The Village of
PORT CLEMENTS
"Gateway to the Wilderness"

36 Cedar Avenue West
PO Box 198
Port Clements, BC
V0T1R0
OFFICE: 250-557-4295
Public Works: 250-557-4295
FAX: 250-557-4568
Email: office@portclements.ca
Web: www.portclements.ca

7:00 p.m. Regular Meeting of Council, Monday, December 16th, 2019

AGENDA

1. **ADOPT AGENDA**
2. **PETITIONS, DELEGATIONS & OPENING OF SEALED TENDERS**
3. **MINUTES**
   M-1 – December 2nd, 2019 Regular Council Meeting Minutes
4. **BUSINESS ARISING FROM THE MINUTES & UNFINISHED BUSINESS**
5. **ORIGINAL CORRESPONDENCE**
   C-1—ASIST PROGRAM 2020 – additional 2020 workshop – letter of support – Karen Walhout
6. **FINANCE**
7. **GOVERNMENT**
   G-1—Amended Financial Management Plan for the years 2019 – 2023, Bylaw #455, 2019– reconsideration & adoption.
   G-2 – UBCM's Community Emergency Preparedness Fund – Flood Risk Assessment, Mapping and Mitigation Planning – Invitation to RFP– North Coast Regional District
   recommended motion: "That Council rescind motion:
   2019-12-305—Moved by Councillor Kazamir, seconded by Councillor Kish
   THAT the Village of Port Clements joins the North Coast Regional District's project and thus application to the UBCM's Community Emergency Preparedness Fund and that Council writes a letter to NCRD to agree to join their application.
   CARRIED"
   recommended motion: "That the Village of Port Clements applies to the Union of B.C. Municipalities' 2020 Flood Risk Assessment, Mapping & Mitigation Planning program."
   Recommended motion: "THAT the Village of Port Clements joins the North Coast Regional Districts proposal for a joint RFP for Flood Risk Assessment, Mapping and Planning Mitigation Planning"
   G-3— BC Hydro – energy Grant Application—MIEDS
   recommended motion: "That the Village of Port Clements supports a grant application by the Misty Isles Economic Development Society to the Gwaii Trust Society's Special Projects program for up to $100,000 towards a Haida Gwaii Community Energy Plan co-funded by BC Hydro."
   G-4—Discussion on Allowable Annual Cut (AAC) Review – Mayor Daugert
8. **NEW BUSINESS**

9. REPORTS & DISCUSSIONS

10. ACTION ITEMS

A-1 – see Action Items list.

11. QUESTIONS FROM THE PUBLIC & PRESS

12. IN-CAMERA

As per section 90

(1) A part of a council meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:

(b) Labour relations or other employee relations;

(g) litigation or potential litigation affecting the municipality;

(2) A part of a council meeting must be closed to the public if the subject matter being considered relates to one or more of the following:

(b) the consideration of information received and held in confidence relating to negotiations between the municipality and a provincial government or the federal government or both, or between a provincial government or the federal government or both and a third party;

13. ADJOURNMENT

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Minutes of the 7:00 p.m. Regular Meeting of Council, Monday, December 2nd, 2019

Present:
Mayor Daugert
Councillor Kish
Councillor Gould
Councillor Falconbridge
REGRETS Councillor Cumming

CAO Decock

Members of the Public and Press: Craig Beachy, Doris Fischer, Bev Lore, Maureen Bailey, Marilyn Bliss

Meeting Called to order at 7:00 PM
Mayor Daugert: I call to order this meeting of the Council of the Village of Port Clements being held on the traditional territory of the Haida People.

1. ADOPT AGENDA
2019-12-300—Moved by Councillor Falconbridge, seconded by Councillor Kish
THAT the December 2nd, 2019 Regular Council Meeting Agenda be adopted as presented.
CARRIED

2. PETITIONS, DELEGATIONS & OPENING OF SEALED TENDERS

3. MINUTES
M-1 – November 18th, 2019 Regular Council Meeting Minutes
2019-12-301—Moved by Councillor Falconbridge, seconded by Councillor Gould
THAT the November 18th, 2019 Regular Council Meeting Minutes be adopted with the correction of removing the second "Marilyn Bliss" from the Members of the Public and Press section.
CARRIED

4. BUSINESS ARISING FROM THE MINUTES & UNFINISHED BUSINESS

5. ORIGINAL CORRESPONDENCE
C-1 – Board Highlights - North Coast Regional District
2019-12-302—Moved by Councillor Gould, seconded by Councillor Kish
THAT the North Coast Regional District's Board Highlights be received.
CARRIED

6. FINANCE

M-1

7. GOVERNMENT

G-1—Amended Financial Management Plan for the years 2019 – 2023, Bylaw #455, 2019– 1st, 2nd & 3rd reading
2019-12-303—Moved by Councillor Falconbridge, seconded by Councillor Kish
THAT Council does the 1st, 2nd and 3rd reading of the Amended Financial Management Plan for the years 2019-2023, Bylaw #455, 2019.
CARRIED

G-2 – UBCM's Community Emergency Preparedness Fund – Flood Risk Assessment, Mapping and Mitigation Planning – Invitation to Join Project – North Coast Regional District
2019-12-304—Moved by Councillor Kazamir, seconded by Councillor Gould
THAT Council receives the correspondence from the North Coast Regional District which invites municipalities to join their project for a Flood Risk Assessment, Mapping and Mitigation Planning and thus their application to UBCM's Community Emergency Preparedness Fund.
CARRIED

2019-12-305—Moved by Councillor Kazamir, seconded by Councillor Kish
THAT the Village of Port Clements joins the North Coast Regional District's project and thus application to the UBCM's Community Emergency Preparedness Fund and that Council writes a letter to NCRD to agree to join their application.
CARRIED

G-3 – Appointment of Committee Representatives
2019-11-306—Moved by Mayor Daugert, seconded by Councillor Kish
THAT Council makes the following appointments for Committee Representatives for the 2020 year:

EMERGENCY MANAGEMENT COMMISSION: **Councillor Teri Kish**
Alternate: **Councillor Brigid Cumming**

RECREATION COMMISSION: Councillor **Kazamir Falconbridge**
Alternate: **Councillor Ian Gould**

PARK MANAGEMENT COMMITTEE: **Councillor Brigid Cumming**
Alternate: **Councillor Teri Kish**

NORTHERN DEVELOPMENT INITIATIVE TRUST Regional Advisory Committee: **Councillor Kazamir Falconbridge**
Alternate: **Councillor Teri Kish**

NORTH COAST REGIONAL DISTRICT – NORTHWEST REGIONAL ADVISORY COMMITTEE: **Mayor Doug Daugert**
Alternate: **Councillor Kazamir Falconbridge**

*NORTHERN HEALTH AUTHORITY: **Mayor Doug Daugert**
Alternate: **Councillor Kazamir Falconbridge**
*This appointment is tied to the NCRD appointment

MISTY ISLES ECONOMIC DEVELOPMENT: **Mayor Doug Daugert**
Alternate: **Councillor Ian Gould**

GWAIITEL SOCIETY: **Councillor Kazamir Falconbridge**
Alternate: **Councillor Teri Kish**

VANCOUVER ISLAND REGIONAL LIBRARY: **Councillor Ian Gould**
Alternate: **Councillor Kazamir Falconbridge**

COMMUNITY FUTURES: **Councillor Brigid Cumming**
Alternate: **Mayor Doug Daugert**

MUNICIPAL INSURANCE ASSOCIATION BOARD REPRESENTATIVES: **Councillor Brigid Cumming**
Alternate: **Mayor Doug Daugert**

CARRIED

**NOTE TOURISM COMMITTEE NOT APPOINTED AT THIS TIME AS COMMITTEE IS INACTIVE (BEING REVIEWED)*

G-4 – Appointment of Deputy Mayor
2019-12 - 307—Moved by Councillor Gould, seconded by Mayor Daugert
THAT Council appoints Councillor Kish as the Acting Mayor for 2020
CARRIED

G-5 – Schedule of 2020 Council Meetings – Deputy Clerk Cumming
2019-12-308—Moved by Councillor Falconbridge, seconded by Councillor Kish
THAT Council receives the Schedule of 2020 Council Meetings Report.
CARRIED

2019-12-309 - Moved by Councillor Falconbridge, seconded by Councillor Gould
THAT Council adopts the proposed draft schedule as the 2020 Regular Council Meeting schedule, with the following revisions: moving the January 6th meeting to January 13th and cancelling the January 20th Meeting, moving the February 3rd Meeting to February 10th and cancelling the February 20th Meeting, and moving the proposed July 20th meeting to July 13th.
CARRIED

8. NEW BUSINESS

9. REPORTS & DISCUSSIONS

Councillor Falconbridge: Recreation Commission held a movie event last Friday. Attended GwaiiTel Society AGM on November 30, 2019. There was an upgrade on Radio link was done in 2019 a further upgrade will occur in 2020 to increase the radio transmission rates; however, Haida Gwaii will not be expected to increase experiencing until 2021 where direct fibre install through the subsea cable. Also attended the strategic planning session.

Councillor Gould: wanted more information to be explained about the Boil Water Advisory and what to expect.

Councillor Kish: Attended strategic planning meeting and preparing for the Christmas in the Park event. Attended the Island Protocol Meeting.

Mayor Daugert: Attended Protocol Meeting in which BC Hydro made a 2-hour presentation on energy reduction strategy, electric vehicle charging stations, LED street lighting is a go ahead – each community needs to select preferred colour options for the LEDs and type from selection. Energy conservation assistance program and separate initiatives for First Nations and civic communities, up to $350 dollars for energy initiatives for individual households (contact BC Hydro for what is available). Alternate and renewable energy sources for Haida Gwaii, BC Hydro has not picked a single technology, though they have stated that they are not looking at new technologies

or unproven technologies, only proven systems with an operating track record. The key to moving forward is an alignment of the communities in support of this initiative and they did not say that they would be confining themselves to a single supplier but suggested multiple sources of alternate energy.

In furtherance of that they are going to hold community consultations early next year and hope to get alignment of the communities and clear preferences from the communities on the sources they would like to see on Haida Gwaii in different communities, and they would like to have all-islands cooperation for anything they do. They identify that that is the key to them moving forward. They will only do it if they have an all-island agreement, and a project short-list of what the islands would want. If they have that then they will go to the BC Utilities Commission, which takes upwards of a year to make decisions, so they would like to do this in April of 2020.

They are proposing to do two rounds of consultation in all the communities sometime between January and mid-March and that they recognize that might be a difficult time frame. They would like to have more than a single provider chosen and they basically want to go with a community energy plan, that not only covers alternate energy proposals but also current and anticipated energy savings from new technologies they hope to install and we as communities hope to install. Basically, they want a plan from each community on how they are going to save energy and possible or potential new sources of use of energy (like if there were bitcoin miners coming to Port Clements and a few megawatts were needed for that). So, they want a community energy plan out of us, quickly, so they can go to the Utilities Commission in 2020, so they would be able to begin construction in 2021. For this community energy plan, they were putting up $50,000 of a $100,000 study and they were looking to the communities to provide the other $50,000. MIEDS volunteered to be the point agency in writing to the Gwaii Trust Society to see if they are in support of this.

That was the focus of the protocol meeting, then there was an hour discussing the community forest, somewhat informed by the first runs of the data package of the new Timber Supply Review that was recently completed. It applied the data set to the actual geography occupied by the proposed community forest would result in a sustainable harvest of less than 50,000 metres of harvest under the most relaxed set of assumption of the land use plan. Basically, the new timbre supply review indicated that there was not a sustainable harvest in the area of 80,000 metres FLNRO had allotted on that, which opens a large can of worms. Possible, it would be even less than that if the assumptions become more rigorous, i.e. the goshawk areas are now identified become the goshawk foraging areas, which would lead to more land set aside and further restrictions on logging. In the foraging areas they would have any clear cut no more than 500 metres from boundary to boundary, which would take more land they could not harvest in the current rotation they are following.

Also, MIEDs is going to have to make its counterproposal before January 14th because that is the submission deadline for the annual allowable cut determination and as you change the area you change the allowable cut because if you divide out one area so it is smaller they will not have the same options for moving around for getting the cut, if they end up not being able to harvest by moving around as much in the two separated areas then it becomes somewhat less than the whole in terms of the harvest.

Also attended the Strategic Planning meeting and the Community Wildfire Protection Plan meeting.

CAO Decock: Worked on the Strategic Planning meeting, Community Wildfire Protection Plan meeting, and the Housing Needs Assessment Meeting with Port Clements Housing & Restoration Society. Prepared for the budget amendment, adjudication bylaw and work on the awarding the Wharf Maintenance contract, assisting in getting the clarification on the

2019-12-309—Moved by Councillor Falconbridge, seconded by Councillor Kish
THAT Council receives the verbal Reports from Council and CAO Decock.
CARRIED

10. ACTION ITEMS

11. QUESTIONS FROM THE PUBLIC & PRESS

Craig Beachy: met with Fire Chiefs at the All-Island Fire Chiefs Meeting, so everyone is on the same page. Port Clements was identified as a high point on island. The higher points in Port Clements are safe from Tsunamis as far as we know, but you could not get out of town from these high areas – in either direction you must go down low to get out. Something to think about if there was a road from the Community Park going north or south, then it could hook up to the highway without going down low. Also working together for getting an Island 911 service here. Most 911s in the province are not run out of the town they are in, so why don't we have it here? We should be able to do it here.

Bev Lore: question about the streetlight outages – do we report it to the Village Office?

Answer: Yes, just provide the cross-street location and the pole number (located on a plaque on the pole) and the office staff will report it into BC Hydro's SLIM program.

Bev Lore: question about risk of school closure given declining children enrolled, and request for Council to say something about the school bussing, as a school is needed for a viable community.

Answer: While a School District can amalgamate schools if there are multiple schools in a community, it takes an Order in Council from the Provincial Government to close the only school in a small community. There are ways that a school could stand out to draw attendance in – such as specializing as an Art School or French Immersion School, or in other ways. Council agrees that it would be more effective if Council used its political influence in Victoria, writing to all School Board Trustees and respective Council in each community to make a persuasive argument and lobby for these concerns to be addressed, then if an individual resident was to lobby.

Maureen Bailey: Update, Gwaii Trust has, or will have, maxed out its grant streams this way. We are strongly encouraging the Village and all member communities to look at their Vibrant Communities Grant this next year and using it as much as possible as next year is the last year it is available.

12. IN-CAMERA

As per section 90

(1) A part of a council meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:

(c) labour relations or other employee relations;

2019-12-310—Moved by Councillor Falconbridge seconded by Councillor Kish
THAT Council moves to In-Camera per Section 90(1)(c) of the *Community Charter* at 8:57 PM
CARRIED

13. ADJOURNMENT

2019-12-311—Moved by Councillor Kish
THAT this meeting be adjourned at 9:37 PM
CARRIED

Mayor Doug Daugert **CAO Ruby Decock**

Elizabeth Cumming

From: Karen Walhout <kwalhout@sd50.bc.ca>
Sent: December-04-19 1:40 PM
To: Elizabeth Cumming
Subject: Re: Request for Support

Dear Elizabeth,
I am sorry to make a third request but we have decided to include two workshops in the 2020 grant application. We will be conducting the ASIST workshops March 12-13 and October 29-30. If you could add "two two-day workshops in 2020," to the letter of support, that would be sufficient.
Thanks so much! And apologies for the inefficiency!
Karen

Here is the official request with clarity around the number of workshops.
Dear Elizabeth Cummings,
Mental Health Councillor Dan Binnema and myself, Karen Walhout, have been offering Applied Suicide Intervention Skills Training (ASIST) on island for one year. We have been fortunate to have had grants from Gwaii Trust and the First Nations Health Authority while working with the Skidegate Health Center. At the moment we have no non-profit affiliation but are looking for support to apply for Gwaii Trust funding once more, in order for the program to be available to all community members. If your organization can help us apply or offer a letter of support, that would be greatly appreciated. Bellow is a description of the course. The deadline for our application is January 1st. (Our previous request indicated November 1st deadline but unfortunately the funding for that stream was depleted by then.)
We will be hosting two workshops in 2020.

Thank you for your time,
Sincerely,
Karen Walhout
250-637-1918

ASIST is a two day workshop that prepares one to provide life-assisting, verbal first aid. At a LivingWorks ASIST workshop, participants learn how to prevent suicide by recognizing signs, providing a skilled intervention, and developing a safety plan to keep someone alive. Anyone 16 or older can learn these life-saving skills. By providing these workshops in Haida Gwaii, we hope to increase awareness, support those at risk, and create a network of caregivers.

From: Elizabeth Cumming <deputy@portclements.ca>
Sent: Monday, November 25, 2019 12:15 PM
To: Karen Walhout <kwalhout@sd50.bc.ca>
Subject: RE: Request for Support

Good Morning,

Please find attached a letter of support from the Village of Port Clements for your Gwaii Trust Application.

Regards,

C-1

VILLAGE OF PORT CLEMENTS

BYLAW NO.455, 2019

Respecting an Amendment to The Financial Plan Bylaw for the Years 2019-2023, Bylaw #450, 2019

The Council for the Village of Port Clements, in open meeting assembled, enacts as follows:

1. Schedule A attached hereto and made a part of this bylaw is hereby adopted and comprises the Amended Financial Plan for the Village of Port Clements for the years 2019 and ending December 31, 2023.
2. This Bylaw may be cited for all purposes as "The Amended Financial Plan for the years 2019-2023 - Bylaw #455, 2019".

READ A FIRST TIME THIS 2ND DAY OF DECEMBER 2019.

READ A SECOND TIME THIS 2ND DAY OF DECEMBER 2019.

READ A THIRD TIME THIS 2ND DAY OF DECEMBER 2019.

FINALLY PASSED AND ADOPTED THIS 16th DAY OF DECEMBER 2019.

Doug Daugert
MAYOR

Ruby Decock
CAO

CERTIFIED A TRUE COPY OF "THE AMENDED FINANCIAL PLAN 2019-2023 BYLAW # 455, 2019"

Schedule 'A" to Bylaw #455

The Amended Financial Plan for the Five-Year Period 2019 – 2023

	2019	2020	2021	2022	2023
Revenues					
Property Tax- Municipal	130,810	134,734	138,776	142,940	147,228
Water /Sewer Taxation	90,436	90,436	89,120	89,120	89,120
Water/Sewer User Fees	89,000	90,750	90,750	96,950	96,950
Payments in Lieu	8,285	8,315	8,315	8,315	8,315
Sales of Services	18,600	18,700	18,700	18,750	18,750
Revenue from Own Sources	109,840	109,840	108,840	109,340	109,340
Unconditional Grants	405,700	405,700	405,700	405,700	405,700
Conditional Grants (ops.)	292,974	221,863	211,507	217,664	212,503
Conditional Grants (Capital)	1,528,200	1,700,000	1,110,000	35,000	35,000
Multi Purpose Building Revenue	13,700	13,700	13,700	13,700	13,700
Transfers from Reserves	43,319	0	0	0	0
Collections for Other Agencies	187,864	192,563	197,377	202,311	207,369
TOTAL REVENUES	2,918,728	2,986,602	2,392,786	1,339,790	1,343,975
Expenditures					
Legislative Expenses	47,700	41,200	41,750	42,800	42,800
General Administration	334,825	260,238	240,577	250,946	249,271
Fire Department	48,150	46,150	47,650	48,250	48,250
Emergency Services	2,674	4,000	4,000	4,000	4,000
Common Services	40,060	46,873	48,306	52,330	53,635
Wharf Services	23,000	16,000	16,000	16,000	16,000
Small Craft Harbour	16,000	15,500	16,000	16,500	16,500
Roads	65,500	60,025	63,325	65,400	66,400
Environmental Health	680	780	880	1,080	1,080
Environmental Development	6,550	4,400	4,400	4,400	4,400
Parks and Recreation	76,300	57,550	58,600	59,650	59,650
Economic Development	80,000	65,000	65,000	65,000	65,000
Multi Purpose Building Expenses	72,400	72,500	73,200	73,300	73,300
Fiscal Services	2,300	2,300	2,300	2,300	2,300
Water Operations	93,713	95,340	95,784	100,693	101,370
Sewer Operations	57,812	53,884	54,968	56,015	56,579
Contributions to Reserves	65,000	82,299	82,669	73,814	71,072
Capital Expenditures	1,528,200	1,700,000	1,110,000	35,000	35,000
Amortization	170,000	170,000	170,000	170,000	170,000
Taxes Levied for Other Agencies	187,864	192,563	197,377	202,311	207,369
TOTAL EXPENDITURES	2,918,728	2,986,602	2,392,786	1,339,792	1,343,975

Village of Port Clements
2019-2023 Financial Plan
Statement of Objectives
For Bylaw No. 450, 2019

In accordance with Section 165(3.1) of the *Community Charter*, the Village of Port Clements (Village) is required to include in the Five-Year Financial Plan, objectives and policies regarding each of the following:

1. The proportion of total revenue that comes from each of the funding sources described in Section 165(7) of the *Community Charter*;
2. The distribution of property taxes among the property classes
3. Permissive Tax exemptions

Funding Sources

Table 1 shows the proportion of total revenue proposed to be raised from each funding source in 2019. Government grants form the greatest proportion of revenue. The government grants that are included in this total include the following: $405,700 for the small community grant and $65,000 from the community works fund and $213,385 from Northern Development Initiative Trust, Government of Canada and Gwaii Trust Society.

Property Taxes make up the second highest amount for 2019.

The third highest source of revenue is Other Sources of Revenue.

Objective

- For the 2019 – 2023 years to incorporate a 3.0% tax increase and 0% increase for both water and sewer in 2019, 2020– 2023 there will be a 3.0% tax increase which includes a 2.5% Cost of Living Allowance increase annually.
- Council has planned to incorporate local employment where possible, and encourage contractors bidding on works with the Village to utilize unemployed workers.

Table 1: Sources of Revenue

Revenue Source	% of Total Revenue	Dollar Value
Property taxes	14.3%	417,395
User Fees and charges	3.1%	89,000
Other sources	4.8%	140,640
Proceeds from borrowing	0.0%	0
Transfer from Reserves	1.5%	43,319
Government grants	76.3%	2,212,285
Total	**100.0%**	**$2,918,728**

Distribution of Property Tax Rates
Table 2 outlines the distribution of property taxes among the property classes. The residential property class provides the largest proportion of property tax revenue. This is appropriate as this class also forms the largest portion of the assessment base and consumes the majority of the Village's services.

Objectives

Policies

- Continue to maintain and encourage economic development initiatives designed to attract more retail and commercial businesses to invest in the community.

- Align the distribution of tax rates among the property classes with the social and economic goals of the community, particularly to encourage a range of employment opportunities.

- Regularly review and compare the Village's distributions of tax burden relative to other municipalities in British Columbia.

Table 2: Distribution of Property Tax Rates

Property Class	% of Total Property Taxation	Dollar Value
Residential (1)	55.6%	72,720
Utilities (2)	0.3%	437
Light Industry (5)	25.0%	32,687
Business and Other (6)	17.7%	23,112
Managed Forest (7)	1.3%	1,697
Recreation/Non-profit (8)	0.1%	156
Total	**100.0%**	**$130,810**

Permissive Tax Exemptions

- The Village did not issue permissive tax exemptions in 2018 for the 2019 Taxation year.

	A	B	I	J	K	L	M	N
2			2019	2020	2021	2022	2023	Comments
3		**NOV 29 2019 FINAL**	Budget	Budget	Budget	Budget	Budget	
4		**COLA Rate**	2.50%	2.50%	2.50%	2.50%	2.50%	
5		**Tax Rate Increase (%)**	3.00%	3.00%	3.00%	3.00%	3.00%	
6		**Tax Rate Increase ($)**	$ 3,810.00	$ 3,924.30	$ 4,042.03	$ 4,163.29	$ 4,288.19	
7	10-1-11-00-00	Property Tax - Municipal	130,810	134,734	138,776	142,940	147,228	
8		**TOTAL TAXES**	130,810	134,734	138,776	142,940	147,228	
9	10-1-21-00-00	Grant in Lieu - Federal	1,300	1,300	1,300	1,300	1,300	
10	10-1-24-00-00	Grant in Lieu - Hydro	5,515	5,515	5,515	5,515	5,515	
11	10-1-27-00-00	Grant in Lieu - Telus	1,470	1,500	1,500	1,500	1,500	
12		**TOTAL PAYMENT IN LIEU OF TAXES**	8,285	8,315	8,315	8,315	8,315	
13								
14	10-1-12-99-99	Sales - Village Property	0	0	0	0	0	
15	10-1-32-10-00	Taxes - School Tax Admin Fee	2,100	2,100	2,100	2,100	2,100	
16	10-1-41-10-10	Sales - Faxes	350	250	250	250	250	
17	10-1-41-10-00	Sales - Photocopies	400	400	400	400	400	
18	10-1-41-10-20	Sales - Tax Searches & Commissioner	450	500	500	550	550	
19	10-1-42-10-00	Misc. - Fire Protection Agreement	300	450	450	450	450	
20	10-1-44-10-00	Sales - Garbage Tags	0	0	0	0	0	
21	10-1-53-10-20	Rental -Weight Room	1,500	1,500	1,500	1,500	1,500	
22	10-1-71-10-00	Misc. Rec Commission Revenue	5,500	5,500	5,500	5,500	5,500	
23	10-1-13-00-00	Water sewer admin recovery	8,000	8,000	8,000	8,000	8,000	
24		**TOTAL SALES OF SERVICE**	18,600	18,700	18,700	18,750	18,750	
25								
26	10-1-51-20-00	Sales - Business Licenses	1,200	1,200	1,200	1,200	1,200	
27	10-1-53-10-10	Rental - Gym	0	0	0	0	0	
28	10-1-53-10-30	Rental - Ambulance	6,600	6,600	6,600	6,600	6,600	
29	10-1-53-10-40	Dog Tag Revenue	15	15	15	15	15	
30	10-1-53-10-50	Rental - St. Mark's Church	125	125	125	125	125	
31	10-1-53-10-70	Rental - Shoreline Park RV	7,000	7,000	7,000	7,500	7,500	
32	10-1-53-10-80	Rental - CBC Site	1,400	1,400	1,400	1,400	1,400	
33	10-1-53-20-00	Rental - Clinic	8,400	8,400	8,400	8,400	8,400	
34	10-1-53-20-10	Garbage Admin	3,500	3,500	3,500	3,500	3,500	
35	10-1-51-70-00	Biomass recovery	11,000	11,000	11,000	11,000	11,000	
36	10-1-56-10-00	Property Tax Penalties	6,000	6,000	6,000	6,000	6,000	
37	10-1-56-10-10	Property Tax Arrears Interest	1,000	1,000	1,000	1,000	1,000	
38	10-1-56-10-15	Delinquent Tax Interest	600	600	600	600	600	
39	10-1-59-90-00	Interest Revenue	40,000	40,000	40,000	40,000	40,000	
40	10-1-59-90-40	MIA Dividends	0	0	0	0	0	
41	10-1-59-90-01	Rainbow Wharf Revenue	0	0	0	0	0	
42	10-1-59-90-10	Small Craft - Electricity Revenue	6,000	6,000	5,000	5,000	5,000	
43	10-1-59-90-20	Small Craft - Fee for Use	17,000	17,000	17,000	17,000	17,000	
44		**TOTAL REVENUE FROM OWN SOURCES**	109,840	109,840	108,840	109,340	109,340	
45								
46	10-1-53-10-11	MPBC Library Revenue	10,200	10,200	10,200	10,200	10,200	
47	10-1-53-10-12	MPBC Space rental	3,500	3,500	3,500	3,500	3,500	
48		**TOTAL MULTI PURPOSE BUILDING RENTAL**	13,700	13,700	13,700	13,700	13,700	
49								
50	10-1-62-10-00	Grants - Small Community Protection	405,700	405,700	405,700	405,700	405,700	
51		**TOTAL UNCONDITIONAL TRANSFERS**	405,700	405,700	405,700	405,700	405,700	
52								
53								

	A	B	I	J	K	L	M	N
54	10-1-59-10-00	Misc. - Donations	50	100	100	100	100	
55	10-1-59-10-10	Misc. - NSF & Sundry Charges	25	25	25	25	25	
56	10-1-59-10-20	Miscellaneous (Includes Gwaii Communications Fibre Install $20,	20,500	500	500	500	500	
57	10-1-75-10-00	Misc. Grants (27,000 NDIT; 42630 asset mgmnt, $15,000 Busine	93,310	13,200				
58	10-1-89-00-00	Community Works Fund (Gas Tax)	33,000	66,000	66,000	66,000	66,000	
59	10-1-89-10-30	Grants - GT - Christmas	10,000	10,000	10,000	10,000	10,000	
60	10-1-89-10-40	GT Community Events program	5,000	5,000	5,000	5,000	5,000	
61	10-1-89-10-70	NDI Proposal Writer	0	0	0	6,400	0	
62	10-1-89-10-71	NDI Economic Development funding	50,000	50,000	50,000	50,000	50,000	
63	10-1-89-10-80	Tsunami Grant	0	0	0	0	0	
64	10-1-89-10-95	Coast Sustainability Trust Concession Stands	0	0	0	0	0	
65				0	0	0	0	
66				0	0	0	0	
67				0	0	0	0	
68		**TOTAL CONDITIONAL TRANSFERS**	**211,885**	**144,825**	**131,625**	**138,025**	**131,625**	
69							0	
70	10-1-92-10-00	Transfers From Reserves	43,319					to balance budget transfer years 2020 -2023
71		Transfer from Deferred Revenue	0	0	0	0	0	
72		Transfer from Rec Reserve	0	0	0	0	0	
73		Transfer from gas tax fund	0	0	0	0	0	
74		Industrial road	0	0	0	0	0	
75		boat launch amm fund	0	0	0	0	0	
76		**TOTAL TRANSFER FROM RESERVES**	**43,319**	**0**	**0**	**0**	**0**	
77								
78	10-1-98-10-00	Taxes - School Residential	78,045	79,996	81,996	84,046	86,147	
79	10-1-98-10-10	Taxes - School Non-residential	25,590	26,230	26,885	27,558	28,247	
80	10-1-98-20-00	Taxes - NCRD	33,284	34,116	34,969	35,843	36,739	
81	10-1-98-20-20	Taxes - NW Regional Hospital	22,649	23,215	23,796	24,390	25,000	
82	10-1-98-20-30	Taxes- Police	13,561	13,900	14,248	14,604	14,969	
83	10-1-98-30-10	Taxes - BCAA	1,400	1,435	1,471	1,508	1,545	
84	10-1-98-30-20	Taxes - MFA	7	10	10	10	10	
85	10-1-98-40-00	Taxes - VIRL	13,328	13,661	14,003	14,353	14,712	
86		**TOTAL COLLECTIONS FOR OTHER AGENCIES**	**187,864**	**192,563**	**197,377**	**202,311**	**207,369**	
87		**Total Revenue**	**1,130,003**	**1,028,378**	**1,023,034**	**1,039,081**	**1,042,027**	

	A	B	I	J	K	L	M	N
88	EXPENSES							
89	10-2-11-10-00	Council Remuneration	17,000	17,000	17,000	17,000	17,000	
90	10-2-11-10-10	Council Training Expense	5,000	2,000	2,000	2,000	2,000	
91	10-2-11-10-20	Council Travel	12,000	10,000	11,000	12,000	12,000	
92	10-2-11-10-30	Council Benefits Expense	2,000	500	0	0	0	
93	10-2-11-10-40	Council Membership Expense	1,700	1,700	1,750	1,800	1,800	
94	10-2-11-10-50	Grants Awarded	10,000	10,000	10,000	10,000	10,000	
95		**TOTAL LEGISLATIVE EXPENSES**	**47,700**	**41,200**	**41,750**	**42,800**	**42,800**	
96			25,700					
97	10-2-12-10-00	Administrative Wages	123,500	126,588	129,752	132,996	136,321	
98	10-2-12-10-10	Administrative Benefits	28,000	29,000	30,000	31,000	31,000	
99	10-2-12-10-01	General Consulting	42,150	10,000	0	0	0	
100	10-2-12-10-11	Intern Wages	27,000	13,000	0	0	0	
101	10-2-12-10-12	Intern Benefits	5,400	2,600	0	0	0	
102	10-2-12-10-15	NDI Grant Proposal Writer	4,650	4,650	4,650	4,650	4,650	
103	10-2-12-10-20	Administrative Travel	4,000	4,000	4,000	4,000	4,000	
104	10-2-12-10-25	Training	10,500	5,000	5,000	5,000	5,000	
105	10-2-12-10-30	Membership Fees	650	650	650	650	650	
106	10-2-12-10-40	Audit & Accounting Expense	10,000	10,000	10,000	10,000	10,000	
107	10-2-12-10-50	Legal Expense (need Bylaw enforce. GL#)	14,000	8,000	8,500	8,500	8,500	
108	10-2-12-10-51	Mediation	0	0	0	0	0	
109	10-2-12-11-00	Office Supplies	3,000	3,000	3,500	3,500	3,500	
110	10-2-12-11-10	Website Fees	3,000	3,000	3,000	3,000	3,000	
111	10-2-12-11-20	Computer Software Expenses	4,500	4,500	4,500	4,600	4,600	
112	10-2-12-11-30	Administrative Operating Costs	6,100	5,200	5,200	5,300	5,300	
113	10-2-12-11-40	Supplies (Council)	350	400	400	450	450	
114	10-2-12-11-50	Advertising	5,500	4,000	4,000	4,000	4,000	
115	10-2-12-11-60	Postage Expense	1,575	1,650	1,725	1,800	1,800	
116	10-2-12-11-70	Misc. - Tax Sale Expenses	1,200	1,200	1,200	1,200	1,200	
117	10-2-12-13-00	Elections Expense	0	0	0	5,000	0	
118	10-2-12-14-10	Janitorial Contract	6,300	6,800	7,000	7,300	7,300	
119	10-2-12-14-30	General Insurance Expense	17,000	17,000	17,500	18,000	18,000	
120	10-212-99-12	Asset Management Program	16,450	0	0	0	0	
121		**TOTAL ADMINISTRATION**	**334,825**	**260,238**	**240,577**	**250,946**	**249,271**	
122								
123	10-2-24-60-00	FD - Training	4,000	4,000	4,000	4,000	4,000	
124	10-2-24-60-10	FD - Fire Fighters	500	500	500	500	500	
125	10-2-24-70-00	FD - Repairs & Maintenance	10,000	7,500	8,000	8,000	8,000	Overseeing of Fire Re-enveloping project increase from $7500 , service fire trucks
126	10-2-24-70-10	Fire hall Utilities	12,500	12,500	13,000	13,000	13,000	
127	10-2-24-70-20	FD - License & Insurance	5,500	5,500	6,000	6,000	6,000	
128	10-2-24-80-00	FD - Equipment	8,000	8,500	8,500	9,000	9,000	
129	10-2-24-80-10	FD - Fuel	1,500	1,500	1,500	1,600	1,600	
130	10-2-24-90-00	Fire hall Janitorial	4,750	4,750	4,750	4,750	4,750	Increased from $3300 more fire janitorial work
131	10-2-24-90-10	Weight Room	1,400	1,400	1,400	1,400	1,400	Increased from $1200 more weightroom janitorial work
132		**TOTAL FIRE DEPARTMENT**	**48,150**	**46,150**	**47,650**	**48,250**	**48,250**	**Total bottom line increased by $4150**
133								
134	10-2-25-00-00	Misc. - Emergency Committee	2,000	4,000	4,000	4,000	4,000	
135	10-2-25-00-10	Tsunami Project	674	0	0	0	0	
136		**TOTAL EMERGENCY SERVICES**	**2,674**	**4,000**	**4,000**	**4,000**	**4,000**	

	A	B	I	J	K	L	M	N
137								
138	10-2-19-00-00	Common Services Utilities	1,000	1,000	1,100	1,100	1,100	
139	10-2-31-00-00	Common Services - Wages	26,810	33,210	34,377	36,980	38,110	decreased amount and reallocated to balance the budget - applied to appropriate PW GL's
140	10-2-31-00-10	Common Services - Benefits	6,500	6,663	6,829	7,000	7,175	
141	10-2-31-00-20	Common services Misc	750	1,000	1,000	1,250	1,250	
142	10-2-31-30-00	Public Works Trainings	5,000	5,000	5,000	6,000	6,000	
143		**TOTAL COMMON SERVICES**	**40,060**	**46,873**	**48,306**	**52,330**	**53,635**	**Total Bottom line decreased by $15,190**
144								
145	10-2-34-00-00	Wharf - Wages	1,000	1,000	1,000	1,000	1,000	
146	10-2-34-00-10	Wharf - Benefits	200	200	200	200	200	
147	10-2-34-00-12	Wharf Insurance	1,400	1,400	1,400	1,400	1,400	
148	10-2-34-00-15	Wharf Hydro	400	400	400	400	400	
149	10-2-34-00-20	Wharf - Maintenance	20,000	13,000	13,000	13,000	13,000	
150		**TOTAL RAINBOW WHARF**	**23,000**	**16,000**	**16,000**	**16,000**	**16,000**	
151								

	A	B	I	J	K	L	M	N
152	10-2-34-00-30	Small Craft Harbour- Wharfinger Expense	0	0	0	0	0	
153	10-2-34-00-40	Small Craft Harbour - Hydro Expense	8,000	8,000	8,000	8,000	8,000	
154	10-2-34-00-50	Small Craft Harbour- Insurance Expense	0	0	0	0	0	
155	10-2-34-00-60	Small Craft Harbour - Legal Expenses	500	500	500	500	500	
156	10-2-34-00-70	Small Craft Harbour- Maintenance	6,000	6,000	6,500	7,000	7,000	
157	10-2-34-00-71	Boat Launch & Parking Lot	1,500	1,000	1,000	1,000	1,000	
158		**TOTAL SMALL CRAFT HARBOUR**	**16,000**	**15,500**	**16,000**	**16,500**	**16,500**	
159								
160	10-2-12-99-60	Public Works Truck (2 vehicles) need GL's	3,000	2,500	2,500	3,000	3,000	
161	10-2-31-90-00	Common Services - Fuel	1,550	1,600	1,650	1,750	1,750	
162	10-2-31-90-10	Public Work's Truck Insurance	1,500	2,000	2,000	2,200	2,200	
163	10-2-31-90-20	Tractor Insurance	400	425	425	450	450	
164	10-2-31-90-21	Tractor Expense	1,000	500	500	500	500	
165	10-2-32-31-00	Street Maintenance	10,850	11,500	12,250	13,000	13,000	
166	10-2-32-37-00	Street Sanding	6,000	6,000	6,500	6,500	6,500	
167	10-2-32-37-10	Industrial Road Maintenance	7,200	5,000	6,000	6,000	7,000	
168	10-2-32-37-20	Ditching	8,000	4,000	4,000	4,000	4,000	
169	10-2-32-50-00	Hydro - Street Lights	16,000	16,000	16,500	16,500	16,500	
170	10-2-32-90-00	Equipment Maintenance	7,500	8,000	8,500	9,000	9,000	
171	10-2-71-89-40	Brushing Operating Expense	2,500	2,500	2,500	2,500	2,500	
172		**TOTAL ROADS**	**65,500**	**60,025**	**63,325**	**65,400**	**66,400**	
173								
174	10-2-43-00-00	Common Services - Garbage Expense	600	700	800	1,000	1,000	
175	10-2-43-00-10	Garbage Tags / Dumpster Fees	80	80	80	80	80	
176		**TOTAL ENVIRONMENTAL HEALTH**	**680**	**780**	**880**	**1,080**	**1,080**	
177								
178	10-2-52-00-00	Clinic R&M	4,200	3,000	3,000	3,000	3,000	Increase from $3000 because of trailer install work & new clinic flooring, reg. maint.
179	10-2-72-50-00	Ambulance R&M	2,350	1,400	1,400	1,400	1,400	Increase from $1400 because of trailer install
180		**TOTAL ENVIRONMENTAL DEVELOPMENT**	**6,550**	**4,400**	**4,400**	**4,400**	**4,400**	
181								
182	10-2-12-71-00	Mowing expense	3,000	3,000	3,000	3,000	3,000	
183	10-2-12-71-01	Mower Insurance	400	400	400	400	400	
184	10-2-12-71-10	Community Public Washrooms	300	300	300	300	300	
185	10-2-71-21-00	Community Hall Grounds Keeping	500	500	500	500	500	
186	10-2-71-89-00	Community Park O&M	20,000	13,000	13,000	13,000	13,000	
187	10-2-71-89-10	Beautification (Blooming Program, Payroll)	7,000	4,000	4,500	4,500	4,500	
188	10-2-71-89-20	Millennium Park O & M	5,000	3,800	3,800	3,800	3,800	
189	10-2-71-89-30	Sunset Park O & M	14,000	8,500	9,000	10,000	10,000	
190	10-2-71-89-45	Museum Grounds keeping	3,100	3,100	3,100	3,100	3,100	
191	10-2-71-89-50	Cemetery	500	500	500	500	500	
192	10-2-72-50-10	Tourism	8,000	8,000	8,000	8,000	8,000	
193	10-2-72-91-00	St Mark's Church	2,500	450	500	550	550	
194	10-2-75-00-00	Recreation Commission	12,000	12,000	12,000	12,000	12,000	
195		**TOTAL PARKS, RECREATION AND TOURISM**	**76,300**	**57,550**	**58,600**	**59,650**	**59,650**	
196								
197	10-2-71-21-10	MPBC Fuel	13,000	13,000	13,000	13,000	13,000	increase from $11,000
198	10-2-71-21-11	Library O & M	3,300	3,300	3,500	3,500	3,500	Increase from $3000 - new janitorial contract
199	10-2-71-21-12	MPBC Grounds keeping	10,000	10,000	10,500	10,500	10,500	increase from $8000
200	10-2-71-21-15	MPBC Utilities	15,000	15,000	15,000	15,000	15,000	

	A	B	I	J	K	L	M	N
201	10-2-71-21-20	MPBC Janitorial	4,000	4,000	4,000	4,000	4,000	increase from $3610 - new janitorial contract
202	10-2-71-21-25	MPBC Insurance	7,100	7,200	7,200	7,300	7,300	
203	10-2-71-21-30	Biomass (fuel, delivery, labour)	20,000	20,000	20,000	20,000	20,000	increase from 18,000 - cost of operating plant increased
204		**TOTAL MPBC OPERATING EXPENSES**	**72,400**	**72,500**	**73,200**	**73,300**	**73,300**	*** Total bottom line changed by**
205								
206	10-2-81-90-00	General Service Charges	1,800	1,800	1,800	1,800	1,800	
207	10-2-81-90-10	Bad Debts Expense	500	500	500	500	500	
208	10-2-81-90-20	Till Over/Short						
209		**TOTAL DEBT SERVICES**	**2,300**	**2,300**	**2,300**	**2,300**	**2,300**	
210								
211	10-2-81-90-30	Transfer to Reserves	0	17,299	17,669	8,814	6,072	
212	10-2-82-22-00	Transfers To Reserves climate action	0	0	0	0	0	
213		**TOTAL RESERVES**	**0**	**17,299**	**17,669**	**8,814**	**6,072**	
214								
215	10-2-12-32-00	Community Events Program - Gwaii Trust Canada Days	5,000	5,000	5,000	5,000	5,000	
216	10-2-12-99-11	NDI Economic Development funding	50,000	50,000	50,000	50,000	50,000	
217	10-2-12-99-30	Misc. - GT - Christmas	10,000	10,000	10,000	10,000	10,000	
218	10-2-12-99-66	NDI Business Façade	15,000	0	0	0	0	
219		**TOTAL GRANTS/ECONOMIC DEVELOPMENT EXPENSES**	**80,000**	**65,000**	**65,000**	**65,000**	**65,000**	
220								
221	10-2-28-19-40	Amortized Asset Expense	126,000	126,000	126,000	126,000	126,000	
222		**TOTAL AMORTIZED ASSET**	**126,000**	**126,000**	**126,000**	**126,000**	**126,000**	
223								
224	10-2-84-10-00	Taxes - NCRD	33,284	34,116	34,969	35,843	36,739	
225	10-2-84-20-00	Taxes - VIRL	13,328	13,661	14,003	14,353	14,712	
226	10-2-84-20-10	Taxes-Police	13,561	13,900	14,248	14,604	14,969	
227	10-2-88-11-00	Taxes - School Residential	78,045	79,996	81,996	84,046	86,147	
228	10-2-88-11-10	Taxes - School Non-residential	25,590	26,230	26,885	27,558	28,247	
229	10-2-88-20-10	Taxes - NW Regional Hospital	22,649	23,215	23,796	24,390	25,000	
230	10-2-88-30-00	Taxes - BCAA	1,400	1,435	1,471	1,508	1,545	
231	10-2-88-30-10	Taxes - MFA	7	10	10	10	10	
232	10-2-88-40-00	PILT's For Others	0	0	0	0	0	
233		**TOTAL COLLECTED FOR OTHER AGENCIES**	**187,864**	**192,563**	**197,377**	**202,311**	**207,369**	
234		**Total Expenses NO CHANGES FROM ORIGINAL BUDGET**	**1,130,003**	**1,028,378**	**1,023,034**	**1,039,081**	**1,042,027**	
235		negative means a loss	0	0	0	0	0	

