection of the Sikanni-Beaton Upland, 95% of the biogeoclimatic units within which are boreal white and black spruce (bwbs), and 5% of which are montane spruce (ms).

2.2 The Area Socio-Economy

The bulk of the Prophet River deferral area lies within the Fort Nelson-7 Regional District, within which the town of Fort Nelson is the largest centre. The District covers an area of approximately 85,000 square km and is bounded by the Alberta and NWT borders to the east and north. The upstream portions of the Prophet River lie just to the south of the District's boundary. In 1990, the District's total population was only 5,500, about 400 of whom resided in the area's Indian Reserves (including the Fort Nelson Indian Reserve), 4034 in the town of Fort Nelson, and the balance in unorganized areas. Aside from Fort Nelson, the area is almost all remote wilderness, with thousands of kilometres of rivers and hundreds of lakes. The Alaska Highway roughly bisects the Regional District's area, and the vast majority of the area's non-native population live within 10 km of the highway.

Fort Nelson is the business and transportation hub, and it's economy is based on the resource industries (forestry and energy), transportation and tourism, and government. Fort Nelson is the base for Westcoast Energy's gas processing plant, the largest in North America, Tackama Forest Products veneer/plywood and stud mills, and the world's largest chopstick manufacturing plant. There are five elementary schools and one high school within the District, with a total enrolment of 1042. Fort Nelson also has a community college, Northern Lights College. The town has a 32 bed acute care hospital as well as a medical clinic with a staff of 4 and a dental clinic. These facilities are partially underwritten by these businesses property tax contributions.

Aside from Fort Nelson itself, which lies a few kilometres north of the Deferral Area, the only other adjacent settlements of any size are the Fort Nelson Indian Reserve; the unincorporated

area of Muskwa Heights (both of which fall within the greater Fort Nelson area); and the Indian Reserve of Prophet River. The latter settlement lies on the Alaska Highway a few km east of the southern edge of the Deferral Area. The area's natives form part of the Treaty Eight Tribal Area, which also extends into Alberta. While Fort Nelson band members are relatively well integrated into the local economy (some members are employed by Tackama Forest Products), the outlying native economy is predominantly a subsistence one (hunting and trapping), and many outlying members are relatively unintegrated into the surrounding non-native economy, and in a number of instances are non-English speakers.

2.2.1 Forestry Sector

The deferral area forms part of the Fort Nelson Timber Supply Area, part of the larger Prince George Forest Region. Effective as of December 1991, the total AAC for the Fort Nelson TSA was set at 972,000 cubic metres. Of this total, 750,000 m³ (or 77%) was in coniferous stands (spruce and pine), 674,000 m³ of which was licensed to Tackama Forest Products based in Fort Nelson, with the bulk of the 76,000 m³ balance allotted under the Small Business Forest Enterprise Program. The 222,000 m³ deciduous cut component was broken down into 145,000 m³ of cottonwood (or balsam/poplar), held under licence by Tackama, and 77,000 m³ in aspen, licensed to Canadian Chopsticks Ltd. also based in Fort Nelson.

With respect to this TSA's future coniferous harvest, two options are now under consideration. Under option one, the current harvesting rate of 750,000 m³ would be immediately reduced to 550,000 m³, to reflect current utilization and harvesting practices. Under option two, which assumes full utilization standards being met (i.e. utilization of pine and spruce/pine mixtures as well as lower volume stands), the current rate of harvest could be increased to 820,000 m³. An additional 514,000 m³ in potential additional harvest exists outside the current economic net land base, though only 55% of that is within economic distance of the area's only processing facilities located in Fort Nelson.

The current cottonwood harvest of 140,000 m³ is judged to be unsustainable, as it would deplete the mature timber supply in about 14 years. It has now been reduced to 60,000 m³, with a further reduction to 40,000 m³ also under consideration. The cottonwood that has been harvested to date is all river bottom stands, the LRSY for which is only 20,000 m³. As is the case with the coniferous harvest, with improved utilization performance the sustainable harvest could be increased to 120,000 m³. While there is up to another 117,000 of potentially available cottonwood harvest outside of the current economic land base, 99% of that is beyond an economic distance to Fort Nelson. The present aspen forest license of 77,000 is sustainable in the long run, and could be increased, depending on the utilization standards adopted, by a multiple of three to five. There are also significant aspen stands outside of the current economic distance to Fort Nelson.

Insofar as the area's existing processing capacity is therefore concerned, the general situation appears to be one in which future fibre supplies may be constrained, unless changes to current timber utilization practices are implemented. Processing activity is limited to Tackama's veneer/plywood and stud mill, and the recently opened Canadian Chopstick plant. Expansion

of the area's forestry sector has traditionally been limited by high costs associated with a short logging season.

2.2.2 Recreation and Tourism Sector

The Prophet River area is located within the Peace River/Alaska Highway Tourism Region. The boundaries of the region extend from Summit Lake north of Prince George in the south to the Alberta border, the Yukon and Northwest Territories borders and Tatlatui Park and MacKenzie along the western boundary. The Alaska Highway, which commences at Dawson Creek and continues for 2300 kilometres to Fairbanks Alaska, parallels the river for about 100 km. The highway serves as a major transportation corridor for local resident, pleasure and commercial travellers alike. The study site has limited accessibility from the Alaska Highway. Fort Nelson is the closest major community, and local attractions include:

- B.C.'s largest Natural Gas Processing Plant;
- Fort Nelson Historic Museum; and
- World's Largest Chopstick Manufacturing Plant.

The Alaska Highway is an attraction in itself, with the perception by many that northern B.C. and Canada are among the "last frontiers" and a trip along the highway is seen as a challenge and significant accomplishment, despite the fact that most of the highway is now paved.

The Peace River/Alaska Highway Tourism Region is currently a region through which most visitors travel in order to get somewhere else, i.e. Yukon, Alaska, southern Alberta or B.C. Many travellers make a circle route and travel one way by road and one way via the Inside Passage ferry route between Skagway Alaska, Prince Rupert and Port Hardy on Vancouver Island.

There are 20 provincial parks and recreation areas in the region. Their purpose is to meet the needs and interests of travellers driving the road and to preserve and protect several outstanding examples of the area's diverse landscapes. Stone Mountain, Muncho Lake and Liard River Hotspings Provincial Parks, all located in the Northern Canadian Rocky Mountains section of the Alaska Highway more than 120 km west of Fort Nelson, offer some of the region's most spectacular scenery, excellent recreational opportunities, and are popular stopping and camping spots for visitors.

The Visitor '89¹ survey provides a reasonable estimate of annual non-resident travel to the Peace River region. In 1989 this was estimated at 123,600 travel parties, with an average party size of 2.84 persons, or just over 350,000 people. With over 60% originating from the United States, the non-resident travel market is very much touring/passing through between Alaska and the USA. These visitors are typically retirees travelling in an RV or camper. Whilst they are not likely to venture too far off the Alaska Highway into the study area, an abundance of

¹ A travel survey of visitor to British Columbia (non-residents) prepared for the B.C. Ministry of Tourism, 1989.

wildlife in the region is important in order to enhance opportunities for passive wildlife viewing along the Alaska Highway.

The Ministry of Tourism's survey of residents in 1989,² estimated approximately 1.4 million person trips were taken in northern B.C. (Peace River Alaska Highway and North by Northwest Tourist regions) in 1989. An estimated 30-40% of these travellers or 400-500,000 people were going to the Peace/Alaska region. Resident travel patterns differ significantly from those of non-residents as a result of the high level of business travel and almost twice the level of visiting friends/relatives. Wilderness/outdoor travel may occur as a secondary activity while in the region. Also noteworthy is the high proportion (over 50%) of travellers originating in northern B.C.

There are three provincial parks and recreation areas (RA) along the highway which are in general proximity to the Prophet River study site.

- Andy Bailey RA - 32 vehicle/tent campsites, picnic area, swimming, boat launch.
- Prophet River RA - 36 vehicle/tent campsites; limited facilities and activities with the exception of fishing for grayling and some Dolly Varden; birdwatching; occasional base camp for hunters.
- Buckinghorse River - 30 vehicle/tent campsites; limited facilities and activities with the exception of fishing for grayling; birdwatching; occasional base camp for hunters.

Birdwatching in the region is most active during the one to two weeks during the spring and fall when migrating birds including warblers, grosbeaks, finches, raptors and sandhill cranes fly north and south respectively. These birds can be viewed from many locations along the highway.

For the most part the above provincial parks are utilized by transient visitors to the region as an overnight stop as they travel north or south. Because of its proximity to Fort Nelson (approximately 30 km), Andy Bailey is frequently utilized as a day trip destination by residents of the area.

General indicators of traffic volume and visitor activity are:

- 1991 Highway traffic counts at Wonowon 50 km north of Fort St. John measured average daily traffic volume (north and south) in summer at 1,700 vehicles. Annual traffic is over 180,000 vehicles with 45% occurring between May and September.³

² Resident Travel in B.C., a survey of B.C. resident travel patterns. Prepared for the B.C. Ministry of Tourism, 1989.

³ B.C. Ministry of Transportation and Highways, Planning Services Branch.

Early indicators for 1992 suggest the year will be 20 to 30% higher than previous, largely as a result of the extensive Alaska Highway Celebrations campaign.

