HAIDA GWAII MANAGEMENT COUNCIL

Rationale for Allowable Annual Cut (AAC) Determination for

Haida Gwaii

Effective April 4th, 2012

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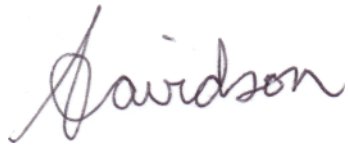
Haida Gwaii Management Council Annual Allowable Cut Decision

Effective April 4, 2012, the Annual Allowable Cut (AAC) for all commercial forest harvesting for the Haida Gwaii Management Area is 929,000 cubic metres. This document contains the rationale of the Haida Gwaii Management Council for this determination:

Members' signatures:



Allan Davidson

Lindsay Jones, RPBio

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Trevor Russ

Witnessed by:

Derek Thompson, Chair

Acknowledgement

The HGMC wishes to express its sincere thanks to the Joint Haida-BC Technical Working Group (JTWG) for the group's extensive work in compiling and preparing information for consideration in this AAC determination. Our gratitude is also extended to the Solutions Table for their helpful information and discussion; to all who contributed responses for our consideration through the public review process; to Terry Chantler who compiled and brought order to the large body of discussion on the many factors considered by the council, and assisted in the drafting of this rationale; and to others who provided technical assistance and support.

The names of JTWG members and of others who provided technical assistance are listed in Appendix 11.

Purpose of this document

This document describes the allowable annual cut (AAC) determination for Haida Gwaii made by the Haida Gwaii Management Council (HGMC), and the considerations and reasoning used in reaching the determination.

The HGMC was established under the Kunst'aa guu-Kunst'aayah Reconciliation Protocol, which the Council of the Haida Nation (CHN) and the Province of British Columbia (BC) (the Parties) signed in December 2009, and under *KaayGuu Ga gaKyah ts 'as- Gin 'inaas 'Iaas 'waadluwaan gud tl 'a gud giidaa,* the Haida Stewardship Law, and the provincial *Haida Gwaii Reconciliation Act*, which provide statutory authority. The council consists of four members, two from both the Haida and the Province, which the Parties appointed in consultation with each other, and a jointly appointed chairperson. The AAC determination reported in this rationale is a unanimous decision arrived at through a consensus-based approach.

The determination and underlying considerations and reasoning were made by the two Haida Nation representatives and the two Province of BC representatives in accordance with section 3(3) of the *Haida Gwaii Reconciliation Act*. Since the Parties' appointed council members reached a unanimous consensus decision, the HGMC chair did not participate in the decision. As such, reference throughout this document to the HGMC is specific to the four appointed council representatives.

The AAC determination applies to the Haida Gwaii Management Area. As defined in the *Haida Gwaii Reconciliation Act*, the management area encompasses all of Haida Gwaii, except for private land, and areas within Indian Reserves and municipalities. Harvesting cannot occur in established protected areas and federal reserves, or in areas that are reserved to meet legal management requirements such as those in the Haida Gwaii Land Use Objectives Order (LUOO) or in the *Forest and Range Practices Act*. This AAC determination is the first made following the Strategic Land Use Agreement (SLUA) and LUOO, including the removal of new protected areas from the operational landbase.

Subsequent to this "island wide" determination, AAC determinations for the specific forest management units on Haida Gwaii will be made by other decision makers. Specifically, the provincial chief forester is responsible for determinations for the two Tree Farm Licences (TFLs) and the Timber Supply Area (TSA) on Haida Gwaii. The district manager of the Haida Gwaii Forest District has been delegated the responsibility for determining AACs for Woodlot Licences. The apportionment of the TSA AAC to licences within the TSA, and establishment and allocation of AAC to any new Community Forest Agreements and First Nations Woodland Licenses are responsibilities of the Minister of Forests, Lands, and Natural Resource Operations, not of the HGMC.

The HGMC determination is consistent with the land use and management decisions made in the SLUA signed by the Haida and the Province in 2007, and the LUOO, which was established in December 2010. The land use and management regime includes protected areas, and many aspects of ecosystem-based management (EBM), which are designed to protect important Haida cultural values, support ecosystem integrity and provide environmental benefits. A technical analysis, which was undertaken according to all established standards of practice, was done by a Joint Technical Working Group (JTWG) composed of Haida Nation and BC staff to support the determination.

This document describes the factors we, the HGMC, considered, and the reasoning we employed in making the AAC determination for Haida Gwaii, and also identifies recommendations for monitoring, information gathering, and planning that we consider would benefit future AAC determinations.

Statutory framework

The AAC determination was made under the authority of *KaayGuu Ga gaKyah ts 'as- Gin 'inaas 'Iaas 'waadluwaan gud tl 'a gud giidaa*, the Haida Stewardship Law, and the provincial *Haida Gwaii Reconciliation Act*.

Those laws were written pursuant to the agreement documented in the 2009 *Kunst'aa Guu – Kunst'aayah* Reconciliation Protocol, directing the AAC for Haida Gwaii to be determined jointly by the Haida and the Province. Schedule B, section 2.2.3 of the Protocol specifies that the HGMC will determine and approve the AAC for Haida Gwaii. Schedule B, Sections 2.0 to 2.2.6 of the 2009 Protocol are appended to this document as **Appendix 1**.

Section 5(b) of *KaayGuu Ga gaKyah ts 'as- Gin 'inaas 'Iaas 'waadluwaan gud tl 'a gud giidaa*, the Haida Stewardship Law, provides the HGMC with the responsibility to determine and approve the AAC for Haida Gwaii not including federal reserves, municipalities and fee simple lands. Section 5 of the Haida Stewardship Law is appended to this document as **Appendix 2**.

The *Haida Gwaii Reconciliation Act*, outlines responsibilities for the HGMC to determine the AAC for Haida Gwaii, and for the chief forester of the Province of British Columbia (BC chief forester) to provide the HGMC with information that the BC chief forester would consider in making TFL and TSA AAC determinations under section 8 (1) of the *Forest Act*. Under the *Haida Gwaii Reconciliation Act* the HGMC must give written notice of its AAC determination to the BC chief forester and publish the determination on a publicly accessible website. Section 5 of the *Haida Gwaii Reconciliation Act* is appended to this document as **Appendix 3**.

Amendments to Section 8 of the provincial *Forest Ac*t require the BC chief forester to determine the AAC for the 'Crown land' in each TSA, and each TFL area on Haida Gwaii. The amendments also stipulate that the aggregate of the AACs for all of the various management units on Haida Gwaii must not exceed the total AAC determined by the HGMC. Section 8(11) of the *Forest Act* is appended to this document as **Appendix 4**.

AAC determination process

A central body of information that supported this AAC determination was a timber supply analysis in which the volumes of timber potentially available for harvest over time were projected. The timber supply analysis was conducted by a Joint Haida-BC Technical Working Group (JTWG), consisting of staff from the Council of Haida Nation and the BC Ministry of Forests, Lands and Natural Resources Operations (MFLNRO). The analysis process began with compilation of information on the land base, forests, and the land use and management regime applied on Haida Gwaii. A central component of land use and management is the EBM regime established under the SLUA and LUOO, which consists of protected areas, EBM reserves, and requirements for forest conditions in specific areas to protect cultural and ecological values. The information is documented in the *Haida Gwaii Timber Supply Review Data Package*, dated April 4th, 2012, which can be accessed at www.haidagwaiimanagementcouncil.ca. An initial version of the data package was released in October 2011. To improve accuracy, some aspects of this the package were updated, and the most recent version reflects the information on which the analysis and this determination are based.

Once the analysis was completed, a Public Discussion Paper (PDP) was published to support a 45-day period of Public Review and Comment, from November 3, 2011, to December 17, 2011. The two band councils (Old Massett, Skidegate), incorporated villages (Masset, Port Clements, Queen Charlotte), regional district representatives (Area D, Area E), along with interested persons, groups and licensees were notified of the PDP through public advertisements and by letters distributing the PDP and identifying where the data package could be viewed. The PDP

invited comment, opinion, and any other information related to the Timber Supply Review including the forthcoming AAC determination, from anyone considering their interests to be affected by the determination.

The PDP specified the 'base-case' timber supply projection (described below) as one of a number of computer-generated forecasts of the timber supply on Haida Gwaii. The forecast is not a recommended AAC for Haida Gwaii, nor is it the only possible harvest level; rather, it provides just one of the several sources of information for us to consider in our determination. Other information sources include the invited information from the public, the 2007 SLUA's commitment to an economic timber harvest opportunity of no less than 800 000 cubic metres per year, a socioeconomic background analysis that was presented in the PDP, and identified uncertainties in the technical information.

All information received from the 45-day Public Review and Comment period was compiled, summarised and presented to the HGMC for consideration during a three-day AAC determination meeting, on February 14, 15 and 16, 2012. That summary is appended to this document as **Appendix 5**.

After the process described above, we considered all of the technical information along with input from the public review. The considerations consisted primarily of assessing whether or not the inputs used in the timber supply analysis appropriately represented the land use designations and forest management objectives and practices on Haida Gwaii, and if necessary to define how specific inputs would need to be modified to more accurately represent current land use and management. A critical reference point in making these considerations were the guiding principles we developed and adopted to ensure our approach is explicit and transparent, and that the principles used in successive determinations by the HGMC are consistent. Those principles are described in **Appendix 7**, "Haida Gwaii Management Council Guiding Principles for AAC Determination".

The following section describes more detail on the timber supply analysis process and the base case, or reference, forecast.

Timber supply analysis and the base case forecast

As noted earlier in '**Statutory Framework**', in our AAC determination we have considered a range of factors equivalent to those considered and documented in AAC determinations made by the BC chief forester throughout BC. In doing so, we have made reference to a timber supply analysis including timber harvest forecasts provided by the JTWG, which will also be available to the BC chief forester for consideration in his subsequent determinations for the TSA and the TFLs on Haida Gwaii.

Consistent with practice elsewhere in BC, the analysis model used to produce the forecasts was the 'Forest Service Spatial Analysis Model' (FSSAM), a spatial, deterministic simulation forest estate model that was used to project harvesting and growth over an analysis horizon of 400 years. The analysis was based on an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data, the model was used to produce a series of timber supply forecasts.

Several general rules were followed in deriving harvest forecasts. These are described in detail in **Appendix 8** ("Timber supply analysis principles for Haida Gwaii").

Base case forecast for Haida Gwaii

The 'base-case' forecast for Haida Gwaii was designed to represent sustainable timber harvest levels according to current practice and management requirements, including the legal requirements in the LUOO. The model data set was prepared to provide a reasonable representation of current forest management practices based on evidence of actual practices, and a pre-cautionary approach to EBM requirements from the LUOO, with effort made to use the best available information. The base case is used as a reference point to assess the timber supply on Haida Gwaii, and forms the basis to weigh uncertainties through sensitivity analyses.

The forecasts are not predictions, because many unforeseeable events will certainly occur, and practices and knowledge will change and evolve. Given this change and uncertainty, the projection may change in the future. Changes in practices and information will be incorporated into future AAC determinations. However, the forecasts developed to support this AAC determination were designed to provide a rigorous and reasonable basis for this AAC decision,

The base case represents only one in a number of possible forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for Haida Gwaii is not an AAC recommendation. Its validity – as with all the other forecasts provided – depends on the validity of the data and assumptions incorporated into the computer analysis used to generate it.

Much of what follows in the considerations outlined below is an examination of the degree to which the assumptions made in generating the base case forecast are accurate, realistic and current, and of the degree to which resulting predictions of timber supply must be adjusted to more properly reflect the current situation. These adjustments are made on the basis of informed judgement, using currently available information about forest management some of which may have changed since the original data package was assembled. Even though the timber supply analysis was integral to our considerations, the AAC determination is a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. The AAC determination we have made reflects the outcomes of these considerations. As a result, the AAC determined may or may not coincide with the base case forecast. Judgements that in part may be based on uncertain information are often qualitative and general in nature and, as such, are subject to an element of risk.

In the base case analysis an initial harvest rate of 895 266 cubic metres per year was projected for the first 80 years, followed by one-step rise to the sustainable long-term harvest level of 923 558 cubic metres per year. The flows from the individual management units that comprise the base case forecast are described in *Haida Gwaii Timber Supply Review Timber Supply Analysis Report*, January 25th, 2012.

One public comment from the review and comment period characterised the Haida Gwaii base case as '*just the maximum harvest level that can be sustained from the identified contributing land base, while all the other environmental objectives are met'*. This is essentially accurate, and is consistent with our interpretation of our mandate to enable sustainability both in meeting environmental objectives and in providing for the generation of socioeconomic benefits for the people of the islands.

In addition to the base-case harvest projection, the analysis was undertaken in response to the general question: "Using the same land base, growth and yield and management inputs as in the base case would it be possible to produce alternative flows of timber supply, particularly, flows that have higher timber supply in the short term without requiring reductions or causing disruptions in later years?"

The results showed very little flexibility to increase harvest above the forecast indicated in the base case without causing later disruption. It was possible to raise the initial level on the TSA alone by 7.4 percent or 36 520 cubic metres per year, but only for 10 years if harvest failures relative to the base case were to be avoided further into the future. No increases in the initial level were possible for the TFLs without causing future disruption.

Since the base case represents the upper limit on timber supply within the constraints of current management practices and the need to meet the LUOO requirements, it would also have been possible to generate harvest forecasts that are lower than the base case while using the same land base, tree growth and management inputs as used in the base case. The possibilities for lower forecasts are almost endless, and any specific forecast would be based on judgement, such as an approach to addressing risk and uncertainty.

As part of the analysis, the implications of treating the entire Timber Harvesting Land Base (THLB) for Haida Gwaii as one management unit were examined. Combining the three major management units on the islands allowed the timber supply model the additional flexibility to increase the projected availability of the timber supply by 10.3 percent for the first 40 years, and by 5.1 percent for the following 40 years, with no projected change in the long-term level. The HGMC has not been informed about a proposal to combine the three management units on Haida Gwaii into one unit, and therefore has not considered this as a relevant benchmark to inform a base case.

We used the base case only as a point of reference for the consideration of many factors that affect timber supply and the determination of the AAC. We carefully reviewed the harvest flow rules described in Appendix 8, which are commonly applied in timber supply analyses in BC, and the adequacy of the representation in the analysis of legally required environmental objectives.

We agree that the base case provides the most appropriate projection for use as the reliable reference point from which to assess the timber supply on Haida Gwaii, including assessing the implications of the uncertainties identified in the considerations documented below. In addition to the base case, we have reviewed sensitivity analyses and alternative harvest projections which have also been helpful in our considerations, as documented in the following sections and in the reasoning leading to our determination.

New AAC determination for Haida Gwaii

As a result of the deliberations itemised below, we have determined that effective April 4th, 2012, the new AAC for all commercial forest harvesting for the Haida Gwaii Management Area is 929,000 cubic metres. The management area encompasses all of Haida Gwaii, except for private land, and areas within Indian Reserves and municipalities.

This new AAC represents a reduction of 47.8 percent from the previous AAC of 1 780 092 cubic metres, and accounts for all newly protected conservancies and heritage sites, as well as for the EBM regime outlined in the Strategic Land Use Agreement and the Land Use Objectives Order.

While the AAC applies to the whole of the Haida Gwaii Management Area, harvesting cannot occur within established protected areas, or within areas that are reserved to meet legal management requirements such as those in the Haida Gwaii Land Use Objectives Order or in the *Forest and Range Practices Act*. The management area encompasses TSA #25 (the 'Queen Charlotte' TSA, excluding municipalities), TFL 58, TFL 60, and all woodlots (excluding private lands). When they are established, community forest agreement areas and First Nations woodland licences will also be within the Haida Gwaii Management Area.

The determination is based on the reasoning presented in the following "Reasons for decision" section, which in turn are based on consideration of all of the factors documented in the

"Consideration of factors influencing the timber supply on Haida Gwaii," section later in this document.

This AAC will remain in effect until the next AAC determination, which in accordance with the *Haida Gwaii Reconciliation Act*, must take place at least once in every 10 years. In view of uncertainties identified during this determination process, and of recommendations we have made for the completion of related work, if new and compelling information becomes available before that time, the HGMC may determine the next AAC at an earlier date than required in the *Haida Gwaii Reconciliation Act*.

Reasons for decision

In reaching our AAC determination for Haida Gwaii, we have considered all of the factors set out above and have reasoned as follows.

In the base case an initial harvest rate of 895 266 cubic metres per year was projected for the first 80 years, followed by a one-step rise to the sustainable long-term harvest level of 923 558 cubic metres per year. This forecast is the aggregate of the forecasts for TSA 25, TFL 58, and TFL 60. Since our determination applies to the whole of the Haida Gwaii Management Area, the separate forecasts for each management unit are not described here. However, the contributions of those three units to the overall forecast are described in *Haida Gwaii Timber Supply Review Timber Supply Analysis Report*, January 25th, 2012.

A primary function of our considerations in this determination has been to assess the extent to which the assumptions incorporated in the base case are and will remain reliable and accurate, and in the event of uncertainty or new or more accurate information that has been developed since completion of the timber supply analysis, the extent to which the base case may represent an over- or underestimation in the actually available timber supply.

Our considerations have identified a number of such cases which are discussed below. In some cases the over or underestimation has been quantified as a percentage of the THLB, and in others, as a percentage of the base-case harvest level. While these parameters are not strictly fully interchangeable due to variations in productivity across the THLB, for the purposes of this determination we are assured by the JTWG that any error introduced by treating these quantities as numerically compatible is essentially negligible against the overall projected volume of the harvest. Therefore, in quantifying any adjustments to the base case timber supply, we have added or subtracted percentage areas and volumes that relate to each of the factors considered.

Those factors which our considerations have identified as having introduced over or underestimations in the projected timber supply are described as follows, with more detailed discussion in the '**Consideration of factors influencing timber supply on Haida Gwaii'** section, below.

- *overestimations in the projected timber supply in relation to the base case:*

- **Terrain stability:** Our considerations have identified the likelihood of an overestimation in the extent to which harvesting may take place appropriately on potentially unstable areas, resulting in a roughly three-percent overestimation in the size of the THLB.
- **Economic inoperability:** We have concluded that due to the reduced possibility of harvesting for the foreseeable future in expensive and poorly serviced areas such as much of the Sewell Inlet landscape unit, the size of the THLB in the base case is overestimated in the order of about three percent.