	A	B	I	J	K	L	M	N
1	Account #	Description	2019	2020	2021	2022	2023	
2		**Nov 29, 2019 FINAL**	Budget	Budget	Budget	Budget	Budget	
3		**COLA Rate**	2.50%	2.50%	2.50%	2.50%	2.50%	
4								
5	40-1-44-00-00	Sewer - User Charges	31,000	31,000	31,000	31,000	31,000	
6	40-1-49-00-00	Sewer - Frontage Tax	36,120	36,120	36,120	36,120	36,120	
7	40-1-49-00-10	Sewer - Parcel Tax - PC East	1,316	1,316	0	0	0	
8		**TOTAL FEES AND TAXATION**	**68,436**	**68,436**	**67,120**	**67,120**	**67,120**	
9								
10		Community Works for sewer upgrades						
11	40-1-91-00-00	Sewer - Reserve/Surplus	6,440	1,477	1,513	1,551	1,590	to balance budget
12	40-1-92-90-46	Transfer from reserves	936	1,971	4,335	5,345	5,868	
13		**TOTAL GRANTS AND TRANFERS**	**7,376**	**3,448**	**5,848**	**6,896**	**7,458**	
14								
15		**TOTAL REVENUE**	**75,812**	**71,884**	**72,968**	**74,016**	**74,578**	
16								
17	40-2-42-10-00	Sewer - Administration Charges	3,000	3,000	3,000	3,000	3,000	
18	40-2-42-10-10	Sewer - Licenses & Permits	850	850	850	850	850	
19	40-2-42-30-00	Sewer - Training	1,000	1,000	1,000	1,000	1,000	
20	40-2-42-90-00	Sewer - Maintenance Salaries	20,862	21,384	21,918	22,466	23,028	Increase from $19422 due to Museum Lift station repair need to double
21	40-2-42-90-20	Sewer - Benefits	4,600	4,650	4,700	4,700	4,700	
22	40-2-42-90-40	Sewer - Utilities Expense	4,000	4,000	4,000	4,000	4,000	
23	40-2-42-90-50	Sewer - Repairs & Maintenance	20,000	15,500	16,000	16,500	16,500	Increase from $15,000 due to Museum Lift station repair
24	40-2-42-90-60	Sewer - Fuel	1,500	1,500	1,500	1,500	1,500	
25	40-2-42-90-70	Public Work's Truck	2,000	2,000	2,000	2,000	2,000	
26		**TOTAL OPERATING EXPENSES**	**57,812**	**53,884**	**54,968**	**56,016**	**56,578**	
27								
28	40-2-42-20-35	Sewage upgrade TFT	0					
29		**TOTAL CAPITAL EXPENSES**	**0**	**0**	**0**	**0**	**0**	
30								
31		Contribution to sewer reserves	0	0	0	0	0	
32								
33	40-2-81-30-00	Sewer - Debenture						
34	40-2-81-20-00	Sewer - Interest Expense						
35	40-2-81-90-00	Sewer - Income/Loss on Exchange Rate						
36	40-2-82-21-01	Amortized assets expense	18,000	18,000	18,000	18,000	18,000	
37		**Total Debt and Amortization Expense**	**18,000**	**18,000**	**18,000**	**18,000**	**18,000**	
38								
39		**TOTAL EXPENSES**	**75,812**	**71,884**	**72,968**	**74,016**	**74,578**	
40								
41		**SURPLUS -DEFECIT**	**0**	**0**	**0**	**0**	**0**	
42								
43		**Total Original Budget**	69372	70407	71455	72465	72988	
44		**Increase in Budget**	**6,440**	**1,477**	**1,513**	**1,551**	**1,590**	

5

	A	B	I	J	K	L	M
1	Account #	Description	2019	2020	2021	2022	2023
2		**Nov 29, 2019 FINAL**	Budget	Budget	Budget	Budget	Budget
3		**COLA Rate**	2.50%	2.50%	2.50%	2.50%	2.50%
4							
5	30-1-44-00-00	Water User Charges	56,000	56,000	56,000	56,000	56,000
6	30-1-44-10-00	Water - Miscellaneous					
7	30-1-49-00-00	Water Frontage Tax	53,000	53,000	53,000	53,000	53,000
8	30-1-55-00-00	Water - Past Due Interest Revenue	2,000	2,000	2,000	2,000	2,000
9	30-1-91-00-00	Contributions From Capital Reserves	0	1,750	1,750	7,950	7,950
10		**Total FEES & TAXATION REVENUE**	**111,000**	**112,750**	**112,750**	**118,950**	**118,950**
11							
12	30-1-62-00-20	Community Work's Fund (Gas Ta)	65,000	65,000	65,000	65,000	65,000
13	30-1-62-00-25	MRIF Water Treatment	0	0	0	0	0
14	30-1-62-00-30	GT Water Treatment	0	0	0	0	0
15	30-4-90-00-00	Transfer from Ops. Surplus	8,713	8,590	9,034	7,743	8,420
16		**TOTAL GRANTS**	**73,713**	**73,590**	**74,034**	**72,743**	**73,420**
17							
18		**TOTAL REVENUE**	**184,713**	**186,340**	**186,784**	**191,693**	**192,370**
19							
20	30-2-41-10-00	Water - Administration Charges	5,000	5,000	5,000	5,000	5,000
21	30-2-41-10-25	Pump house	0	0	0	0	0
22	30-2-41-20-00	Water - Testing Expense	1,000	1,000	1,000	1,000	1,000
23	30-2-41-30-00	Water - Training	2,500	2,500	2,500	2,500	2,500
24	30-2-41-30-10	Water - Maintenance Wages	25,113	25,740	26,384	27,043	27,720
25	30-2-41-30-20	Water - Maintenance Benefits	6,500	6,500	6,500	6,500	6,500
26	30-2-41-30-30	Water - Supplies	1,000	1,000	1,000	1,000	1,000
27	30-2-41-30-40	Public Work's Truck	2,000	2,000	2,000	2,000	2,000
28	30-2-41-40-00	Water - Repairs & Maintenance Treatment Plant	24,500	24,750	24,750	28,000	28,000
29	30-2-41-40-01	Water - Repairs & Maintenance Distribution	5,000	5,500	5,500	6,000	6,000
30	30-2-41-40-10	Water - Fuel	1,900	1,900	1,900	1,900	1,900
31	30-2-41-50-00	Water - Utilities Expense	17,500	18,000	18,000	18,500	18,500
32	30-2-41-90-20	Water Licensing	1,700	1,450	1,250	1,250	1,250
33		**TOTAL EXPENSES**	**93,713**	**95,340**	**95,784**	**100,693**	**101,370**
34							
35	30-2-41-10-20	Water Treatment Upgrade	0	0	0	0	0
36		**TOTAL CAPITAL EXPENSES**	**0**	**0**	**0**	**0**	**0**
38	30-2-82-21-00	Cont. To Water Capital Reserve	0	0	0	0	0
39		Tsf part of community works fund to sewer fund					
40		Cont to deferred revenue Community Works fund	65,000	65,000	65,000	65,000	65,000
41	30-2-82-21-01	Amortized asset expense	26,000	26,000	26,000	26,000	26,000
42		**TOTAL CONTRIBUTION TO RESERVES**	**91,000**	**91,000**	**91,000**	**91,000**	**91,000**
43							
44		**TOTAL EXPENSES**	**184,713**	**186,340**	**186,784**	**191,693**	**192,370**
45							
46		**SURPLUS -DEFICIT**	**0**	**0**	**0**	**0**	**0**

1-5

Elizabeth Cumming

Subject: FW: CEPF - Flood Risk Assessment, Mapping and Mitigation Planning

From: Daniel Fish [mailto:cao@ncrdbc.com]
Sent: Tuesday, December 03, 2019 10:34 AM
To: Lori Wiedeman <cao@queencharlotte.ca>; vom@mhtv.ca; 'Kim Mushynsky' <cao@portclements.ca>; cao@skidegate.ca; omvcfin@oldmassett.ca
Cc: 'Andrew Hudson' <andrew@gohaidagwaii.ca>
Subject: RE: CEPF - Flood Risk Assessment, Mapping and Mitigation Planning

Hi Lori et al.,

Apologies – I think my initial email should have been a bit clearer on this project.

My understanding of the Board's intent here is to have each community submit its respective application to the CEPF program and look at partnering on an island-wide RFP for the project if funding is successful. I've got a call in to Northwest Hydraulics (waiting to hear back), and I'm hoping they're able to provide a cost estimate/quote to support an NCRD application to the program. I'm happy to have the discussion with NH around potential applications being put forward by the municipalities and passing along contact details for those interested in applying. There may be a bit of back and forth needed to identify particular areas of concern in each of the communities. Once known, each community's application would be written to note that, while applications are being made separately, the intent is to conduct a risk assessment for the entirety of the island (those communities interested) through a joint-RFP. I'm hoping to hear back from the contact at NH this afternoon, at which time I can provide you all with an update.

As an FYI – I have only heard back from VQC at this point in time.

Again, apologies if my initial email on the proposal was unclear. Please feel free to give me a call if you wanted to discuss further.

Best regards,

Daniel Fish
Chief Administrative Officer | ***North Coast Regional District***
P: 250.624.2002 *(ext.8)*

A: 14, 342 3rd Avenue West, Prince Rupert BC, V8J 1L5
T: 888.301.2002 | *F:* 250.627.8493

www.ncrdbc.com

From: Lori Wiedeman [mailto:cao@queencharlotte.ca]
Sent: Tuesday, December 3, 2019 9:56 AM
To: 'Daniel Fish'; vom@mhtv.ca; Kim Mushynsky; cao@skidegate.ca; omvcfin@oldmassett.ca
Cc: Andrew Hudson; Legislative
Subject: RE: CEPF - Flood Risk Assessment, Mapping and Mitigation Planning

Hi Daniel, the VQC would be interested in participating in this application. Do you need a formal resolution?

Lori *– CAO Village of Queen Charlotte*

G-2

From: Daniel Fish [mailto:cao@ncrdbc.com]
Sent: Tuesday, November 26, 2019 12:39 PM
To: vom@mhtv.ca; Lori Wiedeman <cao@queencharlotte.ca>; Kim Mushynsky <cao@portclements.ca>; cao@skidegate.ca; omvcfin@oldmassett.ca
Cc: Andrew Hudson <andrew@gohaidagwaii.ca>
Subject: CEPF - Flood Risk Assessment, Mapping and Mitigation Planning

Good afternoon CAOs,

I hope that this email finds all of you well.

The NCRD Board is interested in making an application to UBCM's Community Emergency Preparedness Fund – Flood Risk Assessment, Mapping and Mitigation Planning stream to undertake a coastal erosion risk assessment and mitigation planning project for areas that have been identified in Electoral Areas D and E. Prior to developing an application, the Board directed staff to follow up with island communities to see if there is an interest in partnering on this initiative and addressing additional areas of concern in municipalities and on reserve.

I have attached an NCRD staff report with additional information on the funding program and the scope of the project. Note that there are still unknowns that will need to be identified and will be subject to any partners wishing to join the project.

The application intake deadline is January 24th, 2020, which does not leave a lot of time to develop an application and seek approval from the Board prior to its submission. With that, I would ask that each of you please let me know by Wednesday, December 11th at 4:00 p.m. if this is something your Council's are interested in. At that time, we will move forward with the project based on responses received.

If you have any questions in the interim, please do let me know.

Best regards,

Daniel Fish
Chief Administrative Officer | ***North Coast Regional District***
P: 250.624.2002 *(ext.8)*

A: 14, 342 3rd Avenue West, Prince Rupert BC, V8J 1L5
T: 888.301.2002 | *F:* 250.627.8493

www.ncrdbc.com

G-2

Ruby Decock

From:	Daniel Fish <cao@ncrdbc.com>
Sent:	November-26-19 12:39 PM
To:	vom@mhtv.ca; Lori Wiedeman; Ruby Decock; cao@skidegate.ca; omvcfin@oldmassett.ca
Cc:	Andrew Hudson
Subject:	CEPF - Flood Risk Assessment, Mapping and Mitigation Planning
Attachments:	CEPF - Flood Risk Assessment Mapping and Mitigation Planning - Coastal Erosion.pdf

Good afternoon CAOs,

I hope that this email finds all of you well.

The NCRD Board is interested in making an application to UBCM's Community Emergency Preparedness Fund – Flood Risk Assessment, Mapping and Mitigation Planning stream to undertake a coastal erosion risk assessment and mitigation planning project for areas that have been identified in Electoral Areas D and E. Prior to developing an application, the Board directed staff to follow up with island communities to see if there is an interest in partnering on this initiative and addressing additional areas of concern in municipalities and on reserve.

I have attached an NCRD staff report with additional information on the funding program and the scope of the project. Note that there are still unknowns that will need to be identified and will be subject to any partners wishing to join the project.

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If you have any questions in the interim, please do let me know.

Best regards,

Daniel Fish
Chief Administrative Officer | North Coast Regional District
P: 250.624.2002 *(ext.8)*

A: 14, 342 3rd Avenue West, Prince Rupert BC, V8J 1L5
T: 888.301.2002 | *F:* 250.627.8493

www.ncrdbc.com

6-2

NORTH COAST
REGIONAL DISTRICT

Staff Report

Date: November 15th, 2019

To: North Coast Regional District Board

From: D. Fish, Chief Administrative Officer

Subject: CEPF – Flood Risk Assessment, Mapping & Mitigation Planning

Recommendations:

THAT the report from staff entitled "CEPF – Flood Risk Assessment, Mapping & Mitigation Planning" be received;

AND THAT

PURPOSE:

To provide information to the Board of the North Coast Regional District (NCRD) with respect to the Community Emergency Preparedness Fund (CEPF) – Flood Risk Assessment, Mapping and Mitigation Planning program (Program) and a proposed application to undertake a coastal erosion risk assessment for identified areas in Electoral Areas D and E.

BACKGROUND:

At its Regular meeting held October 18, 2019, the Board of the NCRD directed staff to prepare a staff report with respect to the CEPF - Program and a proposed application to the program to undertake a coastal erosion risk assessment in Electoral Areas D and E.

G-2

DISCUSSION:

CEPF – Flood Risk Assessment, Mapping and Mitigation Planning Program

The purpose of the CEPF is to enhance the resiliency of communities in responding to emergencies. Funding is provided by the Province of B.C. and administered through the Union of BC Municipalities (UBCM).

The intent of the Program is to support applicants to ensure they have accurate knowledge of the flood hazards they face and to develop effective strategies to mitigate and prepare for those risks. Under the program, the following components may be developed:

- Risk Assessments – identifying the social, economic and environmental impacts that flood events will have on the community, including identifying the specific flood hazards, compounding hazards, community and infrastructure vulnerabilities, risk tolerance and the overall flood risk profile for a community.
- Flood Mapping – allowing a community to more accurately determine its vulnerabilities in relation to flood risks that have been identified by a risk assessment.
- Mitigation planning – addressing flood risk through a service of comprehensive mitigation solutions.

Eligible projects must demonstrate the need to develop a flood risk assessment, map and/or mitigation plan. Additionally, projects must be:

- A new project;
- Capable of completion by the applicant within one year from the date of grant approval;
- Completed by a qualified professional; and
- Where applicable, completed to acceptable provincial and federal guidelines (ie. *Provincial Flood Hazard Area Land Use Management Guidelines & Professional Practice Guidelines – Legislated Flood Assessment in a Changing Climate in BC*).

Eligible activities include completion of a flood risk assessment; development of flood maps; completion of flood mitigation plans; preparation of maps and spatial data; hydrometric and/or geotechnical data collection and analysis; and amendments to relevant plans, bylaws and policies.

Consultant costs, incremental staff and administration costs, and public information costs associated with the above activities are eligible.

The Program may provide a maximum of 100% of the cost of eligible activities to a maximum of $150,000.

The application intake deadline is January 24, 2020.

As part of the application, Staff are required to identify the following information:

- Type of project;
- Project cost;
- Detailed project information:
  - rationale
  - project area
  - proposed activities
  - implementation risks
  - engagement and collaboration
  - proposed deliverables and outcomes
  - monitoring and performance measures
  - qualified professionals and procurement process
- Board resolution in support of the application;
- Detailed work plan and budget; and
- Mapping.

Given the information required to complete a proposed application, Staff is seeking further clarity from the Board with respect to the scope of this project. Specifically:

- It is the understanding of staff that this project is for the completion of a coastal erosion risk assessment in identified areas in Electoral Areas D and E (Tlell and Shingle Bay Road). **Are there additional areas of study?**
- It is the understanding of staff that the intent of this project is to hire a qualified professional (consultant) to undertake a comprehensive coastal erosion risk assessment in the areas of study. **Does this include hydrometric and geotechnical data collection? Are there additional activities to be considered?**
- **Is there a desire to approach the municipalities and First Nations on Haida Gwaii to form a regional assessment?** Note that higher application review scores are given to projects that contribute to a comprehensive, cooperative and regional approach to flood mitigation. In conversation with the

Ministry of Transportation and Infrastructure, their office has also identified areas of concern in Old Massett.

- It is understood that the outcome of this project will be a completed coastal erosion risk assessment for the identified study area. **Are there additional deliverables intended for this project?**

Note that higher application scores are given to projects that:

- Demonstrate evidence of local flood hazard and/or seismic vulnerability;
- Support the applicant in meeting provincial flood hazard area land use management guidelines;
- Contribute to a comprehensive, cooperative and regional approach to flood mitigation;
- Consider and mitigate the impacts of climate change in the project methodology and deliverables;
- Increase understanding of the social and economic impacts of flood events to the community;
- Include in-kind or cash contributions to the project from the applicant, community partners or other grant funding; and
- Are cost-effective.

Financial Implication

It is the understanding of staff that this project will seek 100% reimbursement of anticipated consultant costs to carry out a coastal erosion risk assessment in the identified areas of study. If this is not the case, staff would propose budgeting funds for 2020 in each of the Electoral Areas D and E emergency planning functions. If there is a desire to partner on this project, additional funds may be sourced from partners.

As part of the application, staff is intending to secure a proposal from a qualified professional to accompany a proposed application to CEPF. Staff is proposing to engage with Northwest Hydraulic Consultants for this piece.

Following clarification of the project scope, and receipt of a proposal, a more refined cost can be considered.

Strategic Plan Implication

The NCRD Board identified the development of an erosion prevention strategy as high priority throughout its 2019-2022 term. Consultation with neighbouring jurisdictions on shared erosion concerns was identified as an action item under the priority.

CONCLUSION:

Staff is seeking further direction from the Board with respect to the proposed project's scope. Specifically, staff needs clarification on identifying prospective partnerships with neighbouring jurisdictions; identifying any additional areas of concern to be included in the project; and direction regarding the proposed approach to undertaking the project as outlined in this report.

The next steps of this process would be to engage with a qualified professional for a proposal. If identified, project partners will also be invited to participate. Staff recommends preparing an application once project details have been identified.

RECOMMENDATION:

Given the identification of consulting with neighbouring jurisdictions on this issue in the Board's strategic plan, as well as more favourable scoring being awarded to regional projects, staff is recommending that the NCRD consult with municipalities and First Nations on Haida Gwaii to invite them to partake in this initiative. Ultimately, an assessment for the entirety of Haida Gwaii would be most useful for each community's emergency planning purposes and is consistent with the discussion around integrating emergency management approaches.

Staff is seeking further direction from the Board.

Elizabeth Cumming

From: Ruby Decock
Sent: December-11-19 12:44 PM
To: Elizabeth Cumming
Subject: Fw: [POSSIBLE SPAM] BC Hydro Community Energy Plan for Haida Gwaii - Agenda ad

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From: Alanah Mountifield <alanah@gohaidagwaii.ca>
Sent: Wednesday, December 11, 2019 9:47:54 AM
To: Lori Wiedeman <cao@queencharlotte.ca>
Cc: Daniel Fish <cao@ncrdbc.com>; Ruby Decock <cao@portclements.ca>; Trevor Jarvis <vom@mhtv.ca>; Andrew Hudson <andrew@gohaidagwaii.ca>
Subject: Re: [POSSIBLE SPAM] BC Hydro Community Energy Plan for Haida Gwaii - Agenda ad

HI Lori,

Thanks so much for asking! I think we need a similar resolution to the one below from each civic community, If the CAO's can get this on their council agenda's it will be very helpful to making this move forward more quickly.

Best,
Alanah

> On Dec 11, 2019, at 9:43 AM, Lori Wiedeman <cao@queencharlotte.ca> wrote:
>
> Hi Alanah, would you need letters of support from the civic communities? We can still add this to our Monday Dec 16th agenda for VQC.
>
> ***Lori*** *– CAO Village of Queen Charlotte*
>
> ---
>
> **From:** Alanah Mountifield [mailto:alanah@gohaidagwaii.ca]
> **Sent:** Wednesday, December 11, 2019 9:35 AM
> **To:** Daniel Fish <cao@ncrdbc.com>
> **Cc:** Lori Wiedeman <cao@queencharlotte.ca>; Ruby Decock <cao@portclements.ca>; Trevor Jarvis <vom@mhtv.ca>; Evan Putterill <eputterill@gmail.com>; Johanne Young <aread-director@ncrdbc.com>; Andrew Hudson <andrew@gohaidagwaii.ca>
> **Subject:** [POSSIBLE SPAM] BC Hydro Community Energy Plan for Haida Gwaii - Agenda ad
> **Importance:** Low
>
> Hi Daniel,
>
> At the All Islands Protocol Table meeting on November 18, BC Hydro presented a proposal to deliver a community energy plan for all of Haida Gwaii. There was discussion around how to best obtain funding for the project (BC Hydro funds 50% of these projects). After the discussion, I offered that MIEDS be the lead applicant on behalf of the HG civic communities and Skidegate and Old Masset Bands, for the purpose of securing 50% of the funding from the Gwaii Trust through a special projects application for the all island Community Energy Plan project to facilitate the completion of the CEP for HG.

G-3

I'm hoping we can get this added to the NCRD meeting agenda for this Friday and obtain a resolution of support. There is a sensitive timeline related to applying to the Gwaii Trust and we need the support of the regional district and all civic and Haida governments in order to move forward with the application. Following is a proposed resolution in support of this grant application/project.

Resolved
"That the North Coast Regional District support a grant application by the Misty Isles Economic Development Society to the Gwaii Trust Society's Special Projects program for up to $100,000 towards a Haida Gwaii Community Energy Plan co-funded by BC Hydro."

I apologize for the short notice on this request and I hope it can still be added to the agenda. Please get it touch with me or Andy if you need more information about the project or request.

Best,

Alanah Mountifield
Economic Development Manager,
Misty Isles Economic Development Society
Go Haida Gwaii ~ Love Haida Gwaii
113 Oceanview Drive | PO Box 652, Queen Charlotte, BC V0T 1S0
Phone (250) 559-8050 | Cell (250) 637-1403
alanah@gohaidagwaii.ca

G-3

BC Hydro
Power smart

BC Hydro
333 Dunsmuir Street
Vancouver BC, V6B 5R3

November 21, 2019

Gwaii Trust Society
226 Front Street,
Skidegate BC, V0T 1S1

Re: Letter of support for the **Haida Gwaii Community Energy Plan**

Dear Sir/Madam,

Please accept this letter as our commitment to participate as a funding partner in the proposed ***Haida Gwaii Community Energy Plan*** project.

We believe that by partnering with the communities of Haida Gwaii in the creation of an all-island energy plan, we will be addressing areas of strategic priority for our organization. Further, this project will lay the foundational groundwork to identify strategic initiatives targeted at transitioning away from diesel-powered electricity on Haida Gwaii.

The project aims to engage with subject matter experts in the creation of a community energy plan, in two phases that includes, but is not limited to, the following areas of work

- Demand Side Resource Analysis
- Supply Side Resource Analysis
- Project Portfolio Analysis and Financial Modeling
- Community Engagement and Load Baselining
- Fuel and Infrastructure Inventory
- Load Forecast Scenario Modeling

BC Hydro is a Crown corporation, owned by the government and people of British Columbia. As a Provincial Crown corporation, the owner and sole shareholder of BC Hydro is the Province of British Columbia. We report through the Ministry of Energy and Mines and Petroleum Resources with a mandate to generate, manufacture, conserve, supply, acquire, and dispose of power and related products.

BC Hydro will support this project with 50 percent funding, up to the half of the expected maximum total project cost of $200,000. Additionally, BC Hydro will support the project with project management, data, analysis and coordination with third party suppliers, as needed, to complete the scopes of work.

Our support is conditional upon approval of funds from the Gwaii Trust Society and of participation from the Old Masset Village Band Council, the Skidegate Band Council, and the Council of the Haida Nation.

Sincerely,

Michael Savidant
Manager, Commercial Negotiations and Financial Analysis

File Ref: CR717159
Contact: Greg Lehoux
RFQ Submission: Greg.Lehoux@bchydro.com
Quote Due Date: November 29, 2019
Report Completion Date: April 30, 2020

Background

The Haida Gwaii is a group of about 200 isolated small and large islands located approximately 100 km west of the northern coast of British Columbia. The archipelago extends roughly 250 km from its southern tip to northernmost point. It is separated from the B.C. mainland by the Hecate Strait. Two large islands, Graham and Moresby, comprise the bulk of the 10,000 km^2 area of Haida Gwaii. About 5,000 people live on Haida Gwaii, largely inhabiting the two large islands.

Haida Gwaii is not connected to BC Hydro's integrated system, with its electricity needs currently being served by BC Hydro's Non-Integrated Area (NIA) via two separate generation-distribution systems. BC Hydro provides power to the northern grid on Graham Island that serves Old Massett, Masset and Port Clements through its diesel generating system in Masset. The southern grid on Moresby Island serves Skidegate, Queen Charlotte City, Tlell and Sandspit and receives most of its power from a private hydroelectric plant (Moresby Lake) owned by Atlantic Power that is supported by BC Hydro's diesel generation station in Sandspit. In total, BC Hydro provides electricity service to about 3,200 customers on Haida Gwaii.

BC Hydro's Masset diesel generation system on the north grid is comprised of five diesel generators with a combined capacity of 10.445 MW. The Sandspit station on the south grid is comprised of eight diesel generators with a combined capacity of 9.65 MW. The two diesel generation systems supply about two-thirds of Haida Gwaii's electricity requirements.

Relevant Developments

- During 2007, the Council of the Haida Nation (CHN) and BC Hydro commissioned a Vancouver-based consulting firm to develop a Community Electricity Plan for Haida Gwaii. The plan addressed both the supply and usage of electricity including demand-side management (DSM) options such as conservation and efficiency measures. The plan did not go as far as providing a power generation and electricity distribution strategy for Haida Gwaii due to insufficient information on certain key aspects. However, an action plan was developed in the form of several key recommendations.
- In May 2019, the Skidegate Band Council (SBC) and Old Massett Village Council (OMVC) announced the formation of a 50/50 partnership known as Tll Yahda Energy (TYE) to initiate, develop and own renewable energy projects on Haida Gwaii. TYE's intention is to move

G-3

toward the goal of 100% clean renewable energy on Haida Gwaii, eliminating all diesel generation and diesel fuel shipments for power production. TYE is proceeding with the first phase of its Haida Gwaii Clean Energy Project with the support of $10.4 million of funding from Natural Resources Canada. This project will enable community ownership of an existing hydro asset (Moresby Lake Generating Station) on the South Grid and deploy new solar generation and energy storage on the North Grid, thereby resulting in economic and environmental benefits for Haida Gwaii.

- During June 2019, the SBC, OMVC and Council of the Haida Nation expressed their support to engage in a Community Energy Plan (CEP) process with BC Hydro. This CEP process is underway under a separate scope of work.

Load Forecast Purpose and Objectives

The purpose of this work is to develop a comprehensive, bottoms-up Load Forecast for Haida Gwaii that will serve the following purposes:

a) Informing BC Hydro's load forecasting process for Haida Gwaii and other non-integrated communities.
b) Providing updated inputs for BC Hydro's future power procurement and other initiatives on Haida Gwaii.
c) Creating broad understanding of load changes and discreet projects affecting load across key stakeholders including the Haida Nation bands, the local Haida Gwaii community and BC Hydro's shareholder and customers.
d) Supporting the identification of future residential and community infrastructure projects to inform demand-side management program planning.

In addition to fulfilling the above-noted objectives, this load forecast will help promote several community objectives and aspirations, as follows:

a) Maintaining safe, stable and reliable electric service for the community.
b) Building agreement around community objectives related to electricity supply including interests in energy security, self-sufficiency, resiliency and obtaining power from clean/renewable resources.
c) Creating increased awareness of economic and environmental issues associated with changes in load.
d) Providing high-level energy consumption scenarios to help establish long-term energy-related priorities and guidance for future community initiatives

Load Forecast Methodology

The Load Forecast for Haida Gwaii will be prepared by a knowledgeable consulting firm with project management direction being provided by BC Hydro working in partnership with the Haida Nation and local communities. Some of the key input parameters for preparation of the Load Forecast will come from the following sources:

Information Source	Key Inputs
BC Hydro (subject matter experts)	– Historical electricity load and energy consumption data
Haida Nation (CHN, SBC, OMVC & TYE)	– Previous energy and load studies, DSM initiatives, and load-related investigations/activities – Planned growth (new buildings and infrastructure in development) to inform load forecast – Coordination of engagement activities with local populace
Local Governments	– Previous energy and load studies, DSM initiatives and supply-side investigations – Planned growth and development for future initiatives
Public Information (internet, literature, etc.)	– Consultant review of public information about energy-related Haida Gwaii initiatives and opportunities

Scope Parameters

The selected consultant will use BC Hydro supplied data to understand historical electrical energy consumption and demand for the communities. Other energy sources that are not metered by BC Hydro should be included in the baseline. BC Hydro will work with selected vendor to supply available data in a format that is suitable to the vendor.

Load growth scenarios may discuss, but should not be contingent on BC Hydro system infrastructure upgrades or interconnections between grids.

Use of local Haida resources for facilitation and/or coordination of on-island engagement activities is strongly recommended.

The Load Forecast, where possible, should not overlap any work currently being completed as part of the Haida Gwaii Community Energy Plan. Scope documents for the CEP can be provided. It is expected that the successful proponent will work with the CEP consultant to align activities for the most efficient delivery of the final reports.

63

As outlined in the Scope of Work section below, the selected consultant will undertake the Load Forecast preparation in the following general areas:

1. Load Baseline
   - Energy Use Breakdown
   - Impacts of completed DSM activities
2. load Forecast
   - Population and economic analysis
   - Infrastructure planning
3. Load Forecast Scenario Modelling and Analysis

Timetable and Deliverables

The target date for completion of the Load Forecast for Haida Gwaii is April 30, 2020. The successful consultant will be required to provide a final copy of the comprehensive Load Forecast to BC Hydro and the Haida Nation representatives by the target date.

Request For Quote Requirements

Interested parties planning to respond to the Request for Quote (RFQ) for a Haida Gwaii Load Forecast consultant will be required to submit relevant information pursuant to BC Hydro's standard procurement practices, including the following:

- Experience and qualifications
- Consulting team and resumes
- Planned work methodology
- References
- Pricing/cost

Scope of Load Forecast

1. Load Baseline: Establish a baseline year and quantify energy consumption and peak demand using historical data provided by BC Hydro. BC Hydro will work with the consultant to develop base line electrical energy and demand projections using various types of historical information that could be used to support the development of a forecast.
   a. Breakdown of fuel sources used on Haida Gwaii (wood, propane, oil and electricity) and summary of relative costs
   b. Analysis of historical electricity demand and consumption data
      i. monthly vs. annual

   ii. breakdown by sector – residential, commercial, industrial and other
   iii. number of customers and location
   iv. average electricity usage by sector
   v. usage of electricity by equipment type e.g., lighting, heating, appliances
   vi. quality and reliability of electricity supply e.g., trouble calls, outages
c. Description of residential dwellings and commercial/community buildings
   i. building age and structural type
   ii. occupancy and floor space
d. Electricity costs and monthly/annual bills
e. Impact of energy audits, recent DSM measures and existing energy efficiency programs e.g., heat pumps (Skidegate) and solar panels (Sandspit and Masset)

2. Load Forecast: Establish a base case and develop load forecast scenarios for each of the north and south grids for the next 20 years (show interim milestones). The scenarios could include modifications to the base case load drivers, including the following factors:
   a. Discussions with communities to understand planned growth and timelines for installation of new housing, commercial buildings and community facilities
   b. Estimates of population and account growth
   c. Listing of planned new infrastructure buildings, services and facilities including size and demand/consumption estimates
   d. Fuel switching plans for heating and other applications
   e. Forecasts for electric vehicle adoption
   f. Factors that may result reduced electrical usage e.g., improved insulation
   g. Impact of efficiency improvements e.g., new building codes and standards, retrofits, housing insulation

3. Forecast Scenario Modelling and Discussion: Compare load forecast scenarios and provide discussions on low, medium and high alternatives. The load forecast scenarios should meet the following criteria:
   a. Use a defined decision analysis methodology with ranking criteria.
   b. Define risks associated with selected parameters and outcomes.
   c. List all assumptions included in the analysis process.
   d. Be based on community input and be compatible with community planning and objectives.
   e. Include all sectors including residential, commercial and industrial.

G-3

File Ref: CR716171
Contact: Greg Lehoux
RFQ Submission: Greg.Lehoux@bchydro.com
Quote Due Date: October 3, 2019
Report Completion Date: March 15, 2020

BACKGROUND

The Haida Gwaii is a group of about 200 isolated small and large islands located approximately 100 km west of the northern coast of British Columbia. The archipelago extends roughly 250 km from its southern tip to northernmost point. It is separated from the B.C. mainland by the Hecate Strait. Two large islands, Graham and Moresby, comprise the bulk of the 10,000 km^2 area of Haida Gwaii. About 5,000 people live on Haida Gwaii, largely inhabiting the two large islands.

Haida Gwaii is not connected to BC Hydro's integrated system, with its electricity needs currently being served by BC Hydro's Non-Integrated Area (NIA) via two separate generation-distribution systems. BC Hydro provides power to the northern grid on Graham Island that serves Old Massett, Masset and Port Clements through its diesel generating system in Masset. The southern grid on Moresby Island serves Skidegate, Queen Charlotte City, Tlell and Sandspit and receives most of its power from a private hydroelectric plant (Moresby Lake) owned by Atlantic Power that is supported by BC Hydro's diesel generation station in Sandspit. In total, BC Hydro provides electricity service to about 3,200 customers on Haida Gwaii.

BC Hydro's Masset diesel generation system on the north grid is comprised of five diesel generators with a combined capacity of 10.445 MW. The Sandspit station on the south grid is comprised of eight diesel generators with a combined capacity of 9.65 MW. The two diesel generation systems supply about two-thirds of Haida Gwaii's electricity requirements.

Relevant Developments

- During 2007, the Council of the Haida Nation (CHN) and BC Hydro commissioned a Vancouver-based consulting firm to develop a Community Electricity Plan for Haida Gwaii. The plan addressed both the supply and usage of electricity including demand-side management (DSM) options such as conservation and efficiency measures. The plan did not go as far as providing a power generation and electricity distribution strategy for Haida Gwaii due to insufficient information on certain key aspects. However, an action plan was developed in the form of several key recommendations.
- In the fall of 2012, BC Hydro undertook a Request for Expressions of Interest (RFEOI) for the purpose of identifying clean or renewable projects on Haida Gwaii as part of the effort to reduce the use of diesel-generated electricity on the northern grid with cost-effective, reliable and clean electricity. BC Hydro received expressions of interest from 26

respondents. After reviewing the submissions and considering different process options, BC Hydro decided not to proceed with a commercial power procurement process.

- In September 2018, a local non-profit group (Swiilawiid Sustainable Society) hosted the Haida Gwaii Renewable Energy Symposium. The symposium brought Islanders together to share information and discuss how to collectively reach their target of getting off diesel and becoming 'energy sovereign' by 2023 as articulated in the *People's Clean Energy Declaration for Haida Gwaii*, signed by all indigenous and municipal leaders on Haida Gwaii.
- In May 2019, the Skidegate Band Council (SBC) and Old Massett Village Council (OMVC) announced the formation of a 50/50 partnership known as Tll Yahda Energy (TYE) to initiate, develop and own renewable energy projects on Haida Gwaii. TYE's intention is to move toward the goal of 100% clean renewable energy on Haida Gwaii, eliminating all diesel generation and diesel fuel shipments for power production. TYE is proceeding with the first phase of its Haida Gwaii Clean Energy Project with the support of $10.4 million of funding from Natural Resources Canada. This project will enable community ownership of an existing hydro asset (Moresby Lake Generating Station) on the South Grid and deploy new solar generation and energy storage on the North Grid, thereby resulting in economic and environmental benefits for Haida Gwaii.
- During June 2019, the SBC, OMVC and Council of the Haida Nation expressed their support to engage in a Community Energy Plan (CEP) process with BC Hydro.

COMMUNITY ENERGY PLAN

CEP Purpose and Objectives

The prime purpose of the CEP is to identify potential demand-side and supply-side initiatives for Haida Gwaii that would:

a) Realize reductions in diesel consumption and associated greenhouse gas (GHG) emissions
b) Achieve community objectives related to electricity supply including interests in energy security, self-sufficiency, resiliency and obtaining power from clean/renewable resources
c) Provide updated input for BC Hydro's future power procurement and DSM initiatives on Haida Gwaii
d) Obtain broad support from all key stakeholders including the Haida Nation bands, the local Haida Gwaii community and BC Hydro's shareholder and customers
e) Provide evidentiary support for BCUC approval of identified projects and initiatives

In addition to fulfilling the above-noted objectives, a successful CEP will help promote several community objectives and aspirations, as follows:

a) Maintaining safe, stable and reliable electric service for the community
b) Identifying opportunities for local economic development and employment
c) Creating increased awareness of economic and environmental issues associated with energy generation and usage
d) Providing a high-level framework to help establish long-term energy-related priorities and guidance for future community initiatives

CEP Methodology

As the electrical utility serving the communities within Haida Gwaii, BC Hydro will work in partnership with the Haida Nation and local communities on Haida Gwaii to develop and implement the CEP.

The CEP for Haida Gwaii will be prepared by a knowledgeable consulting firm with project management direction being provided by BC Hydro working in partnership with the Haida Nation and local communities. Some of the key input parameters for preparation of the CEP will come from the following sources:

Information Source	Key Inputs
BC Hydro (subject matter experts)	– Historical electricity load and energy consumption – Technical/operating information about diesel generation – Summary of previous/ongoing DSM initiatives on Haida Gwaii
Haida Nation (CHN, SBC, OMVC & TYE)	– Previous energy and GHG plans, load studies, DSM initiatives, and supply-side investigations/activities – Planned growth (new buildings and infrastructure in development) to inform load forecast – Coordination of engagement activities with local populace
Local Governments	– Previous energy and GHG plans, load studies, DSM initiatives and supply-side investigations – Planned growth and development for future initiatives
Haida Gwaii Citizens	– Active participation in CEP engagement events as determined by Haida Nation (e.g., response to questionnaires/surveys, attendance at public meetings)
Public Information (Internet, literature, etc.)	– Consultant review of public information about energy-related Haida Gwaii initiatives and opportunities

Gr 3

Scope Parameters

As outlined in the Scope of Work section below, the selected consultant will undertake the CEP preparation in the following key energy planning areas:

1. Demand-Side Resources
2. Supply-Side Resources
3. Initial Load Forecast (limited scope)
4. Portfolio Modelling and Analysis

An assessment of the feasibility of connecting the north and south grids on Haida Gwaii is outside of the purview of the consultant's scope of work. The evaluation of the existing generation, transmission and distribution systems and potential improvement options will be conducted by BC Hydro in a separate review process. However, when assessing supply-side opportunities, the north-south grid intertie should be considered a possible future scenario and identified as a requirement where needed.

The geographic area covered by the CEP primarily consists of the Graham Island north grid and the Moresby Island south grid. Extension of electricity service to other Haida Gwaii areas can be examined if they are economically reasonable. However, the scope of the CEP review does not extend to links with other areas outside of Haida Gwaii such as the B.C. mainland.

Load baseline data will be provided by BC Hydro as needed to inform the CEP. A detailed load forecast is outside of the scope of the CEP. Within this scope, the consultant will use baseline data and the identification of major initiatives identified by the Haida Gwaii communities to provide high level load forecast projections to inform demand-side opportunities. The scope for this CEP should focus mainly on the identification of demand side and supply side options resulting in an analysis and strategy that will be presented to BC Hydro and Haida Gwaii communities.

Timetable and Deliverables

The target date for completion of the Community Energy Plan for Haida Gwaii is March 15, 2020. The successful consultant will be required to provide a final copy of the comprehensive CEP report to BC Hydro and the Haida Nation representatives by the target date.

Request For Quote Requirements

Interested parties planning to respond to the Request for Quote (RFQ) for a Haida Gwaii CEP consultant will be required to submit relevant information pursuant to BC Hydro's standard procurement practices, including the following:

- Experience and qualifications
- Consulting team and resumes
- Planned work methodology
- References
- Pricing/cost

G-3

SCOPE of COMMUNITY ENERGY PLAN

1. **Demand-Side Resources**

1.1. Current Situation: Review existing Haida Gwaii load structure in order to identify opportunities for demand-side management. BC Hydro will provide energy usage data and previous DSM activity data and evaluations and will work with consultant to tailor information that will inform discussions with Haida Gwaii communities.

a) Analyze structure and characteristics of existing load

- residential vs. commercial sector
- load shape (monthly/seasonal)
- capacity and energy requirements
- usage of electricity for heating, lighting, appliances, etc.
- housing and non-residential buildings

b) Review previous Haida Gwaii experience with energy efficiency programs and other DSM initiatives e.g., installation of heat pumps and solar panels

c) Identify areas for further in-depth analysis based on characteristics of existing load (e.g., commercial building opportunity assessments)

d) Assess public awareness of DSM programs and associated attitudes/behaviour

e) Identify existing DSM barriers and obstacles e.g., affordability, training

f) Review existing energy efficiency programs at the federal, provincial, local and utility levels, including incentives and funding support

1.2. DSM Options: Evaluate DSM options based on technical, environmental (electricity and GHG reductions) economic (cost-effectiveness) and social attributes

a) Identify and assess future energy efficiency measures, including measures offered by BC Hydro for its NIA initiatives

- Existing buildings e.g., insulation envelope upgrades
- Space and water heating e.g., thermostats, heat pumps, biomass heating
- Lighting e.g., compact fluorescent, LED
- Appliances e.g., high-efficiency upgrades
- Hot water system e.g., showerheads, insulation
- Electronics e.g., monitors, TVs, computers
- New Buildings – incorporation of latest codes/standards

b) Use modelling tools to determine potential energy savings and other metrics such as cost, participation rates and equipment life estimates

GI-3

1.3. DSM Actions: Identify (with community input) and quantify a slate of potential DSM solutions/scenarios which can be used for portfolio modelling and analysis purposes, including specific actions relating to the following areas:

a) Building upgrades for existing structures and new buildings
b) Efficiency upgrades for electrical equipment and infrastructure
c) Behavioural changes – capacity building and training programs
d) Participation/uptake and penetration rates for all modelled measures
e) Use of energy audits, pilot programs, etc.