- Combined campground attendance at the three provincial parks identified above was nearly 3,000 overnight parties plus over 12,500 day use parties in 1991, as shown in Table 1. This compares to the level of attendance in the Regions most prominent parks northwest of Fort St. John (Liard River, Muncho Lake and Stone Mountain) which together attract over 10,000 overnight camping parties and over 45,000 day use parties annually mainly between May and September.

Table 1: Selected Park Usage, Peace River Alaska Highway Region, 1991

	Campground	Parties Day Use	Total
Andy Bailey RA	185	2,962	3,147
Buckinghorse River	1,258	3,321	4,579
Liard River Hotsprings	6,584	29,694	36,278
Muncho Lake	2,216	8,539	10,755
Prophet River RA	1,341	6,293	7,634
Stone Mountain	1,425	7,159	8,584

Source: Park Data Handbook, Ministry of Environment, Land & Parks, 1991.

2.2.3 Energy Sector

Northeastern B.C. is an extension of the Great Plains region and the only sedimentary area in British Columbia that is currently producing oil and gas. Westcoast Energy's gas pipeline from the Peace River district to Vancouver was built in the 1950's to provide a market for these hydrocarbon resources. In 1964, a pipeline was built to Fort Nelson from the main Westcoast Energy pipeline at Chetwynd to tap newly discovered natural gas fields. This gas gathering system has since been extended even further north. A large processing plant at Fort Nelson removes sulphur and other impurities from the gas before it is pipelined south. Pipelines now serve markets throughout the province.

The Prophet River site is situated in what the British Columbia Ministry of Energy, Mines and Petroleum Resources has designated to be an area with a high potential for recoverable natural gas reserves. At present, 40% of the sub-surface oil and gas rights in the Prophet River region are held by private interests. This relatively low level of tenure (especially compared to the Sikanni Chief River area), reflects the maturity of the gas fields in the area: exploration and development activities have been occurring within the region for a considerable period of time

and the underlying natural gas reservoirs are fairly well defined, hence, unproductive PNG tenure rights have been released back to the Crown.

The Prophet River region has been an active producer of natural gas for the past forty years. Natural gas reservoirs were first identified in the region in the early 1950s and the first natural gas well was drilled in the Tenaka Field (which lies northwest of the settlement of Prophet River) in 1952. The discovery of the Clarke Lake Field (to the south and east of Muskwa), in the late 1950s, provided the impetus for heightened exploration and drilling activity in the region, through the 1960s and 1970s, as the reserves within this field were developed. In the late 1960s, attention was also drawn to the Adsett Field (which lies north of the settlement of Prophet River) and, over the 1970s and 1980s, this field was developed. In total, 112 wells have been drilled in the region since the initial discovery in the Tenaka Pool; however, the bulk of the drilling activity occurred over the period from 1950 to 1980. While drilling activity is still present in the Clarke Lake and Adsett Fields, only 22 wells have been drilled in the region over the last 12 years (9 of these wells were drilled between 1990 and 1992), and most of the recent drilling activity has occurred in the Milo Field to the west of the old growth area.

Given the long history of drilling activity in the region, the infrastructure required to service the various gas fields is in place and well developed (a factor which will significantly reduce the cost of any further development activity in the region). The gas pipelines which service the area are an extension of Westcoast Energy's initial gas pipeline, brought into the Peace River district in the 1950's to service reservoirs discovered in the vicinity of Dawson Creek. In 1964, this pipeline was extended to Fort Nelson, from the main Westcoast Energy pipeline at Chetwynd, to service the Clarke Lake natural gas field. This gas gathering system has since been extended to the north, to service the Poplar Hills region, and further south to more effectively service the Clarke Lake and Adsett Fields. In addition to the extensive pipeline network, Westcoast Energy maintains North America's largest gas processing plant in Fort Nelson which removes sulphur and other impurities from the gas before it is piped to southern markets.

In terms of drilling activities within the region which are of relevance to this study, on the basis of information received from the Ministry of Energy, Mines and Petroleum Resources, one well has been drilled just outside of the old growth deferral area's boundary and four wells have been drilled within the site. However, of the four wells drilled within the old growth area, one well was dry, and subsequently abandoned, and the remaining three wells were deemed to have unrecoverable reserves under present or anticipated economic conditions.⁴ Each of these wells has been capped and they are not expected to be brought into production in the near future.

⁴ The natural gas reserves associated with a given well may be rendered uneconomic due to a small volume of reserves, low permeability of the reservoir and/or distance to pipelines.

3.0 Description of Options

The original deferral application referred to the entire Prophet River bottom area (from the junction with the Muskwa River downstream, to Jacknife Creek upstream), a total of 9113 hectares. This original submission was based on a relatively superficial inventory review by Forest District staff and was subsequently reduced to a 3198 hectare area based on more definite data regarding the extent of old growth in the Prophet River area. What is specifically at issue however is a 3583 hectare area, comprising the 3198 hectares that were the subject of the deferral submission, and an additional 385 hectares of "old growth" stands that fall within Tackama's existing 20 year development plan (which runs to the year 2004), and for which cutting permits were in the process of being issued. This 385 hectares is made up of five spruce blocks covering 122 hectares and containing 35,000 m³ of timber, and 17 cottonwood blocks covering 263 hectares and containing 88,000 m³ of timber. It should be noted that substantial uncertainty surrounded the delineation of the exact area and timber types for which a deferral decision was to be sought, before the area of 3583 hectares covering both spruce and cottonwood stands was settled on.

Based on a Ministry of Forests inventory carried out in August 1990, the full 9113 hectare Prophet River area can be broken down as follows:

OG Proposed for Immediate Development:	385 ha.
OG Coniferous (Age Class 6):	720 ha.
OG Deciduous (Age Class 6):	753 ha.
OG Mixed (Age Class 6):	1,725 ha.
(OG Sub-total 3583 ha.)	
Burnt Area:	21 ha.
Previously Logged:	1,943 ha.
Remainder (proceeding toward "old growth"):	3,567 ha.
Total:	9,113 ha.

As indicated, some confusion surrounded the precise subject area of the deferral application (Short Term Deferral #11), which specified a 3200 hectare area. This mistakenly refers to the 3198 hectares of Age Class 6 Old Growth shown above. None of this land lies within the company's current development plan (which extends to 2004), and it is not therefore immediately threatened. While this 3198 ha., in addition to the 3567 ha. of "evolving" Old Growth, and the previously logged 1943 ha., is all effectively off-limits to harvesting for a minimum of twelve years (the previously logged area for at least 15 years due to the maturing or "green up" process), it was combined with the 385 hectares slated for immediate harvesting for purposes of defining the potential deferral area.

In the course of our inquiry, the existence of differences of view as to how old growth is defined became apparent. According to Fort Nelson Forest District staff, their original deferral submission was based on a more conservative definition (age classes 6 and higher) than the Old

Growth Committee is in fact working with (age classes 8 and higher). While the Fort Nelson staff's working definition resulted in a current Old Growth estimate of 3583 hectares (3198 + 385), it is their current position that none of the Prophet River area meets the committee's Age Class 8 definition. Since we clearly can't resolve this issue, we have continued with our assessment based on the original understandings provided.

Aside from definitional issues, there are some salient facts about this area that are relevant to any assessment. These are as follows: Firstly, the Prophet River area was previously logged in the 1970's, and again in 1981/82, 1985/86, and 1990/91. These areas (including the 1942 ha. above) were only sporadically replanted, and will not be available (because of "green up" standards) for reharvest for between 15 to 40 years. This past logging also implies that this is not a wholly pristine and intact valley area. Secondly, insofar as it's current 20 year development plan is concerned, Tackama has no plans for additional harvesting (i.e. in addition to the 385 hectares) in the Prophet River area. Under no revised circumstances would they be reapplying under the year 2004 time frame for additional spruce cuts in this area, though a reapplication for additional cottonwood remains a possibility. Under their current area plan, their cottonwood requirements out to 2004 are being met from harvesting in other river bottom areas (e.g., the Fort Nelson/Muskwa river areas). Beyond 2004, the Prophet River area would again be a focus, both for cottonwood and spruce along the river bottom, and for spruce/pine upland from the river. While not as valued as the riverbed stands (much of the upland areas are muskeg), there are sufficient upland stands of white spruce and pine to be worth pursuing. Portions of the uplands will remain permanently off-limits because of terrain (swamp, muskeg) or species (black spruce) limitations. The timing of an increased upland harvest may revolve around the completion of plans by energy interests in the area to construct a fixed river crossing. The upstream portions of the Prophet River (from about Jackknife Creek south) are of no commercial interest, in the short or long run.

The layout and size of the proposed cutting blocks should also be noted. They are not bunched together, but are distributed at varying intervals for 40 to 50 kilometres along the river bank. This has implications both for the visual effects of the logging, and for Tackama's preferred logging sequence. Visually, the logging of twenty three small (averaging 17 hectares), non-contiguous blocks is arguably less detrimental than clear cutting of a larger block. This pattern of block dispersal also influences Tackama's preference for the joint harvesting of the spruce and cottonwood blocks. Since these are interspersed, the logistics and costs involved in winter logging and hauling (e.g., construction of ice bridges) are considerably improved if both can be taken together. It is for this reason that Tackama is deferring the harvesting of the cottonwood, pending a decision on the five spruce blocks. Notwithstanding the higher per unit logging costs that would however be entailed, Tackama is still committed to harvesting the cottonwood alone. Insofar as the full 3583 hectares is concerned, the blocks concerned would be sufficiently close together that visual effects would be very evident.