- **Areas within municipal boundaries:** Some areas within municipal boundaries were not excluded in deriving the THLB, in respect of which the THLB is overestimated by about 1.1 percent.
- **Timber Licences:** In the base case analysis, due to the inclusion of timber in unreverted Timber Licences, the THLB was overestimated by 0.4 percent.
- **Recreation:** Due to unaccounted for buffers for trails and recreation sites, the THLB is overestimated by about 0.1 percent.
- **Potential Northern Goshawk nests:** In respect of unaccounted for potential Northern Goshawk nest sites, the THLB is overestimated by about 1.1 percent.
- **Great Blue Heron nests:** The need to ensure adequate provision for heron nests indicates a very small overestimation in the THLB of 76 hectares, or 0.035 percent of the THLB.
- **Cedar retention**: The LUOO requirement to reserve 15 percent of the cedar composition in managed second-growth stands will begin to constrain the timber supply as these stands mature toward harvestable age. The timber supply impact of reserving the 15 percent composition in managed second-growth stands represents a 0.4 percent reduction to the THLB beginning in several decades. This does not constrain the timber supply in the short term, but may be of interest to the BC chief forester in considering the appropriateness of including a partition specifying a particular harvest level for cedar in the forthcoming determinations for the TFLs and the TSA on Haida Gwaii.
- **Upland streams:** since the assumptions in the sensitivity analysis are a more precise representation of the LUOO hydrology requirements for upland stream areas than those in the base case, the base case forecast harvest level is overestimated by one percent throughout the forecast.

- *underestimations in the projected timber supply in relation to the base case:*

- **Taper and loss:** Application of volume adjustments indicated by a taper and loss study completed in 1999 show the strong likelihood of a substantial underestimation in the timber supply forecasted in the base-case for the short term, which in our judgement we have estimated to be in the order of approximately 12 percent.
- **Risk managing the LUOO:** We expect that some degree of 'risk management' of the objectives in the LUOO will occur in 10 to 20 percent of cutting permit applications, Since no risk management was incorporated in the base case, this indicates a small underestimation in the base case forecast, which we have assumed to be in the order of one to two percent, averaged to 1.5 percent.

The indicated sum of all of the overestimations in the near term amounts to roughly 9.7 percent, and the sum of the underestimations is 13.5 percent, for a net underestimation of about 3.8 percent. Calculating 103.8 percent of the base case initial harvest level of 895 266 gives 929 300, rounded to 929 000 cubic metres.

We note that this AAC is premised upon ongoing contributions from species in proportion to their occurrence in the THLB, and an orderly transition to harvesting in second growth stands. We have therefore recommended that the BC chief forester may wish to consider, in the forthcoming AAC determinations for the individual management units on Haida Gwaii, the use of partitions specifying:

(1) appropriate portions of the harvest in the several managements units in order to ensure a harvest of second-growth timber, and

(2) a sustainable harvest of cedar-leading stands, in proportion to their contribution to the inventory, to ensure their continuing contribution to the harvest through the transition period to dependence on second growth.

These points are reflected in **'Recommendations'**, below.

With this one proviso, we are confident in the sustainability of this AAC for the duration of its effective period as the EBM regime described in the LUOO and SLUA is implemented on Haida Gwaii.

In conclusion, this AAC represents a very significant reduction – almost 48 percent – from the previous AAC. The reduction in large part corresponds to the changes in land use and management related to the SLUA and LUOO. The environmental benefits from these changes are clearly very substantial to Haida Gwaii, to British Columbia, and to the world. The socioeconomic impact of this determination is moderated by the fact that the actual harvest levels on Haida Gwaii over the last few years have been less than AACs, thus the adjustment relative to recent activity is substantially less. The next challenge for Haida Gwaii will be to ensure that optimal socio-economic benefits are realized from the timber harvest at the level facilitated by the new AAC. The HGMC fully intends to do its part in meeting this challenge, as we cooperatively engage, in the near future, in our mandate to develop a comprehensive Forestry Management Strategy for the islands and people of Haida Gwaii, for recommendation to the Parties.

Recommendations for monitoring, information collection, planning, and future AAC decisions

As an integral component of this determination, we are making the following recommendations to improve the quality of available information and to reduce associated levels of uncertainty for future timber supply analyses and AAC determinations:

Inventories and databases

1. Forest cover inventory – Upon the completion of the new Vegetation Resource Inventory, summaries based on the new inventory should be compared with the inventory information used in this timber supply review. Large differences may indicate the need for an early timber supply review.
2. Terrain Resource Inventory Mapping – A new Terrain Resource Inventory Mapping project for Haida Gwaii should be implemented to provide improved and consistent information for Haida Gwaii.
3. Ecosystem mapping – Ecosystem mapping for Haida Gwaii should be improved with the view to working towards completion of consistent terrestrial ecosystem mapping (TEM) for all of Haida Gwaii. Improved TEM will support aspects of forest management such as ecosystem representation, the protection of forested swamps and red- and blue-listed ecological communities, and the application of site index information in timber supply analysis.
4. Growth and yield data – Local growth and yield data should be updated and consolidated, and used to assist in producing yield curves—including operational adjustment factors—that are based on local conditions.
5. Volume estimates for existing stands:
    a. After completion of the VRI ground sampling and analysis the results should be compared to the inventory information used in the timber supply analysis to assess if the

conclusion reached by the HGMC with respect to the volume adjustment is sound, and if there is a need to consider an early revisiting of the AAC determination.

b. The appropriate BC government staff should communicate to ensure consistency is maintained between the volume information that informed the AAC determination (including the taper and loss study), and the volume information used for cut control.

6. Silvicultural data bases – To ensure that current information is easily available on the regeneration status of recently harvested stands and other aspects of forest management for future determinations, it is important for forest professionals to promptly record all harvesting and regeneration information required to be entered in the RESULTS system.

Monitoring

7. Unstable terrain (economic feasibility of harvesting) – The economic feasibility of harvesting on potentially unstable terrain should be monitored to assess the extent to which class IV and V terrain should be included in the THLB for future AAC determinations.
8. Unstable terrain (ecological and cultural impacts) – The impacts on ecological and cultural values of harvesting on unstable terrain (classes IV and V) should be monitored to inform the decisions on the extent to which such terrain should contribute to the THLB for future AAC determinations.
9. Harvest-origin second growth stands – The amount of harvesting in harvest-origin second growth stands should be monitored to improve understanding of the timing of the transition to second growth harvesting for the next AAC determination.
10. Isolation of stands – Harvest monitoring should be done to determine the effects on economic operability of isolation of stands due to infrastructure limitations and retention patterns associated with EBM. This could include monitoring the amount of harvesting in more remote landscape units or areas where infrastructure limitations currently limit access, as well as quantifying the extent to which portions of harvest blocks are isolated during operations under the LUOO.
11. EBM (requirements for cultural and ecological objectives in LUOO) – As EBM is implemented, relevant digital spatial data should be submitted as part of ongoing harvest reporting requirements to help build a data base on trends in management for LUOO values including cultural and monumental cedar, culturally modified trees, Haida Traditional Heritage Features, Haida Traditional Forest Features, western yew, and Black Bear dens. This information should be analysed for incorporation in future timber supply reviews.
12. Silviculture systems for EBM – In order to understand if there are any growth-and-yield implications from shading or other aspects of EBM, information needed to enable modeling of the silvicultural regimes used to achieve EBM objectives under the LUOO should be collected systematically as experience and related data are accumulated on Haida Gwaii.
13. Disturbance and unsalvaged losses – Improved monitoring and reporting of disturbances from wind-throw and from insects should be undertaken to ensure accurate representation of unsalvaged losses in timber supply analysis.
14. Recreation – For the next analysis and determination, it is important to consolidate and rationalise the various recreation inventory data sources, and to integrate related work with the review of visual quality management currently underway, and to coordinate the visual quality and recreation feature inventory and planning work.

Forest management planning

15. Harvest planning and priority – MFLNRO timber supply analysts should work with staff from the district, licensees, and the CHN to develop analyses that explore the range of approaches to harvest sequencing and priority setting, so that a recommended approach for modeling this issue can be included in the next timber supply review.

Specific values

16. Northern Goshawk – When a final decision is reached on a recovery plan for management and protection of Northern Goshawk habitat (currently being led by the federal and provincial governments), the requirements under the plan should be compared to the management objectives modeled in support of this AAC determination. If there are substantial differences, the HGMC will give consideration to the need for an early Timber Supply Review for Haida Gwaii.
17. Karst – Given the challenges associated with predicting the location of areas with a high probability of occurrence of karst, resource managers should become more informed about the nature of karst features and about associated management issues that may have implications for harvest planning and operations.

Subsequent AAC determinations

18. Partitions – In the forthcoming AAC determinations for the individual management units on Haida Gwaii, the chief forester should consider the use of partitions that specify appropriate portions of the harvest as attributable to:

    a. second-growth timber, to ensure an orderly transition to eventual dependence on second growth; and

    b. cedar-leading stands, to ensure that allowable harvests in such stands are in proportion to their contribution to the inventory, so that they are available to contribute to harvests through the transition period to dependence on second growth.

Consideration of factors influencing the timber supply on Haida Gwaii

As noted earlier, in 'Statutory framework', the HGMC is not specifically required by any law to make any particular type of consideration in determining an AAC for the Haida Gwaii Management Area. This differs from the legislation mandating AAC determinations by the BC chief forester, who is required in all such determinations for TSAs and TFLs in BC to consider a specific set of factors set out in Section 8(8) of the *Forest Act*.

There is an extensively documented record of considerations in numerous AAC determinations made by the chief forester in recent decades in BC. The chief forester has established a sound procedure for considering the factors that affect timber supply, and the courts have clearly accepted it as reasonable and defensible. We therefore conclude that the procedure used by recent chief foresters of identifying and considering specific individual factors that are relevant in defining timber supply provides a sound basis for determining a reliable AAC. For these reasons, the considerations and our reasoning in reaching this AAC determination have been structured in a similar way to that followed by BC chief foresters. In this way, the technical, management and socio-economic information presented to and considered by the HGMC, as well as the documented considerations and reasoning, are consistent with the requirements of the BC chief forester for incorporation in his subsequent, separate determinations for each of the management units on Haida Gwaii.

In view of the large number of factors for which information has been presented to and considered by the HGMC—the documentation in this rationale follows the structure of other recent AAC rationales whereby the factors are essentially divided into two kinds as follows.

For some factors, we have concluded that the information as published in the *Haida Gwaii Timber Supply Review Data Package*, and documented in the *Haida Gwaii Timber Supply Review Timber Supply Analysis Report* and in the *Haida Gwaii Timber Supply Review Decision Binder*, provides the best available information and appropriately describes and represents current management. Where we have found that these factors have been appropriately modelled in the base case in all known respects, with no identified contention in public comment from the review process, and where uncertainties about the factor in any case have negligible influence on the projected timber supply, we have concluded that there is no additional informational benefit to be gained from corroborative discussion in this rationale.

For other factors related to which we have concerns about the information used or the modeling technique, we have made adjustments to the base case, public comment suggests there is contention, or we have made a recommendation regarding opportunities for improving the availability or accuracy of information for subsequent analyses and determinations we have listed these in the section following Table 2.

All such factors are therefore listed below in TABLE 2. 'LIST OF FACTORS INFORMING THE DETERMINATION.

It should be noted that the biophysical, social and economic conditions on Haida Gwaii provided an important context for our considerations. For brevity in this document, we refer readers to description of those condition provided in the October 2011 *Public Discussion Paper* published by the HGMC for the November 3, 2011 to December 17, 2011 Public Review Period for this AAC determination process. This document is available electronically at

http://www.haidagwaiimanagementcouncil.ca/Documents/HaidaGwaiiAACPDPOctober31_final.pdf

Factors considered in the determination

TABLE 2. LIST OF FACTORS INFORMING THE DETERMINATION

Category of factor	Factors	Decision
Land base contributing to timber harvesting—deletions in deriving the THLB	1. Water bodies and non-productive forest 2. Non-forest, no typing, no species information 3. Low-productivity sites 4. Non-merchantable forest types 5. Roads, trails and landings 6. Low productivity sites	Accepted base case
	7. Unstable terrain 8. Economically inoperable forest 9. Administrative classes not contributing to forest management	Adjustment to base case required
Growth and yield, and site productivity estimates	10. Volume estimates for existing natural stands 11. Utilization levels 12. Decay, waste and breakage 13. Operational adjustment factors for managed stands 14. Yield table development	Accepted base case
	15. Existing natural and future managed Stands	Accepted base case with recommendations
	16. Inventory audit and volume and decay sampling studies	Adjustment to base case required
Silviculture	17. Regeneration delays and impediments to prompt regeneration 18. Species composition of regeneration 19. Stand density 20. Stand rehabilitation 21. Incremental silviculture and commercial thinning 22. Genetic resource—use of select seed	Accepted base case
	23. Backlog and current Not Satisfactorily Restocked (NSR) 24. Silvicultural systems 25. Silviculture history	Accepted base case with recommendations
Timber management and harvesting	26. Harvest rules (oldest first queue) 27. Harvest profile (except issues respecting cedar) 28. Disturbance outside the THLB 29. Decidious volume exclusions	Accepted base case
	30. Minimum harvestable age 31. Harvest priority 32. Partition 33. Harvest emphasis on cedar 34. Cut control and actual harvest performance 35. Woodlots	Accepted base case with recommendations

Category of factor	Factors	Decision
Forest management objectives	36. Stand-level biodiversity 37. Cutblock adjacency 38. FPPR requirements for non-fish habitat	Accepted base case
	39. Community watersheds 40. Visual quality management 41. Karst features	Accepted base case with recommendations
	42. Recreation 43. Identified wildlife	Adjustment to base case required
Land Use Objectives Order (LUOO) Requirements	44. Protected Area removals 45. Type I and Type II fish habitat 46. Buffers for lakes and wetlands 47. Active fluvial units 48. Tree lengths 49. Cedar stewardship areas	Accepted base case
	50. Monumental cedar, including cultural cedar stands 51. Culturally modified trees 52. Haida Traditional Heritage Features 53. Haida Traditional Forest Features 54. Cedar retention 55. Western yew trees 56. Black bear 57. Northern Saw Whet Owl 58. Marbled Murrelet 59. Landscape-level biodiveristy 60. Forested swamps 61. Red and blue listed ecological communities 62. Sensitive watersheds and upland streams	Accepted base case with recommendations
	63. Risk managing Haida Gwaii LUOO 64. Great Blue Heron 65. Northern Goshawk**.**	Adjustment to base case required
Socio Economic Considerations	66. Alternative harvest flows 67. Economic and employment implications 68. Summary of public input 69. Timber volume commitments made by province	Accepted base case
Disturbance and Losses	70. Unsalvaged losses	Accepted base case

Factors requiring additional explanatory consideration

In addition to the factors listed in Table 2, we have also considered the following factors requiring comment or discussion.

Land base contributing to timber harvesting

- *general comments*

The total area of the Haida Gwaii management area as defined in the timber supply analysis is 1 006 310 hectares. From this, a total land base of 197 342 hectares is currently suitable and available for commercial forest harvesting operations. An accounting was also made for roads, trails and landings by adjustments to yield curves for available timber volumes. The accounting for roads, trails, and landing results in an effective, long-term timber harvesting land base of 188 718 hectares.

The HGMC recognizes that with respect to a number of the land base deductions made, although the best currently available inventory information was used in the analysis, future analyses would benefit in many ways from greater levels of certainty that could be achieved from improved inventory information. For instance the use of the new Vegetation Resources Inventory to be completed in the next few years will fundamentally re-establish a new baseline of standardized forest inventory for Haida Gwaii, or through implementation of an updated Terrestrial Ecosystem Mapping inventories, or Terrain Resource Inventory Mapping (TRIM) project. In view of the number of factors to which this observation applies in our considerations below, we recommend, as noted above in **'Recommendations'**, that all possible effort be made to improve and consolidate the inventory and forest management information on the management units on Haida Gwaii.

In addition to these general comments, having reviewed all of the land base deductions as applied in the analysis in deriving the THLB, the HGMC agrees with the information already published for the factors listed above in row 1 of Table 2, and for all other factors requiring specific comment, our considerations follow.

- *unstable terrain*

Areas classified as unstable terrain, some of which are subject to disturbances such as landslides, may not be entirely suitable for timber harvesting. Uncertainty exists in the extent to which areas associated with terrain classes IV and V may be considered harvestable, and in previous timber supply reviews differing approaches were employed, in which different percentages of the land so classified were excluded in deriving the THLB. For the current analysis, a consistent approach was applied throughout, based on actual operational practice. A review of the Electronic Commerce Appraisal System found that of the area harvested over the 10 years from 2000 to 2010 on Haida Gwaii, eight percent was from class IV terrain, and five percent was from class V terrain. In defining the THLB, 25 percent of the land in class IV, and 50 percent in class V, were excluded as inaccessible to reflect that these classes have not been harvested in proportion to their representation on the forest management land base, which is approximately eleven percent for class IV and nine percent for class V.

The JTWG and the HGMC recognize that just because a particular type of area was harvested in the past does not mean such practice is always consistent with sound forest management. Data from the local Forest and Range Evaluation Program does not provide information on harvests on potentially unstable terrain, but staff of the Haida Gwaii Forest District consider that harvesting since 2006 in such areas demonstrates sound forest management.

To explore how the THLB could change if the percentage land base exclusions had overestimated the area in terrain classes IV and V that is appropriate for harvesting, the percentage exclusions were increased to 50 percent for terrain class IV, and to 100 percent for class V. In this sensitivity analysis the new area consequently classified as unstable doubled relative to the base case from 54 292 hectares to 108 585 hectares, the presence of overlaps with exclusions for other factors resulted in a net decrease on this account of just 4.3 percent in the THLB relative to the base case.

We have concerns, corroborated by field experience related by the Solutions Table, that it is now less likely that harvesting will occur in these areas when considering a number of factors including: market and operational economics—in particular the now limited amount of helicopter harvesting carried out by all licensees in recent years; as well as concern for the potential impacts of harvesting in these areas on fish streams and other land values on which the Haida people depend. This indicates that the assumptions in the base case are likely to be somewhat optimistic, particularly during current economic circumstances.

For these reasons the HGMC has taken guidance from the noted sensitivity analysis in which all class V, and 50 percent of all class IV areas were excluded, which resulted in a reduction of 4.3 percent in the THLB. The HGMC recognizes the possibility for some environmentally responsible harvesting on these areas in better economic times. We have therefore accounted in our determination for an overestimation in the THLB of 3 percent, as accounted for in **'Reasons for Decision'**.

In view of the need to resolve the complexity of related assessments of the extent of harvestable land in these terrain classes, in the **'Recommendations'** section above we have made two recommendations to licensees and to staff of the MFLNRO and the CHN:

> (1) to monitor the impacts of economics on the feasibility of harvesting on potentially unstable terrain; and
>
> (2) to monitor the impacts of harvesting on unstable terrain (classes IV and V) on ecological and cultural values.