2. **Supply-Side Resources**Current Inventory: Prepare an inventory of clean or renewable energy projects which are currently operating or are identified as potential opportunities on Haida Gwaii.

a) Liaise with BC Hydro, Haida Nation and community representatives to identify known projects and to gain access to previous studies and investigations
b) Conduct a desktop search using internet and non-electronic sources to identify potential opportunities
c) Interface with technology experts and project proponents to obtain updated data on clean/renewable supply resources

2.2. Potential Projects: Carry out a high-level screening assessment of potential supply-side projects on Haida Gwaii

a) Identified energy projects should be segregated by potential or likelihood of being economic (i.e., high vs. medium-low)
b) Based on a review of prior technological and economic assessments, the list of potential projects should include the following:

High Potential	Medium or Low Potential
• Small hydro (new or expanded)	• Tidal
• Wind	• Wave
• Solar	• Biogas
• Biomass	• Alternative fuels (e.g., green diesel)
• Cogeneration (heat & power)	• Geothermal
• Battery storage – to complement intermittent energy generation	• Other

G.3

c) Screening of potential projects should include the following considerations:
- Technical feasibility – is the technology proven and commercially viable?
- Economic viability – is the cost of energy relatively competitive?
- Environmental impact
- Cost/benefit analysis
- Availability of local resources
- Local development opportunities
- Risks and constraints

2.3. Summary of Projects: Identify those potential supply-projects which are viewed as being worthy of further investigation and assessment i.e., candidates for more detailed feasibility studies

3. High Level Load Forecast

3.1. This limited scope load forecast should provide enough detail to inform the dependency of DSM measures on new stock and allow for input into the analysis of the impact of supply-side measures.

a) Develop high-level future population scenarios for the north and south grids, and related impact on energy consumption.

b) Identify major housing/infrastructure projects that could have a material impact on load forecasting

c) Develop high-level load forecast scenarios for the north and south grids based on findings.

4. Portfolio Analysis/Modelling

4.1. Portfolio Development: Develop a portfolio of selected supply-side and demand-side resource options

a) Selected options should stem from prior review of DSM alternatives and electricity supply options

b) Chosen resource options should be bundled together for portfolio analysis purposes

c) Selected resources must meet existing and estimated future load requirements and advance conservation and energy efficiency goals

d) Mix of supply and demand-side resources should be compatible with community objectives

G-3

4.2. Portfolio Analysis: Develop a portfolio model to analyze and compare individual portfolios

a) Undertake a decision analysis process to identify and evaluate various attributes for each portfolio

b) Based on input from community and other stakeholders, the portfolio attributes should be ranked to demonstrate relative importance

c) Portfolio attributes should reflect a variety of economic, environmental and societal factors including the following:

- Unit cost of electricity
- Reliability of generation and energy delivery
- GHG emissions
- Other environmental impacts (land, water, noise, etc.)
- Economic development
- Job creation
- Risks and constraints

4.3. Strategy Development: Develop a preferred strategic approach based on portfolio analysis and outcomes

a) Recommend specific supply-side projects and demand-side initiatives which should be further assessed

b) Assist in developing recommended action plans for advancement and implementation of identified projects and DSM initiatives

G-3

Haida Gwaii Management Council

Wednesday, November 13, 2019

Village of Port Clements
PO Box 198
36 Cedar Avenue West
Port Clements V0T 1R0
T: 250.557.4295
F: 250.557.4568

Dear Village of Port Clements Mayor and Council,

You are receiving this letter to let you know about the Haida Gwaii Management Council's review period for the determination of Haida Gwaii's allowable annual cut.

The purpose of the review period is to solicit feedback from individuals, communities, licensees, and other interested parties on any matter related to the information in the documents listed below, which along with your feedback, will form the basis for the HGMC determination of the AAC. The information package contains the material that the HGMC will consider in making their determination.

The package is available at haidagwaiimanagementcouncil.ca or either Council of the Haida Nation office and includes:

Haida Gwaii Timber Supply Review Public Discussion Paper

This paper presents an overview of the responsibilities of the Haida Gwaii Management Council in determining the allowable annual cut for Haida Gwaii, and a summary of information on the timber supply, social and economic factors, and forest management issues that the Council will need to review in determining the allowable annual cut.

Haida Gwaii Timber Supply Review Analysis Report

This report details the results from the analysis that will support the allowable annual cut determination. It details the inputs used in the analysis for assessing how land use and management on Haida Gwaii, including protected areas and the Haida Gwaii Land Use Objectives Order, affect timber supply. The Order includes requirements for managing and protecting ecological, cultural and traditional values, such as monumental cedar, and Northern Goshawk habitat.

Socio Economic Analysis

This analysis looks at the social and economic dimensions of the Haida Gwaii's forest sector over the last ten years. It also looks at issues that are likely to be important in the future.

Haida Gwaii Timber Supply Review Data Package and Appendices

This package contains descriptions of the technical data and modeling approaches used for the timber supply analysis. The data package provides information on land base and forest classification; forest productivity, growth and yield; and management objectives and requirements for all forest values.

G-4

Upon closing of the review period (January 14, 2020) the HGMC will produce a summary document of the feedback we have received and upon announcement of the AAC determination we will be having public meetings to discuss the result.

If you have any questions regarding the data or process, please contact us at 250 626 6058, or admin@haidagwaiimanagementcouncil.ca.

Sincerely,

Warren Mitchell

Warren Mitchell, Chair

Haida Gwaii Management Council

Haida Gwaii

Public Review Period *for* *an* Annual Allowable Cut Determination

By the

Haida Gwaii Management Council

November 2019

G-4

1. Executive Summary

Haida Gwaii consists of more than 150 islands located roughly 80 kilometres off the northern mainland coast of British Columbia (BC). In 2009, the Council of the Haida Nation and the Province of British Columbia ('the Province'), while acknowledging dispute of title over Haida Gwaii, signed the historic *Kunst'aa Guu – Kunst'aayah Reconciliation Protocol* (Reconciliation Protocol).

Through the Reconciliation Protocol, both Governments choose a more respectful approach to co-existence by way of land and natural resource management through shared and joint decision-making. One aspect of the 2009 Reconciliation Protocol was a commitment to establish the Haida Gwaii Management Council (HGMC). This commitment was enabled by the Council of the Haida Nation's 2010 KaayGuu Ga ga Kyah ts'as – Gin 'inaas 'laas 'waadluwaan gud tl'a gud giidaa (*Haida Stewardship Law),* and BC's *Haida Gwaii Reconciliation Act*. With this commitment and legal authorities in place , the HGMC was formed in 2011.

The HGMC consists of two members appointed by the Haida Nation, two members appointed by the Province, and a chairperson jointly appointed by both Governments. The HGMC has the authority to make joint decisions related to a specified set of strategic land and resource decisions

Prominent among the official responsibilities of the HGMC, is the determination of an allowable annual cut (AAC), to define how much timber may be commercially harvested each year from the Haida Gwaii Management Area ('Haida Gwaii') – which encompasses all of Haida Gwaii except for private land, and areas within Indian Reserves and municipalities. The HGMC sets an AAC for Haida Gwaii, and the *Haida Gwaii Reconciliation Act* requires that the determination of AACs for specific management units (Tree Farm Licences, Timber Supply Area, Woodlots, Community Forest Agreements, and First Nations Woodland Licences) not exceed the overall level determined by the HGMC. Further information on the HGMC can be found at: http://www.haidagwaiimanagementcouncil.ca/

A key purpose of the Haida Gwaii timber supply review is to ensure that the AAC reflects the protected areas and ecosystem-based management (EBM) regime stemming from the 2007 Strategic Land Use Agreement and the *Haida Gwaii Land Use Objectives Order*; and reflects any new land use decisions and inventory updates affecting the forest management land base.

The HGMC mandated the Joint Technical Working Group, made up of technical representation from the Council of the Haida Nation and the Province, to oversee the technical process associated with the timber supply review. The Joint Technical Working Group prepared the 2019 Haida Gwaii timber supply review *Data Package* and *Timber Supply Analysis Report* for the HGMC. The *Data Package* describes the inputs and approaches that were used in the timber supply modelling, while the *Timber Supply Analysis Report* describes the findings from the modelling; both documents are key to informing the AAC determination for Haida Gwaii.

As part of the technical process, a computer-generated spatially explicit projection of timber supply available under assumed land use and forest management conditions was prepared to provide a 'base case' harvest projection. Analytical findings are described briefly in this discussion paper and include the 'base case' projection showing that for all of Haida Gwaii an even flow annual harvest level of 842,781 cubic metres can be maintained.

This base case projection is not a recommended AAC for Haida Gwaii. The base case is just one of several projections and sources of information the HGMC will consider in its AAC determination. Other sources include the ideas, opinions, and personal experiences of people who live on Haida Gwaii and/or who consider their interests to be affected by the determination. As part of the AAC determination process the HGMC will consider the technical data as well as social, economic and cultural considerations, including those brought forward through the engagement processes.

To engage Haida citizens, other residents of Haida Gwaii and in BC, the HGMC is circulating this *Public Discussion Paper* as an integral part of its decision-making process. This *Public Discussion Paper*

G-4

provides information on the timber supply analysis, forest management issues, and socio-economic factors that HGMC will consider in making its determination, as well as on the AAC determination process itself. The HGMC hopes this will enable individuals, communities, licensees, and other interested parties to provide informed responses on any matter that they believe should be considered in the AAC determination, whether consistent with, or critical of, any data, information or approaches used in the *Data Package*. The HGMC now therefore invites and welcomes your feedback on any aspect of this *Public Discussion Paper*, and/or on any other issue or concern that you feel needs to be considered in assessing the timber supply on Haida Gwaii.

To that end, please see Section 13 **'Your Feedback is Needed'** at the end of this document. To help the determination process to remain on schedule, we would appreciate receiving your comments during the **Public Review and Comment period. In consideration of the upcoming holiday season, the HGMC is extending this period from November 15, 2019 to January 14, 2020.**

Following the HGMC's AAC determination for Haida Gwaii, the Province's Chief Forester, using the same technical information and public feedback from this *Public Discussion Paper*, will then make separate AAC determinations for the Timber Supply Area (TSA) and the two Tree Farm Licences (TFLs) on Haida Gwaii that must not in total, when combined with Woodlot Licence AACs, exceed the HGMC AAC determination. After the Chief Forester's determinations are made, the Minister of Forests, Lands, Natural Resource Operations and Rural Development ('the Minister') will apportion the TSA AAC to different forest tenure types.

2. Introduction

Major Government-to-Government agreements, protocols, processes and land use objectives that have shaped the timber supply review for Haida Gwaii are highlighted in this section.

Timber Supply Review

A timber supply review assesses the amount of timber available for harvesting over time. An allowable annual cut (AAC) is the maximum average level of timber harvest permitted for a forest management area, usually expressed as cubic metres of wood. The AAC represents a harvest level that aims to balance environmental, economic, social and cultural considerations.

When undertaking a timber supply review in support of an AAC determination, basic elements of timber supply need to be described:

- The location and types of forest including timber volumes and values (forest inventory)
- How fast forests grow over time (growth and yield)
- Where timber harvesting can occur (timber harvesting land base)
- Forest management practices based on legal requirements and other factors such as economics
- Rate or level of harvesting over time (such as even-flow annual harvest levels).

The unique AAC circumstance of Haida Gwaii

The authority for determining the AAC on Haida Gwaii rests with the HGMC, a specially mandated body established under the *'Kunst'aa Guu – Kunst'aayah' Reconciliation Protocol*; as well as in the *Haida Gwaii Reconciliation Act*, and in the *Haida Stewardship Law*. This unique arrangement has developed from these and other significant agreements reached between the Council of the Haida Nation and the Province as described below.

G-4

2007 Strategic Land Use Agreement

The 2007 Strategic Land Use Agreement between the Council of the Haida Nation and the Province identified land use zones (including new protected areas, special value areas, and operating areas), and provided EBM objectives for cultural, aquatic, biodiversity and wildlife values.

2009 Kunst'aa Guu – Kunst'aayah Reconciliation Protocol

The 2007 Strategic Land Use Agreement was followed by the co-signing of the historic 2009 *Kunst'aa Guu – Kunst'aayah Reconciliation Protocol* ('Reconciliation Protocol') by the Council of the Haida Nation and the Province.

The 2009 Reconciliation Protocol, whose title means 'in the beginning', is a commitment by both Governments to continue working together toward comprehensive reconciliation, focussing on joint and shared strategic-level decision making respecting lands and natural resources on Haida Gwaii, and other collaborative arrangements. The Reconciliation Protocol includes agreements to address:

- Shared and joint decision making
- Carbon offset and resource revenue sharing
- Forest tenures and other economic opportunities
- Enhancement of Haida socio-economic well-being.

Haida Gwaii Management Council (HGMC)

The 2009 Reconciliation Protocol committed both Governments to a process for shared decision-making regarding resource use on Haida Gwaii, notably by requiring the creation of the HGMC, which was established in 2011. The 2009 Reconciliation Protocol required both Governments, in consultation with the other, to appoint two members, and to then jointly appoint a chairperson. The HGMC's documented responsibilities include making key strategic decisions through a joint decision-making process that aims to achieve consensus. 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.

Joint decisions made by the HGMC focus on:

- Implementation and amendment of the 2007 Haida Gwaii Strategic Land Use Agreement
- Establishment, implementation and amendment of land use objectives for EBM forest practices
- **Determination of the AAC for Haida Gwaii**
- Approval of management plans for protected areas
- Development of policies and standards for the identification and conservation of heritage sites.

Significant in the above list is the third point, the requirement for the HGMC to determine an AAC for Haida Gwaii; it is in support of this requirement that this *Public Discussion Paper* was prepared.

Land Use Objectives

To further implement the 2007 Strategic Land Use Agreement and consistent with the 2009 Reconciliation Protocol, both Governments collaboratively developed land use objectives.

The land use objectives for forest-based values were formally agreed upon by both Governments and were established through the 2010 *Land Use Objectives Order* as legal requirements to further the implementation of EBM. The 2010 Order was amended by the HGMC in 2014 and 2017 to support improved implementation of EBM. Forest plans and practices on Haida Gwaii must be consistent with the land use objectives that include:

- Cultural objectives
- Aquatic objectives
- Wildlife objectives
- Biodiversity objectives.

The timber supply review therefore has accounted for these land use objectives in support of the HGMC's AAC determinations.

3. Haida Gwaii Timber Supply Review

This Timber Supply Review (TSR) was prompted by two considerations. In 2014 an updated inventory on the forests of Haida Gwaii (Vegetation Resource Inventory, or VRI) was completed, and between 2015-2017 the inventory was independently audited. Between 2012-2015 both Governments monitored the rate of cedar harvests on Haida Gwaii relative to the maximum ceiling set by the Chief Forester's AAC determination in 2012. The HGMC initiated an early TSR with an interest in applying the new forest inventory to an updated AAC determination, as well as informing the timber supply for cedar. The HGMC's AAC determination process began with the appointment of a Joint Technical Working Group co-led by both Parties to provide two timber supply review reports: (i) a *Data Package* that describes current forest management as a basis from which to assess the timber supply on Haida Gwaii; and (ii) a *Timber Supply Analysis Report* that documents results of a spatially explicit analysis, including projections of feasible future harvest levels based on inputs about the forest and how it grows, and the objectives and practices used to protect and conserve important values. In addition, the HGMC commissioned a socio-economic analysis report for Haida Gwaii. The three reports are available at: www.haidagwaiimanagementcouncil.ca.

The projections in the *Timber Supply Analysis Report* include a 'base case' projection that reflects current land use and forest management conditions. However, the base case projection is not a recommended AAC for Haida Gwaii; rather, it provides one of the several sources of information the HGMC will consider in making its AAC determination. Other information sources include: sensitivity analyses (prepared as part of the timber supply analysis - see Section 11) that examine different assumptions in forest management, and compares that with the base case; the socio-economic analysis report; and—very importantly and the reason for this paper—the ideas, opinions, and personal experiences of people who live on Haida Gwaii, and/or who consider their interests to be affected by the determination.

The HGMC hopes that the information in this *Public Discussion Paper* will engage local communities across Haida Gwaii, as well as other individuals, licensees, and interested parties to provide informed responses on any matter that they believe should be considered in the AAC determination. All of information received during the comment period will be taken into account by the HGMC before making their AAC determination.

To provide your ideas and suggestions, please see Section 13 **'Your Feedback is Needed'** at the end of this document – which, for example, states where you can submit your feedback. To help the determination process remain on schedule, we would appreciate receiving your written comments by January 14, 2020 which is the end of the 60-day Public Review and Comment period.

The 2009 Protocol requires all decisions by the HGMC, which include AAC determinations, be made by consensus or vote as described earlier in Section 2 under 'Haida Gwaii Management Council'. These requirements are mirrored in the *Haida Gwaii Reconciliation Act*, which also requires HGMC decisions to be published in the *BC Gazette*. The decision will also be published in the Haida Laas newsletter, the Haida Gwaii Observer, and the Haida Gwaii Trader. The HGMC's rationale document for its AAC determination will be posted on its website www.haidagwaiimanagementcouncil.ca and in the *BC Gazette*.

Stages in the AAC determination process

- Joint Technical Working Group began assembling data for data package
- The Province's Chief Forester provided information needed to analyze timber supply to HGMC
- Data package, timber supply analysis, and socio-economic analysis completed [November 2019]
- **Public discussion paper released [November 2019]**
- **60-day Period for Review and Comment by public and licensees** [November 15 to January 14, 2020]
- AAC determination for Haida Gwaii by HGMC completed and conveyed to Chief Forester
- HGMC rationale released

6-4

- BC's Chief Forester determines AACs for specific management units within limits of HGMC determination (see 'Chief Forester's role' below)
- Chief Forester's determination and rationale released (anticipated in early 2020).

Chief Forester's role

The Province's Chief Forester will make separate AAC determinations for the TSA and two TFLs that must not in total, when combined with Woodlot Licence AACs, exceed the overall AAC determined by the HGMC for Haida Gwaii. It is anticipated that the Chief Forester will make these determinations as soon as possible after the HGMC determines the new AAC for Haida Gwaii. The determinations by the Chief Forester are required by Section 8 of the Province's *Forest Act*, under which the Chief Forester must regularly determine a new AAC for all TFLs and TSAs in BC.

What the AAC determination does and does not do

The new AAC set by the HGMC will regulate how much timber may be harvested on Haida Gwaii, and the decisions by the Chief Forester will determine how much of the AAC may be harvested from each TFL and the TSA. A key purpose of the AAC determinations is to establish allowable harvest levels that are sustainable and consistent with the land use objectives that support the EBM regime for Haida Gwaii.

The AAC determination does not allocate harvesting rights or direct forest practices. These decisions are made through other processes - for example, the Minister will apportion the AAC that is determined for the TSA among various types of forest tenures, and the HGMC can amend the land use objectives that support EBM implementation. The AAC determination process does not make land use decisions, such as adding new protected areas. The sensitivity analyses conducted through this process can help inform future land use or resource management decisions.

4. Description of Haida Gwaii

Xaadaa Gwaay, Xaaydaġa Gwayyaay, or Haida Gwaii ("Islands of the people") is an archipelago of more than 150 islands off the north coast of BC. The mainland north coast of BC lies 80 kilometres to the east across Hecate Strait, and the state of Alaska lies to the north across Dixon Entrance. Haida Gwaii's total landmass of just over a million hectares is situated mostly on two main islands: the larger, *Kiis Gwaay* (Graham Island), being to the north; and *Gwaay Haanas* (Moresby Island) to the south.

The geography of the Islands is similar to the mainland coast of BC and the southern regions of Alaska, including mountainous terrain, deep fjords, temperate rainforests, sub-alpine forests and alpine tundra.

The rugged mountains that dominate the west side of the Islands descend abruptly into the ocean to form a steep, rocky coastline. The weather is cool and wet, with deep snow at higher elevations. Steep headwater streams and gullies drain the mountainsides, carrying water, sediment and organic materials to the alluvial fans and floodplains that line the valley bottoms.

The Skidegate Plateau occurs east of the west coast mountains and includes the most productive forest lands on the Islands. Many of the largest trees found on Haida Gwaii are located within the Skidegate Plateau. The Plateau has high levels of biodiversity with some of the best habitat for wildlife found anywhere on the Islands.

Relatively flat, lowlands are found to the northeast of the Skidegate Plateau. This area is dominated by extensive blanket bogs, shallow lakes and scrub forest, with patches of productive forest in well-drained areas.

The diverse geography and landscapes of the Islands is reflected in its biological diversity. There are many plant and animal species and sub-species that are only found on the Haida Gwaii archipelago. This is one reason why the Islands are often referred to as "the Galapagos of the North."

G-4

Coastal temperate rainforests represent only 2% of the world's forests but provide critical habitat for many unique species. BC has a sizeable percentage of the world's coastal temperate rainforests in areas like Haida Gwaii and the Great Bear Rainforest. Haida Gwaii's coastal temperate rainforests occur at lower elevations with western hemlock, western redcedar and Sitka spruce being the most dominant tree species along with lodgepole pine, western yew, and red alder. High elevation tree species include mountain hemlock and yellow-cedar. At yet higher altitudes, closed forests give way to open parkland forests and alpine meadows. About 80% of Haida Gwaii is forested.

Haida Gwaii supports a wide range of wildlife including species for which land use objectives have been established. These are black bear, northern goshawk, northern saw-whet owl, marbled murrelet, and great blue heron.

As shown in Figure 1 and later in Table 3, about half of Haida Gwaii is in protected areas. Figure 1 also shows the location of the three main forest management units on the Islands: the Timber Supply Area (TSA) and two Tree Farm Licences (TFLs).

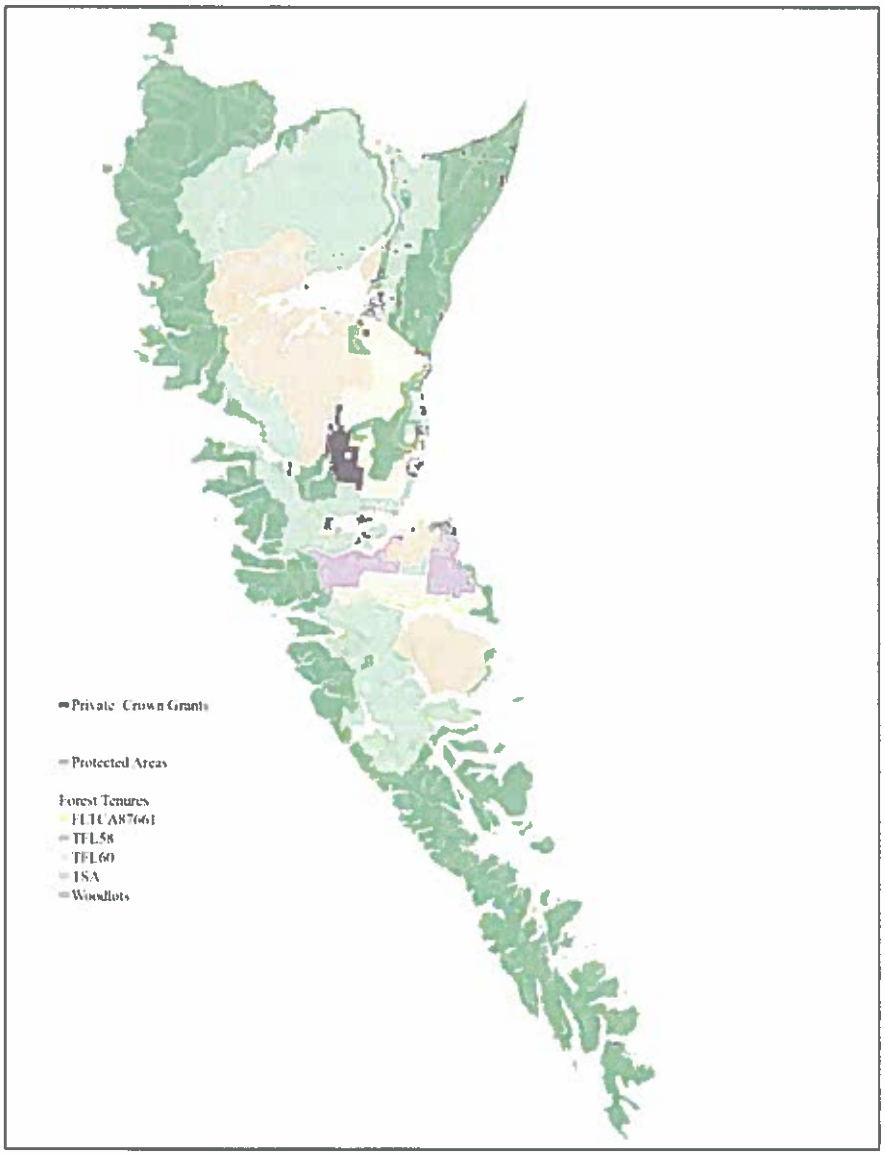

Figure 1: Protected Areas and Forest Management Units on Haida Gwaii

G-4

5. Socio-economic Conditions

This section highlights key findings from the *Socio-Economic Analysis in support of the Haida Gwaii Timber Supply Review* report that was commissioned by the HGMC. The socio-economic report provides sources of data for the information presented in this section of the *Public Discussion Paper*, and is available at: www.haidagwaiimanagementcouncil.ca.

Population

The 2016 population of Haida Gwaii was 4,198, a 12.8% decrease from the 2006 population of 4,812, and a 28.0% decrease from the 1996 population level. By comparison, the overall population of BC rose by 12.2% over the 2006-2016 period. In 2016, an estimated 47.5% of the Haida Gwaii population identified as an Aboriginal/Indigenous person. The Haida population of Haida Gwaii was an estimated 1,915 in 2016, a 1.6 % increase over the 2006 population of 1,885. Although demonstrating a positive trend, the Haida population increase of 1.6% trailed, by a large margin, the 38% increase in the overall BC Aboriginal/Indigenous population during the 2006-2016 period.

The five main communities by population in 2016 are Queen Charlotte (852), Skidegate (*Higaagilda)* (837), Masset (793), Old Massett (*Gaw)* (555), and Port Clements (282); these communities account for about 80% of the overall population on Haida Gwaii. The remaining 20% of the population inhabits other areas of Haida Gwaii including the unincorporated communities of Tlell, rural Graham Island, and Sandspit. Skidegate was the only Haida Gwaii community or area that registered a population gain for the 2006-2016 period. The median age of the Haida Gwaii population increased from 39.7 years to 45.1 years over the 2006-2016 period, By comparison, the estimated 2006 median age on the islands was similar to that of the province (40.8 years) whereas by 2016, the estimated Haida Gwaii median age (45.0) was higher than the BC median of 43.0 years.

Labour Force

Table 1 shows the estimated total number of labour force workers[1] resident on Haida Gwaii and estimates for the three main sectors (public services, tourism and forestry) in 2016 and 2006. The resident labour force in 2016 totaled 2,290 workers, a 19.1% decline from the 2006 total of 2,830. Worker numbers in two of the main sectors, tourism and forestry, declined over the 2006-2016 period, 9.4% and 10.8%, respectively, but by a lesser amount than in the public services sector and other sectors (as a group).

Sector	2016 #	2016 %	2006 #	2006 %	% change 2016 vs 2006
Tourism	387	16.9	427	15.1	-9.4%
Forestry	290	12.7	325	11.5	-10.8%
Public Services	640	27.9	795	28.1	-19.5%
Other Sectors	**973**	**42.5**	**1,283**	**45.3**	**-24.2%**
Total	**2,290**	**100**	**2,830**	**100**	**-19.1%**

Table 1: Haida Gwaii Labour Force, 2016 and 2006

The preceding table focused on the resident labour force. Both the forestry and tourism sectors on Haida Gwaii have historically utilized non-resident workers who either reside seasonally or long-distance commute for periods of one or more weeks to Haida Gwaii. Generally, less data and information are available on this group of workers but a survey conducted for this timber supply review indicates that the on islands resident share of Haida Gwaii forestry employment has risen in recent years. This shift appears

1 Includes persons working part-time and full-time

G-4

to be largely due to the efforts of Haida Gwaii headquartered Taan Forest Products Ltd. to utilize Haida Gwaii resident workers and contractors. Fishing resort lodges (an estimated 16 in 2018) have collectively been an important factor in the Haida Gwaii tourism sector since the 1990s but they have relied as a group on a significant number of off islands seasonal and full-time workers. A new study (expected to report in 2019) may show a greater reliance on local workers at these lodges, in part due to Haida Gwaii-headquartered HaiCo's entrance into the fishing lodge sector and its efforts to hire Haida Gwaii resident workers for its lodges.

AACs and Haida Gwaii Timber Harvest

Table 2 shows recent AACs for Haida Gwaii management units TSA 25, TFL 58, and TFL 60. The sum of the management unit AACs determined in 2012 for Haida Gwaii was 931,000 cubic metres, a decline of 47.5% from the previous total AAC of 1,772,616. The four woodlot licences contribute an additional 9,293 cubic metres of AAC.

Management Unit	AAC determined in 2012 (cubic metres)	Prior AAC (cubic metres)	% change in AAC
TSA 25	512,000	869,748	-41.1%
TFL 58	79,000	100,000	-21.0%
TFL 60	340,000	802,868	-57.7%
All Units	**931,000**	**1,772,616**	**-47.5%**

Table 2: Recent AACs for Haida Gwaii Management Units (cubic metres)

The 5-year average annual harvest on HGMA lands was 831,172 cubic meters between 2013 and 2017 which is about 10% less than the sum of the current AACs.

Although the available timber supply for annual harvesting was in the 1.2–1.8 million m^3 range over the 2000–2012 period, the amount of timber harvested by commercial operators and supplied into domestic and international markets fell well short of these levels due to target market demand conditions, cost constraints, and administrative and policy parameters on the Haida Gwaii timber supply side. During the 10-year 2003-2012 period prior to the initial AAC determination of the HGMC, the Haida Gwaii annual timber harvest averaged approximately 780,000 m^3, well below the cumulative total of the then current Haida Gwaii AACs and below the average annual harvest for the 5-year 2013-2017 period.

Over the 2008-2017 decade, red and yellow cedar accounted for an annual average share of almost half (48.4%) of the total Haida Gwaii Management Area (HGMA) harvest. Historically, stands with substantial percentages shares of old growth western redcedar volumes have formed a large portion of the operable timber harvesting landbase of Haida Gwaii. This accessible local cedar supply in combination with the strong and large scale external demand for cedar logs and wood products in Canada, the U.S. and abroad over the past couple of decades, have resulted in both attractive prices for cedar logs and wood products and substantial cedar timber harvests on both HGMA lands and private lands.

As throughout coastal BC, log export volume from Haida Gwaii has increased markedly over the past decade. The volume and share of the timber harvest on HGMA lands that was exported under provincial log export rules climbed from 61,552 m^3 and a 9.1% share of the HGMA lands harvest in 2010 to 267,873 m^3 and a 41.5% share in 2017. Lower value whitewood species accounted for the vast majority of coastal BC export logs because the Government of BC limits the issuance of export permits for cedar logs to ceremonial or religious uses (incorporation into construction of a religious temple for example). No red or yellow cedar logs harvested on HGMA lands over the 2010-2017 period were exported outside of BC; the HGMA lands harvest that was exported outside of BC was comprised of whitewood logs.

G-4

Forest Sector Employment Trends

Both timber harvesting and wood processing employment of Haida Gwaii residents fell since the mid-2000s. The main factors contributing to declines in harvesting-related employment were:

- Lower AACs in response to new protected areas and land use objectives (see Table 2)
- Actual harvest levels over the 2013-2017 period were about 10% lower than the AAC level set forth in the 2012 determination for the HGMA
- 2008 financial crisis that lowered demand for wood products in key markets (U.S. housing for example) resulting in less timber harvesting and associated forestry employment on Haida Gwaii that recovered but not to the pre-financial crisis levels
- Increased use of mechanized (less labour intensive) harvesting methods
- Timber harvest permitting challenges
- Forestry labour supply sourcing challenges

Timber processing activity and associated employment has historically been relatively low on Haida Gwaii and dropped in recent years. The total amount of Haida Gwaii timber processed on the islands was small (5%) in 2002-2004 by comparison to the Haida Gwaii volume processed elsewhere, which is also the current situation. In the 2015-2017 period, the portion of the Haida Gwaii harvest annually processed on the islands was an estimated 0.6%. The main factor in the reduction of wood processing employment on Haida Gwaii is the combination of adverse operational and financial challenges faced by Haida Gwaii Forest Products (formerly Abfam), which has a small sawmill in Port Clements. This facility was shuttered in 2017 but discussions have taken place between the owners and potential investors about renovating and re-opening this Port Clements mill. The portion of the Haida Gwaii harvest processed in BC and controlled by Haida Gwaii focused operations did increase significantly, however, due mainly to TaanForest Product Ltd.'s establishment of a custom cut program, which was an addition to the well-established custom cut programs of O'Brien & Fuerst and Husby Forest Products Ltd.[2] The custom cut programs of these Haida Gwaii focused harvesting operators accounted for the majority of the Haida Gwaii logs that stayed in BC for processing (and supported associated mill employment).
During the 2015-2017 period, the estimated annual average direct employment on Haida Gwaii based on harvesting and processing HGMA timber was 285 person years (PYs), and the majority of this direct employment, 270 PYs (95%), was in harvesting activities including log transport.[3] In terms of total employment on Haida Gwaii, which also includes an estimate of the employment supported by forestry firms purchasing goods and services and the employment supported by forest sector connected households locally buying goods and services, the average annual effect of the local forest sector activity on Haida Gwaii was an estimated 414 PYs during the 2015-2017 period.

On a province-wide basis, the employment effects connected to harvesting and processing Haida Gwaii timber more than double. During the 2015-2017 period, the estimated annual average direct employment in the province based on harvesting and processing HGMA timber was 622 PYs and the total employment effect was an estimated annual average of 1,244 PYs. Although Haida Gwaii resident workers accounted for the largest share of harvesting direct employment (82%), on islands workers held less than half of the total (harvesting and processing) direct employment (43%) because of the small amount of wood processing activity on Haida Gwaii.

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2 Custom cutting programs on coastal BC are based on a market logging or log trading operations renting capacity and services at southwest BC sawmills in order to process their harvested logs (mainly cedar logs) and to sell the resulting lumber products to wholesalers and retailers in Canada, the U.S. and internationally. Custom cut programs are an alternative to owning and operating wood processing facilities.

3 Employment is stated in person-years (PYs), which is defined as one person working the equivalent of one full year, which is defined as 180 days of work. A person working for 90 days accounts for 0.5 PYs. Full-time equivalents (FTEs) is a term that is used inter-changeably with PYs.

6. Timber Supply Analysis and the Land base

Haida Gwaii Timber Supply Review Considerations

The AAC determination for Haida Gwaii will be the second undertaken by the HGMC that involves a comprehensive review of the timber supply for all of the forest management units on Haida Gwaii into one determination.

The Haida Gwaii land use objectives were used by the Joint Technical Working Group to support the Haida Gwaii timber supply review. The land use objectives support an EBM regime on Haida Gwaii that in many cases supersedes or augments objectives under the Province's *Forest and Range Practices Act.* However, where the land use objectives requirements do not apply, forest practices must still be consistent with the *Forest and Range Practices Act.* The Haida Gwaii timber supply review accounts for all protected areas including heritage sites, conservancies, ecological reserves, parks and protected areas as these areas do not contribute to timber supply.

Timber Supply Analysis – improved information and analysis since the last time

Since the last timber supply review that supported the HGMC's 2012 AAC determination, a number of changes have occurred to improve the Haida Gwaii timber supply analysis including use of:

- New forest inventory
- Improved site productivity estimates based on a higher number of Haida Gwaii field samples
- Improved information on growth and yield with model estimates compared against field plots
- Improved operational data to estimate the timber harvesting land base and reflect forest practices based on implementation of the land use objective order
- Better data in general (e.g. use of LiDAR for new terrain and fluvial mapping)
- Refined estimates of natural disturbances
- Detailed operability modelling
- More sophisticated spatial model
- Large number (over 60) of sensitivity analyses.

Protected Areas

Protected areas, where timber harvesting is excluded, are valuable areas that help ensure continuance of the natural values that support activities integral to the traditional way of life of the Haida, and also ensure protection of the environmental values that attract visitors from all over the world. This visitor activity is also an important contributor to the economy of Haida Gwaii. The Council of the Haida Nation and the Province collaboratively manage provincial protected areas. The Council of the Haida Nation and the federal government collaboratively manage Gwaii Haanas. In the timber supply review, all protected areas on Haida Gwaii (listed in Table 3) were excluded from the timber harvesting land base.

Protected Area	Area (hectares)
Gwaii Haanas National Park & Heritage Site	145,753
Daawuuxusda	70,295
Damaxyaa	822
Drizzle Lake	814
Duu Guusd	144,762
Duu Guusd Ecological Reserve	8,684
K'uuna Gwaay	2,105
Kamdis	1,894
Kunuxalas	3,344

Protected Area	Area (hectares)
Naikoon Provincial Park	67,268
Nang Xaldangaas	6,897
Pure Lake Provincial Park	142
SGaay Taaw Siiwaay K'adjuu	597
Tlall	16,208
Tow Hill Ecological Reserve	451
Yaaguun Gandlaay	2,450
Yaaguun Suu	7,970
Total	**480,456**

Table 3: Protected Areas on Haida Gwaii

Forest Tenures

The majority of the area on which timber harvesting is permitted is contained within two Tree Farm Licenses (TFLs), TFL 58 and TFL 60, and the Timber Supply Area (TSA) as shown in Figure 1.

TFL 60 is a replaceable area-based tenure that was purchased in 2012 by Taan Forest – a 100% Haida-owned forest company, and a wholly owned subsidiary of the Haida Enterprise Corporation, the economic development entity of the Haida Nation whose shareholders are Xaayda *Haida* citizens. TFL 60 is the largest area-based tenure on Haida Gwaii with a total area of 134,526 hectares (including non-forested areas). Most of TFL 60 is on Graham Island with a smaller portion on northern Moresby Island and Louise Island. TFL 60 is certified under the Forest Stewardship Council's sustainable forest management standard for BC.

TFL 58 is replaceable area-based tenure that was purchased in 2016 by A&A Trading (Haida Gwaii) Ltd. The total area of the TFL is 23,933 hectares (including non-forested areas) occurring entirely on northern Moresby Island.

Forest Licence to Cut (FLTC) A87661 is a short term non-replaceable tenure with a maximum volume that was provided to Taan Forest in 2012 as part of the fulfillment of the 2007 Strategic Land Use Agreement and the 2009 Reconciliation Protocol for the management of 120,000 cubic meters/year area based tenure. A Haida Forest Tenure Agreement was signed between the Province and the CHN in 2014, and the CHN were invited to apply for a First Nations Woodland Licence over a specified area. The 58,606 hectare area is currently managed under the FLTC pending the creation of the First Nations Woodland Licence. The tenure area, as shown in Figure 1, is primarily located on the central coast of Graham Island, along with a supply area on north Moresby Island.

Table 4 shows the current apportionment and commitments of the AAC for the rest of the TSA. Also shown are the AACs for the four area-based Woodlot Licences on Haida Gwaii, with a combined total area of 1,842 hectares and a combined AAC of 9,293 cubic metres. The current AAC established in 2012 for the TSA and two TFLs (without the Woodlots) is 931,000 cubic metres.

Tenure	Holder	Total Area (hectares) includes non-forest area	Current AAC (cubic metres/year)
TFL 60	Taan Forest	134,526	340,000
TFL 58	A&A Trading (Haida Gwaii) Ltd	23,953	79,000
TSA 25: FLTC A87661	Taan Forest	58,606	120,000
TSA 25: Other tenures		337,700	392,000
- FL A16869	-Husby Forest Products Ltd	-	(192,044)
- FL A16870		-	(13,632)

G-4

Tenure	Holder	Total Area (hectares) includes non-forest area	Current AAC (cubic metres/year)
- FL A75084 - Licence/licence to cut - Non-replaceable licence - Community Forest Agreement - Forest Service Reserve	-A&A Trading (Haida Gwaii) Ltd -Dawson Harbour Logging Co -BC Timber Sales - -proposed -	- - - - - -	(7,956) (81,658) (14,210) (80,000) (2,500)
Woodlots: - W1841 - W1840 - W0161 - W0162	 - Old Massett Village Council - Skidegate Band Council - Dave Younger - Gerald Lavoie	 478 422 477 465	 2,120 2,000 2,728 2,445
Totals		**556,627**	**940,293[4]**

Table 4: AAC Forest Tenure Apportionment and Commitments on Haida Gwaii

7. Forest Management

The Haida Gwaii timber supply review accounted for the Haida Gwaii land use objectives, and for several other important factors and values as described below.

Ecosystem-Based Management (EBM)

The 2007 Strategic Land Use Agreement defined EBM for Haida Gwaii as:

> "an adaptive, systematic approach to managing human activities, that seeks to ensure the co-existence of healthy, fully functioning ecosystems and human communities."

The Strategic Land Use Agreement also notes that:

> "[t]he Haida will establish the EBM Objectives in accordance with their laws, policies, customs, traditions and decision-making processes."

The Haida Gwaii Land Use Objectives Order states:

> "This Land Use Objectives Order establishes legal objectives for forest-based values to support implementation of ecosystem-based management. 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. Human well-being is maintained through policies and initiatives designed to achieve socio-economic benefits, including carbon values, and timber harvest levels that will support a viable forest industry."

The aim of Haida Stewardship Law is: '...bringing land and resource use balance to Haida Gwaii to ensure the continuity of Haida culture and a sustainable islands economy'.

The Haida Land Use Vision places emphasis on 'the well-being of the land', 'the condition of the land', and 'the natural ability of the land to function and provide'. The Haida Land Use Vision also refers to:

[4] Includes 9500 cubic metres for municipal areas in the TSA and TFL 60, and private land portions of woodlots - that are not part of the aggregate area determined by HGMC in 2012

6-4

"Yah'guudang—our respect for all living things—[which] celebrates the ways our lives and spirits are intertwined and honours the responsibility we hold to future generations."

Incorporating Haida Gwaii Land Use Objectives in the Timber Supply Review

Haida Gwaii land use objectives support EBM implementation on Haida Gwaii. The establishment of these legal objectives through the *Land Use Objectives Order* helps ensure that forest plans and practices on Haida Gwaii are consistent with the objectives. The land use objectives are accounted for in the timber supply review as required current practice. The legally established land use objectives include:

Cultural objectives for:

- Cedar Stewardship Areas
- Cultural Feature Identification
- Haida Traditional Heritage Features
- Haida Traditional Forest Features
- Western redcedar and yellow-cedar retention
- Western yew retention
- Culturally modified trees and monumental cedar.

Aquatic habitat objectives for:

- Type I fish habitat [as defined in the Order]
- Type II fish habitat [as defined in the Order]
- Active fluvial units
- Upland stream areas
- Sensitive watersheds.

Biodiversity objectives for:

- Forested swamps
- Ecological representation
- Red-listed and blue-listed ecological communities.