Option Definition

Insofar as non-forestry sector impacts are concerned, the alternative to the base case harvesting option is that of the permanent preservation of the 3583 hectares of old growth stands. Non-

forestry sector impacts are therefore similar across whatever TSA-wide adjusted future harvesting profile may be chosen. Forestry sector impacts may however vary, depending on what TSA-wide harvest profile is assumed, and how that profile might require adjusting to allow for the set-aside of the Prophet River site. Before developing these TSA-wide adjustments, estimates are required of the standing timber volume and annual growth increments in the deferral area. These were respectively estimated as follows:

To estimate standing timber volume, we combined information from the following; the smaller 385 hectare stands; the Fort Nelson District 1990 inventory distribution shown above; and from material assembled for the wider Prophet River area by T.M. Thompson and Associates. The estimate of 35,000 m³ of spruce and 88,000 m³ of cottonwood for the smaller 385 hectare area is a reliable one, and corresponds to per hectare volumes of 287 m³ of spruce, and 335 m³ of cottonwood. If we apply these volume ratios to the 720 hectares of "pure" OG spruce stands and to the 753 hectares of "pure" OG cottonwood stands, and add in the known volumes for the 385 hectare area, we obtain respective totals of 242,000 m³ of spruce and 340,000 m³ of cottonwood contained in the "pure" OG stands. In addition to the "pure" OG stands, there are an estimated 1,725 hectares of mixed OG stands in the deferral area, the spruce/cottonwood weighting of which was not reported. To estimate the timber volumes on these mixed stands, we referred to the T.M. Thompson estimates (325 m³ per hectare for inventory type 26 "leading" spruce stands and age range 101-120 years). This yielded an estimate for the mixed stands of 560,000 m³, which, when added to the pure OG stands, yielded an estimated total area volume of 1,142,000 m³. This approximation incorporates some offsetting factors supporting a balanced estimate. Thus, the use of the (more decadent) 385 hectare area volumes for the full "pure" OG area is probably a volume overstatement, but one that is offset by use of what may be a low age class for the mixed stands.

Insofar as area productivity rates were concerned, a mean annual increment (MAI) of 3 m³ per hectare was used. Based on information from region staff, the Fort Nelson District MAI is 1.93 m³, but this is based on all forest types. A more representative MAI for the alluvial growing sites typical of the Prophet River basin would lie in the 2.6 to 3.0 m³ range. Using the upper bound of 3.0 m³, for the full 3583 hectares, this translates to an annual growth increment of 10,750 m³.

These timber stand and growth increment estimates were then applied against the two alternative TSA-wide harvesting profiles now up for consideration. These are:

Option A: Effective immediately (winter 1992), an annual coniferous harvest of 550,000 m³, with a falldown to the LRSY level of 350,000 m³ being phased in over years 11 to 80. Also effective immediately, an annual deciduous harvest of 50,000 m³, being phased down over a roughly similar period to the LRSY level of 20,000 m³. This profile is based on no change in existing timber utilization practices. For purposes of estimating impacts, an average 80 year falldown period was assumed, and resulted in the following average annual harvest reductions: From years 1 through 80, 14,3000 m³ (1.142 million m³ divided by 80), and for years 81 and on, 10,750 m³ (the lost annual growth increment).

Option B: Effective immediately, an increase in the LRSY harvest to 820,000 m³ of coniferous and 120,000 m³ of deciduous. Under this scenario, based on the implementation of improved utilization practices, there is no falldown effect, only the removal of that growing site, with an annual harvest impact estimate of 10,750 m³.

4.0 Assessment of Options

4.1 Regional Accounts

4.1.1 Regional Economic Impacts

Direct

A. Forestry

Forestry sector impacts were estimated based on a presumed requirement for offsetting TSA-wide harvesting adjustments to maintain even-flow harvesting levels. The licensee has already made adjustments within its existing harvesting plan to temporarily replace the 385 hectares of timber immediately at issue. This adjustment consisted of moving up its harvesting schedule in the Fort Nelson River and Sikanni/Sahtaneh River areas, with the 23 Prophet River blocks now scheduled for cutting in the 1993/1994 and 1994/1995 seasons. Tackama draws its supplies from three general geographic areas. Approximately one-third comes from the upper Liard/La Biche river areas, a large portion of which is decadent spruce. This is viewed as being at the economic limit (160/200 km north) of its mill supply area. A second one-third is drawn from the uplands (the Snake/Sahtaneh river areas) due east of Fort Nelson. The balance is from the immediate Fort Nelson area, including the Prophet River area. Much of this is mixed wood, including some salvage and increasing amounts of pine. Their harvesting plans over the next few years focus on the adjacent Fort Nelson River area. This smaller Prophet River supply tract can, at least in the immediate term, be therefore replaced from within their existing harvesting areas. The company's future room for manoeuvre may soon be more curtailed, on the basis of one of the more restricted harvesting options, option A above.

To approximate the wider TSA area impacts, direct employment factors were used that corresponded to the situation prevailing in the Prophet River logging area, and at Tackama's Fort Nelson milling operations. The combined timber volume of 123,000 m³ in the 385 hectares immediately at issue is, according to company and MOF sources, roughly equivalent to two winter logging seasons, each of approximately 100 days duration. The required full size logging crew numbers 26 (20 loggers and six truckers). Based on a 100 work day season (and a yearly work day total of 240), this is equivalent to approximately .42 py's per crew member per season, or 22 PY's in total. This corresponds to a harvesting employment factor of .18 py/'000 m³. Based on an average logger/trucker income range of \$75,000 (covering contractor as well as wage income, and benefits), a direct wage injection of approximately \$13,500 per '000 m³ is also indicated.

Insofar as direct processing sector impacts are concerned, these were estimated with reference to Tackama's Fort Nelson operations (which are the only ones that would be affected). Tackama has a full-time employment of about 375 at its Fort Nelson sawmill and plywood/veneer operations (245 and 130 respectively at each), with an average wage and benefits package of

about \$55,000. Based on an annual log throughput of about 730,000 m³ (673,000 m³ coniferous and 60,000 m³ deciduous), the respective processing employment and direct wage factors are estimated at .51 py's/'000 m³, and \$28,000/'000 m³. The corresponding combined harvesting/processing ratios are therefore .69 py's/'000 m³ and \$41,500/'000 m³.

These are direct harvesting/mill employment and wage impacts only, and exclude any direct administration and forestry management related direct impacts. Because of the volumes involved relative to the larger TSA area, management and administration impacts would almost certainly be relatively minor. The funding for such activities is also ultimately related to budgeting considerations rather than changes in management plans. For both of these reasons, the possibility of such impacts has been excluded from the analysis. The indicated direct job ratio of .69 per 1,000 m³, may be compared to the combined (harvesting and sawmilling) .62 ratio used in the Kispiox study and the .96 province wide 1984-1988 direct job ratio estimated by the Economics and Revenue Policy Branch in their December 9, 1991 paper. The provincial ratio was developed across the entire fibre utilization mix (including pulp and paper), included forest administration jobs, and referred to Coast and Interior areas combined. It is not therefore directly comparable, but is useful for reference purposes. The province based study also estimated a direct GDP impact of \$74,500 (\$1989) per '000 m³ of timber harvested, but this included a return to capital. The direct capital based GDP component should be less for the Prophet River area, based both on apparently lower profitability levels for Tackama operations, and given the higher weighting for more capital intensive pulp operations in the provincial average.

Direct forestry sector impacts are therefore as follows:

	<u>Direct Forestry Impacts (Annual)</u>	
	Employment (PY's)	Wage Income
Option A (80 year falldown):	9.4	\$566,000
Option B (No falldown):	7.4	\$445,000

- Notes: 1. These are presented on the basis of a 100 year evaluation period. The choice of any other evaluation period would have no effect on Option B results, but would slightly alter Option A results since these are calculated based on a weighted combination of the 80 year annual AAC impact and the annual LRSY impact. The annual AAC impact is 14,3000 (m³) times .69 or 9.9 PYs, and the annual LRSY impact is 10,750 (m³) times .69 or 7.4 PY's. When weighted 80:20 (100 year period), an annual PY impact of 9.4 results for Option A.
2. The wage income estimates are based on an annual average of \$60,000 which is a weighted combination of annual harvesting and processing wage incomes, as derived from Tackama's Prophet River operations.

B. Recreation and Tourism

As indicated earlier in section 2.0, the main focus of tourist (i.e. non-resident) activity is in and around the Alaska Highway itself, with the provincial parks located northwest of Fort Nelson offering much more unique scenery and a greater variety of recreational activities than what is available in proximity to Fort Nelson. Fort Nelson's accommodation supply does include close

to 300 rooms and 75 RV/campsites, and while the community acts as an important visitor service centre, this is predominantly for those in transit to other destinations.