-economically inoperable forest

Economically inoperable forest consists of areas that are not likely to be harvested because the costs of accessing, harvesting and removing timber outweigh the value of the harvestable timber. Accurately assessing economic operability is difficult, due to uncertainty about several factors. Average costs, which are often the most readily available source of information, may not reflect specific local conditions, and in general accurate information on anticipated costs and revenues is seldom available. The ability to 'blend' differently valued stands in cutting permits makes it difficult to develop accurate operability assessments for specific stands. Although the general relationship between markets and economic operability is known—that is, when markets are poor the economically operable area shrinks—the nature of future markets is highly uncertain, which adds to the challenge of defining the operable area.

Recognizing the difficulty of accurately predicting the economic operability of forests for the timber supply analysis, the JTWG used an empirical approach that correlated parameters that logically represent limitations of physical accessibility with those that approximate timber values. Ten years of harvest history and information on inventory types and slope were correlated to define minimum volume thresholds for various stand types and slope classes. A minimum threshold for operability was established for various stand types and slope classes as the stand volume above which 99 percent of all harvested volume was taken. The 99 percent threshold was used to exclude potential outliers in the inventory and harvesting data, while including as economically operable most types of areas that the available information indicates have been

harvested in the past 10 years. A total of 85 644 hectares were excluded from the THLB when applying this approach.

Although the above approach is reasonable, in that it uses information on actual harvesting to approximate what types of land and forest may be economic to harvest, there are nevertheless, uncertainties. To assess the potential implications from uncertainties on the THLB thresholds were redefined for a sensitivity assessment. In this assessment, instead of excluding the stands with volumes per hectare at or below the bottom one percent threshold as in the base case, stands with volumes per hectare in the bottom 10 percent were excluded. Although this change significantly increased the total forest area that was classified as 'inoperable' (by 80 percent above the base case level), the THLB was reduced by only 5.6 percent, because of overlaps with other, mostly EBM-related, exclusions.

One uncertainty related to operability that was not incorporated into the approach used in the base case, or in the sensitivity assessment is the potential that geographic isolation of stands may increase access costs and make stands uneconomic to harvest. Haida Gwaii Forest District staff identified some areas, such as the Sewell landscape unit, where harvesting occurred in the past, but where the remaining mature timber is dispersed and the roads and bridges require substantial renovation to enable operations. In such areas, given the costs and the current isolation of mature timber, significant operations will not likely take place under current economic conditions. Improvements in market conditions would increase the possibility of harvesting in the near term. It is also possible that retention of forest to achieve EBM objectives may result in the isolation of small blocks of timber that are difficult to harvest economically under all but the best market conditions.

We have considered all of this information, and have concluded that the isolation of timber stemming from the pattern of past operations and the implementation of EBM is likely to increase the amount of economically inoperable forest when compared to the base case estimate. Although it is difficult to predict with certainty what impact such isolation may have on the THLB, for the purposes of this determination we take guidance from the land base sensitivity assessment described above. That assessment showed that large increases in the overall inoperable area result in a substantially smaller net impact on the THLB; therefore, for the purpose of this determination, we estimate that the downward pressure on timber availability in the short term is 3 percent. This factor is discussed in **'Reasons for Decision'**.

- *administrative classes not contributing to forest management*

In the timber supply analysis, areas in the following administrative or ownership classes that do not contribute to forest management objectives were appropriately excluded in deriving the THLB: Private - Crown Grant; Federal Reserve; National Park; Indian Reserve; Military Reserve; Crown Ecological Reserve; Crown UREP (Use, Recreation and Enjoyment of the Public); Crown Provincial Park Class A; Crown Provincial Park equivalent or Reserve; Crown Miscellaneous Reserve; Crown Miscellaneous Lease, as well as Heritage Sites/Conservancies.

While all of the above areas were appropriately excluded in deriving the THLB, areas within municipal boundaries were not excluded, which represents an over estimation of the THLB area in the base case. The Haida Gwaii Management Area excludes municipal lands, so to be consistent with the statutory framework these areas should not contribute to the harvest forecast. These areas in hectares, and as a percentage of the THLB for Haida Gwaii are as follows: Massett, 281 ha, 0.1 percent; Port Clements, 519 ha, 0.3 percent; and Queen Charlotte Village, 1341 ha, 0.7 percent. In total these represent an overestimation in the THLB of 1.1 percent. This is accounted for in the determination as noted in **'Reasons for Decision'**.

Another component of this factor is the reversion of Timber Licences (TLs), a form of tenure on Crown land within TFLs and TSAs. In TFLs, the licence holder has agreed to manage the TLs as part of the TFL, and therefore the TLs are included in the TFL THLB. In TSAs, however, TLs are managed separately from the remainder of the management unit. In TSAs, the existing old-growth timber on TLs is owned by the licence holder, and may be harvested at any time independent of an accounting under an AAC. Once harvested, the land reverts to provincial government administration. However, for the Haida Gwaii analysis the TL areas were not excluded from the THLB. Therefore, the THLB was overestimated slightly. For Haida Gwaii, the total area of TLs on Haida Gwaii is 63 530 hectares, with 29 627 hectares within the THLB. Of this THLB area, 23 140 hectares is in TFLs, and 6487 hectares in the TSA. Of the area in the TSA, only about 800 hectares is occupied by old forest, and therefore estimated to be unreverted. This area amounts to 0.4 percent of the total THLB on Haida Gwaii.

In respect of this, due to the unreverted Timber Licences on the TSA containing harvestable volumes that were included in the base case but which are not available to contribute to the timber supply and to the AAC in the short term, we have accounted in our determination for an overestimation of 0.4 percent of the THLB in the short term, as noted in **'Reasons for Decision'**.

Growth and yield and site productivity

- *volume estimates for existing and future managed stands*

The HGMC is satisfied that in the timber supply analysis the best available information was used in predicting timber volumes in managed stands through the use of the Table Interpretation Program for Stand Yields (TIPSY) and the application of standard provincial operational adjustment factors. However, we were advised that in many cases the growth and yield estimates used in the timber supply analysis relied on non-local information – from Washington and Oregon states in some cases – and from Vancouver Island, as well as on information for other species (e.g. red cedar data used for yellow cedar), instead of on the localized information from more than 480 growth-and-yield sample plots that have been established on Haida Gwaii since the mid-1960s. To date, for proprietary and other reasons related to the administration of formerly much larger management units spanning areas much larger than individual TFL blocks on Haida Gwaii, timber supply review processes for Haida Gwaii have not been able to utilise the substantial amount of local data. An integrated initiative is required to ensure the availability of this information, to create localised yield curves and to fill in information gaps for future analyses and AAC determinations.

In the interest of improving information for future analyses and AAC determinations for Haida Gwaii, we recommend that local growth and yield data be updated and consolidated, and used to assist in producing yield curves, and operational adjustment factors, that are based on local conditions. This recommendation is included in the **'Recommendations'** section, above.

- *inventory audit and volume and decay sampling studies*

In the late 1990s, an inventory audit and a volume-and-decay sampling study were carried out on Haida Gwaii. The results were published in 1999 in the *Queen Charlotte Islands TSA Timber Supply Analysis Adjustment; FIP File Adjustment Process*. This inventory audit, which was based on the Variable Density Yield Prediction model VDYP6 and included adjustment factors specific to TSA25, produced results applicable at the stand level. For the TSA it was found that when comparing inventory volumes calculated by VDYP6 from inventory heights and ages with those calculated using ground sampled heights and ages, any errors in the height and age attributes were overall not large enough to cause significant errors in the inventory volumes. However, the audit

was completed slightly prior to the taper and loss study, and therefore did not incorporate new volume and decay results.

This other part of the investigation – the volume, taper, and decay study – involved unbiased volume and decay sampling to assess these factors for the entire forest management land base of Haida Gwaii, including TFLs. This study developed refined taper equations, loss factors, and definitions of proportions of sound wood for red and yellow cedar, hemlock, and spruce. The study indicated that the old taper and loss factors were underestimating the sound wood volumes.

Since the new taper equations and sound wood factors are not yet incorporated into the MFLNRO Vegetation Resource Inventory Management System which uses the VDYP7 model, they were not applied to the forest cover inventory information used in the base case forecast. Neither were the new factors incorporated into the yield estimates for existing older (unmanaged) stands in the base case.

A volume and decay expert from the BC MFLNRO Forest Analysis and Inventory Branch provided the JTWG with factors consistent with the taper and loss study that could be applied to the yield tables for the purposes of a sensitivity analysis.

Sensitivity analysis showed that when the new loss factor and taper equations are applied, the volume adjustments add very substantially to timber supply, significantly affecting the base case forecast, as follows:

- For the first 20 years, the base case initial harvest level is increased by 21.0 percent.
- From 20 to 40 years into the forecast, the harvest level is increased by 13.7 percent.
- From 40 to 80 years, the harvest level is 6.7 percent higher than base case.

The average increase over the first 80 years of the forecast is 12 percent. The long-term harvest levels remained unchanged from those projected in the base case.

We are aware of several reasons that the impacts of the taper and loss study as reflected in the sensitivity analysis should be treated with caution.

First, almost 20 years have passed since the audit study was completed. Given the amount of harvesting in old forests during that period, the applicability of the audit results to the current TSA inventory is somewhat uncertain. Second, the new taper and loss factors on Haida Gwaii apply at the individual tree level not at the stand level. In the sensitivity analysis, the tree-level factors were applied based on the stand composition listed in the forest inventory, which is an appropriate approach. However, the factors are not strictly applicable to stand-level yield curves, therefore, the approach used for the sensitivity analysis provides only a general idea of how inventory volume estimates would change given integration of the taper and loss factors into VDYP7. Third, while the ratios are stratified somewhat by age, the categories are broad. In reality the application of the new taper equations and loss factors would affect volumes differently at different ages and in different types of forests. Therefore, the ratios can provide only a general idea of the potential volume underestimate. Notwithstanding these caveats, advice from the forest inventory specialist who led the taper and loss study indicates that in relation to the base case timber supply projection *'there is likely an upward influence [on the timber supply] that can't be strictly quantified but is probably fairly large'* due to the results of the taper and loss study.

From all of this, the HGMC accepts (i) that the base case forecast did not incorporate the findings of the study indicating the presence of significantly higher volumes in natural stands than those that are indicated in the inventory data, and (ii) that sensitivity analysis using the findings of that study shows significantly greater timber availability in the short-to-mid term *'that can't be strictly quantified but is probably fairly large'*.

The HGMC considers that it is reasonable to conclude that the existing volume estimates as applied in the timber supply analysis were underestimated to a substantial degree, and that this has caused the base case forecast to underestimate the timber supply, certainly in the short and mid terms, to an uncertain but very considerable extent, potentially by as much as up to 21 percent. The actual magnitude of the underestimation remains essentially unquantifiable due to the caveats discussed above.

Although we acknowledge that the taper and loss study indicates that volumes used in the base case underestimate actual volume to a substantial degree, given the caveats associated with the application of the study results discussed above, we have concluded that it would be most reasonable to be conservative with respect to the likely impact relative to the base case forecast harvest level. The sensitivity analysis indicated that full application of the factors from the study increase short-term timber supply by 21 percent above the base case, and the average supply over the first 80 years by 12 percent. We believe that a reasonably conservative application of the study would be to conclude that the short-term impact is a 12 percent increase above the base case initial timber supply. This conclusion is reflected in **'Reasons for Decision.'** Given a conservative application, the timber supply impact would decline over the next few decades, in parallel with the results of the sensitivity analysis, as the contribution of existing old stands to harvests declines and second growth contributes more.

In view of the magnitude of the impact of this factor on this determination, and the importance to future AAC determinations of reducing the current level of uncertainty in the volume estimates, we recommend the following. After completion of the VRI ground sampling and analysis, the results should be compared to the inventory information used in the timber supply analysis used to support this determination to assess both if the conclusion reached by HGMC with respect to the volume adjustment is sound, and if there is a need to consider an early revisiting of the AAC determination. Second, the appropriate MFLNRO staff should communicate to ensure consistency is maintained between the volume information that informed the AAC determination, and the volume information used for cut control. These recommendations are included in the '**Recommendations**' section above.

- *site index estimates*

In BC, the productive potential of a forest stand to grow timber is expressed by a 'site index' which is determined from the height and age of the largest trees in a stand, typically expressed as the height at a breast height age of 50 years. Site productivity largely determines how quickly trees will grow, which affects many factors in forest management and timber supply analysis—the time taken by seedlings to reach green-up conditions, the volume of timber that can be produced, the age at which a stand will satisfy mature forest cover requirements, and the age at which a merchantable condition is reached.

In support of this AAC determination the JTWG compiled and presented to the HGMC a substantial amount of information on the derivation of site index estimates from various sources; this provides the best currently available information on these estimates for Haida Gwaii and includes sensitivity analyses examining the implications of uncertainty in the information.

The HGMC has considered all of this information carefully and is satisfied that its incorporation in the timber supply analysis provides the most current and reliable basis from which to project timber supply. The sensitivity analyses, however, identified a sufficient range of variability in the timber supply associated with the different site index estimates to warrant a recommendation to complete work to bring the Terrestrial Ecosystem Mapping work to a satisfactory standard, which will help minimize related uncertainty in future timber supply analyses and AAC determinations. This recommendation is included above in '**Recommendations'**.

Silviculture

- 'backlog' and 'current' not-satisfactorily restocked areas

The amount of land on Haida Gwaii that could potentially be considered not satisfactorily restocked (NSR) was derived from three sources. The first source was the 'Reporting Silviculture Updates and Land status Tracking System' (RESULTS), which identified roughly 3700 hectares of NSR within the analysis area.

The second source was the NSR label on the forest inventory, which identified 15 000 hectares that did not overlap with the NSR identified in RESULTS. As emphasized by the discrepancies between RESULTS and the inventory, an inventory label of NSR does not necessarily mean that the site is still not satisfactorily restocked. For many of these areas, information on species and age was available, which allowed for derivation of site indexes for use in the TIPSY yield estimation program. Managed stand TIPSY curves were developed for stands that were initially identified as NSR in either the inventory or RESULTS. These curves were built for stands with adequate TIPSY input information such as age and species composition and stand density from the inventory or RESULTS. Thus, inventory NSR stands were not removed from the THLB, but were allowed to contribute to the forecast according to their stand characteristics.

Finally, the third source of potential NSR was the species and age variables on the forest inventory. On the inventory, 2700 hectares of forest (that did not overlap with NSR identified in RESULTS) did not have species information but had other forest cover information such as age of site index. For these records, yield tables were generated using stem densities and species compositions based upon personal communication with Haida Gwaii district staff. District staff experience indicated that on average these stands could be expected to have 900 stems per hectare and a species composition of 40 percent Western hemlock, 30 percent Western Red Cedar, and 30 percent Sitka Spruce.

We are satisfied from our discussions with the JTWG that given the normally high success of natural regeneration on Haida Gwaii, it is reasonable to conclude that all of these areas will regenerate satisfactorily. For efficiency, reliability and comprehensiveness in future determinations, however, it is important for forest professionals to provide information to allow all relevant databases related to post-harvest regeneration to be kept up-to-date. It is quite conceivable that all of the areas discussed in this section are in fact satisfactorily stocked, but have not yet been reported by licensees and included in the RESULTS data. We have included a recommendation to this effect in the **'Recommendations'** section above.

- silvicultural systems

Various silviculture systems used for timber harvesting, such as 'clearcut', 'variable retention', or 'partial cut' affect the method used for post-harvest regeneration and can affect the expected growth and yield of timber volume in the regenerating forest, due to shading and related effects.

In the timber supply analysis model, to represent the silvicultural implications of implementing EBM on Haida Gwaii, all harvesting was assumed to be carried out through 'variable retention', by modeling a system of clear-cuts with reserves. This representation is not completely accurate, as some single select partial harvesting has been employed on Haida Gwaii. However, this has been applied only on a limited area in the past and few cutting permits for single select partial cutting have been approved in the past few years. District staff anticipate that the future use of high retention partial harvesting will be limited, due to high cost and the fact that the high retention partial cutting system promotes the regeneration of hemlock and inhibits regeneration of the currently more valuable cedar and spruce.

Most harvesting does involve retention of some trees within blocks, which can result in shading and consequent reduction in growth rates, and it is anticipated that clear cut with reserves will be the most common silvicultural system employed under EBM. Due to uncertainty in the extent to which the consequent shading may affect growth and yield, in the base case no adjustments were applied to growth-and-yield estimates to account for shading.

Growth-and-yield specialists advise that it is possible to model the volume implications of the variable retention system using the TIPSY program, as the model can account for both loss of area and the impacts of shading. However, this modeling requires information that is difficult to anticipate without clear plans or documented experience. Such information includes the top height of the residual stand at the next entry, whether the retention is in aggregated groups or dispersed single trees and in each case the percentage of the crown cover retained in the stand, and more. In BC, although some localized studies related to variable retention have been carried out, for instance on Vancouver Island, no broad provincial study of the impacts of variable retention on growth and yield has been performed, and it is not possible to make general statements about impacts on Haida Gwaii without describing the silvicultural regimes in more detail. Implementation of EBM on Haida Gwaii officially began only in June 2011, and considerable information based on local experience with EBM will be needed in order to understand the possible range and magnitude of timber supply implications.

No related volume adjustments were applied in the base case and this is in fact appropriate since in operational reality the growth and yield impacts from shading will occur in managed stands, and will affect timber supply in the longer term. It should be noted therefore that an unquantified over-estimation may be present in the projected long-term timber supply, consequent to the shading effects of in-stand retention.

From the foregoing considerations we accept the current modeling of the timber supply in relation to the applicable silvicultural systems, with a recommendation, noted in the '**Recommendations'** section above, for systematic collection of the information on the silvicultural regimes used to achieve EBM objectives under the LUOO, in order to monitor any growth-and-yield implications from shading or other effects as experience is gained in implementation of EBM on Haida Gwaii.

- *silvicultural history*

In the timber supply analysis, all stands aged 30 years and younger, having already been harvested, were assumed to be managed stands and were assigned volume yields using the TIPSY program. All of the stands in the MFLNRO RESULTS system were assigned TIPSY yield curves for 'existing' managed stands. Later it was discovered that about half of the stands under age 30 had not been entered in the RESULTS database. Consequently, the young stands not found in the RESULTS data were placed on the relevant 'future' managed TIPSY curves at the start of the forecast. While this did not lead to any necessity to adjust the timber supply as projected in the base case forecast, it did lead to avoidable confusion in the published graphing of the modelled data. To ensure efficiency and clarity for future analyses, as noted above in **'Recommendations'**, we recommend the prompt recording by forest professionals of all data required to be entered in the RESULTS system.