Wildlife objectives for:

- Black bear dens
- Marbled murrelet nesting habitat
- Northern goshawk habitat
- Great blue heron nesting habitat
- Northern saw-whet owl nesting habitat.

Forest reserve objectives for:

- Areas reserved to meet landscape level objectives.

Examples of how these objectives are incorporated into the analysis are described briefly below. Please refer to the *Data Package* for a full description of how each objective was accounted for in the timber supply review, either by excluding areas from the timber harvesting land base or by applying forest cover requirements. One example objective requires that all Class 1 Haida Traditional Heritage Features (as defined in the Order) be protected in a reserve zone with a minimum width of 500 metres, measured from the edge of the feature. (The reserve zone may be reduced if it is decided through an intergovernmental process that it is necessary and unavoidable.)

To account for these reserves in the timber supply analysis, an appropriate, corresponding area was excluded from the timber harvesting land base and was assumed to not contribute to the timber supply at any time. The reserves provide forest cover and therefore contribute to achieving biodiversity objectives.

Another example objective requires that all forest within Type I fish habitat (as defined in the Order), and all forest within two tree lengths adjacent to such habitat (plus or minus half a tree length), be protected in a reserve zone. Accordingly, for the analysis, the area of riparian reserves within each forest stand was

determined, and that area excluded from contributing to the timber harvesting land base.

For some objectives, instead of excluding area from the timber harvesting land base, a forest cover requirement was applied such that no more than a given percentage of the forest cover may be harvested at any time. For example, sensitive watersheds equal to or greater than 500 hectares require that no more than five percent of the watershed area be harvested in a five-year period; while sensitive watersheds smaller than 500 hectares require that no more than 10 percent of the watershed area be harvested in a 10-year period.

If too much timber has already been harvested in a sensitive watershed (representing an equivalent clearcut area of 20 percent or more), then no harvesting may occur until the area is adequately 'greened-up'.

In these ways, the land use objectives that help implement EBM were modelled in the spatially explicit timber supply analysis for the Haida Gwaii.

Of particular note is management and protection of monumental cedar. A new version of the Cultural Feature Identification Standards Manual was released in late October 2019. The standards were designed to implement the LUOO requirements as currently written, not to revise the LUOO. A preliminary estimate of the frequency of monumental cedar was applied in the base case. However, some uncertainties remain, including: how many cedar trees with diameters over 100-cm meet monumental cedar criteria; and how monumental cedar will be managed and harvested. In response to these uncertainties, the HGMC through the Technical Working Group will be compiling additional information and undertaking analysis to explore: (1) the likelihood that a broader range of log grades than estimated for the base case will contribute monumentals; (2) indications that younger ages classes than assumed for the base case will contain monumental cedar; (3) timber supply implications of various levels of retention of monumental trees from harvesting. Given the recent release of the new standards, these analyses are ongoing. The results will be available for the HGMC for its determination of the Haida Gwaii AAC. This issue is an example of the dynamic nature of forest management that means the base case timber supply projection described in section 10 is just one source of information for the HGMC and must be interpreted together with other relevant information, such as the sensitivity analyses discussed later in this document, and that will be completed on monumental cedar.

Other Factors Considered

In addition to land use objectives, other factors considered in the timber supply review either reduced the timber harvesting land base or were addressed through forest cover requirements such as:

- Natural disturbance reductions
- Visual quality objectives
- Community watersheds
- Terrain stability
- Wildlife habitat areas
- Hydrologic recovery
- Economic operability (see Section 11 on 'Sensitivity Analysis')
- Karst management
- Wildlife tree retention areas
- Permanent sample plots
- Recreation sites and trails
- Minimal harvestable age requirement for timber.

The first five factors listed above are described briefly below. Please refer to the *Data Package* for a full description of how each factor was excluded from the timber harvesting land base or otherwise addressed in the timber supply review.

Trees that are killed by natural disturbances and are not harvested result in non-recoverable losses in timber supply analyses. The timber supply review used forest health aerial overview survey data collected between 2006 and 2017 to estimate current and future losses from forest pests. Satellite imagery was used to assess forest impacts from winds and landslides in 2011 and 2017 to account for current and future losses from these events.

Visual quality objectives set a threshold for how much a forest can be visually altered within scenic areas (e.g. designated areas that can be seen from significant public viewpoints). The amount of alteration permitted varies by visual quality objective class ranging from preservation (no visible activities) to maximum modification (where activities are dominant). 'Visually effective green-up' is a term used to describe when forest regeneration is no longer considered visibly altered. The timber supply analysis accounted for existing visual quality objectives and estimates of when visually effective green-up can be reached thereby restraining how much forest harvesting can occur in scenic areas.

Community watersheds that have been legally designated on Haida Gwaii are those that feed domestic water use for Skidegate and Queen Charlotte which include the Honna, Jervis, Slarkedus and Tarundl watersheds. Forest activities in these watersheds must ensure that the cumulative hydrological effects do not materially adversely impact the quantity of water, timing of water flow, or human health. In the timber supply analysis, a forest cover requirement was applied where at least 80% of the entire area of community watersheds needs to be hydrologically recovered consistent with professional hydrologic assessments.

Terrain areas with a moderate or high likelihood of landslide initiation following timber harvesting or road construction have been mapped, or existing mapping was improved, using recently acquired Light Detection and Ranging (LiDAR) coverage for Haida Gwaii. The timber supply review assessed the contribution of these terrain areas to the timber harvesting land base. The timber supply review also assessed the areas of slides relative to the total area logged in these terrain areas and found the area to be small (less than one percent).

Two Wildlife Habitat Areas (WHAs) for northern goshawk with a total area of 4,905 hectares were established in 2001 and 2003 under the *Forest and Range Practices Act.* The WHAs include Post-Fledging Areas (PFAs) and Foraging Areas. The PFAs are smaller reserves within the broader WHAs generally centered on known nest sites and do not allow any forest harvesting. Consequently, the PFAs were deducted from the timber harvesting land base. The WHA Foraging Areas have forest age class requirements (e.g., at least 384 hectares must be in old forest age class of >250 years in WHA #6-001) that were modelled in the base case.

8. Timber Harvesting Land Base

Protected areas, areas set aside to support EBM and land use objectives, and others areas that do not contribute to timber supply were removed from the timber harvesting land base for Haida Gwaii as shown in Table 5. Following these deductions, some of which overlap, the total of the combined areas in the TFLs and the TSA which contribute directly to the current timber harvesting land base is 147,746 hectares about 15% percent of the total area of Haida Gwaii. This is about 18% less than the 190,907-hectare timber harvesting land base that was derived in the last timber supply review.

***Table 5: Areas removed from the timber harvesting land base for Haida Gwaii** (including overlaps)*

Protected Areas, EBM-related Areas and Other Areas removed from the timber harvesting land base	Total area removed (hectares)
Protected areas	
• Protected areas (CHN/Federal)	145,735
• Protected areas (CHN/Provincial)	332,273

G-4

Protected Areas, EBM-related Areas and Other Areas removed from the timber harvesting land base	Total area removed (hectares)
Cultural	
• Heritage (e.g. Haida Traditional Heritage Features, Culturally Modified Trees, Archaeological Sites)	27,946
• Cedar Stewardship Areas	25,303
• Monumental cedar (current retention)	442
• Monumental cedar (future retention)	77,615
• Haida Traditional Forest Features (current retention)	281
• Western Yew retention (current retention)	212
• Cultural and recreation trails	1,693
Aquatic habitat	
• Active fluvial units	36,353
• Type 1 fish habitat	93,149
• Type 2 fish habitat	58,108
• Other riparian reserve zone and riparian management zone	24,143
• Forested swamps	15,331
Biodiversity	
• Red-listed ecosystems	13,567
• Blue-listed ecosystems	62,444
• Karst ecosystems	7,179
• Rare ecosystems	12,019
• Small islands	3,123
Wildlife	
• Marbled Murrelet reserves (current retention)	116
• Northern Goshawk nesting	3,661
• Saw-whet Owl nesting	730
• Black Bear denning (current retention)	62
• Wildlife habitat areas	623
• Stand level (in block) retention (also for cultural values)	85,353
Forest reserves (landscape level objectives)	
• Forest reserves (Marbled Murrelet, Rare Ecosystems)	31,201
Terrain stability and economic	
• Landslides	1,209
• Class IV Terrain	16,816
• Class V Terrain	30,987
• Low productive forest	79,652
Other	
• Surface water	64,685
• Non-forest	86,940

G-4

Protected Areas, EBM-related Areas and Other Areas removed from the timber harvesting land base	Total area removed (hectares)
• Existing roads	9,100
• Federal reserves	1,541
• Other federal (e.g. military)	1,026
• Provincial reserves/non-timber tenures	6,259
• Private (crown grants)	17,300
• Municipal	3,092
• Permanent Sample Plots	1,010

9. Forest Inventory

The forest inventory used for this timber supply review consisted of the most up to date:

- Vegetation Resource Inventory completed for all of Haida Gwaii between 2011 and 2013 for natural stands for attributes such as species, age and site index (updated to 2018)
- LiDAR Enhanced Forest Inventory for natural stands for attributes such as basal area and heights
- Silviculture records for existing managed stands.

Two types of field audits were used to assess the accuracy of the inventory:

- Mature stand audit
- Young stand monitoring.

The mature stand audit results indicated that the photo-interpreted ages matched ground samples very well; that ground-measured heights were slightly lower than the photo-interpreted inventory; and that ground-measured basal area and number of trees per hectare were substantially greater than the photo-interpreted inventory. However, due to large sampling errors, the results of the mature stand audit were not applied to the inventory or in other aspects of the analysis.

Forty-three (43) young stand monitoring plots, established in 2016, targeted stands between 15 and 50 years of age to compare, among other things, observed stand yields with those estimated from managed stand yield models. Based on the plots sampled, there was no statistically significant difference between observed and modeled manage stand yields.

The growth of young forests following timber harvesting ranges from about 5 to 10 cubic metres per hectare per year depending on ecological conditions while averaging around 8 cubic metres per hectare per year overall for Haida Gwaii.

LiDAR coverage was acquired for a significant portion of Haida Gwaii between 2015 and 2017 through various partners and projects. LiDAR was used to provide enhanced terrain stability and active fluvial unit mapping; and was also used to enhance the photo-interpreted forest inventory for attributes such as volume, basal area and height.

Based on the forest inventory, Figure 2 shows the tree species and age class distribution by volume for all forests on Haida Gwaii and for the timber harvesting land base where Y = yellow -cedar; C = western redcedar; S = spruce; H = hemlock; P = pine; and D = red alder. Most forests are in the older age classes with western redcedar and hemlock being the main species. Younger age classes are mainly comprised of hemlock and spruce with minor amounts of western redcedar.

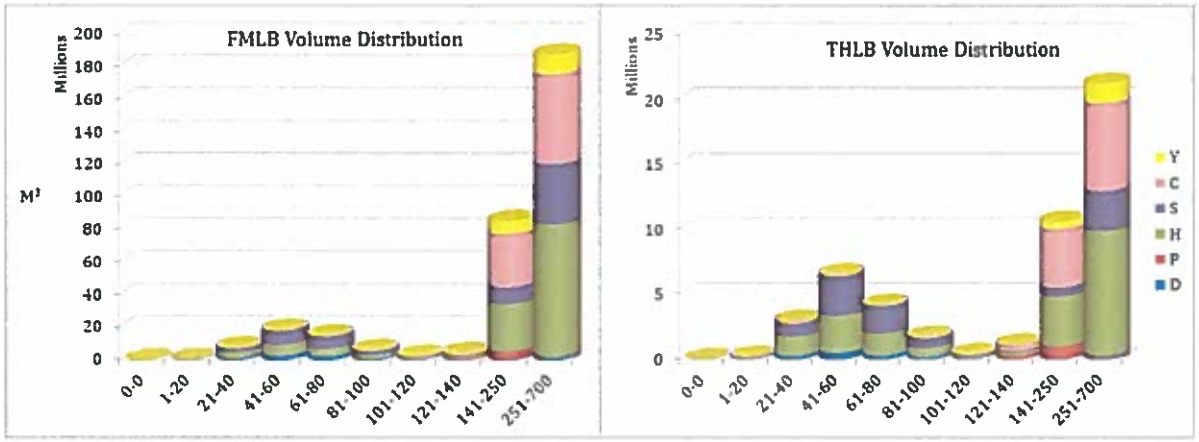

Figure 2: Haida Gwaii Forest Managed Land Base (all forests) and Timber harvesting land base (THLB) age class volume distribution by species

10. Timber Supply Analysis Results

The information the HGMC will review in making its AAC determination for Haida Gwaii includes the timber supply analysis, prepared by the Joint Technical Working Group, which models the development of the forest on the Islands through time and its response to harvesting while respecting land use objectives and other forest management requirements. This section highlights some of the important findings from the timber supply analysis. The HGMC will also be reviewing your comments on this *Public Discussion Paper* as another important consideration before making their AAC determination (see Section 13, **'Your Feedback is Needed'**).

The base case

The Haida Gwaii timber supply analysis uses the timber harvesting land base and forest management information such as EBM implementation through the land use objectives. The analysis includes a timber supply projection, aggregated from the projections prepared for the TFLs and the TSA, using the most up-to-date and best available information. Based on analysis principles such as having an even flow (or non-declining) harvest projection, a timber supply projection is provided that is called the 'base case'. The base case is not an AAC recommendation, but rather one of many potential harvest projections and other sources of information the HGMC will consider when determining the AAC, which may be greater or lesser than the harvest levels projected in the base case. Other assumptions or sources of uncertainty are examined in the timber supply analysis as described in Section 11, 'Sensitivity Analysis'.

The base case harvest projection in Figure 3 shows an even flow annual harvest level of 842,781 cubic metres for Haida Gwaii. Figure 3 also shows harvest projections for TSA and the two TFLs. These results are relevant for the Chief Forester's determinations for the TSA and TFLs. The even flow annual harvest level projection for the TSA is 425,287 cubic metres; for TFL 58 is 91,169 cubic metres; and for TFL 60 is 298,325 cubic metres.

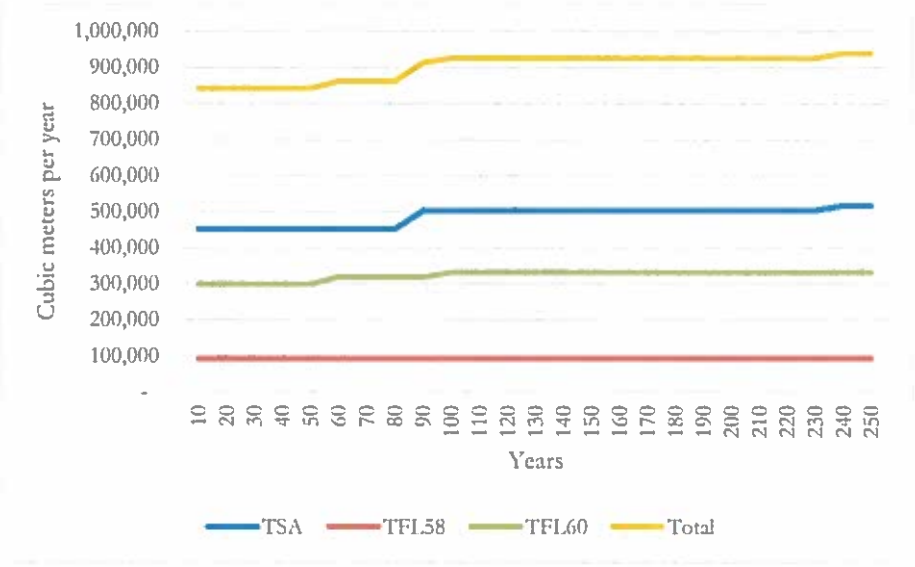

Figure 3: TSR base case harvest projection

11. Sensitivity Analysis

Over 60 sensitivity analyses were undertaken as described in the *Data Package* and *Timber Supply Analysis* reports. Types of sensitivity analysis undertaken responded to:

- Anticipated policy changes
- Reasonably foreseeable changes to markets or economic operability
- Potential changes in forest growth over time
- Potential changes in forest management strategies (e.g. rotation lengths)
- Alternative technical approaches to represent management practices and objectives.

Below is a description of some of sensitivity analysis undertaken and key findings.

Cedar sustainability

The long-term sustainability of cedar was a principle reason why the HGMC initiated this timber supply review. Aside from the high cultural value of cedar, the sustainability of western redcedar and yellow-cedar in the timber harvesting land base is a concern as the presence of cedar generally improves the economic viability of timber harvesting. Consequently, stands with higher volumes of cedar are typically targeted first for harvesting. The base case shows that timber supply from cedar stands within the timber harvesting land base will decline in all management units within Haida Gwaii from about 277,000 cubic metres per year in Year 10 to about 122,000 cubic metres in Year 40 before increasing to approximately 176,000 cubic metres annually in Year 80 (see Figure 4). The current AAC includes a maximum limit of 360,000 cubic metres per year for cedar (although at this time the only formally established partition is for the TSA - 195,000 cubic meters – since the maximum limits were being followed voluntarily in the TFLs).

6-4

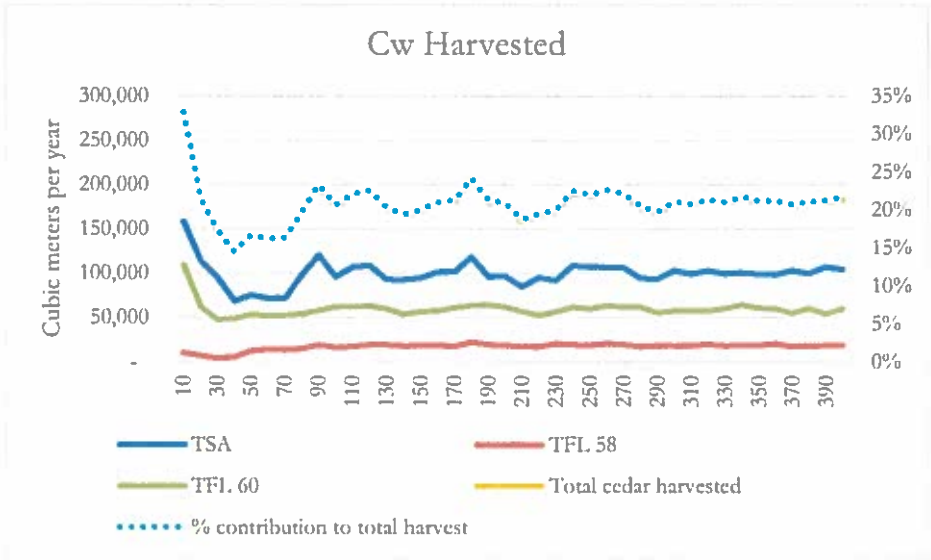

Figure 4: Base case projection of cedar volumes in the timber harvesting land base

If cedar were harvested in a manner that achieved a more or less even flow, the average amount of cedar that could be harvested annually over the entire analysis horizon would be about 146,371 cubic metres. This would allow mature/old cedar in the timber harvesting land base to last until a greater amount of second growth cedar can contribute to harvest levels. Managing cedar in this manner would result in a base case harvest levels for all species of 762,731 cubic meters per year.

Northern goshawk foraging habitat

Stads k'un *northern goshawk* was named by the Council of the Haida Nation as Haida Gwaii's national bird. Northern goshawk is a red-listed subspecies that is considered threatened by the Committee on the Status of Endangered Wildlife in Canada. A peer reviewed, published article cites the Haida Gwaii goshawk as genetically distinct from other northern goshawks. Northern goshawk nesting habitat is protected by the land use objectives with approximately 200-hectare reserves over 22 known goshawk territories. In total 3,661 hectares of known nesting habitats were excluded from the timber harvesting land base (see Table 5).

A predictive goshawk nesting territory model was used to account for 200-hectare reserves from expected goshawk territories that are not currently known. A series of sensitivity analyses explored retaining nesting reserves for predicted territories. Outside the protected areas, and the two wildlife habitat areas (noted in Section 7), northern goshawk foraging habitat is not protected. A 2015 publication concluded that territories with at least 60% suitable foraging habitat have the lowest risk of territorial abandonment based on data from Haida Gwaii and Vancouver Island. The 2018 proposed Federal *Recovery Strategy for the Northern Goshawk* also cites the importance of maintaining 65% of suitable foraging habitat per territory. A series of sensitivity analyses were undertaken to examine the timber supply implications of maintaining 65% of suitable foraging habitat for each known or predicted goshawk territory (see Table 6). This was initially applied using the Federal Recovery Plan target of 38 territories. The same analysis was applied using the 2018 Provincial Implementation Plan for northern goshawk recovery, which targets 25 territories. Lastly, a 'full occupancy' scenario assumed 67 territories as managed for nesting and foraging habitat.

G-4

	22 territories	25 territories	38 territories	67 territories
Foraging target of 65% suitable habitat and projected annual harvest level impacts relative to the base case	838,244 m^3 (0.5% reduction)	832,857 m^3 (1.2% reduction)	802,043 m^3 (4.8% reduction)	689,656 m^3 (18.2% reduction)

Table 6: Results from goshawk foraging habitat scenario

Mosquito Lake and Slatechuck watersheds

A 2015 Haida House of Assembly resolution designated Mosquito Lake watershed as an area of importance to be placed under the protection of the Council of the Haida Nation. The watershed is currently within the TSA on northern Moresby Island. A sensitivity analysis was undertaken to examine the removal of the watershed from the timber harvesting land base.

Slatechuck or *Tllgaduu* is a watershed and mountain east of the Village of Queen Charlotte whose creek, *Tllgaduu Gandlaay*, empties into Skidegate Inlet, to the ancient village of *Tllgadaaw Llnagaay*. The argillite deposits found in the watershed are the focus of a sacred quarry that the Haida Nation has traditionally used to access high quality argillite for carving. The quarry is protected by an 18-hectare federal reserve. Recent proposals for timber harvesting within the watershed outside the quarry reserve have been met with opposition by the Council of the Haida Nation. A sensitivity analysis was therefore undertaken to assess the implications of removing the watershed from the timber harvesting land base.

For Mosquito Lake there was a 19,800 m^3 or 2.3% decrease from the base case that results from a 1,845 hectare reduction from the THLB. For Slatechuck there was an 5,450 m^3 or 0.6% decrease from the base case that results from a 203 ha reduction of the THLB.

Economic operability

The 'operable area' in which licensees are able to harvest economically is subject to uncertainty. In some cases, harvesting has taken place in areas previously assumed to be inoperable, and some areas assumed operable have proved to be too expensive to harvest. If the assumed economically operable area is over-estimated, then the modelled timber supply would not be sustainable. For the base case, the timber supply review incorporated an economic operability assessment through a relative cost and marginal value model. The model incorporates costing surrogates (roads) and value surrogates (dynamic stand values) that approximate operational limitations. The relative stand values were derived from: (a) harvested stands in Haida Gwaii; and (b) log market prices. The base case assumed average log market prices when defining economic operability. Sensitivity analyses explored using high (strong) and low (weak) markets between 2008 to 2017, to assess impacts on operability and timber supply. These resulted in an approximate +/- 3.4% change in timber supply.

Another sensitivity analysis treated isolated areas, namely Sewell Inlet, Peel Inlet and Louise Island, as distinct timber supply units to assess the implications if any of these areas were partitioned in an AAC determination. Collectively these areas contribute 118,937 m^3 annually to the harvest projections. Approximately 77,624 m^3, representing 17% of the volume of the TSA and 40,550 m^3 or 14% of the volume of TFL 60.

Minimum harvestable age

For timber supply analysis, estimates are made when trees will reach a harvestable condition. Mean annual increment (MAI) is a measure of the volume grown annually. Culmination mean annual increment (CMAI) is the age at which the average productivity of a stand is at the maximum. Viewed over many stands,

harvesting at or near the age of CMAI would produce the maximum long-term timber supply. Due to harvest flow requirements, setting a timber supply model to CMAI tends to force the model to harvest a stand after CMAI. Therefore, for this factor, the minimum harvest age was set in the base case to when 95% of CMAI is achieved. Minimum harvest volumes is another factor addressed in the timber supply analysis where a minimum volume of 250 cubic metres per year was assumed in the base case; this factor can increase the minimum age before a stand is harvested beyond 95% of CMAI.

There is some uncertainty regarding what the minimum harvestable ages in reality should be. There were several sensitivity analyses that examined uncertainty in this factor. For example, one sensitivity analysis set the economic harvest rotation based on a 30 cm minimum stand diameter where the minimum age was lowered for those analysis units that met the minimum diameter before CMAI, otherwise the minimum harvest age was kept at 95% of CMAI (as per base case). This resulted a 3.5% (29,837 m^3) decrease in timber supply.

Another sensitivity analysis examined extending the rotation age to better represent natural forest age distributions on Haida Gwaii, and to increase log quality, increase carbon sequestration, and improve habitat conditions for late seral dependent wildlife. In this scenario, all existing and future managed stands had a minimum harvest age set to 150 years or maintained CMAI age if it was over 150 years. A reason for exploring this scenario is that most stands 150 years of age or older have log grade characteristics similar to old forests. This resulted in a 79% (667,837 m^3) decrease in timber supply.

Community Forest

The Province has been in negotiations with the Communities of Haida Gwaii towards the establishment of a Community Forest Agreement (CFA) from portions of the TSA. The Minister has apportioned 80,000 cubic metres of the TSA's AAC for the proposed Community Forest. The Council of the Haida Nation continues to support the establishment of an area-based Community Forest. In 2017, the Province made a formal offer of a Community Forest tenure that included a reduced volume condition and legal partnership with BC Timber Sales. While the offer has not been accepted, a sensitivity analysis was undertaken to assess the timber supply implications if that 2017 offer proceeded and the area was deleted from the TSA.

The proposed CFA area would sustain a harvest of 48,325 m^3 per year and result in a 1.6% decrease in overall timber supply on Haida Gwaii. Overall this would amount to a 13% reduction to the volume of the TSA (as the volume would be shifted into the CFA).

First Nations Woodland Licence

In 2011, the Council of the Haida Nation became the forest manager of TFL 60 and also have a commitment for an area based First Nations Woodland Licence (FNWL) tenure over the area currently within the TSA managed under Forest Licence to Cut (A87661). The Province, Council of the Haida Nation, and Taan Forest Products have been negotiating the creation of an expanded First Nations Woodland Licence that would effectively merge TFL 60 and the original area of the First Nation woodland licence invitation, currently managed under the Forest Licence to Cut. Taan Forest Products manages both tenures as if they were one already (e.g. in the submission of one Forest Stewardship Plan). A sensitivity analysis was therefore undertaken to assess the timber supply implications of merging TFL 60 and the area identified for the first nations woodland licence into one management unit. The timber supply implications potentially affect both the proposed expanded First Nations Woodland Licence and the reduced TSA, and therefore the Haida Gwaii AAC overall in terms of meeting even flow annual harvest levels for each management unit.

The proposed FNWL area would sustain a harvest of 489,025 m^3 per year and a 1.4% increase in overall timber supply on Haida Gwaii. Overall this would amount to 39% reduction to the volume of the TSA (as the volume would be shifted into the FNWL).

12. Next steps

After the public review and comment period is complete, the HGMC will review feedback and, based on the feedback, will determine if further timber supply analysis is required ahead of a determination. A determination, which considers the timber supply methods and inputs, analysis results, socio-economic assessments as well as industry and public feedback will follow.
This AAC determination, and the rationale to support it, will then be published and provided to the Chief Forester to support the Chief Forester's subsequent determination for the three management units on Haida Gwaii (TSA, TFL 58, TFL 60).

13. Your Feedback is Needed

Information provided by local and interested people is of major importance in the considerations that support AAC determinations. Your personal experience and knowledge of a particular area may be essential to a well-informed determination, particularly if something significant has been overlooked in the information under consideration. Your feedback is welcomed on any aspect of this discussion paper, on any other issue related to the timber supply, or on any other matter you feel the HGMC and the provincial Chief Forester should account for in making their AAC determinations.

If interested, you can view the timber supply data package report, timber supply analysis report, and the socio-economic analysis report at the HGMC website at www.haidagwaiimanagementcouncil.ca.

This is your opportunity to provide input on the HGMC's Haida Gwaii AAC determination as well as the Chief Forester's AAC determinations for the TSA and TFLs. There will not be a separate public consultation process for the Chief Forester's determinations.

The HGMC will be pleased to hear from you and to answer questions to help you prepare your response.

Please send your written comments via e-mail to: admin@haidagwaiimanagementcouncil.ca or to PO Box 589 Masset, Haida Gwaii, BC V0T 1M0.

In the interest of keeping the AAC determination on schedule, it would be appreciated if we can receive your comments by the **end of the Public Review and Comment Period, on January 14, 2020.**

You may identify yourself in your response if you wish; please note that all responses may be made public under the *Freedom of Information and Protection of Privacy Act*, but if the responses are made public, personal identifiers will be removed before the responses are released.

For more information, please contact the Haida Gwaii Management Council at:
admin@haidagwaiimanagementcouncil.ca
Or, write to: **PO Box 589 Masset, Haida Gwaii, BC V0T 1M0**

Haida Gwaii Timber Supply Review Analysis Report

Haida Gwaii Timber Supply Review Technical Working Group Report for the Haida Gwaii Management Council
2019

6-4

Date
November 2019

Citation
Technical Working Group. 2019. Haida Gwaii Timber Supply Review Analysis Report. Report for the Haida Gwaii Management Council. Old Massett, Haida Gwaii, B.C.

The Technical Working Group (TWG) was co-chaired by Nick Reynolds, RPF (CHN) and Christine Fletcher, RPF (Forest Analysis and Inventory Branch), and included members David Stuart, RPF (Forest Analysis and Inventory Branch) and Sean Muise, RPF (Haida Gwaii Natural Resource District) and Ted McRae (Forest Analysis and Inventory Branch). The TWG received substantial and invaluable support from Dr. Andrew Fall (Gowlland Technologies).

Contents

G-H

Executive Summary

This report details the results from the analysis to support the 2019 Haida Gwaii Timber Supply Review and Allowable Annual Cut determination by the Haida Gwaii Management Council for Haida Gwaii. Results from these analyses are intended to further support the Chief Forester's Determinations for Tree Farm Licence 60, Tree Farm Licence 58, and the Timber Supply Area #25. The Haida Gwaii Timber Supply Review Data Package (referred to herein as the Data Package) offers details on model inputs and assumptions that were used in this analysis.

The long-term Timber Harvesting Land Base (THLB) is anticipated to be approximately 147,746 hectares, or approximately 51% of the area of Haida Gwaii. The area-weighted mean annual increment across all of the THLB is approximately 7.5 m^3 per year.
The base case reference projection follows a non-declining flow. For the first 100 years, the level is 842,781 m^3/year, which is projected to increase to 926,600 m^3/year at that time, and then to 939,700 m^3/year after 240 years. The base case reference results in a major decline in the contribution from old or existing natural forest until decade 8, signifying a transition to managed forest/second growth on the Timber Harvesting Land Base.

The amount of cedar being logged has been in decline since the 1990's, however its percentage contribution to the annual cut has been relatively stable (see figure 1.2.4), hovering around 50% of the cut. Currently, most of the cedar in the THLB on Haida Gwaii is mature and old (figure 1.1.1). The contribution to the projected harvest level from cedar (both western red cedar and yellow cedar) is anticipated to continue to decline until decade 4. Its current contribution to the cut across all forest tenures (since the cedar partition in 2017) is approximately 40%, this is anticipated to decline to 22% in 20 years, 14% in 40 years before stabilizing at 20% in 80 years. In contrast, the cedar growing stock, which represents second growth cedar in the THLB, is expected to increase from its current amount of approximately 337,900 m^3 to 3.3 million m^3 by decade 4, 6.7 million m^3 by decade 8 and then stabilizing at over 10 million m^3 by decade 20.

Managing mature and old cedar so there is a non-declining or even flow would amount to managing the current mature/old forest within the THLB until second growth cedar stands have regrown to a merchantable age. In effect this amounts to determining a long-term harvest level for cedar. An even flow harvest level for cedar results in a harvest of cedar not exceeding 146,371 m^3 annually for all of Haida Gwaii. This results in an overall even-flow harvest level (all species) of 762,731 m^3 for all management units.

A series of timber supply scenarios were completed and documented in this report to explore alternatives in policy, markets and forest operations. Some key findings include:

Isolated operating areas, especially those that are considered difficult to access with a high proportion of young second growth forest, such as Peel/ Sewell Inlets and Louise island contribute 77,624 m^3/year to the projection in the TSA and 40,550 m^3/year in TFL 60.

Managing Northern Goshawk nesting habitat to the Federal Recovery Strategy targets, which aim for 38 active territories, would result in a 1.3% reduction in timber supply, while managing nesting habitat while assuming full territory occupation (67 territories) would result in a 1.8% decrease in timber supply, amounting to 827,344 m^3/year.
Managing Norther Goshawk foraging habitat to the Federal Recovery Strategy targets, whereby 5,564 hectares of suitable habitat is retained or recruited for 38 territories, would result in a 4.8% reduction in timber supply.

Extending rotation ages (the time before a forest is logged) up to a minimum of 150 years, when log qualities begin to approximate old forest grades, results in a 79% (667,837m^3/year) reduction in timber supply. Conversely, shortening the rotation based on economic criteria also reduces the timber supply, resulting in a 3.5% (29,837 m^3/year) reduction in timber supply.

G-4

The exclusion of the Mosquito Lake Watershed or Slatechuck Creek from the Timber Harvesting Land Base results in a 3% (25,250 m^3) reduction in timber supply.
Approximately 60 sensitivity analyses were conducted for this timber supply review, with the majority of results presented in this report.

Introduction
The analysis report details the results from the 2019 Haida Gwaii Timber Supply Review (TSR) analysis. The Haida Gwaii Management Council (HGMC) has the responsibility for setting the Allowable Annual Cut for Haida Gwaii and has tasked a technical working group (TWG) made up of technical representatives for the Council of the Haida Nation and the Province of BC. The Haida Gwaii TSR Data Package provides in depth background on the process, inputs and methods used in the timber supply analysis. This report focusses exclusively on the results of those analyses to support both the HGMC and the Chief Forester in their subsequent determinations for the Allowable Annual Cut on Haida Gwaii.

The report begins with descriptive statistics of the state of forests on Haida Gwaii as well as reporting on a series of indicators that illustrate model performance over time. These are supported by the results of 60 separate model scenarios, known as sensitivity analyses, to explore a variety of uncertainties. All of the model scenarios have been completed using a spatial computer model. This model uses the *Spatial Timber Supply* software which is a module of the *Spatially Explicit Lanscape Event Simulator* (SELES). Modelling forest management tends to extend over huge time periods as a result of the long-life of trees. In this timber supply analysis, the 'planning horizon' is 400 years. While there are major uncertainties in how resources will be managed in coming decades, the 400-year timeframe helps ensure there aren't shortfalls, pinch points or 'crashes' in forest inventory when analyzing different rates of cut over time.
These long-term uncertainties can in part be addressed by renewed timber supply analyses every 10 years or less.

TSRs include the technical analyses and reporting, consultations (public, stakeholders, licensees) as well as the determination process. **This Analysis Report is only that part of the TSR that reports on the results of the timber supply analysis.**

Other key documents that support the TSR process include:
(i) The Data Package: the documentation of inputs and approaches used in the timber supply analysis;
(ii) A Public Discussion Paper: An amalgamation of key timber supply inputs, approaches and findings, as well as a description of the TSR process and timelines;
(iii) A Socio-Economic Analysis Report: a detailed socio-economic evaluation of the forest industry on Haida Gwaii;
(iv) The AAC rationales: The final determination document by decision makers that sets the AAC.

1.0 Base case reference scenario

In timber supply analysis it is common to create a model scenario that best reflects the current inventory, area available for logging (known as the Timber Harvesting Landbase), tree growth rates and current practice as defined by current forest management policy. This scenario is often called the 'base case'. For this timber supply analysis, the base case is best considered a *reference* scenario that can be used to compare the results from the variety of *sensitivity* scenarios. While the base case is an important point of reference, by no means should it be construed as an *AAC*, which in turn is a decision that will account for a large variety of factors, including public feedback, that will be considered to address uncertainties.

Some key inputs and methods in the timber supply review include:

- The newest and seamless Vegetation Resource Inventory data as well as key inventory attributes from LiDAR (termed LiDAR Enhanced Forest Inventory, or LEFI) and detailed silviculture records (RESULTS), formed the basis for forest inventory;
- Tree age and height relationships (site index) were based on ecological and forest mensuration plot data that was regionally specific to Haida Gwaii (enhanced SIBEC);
- Updated ecosystem mapping informed site productivity estimates;
- Growth and yield models (VDYP7 and TIPSY 4.4), developed by the Forest Analysis and Inventory Branch, were used to model stand growth over time;
- Aside from LEFI, LiDAR data was used to map fans and floodplains and update certain areas for terrain stability mapping;
- Natural disturbance factors, such as windthrow and landslides, were stochastically and spatially incorporated into timber supply modelling;
- Haida Gwaii Land Use Objectives Order (HGLUOO) and all other forestry regulations were applied in the model environment.
- A spatially explicit Timber Harvesting Land Base was developed and used in this timber supply analysis;
- Where possible, regionally specific empirical information was used to inform inputs and methods;
- The Spatial Timber Supply Model which runs on the SELES software platform was used;
- A non-declining flow, whereby the long-term harvest level at the end of the planning period (400 years) is the same as the beginning, was used in this timber supply analysis;
- Harvest criteria where stands can only be harvested at age where the volume is within 95% of the Culmination Mean Annual Increment and if stands are over 250m^3 per hectare.

The Data Package provides a detailed record of inputs and methods used. Appendix 8 of the Data Package summarizes inputs and methods applied within this TSR analysis.

Towards the end of this analysis, the policy for how monumental cedar are classified was changed. This change was through a deliberative process towards amending the *Cultural Features Identification* (CFI) *Standards* manual (v.5). The amendments, administered through the Council of the Haida Nation, were mandated by a Haida House of Assembly Resolution and direction from the Hereditary Chiefs Council to better align the classification of monumental cedar with cultural practice and use. Through consultation with Haida experts, carvers and CFI surveyors, the classification was refined to minimize subjectivity and better represent past use and current cultural practice. Defining cultural features is a responsibility of the Haida Nation. Identifying those cultural features in forest management is also the authority of the Haida Nation, as described in section 4 of the Haida Gwaii Land Use Objectives Order. The management of those features are jointly determined through the Haida Gwaii Land Use Objectives Order, which in turn is authorized by the Haida Gwaii Management Council. This new standard for monumental tree identification will impact the amount of monumental cedar that is required to be retained under the LUOO. Because this is considered current policy, the base case now reflects this new management approach.

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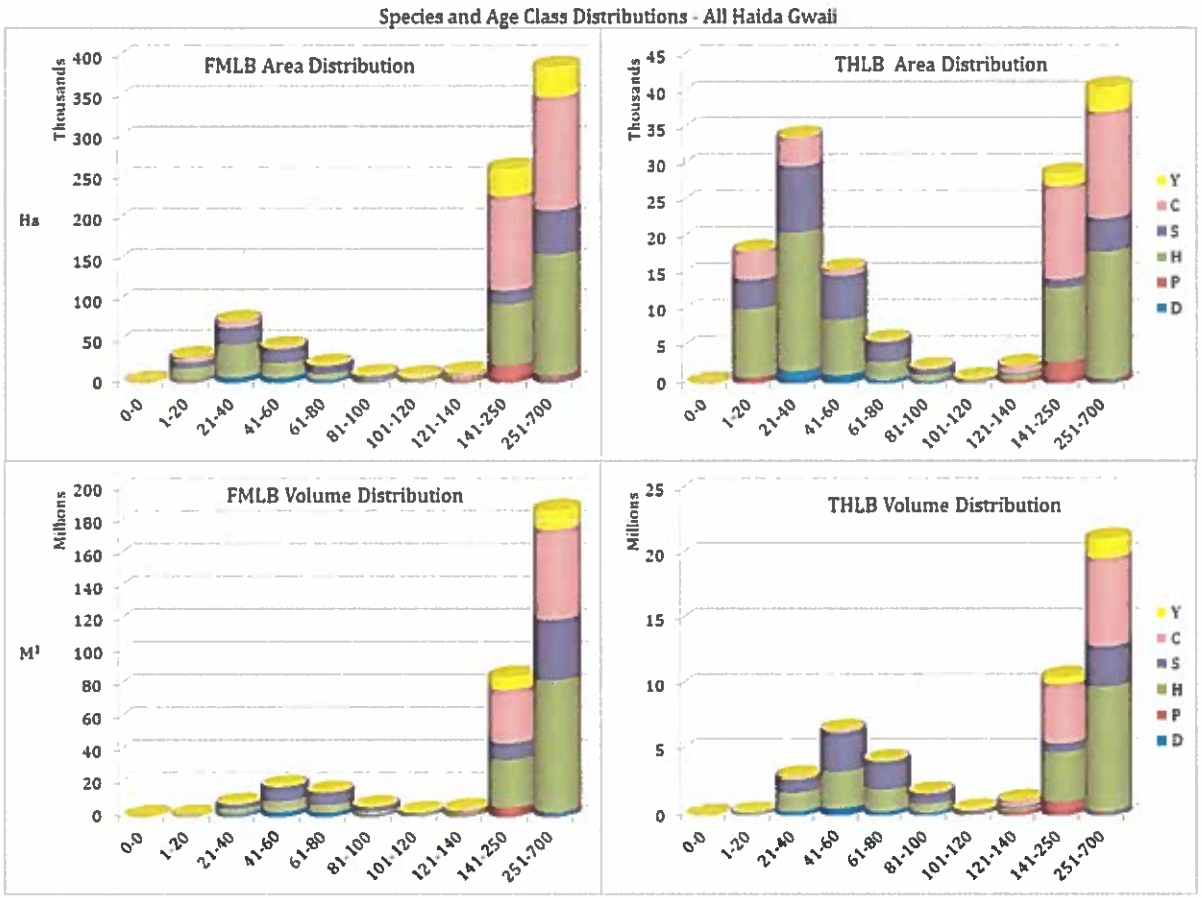

Figure 1.1.1. Tree species and ages for the forested area of Haida Gwaii (Forest Managed Land Base) and the Timber Harvesting Land Base (THLB), expressed in area (hectares) and volume (m^3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

While protected areas cover approximately 50% of Haida Gwaii, approximately 89% of the area and 88% of the current volume of mature and old forest (greater than 140 years) are outside of the THLB. The THLB makes up approximately 147,746 ha or 15% of Haida Gwaii. For western red cedar, approximately 87% of the current mature and old volume, accounting for the species composition of all stand types, is outside the THLB. Major species distribution gaps are evident, particularly for red and yellow cedar, in stands under 140 years old.

Within the THLB (across all management units), mature and old red and yellow cedar make up 42% of the volume of mature and old forests, whereas hemlock makes up 42% and Sitka spruce makes up 22% of the volume of mature and old forests.

While 53% of the THLB is second growth (under 140 years) by area, this second growth represents 35% of the volume in the THLB.

6-4

The following graphs present the same information but by management unit.