With the exception of guide outfitting, there is limited to no tourist activity in the Prophet River study area. While an abundance of wildlife in the vicinity of the highway is known to greatly enhance the touring experience, according to the Fort Nelson Visitor Information centre there are currently no tour operators offering adventure or wildlife viewing tours along the Prophet River. Aside from the area guide outfitter, the only other semi-commercial tourism operator in anyway dependent on the Prophet River area is one sport fishing operator, whose volume of business is very limited, at well under 50 fishermen per year. While a large number of non-resident fishing licences are sold in Fort Nelson each year (890 in 1991, as compared to 878 resident licences), this is largely explained by the fact that Fort Nelson is the first major community upon entering B.C. from the North. Accordingly it seems that many visitors purchase their sport fishing license in Fort Nelson to have it available for the duration of their stay in the Province. There are currently no adventure operators working in the area, and while interest was at one time expressed by a local operator who requested use of the Prophet River RA as a pull out for possible rafting tours, this request was turned down by the Ministry of Parks because of the steepness of the bank.

As indicated, there is one active guide outfitter whose licensed area overlaps the Prophet River old growth strip. The business is exclusively hunting oriented, with no wildlife viewing (due to extensive muskeg and dense foliage in the riverbed lowlands). Clients may casually fish adjoining creeks and streams, but fishing is not an integral part of the product package. The hunting is carried out largely from the river, with minimal use of horses due to extensive muskeg. Species hunted are moose, elk, cariboo, black bear and grizzly (rare). Development plans include additional trails and satellite camps to open up the land area, promotion of wildlife viewing, and utilization of the river system for recreational boating trips. The current operator has held the area license since 1982, and has an annual client list of about 25 to 30 (all non-resident, mainly European and American). In addition to the owner operator, there are between 2 to 6 part-time hires during the four month hunting season (cooks, assistant guides, etc.), equivalent in total to around 2.5 py's. This is quite close to the estimated 3.1 py's per operation in the North West as estimated in a 1989 DPA Industry Opportunity study.

As is elaborated more fully in the environmental impact section below, the river bottom old growth habitat is especially important for some of the species hunted, in particular moose (calving and protection from predators) and bear (hibernation). In contrast, elk appear to benefit from the improved grazing that logging can sometimes generate. If carried out with certain precautions, area logging need not be entirely detrimental to hunting operations. These precautions include; logging around existing game trails and mineral springs ("licks") where animals congregate and are easy prey for predators; the leaving of river strips for shelter and protection; and the general avoidance of habitat destruction. The operator does report some satisfaction with the licensees more recent efforts to co-operate (the aspen licensee remains a source of conflict). Even if such precautions were adopted however, logging of an additional one third of the river bottom area would inevitably impair the guided product, in particular insofar as any future expansion might be concerned. On that basis, the following is an

approximate estimate of the direct guide outfitter employment and wage income impacts that might reasonably be assigned to the logging of this area:

<u>Direct Guide Outfitter Impacts (annual)</u>	
Employment (py's)	Wage Income
1.5	\$33,000

Note: The wage income estimate of \$33,000 is based on a 1988 average industry wage estimate of \$18,000 (and after adjusting to \$1992). While low, it reflects the fact that many operations are owner operated and employ family labour, and that free food and lodging is generally provided.

C. Energy

In general, the removal of logging access restrictions tends to have a positive influence on oil and gas drilling activity. When considering the implementation of an exploration and/or development drilling program, the possibility that certain restrictions concerning access to certain forest areas may be imposed is a source of significant financial risk to oil and natural gas exploration and development companies. Restrictions on access or on tree felling can prevent a company from developing a reservoir, regardless of whether they hold the sub-surface rights in a particular area, or have the drilling licenses necessary to develop the resource. Hence, if another industrial concern -- such as a forestry company -- gains access to an area, then the risk to the oil and gas company that is interested in exploring and possibly developing the prospect is reduced. However, despite the positive influence on drilling activity provided by open access, it is not expected that the release of the deferral site in the Prophet River region would lead to significant incremental exploration or step-out drilling in the region over the short to medium term (i.e., into the next century). This conclusion is based on issues of site selection and gas field economics.

In terms of site selection, most drilling activity in the foreseeable future would likely focus on the continued development of existing fields. There are very few areas in the region in which established gas reservoirs overlap with the old growth deferral area (these predominantly involve the western extents of the Slave Point Reef in the Clarke Lake Field, and the Tetcho-Pine Point gas field, where the gas is currently shut-in due to poor economics). Even if each of these prospective areas was drilled, well spacing regulations would suggest that a maximum of 6 to 8 wells would be drilled within the deferral area bordering the Prophet River. However, while it is unlikely that the maximum number of wells would be drilled in the area, even if the ideal location for a well was sited within the old growth deferral area, in many instances the forest stands could still be preserved by moving the well site outside of the deferral area and then apply decline/horizontal drilling techniques to access the reserves.

While the potential exists for wells to be sited within the old growth area, existing price/market conditions also suggest that the sites would still not be considered for development until the next century. Drilling within the Palaeozoic formations which dominate the region is a very expensive venture, due to the complicated subsurface geology: wells in these formations can cost over \$1 million to drill. Similarly, the geology of the region renders the collection of seismic

data an expensive and difficult process -- this is especially true along river banks and beds where the terrain and subsurface geology produces poor seismic data if gathered with traditional techniques. Given the costs associated with developing the sites in the old growth area, combined with the poor price and market prospects, it is more likely that drilling activity, in the foreseeable future, would be confined to the development of existing fields to the east, west and south of the planning area where the geology is fairly well known and less complex, traditional (and less expensive) seismic techniques can be employed, and extensive gas collection facilities are in close proximity.

D. Other Sectors

The only other potentially affected commercial sector is that of trapping. On the basis of information provided during the field interviews, there is just one trapping licence covering the proposed deferral area. It is owned by a non-native, who operates it on a part-time basis, with an estimated annual income of between \$10,000 and \$25,000. While this individuals trapping activities would undoubtedly be disturbed by additional area logging, this has not been factored in to our estimates due to it's relatively small-scale and part-time basis (the trapper in question has more permanent employment in the energy industry). There are two other trappers operating immediately to the south of the deferral area, one of whom is a non-native logger, with the other being a member of the Prophet River Indian Band.

Indirect Impacts

Regionally captured indirect impacts have also to be considered. These were estimated on the basis of an income multiplier of 1.25 for the North region of B.C. (Davis, 1986), and a regional employment multiplier defined as (regional) indirect income divided by a service sector wage approximation of \$30,000 (similar to the approach adopted for the Kispiox TSA study). The results are as follows:

	<u>Indirect Regional Impacts (annual)</u>	
	Employment	Wage Income
Forestry (loss):		
Option A (with falldown):	4.7	\$142,000
Option B (no falldown):	3.7	\$111,000
Guide Outfitting (gain):	.3	\$8,000

These may now be combined with the direct regional impacts presented earlier for the following net regional direct and indirect impact estimate totals:

	<u>Net Regional Impacts (annual losses)</u>	
	Employment	Wage Income
Option A (with falldown):	12.3	\$667,000
Option B (no falldown):	9.3	\$515,000

4.1.2 Regional Environmental Impacts

The currently proposed Prophet River development could involve the harvesting of 3583 hectares of merchantable timber, consisting of old growth white spruce and balsam/poplar. Attributes which may render this area environmentally sensitive include the following:

- First, there is the possibility that the site is genetically unique, in which case, logging of the site raises concerns with respect to the loss of the old growth forest ecosystem and the gene pool inherent within that ecosystem. Concern is growing about the excessive harvesting of alluvial old growth white spruce in the general Fort Nelson region.
- Second, the site is in close proximity to the Alaska highway and the town of Fort Nelson, and may therefore possess certain recreational values associated with both current and future use.
- Third, the area provides a habitat for a variety of old growth forest dependent wildlife species, specifically the Keens Myotis (red-listed), the Grizzly Bear (blue-listed), the Black Bear, Moose, Rocky Mountain Elk, Deer and Fur bearers (all yellow-listed).
- Fourth, the proposed development stretches for a considerable distance along the banks of the Prophet River, and development of this area could lead to erosion impacts over a considerable extent of the Prophet River system. The specific implications of each of these attributes is discussed below.

Use Values

The proximity of the development to the Alaska highway and to Fort Nelson suggests that there may be current and future use values associated with its direct recreational use (for camping, hiking, wildlife viewing, etc.), or as an attribute which improves the recreational value of adjacent sites (i.e., undisturbed forest scenery surrounding a recreational site has a higher amenity value than a clear cut). To the extent that this is true, and to the extent that one can expect that eco/recreational tourism within the region will expand over time, then the harvesting of timber within the deferral area will impose a cost in terms of degrading the quality of the immediate and adjacent areas for recreational purposes. This cost will vary with the quantity and type of recreational activities that occur in the area. If the recreational activity is largely restricted to overnight camping by travellers on the Alaska highway, then this cost may not be that significant.

In so far as direct recreational use is concerned, the accessibility of the site to prospective users is a key consideration. The site can be accessed, but how readily is a source of some debate. There are two non-ATV water points of access. The one mostly used is by boat from the junction of the Prophet with the Muskwa River just outside Fort Nelson. This is largely used by area residents. The second is from the southern end of the site at the Prophet River

provincial recreation area. Access to the river at this point is however restricted. An old boat launch had existed there, but was swept away years ago and never replaced. More recently, the Ministry of Parks has rejected requests for rafting on the river because of the steepness of the river banks. As discussed in the Tourism section of the report, the Prophet River recreation area is largely used by overnights travellers travelling the Alaska Highway (there are 36 vehicle/tent sites). These users are predominantly non-area residents and are en route to other more distant destinations. The only evidence for use of this site as river access is strictly anecdotal and very limited at that. The river can also be accessed at four or five points, but not easily, by off-highway vehicles, which can traverse the logging and energy drilling routes that criss cross the area. Regardless of the means, the river and river bank area is almost exclusively accessed by area residents, in particular from the town of Fort Nelson and the Prophet River Indian Band. Separate from whatever impact it may have on the area's fishery and wildlife resources, the net impact of area logging is to open up access to these area residents by facilitating ways through the otherwise dense undergrowth.