Timber management and harvesting

- *minimum harvestable age*

The 'Minimum Harvestable Age' (MHA) is the youngest age at which a forest stand becomes eligible for harvest in the timber supply forecasting model; this approximates the time needed for a stand to grow to a harvestable condition. The MHA is an important determinant of timber

supply, since to a large degree it defines the period of time over which the existing timber inventory must be relied on while waiting for regenerated stands to achieve a merchantable condition. Although assumptions about MHAs are required for modeling, the actual timing of harvesting depends on many factors that are often unpredictable, such as future market demands and desirable product characteristics. For this reason the MHAs assumed in the analysis are intended to be reasonable representations of actual harvest timing. However, the modeling does not in any way *prescribe* what will actually be taking place as conditions and policies evolve and as licensees make operational decisions over time.

In the base case, MHAs were set at the earliest age by which 95 percent of the maximum mean annual increment (average growth rate) is projected to be achieved; this is known as the 'biologically optimum' rotation age. The MHAs in the analysis varied considerably by species and by productivity of the growing site, ranging from 51 years for alder on its most productive sites to 876 years for yellow cedar on its least productive sites. In the base case, the average age at which stands were projected for harvest began at just over 350 years in the first decade of the analysis horizon and dropped steadily over the next 90 years, levelling out at about 115 years.

As reflected in the high harvest ages observed in the base case for the next few decades, most natural forest stands (i.e. those with no harvesting history) on Haida Gwaii are older than the applicable MHA. Therefore, the largest impact of MHAs on harvest forecasts relates to the timing of availability of trees well into the future. There will always be uncertainty about activities that occur far in the future. Harvest ages are to a very large extent the result of social and economic objectives, which will likely change over time. In addition, although there is a substantial amount of second growth on Haida Gwaii, it is now just beginning to contribute to harvests; therefore, there is still limited experience in harvesting second-growth stands with consequent uncertainty about timing of harvests. Therefore, there is uncertainty about whether the base case MHAs will reflect operational realities, particularly in the future.

To examine the implications of uncertainty about harvest ages, two sensitivity analyses were performed to answer the questions, (a) 'What would happen if stands were allowed to age further before harvesting, so that wood quality would be higher?', and (b) 'What would happen if an economic or financial lens were used, which would tend to emphasize shorter harvest ages, so that revenues could be received as early as possible to offset costs associated with forest operations?' These two analyses were achieved by, in the first case, increasing, and in the second, decreasing the MHAs used in the base case, by 20 percent.

When the MHAs were *increased* by 20 percent, the overall projected harvest level was about 6.5 percent lower than the base case for the entire forecast (with minor variations by TFL and TSA).

When the MHAs were *decreased* by 20 percent, the projected timber supply was 10.7 percent higher than in the base case for the first 20 years, 7.1 percent higher over the next 20 years, and 3.2 percent higher from 40 to 60 years from now. For the remainder of the forecast the harvest level was projected at 1 percent below the base case. The average increase in timber supply over the first 80 years was approximately seven percent.

Several of the comments received from the public review addressed the question of appropriate MHAs. Most concerns related to the need to provide for a range of environmental and cultural values by allowing the forest to grow for longer before harvest.

We take very seriously this expression of concern for the adequacy of provisions for maintaining environmental and cultural values on Haida Gwaii. Under Section 2.3.1 of the 2009 Protocol the HGMC has responsibility for the 'Development of a comprehensive Haida Gwaii forestry management strategy that maintains ecological integrity and supports a sustainable Haida Gwaii

economy, for consideration by the Parties'. Mindful of this responsibility, and of the expressed public concern about the linkage between harvest age and cultural and environmental values, we have considered and assessed the appropriateness of the MHAs used in the base case in the following way.

Many of the considerations we discuss in this rationale are directly related to measures, such as protected areas, EBM reserves, and forest cover objectives related to the LUOO, that are directly intended to protect cultural and ecological values. These measures in some cases exclude harvest and in others extend harvest ages beyond the biological optimum. MHAs are designed to represent the timing of merchantability. The actual age of harvest, both in a model and in reality, is also a function of other requirements, such as those related to EBM.

When the provisions of the LUOO, the protected areas established under the SLUA, previously existing protected areas, and requirements of FRPA are all accounted for, the area on which timber harvesting appears economically feasible and environmentally sound is just 197 000 hectares out of total of over one million hectares on Haida Gwaii. Outside this THLB, including within areas reserved to meet LUOO requirements; trees will naturally reach the old-growth conditions.

On the THLB itself, the forest is managed to realise economic and social benefits for Haida Gwaii, and the timber supply analysis was produced to assess the potential magnitude of these benefits while maintaining environmental integrity to satisfy Haida Stewardship Law and the LUOO. We are satisfied from considerations documented elsewhere in this rationale that, with the specific qualifications we have noted in our determination, all provisions for wildlife habitat and for managing conditions for the other forest values required by the LUOO were fully respected and accounted for in the analysis.

As noted above, the timing of harvest for a particular stand is to a large extent the result of social and economic objectives. In addition to cultural and environmental concerns, important considerations in defining the age of harvesting are the desired timber qualities and the economics of harvesting and processing. The harvest ages that are employed across the land base should reflect a strategy that integrates economic, social, cultural, and environmental objectives. The HGMC cannot reasonably dictate these objectives, but looks forward to facilitating a discussion on this topic, along with other forest management issues as part of developing the forest management strategy for Haida Gwaii, as we have referenced above.

In the absence of a current strategy, for this determination we note that in the base case, all harvesting is not projected to occur at the minimum harvestable ages. Some stands are projected for harvest at significantly older ages. This result reflects the ability in practice to manage some areas for older, higher quality timber, and other areas on somewhat shorter, economic rotations. The MHAs and the overall modeling approach employed in the base case reflect and allows for this kind of flexibility. For this reason we conclude that the MHAs used in the base case analysis reflect a reasonable approach for modeling future practices.

It is our hope that these considerations will assure those who have expressed concerns about MHAs that these concerns are taken seriously and that they will be given additional consideration in the near future when the HGMC contemplates the development of a comprehensive forestry strategy for Haida Gwaii.

- *harvest priority rules*

In the timber supply analysis model, an 'oldest first' harvest priority rule was applied whereby it was assumed that the oldest available forest stands would be given priority and harvested first. A number of other rules could have been applied, including 'relative oldest first' in which the

highest priority is given to stands furthest past their MHA; 'random', in which stands that have achieved their MHA are placed in a random queue before being assessed in relation to other factors such as forest cover requirements and management objectives; and 'user defined targets' which place priority on specified types of forest or geographic locations. Experience suggests that the 'relative oldest first' and 'oldest first' rules typically produce higher projections of timber supply than the 'random' or 'user-defined' rules.

On Haida Gwaii, the main factor other than age that is likely to influence the priority of stands for harvest is economics, which are affected by the cost of accessing and harvesting in a particular area, or the presence of a high-value tree species like cedar. These issues are discussed elsewhere in this document, under '*economically inoperable forest*' and '*harvest emphasis on cedar*'.

In the interests of improving the manner in which harvesting priorities are incorporated into timber supply analysis, the HGMC recommends that MFLNRO timber supply analysts work with staff from the district, licensees, and the CHN to develop analyses that explore the range of approaches to harvest sequencing and priority setting, and develop recommendations for improved modeling approaches for modeling for inclusion in the next timber supply review for Haida Gwaii. A recommendation to this end is included in the **'Recommendations'** section, above.

- *partitioning the AAC*

Section 8(5)(1) of the *Forest Act* provides for the BC chief forester to specify portions of an AAC as attributable to different types of timber or terrain. The current legislation enabling the determination of AACs by the HGMC contains no comparable provision.

The most recent AACs determined on Haida Gwaii include two such 'partitions'. The AAC for TSA 25 specifies a harvest of 75 000 cubic metres per year as attributable to 'low-volume cedar stands, in accordance with a specific definition to be provided by the regional manager'. In his 1996 AAC rationale statement the BC chief forester explained that if these low productivity stands were to be included in the THLB they should be required to contribute to the harvest in proportion to their contribution to the THLB; this was not occurring at that time, as harvesting was more focussed on higher-value, more accessible stands.

The current AAC for TFL 58 includes a partition, established when TFL 58 was still a block within TFL 47, specifying that 'no more than 60 000 cubic metres of old-growth timber should be harvested per year, on average, for the period during which this AAC is in effect'. Analysis showed that maintaining the AAC depended on contributions from second growth, which occupied about 75 percent of the TFL THLB. The partition was intended to encourage this imminent transition to harvesting in second-growth stands.

In the public review process for the current AAC determination, two related comments were received. First, advice was given that '*The AAC should be partitioned to recognize the large contribution that second growth makes to the operable inventory. The averaging of the minimum harvests results in a harvest age of 110 years. But for many second growth stands the cut must be much lower than 110 years. The cut should be partitioned to ensure that there is demonstrable harvest performance in second growth above the minimum harvest age, so that old growth is not over harvested, based on the contribution to the base case from un-harvested second growth.'* Second, it was suggested that *'the AAC should be partitioned to ensure the actual harvest is consistent with the relative contributions from the species in the inventory. Yellow cedar and red cedar have contributed disproportionately to the harvest in recent years, as mentioned in your document'*.

We have given considerable thought to these matters, since they could have significant implications for the validity of the harvest levels in the base case, which depend on the relative contributions assumed in the base case from the various kinds of stands.

Respecting the low-productivity cedar sites, the exclusion of inoperable areas in deriving the THLB used in the current timber supply analysis, in combination with definitions of minimum harvest ages, has reduced significantly the need for specifying a particular harvest level from these stands.

Regarding harvesting in second-growth stands, some second-growth harvesting has occurred on TFL 58, and the establishment of conservancies and heritage sites, together with requirements under the SLUA and LUOO, now directly protect values associated with old forest. However, this is not the only issue; within about two decades, 25 percent of the entire base-case forecast harvest level is expected to come from second-growth stands, while the harvest today in Haida Gwaii remains focussed on older cedar stands. The HGMC has a significant concern in this latter regard, which is discussed in the section immediately below, and which also contributes to our conclusion in this current section on partitioning the AAC, as follows.

In the absence of legislation explicitly enabling the HGMC to specify portions of the harvest as attributable to particular types of timber or terrain, we recommend that the BC chief forester, who does have such statutory authority, consider in the forthcoming AAC determinations for the individual management units on Haida Gwaii, the use of partitions specifying appropriate portions of the harvest as attributable to:

1. second-growth timber, to ensure an orderly transition to eventual dependence on second growth; and
2. cedar-leading stands, to ensure a sustainable harvest in proportion to their contribution to the inventory, to ensure their continuing contribution to the harvest through the transition period to dependence on second growth.

We have included a recommendation to these effects in **'Recommendations'** above.

- *harvest emphasis on cedar*

On Haida Gwaii, as on other parts of the BC coast, timber harvesting has focused on cedar over the past decade in response to the consistently high value of cedar relative to other timber species over that period. The result is that cedar has contributed to harvests in greater proportion than its occurrence in the inventory. This is certainly true for Haida Gwaii, where although stands predominated by western redcedar and yellow cedar account for just 34 percent of the inventory volume, in the fifteen years from 1995 to 2010, cedar contributed 49 percent of all the billed harvest volume.

The discrepancy between actual harvest levels and the species composition in the inventory was not captured in the base case forecast, where it was assumed that all operable species would contribute to the harvest in a proportion corresponding to their contribution to the inventory volumes. The base case showed that, even with this equitable proportion from cedar, only a limited amount of cedar will be available for harvest during the transition of harvests from natural to managed second-growth stands about 60 to 100 years from now, and that (as with the other species) old cedar will not contribute significantly to the harvest after 80 years when most of the harvest will come from stands aged between 80 and 120 years.

Those results reflected cedar contributing to the harvest in proportion to its volume in the inventory, which is not currently the case. Given the current discrepancy between the actual cedar harvest level and its occurrence in the inventory, an analysis was carried out to determine how long old-growth redcedar and yellow cedar could continue to contribute 49 percent of the total

harvest on Haida Gwaii. This analysis showed that if the current harvest emphasis were to continue, the available supply of old growth stands of redcedar and yellow cedar on the THLB would be effectively gone in 41 years—there would be essentially no opportunity to commercially harvest old cedar in 40 years' time, and then for another 60 years, cedar would contribute very little to the harvest.

Unless the ages at which forests are expected to be harvested are extended very substantially, it is inevitable from the harvest transition that at some point, primary, old-growth cedar will no longer be a part of a commercial harvest that becomes increasingly dependent on a THLB containing very little primary forest. Input from the public review included concern over the disproportionate contribution of cedar to the harvest, and a recommendation that the AAC should be partitioned to ensure an proportionally appropriate harvest contribution of cedar.

In concluding from all of this information, we recognize that some adjustment or provision must be made respecting the cedar harvest, since the base case projection does not reflect its current harvesting proportion, and achieving the total projected harvest level over time will at some point require that contributions of species other than cedar, such as spruce and hemlock, be increased beyond their contribution to the inventory. Otherwise, to ensure some level of ongoing harvest of the mix of species, either the overall harvest level will have to be reduced, or the contribution of cedar will need to be brought back into line with its availability in the inventory.

At present, as noted in the section immediately above, '*partitioning the AAC*', the HGMC has no explicit legislated mandate to specify portions of an AAC as attributable to particular species, while the BC chief forester is expressly afforded such authority under the *Forest Act*. To resolve potentially undesirable stewardship implications for the evolving mix of species in the forests and timber harvest of Haida Gwaii, arising from the current harvest emphasis on cedar, we recommend that the BC chief forester include in the forthcoming AAC determinations the specification of appropriate proportions of the harvest as attributable to certain species, and in particular to cedar species, according to their occurrence by volume in the inventory data. In this way, we hope it may be ensured that that some volume of old cedar timber will remain available as a component of the harvest on Haida Gwaii for many decades into the future.

- *cut control and actual harvest performance*

The current AAC for Haida Gwaii (excluding woodlots) of 1 772 616 cubic metres was not reached in any of the years between 2000 and 2010; over this period the average annual volume harvested was 1 031 377 cubic metres. The actual percentages of the AAC harvested in particular years on the TSA and the TFLs varied, dropping from 85 percent in 2000 to just over 50 percent in 2005, rising again to 85 percent in 2008, then down to just over 20 percent in 2009, and about 37 percent in 2010. , The average harvest over the decade was 61 percent of the AAC. In our determination we have remained mindful of this difference. The recently experienced reduced actual harvest levels indicate that the adjustment implied by the difference between the previous AAC and the base case level reflecting the new land use and management in Haida Gwaii may, in good part, already have occurred. The challenge for Haida Gwaii will be to ensure that optimal socio-economic benefits are realized from the timber harvest at the level facilitated by the new AAC, as we have noted in **'Reasons for Decision'**.

- *woodlot licences*

The AAC determined by the HGMC applies to the Haida Gwaii Management Area, which consists of all land outside of Indian Reserves, municipalities, and private land. Legal advice has confirmed that this management area includes the non-private component of lands in woodlot

licences (WLs). The total current AAC for all WLs is 9293 cubic metres, of which 1817 cubic metres are attributable to private lands, and 7476 cubic metres are attributable to non-private land.

In the base case, non-private land in WLs was modelled as if it were a part of TSA 25. When the non-private, WL area was modelled separately, with all LUOO requirements applied, the projected timber supply was 3134 cubic metres per year, substantially less than the corresponding current AAC of 7476 cubic metres. While some of this reduction is attributable to the LUOO (14-21 percent of the reduction), the source of most of the discrepancy is unknown. This WL forecast level is less than 0.4 percent of the base case initial harvest level.

The information provided in this section provides the basis for considerations of the chief forester in determining the TSA AAC, and the minister's designate in determining WLs AACs, in the context of the requirement that the aggregate of the AACs of all forest management units must not exceed the HGMC determination.

Forest management objectives

- *community watersheds*

The Honna, Jervis, Slarkedus and Tarundl watershed areas are listed under section 8.2 of the provincial Forest Planning and Practices Regulation objective for community watersheds. In the base case, a forest cover requirement was applied that limited the area occupied by forest younger than 10 years old at any time to a maximum of 10 percent. This is equivalent to a maximum limit on harvesting of five percent every five years, which is commonly applied to community watersheds in timber supply analysis in BC. The community watersheds on Haida Gwaii are also listed as sensitive watersheds under the LUOO. Therefore, the community watershed areas were subject to both sensitive watershed and the community watershed forest cover requirements.

In the public review process, the Council of the Village of Queen Charlotte advised that it had passed a motion on December 12th, 2011, opposing the provision for harvesting in its community watershed because the cumulative effects would be too large, and because allowing the entire five percent to be harvested during one of the years in a five-year period would not be acceptable. The JTWG examined the model results to determine for each community watershed the percentage of its area that was modeled as being logged in a five-year period. The results showed that on average only 1.8 percent of the area in each watershed was forecast to be logged over a five-year period.

We conclude from this that since the viability of the base case projection depends on a harvest of less than two percent of any of these watershed areas in a five-year period, the model incorporates more than adequately the level of harvesting constraint required to be imposed operationally in these watersheds. Since the LUOO has identified these watersheds as sensitive, the appropriate objectives must apply, and forest licensees must provide results and strategies to meet these objectives, which must meet the Haida Gwaii Forest District Manager's approval. To reiterate, and reassure the village council, even though the forest cover requirement that was applied in the model only restricted the harvest to five percent of the area in five years, in fact no more than two percent need be harvested in the period, and the district manager should easily be able to ensure the operational appropriateness of this small level of harvest. We therefore encourage the village council members to contact the district manager to discuss this to their satisfaction.

- *visual quality management*

We are satisfied that for the purposes of this current AAC determination, visual quality management was appropriately modelled in the base case, in accordance with the requirements of Section 9.2 of the Forest Planning and Practices Regulation, with all sensitive areas identified for management under the categories of retention, partial retention and modification subject to forest cover requirements that set appropriate maximum limits on the area of forest that is not visually greened-up (i.e., below 6 metres in height) at any time in the analysis horizon.

We understand, however, that the Haida Gwaii Forest District Office is currently engaged in re-categorizing the local visual quality spatial data, although the incomplete data could not be incorporated in the timber supply analysis for this AAC determination. We strongly encourage completion of this process, so that the results can be incorporated in the timber supply analysis for consideration in the next AAC determination. This should be carried out in coordination with the identification of recreation features, and the results integrated, as discussed next.

- *recreation management*

Most significant recreation sites on Haida Gwaii are now included in the new heritage sites or conservancies, and as such were excluded from contributing to the THLB in the analysis. Many other recreation sites were excluded either for EBM objectives for aquatic habitat reserves, or were included in the accounting for the management of visual quality objectives.