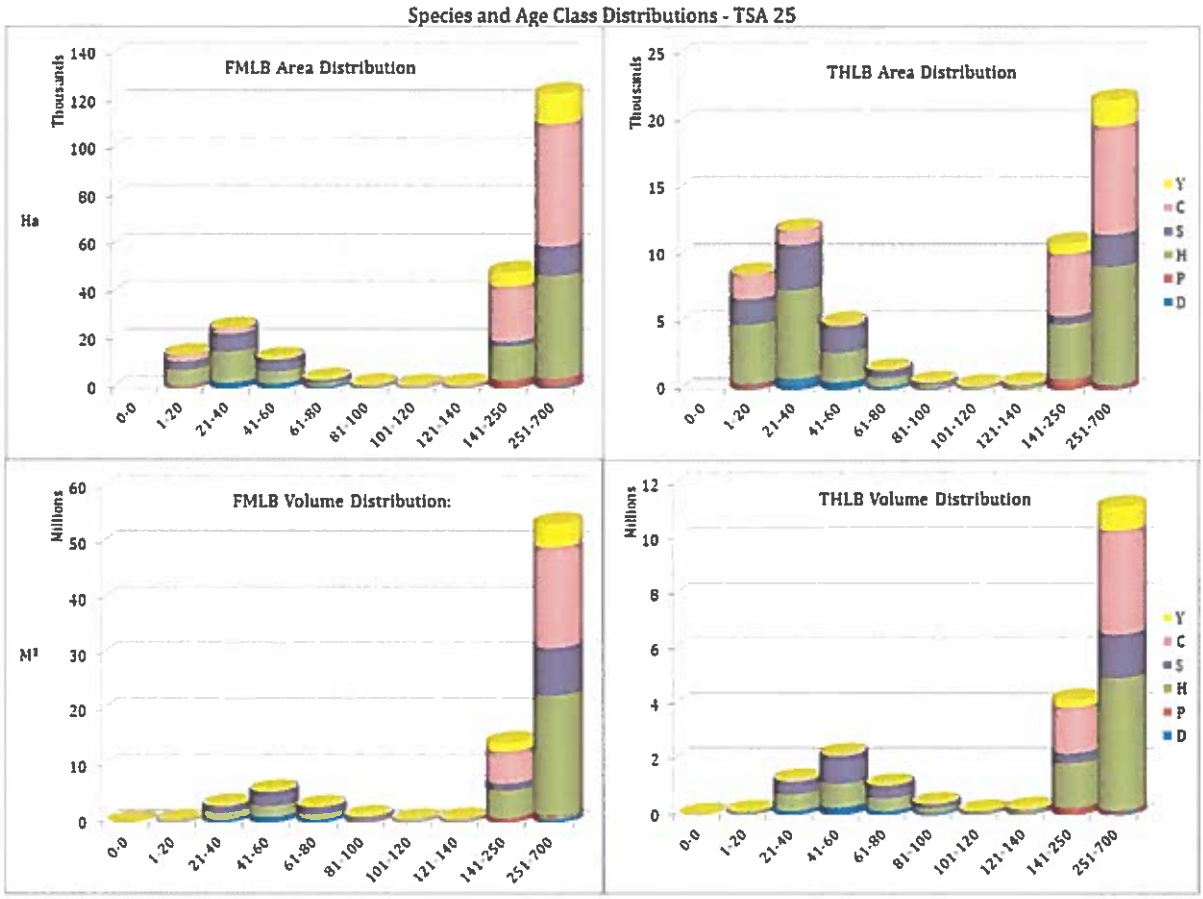

Figure 1.1.2. Tree species and ages for the forested area (FMLB) and the Timber Harvesting Land Base (THLB) for the Timber Supply Area (TSA), expressed in area (hectares) and volume (m3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

G-4

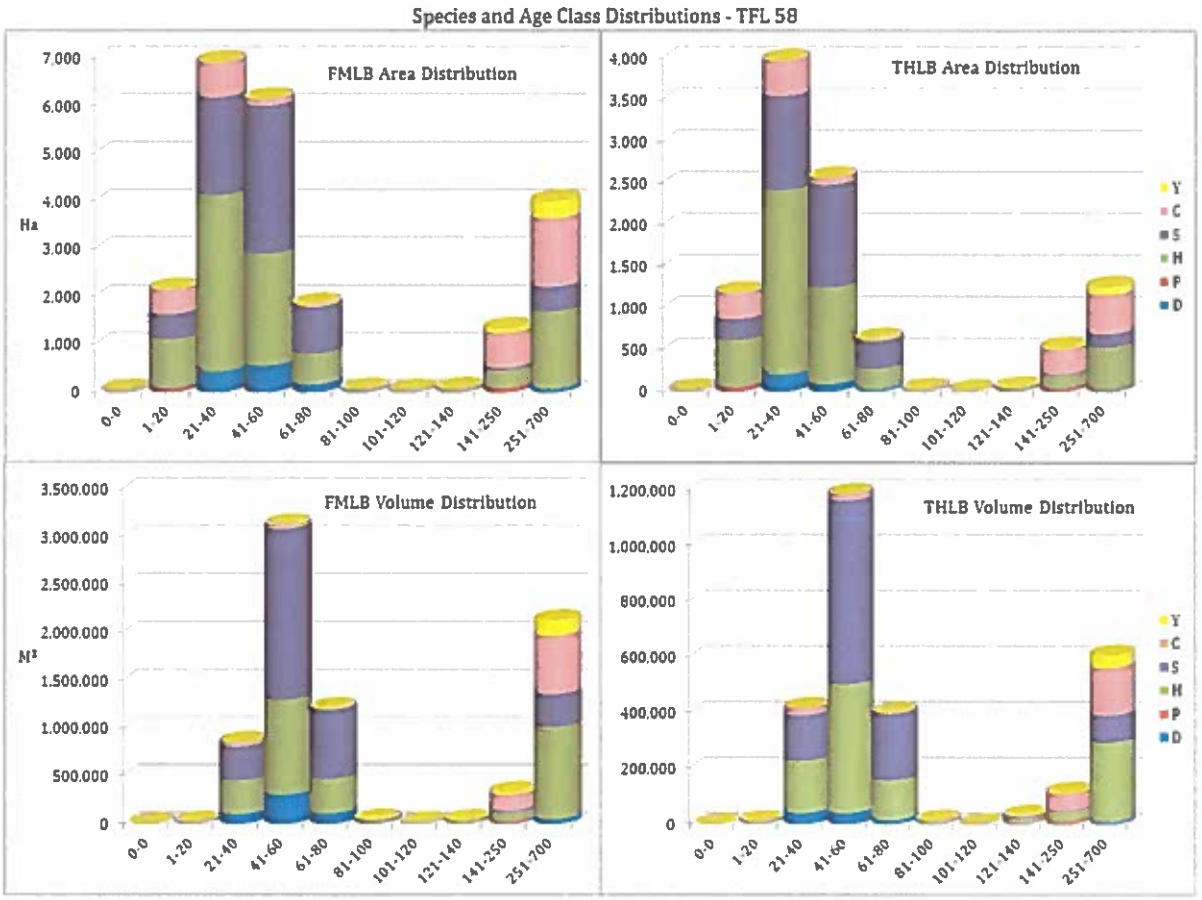

Figure 1.1.3. Tree species and ages for all the forested area (FMLB) and the Timber Harvesting Land Base (THLB) of Tree Farm Licence 58, expressed in area (hectares) and volume (m3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

6-4

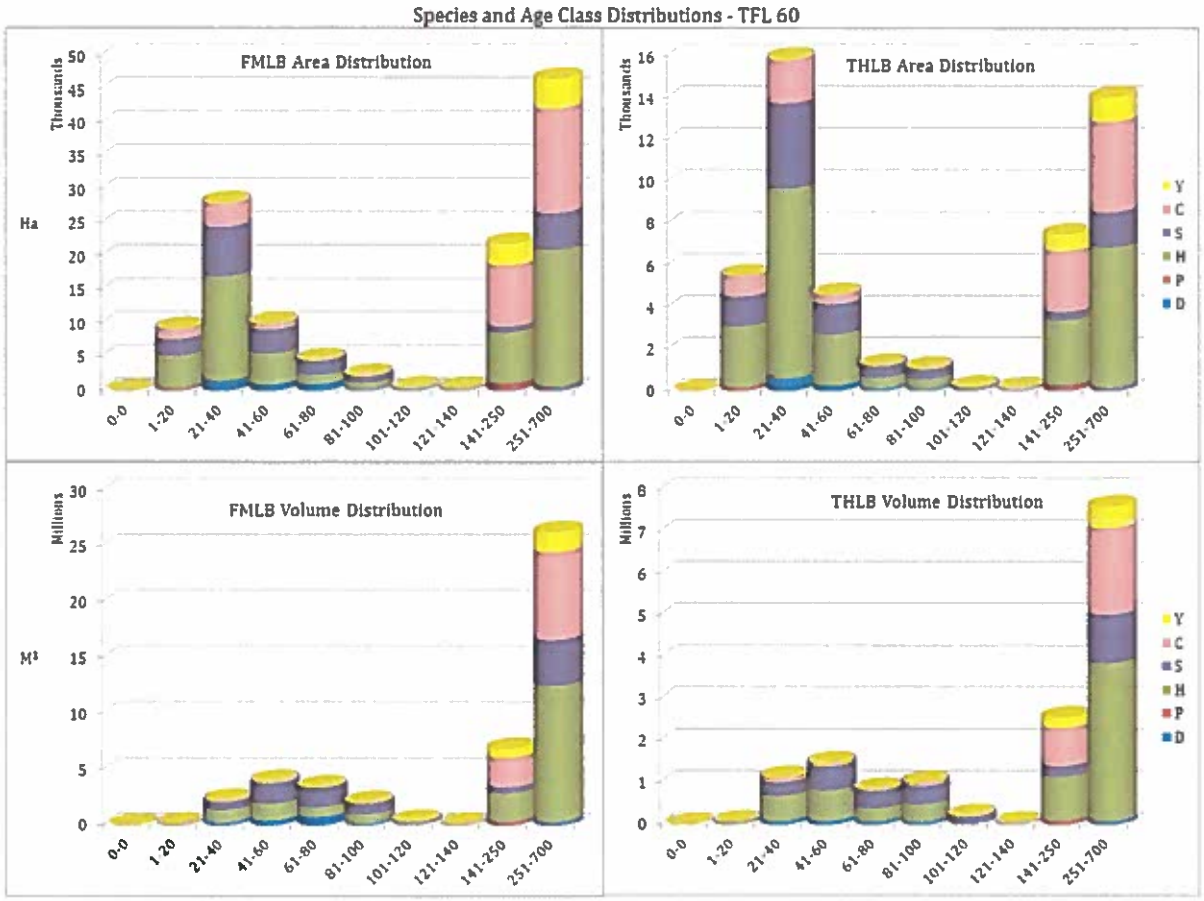

Figure 1.1.4. Tree species and ages for all the forested area (FMLB) and the Timber Harvesting Land Base (THLB) of Tree Farm Licence 60, expressed in area (hectares) and volume (m3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

6-4

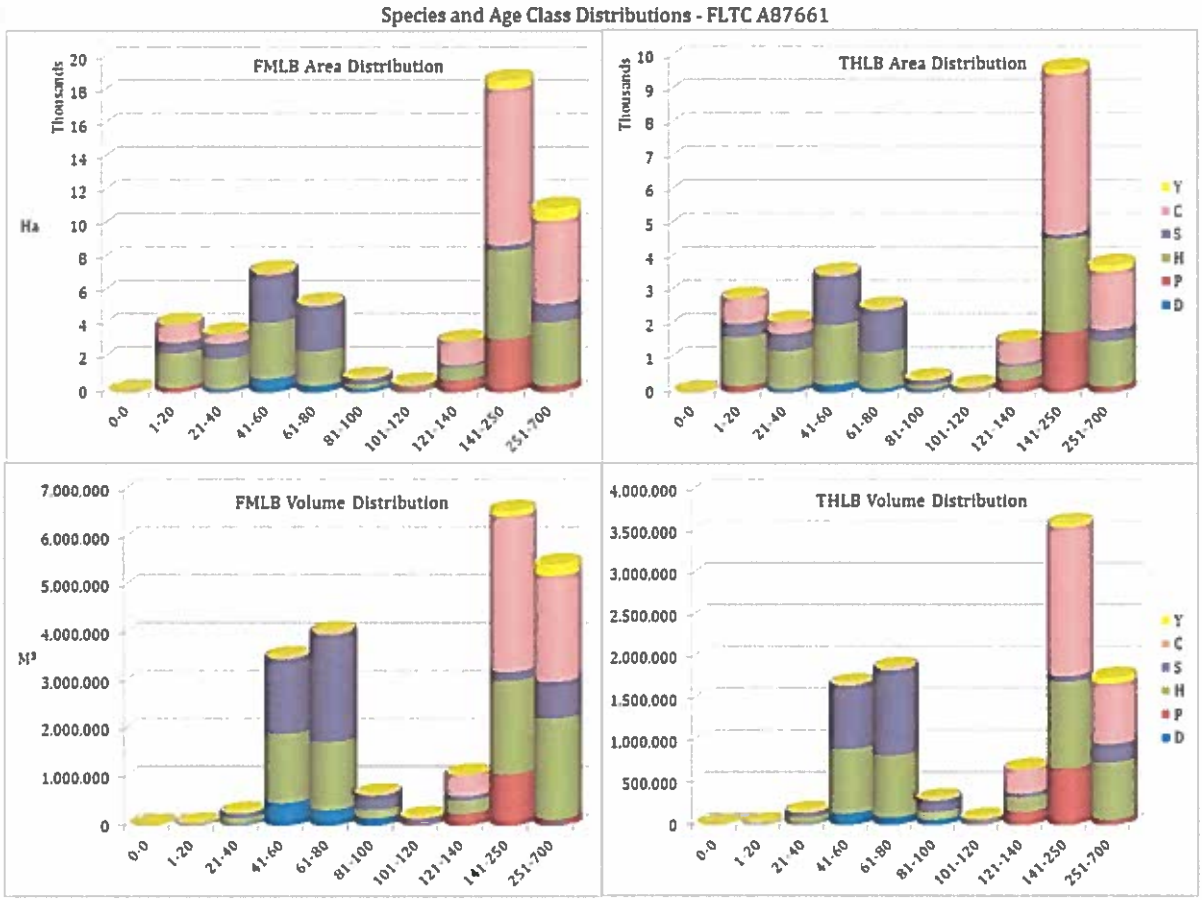

Figure 1.1.5. Tree species and ages for all the forested area (FMLB) and the Timber Harvesting Land Base (THLB) of Forest Licence to Cut A87661 (Taan Forest Products) expressed in area (hectares) and volume (m3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

G-4

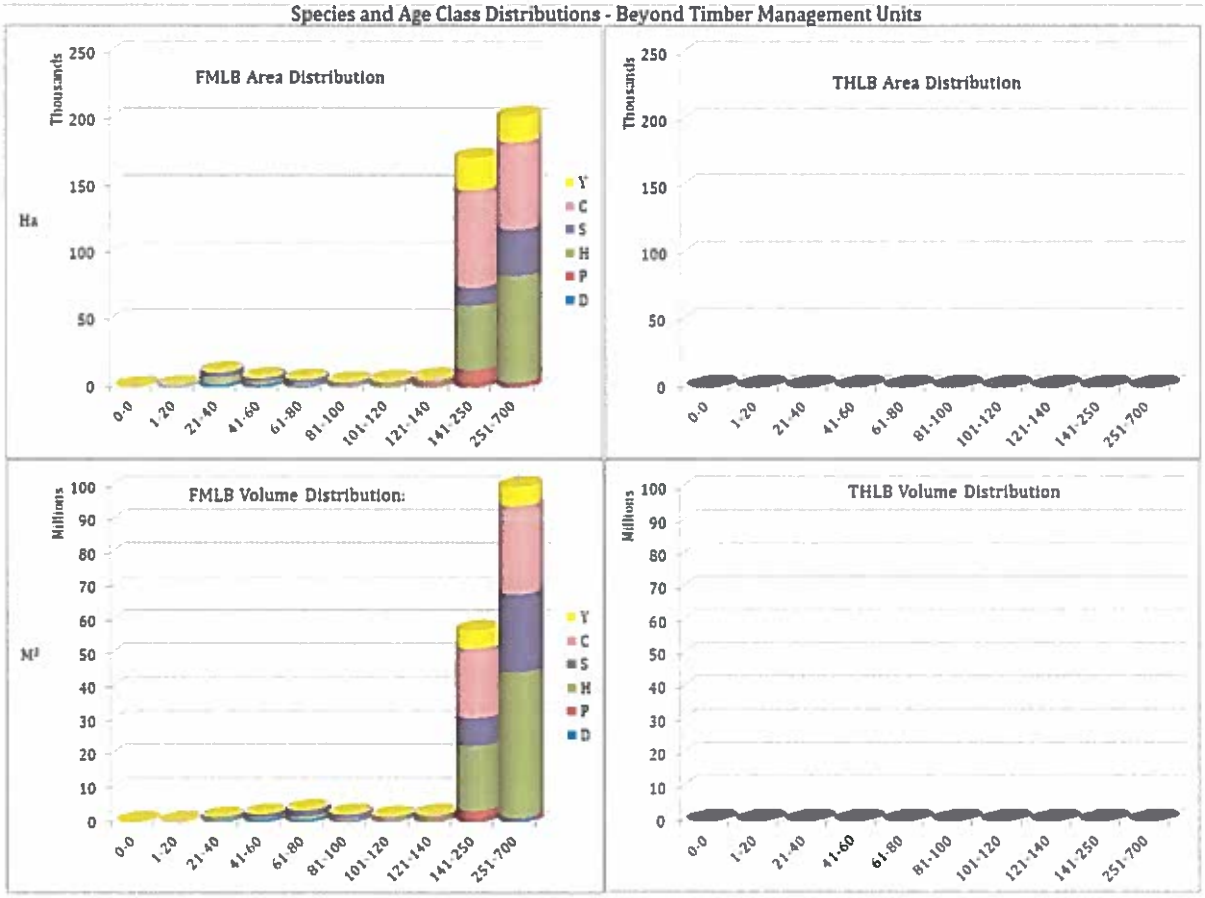

Figure 1.1.6. Tree species and ages for all the forested area (FMLB) <u>in protected areas</u>, expressed in area (hectares) and volume (m3). Y= yellow cedar, C= red cedar, S= Sitka spruce, H= hemlock, P= lodgepole pine, D= red alder.

6-4

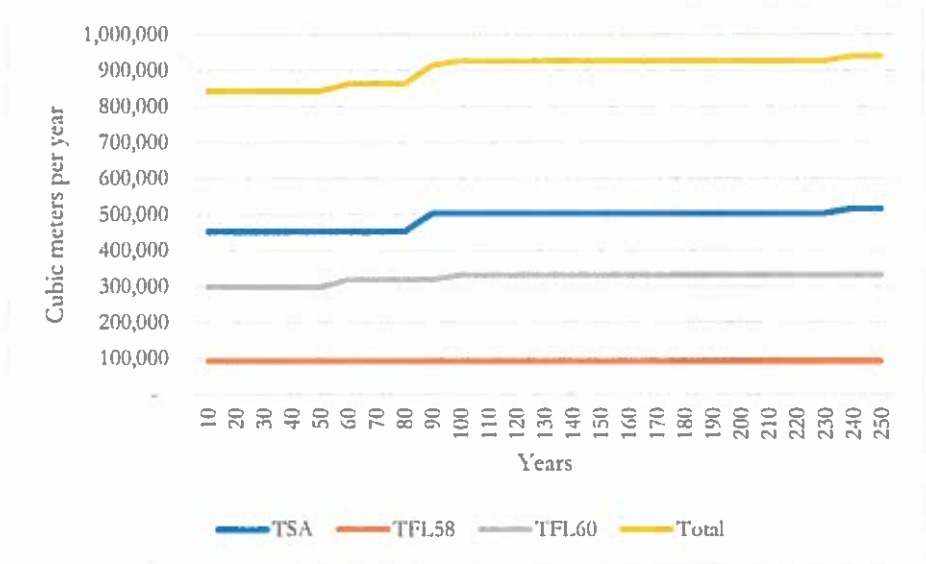

Figure1.1.7. Non-declining flow base case across all three management units.

Figure 1.1.7 illustrates a short-mid term harvest flow of 842,781 m³, with a slight increase in sustained yield between decade 8 and 9 for both TFL 60 and the TSA. This increase primarily as a result of thrifty second-growth stands coming into harvestable age. For the TSA this amounts to 425,287 m³ per year, for TFL 58 this amounts to a harvest of 91,169 m³ and for TFL 60 a harvest level of 298,325 m³. The total long-term harvest level is expected to increase to 926,600 m³ after decade 10 before another small increase to 939,700m³ in decade 24.

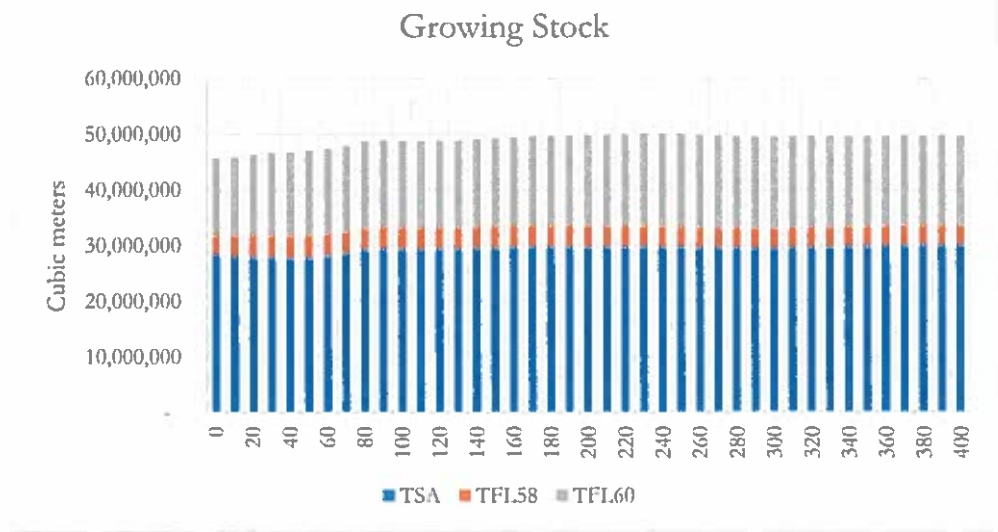

Figure1.1.8. Base case growing stock in the THLB by management unit

Growing stock, which is considered the sum of all the volume of the forest within the THLB, is expected to increase slightly until decade 88, before reaching a steady-state of approximately 49 million cubic metres by decade 8. A relatively flat growing stock is a strong indicator for a sustainable harvest level over the long term.

G-4

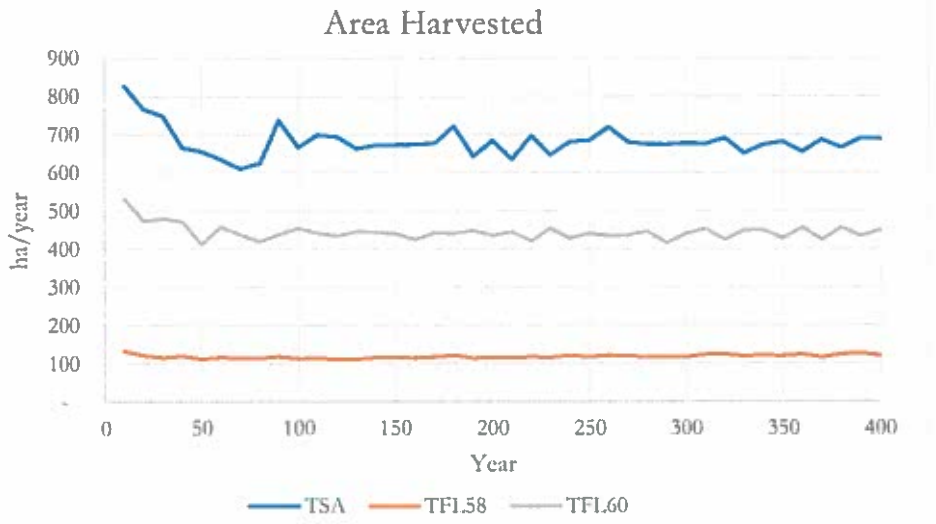

Figure 1.1.9. Base case area harvested by Management Unit over the planning horizon

The area harvested decreases for both TFL 60 and the TSA until decade 8 (figure 1.1.9). This decrease is because of more second growth coming online in these units. Second growth generally have higher volumes per hectare, resulting in less area harvested but maintaining consistent volumes harvested. TFL 58's harvest profile is primarily second growth from the beginning of the planning period and subsequently has a relatively stable ha/year harvested.

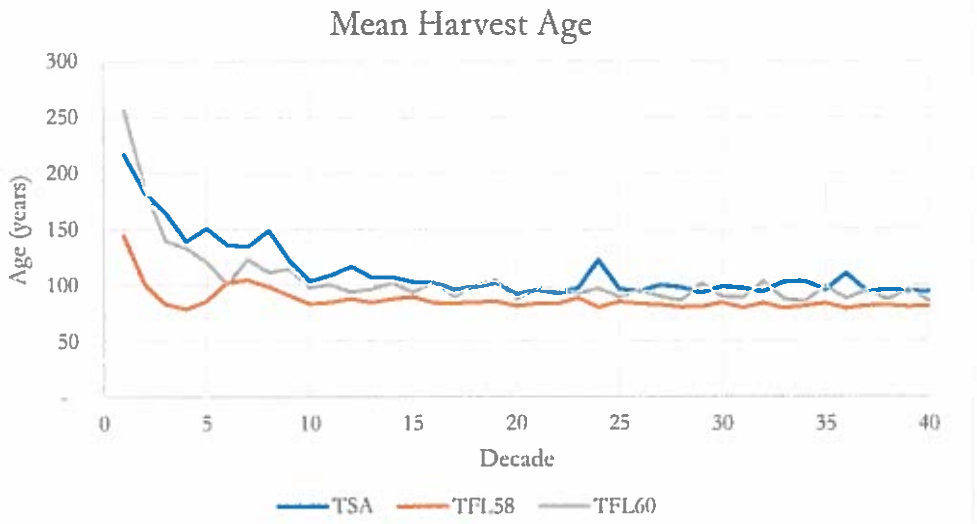

Figure 1.1.10. Base case mean harvest age by Management Unit over the planning horizon

The modelled mean harvest age declines for the first 10 decades (figure 1.1.10), representing the transition from older forest to second growth, before settling on long-term averages ranging from 80-100 years. TFL 58 has consistently younger mean harvest ages as a result of that management unit having generally higher productivity (stands reach Culmination Age sooner).

G-4

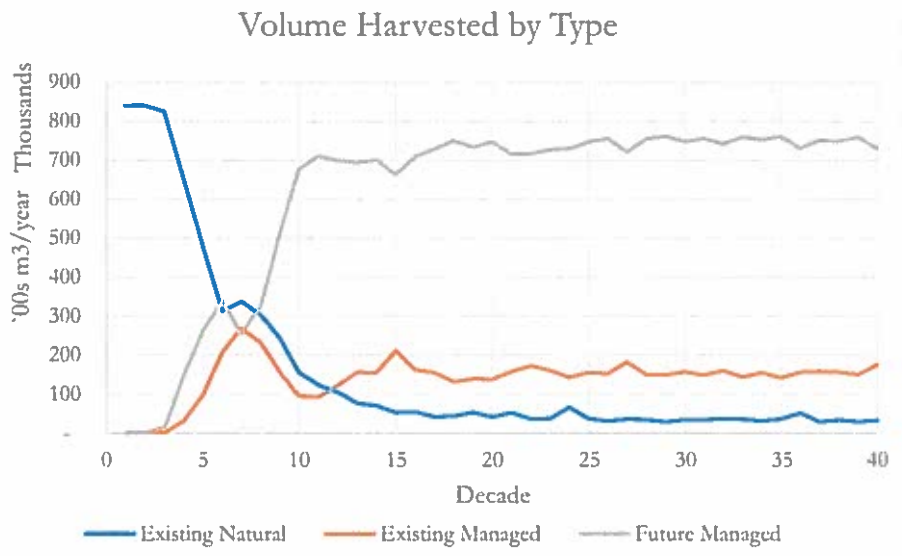

Figure1.1.11. Base case volume harvested by growth and yield curve category. Existing Natural (VDYP model), Existing Managed and Future Managed stands (TIPSY).

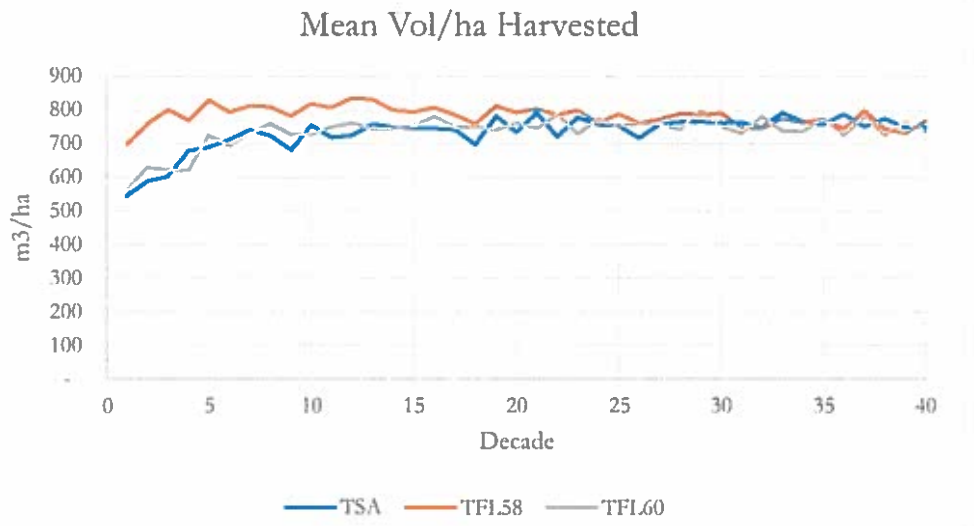

Figure1.1.12. Base case mean volume per hectare harvested by Management Unit over the planning horizon.

All units see an increase in m^3 per hectare harvested over time, which is a function of an increased proportion of second growth harvest over time.

Section 7.6 of the data package describes the application of a relative value model for tracking value as opposed to volume over time and guiding harvest preference in the timber supply model to better reflect current and anticipated future harvest planning. A relative value index, derived from average market prices by species between 2008-2017 and linked to forest inventory, helps gauge relative market values (as a relative index, not dollar value) over time in figure 1.1.13.

G-4

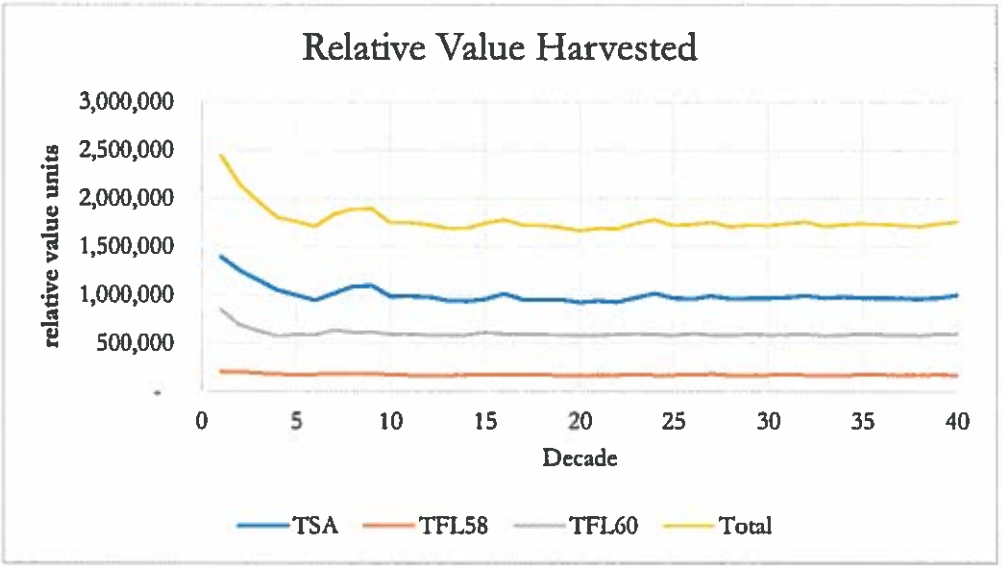

Figure 1.1.13. Relative value associated with harvest over time, based on market value indices from 2008-2017.

The anticipated trend in relative value is anticipated to decline, contrasting with the overall non-decline in volume. This decline is associated with the decrease in existing natural cedar volume in the base case.

Understanding the projected age class distribution provides insight into the projected reliance on existing natural (old) forest versus second growth forest over time. The following three charts illustrates projected harvest by age class and by management over the planning horizon.

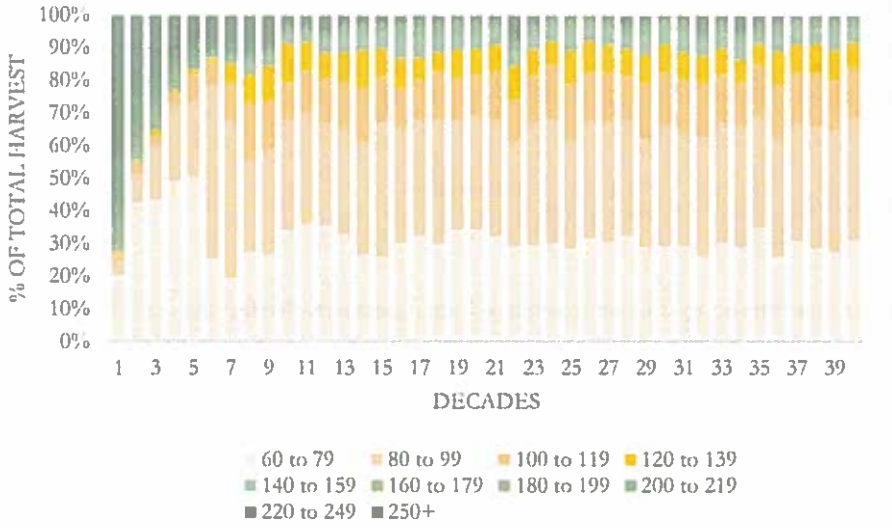

Figure 1.1.14. Harvest age class distribution by 20-year forest age increments over 40 decades for all the management units on Haida Gwaii.

6-4

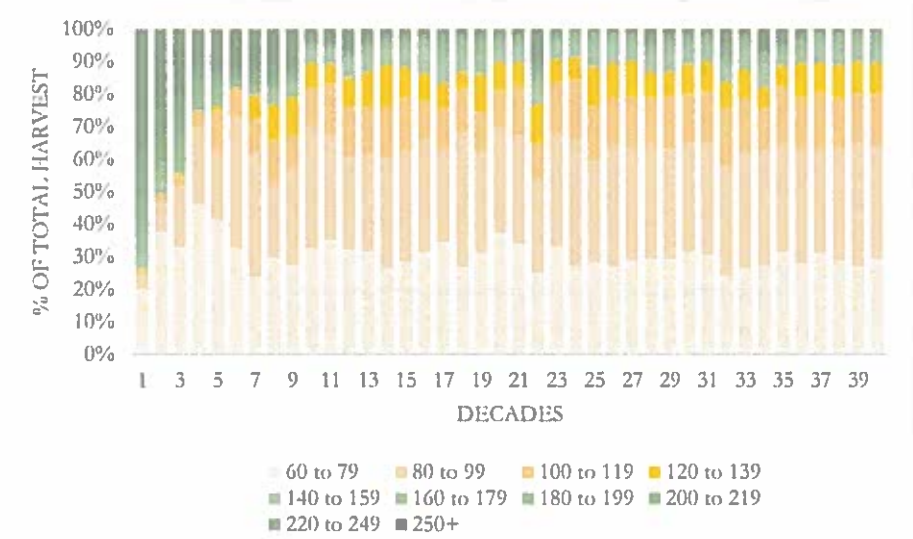

Figure 1.1.15. Harvest age class distribution by 20-year forest age increments over 40 decades for the TSA.

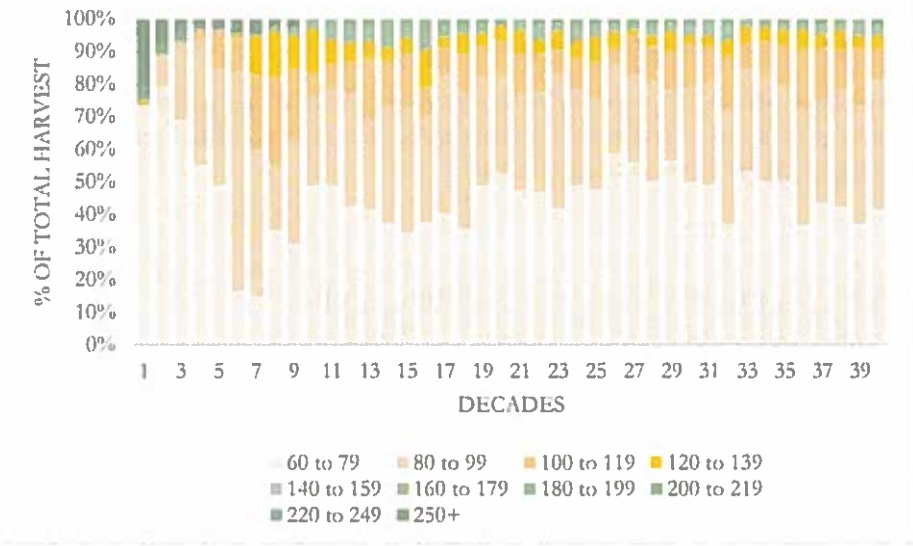

Figure 1.1.16. Harvest age class distribution by 20-year forest age increments over 40 decades for TFL 58.

G-4

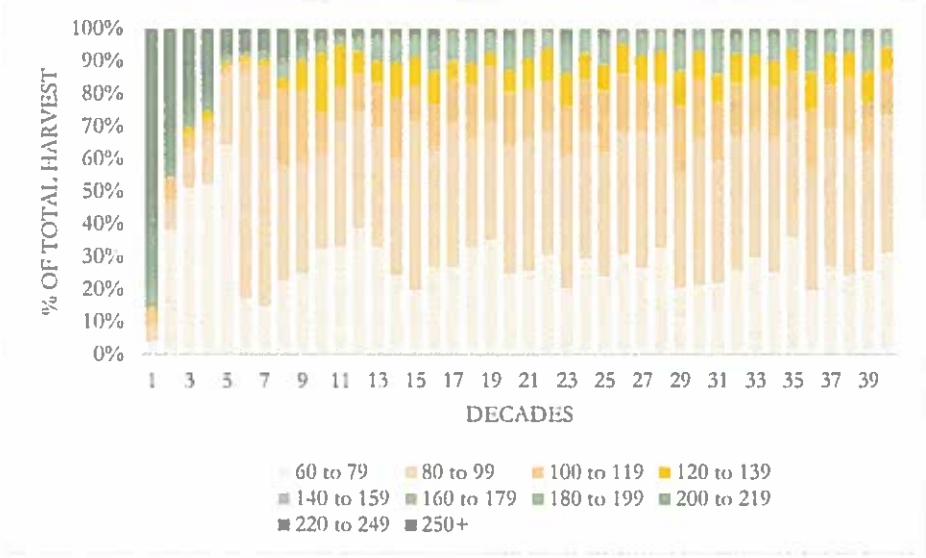

Figure 1.1.17. Harvest age class distribution by 20-year forest age increments over 40 decades for TFL 60.

1.2 Cedar harvest over time (base case)

Particular attention has been paid to the amount and timing of cedar harvest for this timber supply analysis. For both the base case reference scenario and the supporting sensitivity analyses, the species contribution was calculated using the percentage contribution by species in the inventory (not just leading species). Inventories are made up of complex polygons, typically attributing three or more species and their proportions in each polygon. Considering the social, cultural and economic importance of cedar it was deemed important to quantify all the species within a polygon, especially as cedar often is a secondary species.

Throughout this section cedar refers to western red (Cw) unless otherwise specified.

Figure 1.2.1. Base case cedar growing stock by existing natural and managed stands over time on the THLB.

6-4

In the base case reference scenario, cedar growing stock, which represents all the forest volume of cedar in the THLB, declines to decade 4, before increasing and stabilizing to just over 10 million m^3 by decade 8.

This same information is presented in figure 1.2.2 and 1.2.3 by management units.

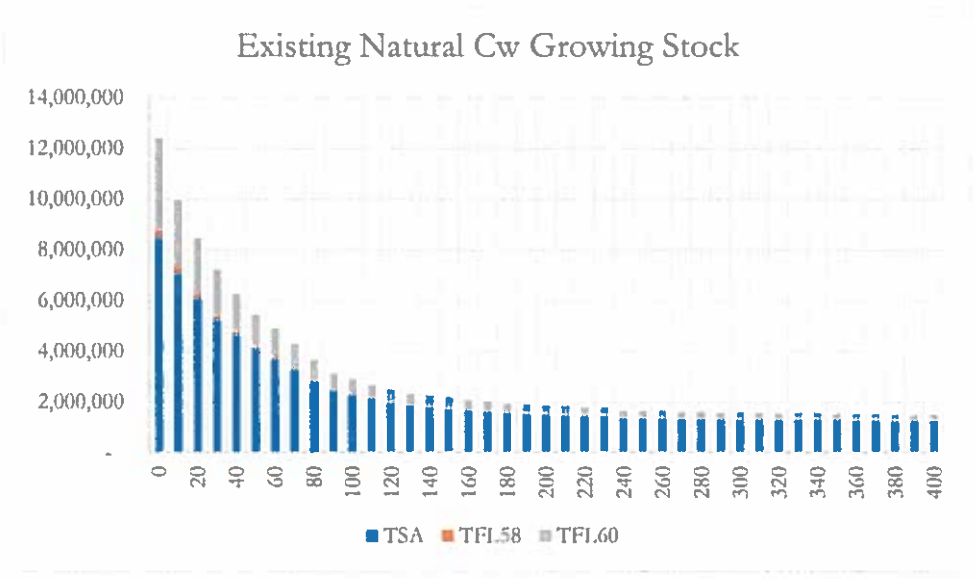

Figure 1.2.2. Existing natural (old growth) western red cedar growing stock by management units over time on the THLB.

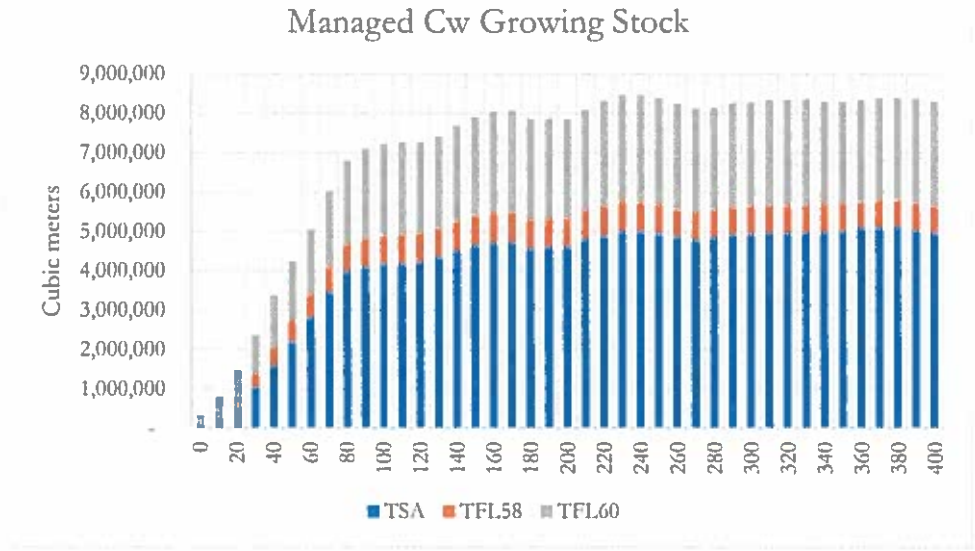

Figure 1.2.3. Managed (second growth) western red cedar growing stock by management unit over time on the THLB.