Area residents use the river both for fishing and for hunting of moose and elk grazing at the river bank and the incremental impact of additional area logging on these activities is addressed below. Insofar as fishing is concerned, while logging does risk increasing bank erosion and siltation, the Prophet River naturally runs muddy, without any significant detriment to the fisheries resource. Of more concern than possible increased siltation is the possibility of damage to tributary estuaries, though this could be mitigated through enforcement of proper logging practices. In so far as ungulate herd sizes are concerned, the effects of logging are more mixed, with some temporarily beneficial grazing effects (particularly for elk), but more lasting damaging effects (particularly for moose) through the elimination of desired old growth cover (for calving, predator protection, and thermal cover).

In so far as area recreational use values are concerned, the net effect of additional logging revolves around the tradeoff between improved resident access and possible damage to the general fishery and wildlife habitat. Reliable estimates of resident use were unavailable, but the emphasis was on hunting as opposed to fishing use, both by river and by land. It should be noted that much more extensive, truly pristine wilderness areas are to be found within a few hours driving distance further north and south of this area, and these are heavily used by area residents. In addition, the area users are predominantly Fort Nelson residents; thus, they have an economic stake in the forestry industry which may at least partially compensate for any losses in recreationally based use values that might occur.

Existence and Biodiversity Values

With respect to existence values, such values tend to be positively related to the uniqueness of the site, and to the existence of accessible site substitutes. Existing information does not suggest that the site is particularly unique, or that there are aspects of the site which would single it out as a site of particular importance from a preservation perspective. The qualities of the site which are deemed to be of importance (maintenance of a gene pool to aid in silviculture development and tree improvements) also relate more to biodiversity and educational/scientific values than existence values. Maintenance of a gene pool within the ecosystem may provide

benefits to (i) silviculture activities by providing information concerning the adaptation of certain plant species to alluvial sites; and (ii) tree improvement activities. The significance of these values are unknown; however, the characteristics of the proposed development site are probably not particularly unique in the region (or the province generally). The evidence for this is best assessed by other study area investigators. In so far as we have been able to establish, while the old growth alluvial white spruce and balsam/poplar species have distinct genetic traits that have to be preserved, there still exists an ample supply of equivalent stands both in the immediate Prophet River area and in north-eastern British Columbia generally. As a consequence, the existence of other, similar sites in the region (and the province generally) would tend to diminish the existence biodiversity and scientific/educational values associated with the Prophet River site. The developer itself, i.e., Tackama, has proposed as alternative old growth set aside areas the Scatter River drainage (6,232 ha.) or the Grayling River drainage (53,820 ha.).¹

Wildlife Impacts

The third potential environmental impact of importance concerns the reduction of old growth dependent wildlife habitats. Of the species which were identified in the deferral statement as residing in the Prophet River area, only one -- the Keen's Long-eared Myotis (a type of bat) -- is red-listed. The only blue listed species in the area is the Grizzly Bear, and this is an attribute dependent species. Finally, there are a number of yellow-listed species within the area, of which Black Bear, Moose, Rocky Mountain Elk and a variety of deer species are deemed to be forest dependent (i.e., these species need intact old growth forests at the landscape level). While no raptors (birds of prey) were identified in the deferral application as dependent on these old growth stands, our interviews established that raptors (bald eagles, red tailed hawks) are resident there. Their preferred nesting habitat is not the spruce but the mature cottonwood stands. The point was made that the very large diameter trees which they like are too large (36 inches plus) for the milling machines available. However, they also depend on the smaller game that live in the undergrowth.

Moose and elk are quite common in the area, with the moose the more dependent of the two on old growth cover, both for protection when calving and for temperature stability. Snow packs are not as deep in this area as closer to the coast, and the protective canopy is not as much of an issue. Of the wildlife groups identified in the deferral submission, all, with the exception of the Myotis, would seem to have the option of moving to alternate old growth or similar forested sites for purposes of winter cover, and the proposed development area is not absolutely essential to their survival. Both the deer and the bear groups range widely, and while logging in this area may be disruptive, it would not comprise irreplaceable damage to their habitat. Reducing the Prophet River habitat may however cause a number of these species to move out of the area.

¹ January 14, 1992 communication from Ron Sedor, Forestry Supervisor, Tackama Ltd. to MO offices, Fort Nelson.

Riverbed Impacts

The Prophet River is fed by a number of glacial streams which have, and will continue, to deposit silt throughout the river. If riparian clear-cutting is permitted within the wider area, then the threat to riverbank stability could increase and the siltation of the river accelerated. This threat could be mitigated through the enforcement of stricter harvesting standards. Any increased levels of debris and silt deposited in the water courses, and any estuary damage, would adversely impact fish habitats, especially for bull trout, grayling, whitefish, burbot and pickerel. While these habitats would be degraded over time as the glacial run-off deposited silt in the river, the process could be significantly accelerated if the wider deferral area is logged, and if standards are not enforced. With the exception of grayling, which requires very clear water, the other fish types can tolerate and do well in muddy water situations.

4.1.3 Native Impacts

Limited information was obtained with respect to native interests in this area. Members of the Prophet River Indian Band (population about 100) do hunt and trap in the wider area, but much of their activity is concentrated to the south of the deferral zone. Some Prophet River Indian band members are employed on a seasonal basis by Tackama in support of their logging operations. While the general sense was that of limited impacts, i.e. over and above those identified above in relation to general environmental impacts, we have no direct testimony from the band to support this observation.

4.2 Provincial Accounts

4.2.1 Provincial Economic Impacts

Provincial economic impacts that are additional to the regionally captured impacts presented above are assumed to exclusively arise by way of forestry driven indirect effects. No province wide harvesting or fibre supply impacts are assumed in addition to those occurring within the Fort Nelson TSA. This is justified on the basis of the relatively small volumes and land area in a province-wide context. Insofar as guide outfitting impacts are concerned, these are assumed to all be captured at the regional level as presented above. To estimate additional province wide impacts, a forestry provincial employment multiplier of 2.0 was used, and a service sector wage approximation of \$30,000. The results are as follows:

Provincial Economic Impacts (annual)
Employment (py's) Wage Income

Option A:		
Forestry driven (losses):	18.8	\$848,000
Guide Outfitter driven (gains):	1.8	\$41,000
Net Impact (losses):	17.0	\$807,000
Option B:		
Forestry driven (losses):	14.8	\$667,000
Guide Outfitter driven (gains):	1.8	\$41,000
Net Impact (losses):	13.0	\$626,000

4.2.2 Provincial Government Revenues

Provincial government revenues will be impacted by the proposed withdrawal of the 3583 hectares of Prophet River old growth stands from the commercial land base. The primary measurable impact will be through the loss of commercial timber stumpage and tax payments. While there may be some resource based revenue impacts (e.g. from licenses or other fees) flowing from non-forestry sectors such as tourism or energy, based on the earlier analysis, the foreseeable impact on these other sectors (including guide outfitting) is so questionable or so small as to make any estimates unreliable. There may be more than minimal impacts flowing from changes to personal income tax collections; any evaluation of these, at least beyond the short term, would require some strong assumptions to be made with respect to the re-employment of the productive factors involved. Since this is not feasible in the context of this study, no provision is made for possible revenue impacts arising from that source. Given the net decline in commercial economic activity associated with either option as set out above however, one may infer that in the absence of countervailing measures, the net revenue effect would be negative, and additional to the estimated revenue loss that follows.

Our provincial revenue impact estimate is therefore limited to the effect derived from the prospective future loss of stumpage and royalty revenues, and logging and corporate tax revenues. For the Prophet River area, the currently applied stumpage rate for spruce stands is \$1.25 per m³, while a \$.50 per m³ royalty is applied to the balsam/poplar stands. Stumpage rates may exhibit substantial variation between different appraisal periods, and while it is possible that the future spruce stumpage rate could increase from this very low level in future periods, (it is currently under review), this remains the current rate, and it is duplicated in the adjacent Tackama cutting permit areas. For estimation purposes, the base rate for the interior of \$7.70/m³ was used rather than the actual \$1.25/m³ rate. Insofar as the \$.50/m³ cottonwood royalty rate is concerned, this is a uniform region wide rate.

These stumpage/royalty rates were combined with logging and corporate income tax rates respectively of \$.26/m³ and \$1.07/m³, which were the rates used in the reference Kispiox TSA study, and are average rates calculated as province wide revenues from these taxes divided by total harvest volumes over the 1986-90 period. These rate combinations were respectively applied to the annual estimates of alienated timber, both from existing stands (over the falldown

period) and from foregone new growth (based as explained above on the estimated area MAD). For both Option A and Option B, the assumed species volume distribution was 50:50 (which is roughly the case with the existing Prophet River area). While avoided provincial forestry expenditures (e.g. for silviculture or road maintenance) should in principle be netted out (these have been estimated at \$1.87/mnn³ province-wide for 1990/91), this was not done so due to the non-availability of the necessary data for the study area and options in question. While this would tend to overstate the overall net government revenue loss, this effect would we felt be more than offset by the effect of the relatively low current stumpage rate in effect, and the exclusion of personal income tax based losses.