However, a number of other 'unofficial' but nonetheless recognized and important recreation sites also exist, and not all of the related information is available in a comprehensive consolidation of inventory data for Haida Gwaii, since it exists in many forms, divided between provincial inventories, licensee inventories, non-profit organizations and various other studies. The JTWG carried out an analysis of potential overestimations in the THLB due to another 27 trails and recreational site features, and to assess the potential implications for the THLB mapped 80-metre buffers along trail features. Where the trails utilised decommissioned logging roads for access, trail buffers were not removed from the THLB. This assessment indicated that these trails and sites overlap about 226 hectares or 0.1 percent of the total THLB, with a very small implication for timber supply.

From this, we conclude that the THLB in the base case is overestimated by 0.1 percent in the, which is accounted for in **'Reasons for Decision',** and that otherwise the assumptions in the base case are a reasonable approximation to current practice.

For the next analysis and determination, it is important to consolidate and rationalise the various inventory data sources, and to integrate related work with the review of visual quality management currently underway. Since the 2001 and 2006 Census data for Haida Gwaii show a significant increase in employment that is dependent on tourism, from 12 percent to 21 percent, the importance of combining accurate information on recreation and visual quality management is correspondingly on the increase, for instance, to avoid locating a visually sensitive area with a 'modification' disturbance class next to an unrecorded but popular existing trail—as well as improving the accuracy of timber supply analysis. For this reason, a recommendation to coordinate the visual quality and recreation feature inventory and planning work is included above, in **'Recommendations'**.

- *Identified Wildlife*

Identified wildlife are wildlife species and plant communities that have been designated under BC's Identified Wildlife Management Strategy (IWMS) as requiring special management attention, usually in the form of protection through establishment of wildlife habitat areas with defined objectives or by general wildlife measures. These objectives or measures may constrain

or preclude timber harvesting activity in certain areas, depending on the specific requirements of particular species or communities.

On Haida Gwaii, nine identified wildlife species are present which require measures for protection that could potentially affect timber supply. These are: 'Queen Charlotte' Goshawk; Marbled Murrelet; Great Blue Heron; 'Queen Charlotte' Northern Saw-whet Owl; Cassin's Auklet; Ancient Murrelet; Sandhill Crane; 'Queen Charlotte' Hairy Woodpecker (*picoideus* subspecies); and the red-listed bat, Keen's Long-eared Myotis. In the timber supply analysis, the habitat requirements for each of these species were modelled as follows.

The protection required for six of the identified species was shown by analysis to be provided by exclusions from THLB in the base case and general wildlife measures without need for additional, individually attributable measures that would have implications for the base case timber supply projection. The Marbled Murrelet is referenced with its own objective in the SLUA and LUOO and is accommodated in the 70 percent of the high-class habitat already reserved in each landscape unit, in parks, protected areas, conservancies, riparian reserves, cedar stewardship areas, and in the two already excluded wildlife habitat areas. All known colonies of both Cassin's Auklet and Ancient Murrelet are within protected areas. No additional habitat is required to be provided from the THLB for the Sandhill Crane, which breeds in boggy areas. There is neither current nor expected specific management for Keen's long-eared Myotis, which roosts in mature and old forest, and in association with caves in karst features. No recovery plan or other special management provision beyond existing measures is anticipated for the Hairy Woodpecker, habitat for which is currently accommodated without specific impacts on the THLB.

In accordance with this information, in the timber supply analysis no additional specific requirements were applied in respect of any of these six identified species. The HGMC has considered the federal and provincial designations of each of these six species, and from our discussions with the JTWG and field staff, we are satisfied that until new scientific information emerges to require specific additional consideration in the modeling, the base case forecast may be considered to represent a timber supply that includes appropriate provision for these species.

The remaining three Identified Wildlife species, the Great Blue Heron, the 'Queen Charlotte' Northern Saw-whet Owl, and the 'Queen Charlotte' Goshawk, are considered separately, next.

- *Great Blue Heron*

For the Great Blue Heron, which is blue-listed provincially and listed as of Special Concern by the federal Committee On the Status of Endangered Wildlife In Canada (COSEWIC), the Haida Gwaii LUOO stipulates reserving a minimum 45-hectare zone around each active nest site. Twenty-four known nest sites have been recorded on Haida Gwaii. The most recent survey report identified eight nest sites with potential activity, and to ensure adequate provision for nesting, the assumption was made that all of these eight sites may either be, or become, active. This requires an associated net reduction to the THLB, after accounting for overlapping reductions for other requirements, of 76 hectares. This represents an overestimation of 0.035 percent on the THLB, which is close to negligible in the context of other uncertainties noted in this rationale and of the precision of available data, but which for completeness is noted in **'Reasons for Decision'**.

- *'Queen Charlotte' Northern Saw-whet Owl*

The Northern Saw- whet Owl is listed by COSEWIC as 'threatened', and is blue-listed provincially. Eleven Saw-whet owl nesting reserves on Haida Gwaii are established under the LUOO (for general territories, as no specific nest sites have been found) each with an average size of 67 hectares, all of which were entirely excluded in deriving the THLB in the base case. The LUOO also contains provisions for any nests that are discovered outside these eleven

reserves. A 10-hectare reserve must be established around any such nests found in the future. The LUOO also requires territory interspacing distances of 1400 metres to be retained where practicable. The IWMS lists the Accounts and Measures for managing this species, but no related formal wildlife habitat areas have been established on Haida Gwaii.

In assessing the adequacy of the modeling provisions for this species in the base case, the HGMC notes that at this time, the eleven mapped territories identified by the Saw-whet Owl Recovery Team provide the best available information, and these were all appropriately excluded from the THLB. The relatively small, ten-hectare reserves for future nests are likely to be manageable with only negligible implications for the THLB, and since only 'stand-level retention' is required for the territory interspacing it is likely that retention for other EBM values will meet this objective. Based on these considerations we conclude that the base case forecast includes appropriate provision for the Northern Saw-whet Owl.

The HGMC also understands that the Northern Saw-whet Owl recovery team is working on telemetry studies for habitat requirements, which will inform appropriate management on the land base, and that the results from these studies will likely be available for incorporation in the next timber supply review.

- *'Queen Charlotte' Northern Goshawk*

The 'Queen Charlotte' subspecies of the Northern Goshawk (*Accipiter gentilis laingi*) is red-listed provincially, being ranked by the BC Conservation Data Centre as 'globally and provincially imperilled', and is listed by COSEWIC as 'threatened' due to its 'estimated small breeding population size of less than 1000 mature individuals and perceived threats to its habitat, primarily from forest harvesting'. The BC Northern Goshawk Recovery Team identifies that the Goshawk population is most imminently threatened by the loss and fragmentation of nesting and foraging habitat, and subsequent reductions in prey diversity and availability. The Recovery Team considers the recovery of the subspecies biologically and technically feasible, and identifies the need to conserve nesting habitat, post-fledging areas and foraging areas.

Section 20 of the LUOO requires protection of the 17 known Goshawk nesting sites mapped in its Schedule 12 by maintaining 'a reserve zone around the nest site that is a minimum of 200 hectares in area, and that maximizes the best available nesting and foraging habitat, to protect the integrity of the nest site'. The LUOO further requires that all newly discovered nests, which are not identified through Schedule 12, be reported, and that for each one a surrounding protective reserve of at least 200 hectares be established and maintained. Potential nesting sites are inventoried annually on Haida Gwaii.

Two Goshawk nesting sites are provided for in established wildlife habitat areas (WHA), which provide foraging areas of 2140 and 2300 hectares, respectively, with restrictions to timber harvesting that were reflected in the base case. Each WHA contains a post-fledging area of approximately 240 hectares. In the timber supply analysis, both 240-hectare nest reserves were entirely excluded from the THLB.

For each of the other 17 known nesting sites, the required exclusion of 200 hectares was applied in deriving the THLB for the base case.

Other known Goshawk nest sites that occur within existing protected areas (parks, heritage sites/conservancies) were excluded from the THLB given their respective administrative classes. For *potential* Goshawk nesting sites, an additional 24 nesting reserves of 200 hectares each were excluded from the THLB areas reported earlier in this rationale; however, they were not excluded until after the base-case forecast had been projected. Therefore the THLB used in generating the forecasts 2154 hectares, or 1.1 percent larger than the actual, final THLB. This has resulted in a

corresponding overestimation in the initial harvest level, which we have accounted for in **Reasons for Decision**.

We have considered carefully the application of the management regimes for foraging habitat. In 2008 the BC provincial government responded to a recommendation by the BC Forest Practices Board that Goshawk foraging habitat should be managed for as well as nesting habitat. In its response, the BC government expressed the opinion that the provisions of the SLUA, particularly for EBM, would likely be adequate to manage for Goshawk foraging habitat. This response was accepted at the time by the then chair of the Forest Practices Board, and accordingly, no specific, additional provision was incorporated in modeling the Haida Gwaii timber supply to represent Goshawk foraging habitat.

In response to the Public Review and Comment Period, the Chair of the Northern Goshawk Recovery Team expressed concerns that ongoing timber harvesting pressures in portions of goshawk territories that are not in protected areas or EBM reserves may reduce the amount of foraging habitat below levels recommended in recent scientific research.

The current Chair of the Forest Practices Board also recently wrote stressing that the HGMC should consider forest cover constraints for goshawk foraging habitat to incorporate an impact on AAC, noting that: '*Managing foraging habitat is a critical aspect of conserving the threatened goshawk'*; that the provincial government committed to *'conduct as assessment of the degree that foraging habitat was captured under the various protected areas and EBM measures required by the SLUA'*; and that *'the AAC determination should consider the foraging habitat analysis … and include forest cover constraints for goshawk foraging habitat around the other known and potential nest sites'*.

Analysis showed that 'fixed' reserves established under the SLUA and LUOO protected on average, 30.4 percent of the foraging habitat. When accounting for all area outside the THLB, this area of protected habitat rises to 31.9 percent, and when accounting for recruitable habitat in areas with stands younger than 50 years, the total amount of goshawk foraging habitat outside the THLB rises to 38.1 percent. Currently, without any further forest development, there is only, on average, about 56 percent medium to high quality foraging habitat in total for all 47 territories analyzed. This has implications for a currently proposed federal recovery strategy proposing a target retention of 60 percent of the critical (moderate to highly suitable) foraging habitat in each territory, since currently this target is not possible to reach, even if all timber harvesting on Haida Gwaii were to cease.

Another analysis looked at foraging habitat available within each territory over time across the entire management area. As this analysis was intended to have a dynamic temporal aspect, it was not possible to use the Recovery Team suitability model because it is static model, and required inputs related to a multiplicity of parameters. Therefore, a surrogate to identify moderately suitable habitat was used, and was founded upon the same criteria used to define the suitability classes within the Recovery Team's model. The Recovery Team's foraging suitability model classifies Sitka spruce stands >60 years old **and** >17m tall, and other forested stands >80 years old **and** >18m tall as moderately suitable. However, to reduce analytical complexity, for timber supply modeling the more conservative >80 year old **and** >18m thresholds for defining moderately suitable habitat were used for all forest types.

Three sensitivity analyses were completed that applied the parameters of the second analysis to determine the effects relative to the base case when constraints consistent with the above requirements were applied (i.e., a minimum of 40 percent, 50 percent, and 60 percent of the foraging area must be of moderate suitability). Three timber supply runs were completed that constrained different percentages of stands >80 years and >18m tall. The results were also divided into 'known territories' and 'known and potential' territories.

The analysis showed that when ensuring 60 percent of foraging habitat for known and potential territories is protected, there is a 25 percent timber supply reduction in relation to the base case. However, the same constraint applied only to known territories shows a negligible (<1 percent) reduction relative to the base case. Using a 50 percent constraint on foraging habitat for known and potential territories, there would be a 6 percent timber supply reduction in relation to the base case, and similarly a negligible (<1 percent) reduction when accounting for only known territories. Ensuring 40 percent of foraging habitat for known and potential territories is protected leads to no reduction to the base case.

The HGMC is aware of ongoing work by Federal and Provincial agencies towards a Federal Northern Goshawk Recovery Strategy, that will provide specific targets for the protection of goshawk foraging habitat.

In reviewing the above, we have concluded that we must make a determination that reasonably reflects current forest management and the approved policies and regulations that guide that management. As such, we feel that the current base case allows for reasonably adequate foraging habitat for known territories in the absence of an approved Federal or Provincial recovery strategy that defines a threshold for minimum habitat protection. In consideration of the recommendation by the Forest Practices Board, and the broader recovery strategies, it is anticipated that decisions will be reached on targets for protection. We conclude that it would be premature to apply an unapproved recovery strategy. When the strategy is approved, its potential effects on timber supply and AAC should be reviewed in the context of the other factors discussed in this rationale, and the need for an early redetermination of an AAC should be assessed. This consideration is reflected in the '**Recommendations'** section, above.

- *karst features*

Karst (calcium carbonate or limestone) features are protected, by order of a Government Action Regulation with the objective of protecting important paleological and ecological resources found in these environments. Although this order has been in effect since 2006 it has not constrained timber harvesting opportunities on Haida Gwaii and therefore no related constraint was modelled in the analysis.

Inventory data is now available from the Geological Survey of Canada identifying high potential karst sites on Haida Gwaii. These were not reflected in the base case. Affected areas are: 36.5 hectares (0.3 percent) of THLB in TFL 58; 1378.4 hectares of THLB (2.4 percent) in TFL 60; and 658.3 hectares (0.5 percent) of THLB in TSA 25, for a total of 2073 hectares, or 1.05 percent of the THLB on Haida Gwaii.

The HGMC has reviewed a map identifying areas with the highest probability of finding pure karst sites. Field experience related by one HGMC member with considerable experience in investigating karst on Haida Gwaii, and by a representative of the Solutions Table, suggests that karst mapping on Haida Gwaii is subject to considerable uncertainty, and that in the past it has been possible to relocate operations around karst deposits without significantly constraining harvesting. For these reasons, we have concluded that management of karst features on Haida Gwaii is likely to be able to continue without constraining the timber supply operationally and that for the effective period of this AAC these features can be managed within the harvest level projected in the base case without need for adjustment.

Given uncertainties about the location of karst, we recommend, as noted above in **'Recommendations'**, that resource managers become more informed about the nature of karst features and about associated management issues which may have implications for harvest planning and operations.

Land Use Objectives Order

The LUOO established legal objectives for forest-based values to support the implementation of EBM. These objectives protect important Haida cultural values, support ecosystem integrity, and provide environmental benefits by maintaining the diversity and abundance of organisms on Haida Gwaii. The HGMC has paid considerable attention to ensuring that all of the objectives in the LUOO were accounted for in the timber supply analysis, and that each one was modelled using the best currently available information about practices needed to achieve the objective, such that the base case reliably projects a timber supply that is realistically feasible to achieve while all the LUOO objectives and requirements are being met.

For those objectives for which the timber supply data package adequately describes the means for meeting the objective, where there was no expressed public concern, and where the HGMC's conclusions were in full agreement with the modeling, the objective is listed above in Table 2.

Objectives for the Great Blue Heron, Northern Saw-whet Owl and Northern Goshawk are considered above, under '*Identified Wildlife*'. Consideration of the remaining objectives, and related issues, some of which have required no more than an explanatory comment or response, or a request or recommendation, follow next.

- *monumental cedar, including cultural cedar stands*

Section 9 of the LUOO provides detailed requirements for protecting cedar stands including culturally modified trees and monumental cedar.

Based on our review of the modeling, the HGMC is satisfied that the LUOO requirements for cultural cedar stands and monumental cedar are adequately represented in the analysis and that the base case projection is reliable on this account for reference in this determination. We are cautious, however, in interpreting the degree to which the modeling will continue to represent not just the LUOO but actual and ongoing operational performance into the future, since the JTWG advises that: (a) the frequency estimates for monumental cedar were based on data from 1995 to 2007, during which period the trend for the occurrence high quality cedar was steadily declining, while a consistent, unchanging distribution was assumed in the analysis; (b) the frequency was also based on data inherently biased to a degree by the recent emphasis on high quality cedar in the harvest billings, such that the data may have overestimated the continuing occurrence of finding cultural cedar, and may thus have overstated the associated impacts on the THLB; (c) it was assumed that the THLB exclusions for monumental cedar were independent of all other exclusions, when in reality these trees may be found in riparian or other EBM reserves; and (d) the exclusions did not account for the 10-percent harvest within management zones allowed under Section 9 of the LUOO.

In view of the uncertainties introduced by the above considerations, in accepting the modeling as based on the best available information and adequate for this determination, we recommend, as noted above in **'Recommendations'**, that as EBM is implemented and as licensees submit relevant digital spatial data as part of their ongoing reporting requirements, harvest reporting should be compiled and trends in LUOO values, including cultural and monumental cedar—as well as culturally modified trees, Haida Traditional Heritage Features, Haida Traditional Forest Features, western yew, and black bear dens, all discussed below—should be tracked and the information analysed and incorporated in future timber supply reviews.

- *culturally modified trees*

In the base case, LUOO requirements for protecting culturally modified trees (CMTs) were modeled based on an assessment of the occurrence of reserves for CMTs in 396 cutblocks

harvested in the Haida Gwaii Forest District between 1995 and 1998. In deriving an updated THLB reduction, it was recognized that required buffers under the LUOO are wider than those required at the time of the original assessment. It was assumed that there are no overlaps of CMTs with reserves for other objectives. The result was an exclusion of 7.7 percent of each hectare of old forest from the THLB (increased from 6.4 percent derived in the original study).

Input received in the public review process, raised the question of whether timber supply may be affected by the existence of paleo inland trails and their related archaeological sites, with specific reference to a potential trail from Naden Harbour to Otard Bay. The letter discussed the potential of using a 'least cost path' a spatial analysis for determining the probability of such trails. The letter also discussed the existence of CMTs on these sites, as well as inland camps and other subsurface archaeological features.

The HGMC agrees with the correspondent that paleo inland trails unquestionably exist, and also agrees with the JTWG that the related implications for timber supply are difficult to quantify. CMTs, which are potential marker features for such trails, have been accounted for as an area exclusion from the THLB. A review of subsurface archaeological feature identification in forestry archaeological impact assessments (AIAs) demonstrates a very limited likely impact. Such features are likely to be discovered in the future, but indications are that they will probably be found in isolated areas, thus likely limiting the reduction to the THLB.

From these considerations, we conclude that the best available field information was used in arriving at the updated estimate of the required land base exclusion to meet LUOO objectives for CMTs, and that due to the application of this exclusion, the base case forecast includes a reasonable representation of current practice. Features additional to those reflected in the base case may be discovered, providing new information for consideration in future timber supply reviews. For this reason, in **'Recommendations'** we have included a recommendation for tracking related new information, as noted in the previous section on monumental cedar.

- *cedar retention*

Section 7 of the LUOO specifies retention requirements for western redcedar and yellow-cedar. The order specifies conditions under which a minimum of 15 percent of the pre harvest composition of cedar should be retained, with a minimum of a one hectare retention area.