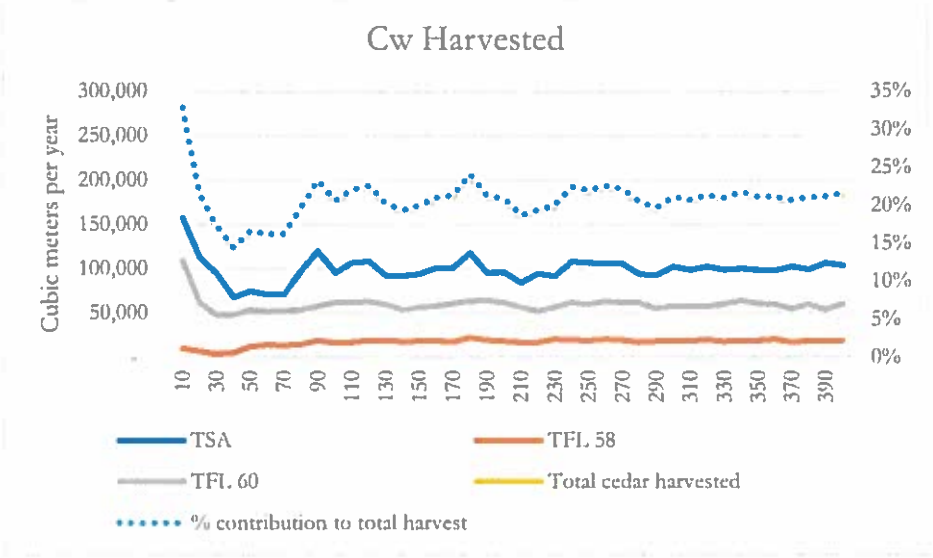

Figure1.2.4. Base case cedar volume harvest by management unit. over time.

As figure 1.2.4 indicates, cedar harvests start at just over 277,000 m^3 before declining significantly down to 122,000 m^3 at decade 4 in the base case reference scenario, before their contributions increases to an approximate average of just over 176,000 m^3 by decade 8. Its current contribution to the cut across all forest tenures (since the cedar partition in 2017) is approximately 40%, this is anticipated to decline to 22% in 20 years, 14% in 40 years before stabilizing and being approximately 20% of the harvest in 80 years.

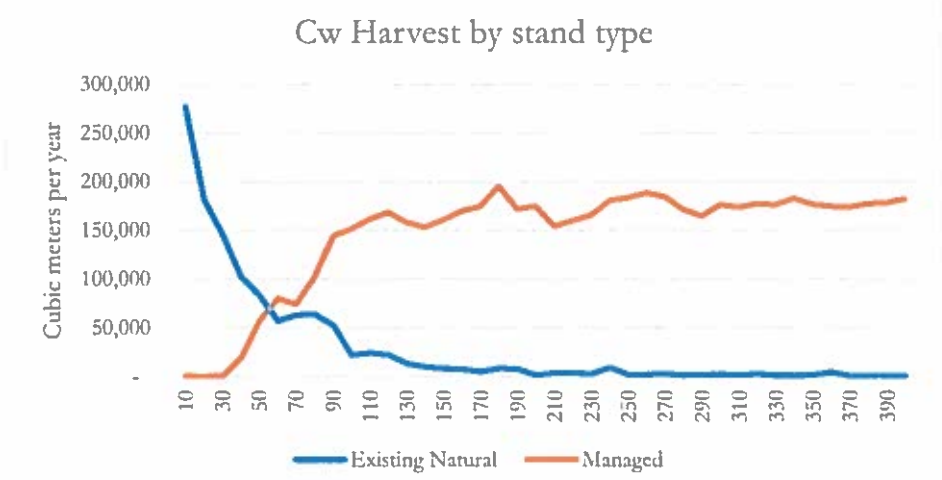

Figure1.2.5. Base case cedar harvest by stand type

G-4

As illustrated in figure 1.2.5, there is a significant reliance on existing natural (old forest) until decade 5, which is when the proportion of the cedar harvest that comes from second growth begins to surpass the proportion from old forest. Understanding where this volume comes from is of interest for long term planning.

General roadsheds or woodsheds, illustrated in figure 1.2.6 can be used to track species and volume contributions to the cut over time. These boundaries are not formal administrative timber supply units, but general groupings of operating areas to understand the anticipated flow of volume over time. Figure 1.2.7 provides the cedar volumes from the base case reference scenario by woodshed. While the amount harvested declines significantly in the first 40 years before stabilizing in 80 years, the proportional contribution from each woodshed over time remains relatively consistent. The smallest volumes come from Moresby North (Peel inlet) and North Narrows (1,100 m^3 and 1,300m^3 respectively per year), modest volumes continue to come from areas like Naden Harbour and Masset Inlet West (Collison point) at an average of 11,600 m^3 and 11,900m^3 respectively per year, contrasting with Juskatla woodshed which has the highest average around 64,400m^3 per year.

Figure 1.2.8 illustrates the contribution of cedar to the overall harvest using data from the last 24 years and the base case reference harvest projection. It shows that the fall-down in timber supply for cedar has been occurring since at least 1995, however its contribution to the cut has increased to ~50% between 1995-2015 before decreasing to 40% in 2017 (likely as a result of the Cedar Partition).

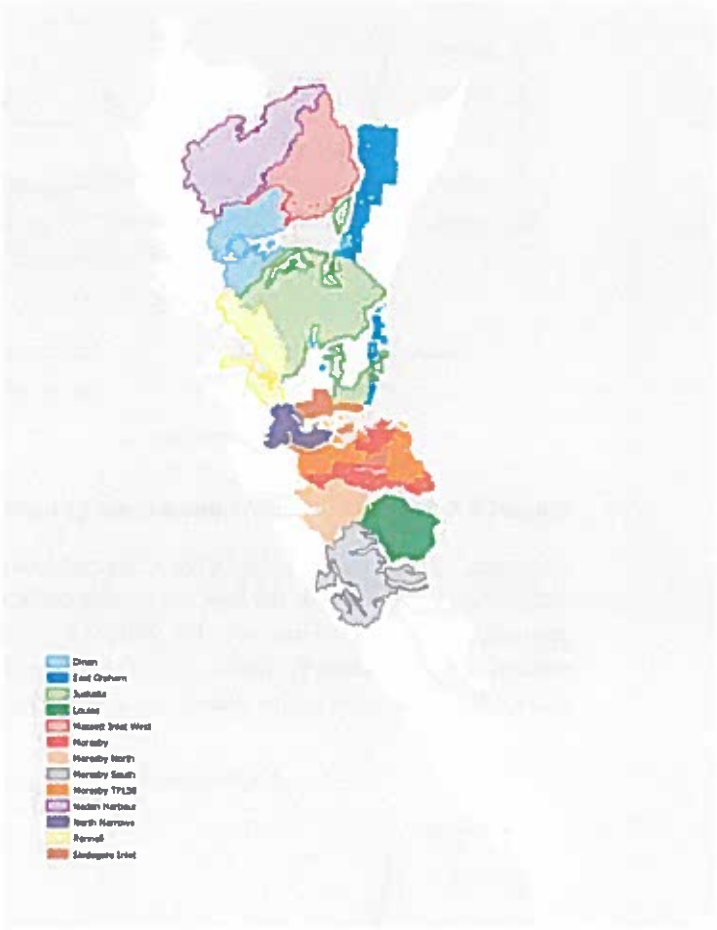

Figure1.2.6. Roadsheds/woodsheds used in the cedar sensitivity analysis

G-4

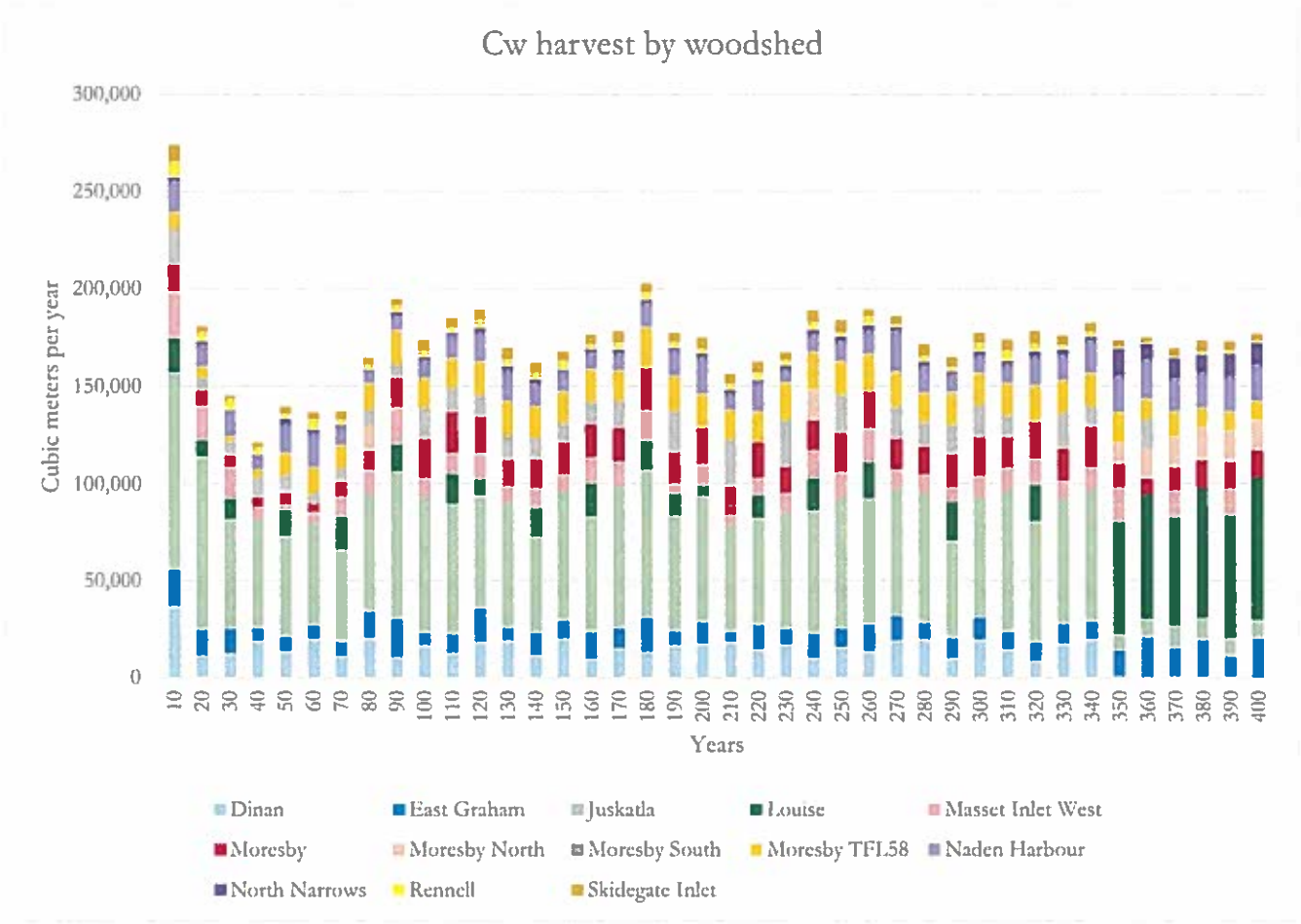

Figure 1.2.7 Base case reference cedar volumes harvested by woodshed

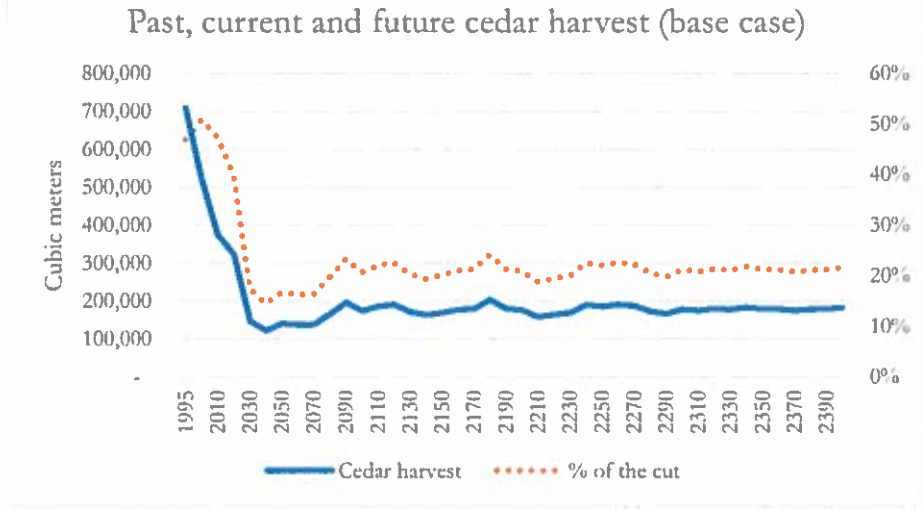

Figure1.2.8. Past, current (HBS 1995-2018) and the future projected base case cedar volume harvested annually over the analysis horizon, as well as the % contribution to cedar over the analysis horizon.

G-H

2.0 Sensitivity analysis

While the base case scenario aims to represent a reasonable estimate of the THLB, best available inventory data, growth and yield assumptions as well as current forest management practices, there are inevitably many uncertainties. Uncertainties exist within technical elements of timber supply (e.g. data inputs, model assumptions, model performance) but there are also uncertainties in forest policy and markets. Sensitivity analyses aim to increase understanding of the implications of these uncertainties by exploring a variety of changes to inputs and methods for analysis.

2.1 Cedar management

A pivotal element of the current timber supply analysis is to explore how cedar can be managed in the future. Cedar is considered a critical species for Haida culture and economy as well as playing a key role in the viability of the forest industry on Haida Gwaii. A 'fall down' effect, where there is a steady decrease in commercial timber supply for cedar, has been apparent for many years. A 2017 Chief Foresters partition was put in place on the TSA to help mitigate this fall-down effect. The current partition however does not resolve the cedar fall-down.

Sensitivity analyses were designed to determine what rate of cut would result in a non-declining flow of cedar. As most of the current volumes of cedar are in mature and old forests, this scenario is analogous to equally allocating the remaining mature/old volumes until second growth cedar volumes become merchantable.

2.1.1 Even flow for Cedar

The even flow scenario results in an average even flow for cedar of 146,371 m^3. This is composed of 88,280 m^3 from the TSA, 15,245 m^3 from TFL 58 and 49,299 m^3 from TFL 60 (figure 2.1.1.1). Applying an evenflow cedar harvest requirement results in an overall timber supply projection of 762,731m^3 per year, a 9.5% reduction relative to the base case.

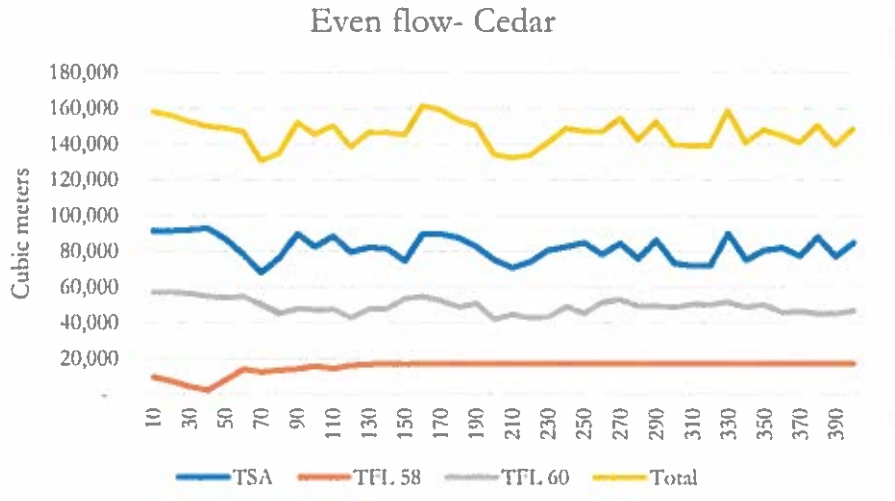

Figure 2.1.1.1 Even flow for Cedar by management unit.

The cedar harvest projections are not perfectly flat because the timber supply model allows for continued cedar harvest from stands with low cedar composition (less than 10%) after the even flow requirement is reached.

6-4

Table 2.1.1. Timber supply based upon an even flow for cedar, for all species and for cedar by management unit.

Factor	Total	TSA	TFL58	TFL60
All species forecast with even flow cedar	762,731	412,387	86,319	264,025
% diff from base case (all species)	9.5%	8.8%	6.3%	11.5%
Even flow Cw volume	146,371	81,827	15,245	49,299

Under this scenario, the growing stock, which represents the total volume of cedar on the THLB, also declines just below 11 million cubic meters until decade 4 before increasing and stabilizing to to over 15 million by decade 32 (figure 2.1.1.2), which is almost 50% higher than in the base case.

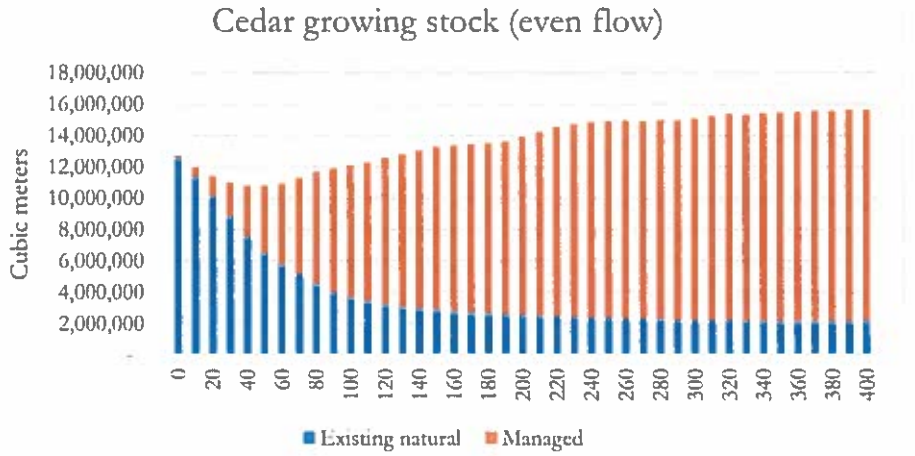

Figure 2.1.1.2. Growing stock for the Cedar even flow scenario.

2.1.2 Evenflow for Cedar +/- 10%

Variations to the long run average yield of cedar both above and below the base case were explored in 10% increments. For +10% and -10% increments, this amounted to an average harvest of cedar volume of 152,577m³ and 138,172 m³ respectively (figure 2.1.2). The projected harvest for all units ranged from a 5.7% decrease from the base case (794,744 m³/year) to a 14.7% decrease from the base case (718,581 m³/year).

G-4

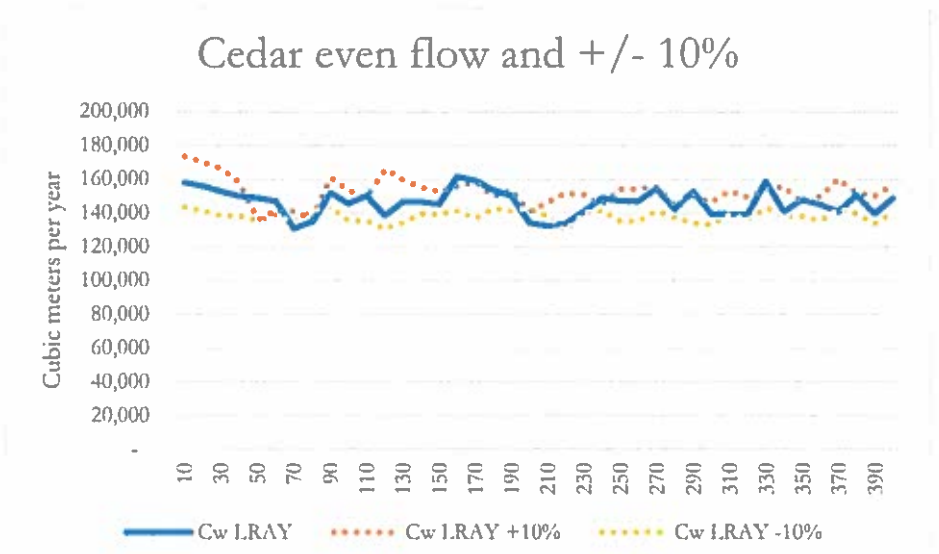

Figure 2.1.2. Cedar even flow (long run average yield~LRAY) compared with +/-10%

2.1.3 Intermediate flow for cedar

The base case reference scenario, outlined in section 1.2, represents a declining flow for cedar which contrasts from the even flow sensitivity described in section 2.1.1. There was interest in exploring an intermediate flow for cedar, whereby the supply would begin in between the two aforementioned scenarios in an attempt to both mitigate the reduction in timber supply and the cedar fall down.

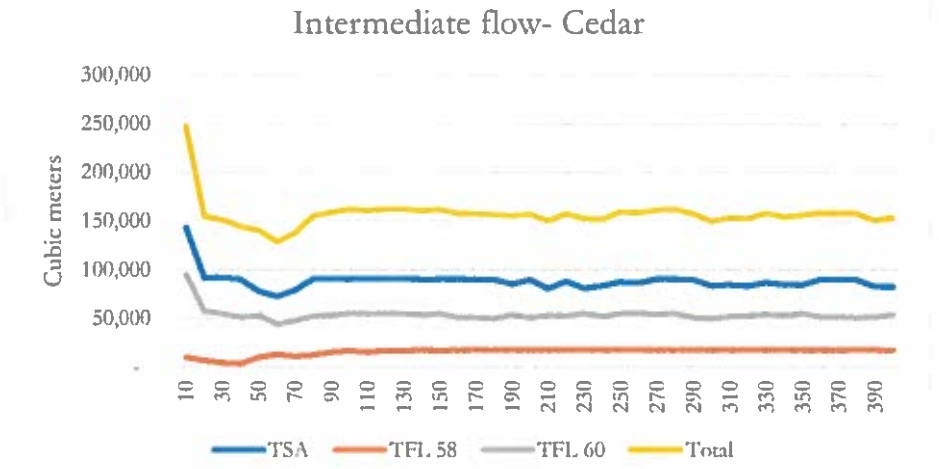

Figure 1.2.1.3. Harvest levels for cedar using an intermediate flow (starting between base case and even flow harvest levels).

G-4

Table 2.1.3. Timber supply based upon an intermediate flow for cedar, for all species and for cedar by management unit.

Factor	Total	TSA	TFL58	TFL60
All species forecast with intermediate flow cedar	822,656	445,313	86,719	290,625
% diff from base case (all species)	2%	2%	6%	3%
Intermediate flow Cw volume long range average	157,288	88,280	15,340	53,668

This scenario projects the cedar harvest beginning at 247,692 m^3 for the first decade, and then dropping to 155,113 m^3 (close to the long -range average) in the second decade. In this scenario, the lowest projected cedar harvest level is approximately 129,000 m^3/year in decade 6.

2.2 Alternative management units

At the time of timber supply analysis, Haida Gwaii was comprised of three management units: Tree Farm Licence 60, Tree Farm Licence 58 and the Timber Supply Area.

There are two distinct tenure awarding processes that in turn move area from the TSA into a First Nation Woodland Licence (FNWL) and into a Community Forest Agreement (CFA). The area of the FNWL is the same geographic extent as the area of the current Forest Licence to Cut (FLTC) A87661 currently managed by Taan Forest Products combined with TFL 60. An area for the CFA has been offered to the Misty Isles Economic Development Society (MIEDS) through the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, however the offer has not yet been accepted.

Factor	Total	TSA	TFL58	TFL60	FNWL/CFA
FNWL	848,307	271,763	92,169	n/a	484,375
CFA	829,444	393,675	92,169	295,275	48,325

For the FNWL scenario, the overall projection increased by 0.7% or 5,526 m^3 from the base case. This is because, when combining TFL 60 and the FLTC A89661 there is greater flexibility in harvest options which results in a small increase in timber supply. As this volume comes out of the TSA, it represents a 40% reduction in volume from the TSA.

Modeling the CFA as a separate unit results in a small 1.6% decrease in overall timber supply when compared to the base case. This is due to introducing a small management unit, reducing flexibility in harvest options. This volume comes out of the TSA, causing a 13% reduction in volume from the TSA.

2.3 Economic operability

Section 7.5 of the Haida Gwaii TSR Data Package describes in detail the economic operability modelling undertaken as part of the base case. In short, the base case applied a relative cost and marginal value model whereby surrogate indices for both operational cost and value were used to spatially approximate operational limitations. For the base case scenario, a least-cost road access model was developed that utilizes enduring features to assign a relative cost index (for example steep slopes are always more expensive than flat areas, wetlands are always more expensive than dry areas). 10-years of market values were averaged by species to attain a relative value index which were applied across the present and future inventory. This 10-year average (2008-2017) was meant to encapsulate the market high and low values. However given that markets are uncertain, there was interest in results from assuming prolonged strong markets and prolonged weak markets. This was explored by using the maximum and minimum market value indices within this 10-year period.

Such an analysis also helps decision makers understand how sensitive timber supply is to large fluctuations in market values. This in turn tries to account for value as a key variable.

2.3.1 Maximum market conditions

This scenario uses the maximum value index (or high market) for all species. Value index was derived from the 10-year average (2009-2017).

	Total	TSA	TFL58	TFL60
Maximum markets	842,131	454,687	92,169	295,275

There was a 650 m^3 or 0.1% increase from the base case. Under maximum market conditions slightly more stands are available for harvesting, since lower volume stands and/or more distant stands are economically viable.

2.3.2 Minimum market conditions

This scenario uses the minimum value index (or low market) for all species. Value index was derived from the 10-year average (2009-2017).

	Total	TSA	TFL58	TFL60
Minimum markets	814,106	433,313	91,769	289,025

There was an 28,675m^3 or 3.4% decrease from the base case. Under the minimum market conditions fewer stands are economically accessible.

2.3.3 No road operability constraints for combined MU's

This scenario 'turns off' the economic operability model, with the results, in effect, representing a biophysical timber supply model (no accounting for economic constraints associated with access).

	Total	TSA	TFL58	TFL60
No road operability	879,557	478,013	92,169	309,375

There was an 36,776 m^3 or 4.4% increase from the base case.

2.3.4 Isolated planning units

Section 7.6.4 of the Data Package describes the assumptions used to explore the timber supply contributions of isolated planning units of Sewell, Peel Inlet and Louise Island. These units are known to have higher operating costs and as a result licencees provided thresholds of volumes needed to be accessible prior to mobilizing efforts towards harvesting in these areas. Operational feedback indicates that Tasu/Sewell and Peel roadsheds require at least 100,000 m^3/year for 3 consecutive years, and Louise requires 50,000 m^3/year over 2 consecutive years. Scaled to a 10-year model step would mean 333,000 m^3 for Tasu/Sewell and Peel, and 250,000 m^3 for Louise would need to be accessible prior to harvesting. Sensitivity analyses were run to determine the long run average yields anticipated to come from these areas, particularly as these areas have had little to no access, but still contribute to the overall timber supply projection in the base case reference projection.

	Total	TSA	TFL58	TFL60
Isolated units excluded	723,844	374,663	91,406	257,775

There was an 118,937 m³ or 14.1% decrease from the base case when these units were excluded from the THLB. Of this, 77,624 m³ came from the Sewell Inlet and Peel Inlet operating areas, and 40,550 m³ came from Louise Island.
The Sewell inlet operating area has not seen logging operations since 2007. Since 2015 Louise Island has had consistent forestry development, and Peel inlet has seen moderate development in its northern and most accessible areas.

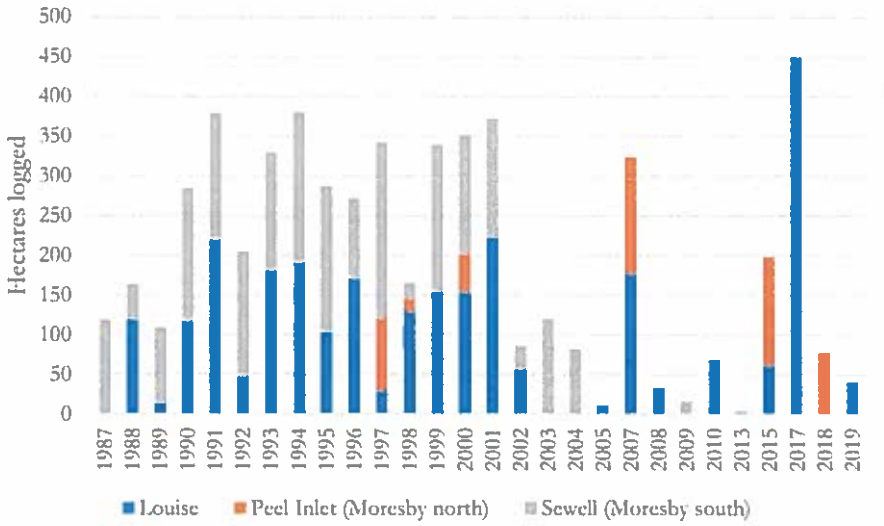

Figure 2.3.4. Area logged within isolated planning units (RESULTS)

2.3.5 No restriction to isolated planning units

This sensitivity assumes the Sewell, Peel Inlet and Louise Island planning units are not operationally constrained in any way.

	Total	TSA	TFL58	TFL60
No restrictions on isolated units	868,581	468,637	92,169	307,775

There was a 25,800m³ or 3.1% increase from the base case. This demonstrates that the access constraints (described in section 7.6.4 of the data package) have a small downward effect on timber supply.

2.3.6 High cost access exclusions

As detailed in section 8.2.5.6 of the data package, approximately 96% of the THLB has an access cost that is less than or equal to 10% of the maximum access cost in the THLB. The area of the THLB with considerably higher relative access cost (~4%) does not have a history of commercial forestry access and may prove to be continually challenging to log due to isolation and/or steep slopes. In this sensitivity these areas were removed from the THLB.

	Total	TSA	TFL58	TFL60
High access cost exclusion	838,206	442,913	92,169	303,125

6-4

There was a 4,574 m^3 or 0.5% decrease from the base case

2.4 Minimum Harvest Criteria

2.4.1 Extended rotation

An extended rotation sensitivity analysis was completed in order to explore the effects on timber supply if harvest age was increased. Extending rotation ages may have beneficial effects on non-timber values (from wildlife habitat, carbon sequestration, etc.) and increase timber values. Section 8.2.6 of the Data Package details the rationale and methods for determining a rotation age set at 150 years where analysis units had culmination mean annual increment ages under 150, otherwise CMAI-based ages were maintained.

	Total	TSA	TFL58	TFL60
Extended rotation	174,944	107,813	3,106	64,025

There was a 667,837m^3 or 79.2% decrease from the base case when extending rotation ages to a minimum of 150 years.

2.4.2 Economic rotation

The decision to harvest a stand is often based upon economic opportunity instead of culmination mean annual increment. Section 8.2.6 of the Data Package details an analysis of stand ages when the average log diameter reaches 30 cm. This generally results in lower harvest ages for richer stand types (30 cm diameter is met before CMAI). These ages were used as a minimum harvest rule to represent an economic rotation sensitivity.

	Total	TSA	TFL58	TFL60
Economic rotation	812,944	435,713	89,806	287,425

There was an 29,837 m^3 or 3.5% decrease from the base case when applying economic rotation criteria. For this sensitivity analysis, the weighted average minimum harvest age of future managed stands within the THLB was 94 years, and for existing managed stands within the THLB was 77 years. The likely reason for this difference in ages is that existing managed stands include a higher proportion of richer sites (e.g. biased or preferred harvest sites) which therefore reach the minimum diameter at a younger age.

2.4.3 No minimum harvest age or volume

This sensitivity examines how the timber supply model responds without any constraint on harvest age or volume. This is to contrast the base case which has a minimum harvest criteria in which stands must not be harvested before reaching 95% of the culmination mean annual increment and 250 m^3/ha (detailed in section 8.2.6 of the Data Package). The reason be4hind this sensitivity analysis was to check if the minimum harvest ages had a significant effect beyond the harvest preference rules applied in the base case reference scenario (i.e., higher priority given to relatively higher-value stands).

	Total	TSA	TFL58	TFL60
No MHA or MHV	912,406	499,163	86,719	326,525

There was an 69,625 m^3 or 8.3% increase from the base case when no minimum harvest age or volumes were applied, which shows that the minimum ages did affect the projection.

6-4

2.4.4 Minimum harvest volume constraint raised to 350m³ for managed stands

The base case minimum harvest volume was based on an analysis of harvest history in relation to the forest inventory. However, the majority of this harvest history is based on logging old forest and there is an expectation that second growth stands may warrant higher minimum volume requirements due to their relatively lower values. As a result, a sensitivity analysis was conducted in which the minimum harvest criteria rule was set to 350m³ for managed stands.

	Total	TSA	TFL58	TFL60
MHV 350	834,169	447,487	91,406	295,275

There was a 8,612 m³ or 1.0% decrease from the base case.
This volume threshold also aligned with an analysis of volumes where 95% of the volume harvested from 2nd growth in the last 10 years came from stands with 350 m³/ha or more.

2.4.5 Maximum harvest age not exceeding 250 years

This scenario explores the evenflow harvest of a non-declining projection resulting from limiting harvest to stands under 250 years. This represents a scenario where no old growth forest is logged.

	Total	TSA	TFL58	TFL60
Second growth only	671,019	367,913	87,481	215,625

There was an 171,762 m³ or 20.4% decrease from the base case.

2.5 Harvest preference

Harvest preference includes sensitivity analyses that set preferences for harvesting stands in the model, in turn training the model to log based on various parameters ranging from forest volumes, ages or values.
Chapter 7 of the Data Package provides further details on model assumptions and rationale.

2.5.1 Relative volume harvest

Whereas the base case scenario set a preference to log based on stand value relative to volume at Culmination Mean Annual Increment (CMAI), the relative volume scenario is defined by stand volume relative to volume at culmination of mean annual increment (CMAI). In other words, stands with higher volumes at CMAI will be preferred to be logged by the model.

	Total	TSA	TFL58	TFL60
Relative volume	840,131	452,287	92,569	295,275

There was a 2,650 m³ or 0.3% decrease from the base case.

2.5.2 Oldest first relative to CMAI

This scenario sets a model preference to log the oldest stand relative to 95% of age at culmination age. This therefore focuses on old growth forest being harvested ahead of any second growth harvests.

	Total	TSA	TFL58	TFL60
Relative oldest first	856,656	456,863	92,169	307,625

G-4

There was a 13,875 m^3 or 1.6% increase from the base case.

2.5.3 Randomized order of harvest

This harvest preference is not limited by value, volume or age but sequentially random. This provides an indication of the relative timber supply effects of the other harvest preference scenarios.

	Total	TSA	TFL58	TFL60
Random harvest order	803,831	426,563	89,844	287,425

There was a 38,950 m^3 or 4.6% decrease from the base case.

2.6 Haida Nation policies

The Haida Nation sets law and policy through the annual House of Assembly, mandates from seasonal sessions (quarterly sittings of the CHN), or political direction from the CHN Executive Committee. Those policies that directly affect timber supply have been explored and their results detailed below.
Methods and rationale are further detailed in section 8.2.3 of the Data Package.

2.6.1 Mosquito Lake

This sensitivity analysis removed the area of the Mosquito Lake watershed from the Timber Harvesting Land Base following the 2014 directive of the Haida Nation's House of Assembly to protect the Mosquito Lake Watershed. The boundaries of the watershed were provided for TSR analysis through the CHN Executive Committee in August 2019.

	Total	TSA	TFL58	TFL60
Mosquito lake	822,981	435,937	91,769	295,275

There was a 19,800 m^3 or 2.3% decrease from the base case that results from a 1,845 hectare reduction to the THLB.

2.6.2 Slatechuck Creek

West of Daajing Giids/ Village of Queen Charlotte, Slatechuck Creek contains an important traditional quarrying site for argillite for the Haida Nation. Development planning in the area has been contested by the Nation, with pressures to keep the area free of industrial activity. Despite no formal land use policy mandate, a sensitivity analysis was conducted to determine the effect on timber supply if the Slatechuck Creek watershed was reserved in perpetuity.

	Total	TSA	TFL58	TFL60
Slatechuck	837,331	449,887	92,169	295,275

There was a 5,450 m^3 or 0.6% decrease from the base case that results from a 203 ha reduction of the THLB.

2.6.3 Monumental cedar protection

A 2018 House of Assembly Resolution mandated the CHN to conserve all monumental cedar. Currently only trees with a diameter at breast height of over 120 cm or trees in Cultural Cedar Stands are 100% protected. Otherwise 10% of trees between 100-120cm are protected and if harvested made available to the Haida Nation.

G-4

There is currently no operational data to analyze the effect from the recently updated changes to the classification of monumental cedar. Section 6.10.19 of the data package describes the inputs and methods for netting down 70% of all monumental cedar (base case reference). Assuming that 100% of monumental cedar are retained leads to a net reduction of 28,410 hectares.

	Total	TSA	TFL58	TFL60
100% monumental retention	804,194	424,163	91,006	289,025

There was a 38,587 m^3 or 4.6% decrease from the base case.

A new version of the Cultural Feature Identification Standards Manual was released in late October 2019. The standards were designed to implement the LUOO requirements as currently written, not to revise the LUOO. A preliminary estimate of the frequency of monumental cedar was applied in the base case, and sensitivity provided here. However, some uncertainties remain, including: how many cedar trees with diameters over 100-cm meet monumental cedar criteria; and how monumental cedar will be managed and harvested. In response to these uncertainties, the HGMC through the Technical Working Group will be compiling additional information and undertaking analysis to explore: (1) the likelihood that a broader range of log grades than estimated for the base case will contribute monumentals; (2) indications that younger ages classes than assumed for the base case will contain monumental cedar; (3) timber supply implications of various levels of retention of monumental trees from harvesting. Given the recent release of the new standards, these analyses are ongoing. The results will be available for the HGMC for its determination of the Haida Gwaii AAC.

2.6.4 Former Monumental cedar identification standards

The Council of the Haida Nation has amended the Cultural Feature Identification standards for the identification of monumental cedar. The previous classification was in place during the implementation of the LUOO between 2011-2019, and as such benefits from extensive operational data, specifically the number of monumental features and the area of management and reserve zones established to protect them. As described in 8.2.3.5 of the data package, when using data sampled between 2012-2016 this amounted to a net reduction in the THLB of 1.9% (with 92% of the reduction in existing natural stands).

	Total	TSA	TFL58	TFL60
Former Monumental standards	937,444	508,537	94,531	334,375

There was a 94,663m^3 or 10% increase from the base case.

2.7 Northern Goshawk

Requirements to manage northern goshawk currently only extend to reserving known nesting areas on Haida Gwaii. However the number of known breeding/nesting areas is anticipated to increase over time, thereby warranting a sensitivity analysis to examine this effect. In addition, the Federal Government has published policy targets to manage foraging habitat, which may align with the Haida Nation's mandate to manage foraging habitat. There are uncertainties regarding how foraging habitat management will be implemented, given the Haida Nation's strategy is not completed and the Provincial government is reviewing forage habitat management in 2020. As detailed in section 8.2.4 of the Data Package, a range of sensitivity analyses were completed to explore these uncertainties.

6-4

2.7.1 Nesting reserves

Three separate sensitivity analyses were completed to explore increasing the netdowns from predicted nesting reserves. All three analyses use the base case nesting reserves (accounting for 22 currently known breeding areas) and then additional nesting habitat based on a predicted territory model and randomly assigned 200-hectare reserves from the 2017 Provincial nesting suitability model centered within each predicted territory. Choosing which predicted territories are included in the scenarios is based upon a ranking of territories with the highest amount of suitable habitat.

2.7.1.1 Provincial nesting target

This scenario assumes that a total of 25 breeding areas will have nesting areas reserved. 25 breeding areas is based upon BC's 2018 *Implementation Plan for the Recovery of Northern Goshawk, laingi Subspecies (Accipiter gentilis laingi) in British Columbia.* This represents an additional three predicted territories and associated 200 ha nesting reserves netted out of the THLB.

	Total	TSA	TFL58	TFL60
25 nest areas reserved	839,331	452,287	91,769	295,275

There was a 3,450 m^3 or 0.4% decrease from the base case.

2.7.1.2 Federal nesting target

This scenario assumes a total of 38 breeding areas will have nesting areas reserved, based upon implementation targets set in the Federal Governments 2018 *Recovery Strategy for the Northern Goshawk laingi subspecies (Accipiter gentilis laingi) in Canada.* This represents an additional 16 predicted territories and associated 200 ha nesting reserves netted out of the THLB.

	Total	TSA	TFL58	TFL60
38 nest areas reserved	831,994	445,313	91,406	295,275

There was a 10,787 m^3 or 1.3% decrease from the base case.

2.7.1.3 Full occupancy target

This scenario assumes that all predicted territories that have ≥40% suitable foraging habitat are considered occupied. Based upon a 2018 Provincial territory nesting model, this increases the number of breeding areas on Haida Gwaii to 67[1]. This represents an additional 45 predicted territories that each had 200 ha nesting reserves netted out of the THLB.

	Total	TSA	TFL58	TFL60
67 nest areas reserved	827,344	445,313	91,406	290,625

There was a 15,437 m^3 or 1.8% decrease from the base case.

2.7.2 Foraging habitat

A total of five timber supply scenarios were completed to explore the effects of managing Goshawk foraging habitat. These range from implementing the Federal Recovery Strategy of maintaining 65.5% (5,564 ha) of suitable foraging habitat for known breeding areas, to managing foraging habitat if assuming full occupancy

[1] Personal communication, Darryn McConkey, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development

G-4

of territories on Haida Gwaii. This set of sensitivity analyses also explores managing for a range of habitat thresholds (45%, 55% and 65.5%).
In all scenarios a 'first-recruit' method was used. This method is based upon a foraging capability model that is built with the TSR forest inventory and growth and yield curves to assign an age that each one-hectare cell across Haida Gwaii becomes suitable habitat, based upon Habitat Suitability Index parameters[2]. Suitable habitat is then reserved outside the THLB to meet the foraging habitat area targets per territory. If there is a deficit of suitable habitat outside the THLB, then suitable habitat inside the THLB is reserved. If there is still a deficit of suitable habitats (due to young forest ages) then the model reserves enough area of capable habitat, based on earliest recruitment to suitable habitat, until targets have been met. With the target preference set for habitat outside the THLB then, if these targets are met over time outside the THLB, then those areas previously reserved within the THLB once again become available to harvest. Methods and assumptions are further detailed in section 8.2.4 of the Data Package.

2.7.2.1 Federal foraging target for known breeding areas (22 territories)
This scenario reserves 5,564 hectares (65.5% of a territory) of suitable or, if suitable habitat is not sufficient, capable habitat within the 22 known breeding areas on Haida Gwaii. Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
Foraging habitat (22 territories)	838,244	445,313	91,406	301,525

There was a 4,537 m^3 or 0.5% decrease from the base case.

2.7.2.2 Federal foraging target for 25 territories
This scenario reserves 5,564 hectares (65.5% of a territory) of suitable or, if sufficient suitable habitat is not available, capable habitat within the 22 known breeding areas on Haida Gwaii and an additional three predicted territories. Choosing which additional three predicted territories are included in the scenarios is based upon a ranking of territories with the highest/most suitable habitat to the lowest/least amount of suitable habitat. Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
Foraging habitat (25 territories)	832,857	438,113	91,769	302,975

There was a 9,924 m^3 or 1.2% decrease from the base case.

2.7.2.3 Federal foraging target for 38 territories
This scenario reserves 5,564 hectares (65.5% of a territory) of suitable or, if sufficient suitable habitat is not available, capable habitat within the 22 known breeding areas on Haida Gwaii and an additional 16 predicted territories. Choosing which additional 16 predicted territories are included in the scenarios is based upon a ranking of territories with the highest/most suitable habitat to the lowest/least amount of suitable habitat.

[2] Mahon, T., McClaren, E., & Doyle, F. (2015). *Northern Goshawk (Accipiter gentilis laingi) Habitat Models for Coastal British Columbia.* Nanaimo, B.C. : Report for the Habitat Recovery Implementation Group of the Coastal Northern Goshawk Recovery Team

G-4

Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
Foraging habitat (38 territories)	802,043	428,737	84,281	289,025

There was a 40,738 m^3 or 4.8% decrease from the base case.