Estimated annual net revenue impacts for each of the two profiles are as follows:

Prophet River Government Revenue Impacts

Option A: Years 1 to 80: \$77,239
Years 81 and on: \$58,374

Option B: Years 1 and on: \$58,374

Corresponding NPV's were also estimated based on a 100 year time frame, (the results are identical over a 150 year period) and a discount rate of 8%. The results are:

Option A: NPV over 100 years: \$1,042,000

Option B: NPV over 100 years: \$787,000

4.2.3 Provincial Economic Surplus

The net surplus derived from the area's resource base will vary with changes in the way that resource base is managed. Such surplus estimates require both valuations of non-market based activities, and adjustments to the market valuations that do exist. Thus, while the methods of stumpage appraisal presently in effect in the province are designed to approximate the economic rent or surplus inherent in the resource, actual stumpage fees may, for a variety of reasons (e.g. administrative) deviate in practice. What is an appropriate surplus measure for timber resource is a complicated calculation and one that could not be attempted for this study. Thus, as a proxy for this measure, the stumpage based estimates presented in section 4.2.2 will serve as one approximation, though, as mentioned before, these appear to be much lower than may be true of a longer run average.

For non-commercial recreational activities involving residents, daily willingness to pay values applied to estimated user days could be used. If we refer to the Kispiox study, daily WTP values (in \$1991) were respectively quoted of \$32/day for angling, \$35/day for hunting, and \$18/day for non-hunting (wildlife viewing, hiking, etc.). These might be taken as also valid for the resident use of the Prophet River area, but would likely have to be adjusted downward, certainly for the hiking based activity, but possibly also for the fishing activity. The area has

very good hunting amenities, and that WTP estimate is possibly valid. The fact is however that additional area logging would have mixed effects on resident recreational use, and on balance could be more likely to enhance that use, in particular by opening up access. Since no reliable estimates of area use were however available, an estimate of these values and of the overall economic surplus was not feasible.

Table 1
Prophet River Regional Accounts

	Option A ¹	Option B ¹
Economic Development		
Net Employment Loss (PY's/year)	12.3	9.3
Annual Wage Income Loss	\$667,000	\$515,000
Environmental Values		
Wildlife	Net Benefit	Net Benefit
Old Growth Existence	Debatable	Debatable
Recreational Values		
Resident Use	Mixed (Reduced access) (Fisheries benefits)	Mixed
Native Impacts	Mixed (Trapping benefits) (Forestry employment losses)	Mixed

¹ Since Option A and Option B each precludes harvesting in the deferral area, and differ only with respect to what is assumed about overall TSA harvest adjustments, they vary only in the economic accounts.

Table 2

Prophet River Provincial Accounts

	Option A¹	Option B¹
Economic Development		
Employment Loss (PY's/year)	17.0	13.0
Annual Wage Income Loss	\$807,000	\$626,000
Environmental Values	Not provincially significant	
Provincial Revenues		
Annual Average Decline	\$73,5000	\$58,400
NPV ¹	\$1,042,000	\$787,000

¹ Discounted at 8% over 100 years.

5.0 Sikanni Chief

5.1 Study Area

The subject deferral area comprises a 30 kilometre stretch of the Sikanni Chief River from its junction with the Fort Nelson and Fontas Rivers in the north, to approximately Gutah Creek in the south. The Sikanni river continues south (upstream) for another 60 or 70 kilometres. At its northern end is the tiny Indian settlement of Fontas (two permanently resident families). The town of Fort Nelson is about 70/80 kilometres north-west, but there is no all-weather road access. The deferral area covers 721 hectares of river-bank old white spruce, and falls within the Ecoregion of the Fort Nelson Lowland, 100% of the biogeoclimatic units within which are boreal black and white spruce (bwbs).

5.2 The Area Socio-Economy

The proposed Sikanni River logging area lies within the Fort Nelson-Liard Regional District, within which the town of Fort Nelson is the largest centre. This area's socio-economy has been fully described in the Prophet River area review, and will not be repeated here.

The Fort Nelson area is the relevant area reference for the majority of potential impacts associated with logging this area, with one important exception, i.e. impacts at the processing mill level, since these would be concentrated in the Fort St. John and Taylor communities. The 1991 populations of these two towns were respectively 14,156 and 821. In addition to the Canfor lumber mill, Fort St. John is home to several steel fabricating facilities, and is a major service centre for significant natural gas fields to the north and northwest. Taylor, which is 13 kilometres south of Fort St. John on the Alaska Highway, has, in addition to Canfor's stud mill, a large oil refinery, natural gas processing plant, and a new BCTMP pulp mill operated by Fibreco.

5.2.1 The Forestry Sector

The deferral area forms part of the Fort St. John Timber Supply Area, part of the larger Prince George Forest Region. The current AAC levels for that TSA are 900,000 m³ of coniferous and 915,000 m³ of deciduous. While there is currently no deciduous manufacturing capacity in the Fort St. John TSA, that deciduous harvest level has been set to encourage the future establishment of deciduous processing facilities.

The coniferous AAC is comprised of 704,000 m³ in renewable forest licences held by Canfor, 147,000 m³ for the SBFEP, and the balance in wood lot allotments and Forestry Reserves. Canfor is now the only licensee in the area, having bought out the only previous licensee, Balfour Ltd. This harvest level can be maintained until 2087 under basic silvicultural conditions, and indefinitely if incremental silviculture is practised. The species distribution is 70% spruce, 28% pine, and 2% balsam, and this is also expected to remain unchanged (unless cottonwood/aspens utilization materializes).

The wood is destined for Canfor's Fort St. John lumber and Taylor stud mills, the annual log throughput of which is approximately 950,000 m³ annually. In addition to the Canfor area licenses, the SBFEP allotment also goes to Canfor, which makes up the remaining fibre shortfall with some supplies from the Dawson Creek TSA and from private land logging.

5.2.2 The Recreation and Tourism Sector

The Sikanni Chief River study area, also located in the Peace River/Alaska Highway Tourism region, is highly remote, located 80 km southeast of Fort Nelson and the Alaska Highway and presently accessible only by air, rail or boat. Fort Nelson is the closest major community, however distance and difficulty of access result in virtually no recreation or tourism activity immediately in the Sikanni study area, with the exception of guide outfitting. The volume and profile of visitors to the Peace River Alaska Highway Tourism Region, and to Provincial parks in the region, discussed in relation to the Prophet River is generally applicable to the more remote Sikanni Chief study area. With the primary tourism activity in the region being vehicular travel along the Alaska Highway, the principal link is the potential for an abundance of wildlife in all areas surrounding the highway to enhance the tourism experience.

5.2.3 The Energy Sector

The Sikanni Chief River site is situated in what the British Columbia Ministry of Energy, Mines and Petroleum Resources has designated to be an area with a moderately high potential for recoverable natural gas reserves. As opposed to the Prophet River, the natural gas reserves within the Sikanni Chief River region remain relatively unexplored and undeveloped. Nevertheless, considerable interest in the regions production potential exists, as attested to by the fact that 80% of the sub-surface oil and gas rights in the Sikanni Chief region are held by private interests. However, while subsurface rights in the region are extensively held, about one-half of the subsurface rights within the boundaries of the old growth area remain in the hands of the Crown.

The Sikanni Chief River region was first explored in the mid-1950s; however, most of the drilling effort within the region has been confined to the 1990s (of the 42 wells drilled in the area since 1955, 21 have been sunk since 1990). Of the wells in the area, the majority have been drilled to the northeast and southwest of the Sikanni Chief old growth area, and only two have ever been brought to production: the remoteness of the area and the distances to existing pipelines has rendered the development of most of the drilled sites in the region uneconomic at prevailing prices and market conditions.

In terms of drilling activities within the region which are of relevance to this study, on the basis of information received from the Ministry of Energy, Mines and Petroleum Resources, within a 2,000 square kilometre area surrounding the old growth site, a total of three wells have been drilled, all of which were dry. None of these wells were drilled within the immediate vicinity of the deferral site (the closest was about 5 kilometres from the boundary) and no applications for permits for drilling in the area have been received.

6.0 Description of Options

The Sikanni Chief deferral application covers a 721 ha. area of old growth white spruce stands that lie along the river banks for an approximate 30 km stretch immediately south of the Sikanni's junction with the Fontas river. The deferral area lies within CP 306, held by Canfor Ltd., and contains eight blocks with 152,000 m³ of merchantable white spruce (there is also an additional 11,000 m³ of deciduous timber, largely cottonwood and birch; this would not be harvested). Canfor has additional cutting permits in the wider area.