In the analysis, for natural, old forest it was assumed that the 21.4 percent of each hectare reserved for monumental cedar, cultural cedar and CMTs was sufficient to meet the less stringent LUOO cedar retention requirement in existing old forest.

The cedar retention requirement also applies in currently younger forest with a cedar composition of over 30 percent. The LUOO requirements for monumental cedar, cultural cedar and CMTs mentioned above do not assist with cedar retention in younger stands because trees that would meet those requirements do not exist in younger stands. Therefore, the base case should have incorporated 15 percent cedar retention in younger forest with a cedar composition of over 30 percent. However, this was not done.

Retention of 15 percent in younger stands would amount to a net reduction of 811 hectares in the THLB, representing a 0.4 percent of the THLB. Since the timber growing on these areas would not be available for harvest for several decades, the impact on timber supply would be also not occur until several decades into the analysis horizon and over the long term.

The corresponding small, overestimation in the longer-term timber supply was identified but not specifically accounted for in the base case, and for completeness is noted above in **'Reasons for Decision'**, as it may have implications for the BC chief forester's consideration of the

appropriateness of including a partition specifying a particular harvest level for cedar in the forthcoming determinations for the TFLs and the TSA on Haida Gwaii.

- *Haida traditional heritage features*

Schedule 2 of the LUOO outlines Class 1 and Class 2 Haida traditional heritage features—including features such as village sites, midden sites, trails, and lithic production areas. During the Detailed Strategic Planning process in support of the LUOO, an analysis of CMT and AIA surveys was conducted for cutblocks harvested between September 1995 and March 2007. The review covered 765 blocks and found nine Class 2 heritage features (five midden sites, two trails, and one intertidal lithic) and one possible occurrence of a Class 1 feature. In the timber supply analysis, since only 1.2 percent of the surveys showed Class 2 features, no related land base removal from the THLB was applied. Respecting Class 1 features, 26 Haida village sites outside of protected areas were identified, for which Schedule 2 of the LUOO requires retention of a 500-metre buffer around each village site; in the analysis, all identified village sites and required buffers were excluded from the THLB.

The HGMC is satisfied that adequate provisions were included in the analysis in respect of Haida traditional heritage features. We are also aware that the MFLNRO's Archaeology Branch compiles information of this nature on its Remote Access to Archaeological Data website (the RAAD system) and that while much data is appropriately entered into this system and is thereby readily accounted for in timber supply analysis, work is still underway to enter additional important data. For this reason, in **'Recommendations'** we have included a recommendation for tracking related new information, as noted above in considerations for cultural and monumental cedar, and CMTs.

- *Haida traditional forest features*

Haida traditional forest features are identified in schedule 2 of the LUOO and are mostly significantly rare, occur within non-forested ecosystems, grow along forest edges, or are associated with special coastal sites.

For Class 1 traditional forest features, analysis showed that Devil's club, one of the most common of the Class 1 features, was found to occur in only 0.9 percent of the 851 field plots from terrestrial ecosystem mapping projects on Haida Gwaii, and in only 0.7 percent of plots outside riparian ecosystems. Other Class 1 forest features are either considered nearly extirpated (for example, high bush cranberry and black hawthorn), or they grow in specialized coastal sites (e.g. fairy slipper) or in estuarine environments (e.g. northern rice root). For timber supply analysis purposes, because of their rarity and location, the Class 1 Haida Traditional Forest Features were not considered to affect the THLB, and no related provision was included in the base case.

For Class 2 features, only 50 percent of occurrences require protection at the forest stand level, and flexibility is available to design this protection to coincide with retention for other purposes, such as riparian protection, cedar retention, or wildlife habitat management. In the analysis, a five-percent aspatial reduction applied to account for stand-level biodiversity was assumed to include adequate accounting for the required protection of Class 2 traditional forest features, as well as Western yew and black bear dens, discussed next.

As with the previous two factors, we recommend, as detailed in **'Recommendations'**, the ongoing compilation of any new, related information, for consideration in future timber supply reviews.

- *Western yew trees*

Section 8 of the LUOO outlines objectives for Western yew. In the timber supply analysis, it was assumed that a five-percent, aspatial reduction, to account for stand-level biodiversity objectives, accounted for the required protection of Western yew trees, as well as for Haida traditional forest features, and Black Bear dens.

The HGMC agrees, and in doing so we reiterate the same recommendation as in the previous three factors, which is detailed in **'Recommendations'**, with respect to tracking and compiling new information, as EBM implementation proceeds, for consideration in future timber supply reviews.

- *Black Bear dens*

Section 18 of the LUOO specifies the required protection of Black Bear dens. These features are primarily identified incidentally during operational planning, and related inventories are incomplete. In the analysis, it was assumed that a five-percent, aspatial reduction to account for stand-level biodiversity objectives accounted for the required protection of black bear dens, as well as the Haida traditional forest features and Western yew.

Again the HGMC agrees, and in doing so we reiterate the same recommendation as in the previous four factors, which is detailed in **'Recommendations'**, with respect to tracking and compiling new information, as EBM implementation proceeds, for consideration in future timber supply reviews.

- *ecosystem representation (landscape-level biodiversity)*

Section 16 of the LUOO outlines the objective to maintain old forest representation at the bioregional scale. In operational practice the majority of the common and rare 'site series targets' listed in Schedule 10 of the LUOO are currently met either through protected areas, by fixed EBM reserves, or by incorporation in LUOO Schedule 8 forest reserves.

In the analysis, the site series were spatially identified in ecosystem mapping, and associated forest cover requirements were established based on the bioregional targets by landscape unit. The contributions from protected areas, fixed EBM reserves, and Schedule 8 forest reserves were accounted for, with non-THLB forested areas also contributing to meeting the requirements. Since areas outside the THLB were not projected to be harvested in the model, it was assumed that where these areas are not currently occupied by mature or old forest, these forests will mature over time, and as such are able to contribute to the conservation targets regardless of their current age. After accounting for the contribution of forest outside the THLB, approximately 5080 hectares of forest from within the THLB were required to meet schedule 10 requirements, and corresponding forest cover requirements were applied.

The HGMC is advised that in the analysis, the necessarily slightly coarser scale of the information relied on in the ecosystem mapping is likely to have led to a small overestimation in the area needed to meet the forest cover requirements; this implies a very small underestimation in the size of the THLB, but no data are currently available to confirm or quantify such an overestimation. For this reason, we accept that the analysis was based on the best currently available information on ecosystem representation, and in doing so we recommend, as noted above in **'Recommendations'**, Terrestrial Ecosystem Mapping be completed to a satisfactory standard to support aspects of forest management such as ecosystem representation, the protection of forested swamps and red and blue listed ecological communities, and the application of site index information.

- forested swamps

Forested swamps, comprising the ecological community Cedar-Spruce-Skunk cabbage, and occurring on less than five percent by area of forested ecosystems on Haida Gwaii, were represented in the timber supply analysis by an exclusion, net of overlaps with provisions for other objectives, of 663 hectares from the THLB.

We are satisfied that the modeling of forested swamps was based on the best currently available information, but again, since the information was derived from ecosystem mapping, the recommendation for satisfactory completion of Terrestrial Ecosystem Mapping, noted in **'Recommendations'** in respect of previous factors, is equally applicable in terms of improving information on forested swamps for use in the next determination.

- red- and blue-listed ecological communities

Section 17 of the LUOO identifies constraints on harvesting to protect red and blue listed ecological communities. The LUOO Schedule 13 list and ecosystem mapping were used to spatially identify red- and blue-listed communities for the analysis. The resulting total net reductions to the THLB were 14 513 hectares for blue-listed ecological communities, and 1801 hectares for red-listed ecological communities.

We are satisfied that the best available information was used to model these constraints, but again, since the information was derived from ecosystem mapping, the recommendation for satisfactory completion of Terrestrial Ecosystem Mapping, noted in **'Recommendations'** in respect of several previous factors, is equally applicable in terms of improving information on the red and blue listed ecological communities for use in the next determination.

- sensitive watersheds and upland streams

When timber harvesting takes place in a watershed, the extent to which precipitation is intercepted by foliage, and therefore the rate at which it may reach the ground and travel as surface water, is altered. The degree to which the hydrological properties of a regenerating forest stand are similar to those in its natural state is a measure of what is known as its 'hydrologic recovery'.

The LUOO requires the maintenance of specified minimum levels of hydrologic recovery: 80 percent for each sensitive watershed, and 70 percent for upland streams. The average height of a stand is a good indicator of hydrologic status; taller, second-growth stands are mostly recovered, old growth is fully recovered, and recently harvested areas are not recovered at all.

In the base-case analysis, to represent these requirements, no more than 20 percent of each sensitive watershed, and no more than 30 percent of each upland stream area was permitted to be hydrologically unrecovered at any time. An area-weighted average age at which hydrologic recovery is projected to be reached was calculated for each constrained area. Hydrologic recovery assessments utilized a hydrologic recovery curve that was based on new research provided by the MFLRO regional hydrologist. The hydrologic recovery curve was calibrated to the timber supply model, and analysis was performed to see if the base case constraints adequately represented the LUOO requirements. The level of hydrological recovery for each sensitive watershed and upland stream area was determined using this recovery curve and the stand conditions that resulted from the base case timber supply projection. The results showed that over the Haida Gwaii management area on average, compliance was achieved throughout the 400-year forecast period

From this, the HGMC concludes that the constraints modelled in the base case forecast were an adequate representation of the hydrological constraints specified in the LUOO. However, the following anomaly remains to be addressed. In the base case, the areas assessed for the upland

stream hydrological recovery constraints included riparian areas. A more specific reading of the LUOO requirements indicates that riparian buffers should not be included in the upland stream for the hydrological assessments. Analysis showed that when this adjustment was applied, the forecast harvest level was one percent lower than in the base case, in the short, medium and long terms. This result applies to each of TSA 25 and TFL 60 considered separately, but TFL 58 is unaffected.

From this, we conclude that, since the assumptions in this sensitivity analysis are a more precise representation of the LUOO hydrology requirements for upland stream areas than those used in the base case, the base-case harvest level is overestimated by one percent throughout the forecast period. This is accounted for in **'Reasons for Decision'**.

- risk-managing the Haida Gwaii LUOO

The LUOO allows for variances in its default objectives in order to 'risk-manage' a given feature or value, to provide operational flexibility in harvesting. These risk variances are not intended to be frequently used, and the SLUA stipulates that their use is acceptable only provided that: the resource value being risk-managed must be protected or sustained; adaptive management principles must be applied; and the purpose for taking the risk managed approach must warrant this consideration.

A sensitivity analysis was run to identify the maximum underestimation in the base case projection of the timber supply if *all* of the potential variances permitted in the LUOO for the *entire* list of objectives were consistently applied in *all* areas, throughout the analysis timeframe.

The results varied by management unit. On TFL 58, the projected harvest level was 7.3 percent higher than in the base case for the first 100 years, with no change in the long-term level. On TFL 60, the increase was 7.3 percent for the first 60 years, with a 3.1-percent increase in the long term. On TSA 25, the increase was 9.3 percent for the first 100 years, with a 3.2-percent increase in the long term. From this it appears that if all of the LUOO objectives were risk-managed for all harvesting, the potential timber supply implications would be significant. However, it is reasonable to assume that, if the intents of the LUOO and SLUA are followed, opportunities for risk management will be more limited than modeled in this sensitivity analysis.

We consider it more likely that some degree of risk management of the objectives of the LUOO is likely to occur in perhaps 10-to-20 percent of applications, and only for some resource values. For this reason we conclude that, it is reasonable to assume that the potential timber supply effects from risk management, relative to the base case, will be considerably more modest than shown in the sensitivity analysis. For these reasons, in our determination we have accounted for a small underestimation in the base case forecast, unquantifiable at present, but perhaps in the order of one to two percent, as noted in **'Reasons for Decision'**.

Socioeconomic considerations

- economic and employment implications

This information is provided for general interest and is not directly consequential in the HGMC's considerations leading to the determination of the magnitude of the AAC, beyond our recognition of the need to optimise socio-economic benefits for the people of Haida Gwaii that may be derived from the harvesting of timber in the local area in consistency with the sustainability requirements in the enabling legislation discussed earlier in **'Statutory Framework'**.

Over the past two decades the population of Haida Gwaii has declined by about 16 percent but is expected to remain fairly stable over the next decade. Population figures from the most recent

Census (Statistics Canada. 2012. GeoSearch. 2011 Census. Statistics Canada Catalogue no. 92-142-XWE. Ottawa, Ontario. Last updated February 8, 2012) are:

> Masset, 884; Skeena – Queen Charlotte Regional District (SQCRD) E, 317; Village of Queen Charlotte, 944; Skidegate, 709; SQCRD D, 524; Port Clements, 378; Old Masset 614; for a current total of 4370.

The employment and income dependencies on various economic sectors for Haida Gwaii, derived from the 2006 Census, are cited as follows, and exclude those who work on the Islands but reside elsewhere:

TABLE 3. HAIDA GWAII EMPLOYMENT DEPENDENCIES BY SECTOR, 2001, 2006 CENSUS

Haida Gwaii	Forestry	Mining & Min Proc	Fish & Trapping	Agric. & Food	Tourism	High Tech	Public Sector	Const	Other	Non Basic	Total
2006 Census	354	20	297	17	488	25	891	141	83	455	2772
	15%	1%	13%	1%	21%	1%	38%	6%	4%		
2001 Census	672	14	191	20	292	0	966	134	95	508	2892
	28%	1%	8%	1%	12%	0%	41%	6%	4%		

Source: 2006, 2001 Economic dependency tables for forest districts, Garry Horne. BC Stats

TABLE 4. HAIDA GWAII INCOME DEPENDENCIES BY SECTOR, 2001, 2006 CENSUS

Haida Gwaii	Forestry	Mining & Min Proc	Fish & Trapping	Agric. & Food	Tourism	High Tech	Public Sector	Const	Other	Trans Payments	Other Non-employ. Income
2006 Census	14%	0%	6%	0%	10%	0%	33%	4%	2%	17%	13%
2001 Census	36%	0%	4%	0%	5%	0%	30%	4%	2%	13%	6%

Source: 2006, 2001 Economic dependency tables for forest districts, Garry Horne. BC Stats.

From the tables it can be seen that over this period both employment and income decreased significantly in the forestry sector, and increased significantly in the tourism sector, indicating diversification in the Haida Gwaii economy.

It is unfortunate that more recent statistics were not available for consideration in this determination. However, labour force statistics related to the 2011 census have not been published at the time of release of this rationale. It usually takes one year after publication of the census for labour force statistics to be released, and several months after that to produce forest dependency tables.

The forestry-related employment associated with the base case forecast of 895 266 cubic metres per year may be estimated (roughly, using multipliers from earlier information that may now have changed) in full-time equivalent jobs, as: harvesting by Haida Gwaii residents, 304; processing by Haida Gwaii residents, 50; associated employment generated off-island, 743; total associated provincial employment, 1098 person years.

The HGMC notes that the relatively low level of employment estimated to be sustained on Haida Gwaii by harvesting at the base-case rate of nearly 900 000 cubic metres per year, i.e. 354 jobs, primarily reflects the location of all processing facilities in the Vancouver Lower Mainland area, or on southern Vancouver Island, with no such facilities located north of Port Alice on the coast.

Socio-economically related input from the public review included suggestions as to the size of the AAC, including that the AAC should be set at not less than the Parties' commitment in the 2007 SLUA to achieving an initial harvest opportunity of 800 000 cubic metres, and another that the base case should be considered a maximum level, implying that a lower level could be chosen. For the reasons given in **Base case forecast for Haida Gwaii**, we have concluded that the base case provides a suitable and reliable reference point for our consideration of the many factors set out in this document that contribute to the actual determination, and in making that determination we have remained mindful of—but not constrained in our considerations by—the commitment by the Parties in the SLUA.

Other comments related to achieving a geographic distribution of harvest areas that would provide an equitable distribution, among the Island's communities, of both the impacts and the maximized socio-economic benefits from harvesting. The HGMC fully appreciates the socially beneficial intent of this suggestion; however, these matters are not within the HGMC's legal mandate to address in an AAC determination. Our role extends only to determining a sustainable harvest level for Haida Gwaii. The BC chief forester then allocates this total volume among the TFLs and the TSA, the Minister of FLNRO then apportions the harvest for each of these management units among various licensees, and the forest district manager then reviews and approves plans by licensees to harvest in particular areas on the landscape. Nonetheless, in order to ensure that the appropriate decision makers are aware of important, related expressions of public interest, we will undertake to forward these suggestions, as well as the received requests for consideration of 120 000 cubic metres for a Haida Community Forest for Port Clements, and 80 000 cubic metres for MIEDS, the Mist Islands Development Society, to the respective offices.

The HGMC greatly appreciates the time taken by those who have contributed expressions of interest related to ensuring that the most value, and the best local distribution of socio-economic benefits may be derived from the AAC under determination. Comments received during the public input period that do not relate specifically to this AAC determination will be forwarded to those responsible for making decisions that more directly relate to the concerns raised. In general, such concerns relate to the apportionment of the AAC in the TSA, stumpage, allocation of timber to particular operators, and provision of forest management tenures.

Disturbances and losses

- *unsalvaged losses*

Unsalvaged, or 'non-recoverable' losses are the average timber volumes that are destroyed or damaged by agents such as fire, slides, wind-throw events, or insects or diseases, and that are not recovered through salvage operations.

In the Haida Gwaii timber supply analysis, information on unsalvaged losses was obtained from the MFLNRO forest health program's aerial overview survey data on Haida Gwaii from 2006-2010. The information, detailed in the timber supply data package, showed total annual average losses, due to Black Headed Budworm, Green Spruce Aphid, Yellow cedar decline, wind-throw, and landslide, of 47 276 cubic metres. Based on consultation with Haida Gwaii Forest District staff, it was assumed that about five percent of these losses would be salvaged, resulting in total average unsalvaged losses for Haida Gwaii of 44 913 cubic metres per year.

It is noteworthy that these losses are *ten times* as high as the losses reported and incorporated in the previous timber supply review. Staff consider that this may be attributable in part to a more diligent approach in recent years to gathering and compiling information—for instance the budworm data was not previously accounted for—and also to actual physical changes, such as Yellow cedar decline. Staff also consider that increases in storm frequency and intensity due to

climate change may increase catastrophic events and as such may require more detailed consideration and quantification in future timber supply reviews.