2.7.2.4 Federal foraging target for full occupancy (67 territories)
This scenario reserves 5,564 hectares (65.5% of a territory) of suitable or, if unavailable, capable habitat within the 22 known breeding areas on Haida Gwaii and an additional 45 predicted territories. Choosing which additional 45 predicted territories are included in the scenarios is based upon a ranking of territories with the highest/most suitable habitat to the lowest/least amount of suitable habitat. Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
Foraging habitat (67 territories)	689,656	417,187	52,344	220,125

There was a 153,125 m^3 or 18.2% decrease from the base case.

2.7.2.5 Reduced foraging target (55% suitable habitat per territory) for full occupancy
This scenario reserves 4,672 hectares of suitable or, if unavailable, capable habitat within the 22 known breeding areas on Haida Gwaii and an additional 45 predicted territories. This represents a foraging habitat threshold where 55% of each territory has suitable habitat. Choosing which additional 45 predicted territories are included in the scenarios is based upon a ranking of territories with the highest/most suitable habitat to the lowest/least amount of suitable habitat. Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
55% target (67 territories)	821,094	445,313	91,406	284,375

There was a 21,487 m^3 or 2.6% decrease from the base case.

2.7.2.6 Reduced foraging target (45% suitable habitat per territory) for full occupancy
This scenario reserves 3,823 hectares of suitable or, if unavailable, capable habitat within the 22 known breeding areas on Haida Gwaii and an additional 45 predicted territories. This represents a foraging habitat threshold where 45% of each territory has suitable habitat. Choosing which additional 45 predicted territories are included in the scenarios is based upon a ranking of territories with the highest/most suitable habitat to the lowest/least amount of suitable habitat. Preference is set to reserve habitat outside the THLB and where recruitment of capable habitat is necessary, recruiting area that becomes suitable soonest.

	Total	TSA	TFL58	TFL60
45% target (67 territories)	824,944	442,913	91,406	290,625

There was a 17,837 m^3 or 2.1% decrease from the base case.

6-4

2.8 Forest cover constraints

Some management objectives are best modelled for timber supply by placing conditions within areas that must be met prior to an area being logged. Examples of forest cover constraints include: Visual Quality Objectives; Wildlife Habitat Area seral targets; Sensitive watersheds; upland stream areas or Community Watersheds. As detailed through the Data Package, these generally include a minimum amount of area to meet a 'green-up' height requirement (e.g. a minimum stand height) over a prescribed area.

2.8.1 Wetlands not considered 'recovered' forests

The HG LUOO contains provisions for managing Upland Stream Areas whereby 70% of the forests in Upland Stream Areas (watersheds defined by Schedule 6 of the HG LUOO) must be hydrologically recovered. Current practice has been to manage Upland Stream Areas so that wetlands are considered areas that contribute toward hydrologic recovery. There are some uncertainties about the role of coastal wetlands acting as buffers to peak flows and how they should be considered as contributing to hydrological recovery. To address this, a sensitivity was completed so that wetlands were not considered hydrologically recovered, and only the forested area (site index ≥5) contributed towards hydrologic recovery.

	Total	TSA	TFL58	TFL60
Wetlands not recovered	834,281	435,937	92,169	306,175

There was a 8,500m^3 or 1.0% decrease from the base case.

2.8.2 All forest cover constraints disabled

This scenario was primarily conducted in order to test how well the timber supply model accounts for the interaction from forest cover constraints, however there is no intention that the requirements be removed.

	Total	TSA	TFL58	TFL60
No forest cover constraints	930,393	510,937	94,531	324,925

There was a 87,612 m^3 or 10.4% increase from the base case. Results indicate that forest cover constraints do indeed affect timber supply.

2.9 Harvest flow

The Haida Gwaii Management Council has established a preferred approach for timber supply projections that inform the AAC determination are non-declining. This timber supply rule means that the timber supply does not drop below the starting level at any time in the projection but may increase above that level later in the horizon, as long as the increase is sustainable. A sensitivity analysis was completed to explore the implications to the long term when harvesting higher levels in the short term.

2.9.1 Short term uplift

This sensitivity allows a short-term uplift to a maximum level subject to (a) downward steps of not more than 10%/decade and (b) mid-term not less than 100% of maximum even flow. Effectively this analysis looks into whether there is flexibility in the short-term timber supply.

G-4

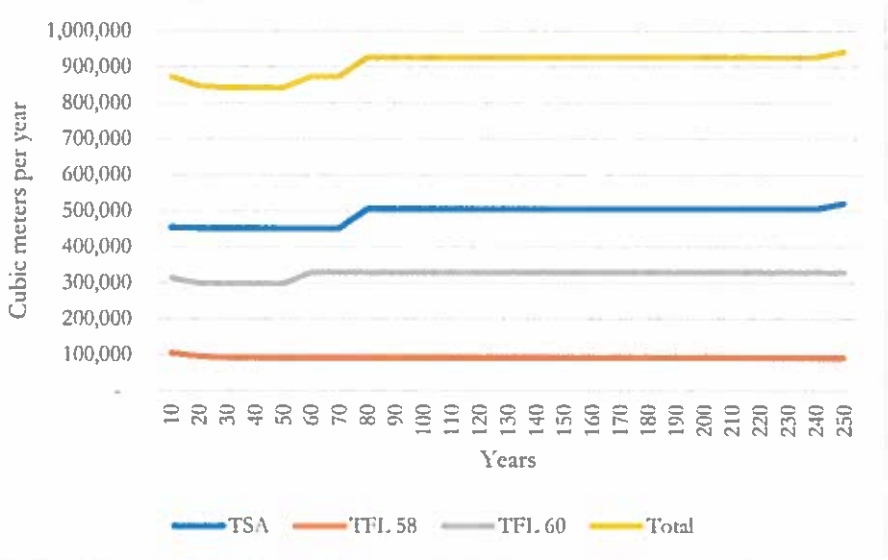

Figure 2.9.1 Long term harvest flow (declining) sensitivity results for all management units.

There was a 30,000 m³ or 4% increase from the base case for the first decade, before dropping to base case levels by decade 3, suggesting very limited flexibility in the short-term supply.

2.10 Alternate Timber Harvesting Land Base (THLB)

The THLB is defined by regulatory boundaries but also accounts for exclusions of areas that reflect current practice. This current practice may be dictated by individual licencee behaviour that in turn further constrains or increases the actual or realized THLB. The following sets of sensitivity analyses are intended to explore this uncertainty.

2.10.1 Increased Wildlife Tree Retention Areas

The Forest Planning and Practices Regulation (FPPR) requires licencees to establish 7% of the area in cutting permits over a 12-month period as Wildlife Tree Retention Areas (WTRA). During the 5-year period between 2012-2016 that was used as a sample to represent post-LUOO current practice, Taan Forest Products Ltd., BCTS and Husby Forest Products established more WTRA than are required by the FPPR. While much of this retention overlapped with Land Use Objective Order features, a significant amount of WTRA was established that had no other overlaps with other regulated objectives. If this current practice continues within the TSA and TFL60 (including FLTC A87661), then the realized THLB would be smaller by 7.1% and 11.6% respectively. Section 8.2.8 of the Data Package details the analysis and methods used to determine these reductions.

	Total	TSA	TFL58	TFL60
Increased WTRA retention	754,006	398,213	91,769	264,025

There was a 88,774m³ or 10.5% decrease from the base case under this scenario.

2.10.2 Alternate access to unstable terrain

The contribution of area that is classified as unstable terrain in the THLB was estimated by how often licencees log in either Class 4 or Class 5 terrain relative to logging in areas of stable terrain. This 'preference ratio' is detailed in section 6.8 of the Data Package. While the base case reference scenario looked at the last 10 years of licencee behaviour to represent current practice in these areas, a sensitivity analysis was completed

G-4

to see how often licencees accessed these areas since the 1996 Forest Practices Code came into effect. The last changes in forest policy that affected how unstable terrain is managed came from the 1996 Forest Practices Code.

	Total	TSA	TFL58	TFL60
Increase unstable terrain access	864,331	468,637	92,569	303,125

There was a 21,550m³ or 2.6% increase from the base case associated with incorporating information from the longer time period.

2.10.3 Land Use Objectives Order risked-managed targets

The HG LUOO contains provisions to risk-manage different objectives contingent upon various conditions (including Inter-Governmental Processes or IGP) being completed. Six years of operational applications from the Solutions Table (2013-2018) were analysed to determine the effect that this may have on timber supply. Table 2.10.3 summarizes these risk-managed applications and the associated increase in the timber harvesting land base.

Table 2.10.3 HGLUOO risk managed applications submitted to the Solutions Table and implemented (2013-2018)

Objective	Description
Removal of monumental cedar >120cm (HGLUOO section 9.4)	8 monumental removed (reserve and management zones) 4 management zones reduced
Reduction of cultural cedar stand management zones (HGLUOO section 9.7/ 9.8)	2 cultural cedar stand management areas reduced
Haida Traditional Forest Feature reserve reduction (HGLUOO section 6.5)	3 management areas of class 1 Haida Traditional Forest Features were reduced
Haida Traditional Heritage Feature reserve reduction (HGLUOO section 5.6)	4 management areas were reduced
Forest reserve reduction or amended (HGLUOO section 23.2/23.3)	39 hectares of forest reserve were amended (moved to other areas- no increase in THLB)
Cedar Stewardship Areas (HGLUOO section 3.2)	3 hectares of CSA were harvested. 1 area reduced to accommodate road building.

Table 2.10.3 represents risk-managed applications that were implemented between 2013-2018, however do not represent the suite of risk-managed opportunities afforded under the HGLUOO. However, in line with timber supply representing current management practices, the results of 6 years of operations amount to approximately 20 hectares of additional THLB available through the risk managed provisions (~3 hectares per year). Given that this is such a small annual increase in THLB (+0.002%) this provision was not modelled, but results reported to the HGMC as a factor consideration in their AAC determination.

2.11 Roads

Roads, including permanent roads, mainlines and branchlines were removed from the THLB for the base case reference scenario. This was based upon the assumption that, while smaller forestry roads (branchlines) may grow trees during a rotation, that their volumes are not considered merchantable.

A sensitivity analysis, detailed in section 8.2.8 of the Data Package, was completed that assumes that branchlines do contribute to timber supply.

G-H

2.11.1 Old roads contributing to timber supply

This sensitivity analysis was designed so that branchlines had their own growth and yield table, assuming that roads were established with red alder, at natural (not planted) densities, after a delayed (4 year) regeneration and moderately reduced (-20%) site index.

There was an approximate 3,000m^3 per year or 0.4% increase from the base case.

G-4

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Socio-Economic Analysis in support of the Haida Gwaii Timber Supply Review

Executive Summary

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Haida Gwaii Management Council

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November 2019

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Table of Contents*

* The references cited in this Executive Summary are itemized in the full report.

Executive Summary

1.1 Introduction

Under the authority of Section 3(3) of the *Haida Gwaii Reconciliation Act*, the Haida Gwaii Management Council (HGMC) initiated a Timber Supply Review (TSR) for the Haida Gwaii Management Area (HGMA). The HGMA is defined in Section 1(1) of the *Haida Gwaii Reconciliation Act* as all of Haida Gwaii except for private lands, Indian Reserves (IRs) and municipalities.

The purpose of this socio-economic analysis report within the timber supply review process is to:

- assemble and present recent historical information and data on the Haida Gwaii forest sector, including its position within the overall Haida Gwaii economy; and
- analyze the effects of certain key timber supply related matters on Haida Gwaii current and future social and economic conditions.

This socio-economic analysis is divided into two parts. The first part is a situation analysis that looks at the recent socio-economic experience of the Haida Gwaii forest sector and as such the time period of the past decade 2008-2017 is primarily referenced in this section. The second part of the report examines several key issues that have influenced the socio-economic performance of the Haida Gwaii forest sector and are likely to be important issues going forward as well.

1.2 Situation Analysis

HAIDA GWAII POPULATION

Declining population, -12.8% over the 2006-2016 period

Based on Census of Canada data, the 2016 population of Haida Gwaii was 4,198, a 12.8% decrease over the 2006 population of 4,812, and a 28.0% decrease over the 1996 population. By comparison, the overall population of BC rose by 12.2% over the 2006-2016 period.

The five main communities by population in 2016 are Queen Charlotte (852), Skidegate (Higaagilda) (837), Masset (793), Old Massett (Gaw) (555), and Port Clements (282); these communities account for about 80% of the overall population on Haida Gwaii. The remaining 20% of the population inhabits other areas of Haida Gwaii including the unincorporated communities of Tlell, rural Graham Island, and Sandspit. Skidegate was the only Haida Gwaii community or area that registered a population gain for the 2006-2016 period. The main reason for the Haida Gwaii population decline is that out-migration from the islands has greatly exceeded its in-migration. For the 2006-2016 period, Haida Gwaii had a small natural population increase (i.e. births exceeding deaths).

Almost half of the Haida Gwaii population identifies as Aboriginal/Indigenous

In 2016, an estimated 47.5% of the Haida Gwaii population identified as an Aboriginal/Indigenous person. The Aboriginal/Indigenous population of Haida Gwaii was an estimated 1,915 in 2016, a 1.6 % increase over the 2006 Indigenous population of 1,885. Although demonstrating a positive trend, the Haida Gwaii Indigenous population increase of 1.6% trailed, by a large margin, the 38% increase in the overall BC Aboriginal/Indigenous population during the 2006-2016 period.

HAIDA GWAII LABOUR FORCE

Shrinking labour supply

The islands resident labour force decreased from an estimated 2,830 workers to 2,290 workers over the 2006-2016 period, a decline of 19.1%.[1]

Aging population and labour supply

The median age of the Haida Gwaii population increased from 39.7 years to 45.1 years over the 2006-2016 period, By comparison, the estimated 2006 median age on the islands was similar to that of the province (40.8 years) whereas by 2016, the estimated Haida Gwaii median age (45.0) was higher than the BC median of 43.0 years.

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[1] This labour force data is from the Census of Canada and based on "place of residence", i.e. these workers constitute the labour force members who had their usual place of residence (i.e. permanent residence) on Haida Gwaii at the times of Census enumeration.

People aged 25 to 54 years old are considered of core working-age because of their strong attachment to the labour market. The estimated number and percentage share of persons residing on Haida Gwaii in the prime working age group of 25 to 54 years declined from 2,217 (45.7%) in 2006 to 1,669 (39.0%) in 2016.

The resident labour forces of each of Haida Gwaii's main economic sectors, forestry, tourism and public services, have contracted

Haida Gwaii's economy is narrowly focused on forestry (mainly logging), tourism (mainly sport fishing, Haida culture and Haida Gwaii ecological experiences) and public services, including elementary and high school education, health care and government administration. The resident labour force in 2016 totalled 2,290 workers, a 19.1% decline from the 2006 total of 2,830. Worker numbers in the tourism and forestry sectors declined over the 2006-2016 period, 9.4% and 10.8%, respectively, but by a lesser amount than in the public services sector and in the overall local economy. Table ES-1 presents Haida Gwaii's labour force numbers and percentage shares by major sector for 2016 and 2006.[2]

Table ES-1: Haida Gwaii Labour Force, 2016 and 2006[3]

Sector	2016 #	2016 %[4]	2006 #	2006 %	% change 2016 vs 2006
Tourism	387	16.9	427	15.1	-9.4%
Forestry	290	12.7	325	11.5	-10.8%
Public Services	640	27.9	795	28.1	-19.5%
Other Sectors	973	42.5	1,283	45.3	-24.2%
Total	2,290	100	2,830	100	-19.1%

Source: Statistics Canada 2007 and 2017; unpublished runs of Statistics Canada 2006 and 2016 labour force data supplied to BC Stats; and author's calculations

Data challenges in estimating Haida Gwaii economic activity

The preceding table focused on the resident labour force. Both the forestry and tourism sectors on Haida Gwaii have historically utilized non-resident workers who either reside seasonally or long distance commute for periods or one or more weeks to Haida Gwaii. Generally, less data and information are available on this group of workers but a survey conducted for this timber supply review indicates that the on islands resident share of Haida Gwaii forestry employment has risen in recent years. This shift appears to be largely due to

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[2] This labour force data are from the Census of Canada and is based on "place of residence", i.e. the workers who constitute the labour force members who had their usual place of residence (i.e. permanent residence) on Haida Gwaii.

[3] The labour force question relates to the individual's job held during the week of Sunday, May 1 to Saturday, May 7, 2016. However, if the person did not work during that week but had worked at some time since January 1, 2015, the information relates to the job held longest during that period. Employment at Haida Gwaii resorts is higher in the summer months than in May but the framing of the question captures workers who may not be working in May but who will likely be working in a month or so.

[4] The percentage share shown in this table is the percentage or share of the total labour force. In the 2009 BC Stats reports, the percentage or share of only the "basic sector" is shown, i.e. forestry's percentage/share of the basic sector.

the efforts of Haida Gwaii headquartered Taan Forest Products Ltd. (Taan) to utilize Haida Gwaii resident workers and contractors. Fishing resort lodges (an estimated 16 in 2018) have collectively been an important factor in the Haida Gwaii tourism sector since the 1990s but they have relied as a group on a significant number of off islands seasonal and full-time workers. A new study (expected to report in 2019) may show a greater reliance on local workers at these lodges, in part due to Haida Gwaii-headquartered Haida Enterprise Corporation's (HaiCo's) entrance into the fishing lodge sector and its efforts to hire Haida Gwaii resident workers for its lodges.[5]

FACTORS DRIVING HAIDA GWAII TIMBER HARVESTING

The basic economic activity that underpins the overall performance of the Haida Gwaii forestry sector, whether considered on an annual or a decade basis, is local timber harvesting

Three factors have had the greatest influence on the timber harvesting performance of the Haida Gwaii forestry sector, two factors on the timber supply side and one factor on the timber demand side.

Demand for wood products in external markets drives Haida Gwaii forest sector economic activities

External market demand for softwoods products (including logs) that matches with the Haida Gwaii log supply profile is a critical factor pushing forward Haida Gwaii forest sector economic activities. Demand conditions in two markets drive the overall commercial harvest on Haida Gwaii Management Area (HGMA) lands. The key longstanding market factor is US housing market demand for cedar wood products and the newer market factor is the demand in China for whitewood logs for input into the manufacture in China of lower value structural wood products, such as cement form materials.

On the supply side, a primary influence on timber harvesting levels has been the regulated Annual Allowable Cuts (AACs) for the Haida Gwaii Management Area (HGMA) and the Haida Gwaii Timber Supply Area (TSA) and Timber Forest Licences (TFLs), which have set the upper limits on the potential total timber harvest in these Haida Gwaii timber harvesting management units. The other very important supply side factor has been the commercially operable volume of Old Growth western redcedar on HGMA lands and on private lands. This factor is directly tied to the cost of timber harvesting and transport on Haida Gwaii.

The intersection of the regulated Haida Gwaii timber supply AACs and the commercially operable western redcedar volumes with the demand for Haida Gwaii timber has driven Haida Gwaii timber harvesting volumes, which has fed through to effects on Haida Gwaii forest sector employment and employment income, log prices, sales revenues and stumpage and goods and services purchasing activity. Shifts in one or more of the three cited key

[5] The Marine Plan Partnership for the North Pacific Coast (MaPP) has a research project underway that is expected to include a survey of Haida Gwaii fishing lodge operators, which will provide an up-to-date estimate of total employment and its characteristics in this key part of the Haida Gwaii tourism sector.

supply and demand factors soon result in distinct economic effects in the Haida Gwaii forest sector and the overall Haida Gwaii economy.

Rising Vancouver Log Market prices reflect strong lumber market demand conditions in the US house building and home renovation markets

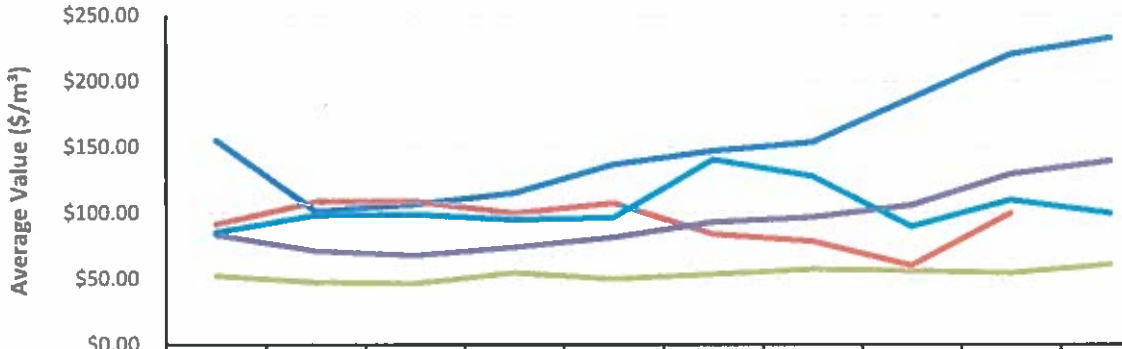
Log prices reflect demand conditions for the wood-based end use products that incorporate the logs extracted from coastal BC forests. The annual average price of western redcedar (Old Growth) logs on the Vancouver Log Market (VLM)[6], taking into consideration all log grades, climbed from a low of $101 in 2009 to $233 in 2017, a more than doubling of the 2009 average price when demand conditions in the US housing market were at a low ebb because of the 2008 financial crisis.

Trends in the US housing market are the main factor that feeds back into the demand for Haida Gwaii cedar timber. In BC, about 75% of the province's cedar lumber exports are directed to the US, 95% of its cedar siding exports go to the US and 95% of cedar shake and shingle exports are US-bound (Gregory, McBeath and Filipescu 2018).

Hemlock log prices were largely stagnant over the 2008-2017 and well below Haida Gwaii per m^3 harvest and transport costs. VLM prices for Sitka spruce logs have been relatively strong (taking into consideration all log grades), peaking at about $140/$m^3$ in 2013. These log price trends largely reflect conditions in key log and wood product markets and demonstrate that commercial viability of timber harvesting on Haida Gwaii is substantively determined by the amount of cedar and/or spruce in stands. Figure ES-1 shows the recent trend in cedar, spruce and hemlock Old Growth log prices on the VLM.

[6] In BC, the functioning log marketplace is organized on a coast-wide basis. Implementation of the BC Government's Forest Revitalization Plan starting in 2003 reinforced this coast-wide marketplace, which facilitates price and quality competition for Haida Gwaii timber along with the timber of other coastal TSAs, TFLs and private lands. Transactions of logs between non-related, Coastal BC-based forest industry parties, such as between a market logger and a wood processing facility, occur within the Vancouver Log Market (VLM), which is a longstanding but informal institution that does not have a centrally organized administrative structure. The selling, buying and trading of logs between entities occurs throughout coastal BC, including Haida Gwaii, but log prices are typically adjusted as necessary to reflect transport costs to the Howe Sound-Fraser River area.

Figure ES-1: Old Growth Log Average Price by Species ($/m³)[7], Vancouver Log Market, 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Cedar	$155.28	$101.29	$106.69	$115.23	$137.00	$147.23	$153.91	$187.26	$220.98	$233.21
Cypress	$91.33	$108.65	$108.89	$99.91	$107.64	$83.83	$78.44	$60.07	$99.60	
Hemlock	$52.24	$47.21	$46.49	$54.48	$50.00	$53.38	$57.10	$55.94	$54.28	$60.75
Spruce	$85.35	$98.48	$99.02	$95.02	$96.66	$140.62	$127.95	$89.82	$109.89	$99.94
All	$83.34	$71.19	$67.94	$74.00	$81.50	$92.99	$96.76	$106.01	$129.54	$139.58

Source: Timber Pricing Branch BC MFLNR 2018 and author's calculations

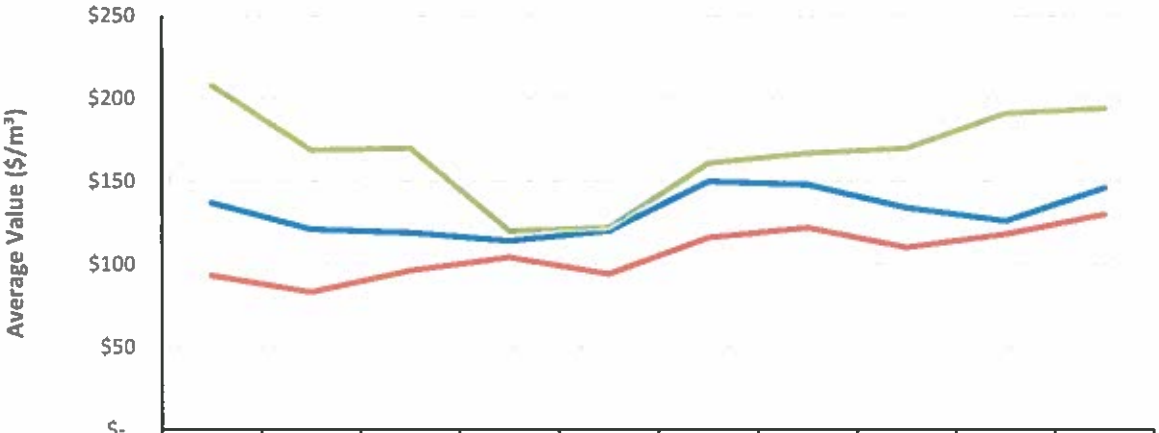
Export log prices, driven by wood product demand conditions in China (hemlock), Japan (spruce) and the US (western redcedar), have generally exceeded VLM log prices

Figure ES-2 shows the recent trend in and levels of average annual prices of BC export logs by species that are sourced from Haida Gwaii.

[7] All dollar amounts in this report are reported in current Canadian dollars unless otherwise noted.

G-4

Figure ES-2: BC Export Log Average Price by Species ($/m³), 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Spruce	$137	$121	$119	$114	$120	$150	$148	$134	$126	$146
Hemlock	$93	$83	$96	$104	$94	$116	$122	$110	$118	$130
Cedar	$208	$169	$170	$120	$122	$161	$167	$170	$191	$194

Source: BC Stats and author's calculations

The higher prices in export markets for hemlock and spruce logs than the prices for these species in the Vancouver Log Market have been a key factor in the diversion of an increasing portion of the Haida Gwaii log harvest from domestic markets over to buyers in China, Japan and South Korea.

HAIDA GWAII AACS AND APPORTIONMENT

From an economic perspective, the HGMC determined AAC sets a maximum allowed annual timber harvesting level for HGMA lands

Table ES-3 shows recent AACs for Haida Gwaii management units TSA 25, TFL 58, and TFL 60. The sum of the Haida Gwaii management unit AACs determined in 2012 was 931,000 m³, a decline of 47.5% from the previous total AAC of 1,772,616 m³. The four woodlot licences contribute an additional 9,293 m³ of AAC.

Table ES-3: Recent AACs for Haida Gwaii Management Units (m³)

Management Unit	AAC determined in 2012 (m³)	Prior AAC (m³)	% change in AAC
TSA 25	512,000	869,748	-41.1%
TFL 58	79,000	100,000	-21.0%
TFL 60	340,000	802,868	-57.7%
All Units	931,000	1,772,616	-47.5%

Source: Sutherland 2012

Haida Gwaii based ownership of Haida Gwaii tenures has greatly increased in recent years

Haida Gwaii-headquartered Taan Forest Products Ltd. is the holder of the TFL 60 tenure, which has an AAC of 340,000 m^3 and is predominantly located on Graham Island with smaller portions located on Moresby Island and on Louise Island. Taan completed the acquisition of the TFL 60 tenure (then called TFL 39 Block 6) from Western Forest Products (WFP) in June 2012 (Taan Forest 2016). Taan also holds a non-replaceable forest licence-First Nations (an area based forest licence to cut), which was obtained in 2010, and accounts for TSA 25's second largest volume apportionment with an AAC commitment of 120,000 m^3.[8] In addition, Taan manages. jointly with BCTS. a volume of 14,210 m^3.[9] These Taan controlled volumes account for approximately 50% of the sum of the Haida Gwaii management unit AACs, a total of 474,210 m^3.

Table ES-4 presents the current AAC apportionment and commitments for TSA 25.

Table ES-4: TSA 25 AAC Apportionment and Commitments (m^3 & % of TSA 25 AAC)

Form of Agreement	m^3	% of AAC
Replaceable Forest Licences	213,632	41.7
Husby Forest Products Ltd. (A16869)	192,044	37.5
A&A Trading (Haida Gwaii) Ltd. (A16870)	13,632	2.7
Dawson Harbour Logging Ltd. (A75084)	7,956	1.6
Non-Replaceable Forest Licences	14,210	2.8
BCTS Partnership (Taan Forest Products)	14,210	2.8
Non-Replaceable Forest Licence – First Nations	120,000	23.4
Haida Tenure (Taan Forest Products)	120,000	23.4
BCTS Timber Sale Licence/ Licence to Cut	81,658	15.9
Community Forest Agreement	80,000	15.6
Forest Service Reserve	2,500	0.5
Total Allowable Annual Cut	512,000	100.0

Source: BC MFLNR 2018b

[8] This tenure is administered as a forest licence to cut (FLTC). Discussions have been underway between the BC Government and Haida Nation associated parties for the conversion of the Taan held FLTC and TFL 60 into an area-based First Nations Woodland Licence, and the arrangements to establish this new licence are expected to be soon finalized.

[9] Joint planning on harvest planning roadbuilding and auctioning.

G-4

HGMA TIMBER HARVEST

The average annual harvest of 831,172 m³ over the 5-year 2013-17 period, which coincides with the April 2012 HGMC determination, shows a shortfall of about 10% relative to the HGMA AAC

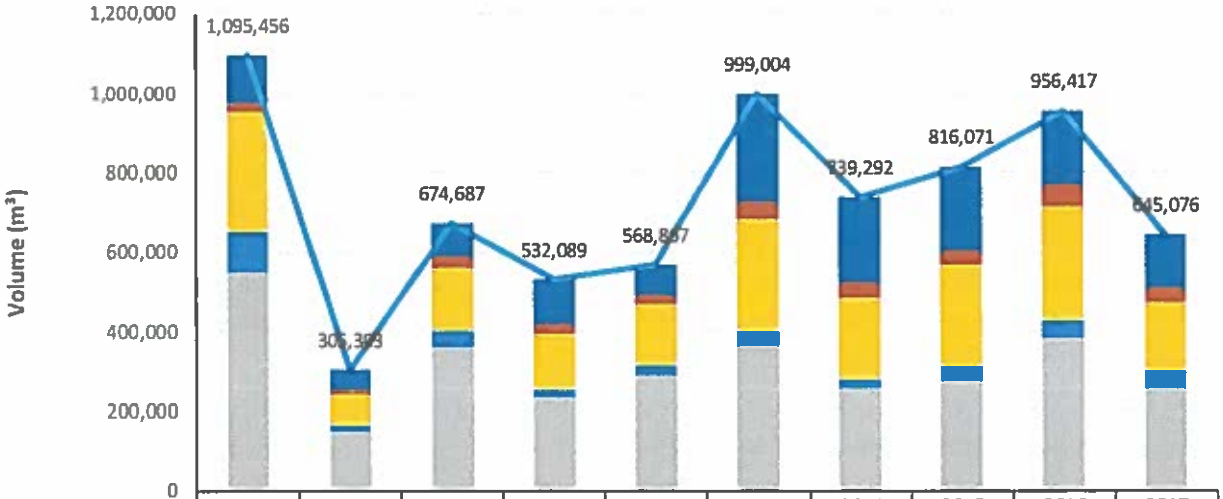
Although the available timber supply for annual harvesting was in the 1.2–1.8 million m³ range over the 2000–2012 period, the amount of timber harvested by commercial operators and supplied into domestic and international markets fell well short of these levels due to target market demand conditions, cost constraints, and administrative and policy parameters on the Haida Gwaii timber supply side.

The most recent 3-year 2015-17 annual average harvest in the HGMA, 805,854 m³, exceeded the 10-year 2008-2017 annual average of 733,226 m³ but was under the 5-year 2013-2017 annual average harvest of 831,172 m³ because of the harvest volume dip in 2017 to 645,076 m³.

During the 10-year 2003-2012 period prior to the initial AAC determination of the HGMC, the Haida Gwaii annual timber harvest averaged approximately 780,000 m³, well below the cumulative total of the then current Haida Gwaii AACs and below the average annual harvest for the 5-year 2013-2017 period.

Over the 2008-2017 decade, the harvest of red and yellow cedar annually averaged approximately 351,000 m³, accounting for an almost half share (47.8%) of the total HGMA harvest. Over the 5-year 2013-2017 period, the cedar share of the HGMA total harvest was lower (41.4%) compared to the 10-year average share. Historically, stands with substantial percentage shares of Old Growth western redcedar volumes have formed a substantial portion of the commercially operable timber harvesting landbase of Haida Gwaii. This accessible local cedar supply in combination with the strong and large scale demand for cedar logs and cedar wood products in Canadian, US and international markets over the past couple of decades have resulted in attractive prices for cedar logs and wood products and substantial cedar timber harvests on both HGMA lands and Haida Gwaii private lands. Figure ES-3 outlines in a graph and a table the HGMA billed harvest volume by species over the 10-year 2008-17 period.

Figure ES-3: HGMA Timber Harvest Volume by Species (m^3), 2008 - 2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Spruce	118,455	51,192	85,031	112,329	75,143	270,736	214,499	212,189	187,211	134,050
Other Species	20,394	9,989	29,083	24,286	23,739	44,403	39,024	36,984	51,329	37,436
Hemlock	304,876	79,393	160,100	142,452	153,689	282,740	207,896	255,562	290,507	171,455
Cypress	101,987	16,471	36,380	17,978	25,343	35,601	18,517	34,197	43,522	44,462
Red Cedar	549,744	148,258	364,093	235,045	290,953	365,525	259,356	277,140	383,848	257,673
Total	1,095,456	305,303	674,687	532,089	568,867	999,004	739,292	816,071	956,417	645,076

Source: Harvest Billing System 2018 and author's calculations

The percentage shares by species of the HGMA harvest for the 2008-2017 period are presented in Table ES-5.

Table ES-5: HGMA Timber Harvest Share by Species (%), 2008 - 2017

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	10-year average
Red Cedar	50.2%	48.6%	54.0%	44.2%	51.1%	36.6%	35.1%	34.0%	40.1%	39.9%	42.7%
Yellow cedar (Cypress)	9.3%	5.4%	5.4%	3.4%	4.5%	3.6%	2.5%	4.2%	4.6%	6.9%	5.1%
Hemlock	27.8%	26.0%	23.7%	26.8%	27.0%	28.3%	28.1%	31.3%	30.4%	26.6%	27.9%
Spruce	10.8%	16.8%	12.6%	21.1%	13.2%	27.1%	29.0%	26.0%	19.6%	20.8%	19.9%
Other	1.9%	3.3%	4.3%	4.6%	4.2%	4.4%	5.3%	4.5%	5.4%	5.8%	4.3%

Source: Harvest Billing System 2018 and author's calculations

LOG EXPORTS

As throughout coastal BC, the log export volume from Haida Gwaii has increased markedly over the past decade

The volume and share of the timber harvest on HGMA lands that was exported climbed from 61,552 m^3 and a 9.1% share of the HGMA lands harvest in 2010 to 267,873 m^3 and a

41.5% share in 2017. Lower value whitewood species accounted for the vast majority of coastal BC export logs because the Government of BC limits the award of export permits for cedar logs to ceremonial or religious uses (incorporation into construction of a religious temple for example). No red or yellow cedar logs harvested on HGMA lands over the 2010-2017 period were given a Government of BC export permit; the HGMA lands harvest that was exported was comprised of whitewood logs.

From the supply side, the main factor influencing Haida Gwaii log exports has been the BC Government order-in-council (OIC) that effectively allows for exporting of Haida Gwaii whitewood logs harvested on BC public lands and BC private lands in any current year equivalent to 35% of the prior year's total harvest volume (excluding waste volumes) from these BC lands. This OIC came into force in 2010 and is part of the longstanding log export regulation systems at the federal and BC government levels.

Another supply side factor was the sale of the private lands portion of TFL 39 Block 6, approximately 10,000 ha, in 2004 by WFP to BC Investment Management Corporation.

FORESTRY RESIDUES

To date, commercially viable market opportunities for Haida Gwaii logging and wood processing residues have proven to be limited but residue utilization initiatives for Haida Gwaii are in the planning stages

Avoidable logging wastes associated with HGMA harvests accounted for about 960,000 m^3 of fibre over the 2008-2017 decade, an annual average of about 96,000 m^3 and 13% of the Haida Gwaii TSA and TFL harvests (HBS 2018 and author's calculations).[10] The Haida Gwaii level of residues is less than the 19% level of avoidable wastes for the overall coastal BC region. Several small Haida Gwaii forestry enterprises have salvage harvest agreements with major tenure holders and/or access small scale salvage licences (for example: Tree Surgeon, Watchman, North Pacific Timber, Maximum Cedar, Against the Grain and Silva).

Plenty of local interest and determination has been shown in recent years to improve Haida Gwaii forestry residues utilization and new efforts have been discussed and a few moved to the planning level.

- A 2012 renewable energy REOFI process for Haida Gwaii was terminated by BC Hydro but HaiCo subsequently submitted biomass fueled generation proposals to BC Hydro
- Taan/HaiCo has conducted business planning for a Haida Gwaii wood processing facility that would incorporate a biomass fueled cogeneration unit
- A fibre recovery tenure on Haida Gwaii was awarded but has not been utilized to date

[10] Avoidable waste volumes are counted as harvest volume against licensee AACs.

- Two small community biomass fueled energy systems on Haida Gwaii currently use externally sourced wood pellets
- A wood fibre briquette making plant at Masset was opened in 2015 but shuttered soon thereafter
- Directing hemlock from Haida Gwaii to southwest BC pulp mills presents cost challenges but pulp log prices are increasing due to sawmill residue constraints in the BC Interior
- Saltwater constraints are generally present for use of coastal log residues in the manufacture of pellets

FOREST SECTOR EMPLOYMENT TRENDS

Both timber harvesting and wood processing employment of Haida Gwaii residents declined since the early 2000s

Estimated Haida Gwaii timber harvesting employment, based on surveys of Haida Gwaii industry participants, shows a decline in the 2015-17 period over the 2002-04 period due to a lower average harvest, greater log export volume and higher logging productivity in the more recent period. Haida Gwaii residents had a higher share of Haida Gwaii direct harvesting employment however in the more recent 2015-17 period, an estimated 81% vs 60% in 2002-04. Table ES-6 compares average annual Haida Gwaii harvests, harvesting employment co-efficients, and harvesting employment for these two time periods.

Table ES-6: Haida Gwaii Timber Harvesting Employment Metrics, 2015-2017 and 2002-2004

Metric	2015-2017	2002-2004
Average annual harvest (m^3)	805,854	1,037,193
Haida Gwaii employment co-efficient (PYs/'000 m^3 of harvested timber)	0.335	0.337
BC employment co-efficient (PYs/'000 m^3 of harvested timber)	0.414	0.557
Haida Gwaii employment (PYs) [11]	270	349
BC employment (PYs)	392	578

Source: survey of HGMA tenure holders, BC MFLNR 2018; Pierce and Lefebvre Consulting 2005; and author's calculations

Timber processing activity and associated employment has historically been relatively low on Haida Gwaii and dropped in recent years

The estimated total amount of Haida Gwaii timber that was processed on the islands was small (5%) in 2002-2004 by comparison to the Haida Gwaii volume processed elsewhere. In the 2015-2017 period, the portion of the Haida Gwaii harvest annually processed on the islands was yet smaller, an estimated 0.6%. The main factor in the further reduction of wood

[11] Employment is stated in person-years (PYs), which is defined as one person working the equivalent of one full year, which is defined as 180 days of work. A person working for 90 days accounts for 0.5 PYs. Full-time equivalents (FTEs) is a term that is used inter-changeably with PYs.

processing activity and associated employment on Haida Gwaii is the combination of adverse operational and financial challenges faced by Haida Gwaii Forest Products (formerly Abfam), which has a small sawmill in Port Clements. This facility was shuttered in 2017 but discussions have taken place between the owners and potential investors about renovating and re-opening this Port Clements mill.

The portion of the Haida Gwaii harvest processed in BC and controlled by Haida Gwaii focused operations did increase significantly, however, due mainly to Taan's establishment of a custom cut program, which was an addition to the well-established custom cut programs of O'Brien & Fuerst and Husby Forest Products Ltd.[12] The custom cut programs of these Haida Gwaii focused harvesting operators accounted for the majority of the Haida Gwaii logs that stayed in BC for processing (and supported associated mill employment in southwest BC).

During the 2015-2017 period, the annual average direct employment on Haida Gwaii based on harvesting and processing HGMA timber was an estimated 285 PYs, and the majority of this direct employment, 270 PYs (95%), was in harvesting activities including log transport

In terms of total employment on Haida Gwaii, which also includes an estimate of the employment supported by forestry firms purchasing goods and services and the employment supported by forest sector connected households locally buying goods and services, the average annual employment impact of the local forest sector on Haida Gwaii was an estimated 414 PYs during the 2015-2017 period.

The employment effects connected to harvesting and processing Haida Gwaii timber more than double when they are considered on a province-wide basis

During the 2015-2017 period, the estimated annual average direct employment in the province based on harvesting and processing HGMA timber was 622 PYs and the total employment effect was an estimated annual average of 1,244 PYs. Although Haida Gwaii resident workers accounted for the largest share of harvesting direct employment (81%), on islands workers held less than half of the total (harvesting and processing) direct employment (43%) because of the small amount of wood processing activity on Haida Gwaii.

HAIDA GWAII TIMBER HARVESTING OPERATING COSTS

Haida Gwaii is a high cost logging location competing in a global market

The higher Haida Gwaii harvesting and transport costs are due to the difficult terrain in certain Haida Gwaii harvesting locations, the cost of barging logs from Haida Gwaii to

[12] Custom cutting programs on coastal BC are based on market logging or log trading operations renting capacity and services at southwest BC sawmills in order to process their harvested logs (mainly cedar logs), to sell the resulting lumber products to wholesalers and retailers in Canada, the U.S. and internationally and to gain a financial return on the sale of wood products manufactured from their harvested logs. Custom cut programs are an alternative to owning and operating wood processing facilities.

Lower Mainland and Vancouver Island timber processing facilities, EBM requirements associated with on islands timber harvesting and use of the FSC certification system (by Taan).

A wide range of logging costs is evident on Haida Gwaii but harvesting of Old Growth timber versus 2nd Growth timber and their associated terrain characteristics is the main point of on islands cost differentiation in recent years and will remain so over the next couple of decades. In the researched examples, helicopter logging is the most expensive ($172/m^3), followed by cable logging of Old Growth timber ($96/m^3). Mechanized falling and yarding of 2nd Growth timber presents as the lowest cost harvesting system on Haida Gwaii ($79/m^3).[13]

[13] The shown costs are representative estimates and are not average costs based upon a survey of costs of harvesting a sample of Haida Gwaii timber stands. Cost estimates include layout/planning, road construction, felling, skidding/yarding, processing, trucking, and barging, sorting, scaling, and log storage. In general, timber harvesting costs on Haida Gwaii vary by terrain, equipment used, timber types, past development, and geographic location (which affects travel time, difficulty of access, and camp requirements).