The wider logging area is known as the Niteal Creek logging area, and is estimated to have approximately 550,000 m³ of merchantable white spruce (including the deferral area). There is an established logging crew in the area (logging along the river bottoms), whose operation requires approximately 75,000 m³ on an annual basis for full seasonal operation (from early December to early March). The general area has been logged for about 10 years (not every year), under previous area licences (Balfour). Because the logging season is short, the necessary road access and preparation is carried out in the preceding year. Access to C.P. 306 would require construction of a six kilometre stretch of roadway. Additional advance preparations include cruising, building of spur roads, pre-harvest silviculture prescriptions, and notifications to other forest users. The company has so far invested \$75,000 in the field preparation of C.P. 306. The alternative cutting permits to C.P. 306 are located adjacent to Kenai Creek, Katah Creek and Gutah Creek all of which flow into the Sikanni. These also contain some mature spruce on river flats. While wood volumes and tree densities per hectare are lower in the deferral area as compared to alternate areas, the trees are generally bigger and more decadent, and of higher quality and easier to work with.

There is no outside road access to this area, even in winter. There are no seismic lines in the area and no active exploration (but 80% of the area is covered by oil and gas tenure). Road access from Fort Nelson (about 70 km distant) ends at the Fontas Indian Reserve, and that consists only of a dirt highway. Logging crews are supplied by air, and the timber is moved out on a B.C. Rail line that takes it south to Fort St. John. With respect to the uniqueness of these particular old growth spruce stands, the concern is that this is the only patch of old growth spruce left on that stretch of the Sikanni, though there are similar river flat stands much further upstream, and upstream on the Fontas River. The tallest known white spruce is in adjacent Conroy Creek.

A working compromise with respect to partial logging of the eight blocks had previously been reached by field staff from the Ministry of Forests, the Ministry of the Environment, and the company. This would have removed four of the eight blocks (#3,4,7, and 8), and a portion of a fifth block (#1), from development, and would still have allowed 60% of the area or approximately 90,000 m³ to be harvested. This potential compromise was based on an assessment of the river bank areas most likely to survive the continuing frequent course changes of the Sikanni River. Like most northern rivers, the Sikanni continually changes it's channel and during rainstorms can undergo tremendous changes in water level (the high water mark in

areas is 12 to 15 feet high). The areas that were to be logged under the compromise proposal are those which it was felt were least likely to survive these future rain storms. The Sikanni apparently floods the entire valley floor (in the vicinity of Fontas) every year.

Just prior to the completion of this report, these two options, 100% or 40% area deferral, were superseded by a field agreement to develop an entirely new development plan, details of which are not yet available. Based on Ministry advice however, the impact assessment was undertaken on the basis of deferral or harvesting of the entire river basin area. Unlike the Prophet River site, an exact estimate of standing timber volumes was available, i.e., 152,000 m³ of old growth white spruce. A similar MAI factor of 3 m³ per hectare was used, based on similar alluvial growing site conditions. Estimation of the future TSA-wide harvesting profile was also less involved for this tract, as it stands at 900,000 m³ (coniferous), with no falldown (assuming basic silviculture) until at the earliest the year 2087. This is the alternative harvesting profile referred to in the following impact assessment sections.

7.0 Assessment of Options

7.1 Regional Accounts

7.1.1 Regional Economic Impacts

Direct Impacts

A. Forestry

Removal of the full 152,000 m³ of merchantable timber could eventually impact the duration of logging operations in the general Niteal Creek logging area. This general area does have additional accessible stands of white spruce available, estimated at 400,000 m³ remaining outside the deferral area, or enough to sustain the logging crew based in the area for another five years. To approximate the wider TSA area impacts, a direct harvesting employment factor was used that corresponded to the situation prevailing in the Niteal Creek logging camp area. The Niteal logging crews full complement is 40 (including loggers, truckers and support staff), and operates a three to four month season (or approximately 100 days), harvesting on average 75,000 m³ per season. The deferral timber volume of 152,000 m³ is therefore equivalent to approximately 34 person years of employment, averaged out over two logging seasons (unlike the Prophet River site some road construction is required in the Sikanni Chief area). This corresponds to a harvesting employment factor of .22 py's/'000 m³. Based on an average logger/trucker income average of \$75,000 (covering contractor as well as wage income and benefits), a direct wage injection of \$16,700 per '000 m³ is also indicated.

Impacts would also be felt at the company's lumber mill in Fort St. John, and its stud mill in Taylor. The combined annual log throughput at these operations is 950,000 m³, based on a 70:30 white spruce/pine mix. The lumber mill employs 148 on a two shift basis, and the stud mill 140 on a one shift basis, for a total employment level (including staff) of 288.

The combined direct processing employment factor is therefore estimated at .30 py's/'000 m³. It should be noted that the individual mill employment factors deviate from this average, and approximate .23 py's/'000 m³ at the Fort St. John mill and .47 py's/'000 m³ at the Taylor mill. While all of the deferral area harvest would be processed at the Fort St. John mill, the combined mill employment factor was considered more appropriate for the wider TSA adjustments being considered. Based on an average processing wage and benefits package of \$55,000, the corresponding direct processing wage income factor was estimated at \$16,500/'000 m³. The corresponding combined harvesting/processing direct ratios are respectively .52 py's and \$33,200 wage income per '000 m³. For similar reasons to those set out in the Prophet River analysis, additional administration related impacts were excluded as most unlikely or relatively very minor.

Direct forestry sector impacts for the Fort St. John TSA are therefore estimated as follows based on a 100 year evaluation period :

	<u>Direct Forestry Impacts (Annual)</u>	
	Employment (PY's)	Wage Income
Option A (95 year falldown):	.85	\$54,000

Note: This is calculated based on an annual AAC harvesting impact for years 1 through 95 of 1,600 m³ (152,000 divided by 95), and an annual LRSY impact for years 96 to 100 of 2,163 m³ (721 HA times MAI of 3 m³), each of which is converted to PYs on the basis of the estimated .52 PY's per '000 m³. An average annual wage of \$63,500 was used, based on the weighting of logging and processing sector wages.

B. *Recreation and Tourism*

As indicated earlier, there is limited to no tourist activity in the Sikanni Chief river area, due to the area's general inaccessibility, and to the comparably greater draw of other attractions in the general Alaska Highway area. Guide outfitting is the single recreational oriented activity that occurs in this area, with one active licensed operator. The business is principally hunting oriented, with some wildlife viewing, river rafting, and sport fishing also offered. Species hunted are principally moose and bear, and the clientele is almost exclusively non-Canadian (80% European, 20% North American). The current annual client base is 20 to 24, with an expansion target of 40. Given the area's relatively greater inaccessibility (to drive by tourists as well as to area resident hunters), the Sikanni would seem to have better potential for longer run development as a guide outfitting area than the Prophet River area. The Sikanni River bottom is also up to this point untouched by logging, and provides effective old growth cover for the principal species of interest (bear and moose). Logging is occurring away from the immediate river bottom and in proximity to a number of important tributaries to the Sikanni, with potential detrimental effects on some fisheries spawning habitat. There is concern with the gradual encroachment of energy exploration and timber harvesting activities. The concern is focused on the desire for pre-activity consultation (so as to avoid sensitive areas) as well as the opening up of area access (e.g., ATV's) to the general public. The guide operation's size is somewhat less than the Prophet River operation, approximately 2.0 py's. While it's future potential appears greater (and a pristine Sikanni basin would enhance that potential), the operation covers an area 50% larger than the Prophet guiding area, (i.e., 9245 square kilometres), with a number of good alternative sites. The direct employment and wage income impacts applied are therefore somewhat less than what was used for the Prophet River.

<u>Direct Guide Outfitter Impacts (annual)</u>	
Employment (py's)	Wage Income
1.0	\$21,000

Note: With respect to the wage income level, please see the corresponding note in the Prophet River section. This excludes additional owner operator income, which, based on a 1989 Industry Opportunity study (DPA 1989), is equivalent to approximately \$.60 per \$1.00 in wages.

C. Energy

In terms of potential impact on natural gas development activity, the lack of roads in the area, the sites greater distance from existing pipelines, and the limited number of active fields in the area all mean that it is unlikely that the removal of access restrictions will have any impact on exploratory/development drilling in the area for some time. Existing market conditions also do not favour such activity. Most recent drilling activity has occurred to the northeast of the old growth site, surrounding the Debolt and Jean Marie Fields; to the southwest, in the Tommy Lakes Field; to the northwest, in the Bulldog Field; and in prospective fields to the east and southeast. It is expected that, when market conditions improve, and well service facilities expand, these areas will continue to be favoured over sites surrounding the old growth area.

D. Other Sectors

The other potentially affected sector is that of trapping. There are between 3 and 4 non-native and native trappers operating in the wider Sikanni basin area, whose activities would be potentially disturbed by logging of the river bottom. Precise estimates of the income generated from these activities were unavailable, but a general guide would be the \$10,000 to \$20,000 range. Since the logging area alternatives also lie within these trapping boundaries, the impacts would tend to cancel out and are not factored in to our impact estimates.

Indirect Impacts

Regionally captured indirect impacts are estimated on the same basis as in the Prophet River area, i.e., an income multiplier of 1.25 for the region and a regional employment multiplier defined as (regional) indirect income divided by a service sector wage approximation of \$30,000 (c.f. Davis, 1986). The estimated results are:

	<u>Indirect Regional Impacts (annual)</u>	
	Employment (py's)	Wage Income
Forestry (loss):	.5	\$13,500
Guide Outfitting (gain):	.2	\$6,000

Net Regional Impacts

By combining these indirect regional impacts with the direct regional impacts earlier estimated, the following net regional impact estimate results:

<u>Net Regional Impacts (annual losses)</u>	
Employment (py's)	Wage Income
.15	\$40,500

Note: The relatively higher wage to py component is explained by the fact that job losses are concentrated in the high wage forestry sector.