The HGMC has reviewed in detail the information on losses applied in the analysis and has discussed with the JTWG the degree of validity to ascribe to anecdotal reports of increasingly visible but often undocumented levels of disturbance on the landscape both from wind-throw and from insects. To conclude, we accept the data and modeling on the higher levels of unsalvageable losses relative to previous timber supply reviews, but are convinced of an increasing need for better monitoring and reporting of disturbances. As second-growth stands grow to occupy larger proportions of the THLB, and potentially become subject to higher levels of insect attack, and as other loss factors such as catastrophic windthrow increase for the reasons discussed, the importance of ensuring that related data are gathered and entered into relevant databases becomes more critical not just to the accuracy of timber supply projections, but also operationally in supporting an increased management focus on improving the salvage of as much as possible of these otherwise non-recoverable losses. We have included a recommendation to this end in **'Recommendations'**, above.

In the alternative, if the losses continue to grow, and are not unaccounted-for in analyses and AAC determinations, timber supply in the coming decades may be placed at risk, presenting a serious sustainability issue for the forests and people of Haida Gwaii.

Appendix 1: 2009 Protocol, Schedule B, Sections 2.0 to 2.2.6 inclusive

Schedule B, Sections 2.0 to 2.2.6., of the December, 2009 Kunst'aa Guu – Kunst'aayah Reconciliation Protocol read as follows, with AAC determination at 2.2.3:

2.0 The Haida Gwaii Management Council

2.1. The Haida Gwaii Management Council is accountable to the Parties for the decisions and actions taken pursuant to its authorities.

2.2. Subject to the approval of statutory amendments recommended by the Parties, the Haida Gwaii Management Council will be responsible for the following joint decisions:

2.2.1. Implementation and Amendment of the Haida Gwaii Strategic Land Use Agreement;
2.2.2. Establishment, implementation and amendment of Land Use Objectives for forest practices;
2.2.3. Determination and approval of the Allowable Annual Cut for Haida Gwaii;
2.2.4. Approval of management plans for protected areas
2.2.5. Developing policies and standards for the identification and conservation of heritage sites; and
2.2.6. Other strategic level management matters that the Parties delegate to the Haida Gwaii Management Council.

Appendix 2: Haida Stewardship Law, Section 5

Section 5 of KaayGuu Ga gaKyah ts 'as- Gin 'inaas 'Iaas 'waadluwaan gud tl 'a gud giidaa, the Haida Stewardship Law, Old Masset, October 8, 2010, reads as follows.

5. **Haida Gwaii Management Council**

a. With this Stewardship Law, the Haida Nation through the Council of the Haida Nation and the Government of British Columbia, through the Kunst'aa Guu-Kunst'aayah Reconciliation Protocol, creates the Haida Gwaii Management Council. The Haida Nation delegates to the Haida Gwaii Management Council the authority to perform the functions set-out in section 5(b). The Haida Nation retains the authority to reassign all of the functions of the Haida Gwaii Management Council if the Haida Gwaii Management Council is unable to perform those functions.

b. **Mandate**: The Council of the Haida Nation and the Government of British Columbia shall set out the Terms of Reference the Haida Gwaii Management Council shall follow in exercising its responsibilities and functions. The Haida Gwaii Management Council
shall perform the following functions

i. implement and amend the Strategic Land Use Agreement;
ii. establish, implement and amend Land Use Objectives for forest practices;
iii. determine and approve the Allowable Annual Cut;
iv. approve management plans for protected areas;
v. develop policies and standards for identifying and conserving heritage sites;
vi. develop a comprehensive forestry management strategy that maintains ecological integrity and supports a sustainable Haida Gwaii economy;
vii. monitor and review the effectiveness of the Solutions Tables;
viii. identify policy issues for consideration by the Council of Haida Nation;

ix. monitor and evaluate the efficiency of its decisions at the operational level; and
x. other functions the Haida Nation and the Government of British Columbia delegate to it.

Appendix 3: Haida Gwaii Reconciliation Act, Sections 3 and 5

Sections 3 and 5 of the *Haida Gwaii Reconciliation Act* read as follows.

Haida Gwaii Management Council

3 (1) The Haida Gwaii Management Council is established by the joint operation of a resolution of the Haida Nation and this Act.

(2) The council consists of

(a) 2 members appointed by resolution of the Haida Nation after consultation with British Columbia,

(b) 2 members appointed by the Lieutenant Governor in Council after consultation with the Haida Nation, and

(c) a chair appointed both by resolution of the Haida Nation and by the Lieutenant Governor in Council.

(3) A decision of the council must be made by consensus of the members referred to in subsection (2) (a) and (b), but failing consensus, by majority vote of those members.

(4) In the event of a tie vote under subsection (3), the chair must cast the deciding vote.

(5) A decision of the council must be published in the Gazette.

Allowable annual cut

5 (1) In this section, **"allowable annual cut"** and **"chief forester"** have the same meanings as in section 1 (1) of the *Forest Act*.

(2) The council must determine the allowable annual cut for the management area at least once in every 10 years after the date of the last determination.

(3) For the purposes of subsection (2), on request of the council, the chief forester must provide to the council all information that the chief forester would consider under section 8 (1) of the *Forest Act* if the chief forester were making the determination under subsection (2) of this section, including, without limitation, information respecting the matters, as they relate to the management area, set out in section 8 (8) of the *Forest Act*.

(4) Promptly after making a determination under subsection (2), the council must

(a) give written notice of the determination to the chief forester, and

(b) publish the determination on a publicly accessible website.

Appendix 4: Section 8(11) of the Forest Act

Section 8(11) of the *Forest Act* reads:

(11) The aggregate of the allowable annual cuts determined under subsections (6), (7) and (10) that apply in the management area, as defined in section 1 (1) of the Haida Gwaii Reconciliation Act, must not exceed the amount set out in a notice to the chief forester under section 5 (4) (a) of that Act.

Appendix 5: Summary of comments from public review

This appendix provides a summary of comments provided in response to the Public Discussion Paper, which the HGMC released in November 2011. The ways in which these comments were considered in the AAC determination are discussed in the body of the AAC rationale.

In addition to comments received on the Public Discussion Paper, major licensees (Taan Forest, Teal Jones, and Husby) and BCTS collectively provided questions and comments on a draft timber supply analysis data package, dated August 2, 2011. The Joint Technical Working Group (JTWG) received licensee comments on September 24, 2011. In response to several of the comments, the data package was updated or altered. In other cases, a clarification was provided by the JTWG. A written response was sent to licensees on November 22, 2011.

The remainder of this appendix provides a summary of comments received on the Public Discussion Paper. The focus here is on comments related to substantive issues associated with forest management and the related social and economic implications. Some comments received during public comment period related to the overall process associated with HGMC decision making and the composition of the council. The authorities under which the HGMC was established and operates, and the principles used by the council in making the AAC determination are discussed in the first sections of the body of this rationale, and in Appendix 8.

Socioeconomic considerations

The Village of Port Clements:

- Encourage the Haida Gwaii Management Committee to set an AAC at a level not less than 800 000 m^3 which was agreed upon in the Strategic Land Use Agreement Document.
- The HGMC to carefully consider the cut areas to ensure that the timber in economically accessible areas and provides geographic distribution among all the communities on island to equal the impacts and maximize the socioeconomic benefits from harvesting for all communities on Haida Gwaii
- It is important to connect wood fiber to all the island communities if we are to have continuity of employment and opportunities. It should be a very high priority to ensure that socioeconomic benefits are fairly distributed among island residents and their communities.
- There is an expectation for an equivalent to the Haida Community Forest of 120K m3 we would appreciate if the members of the HGMC would forward our concerns around the "Community Forest" concept to the appropriate people who will be making the allocation decisions

The Village of Queen Charlotte:

- Clarification on the sources of numbers in the socioeconomic tables in the PDP was requested, and on the impacts of implementing the base case on socioeconomic indicators.
- Motion was made by the Village of Queen Charlotte Council opposes the provision to harvest in the community watershed, five percent (5%) over five (5) years allowable cut, as the cumulative effect is too large and also that allowing the entire five percent (5%) to be harvested in one of the five (5) years is not acceptable.

United Steelworkers:

- Once the TSA AAC is apportioned, there could be dangerously little cut to keep each logging operation viable and able to provide the stable, well paying, full-time, full-benefits jobs that are so desperately needed on Haida Gwaii.

- With the implementation of the Land Use Objectives Order (LUOO), historic, unionized, licence holders Husby Forest Products and the Teal Jones Group have been struggling to maintain sufficient volume for their operations [and] have battled with poor market conditions, the difficulties of operating in a remote location, and the uncertainties of the LUOO.
- The economy of Haida Gwaii is in extremely bad shape and desperately needs well paying, unionized, full-time, full-benefits jobs to stabilize the local communities and provide certainty for the future. While there was a promise of jobs for loggers and their families when the land use plan was announced, unemployment is worse than ever.

Comments by individuals:

- I was disappointed to see that not more consideration was given to update the numbers to reflect current conditions. For example the number of students at the Port Clements Elementary school was in 2006 at 56.5 students and is today at a very low level of 37 students, which reflects a drop of 19.5 students or 34.5%. Families are leaving the Islands businesses can't stay in business and the numbers of empty houses rise to a scary level. The children on HG have not even a chance anymore to enjoy a swimming pool. Which can be life threatening, considering that Hg is surrounded by water.
- It is not as critical to try to achieve the 2007 SLUA commitment of 800k cubic meters per year, than more to focus on the socio economic well being of our residents and communities. This goal may be achieved with 700k or we may need 900k per year and any numbers should be taken into consideration as long as it is sustainable and in line with the newly established EBM harvest rules.
- Harvest opportunities should be first given to Logging operations that can demonstrate and prove best socio economic benefits for island residents and island communities by still maintaining healthy ecosystems' consideration could be to allocate a certain number of meters to a number of companies and keep a "Bonus" as reward for the company that demonstrated (after evaluation) best EBM and socio economic practices that supports healthy ecosystems and vibrant communities.
- An AAC determination should also reflect social and economic objectives on Haida Gwaii, in addition to the interests of the Crown. These social and economic objectives may not automatically align with a harvest rate at the base case level.
- Your discussion paper recognized these questions and asks the public and communities to contribute ideas and perspectives. I hope they respond but I think that the Management Council could take much more of a leadership role by facilitating this important discussion. What do we really want from the forest? How much do we need to cut to meet those objectives?
- The Strategic Land Use Agreement has likely forestalled that discussion about what the real social and economic objectives are. The SLUA establishes a commitment to a cut of "no less that 800k cubic meters. I also suggest that the cut should be stated as "up to 800K". The precedent for this was set for the AAC in TFL 57 (lisaak) in Clayoquot Sound. In future I would like to see the AAC established in hectares, as has also been done for TFL 57.

Timber management, (minimum harvestable age, partitioning)

Comments by individuals:

- Cutting any stands of timber under 100 years should be eliminated, then calculate a sustainable annual allowable cut
- Basing the future islands economy on 50-90 year old wood is a serious error in judgment made by higher level planners who have never processed a log or marketed the products from it.

- The AAC should be partitioned to recognize the large contribution that second growth makes to the operable inventory. The averaging of the minimum harvests results in a harvest age of 110 years. But for many second growth stands the cut must be much lower than 110 years. The cut should be partitioned to ensure that there is demonstrable harvest performance in second growth. Above the minimum harvest age, so that old growth is not over harvested, based on the contribution to the base case from un-harvested second growth.
- The AAC should be partitioned to ensure the actual harvest is consistent with the relative contributions from the species in the inventory. Yellow cedar and red cedar have contributed disproportionately to the harvest in recent years, as mentioned in your document.

Land base contributing to timber supply

The Village of Queen Charlotte:

- Clarification requested on whether the land base used for the AAC was adjusted when Private land was withdrawn from TFL 60.

Comment by individual:

- There is no reference to the Island Timberlands harvest on the south end of Graham Island. The executive summary in the document says that this is a determination for all the Haida Gwaii Management Area, and later "an AAC for Haida Gwaii." Whether the Island Timberlands private lands are in or out of this determination should be stated clearly.

Harvest flow

Comment by individual:

- The information that has been put together in support of completion of the land use plan is very detailed. However, this indicated base case is really just the maximum harvest level that can be sustained from the identified contributing land base, while all the other objectives (environmental objective) are met.

Northern Goshawk

Chair of Northern Goshawk Recovery Team:

- Goshawks (Accipiter gentilis laingi) on coastal BC are a provincially red-listed species and are designated threatened by COSEWIC. Through the impact of forest harvesting and introduced species, the Haida Gwaii population In the last 50 years is estimated to have declined by 63-67% to possibly less than twenty viable territories. Without a management strategy, the number of viable territories will continue to decline and that potentially this species could be lost from the islands by 2040. A recent Population Viability Analysis for the Northern Goshawk of Coastal BC raises similar doubts about the viability of that Haida Gwaii goshawk population. While the LUO provide 200 ha breeding areas for all known goshawk territories these territories will not be viable without sufficient foraging habitat. The science advice from goshawk experts is quite clear in stating that for a territory to be viable, 40-60% of that territory must remain as mature or old growth. Currently a number of the known goshawk territories are approaching the 40% remaining old growth stage, with the Flo territory likely already below that cut off. While it is true that habitat protection provided thorough the LUO in the form of riparian buffer zones, cedar stewardship areas, marbled murrelet habitat etc, often provides suitable foraging habitat for goshawks, in the vast majority of territories this protection is limited to percentages well below the required 40% ranging down to

22% for the Datlaman and Ian territories. If old growth logging continues to occur in the affected goshawk territories, as it likely to do under the new AAC. These territories will be comprised to a degree that they are no longer viable as goshawk habitat

Forest Practices Board***:***

- Managing foraging habitat is a critical aspect of conserving the threatened goshawk." The provincial government committed to "conduct as assessment of the degree that foraging habitat was captured under the various protected areas and EBM measures required by the SLUA""The AAC determination should consider the foraging habitat analysis … and include forest cover constraints for goshawk foraging habitat around the other known and potential nest sites"

Stumpage and timber utilization

Comments by individuals:

- Since 1983 literally millions of dollar s of economically usable wood fiber was burned, smashed, used for back spar trails, punching, buried or left for residue. Although the degree of over cutting has been reduced, the amount of wood wasted is still high.
- Suggest a portion of stumpage be set aside for local processing and shipping infrastructure. In determining cut levels I would urge the board to consider the fact that volume does not equate to value. A 150 year old tree can be worth 10 times the value of a 50 year old tree and yet be only 3 times older. A 1200 cubic meter per hectare stand at 80 years old can generate on a fraction of value in end products compared to a 200-300 year old 800 cubic meters per hectare stand.
- Suggestions to this board is that changes must be made so that if it Is logged it is utilized and at the very least, uneconomic cedar be stored not burned until local infrastructure in place to utilize it. It is my suggestion that fibre not utilized be made available to local millers & deactivation of roads not occur until al usable fibre is removed.

Archaeological Sites

Comment by individual:

- Archaeological Site Potential associated with Paleo Inland trails and related archaeological sites There is high potential for additional archaeological sites that relate to CMTs. These include but are not limited to inland trails, hunting camps, and lithic production areas.

Tenure opportunity

Misty Isles Economic Development Society:

- Ministry of Forests and Range confirmed in a letter to MIEDS that a community Forest License of 80k cubic meters per year would be offered to MIEDS once the AAC had been determined. The letter also stated that MIEDS would be offered immediate access to fibre through a Forest License to cut (FLTC) for 25k cubic meters. Per year until a Community Forest License agreement could be signed.
- MIEDS has an allocated volume of 50k cubic meters with an additional 25k cubic meters as of January 1 2012.
- As of January 1 2012 MIEDS will have 75k cubic meters of volume available through a FLTC. The organization is working diligently with the Ministry, BCTS and the Solutions Table to make this volume available to get local people back to work. It is imperative that, should a reduction in AAC result in downward pressure on volume reduction, that

this volume; and the commitment to 25k cubic meters a year be maintained until the CFA can be signed.

- The Ministry of Forests and Range committed 80k Cubic meter per year in a CFA to MIEDS as the representative of the island communities. This commitment is imperative to the economic health of islanders; and one of the only foreseeable economic development initiatives that will result in immediate growth in on island jobs.
- As many of the large tenure holders have been compensated for loss of volume due to the Land Use Agreement while MIEDS has not received any financial compensation; we respectfully request that the 80k cubic meters/ year commitment to MIEDS remain intact should a reduction be forthcoming.

Appendix 6: Historical context for this determination

On December 11, 2009, the Council of the Haida Nation (CHN) and the Province of British Columbia (BC) signed a historic agreement, the *Kunst'aa Guu – Kunst'aayah Reconciliation Protocol* (2009 Protocol), meaning 'the beginning'. Acknowledging differing views on the title over Haida Gwaii, both governments (the Parties), affirming the necessary authority of each under its respective jurisdiction, committed in the 2009 Protocol to work collaboratively towards shared and joint decision-making in respect of the lands and natural resources of Haida Gwaii.

The 2009 Protocol proceeded from a series of significant events and decisions, and was followed by important legislation; leading to this historically significant AAC determination by the HGMC. This recent history is summarized here briefly for reference:

- **2004: The Haida Land Use Vision:** In May, 2004, the Haida Nation released its documented testimonial to the founding of the nation's respectful stewardship in its long-time relationship with the land and seas of Haida Gwaii. This Vision addresses three integrated aspects from its central premise of *Yah'guudang*, respect. These are: the 'Well-Being of the Land'—the traditional Haida perspective on the importance of all living things, with connections to cedar, salmon, bear, birds and plants; the 'Condition of the Land'—the nature and pace of changes due to industrial use and disturbance, as well as the conditions of life forms that are understood to be relations; and the 'Natural Ability of the Land to Function and Provide'—with guidelines for sustainability, including principles of ecosystem-based management (EBM) and economic stability.
- **2007: Haida Gwaii Strategic Land Use Agreement:** In December 2007, the Haida Nation and the Province of BC signed the Haida Gwaii Strategic Land Use Agreement (SLUA). This agreement culminated two years of government-to-government land-use negotiations and included, among other factors: the establishment of 10 new protected areas including protection and refinement of the protected areas outlined in the Haida Land Use Vision, which include reserves for cultural cedar and wildlife; a commitment to negotiate collaborative management of the new protected areas throughout the islands; establishment of objectives for EBM and an agreement to collaboratively implement these objectives into a legal framework; a commitment to achieving an initial timber harvest opportunity of no less than 800 000 cubic metres per year; and an agreement to develop a process to inform the determination of the long-term timber supply for Haida Gwaii.
- **2009: *Kunst'ah guu Kunst'ayaah* Reconciliation Protocol:** The December 11, 2009 Protocol referred to above included agreements related to shared and joint decision making, carbon offset and resource revenue sharing, forest tenures and other economic opportunities, and the enhancement of Haida socio-economic well-being. It was this protocol that committed both Parties to establishing the HGMC, which was subsequently provided for in law, both by the Haida Nation and BC, respectively in the *KaayGuu Gag a Kyah ts'as – Gin 'inaas 'laas 'waadluwaan gud tl'a gud giidaa* or Haida Stewardship Law, and the *Haida Gwaii Reconciliation Act*, both referenced below.
- **2010: Haida Gwaii Land Use Objectives Order:** To further the implementation of the SLUA, and consistent with the intent of the 2009 Protocol, the Parties jointly and collaboratively developed land use objectives that include managing the forests of Haida Gwaii sustainably and consistently, across all forest tenures, for a wide range of values including ecological integrity and socioeconomic benefit for the people of the islands. The forest management objectives were formally agreed upon and established, both under Haida Stewardship Law, and in the December 17, 2010 Land Use Objectives Order (LUOO) by the BC Minister of Forests, Lands and Natural Resource Operations FLNRO). All forest

practices on Haida Gwaii must now conform to these objectives, which guide the implementation of EBM through legally established standards for the management of: Haida traditional heritage and forest features; culturally modified trees; cedar and yew; aquatic (including fish) habitats; active fluvial units; upland stream areas and sensitive watersheds; forested swamps and old forest ecosystems; Black Bear dens; and habitat for Marbled Murrelet, Goshawk, Great Blue Heron, and Saw-Whet Owl. These new legal standards for EBM on Haida Gwaii represent the current operational forestry practice that must be accounted for in all AAC determinations.