7.1.2 Regional Environmental Impacts

The Sikanni Chief river development site possesses some attributes which may render it as environmentally sensitive. These attributes include the following:

- First, the area is largely undeveloped and virtually inaccessible by road; the surrounding area has however been extensively logged, with disturbance to the area's pristine character, ecosystem, and wildlife habitat.
- Second, the proposed development would involve harvesting the last remaining stand of old growth alluvial white spruce in the lower Sikanni valley; a timber stand that may exhibit a degree of uniqueness.
- Third, the area provides a habitat for a variety of wildlife species many of which may be of commercial/subsistence value to local and native individuals.
- Fourth, the proposed logging area, while being relatively small in total area, is along the banks of the Sikanni river. The existing timber stand acts to stabilize the soil. As a consequence, the development of the site could lead to erosion impacts which could be felt for a considerable distance downstream of the logging sites.

The specific implications of each of these attributes are discussed below.

Use and Existence Values

While highly inaccessible to non-commercial users, the pristine nature of the wider area has been substantially altered by a history of past logging. However, this particular stretch of river flats has up to now remained relatively undisturbed. At present, little commercial or non-native resident recreational activity occurs within the area (other than one guide-outfitter), and as the development proposed would not improve access, the area's relative isolation will continue to limit the development of significant recreational use in the future. With respect to existence values, such values can be substantial if the area in question is truly unique. While the proposed development site may be considered as unique at a local level -- given that it is the last old growth white spruce stand in the lower Sikanni valley -- the site is not the only old growth white spruce stand in the region; there are similar stands much further upstream on the Sikanni and upstream in the Fontas River area. Neither of these other areas are currently subject to preservation orders, and there is logging also in the Fontas area. Were these other sites to be guaranteed preservation, this would serve to reduce the applicable existence values for the lower Sikanni.

Biodiversity and Scientific/Educational Values

Both of these value are dependent on the uniqueness of the site which, as indicated above, appears to be significant only at the local level.

Wildlife Impacts

The third potential environmental impact which could result from the development of the area involves the reduction in wildlife habitat. A wide variety of species of wildlife occupy the old growth forest habitat. According to the initial deferral submission, there are no red-listed species (i.e., under consideration for designation as threatened or endangered) in the area, and only two blue listed species (sensitive or vulnerable) are designated, the grizzly bear and the fisher. It is not clear how numerous either is in the area. These two species are not considered to be old growth forest dependent but rather attribute dependent (i.e., they do not need an old growth forest habitat, rather they need old growth forest attributes within their habitats, such as large diameter dead trees and coarse woody debris carried forward into second growth forests in sufficient quantity to sustain the population). According to the original submission, there are also six yellow-listed species within the area (the Black Bear, Moose, Marten, Piliated Woodpeckers, Weasel, Deer), of which only two are deemed forest dependent: moose and deer.

Information was assembled in the course of the interview process that clarified some of these points. Black and grizzly bears do use the area, in particular for hibernating or denning. There was some disagreement as to the frequency of grizzly use, but the area has large numbers of black bears. Raptors are also common in the Sikanni river bottom area, including bald and gold eagles, and red tailed hawks. They have a clear preference for old growth stands, and the rotten snag tops that they use as an alternative to building nests. These species also use cliff faces in the Sikanni area. The pine marten is apparently one species that would clearly be negatively impacted by the logging, as it depends on voles for food which in turn inhabit the trashy undergrowth.

Of the ungulates, the moose are on balance probably negatively impacted. As stated before, they prefer the river bottom areas for a number of reasons, including protection from predators while calving. The Sikanni old growth stands also provide the temperature stability they desire. There are larger numbers of moose on the Sikanni than on the Prophet, but no reliable estimates. The moose do not derive the beneficial effect that other ungulates such as elk do from the improved grazing that can follow logging, as they are considered feeders of brush and berries.

Erosion and Fish Habitat

The harvesting of the old growth forests within the deferral area could increase the damage associated with winter run-off and the erosion of the river banks. Through the removal of the soil stabilizing force provided by the forest, winter run-off and erosion would increase the levels of debris and silt deposited in the water courses which, in turn, could adversely impact fish habitats, especially for pickerel and jackfish, grayling, northern pike, walleye and burbot. The existing situation is already quite flood-prone, and the bank stability issue was the focus of the

alternate development plans previously prepared. No surveys have been carried out of the area's fish populations, but the spawning occurs upstream in the smaller systems, which are also targeted for logging. The old growth stands have generally high insect populations which are very attractive to the fish.

7.1.3 Regional Native Impacts

The destruction/degradation of fish and wildlife habitats which could result from the removal of the old growth forests along the banks of the Sikanni Chief River could adversely impact the downstream native community of Fontas, and alter the distribution of wildlife species in the area, which would affect the hunting and trapping activities carried out by these natives. The permanent Fontas River settlement now comprises only two families; most of the community have moved permanently to the Fort Nelson Indian Reserve. In addition to the two families permanently resident there, about 25 to 30 natives return to the area in summer. The very small size of the permanent settlement would not support a high subsistence value estimate. Furthermore, the Fontas residents are members of the Fort Nelson Indian band, which has been, and will again in the future, be the recipient of relatively large settlements (\$35 million some years ago, with another equivalent sum set for future payment) for energy exploration on their traditional lands. The potential disruption to subsistence activities therefore seems to be restricted, with the principal impact on the handful of native trappers in the area (some of whom are not from the Fort Nelson band but from the Prophet River band further south). There are native trappers in the general area trapping marten, beaver, squirrel, lynx, and wolves. The fishing is mostly pickerel and jackfish, with some grayling and dolly varden. According to native sources, the wildlife have been impacted by past logging in the area (which includes aspen harvesting for Fort Nelson's chopstick plant), but this is a focus of concern area wide, and not strictly with reference to the river basin deferral area.

7.2 Provincial Accounts

7.2.1 Provincial Economic Impacts

Provincial economic impacts that are additional to the regionally based impacts will be limited to the indirect income driven spinoffs at the provincial level derived from the regional direct impacts. In other words, there will be no additional chains of effect through e.g., required adjustments to other area timber supplies or to tourism traffic and expenditures. Insofar as province wide forestry supply impacts are concerned, the harvesting area volumes and growth potential are too small to have an appreciable effect, and furthermore the overall supply situation in the Fort St. John TSA is relatively sound. The additional province-wide indirect impacts are therefore limited to those flowing from the forestry based income losses; given it's very small level, we have assumed that the full extent of guide outfitter driven income effects are captured at the regional level as presented above. To estimate additional province wide impacts, a forestry provincial employment multiplier of 2.0 was used, and a service sector wage approximation of \$30,000. The results are as follows:

Provincial Economic Impacts (annual)
Employment (py's) Wage Income

Forestry driven (losses):	1.7	\$80,000
Guide Outfitter driven (gains):	1.2	\$26,000
Net Losses:	.5	\$54,000

7.2.2 Provincial Government Revenues

The impact on provincial government revenues arising from the set-aside of the Sikanni Chief deferral area was estimated on the basis of the same procedures applied to the Prophet River area, as explained in Section 4.2.2. This incorporated forestry based stumpage and tax effects, but excluded non-forestry sector resource use taxes and personal income tax effects. Given the relatively much smaller scale of impact for the Sikanni area, the effect of such exclusions is very likely minimal. As with the Prophet River area, any government cost savings arising out of avoided area management charges were also omitted due to the non-availability of estimates specific to this area.

For the Sikanni and adjacent cutting areas, the (coniferous) stumpage rate currently in effect is \$11.60 per m³. For estimation purposes, the Base Interior Rate of \$7.70 per m³ was used. Added to this were the 1986-90 average province-wide logging and corporate tax rates respectively of \$.26 and \$1.07 per m³. For the one area wide harvest profile under consideration, the corresponding annual net revenue impacts were estimated as follows:

Sikanni Government Revenue Impacts

Years 1 to 95:	\$14,250 annually
Years 95 and on:	\$19,531 annually

These annual impacts were also converted to a NPV basis for a 100 year time frame (the results are identical for a 150 year time frame) using an 8% discount rate as follows:

Over 100 years:	\$192,000
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Economic Surplus

As explained in the Prophet River assessment, the calculation of a reasonably accurate overall economic surplus measure was not feasible within the study constraints. Some contrasts to the Prophet River situation should however be mentioned. One is that the Sikanni sites stumpage assessment seems to be closer to the underlying surplus value. Secondly, the use value of the Sikanni site would seem to be quite low, given the area's much greater inaccessibility. It's existence value may however be higher, given it's more pristine and intact nature.

Table 3

Sikanni Chief Accounts

	Regional	Provincial
Economic Development		
Employment Loss (PY's/year)	.15	.5
Annual Wage Income Loss	\$40,500	\$54,000
Environmental Values¹		
Wildlife	Net Benefit	Not significant
Old Growth Ecosystem	Preserved intact	Possibly significant
Recreational Values		
Resident Use	none	-
Native Impacts	Positive	-
Provincial Revenues		
Annual Average Decline	-	\$14,500
NPV ²	-	\$192,000

1 Anticipated environmental benefits could be reduced depending on where and on how substitute area harvesting proceeds.
 2 Discounted at 8% over 100 years.