- **2010: *KaayGuu Gag a Kyah ts'as – Gin 'inaas 'laas 'waadluwaan gud tl'a gud giidaa*-Stewardship Law:** On October 8th, 2010, the Haida Nation passed this stewardship law which includes the delegation and description of legal mandates from the Haida Nation to the HGMC and the Solutions Table. The law was passed under the authority of the Xaayda gwaay Galang gud Gad- Tl'ijang gud tl'a kasgats (House of Assembly), as defined in the Constitution of the Haida Nation. The mandates reflect those responsibilities outlined in the 2009 Protocol, including the HGMC's mandate to determine and approve the AAC for all of Haida Gwaii.
- **2010 Haida Gwaii Reconciliation Act:** This act gave effect to the 2009 *Kunst'aa guu-Kunst'aayah* Reconciliation Protocol by Provincial legislative statute. In particular, it provided for the establishment of the HGMC and for several responsibilities founded in the Protocol including the HGMC's responsibility to determine the allowable annual cut at least once every 10 years..
- **2011: Haida Gwaii Management Council**: As provided for by the 2009 Protocol, the 2010 Haida Stewardship Law, and the 2010 *Haida Gwaii Reconciliation Act*, the HGMC was established in April 2011 as a consensus-based council, empowered by and accountable to each of the Parties' respective authorities for actions and decisions undertaken while fulfilling its responsibilities. Both the Haida Nation and BC have entrusted certain of their respective authorities and jurisdictions to the HGMC.

  The HGMC was constituted, as required by the 2009 Protocol, as follows: each of the Parties, in consultation with the other, appointed two members, and then jointly appointed a chairperson. The HGMC's documented responsibilities include making key, high-level, strategic decisions through a joint decision-making process that aims to achieve consensus. According the procedure outlined in the Haida Gwaii Reconciliation Protocol, if consensus is not reached, a vote will be taken, excluding the chairperson, and in the event of a tied vote, the chairperson will cast a deciding vote. In the case of this AAC determination, consensus was reached by the HGMC.

  The HGMC has a list of 10 responsibilities which include joint decisions focussing on:
    - implementation and amendment of the 2007 Haida Gwaii SLUA;
    - establishment, implementation and amendment of land use objectives for forest practices;
    - determination and approval of the AAC for Haida Gwaii;
    - approval of management plans for protected areas; and
    - development of policies and standards for the identification and conservation of heritage sites.

  The determination of the AAC for Haida Gwaii at this time is an integral part of a comprehensive timber supply review process to ensure that the AAC reflects the jointly established objectives and the new protected areas and EBM regime proceeding from the 2007 Strategic Land Use Agreement for Haida Gwaii. This AAC determination represents the first joint decision made by the Parties.

Appendix 7: Haida Gwaii Management Council guiding principles for AAC determination

In order to make explicit the HGMC's approach in carrying out the responsibility for determining AACs for the Haida Gwaii Management Area, we have developed and adopted the following guiding principles. These principles will assist in achieving desired consistency between decisions made by the HGMC in successive AAC determinations for all of Haida Gwaii, and also between the decisions made by the HGMC and those made by the BC chief forester and the BC Minister of FLNRO in subsequent AAC determinations for the management units on Haida Gwaii.

1. Conservancies/heritage sites/protected areas

The HGMC's AAC determinations account for the deletion from the commercial timber harvesting land base (THLB) of all areas in Haida Gwaii designated with protected status pursuant to the 2007 *Haida Gwaii Strategic Land Use Agreement* , as well as the deletion of previously existing protected areas designated under provincial and federal statutes.

2. Land use objectives

The 2010 *Haida Gwaii Land Use Objectives Order* sets the objectives for cultural resources, aquatic habitats, biodiversity, wildlife, and forest reserves on the commercial THLB. The HGMC incorporates these objectives into AAC determinations by reviewing the ways in which these objectives are actually being implemented in the field and comparing the findings of this review to the inputs applied in the timber supply analysis to represent the objectives

3. Biophysical, social and economic factors

In determining AACs the HGMC considers a number of biophysical, economic, and social factors, comparing information on actual management regimes with corresponding inputs applied in the timber supply analysis. In the 2007 *Haida Gwaii Strategic Land Use Agreement*, the Haida Nation and the Province committed to 'achieving an initial timber harvest opportunity of no less than 800 000 cubic metres per year'; in its AAC determinations the HGMC considers this commitment as an expression of both the Province's and the Haida Nation's social and economic interests.

4. Harvest level sustainability

In AAC determinations the HGMC reviews, evaluates and tests the assumptions of a 'base case' harvest-level forecast that, wherever possible, is based on a 'non-declining flow', that is, a forecast that does not decline from one time period to the next, and which is consistent with expressions by the Parties of social and economic interests. Base-case forecasts are used as a basis from which to assess the effects of uncertainty on timber supply.

5. Uncertainty

Changes in the understanding and management of forest ecosystems, and potentially in the expressions by the Haida and the Province of their social and economic interests in the forests of Haida Gwaii, mean there will always be some uncertainty in the information used in timber supply analysis. The HGMC addresses this uncertainty by:

- reviewing all factors examined in the timber supply analysis and assessing the implications of the sensitivity of the timber supply forecast to changes in each factor;
- recommending scientific studies as appropriate to help to reduce particular uncertainties for future decisions.

The HGMC reflects, as closely as possible, those forest management factors that are a reasonable extrapolation from current management practices. The HGMC does not incorporate factors that could affect the timber supply that cannot be substantiated by demonstrated performance or are beyond current legal requirements. When considering information about which there is substantial uncertainty, the HGMC examines related analysis to understand the effects on timber supply, and where warranted uses a pre-cautionary approach pending the gathering of new information to reduce uncertainty and clarify timber supply implications.

6. Risk management decision making

The HGMC's AAC determination is a choice founded in judgement, not a purely mathematical calculation. Even though the timber supply analysis uses mathematical modeling procedures and is an integral consideration in the determination process, the determination is a synthesis of judgement and analysis of all the factors in which numerous uncertainties are weighed. The AAC determined may or may not coincide with the results of the timber supply analysis, and is essentially a qualitative judgement that, although based in part on technical analysis, also addresses considerations of risk and uncertainty

To deal with this risk, the HGMC supports frequent assessments of the timber supply and if, following the HGMC AAC decision, information regarding forest-based values or the socio-economic situation on Haida Gwaii changes substantially due to significant legislative or regulatory change, implementation of policies, procedures, guidelines or plans, or catastrophic events, the HGMC may consider making a new AAC determination earlier than 10 years after a previous determination for the management area.

7. Aboriginal consultation

The Province and the Haida Nation have legal obligations to enter into consultation as defined in case law regarding aboriginal interests. Notwithstanding these obligations the *Kunst'aa Guu – Kunst'aayah* Reconciliation Protocol and the *Haida Gwaii Reconciliation Act* have established a joint decision-making process with respect to the AAC for the Haida Gwaii Management Area. The Haida Nation and the Province of BC are agreed that this process and the delegation to the HGMC of the responsibility for determining this AAC satisfy the requirement to consult with the Haida Nation in this decision.

8. Other statutory decisions

The AAC determined by the HGMC will guide the BC chief forester and the provincial minister in their statutory decisions related to the management units on Haida Gwaii. The chief forester is responsible for AAC determinations for TFLs and the TSA, while the minister or designate is responsible for AAC determinations for woodlot licences, and when they are established, Community Forest Agreements and First Nations Woodland Licences. . The aggregate of the AACs determined by the chief forester and the minister that apply to the Haida Gwaii Management Area must not exceed the AAC determined by the HGMC for the Haida Gwaii Management Area.

The HGMC is mindful that the HGMC's AAC decision-making process should reflect, as much as possible, considerations similar to those of the BC chief forester, because those considerations generally encompass factors that define timber supply in an areas, without prejudging the BC chief forester's approach or fettering his decision.

Appendix 8: Timber supply analysis principles for Haida Gwaii

The timber supply analysis model used to produce the forecasts was the 'Forest Service Spatial Analysis Model' (FSSAM), a spatial, deterministic simulation forest estate model that was used to project harvesting and growth over an analysis horizon of 400 years. The analysis was based on an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer simulation model, a series of timber supply forests was produced, reflecting various starting harvest levels, rates of decline or increase, and potential trade-offs between short- and long-term harvest levels.

In preparing inputs for the analysis, the JTWG was guided by some general, non-technical principles, which were accepted by the HGMC. These principles were:

- all land on Haida Gwaii should be subject to a consistent forest management regime, with a basis in EBM
- a consistent information base should be the foundation of the analysis;
- the analysis should be documented so the methods and results are transparent to the public, not a "black box";
- technical inputs should be supported by peer-reviewed information where possible.

A computer model, the 'Forest Service Spatial Analysis Model' (FSSAM), was used to generate timber supply forecasts to support the AAC determination. In alignment with common practice in timber supply analyses undertaken by the BC government to support AAC determinations for the chief forester, one forecast was chosen for Haida Gwaii from a range of possible forecasts, in which a number of fundamental principles were applied. These principles, developed by the JTWG and commonly applied throughout BC, were as follows:

1. **Define the upper limit on timber supply over a 400-year horizon, while respecting management constraints (including new constraints from the LUOO and SLUA) and not jeopardizing long term harvest levels.** New conservancies/heritage sites/protected areas from the SLUA were excluded from the THLB, while integrated resource management objectives such as those for fish habitat, cultural heritage, biodiversity, visual quality, and hydrological integrity, were maintained in the modeling environment through application of forest cover requirements to ensure desired forest conditions are maintained before harvesting may occur. The intent is to assess the timber supply available while maintaining a desired range of values over the (in this case) 400-year analysis horizon.
2. **Maintain a non-declining harvest flow if possible.** The Haida Gwaii base case forecast showed no declines from the beginning projection date of 2010 onward, but this projection followed a single very large declining step from the current AAC of 1.77 million cubic metres to the beginning base case level of 895 266, reflecting the substantial recent changes in land base and management regime. Since actual harvest levels have been significantly below the current AAC in recent years, the downward step to be experienced from these levels to the initial base case level would be significantly less than from the current AAC.
3. **For the purpose of sensitivity analyses (to test the implications of potential changes in information due to uncertainty), if it would assist in clarifying timber supply dynamics to develop a harvest forecast that involves declines in the short or medium term (the next few decades), the decline should be no more than 10 percent per decade.** For the non-declining Haida Gwaii forecast, this principle applies only to sensitivity analyses, and was used as a means for understanding the timber supply dynamics, not as any recommended harvest flow. In principle, limiting the decline rate reflects a desire to keep any necessary change in economic activity at a gradual and controlled pace. The limit on decline rate

ensures that harvest levels in the short term are not maintained at levels that could lead to disruptions, or to the need for rapid adjustments in harvest levels, further into the future.

4. **When timber supply is increasing, incline by no more than 10 percent per decade.** Only small inclines were observed in the Haida Gwaii base case forecasts, in the mid to long terms; therefore this principle applies primarily to guiding sensitivity analysis in ensuring that the individual forecasts for the three main management units resemble each other in 'shape' by not affording rapidly increasing socioeconomic benefits in one area at the expense of another.
5. **Avoid harvest failures.** A harvest request failure occurs when the model is unable to fulfill the harvest request and reports less harvest than requested.
6. **Reduce harvest requests sufficiently to clear 'pinch points'.** This complements No. 5; the harvest request is set so that any shortfall observed during higher harvest requests is barely cleared; in the Haida Gwaii forecast, 'pinch points' occur in the mid and long terms.
7. **Maintain a sustainable growing stock.** This is partly ensured by the long planning horizon of 400 years, and can also be monitored by graphing the growing stock. It is unacceptable to have a growing stock that is definitely declining at the end of the planning horizon since that would signify that the long-term sustainable harvest level (LTHL) is not really sustainable. When the growing stock remains constant on average, the harvest level is sustainable.
8. **Time any increase to a long-term sustainable harvest level (LTHL) to correspond with growing stock (inventory) changes.** While even-flow forecasts were possible for the two TFLs that met all of the above principles and in which the long-term growing stock was sustainable, for the TSA such a forecast was not possible, ironically due to 'too much' accumulating volume in the long term; the highest possible even-flow harvest forecast for the TSA resulted in a rising growing-stock level over the long term, signifying that a higher long-term sustainable harvest could be achieved. Therefore, for the TSA, the analysts incorporated an increase (of about 3 percent) in the base case harvest forecast, timed to correspond with when the growing stock levels began to increase in the even-flow forecast.

Appendix 9: Information sources used in the AAC determination

Information sources considered in determining this AAC for Haida Gwaii include:

- *Haida Gwaii Timber Supply Review Data Package 2011*, dated November 8, 2011 (including data source references in the report's Appendix 3, page 92-94), submitted by the Joint Technical Working Group to: Haida Gwaii Management Council and Jim Snetsinger, Chief Forester;
- *Haida Gwaii Timber Supply Review Timber Supply Analysis Report*, January 25th, 2012;
- *Haida Gwaii Timber Supply Review Decision Binder*, submitted by the Joint Technical Working Group to the Haida Gwaii Management Council, February 10, 2012;
- Review and evaluation of current operating conditions on Haida Gwaii and associated timber supply implications through discussions between the HGMC, the Joint Technical Working Group, and the Solutions Table from the Haida Nation and the MFLNRO, at the AAC determination meeting held on February 14, 15 and 16, 2012;
- Responses from the general public to the October, 2011 timber supply review public discussion paper and to the draft data package;

Appendix 10: History of the AAC

The complex history of the AACs for the various land bases (management units) now comprising the two TFLs and the TSA on Haida Gwaii is provided in abbreviated form in **Table A-1**, next page:

TABLE A-1. HISTORY OF THE AAC FOR HAIDA GWAII (EXCLUDING WOODLOT LICENCES*)

Year	'Queen Charlotte' TSA (TSA#25)	TFL 25 'Blk 6'	TFL 47 'Moresby Blk', now TFL 58	TFL 39 'Blk 6', now TFL 60	Haida Gwaii Total
2000	**361 000 m³** (due to Part 13 reduction of 114 000 m³, Dec 99)	**115 000 m³** (from 1998 incorporation of ex-TFL 24)	**100 000 m³** (from Dec 1996 determination)	**1 210 000 m³** (from 1996 determination – not official partition)	**1 786 000 m³**
2001				**1 150 000 m³** (contrib in Nov 2001 determination – not an official partition)	**1 726 000 m³**
2002					**1 726 000 m³**
2003	No change, but 114 000 m³ Part 13 reduction replaced		**100 000 m³** (re-determined in Aug 2003)		**1 726 000 m³**
2004				**1 082 616 m³** (Oct 2004, due to private land removal – not an official partition)	**1 658 616 m³**
2005					**1 658 616 m³**
2006	**245 000 m³** (Part 13 reduction of 116 000 m³)	**106 500 m³** (Part 13 reduction of 8500 m³ Oct 2006)	**83 000 m³** (Part 13 reduction of 17 000 m³ Oct 2006; **TFL 58 formed Dec '06**)	**789 616 m³** (Part 13 reduction of 293 000 m³ Oct 2006)	**1 224 116 m³**
2007					**1 224 116 m³**
2008		**106 500 m³** (base level and Part 13 reduction re-affirmed in Feb 2008 determination)			**1 224 116 m³**
2009	**475 000 m³** (Part 13 reductions end Dec 31, 2009)	**115 000 m³** (Part 13 reductions end Dec 31, 2009)	**100 000 m³** (Part 13 reductions end Dec 31, 2009)	**1 082 616 m³** (Part 13 reductions end Dec 31, 2009)	**1 772 616 m³**
2010	**869 748 m³** (115 000 m³ added from TFL 25; 279 748 m³ added from TFL 60, Dec 2010)	Block added to TSA	**100 000 m³**	**802 868 m³** (Dec 2010; Jan 2010, TFL 39 Blk 6 deleted, TFL 60 formed)	**1 772 616 m³**

The AAC for the total area of the TSA and the two TFLs is **1 772 616** cubic metres.
The current AAC for Woodlots is 9293 cubic metres (1817 cubic metres attributable to private lands, and **7476** cubic metres attributable to non-private land).
Hence, the current AAC for the entire Haida Gwaii Management Area is **1 780 092** cubic metres.

Appendix 11: Individuals who provided technical comments, advice, and support

Joint Haida – BC Technical Working Group

Haida:

Nick Reynolds (co-chair)

Province of BC:

David Stuart, RPF, Forest Analysis and Inventory Branch

Christine Fletcher, RPF, Forest Analysis and Inventory Branch (co-chair)

Greg Wiggins, RPF, Haida Gwaii Forest District

Technical assistance

The following people provided important comments and assistance in the technical aspects of the timber supply analysis and AAC determination process:

William Floyd, John Sunde, Tyler Bellis, Mario diLucca, Wendy Bergerud, Kevin Hardy, Andy Mackinnon, Sari Saunders, Shikun Ran, Colin Richardson, Sean Muise, Mark Salzl, Berry Wijdeven, Terry Sullivan, David Byng, Jon Fane, Rob Sandberg, Keith Moore, Leslie McAulay, Jennifer Burleigh, Alvin Cober, Todd Mahon, Ruby Saunders, Peter Ott, Sinclair Tedder, Tom Johnson, Gordon Nigh, and Will Smith.[1]

The HGMC greatly appreciates the contributions of these people to the timber supply review process, and their assistance to the JTWG.

[1] The presence of individuals in this list does not necessarily imply their agreement with the determination or the conclusions reached in the rationale.