G-4

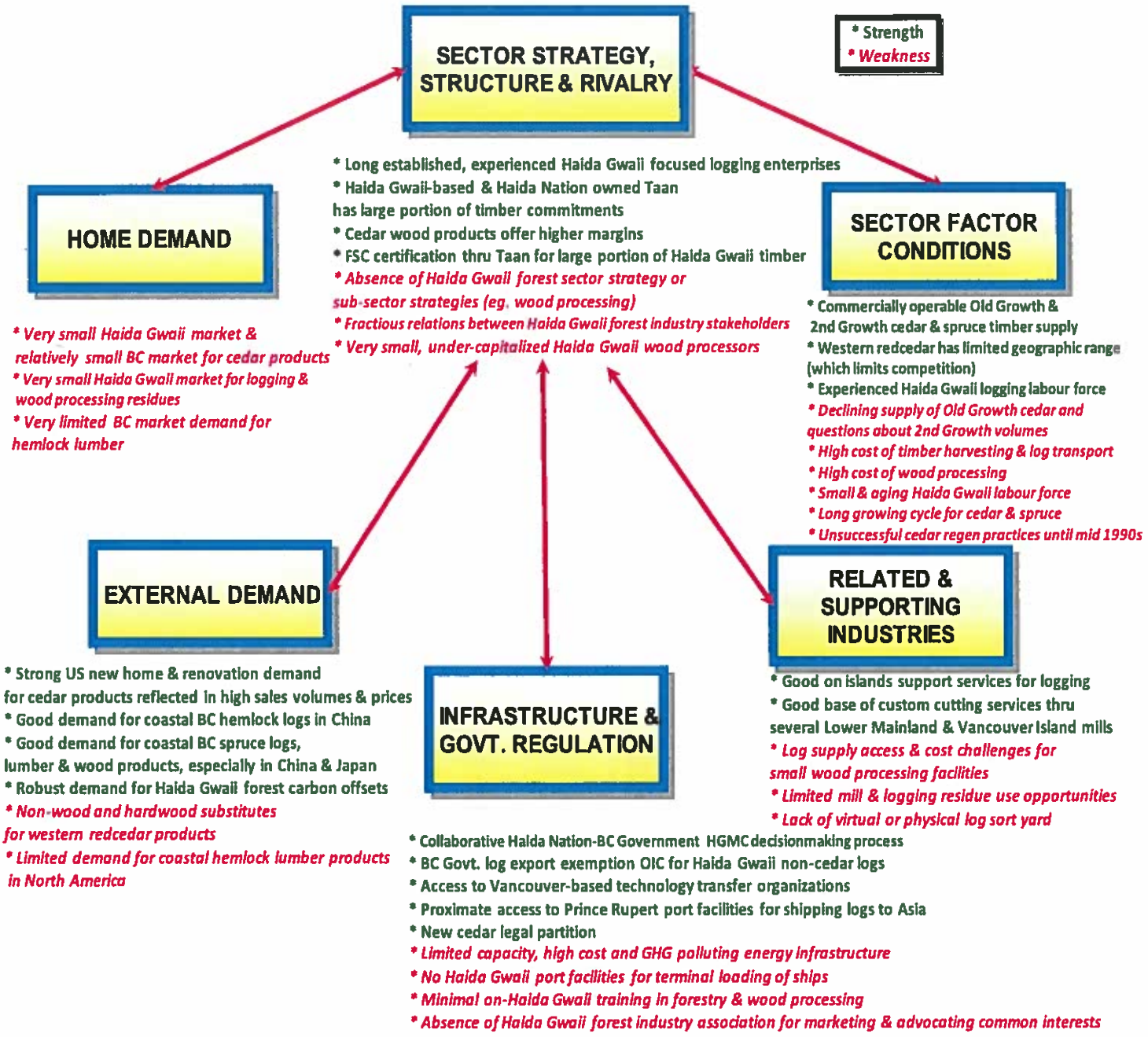
1.3 Key Issues Going Forward

The RFP for this socio-economic report included a Part II in which six questions were framed around issues that look forward at potential effects on the Haida Gwaii forest sector or potential effects of the local forest sector on Haida Gwaii communities and peoples. The six questions were as follows.

- [What is the] Role of cedar as an ongoing economic mainstay (i.e., sustainable supply of economic cedar)?
- What elements of community stability are dependent on timber supply?
- What contribution does wood provide to local versus regional/provincial markets?
- What are the variables and thresholds for second growth forests being economically viable?
- What are the barriers or enablers of fibre flow to local producers? Which barriers have the largest impact on the health of the islands economy?
- What is required (levels of harvest) to provide a security of investment for operators?

Figure ES-1 summarizes the Haida Gwaii forest sector situation analysis and sets much of the context for this review "going forward" issues.

Figure ES-1: Summary of strengths and weaknesses of Haida Gwaii Forest Sector



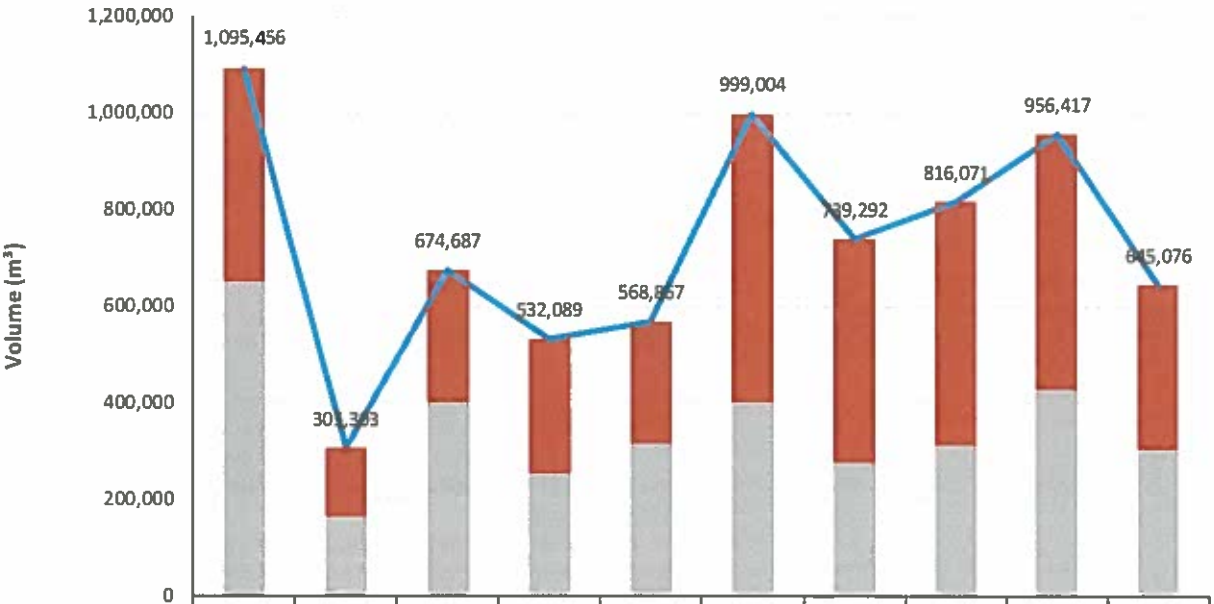
G-4

ROLE OF CEDAR

Harvesting cedar has been the "straw that stirs the drink" for the Haida Gwaii forest sector since the mid-1990s. The limited global supplies of western redcedar and yellow cedar are manufactured into specialty or niche products sought by buyers who appreciate cedar's structural, visual and durability qualities. Cedar timber's manufacture into consumer-oriented products is a key distinguishing feature from other coastal BC softwood species that are primarily used for internal (not visible) structural purposes. A question in the RFP for this socio-economic project was [What is the] role of cedar as an ongoing economic mainstay (i.e. sustainable supply of economic cedar)?

The annual average cedar harvest on HGMA lands over the 10-year 2008-2017 period was approximately 351,000 m³, approximately 48% of the annual average total harvest. Cedar's share of the HGMA harvest ranged from approximately 38% to 60% over this decade. The annual average for the 5-year 2013-2017 period was slightly lower, about 344,000 m³. Figure ES-4 summarizes the harvest of cedar versus the harvest of other species on Haida Gwaii over the 2008-2017 decade.

Figure ES-4: HGMA cedar harvest versus harvest of other species (m³), 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Other Species	443,725	140,574	274,215	279,066	252,571	597,878	461,419	504,735	529,047	342,941
Cedar	651,731	164,729	400,472	253,023	316,296	401,125	277,873	311,336	427,370	302,135
Total	1,095,456	305,303	674,687	532,089	568,867	999,004	739,292	816,071	956,417	645,076

6-4

Source: Harvest Billing System 2018 and author's calculations

In a weak or limited whitewoods export log situation, cedar largely carries the commercial operability of logging in TSA 25 and TFL 60. A substantive decrease in the prices for cedar logs and/or the available supply for commercial harvesting would deeply challenge the financial viability of timber harvesting on Haida Gwaii due to the the relatively high cost of harvesting on and transport from Haida Gwaii.

The Technical Working Group for the current timber supply review has put forward an analysis base case timber supply projection that incorporates applicable forest management rules for the HGMA, including the Haida Gwaii LUOO, and a non-declining timber supply flow over a 400 year projection period. The analysis base case annual timber supply for the HGMA is 842,781 m^3 until the 10th decade whereupon the annual timber supply is projected to increase to 926,000 m^3 and remains at that level in subsequent decades.

This HGMA base case projection incorporated a declining flow timber supply projection for cedar, the target starting point of which was the maximum cedar harvest level from the previous chief forester AAC determinations. The annual timber supply volume of cedar in the base case starts (in the 1st decade) at 277,000 m^3, steeply declines to an annual volume of 122,000 m^3 by the 4th decade and then increases and stabilizes to approximately 176,000 m^3 by the 8th decade.[14]

The base case annual cedar volume projection starts slightly lower than the average annual cedar harvest (for the 2008-2017 period) of approximately 351,000 m^3 and lower than the sum of the maximum cedar harvest levels expressed by the chief forester of 360,000 m^3. Within 30 years, the base case annual cedar volume projection shows a cedar harvest level of about 147,000 m^3, which would be almost the same harvest as that experienced in only one year, 2009, in the past 10. This level would likely be in place for about 10 years, and then drop further yet.

These projections (notably the projected steep declines in cedar volumes and increasing share of hemlock in the HGMA timber supply in the next few decades) and the anticipated increase in market values per m^3 due to the shrinking supply of Old Growth Coastal BC timber indicate that policy and administrative approaches for the management of cedar timber supply over time will be an important consideration for the HGMC and the Chief Forester in HGMA related AAC determinations now and well into the future. At a high level, the current and near term timber stock and supply situation of TFL 58 provides a glimpse into the timber stock and supply situation in 30 years of the other Haida Gwaii management units. Relative to

[14] If a long run average yield (LRAY) approach was taken to projecting cedar timber supply in the HGMA base case then the cedar volume projection would be an average 146,371 m^3 (Technical Working Group 2019). (Technical Working Group 2019).

G-4

TSA 25 and TFL 60, TFL 58 currently has a lower share of cedar and a higher share of managed stands in its timber stock and supply.

COMMUNITY STABILITY AND TIMBER SUPPLY

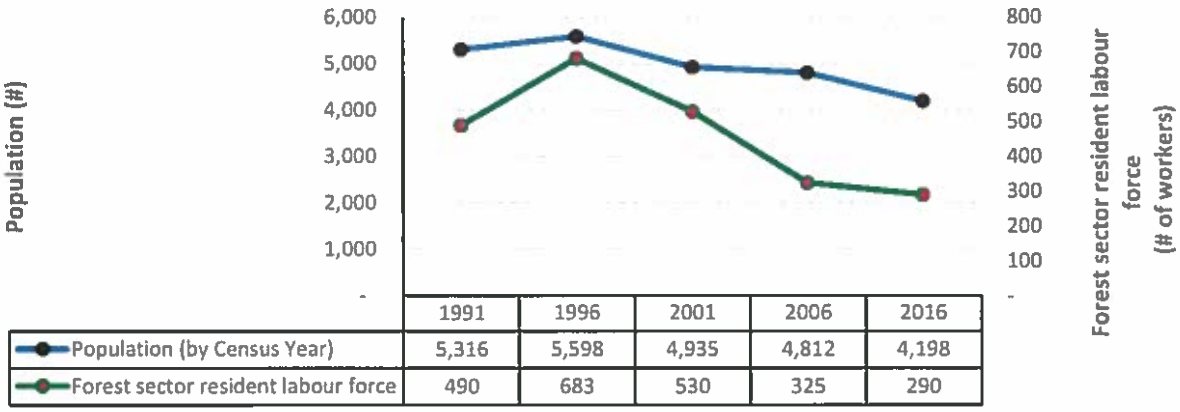
A question in the RFP for this socio-economic project was "What elements of community stability are dependent on timber supply?"

The forest sector employees residing on the islands create both a demand for public services in health, municipal infrastructure, schools and recreation but also contribute to a residential tax base and a critical mass or base of residents who can support the public services of small organized communities. These forest worker households also contribute to creating a customer and client base sufficient to support a small but reasonably broad range of retail and professional services, food and beverage businesses and even public services, such as public schools, spread across the Haida Gwaii communities.

Forest sector related employment is the main pathway through which the forest sector has direct effects on community stability on Haida Gwaii. As forest sector employment contracts some affected individuals and families permanently leave Haida Gwaii to seek or accept new employment resulting in local population decline and shrinkage in the residential tax base and fewer residents to support on islands community activities and to patronize local retailers and public services, such as schools.

Figure ES-5 shows the direct correlation between Haida Gwaii's population levels and the number of local workers employed in the Haida Gwaii forest sector. Both Haida Gwaii's population and the Haida Gwaii forest sector have declined for the shown years since 1996. The decrease in population has not been as sharp in percentage terms as for the forest sector labour force because a portion of the terminated forest sector workers either retire or switch to work in another sector on Haida Gwaii rather than move elsewhere.

Figure ES-5: Trend Comparison of Haida Population and Forest Sector Resident Labour Force by Census Year



	1991	1996	2001	2006	2016
Population (by Census Year)	5,316	5,598	4,935	4,812	4,198
Forest sector resident labour force	490	683	530	325	290

Source: Census of Canada

CONTRIBUTIONS OF HAIDA GWAII WOOD TO HAIDA GWAII, BC AND INTERNATIONAL MARKETS

From a wood products market perspective, the Haida Gwaii situation is consistent and in accord, in a broad sense, with other areas of BC in that the vast majority of Haida Gwaii timber fibre is ultimately sold into international markets. The local Haida Gwaii demand for wood products, especially cedar products, is vibrant in that wood is the focus of local structural and exterior building materials, but the local marketplace is nevertheless very small. In the case of Haida Gwaii, the vast majority of its timber is sold either as cedar lumber products into the US or as whitewood logs into China and a few other Asian countries.

A question in the RFP for this socio-economic project was "What contribution does wood provide to local versus regional/provincial markets?"

A distinct characteristic of the Haida Gwaii situation is that very little Haida Gwaii timber is milled on Haida Gwaii into wood products but a large portion of the processing of Haida Gwaii timber is controlled by Haida Gwaii focused enterprises. Both Husby and O'Brien & Fuerst have long had established custom cutting programs whereby they have maintained control of the processing and marketing of their Haida Gwaii timber through rental of capacity at Lower Mainland mills and log trades. Taan, which now controls the largest share of the HGMA AACs (approximately 50%), has created a custom cutting program using Lower Mainland sawmills over the past few years. The volume and share of the Haida Gwaii timber harvest that is directed through the custom cut programs of Husby, O'Brien & Fuerst and Taan varies on a year to year basis due to several supply and demand factors, including

the proportion of cedar in the total harvest, but in broad terms, the HGMA lands harvest share processed in Lower Mainland mills through the custom cut programs of these three enterprises amounts to about 40% in the past few years.

From the supply side, the main factor influencing Haida Gwaii log exports has been the 2010 BC Government order-in-council (OIC) that effectively allows for exporting of Haida Gwaii whitewood logs harvested on BC Crown lands and BC private lands in any current year equivalent to 35% of the prior year's total harvest volume (excluding waste volumes) from these BC lands.

Since the 2010 introduction of the Haida Gwaii exemption order, whitewood log exports from Haida Gwaii to Asian destinations have greatly increased, driven by the considerable gap in whitewood log prices between offshore and Coastal BC markets, and here the Haida Gwaii logs are processed into, mainly, structural lumber products. All current parties holding major Haida Gwaii tenures are whitewood log exporters. In January 2019, the BC Government extended the Haida Gwaii log export OIC but only until July 31, 2019 and communicated that a plan or strategy to address BC log export policy and TSL bidding is forthcoming. An elimination of this Haida Gwaii OIC would not change log demand conditions in Chinese, South Korean and Japanese markets but would negatively alter the commercial viability of harvesting stands on Haida Gwaii with low cedar and/or spruce components. The matter of log exports and Coastal BC log processing is exceedingly complex and its dimensions and characteristics vary along the BC Coast. Definitive conclusions aren't yet possible about potential effects to the Haida Gwaii forest sector since the contents of the BC Government's log export policy changes are not known at this juncture but the Haida Gwaii case should be looked upon as highly sensitive to alterations in the current OIC given the relatively high cost structure of harvesting and transport of Haida Gwaii timber.

SECOND GROWTH FORESTS ECONOMIC VIABILITY

Second Growth timber on Haida Gwaii presents different challenges for the local forest sector on both cost and revenue sides of the financial ledger. A question in the RFP for the socio-economic project focused on Second Growth forests, "What are the variables and thresholds for second growth forests being economically viable?"

Considerable experience has already developed on Haida Gwaii with both harvesting and marketing Second Growth forests. Within an overall coastal BC context, the BC Government and forest industry organizations, such as FPInnovations, have led research and policy-making on challenges, opportunities and strategies to understand and address the shift from harvesting and processing Old Growth timber to Second Growth timber throughout the BC Coast.[15]

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[15] The "BC Coastal Forest Sector Hem-Fir Initiative" is possibly the most well-known effort, see http://www.bccoastalinitiative.ca/index.html. This program included a "Coastal Cedar Focus".

G-4

On the cost side, in general, harvesting Second Growth stands presents cost advantages. Based on Haida Gwaii examples, the harvest and transport cost for a Second Growth focused logging system is estimated as approximately $\$79/m^3$, which is about 80% of the estimated $\$96/m^3$ cost for an Old Growth focused harvesting system. Specific stands will vary in their costs based on stand volume, terrain, location proximity to a forest road, etc. but this comparison conveys the relative cost advantage presented by harvesting Haida Gwaii Second Growth stands.

The lower per m^3 harvesting cost would largely be captured at the expense of employment as more mechanized harvesting and less road and bridge development would reduce labour requirements. A transition to more mechanized harvesting also reinforces a movement towards larger development volumes to spread out the new overhead capital costs.

On the other side of the ledger, Second Growth cedar logs capture a lower price in the Vancouver Log Market than Old Growth cedar logs. Using 2015-2017 average log prices for comparison purposes, Second Growth logs captured a price in the Vancouver Log Market that was about 82% of the recent average prices for Old Growth cedar logs.

We focus here on log costs and prices but milling cost, lumber recovery rates and wood products (including types that can be manufactured, product quality and wholesale and retail price) vary by use of Second Growth and Old Growth logs as the fibre input. A thorough understanding of many of these Second Growth cedar lumber product issues is an important matter needing additional research and development. FP Innovations undertook a couple of short research exercises on a few Second Growth cedar lumber product issues and the researchers concluded that additional research is needed, "A comprehensive research task force approach is recommended to provide definitive answers to questions and contradictions obscuring a clear understanding of the properties and potential of second-growth redcedar. The task force should be similar to those undertaken on the coast for Douglas-fir and western hemlock." (Middelton and Munro 2013).

TIMBER FLOW TO LOCAL PRODUCERS

A longstanding concern on Haida Gwaii, but also a general concern in several other areas of the province, has been the challenges that small- and medium-sized mills face in acquiring timber to process into wood products. For example, a Canadian Forest Service study issued in 2000 observed that "The key hurdle identified by local QCI manufacturers is a lack of consistent fibre supply. This is the message repeated in virtually all of the reports done on the QCI forest sector. Local processors contend that if wood supply problems could be resolved, they could cope with other challenges…" (Wilson and Stennes 2000). Fibre supply access challenges for micro and small mills are still very much a top of mind issue based on the interviews with small scale Haida Gwaii forestry enterprises undertaken for this project. A question that was raised in the RFP for this socio-economic study was as follows, "What are

the barriers or enablers of fibre flow to local producers? Which barriers have the largest impact on the health of the islands economy?"

The barriers of fibre flow to local wood processors that were identified in the interviews conducted for this socio-economic project were the following.

- Market-based log pricing asked by licensees.
- Payment conditions for acquiring logs from licensees.
- Absence of secure, long-term fibre access arrangements for small scale processors.
- Lack of BCTS Category 2 program auctions on Haida Gwaii for local enterprises with micro- or small-scale wood processing operations.
- Financial challenges of Haida Gwaii small scale wood processors to successfully compete in BCTS TSL and Category 2 program auctions.
- No Haida Gwaii log sort operation to direct fibre to local processors along the lines of the monumental cedar log sort operated by the Ministry.
- No organized notification of available fibre via a website or other means.

The matter of access and cost of fibre for Haida Gwaii wood processors was also raised in the 2015 [Haida Gwaii] Forestry Strategy Forum and its background discussion paper, which also pointed out a few other matters that also have substantial effects for the competitiveness of small scale wood processing on Haida Gwaii, "The lack of a stable, vibrant manufacturing sector is usually attributed to the lack of long-term availability of a supply of high quality logs, the inability to secure capital and lines of credit, the small local market, the lack of a stable trained work force, energy and waste issues, and the lack of information about, and access to, off-island markets." (Moore Resource Management 2015a).

At a minimum, the log availability issue could be quickly addressed in part by using current (and fairly modest) website capabilities to set up a "virtual log sort yard" for Haida Gwaii. On a longer term basis, consideration ought to be given to developing a Haida Gwaii strategy focused on log supply to local micro mills and small wood processors.

TIMBER HARVEST NEEDS FOR FINANCIAL SUSTAINABILITY

A question was posed in this project's RFP about the level of annual average timber harvest in relation to investment security, "What are required (levels of harvest) to provide a security of investment for [harvest] operators?". This question is often discussed throughout the BC forest industry because of the substantial capital and workforce investments that are required to sustain operations over a time period in which investments can be recouped along with a suitable profit in line with the financial risk assumed by the enterprises.

In terms of the level of annual harvest that would be desirable to financially sustain a market logging enterprise on Haida Gwaii, the responses from Haida Gwaii forest sector participants

who were interviewed varied between an annual average of 75,000 m^3 and 100,000 m^3. Location of harvesting, specifically terrain conditions, and stand species and age composition, would be important influencers on the amount of desirable operable volume in the Haida Gwaii context but this 75-100,000 m^3 range is a good basis for consideration of the average annual volume that's needed to sustain a viable market logging enterprise over the long term.

Haida Gwaii Timber Supply Review
Data Package Appendices

Timber Supply Review Technical Working Group report for the Haida Gwaii Management Council

2019

Contents

Appendix 1 Meta data on timber supply spatial inputs

Input	Source	Reference file (TSR Geodatabase)
Protected Areas (CHN/Federal, 51N)	GeoBC: WHSE_ADMIN_BOUNDARIES.CLAB_NATIONAL_PARKS	FEDPA_51N
Protected Areas (CHN/Provincial, 60N)	GeoBC: TA_CA_SVW_polygon TA_PEP_SVW_polygon	PROVPA_60N
Surface water (TRIM waterbodies)	GeoBC: TRIM	WATER
Current roads	GeoBC: FTEN_ROAD_SECTION_LINES_SVW CHN: road updates	ALLROADS MSROADS
Federal Reserves (IR, 52N)	GeoBC: WHSE_ADMIN_BOUNDARIES.CLAB_INDIAN_RESERVES	REDIR_52N
Federal Misc (Military/other, 53N, 54N)	GeoBC: WHSE_TANTALIS.TA_CROWN_TENURES_SVW	FEDBLOCK_54N FEDMILITARY_53N
Provincial Reserves/non-timber tenures (69N, 68U, 61C)	GeoBC: TA_CPR_SVW_polygon WHSE_TANTALIS.TA_CROWN_TENURES_SVW	PROVMISCRES_69N PROVRECRES_68U PROVUREP_61C
Private (crown grants-40N)	GeoBC: WHSE_CADASTRE.CBM_INTGD_CADASTRAL_FABRIC_SVW Integrated Cadastral Information Society layer	PRIVATE_40N
Municipal	GeoBC: MUN_NUM, CRWN_GRANTS	MUNBNDRY
Tree Farm Licence	WHSE_ADMIN_BOUNDARIES.FADM_TFL, WHSE_ADMIN_BOUNDARIES.FADM_TFL_ADDITION, WHSE_ADMIN_BOUNDARIES.FADM_TFL_DELETION, WHSE_ADMIN_BOUNDARIES.FADM_TFL_SCHED_A	PROVFMU_62c_update
Woodlot Licence	GeoBC: WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY_SVW	PROVFMU_62c_update
AFU	Taan Forest:AFU_8152017; Tlewis Mapping HGMC: afu_090814; Gowgaia: Riparian Fish Forest CWAPs	AFU_update

Input	Source	Reference file (TSR Geodatabase)
Type 1 Fish Habitat	HGMC: Sch04_TypeI_20101125 Gowlland: TypeI spatial model PECP_estuarypolys_with_ranking_March2007 est_bc_pt1 (LOS) herring_arc (CRIMS) Kelp_arc (CRIMS)	T1FISH_HAB
Type 2 Fish Habitat	HGMC: Sch04_TypeI_20101125 Gowlland: TypeII spatial model	T1FISH_HAB
Terrestrial Ecosystem Mapping	MFLNRORD: qci_ecp (Shikun Ran) TEM_jul5_10_v1 TEI_Long_tbl6469 (Madrone Louise) NEM_Long_tbl TSM_long_tbl RSLT_FCSLV_polygon Operational_Data_6519_2019.gdb	ECO_updated
Karst	Natural Resources Canada: Sutherland Brown	KARST
Forest Reserves (Marbled Murrelet, Rare Ecosystems)	HGMC: Sch08_FR_20170906	FRN
Marbled Murrelet reserves	HGLUOO annual submissions 2012-2016	MAMU
Northern Goshawk nesting	HGMC: Sch12_NOGO_20170905 Updates (draft reserves) to 2019	NOGO_update
Northern Goshawk predicted territories	HGMC: Technical Working Group	NOGOTERR_update
Saw Whet Owl nesting	HGMC: Sch12_SAWO_20170905	SAWO
Black Bear denning	HGLUOO annual submissions 2012-2016	BEAR
Timber Harvesting Land Base	MoE: NOGO-6-001_ord NOGO-6-002_ord MAMU-6-041_ord MAMU-6-046_ord	THLB10000_BaseCase_Oct31
	MFLNRORD: arch_sites_intersecting_Haida_Coastline_16May19 HGLUOO annual submissions 2012-2016 CHN: Haida Name Place CHN: CMT database	HERITAGE_update

G-4

Input	Source	Reference file (TSR Geodatabase)
Cedar Stewardship Areas	HGMC: Sch03_Csa_20101125	CSA
Monumentals (current in-block)	HGLUOO annual submissions 2012-2016	MON
Haida Traditional Forest Features	HGLUOO annual submissions 2012-2016	HTFF
Yew	HGLUOO annual submissions 2012-2016	YEW
Trails	CHN: all-trails (Tlell Watershed Society- maintained trail map) Haida Mapping- traversed trails -maintained	TRAIL
Permanent Sample Plots	GeoBC: GRY_PSP_AL	PSP
Landslides	CHN	SLIDES
Class IV Terrain	terqci45; tert2545; tsm_qci; tsmqci45; tter_25_6; ssite (TFL39); fr82_pl3;	
Class V Terrain	Weiland2018	TERRAIN
Vegetation Resource Inventory Phase I	GeoBC: veg_comp_lyr_r1_poly	-
RESULTS	GeoBC: RSLT_FCSLV_polygon	-
Visual Landscape Inventory	GeoBC: REC_VLND	VLIINV
Sensitive Watersheds	HGMC: Sch07_SensWS_20101125	SENSWSHDS
Upland Stream Areas	HGMC: Sch06_UpStrSubUnits_20101125	USAWSHDS
Community Watersheds	GeoBC: BC_COM_WTR	CWSHED1
Landscape Units	HGMC: Sch01_LU_20101124	LUNAME
Marbled Murrelet habitat	HGMC: Sch11_Mamu_20101125	MAMULU
Ecosections	MoE:	ECO_SECTIONS
2008-2017 harvest areas	GeoBC: RSLT_FCSLV_polygon Silvacare: 2017 depletion updates	MCBLOCKS_update
Community Forest Agreement (Proposed)		PROVFMU_CFA
First Nation Woodland Licence (Proposed)		PROVFMU_FNWL
Mosquito Lake watershed	LUP: Process Technical Team/CHN	MOSQLK_update
Operability Woodsheds	HGMC: Technical Working Group	OPWDSHEDS

G-4

Appendix 2 Enhanced SIBEC

An expert review coordinated by the TSR working group was conducted[1] to determine which of these previously unused plots could be used to provide updated site index estimates. These plots filled gaps in the SIBEC database; and provided additional information that needed to be compared to the SIBEC database and was assessed by the expert review group.

In proposing changes relative to the published SIBEC estimates, the review group based its recommendations on a combination of expert opinion and available data, considering the following:

- Confidence in site series calls or mensurational work of different plot sources. For example Site Index Adjustment studies explicitly reported that site series were not classified to SIBEC standards, and therefore these plots were not used for adjustments
- Expert experience with ecosystems on Haida Gwaii and along the coast in particular on the mainland adjacent to Haida Gwaii helped to assess the relative reasonableness of SI estimates from different sources based on knowledge of the growth of tree species on different ecosystem types and edatopes (moisture/nutrient) within site types, as well as experience with the comparative growth of different tree species on similar sites. This experience was used by the review team in assessing how and whether to apply data to override or use the existing SIBEC estimates in developing yield estimates.
- Sample sizes and standard error. For example, if the data set that contained a discrepancy relative to the existing SIBEC estimates was very small, less weight was placed on this additional information;

Generally, the expert review concluded that existing SIBEC estimates should be used in the analysis unless it was ecologically and statistically defensible to make a change. Of the approximate 73 forested site series on Haida Gwaii**Invalid source specified.**, SIs were re-assigned for 7 site series as a result of the review (See following table).

Table 2. Site series for which SI adjustments were made relative to the SIBEC database.

BG Zone/Var	Site Series	Species	2013 SIBEC Site index	Adjusted Site Index	No. Plots	St Dev of Site Index	Variance	SE
CWHwh1	101	Cw	21.4	20.08	30	3.56	12.67	0.65
CWHwh1	101	Hw	22.9	26.04	19	5.47	29.91	1.25
CWHwh1	102	Cw	20	18.16	8	3.79	14.33	1.34
CWHwh1	102	Hw	23.9	25.73	45	3.54	12.51	0.53
CWHwh1	102	Ss	27.9	25.37	57	6.06	36.76	0.80
CWHwh1	105	Ss	29.7	30.98	54	4.55	20.66	0.62
CWHwh1	110	Ss	16	22.97	8	4.52	20.41	1.60

[1] Dr. Sari Saunders, Provincial Regional Ecologist; Pam Dykstra, Research Leader forest ecologist interpretations; Dr. Allan Banner, Ecologist.

Appendix 3 Evaluating alternative sources of site index assignments

Evaluating site index assignment alternatives

Independent field plots from a Young Stand Monitoring project were used to evaluate site index assigned from various mapping projects including VRI (site tools), Ecosystem mapping, Provincial Site Productivity Layer and RESULTS silviculture records. Site index from the YSM program, in which SIBEC standards were used for choosing site index trees, can be used to evaluate the various potential site index assignment approaches. The purpose of the comparison was to evaluate which mapping system best represented site index relative to what was found in the field. In the end the ecosystem mapping (using primary deciles) matched with site index for each species component was chosen for the base case.

The 2016 Young Stand Monitoring project was implemented on Haida Gwaii by the Forest Analysis and Inventory Branch (deJong, 2017). A total of 43 ground samples were established in young stands (aged 15-50 years) in order to[2]:

- Characterize the stand species composition, structure, mortality and growth, yield[3] and health;
- Assess the accuracy of the Phase I (photo interpreted) Vegetation Resource Inventory;
- Assess the accuracy of site index estimates in the Provincial Site Productivity Layer;
- Compare observed stand yields to predictions generated from TIPSY, and;

Only two of the YSM plots were in cedar leading stands, which is expected given the short time over which cedar has been successfully regenerated after harvest on Haida Gwaii. Therefore no statistical inference could be made regarding cedar-leading site indices.

The following charts show comparisons of SI derived from YSM data to mapped SI approaches.

Five site index assignment approaches were evaluated against the YSM data: RESULTS[4]; Provincial Site Productivity Layer; VRI (Site Tools) ; and; SIBEC (both primary ecosystem and a separate multi-decile approach). In the following charts, green diamonds represent hemlock leading plots and the red triangles represent Sitka spruce leading plots.

[2] Excerpt from page 1 of (deJong 2017)

[3] Growth and yield comparisons will only be available when re-measurements become available (anticipated in 2021).

[4] On Haida Gwaii the majority of RESULTS standard units are assigned using SIBEC (52%), followed by SI assignments from 1998 rollover (18%), or SI from stand before harvest (12%). An issue is that SIBEC has been re-published over the years- so many of the records would be from 'older' (first-approximation) estimates

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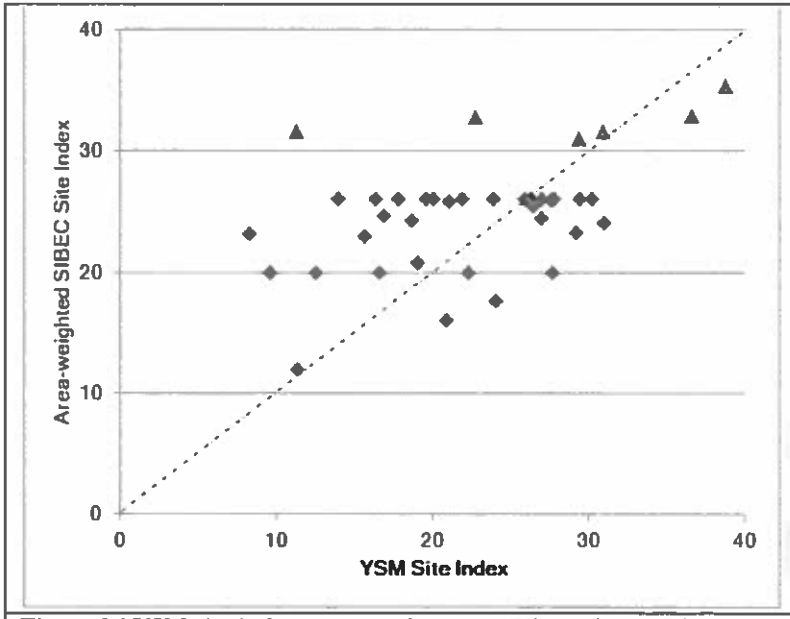

Figure 3.1 YSM site index compared to area-weighted site index from SIBEC and ecosystem mapping (green= hemlock, red=spruce)

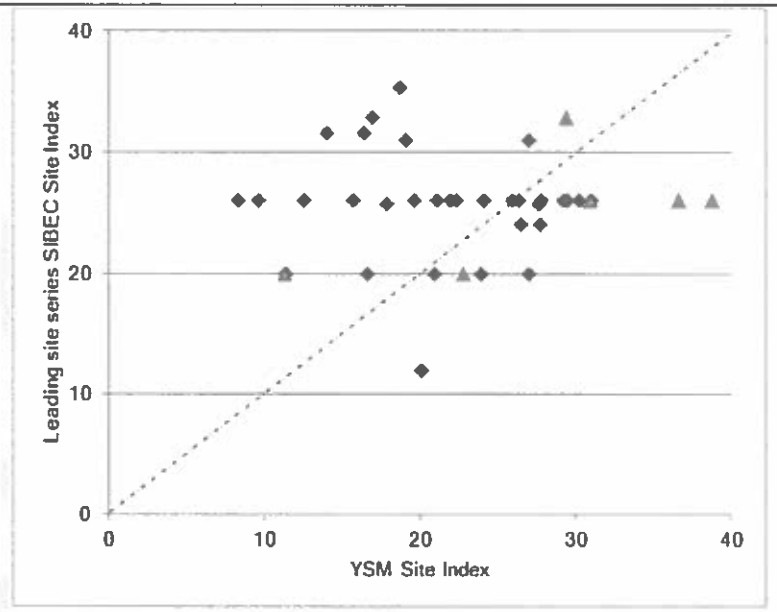

Figure 3.2 YSM site index compared to leading ecosystem site index from SIBEC and ecosystem mapping (green= hemlock, red=spruce)

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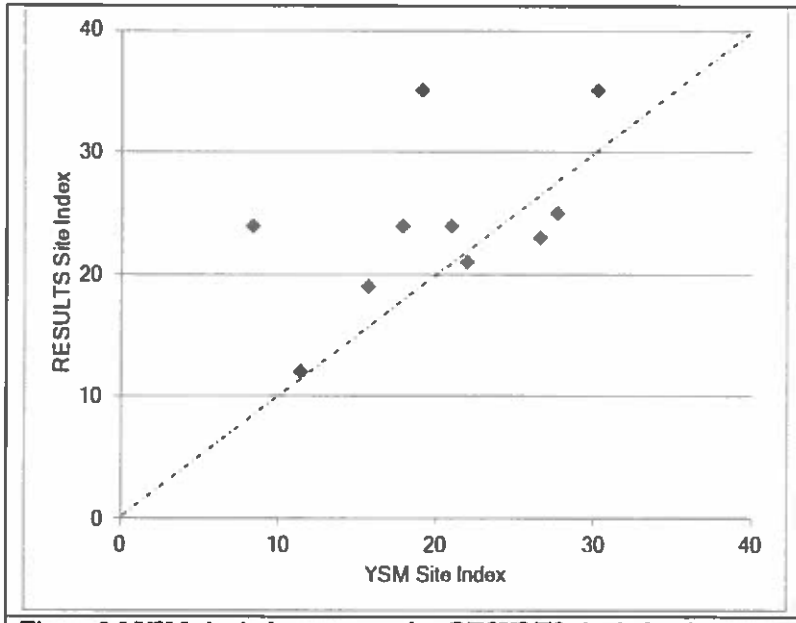

Figure 3.3 YSM site index compared to RESULTS site index (green= hemlock, red=spruce)

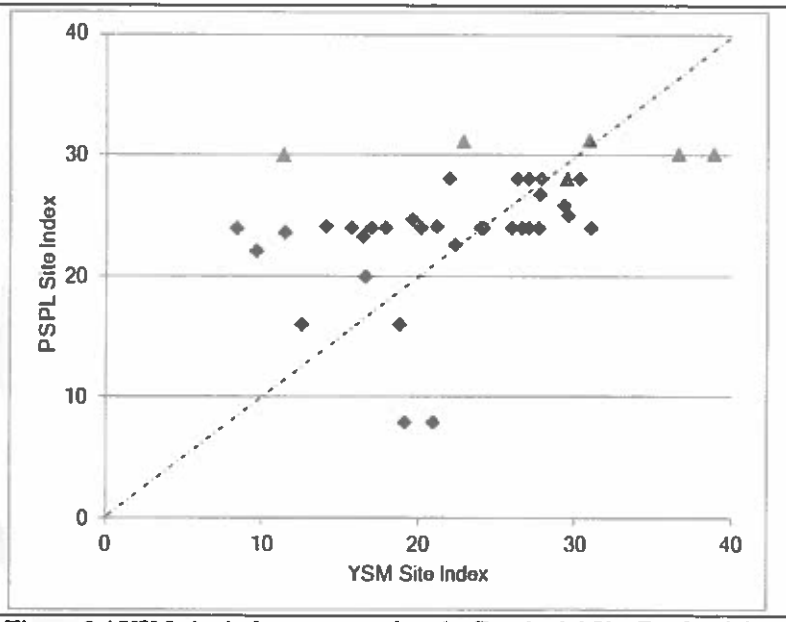

Figure 3.4 YSM site index compared to the Provincial Site Productivity Site Index (green= hemlock, red=spruce)

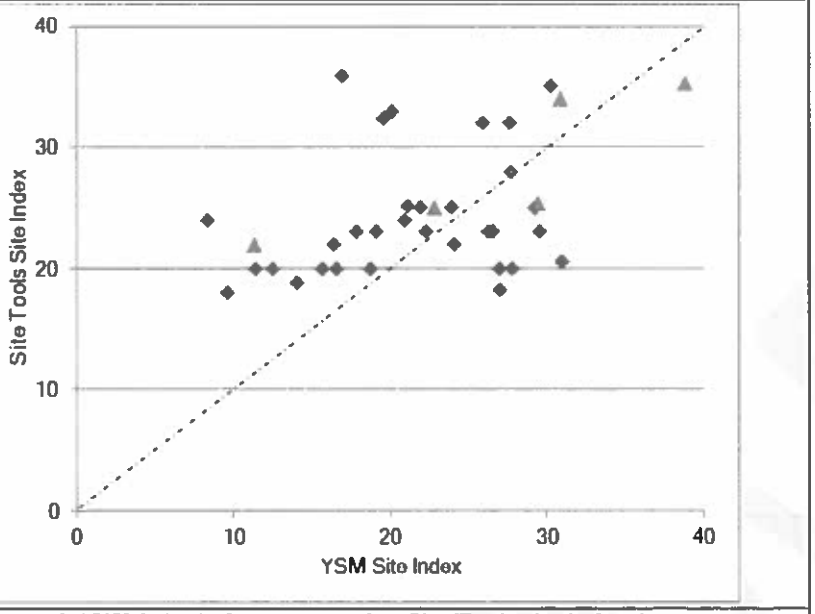

Figure 3.5 YSM site index compared to Site Tools site index (green= hemlock, red=spruce)

All of the mapping products over-estimated site index when compared with the YSM plots. The Provincial Site Productivity Layer was most closely aligned with the YSM site index (+5%, *SE 0.98*, table 4.3.4), however the dataset generalizes site index by species to the BEC variant level (e.g., CWHwh1) for the Timber Supply Area which was considered too coarse a scale for the variety of site types found in the TSA. The area-weighted site index (AWSI) approach, which uses all the deciles of the ecosystem mapping and species composition deciles, was closely aligned with the YSM site index (+9%, *SE 0.76*, table 4.3.1), however its application to growth curves would be impractical: weighting site index by the number of species per polygon (3 to 5) to the power of three (ecosystem mapping typically has three deciles). Therefore the primary decile ecosystem mapping (using SIBEC) was the next best mapping of site index when compared with the YSM plots (+11%, *SE 0.76* table 4.3.2). The following tables provides some descriptive statistics for this comparison:

Table 3.1 Area-weighted ecosystem mapping SIBEC compared to Young Stand Monitoring site index

	YSM	**AWSI SIBEC**	PERC_DIF F	*n*	SE
HW	21.5	23.4	1.09	32.0	0.63
SS	30.1	32.3	1.07	7.0	0.58
TOTAL	23.0	25.0	1.09	39.0	0.76

Table 3.2 Primary decile ecosystem mapping SIBEC compared to Young Stand Monitoring site index

	YSM	**Primary decile ECO SIBEC**	PERC_DIF F	*n*	SE
HW	21.5	25.7	1.20	32.0	0.79
SS	30.1	24.4	0.81	7.0	1.81
TOTAL	23.0	25.4	1.11	39.0	0.72

Table 3.3 RESULTS site index compared to Young Stand Monitoring site index

	YSM	**RESULTS SI**	PERC_DIF F	*n*	SE
HW	19.9	24.2	1.21	10.0	2.16
TOTAL	19.9	24.2	1.21	10.0	2.16

Table 3.4 Provincial Site Productivity Layer site index compared to Young Stand Monitoring site index

	YSM	**PSPL SI**	PERC_DIF F	*n*	SE
HW	21.5	23.1	1.07	32.0	0.86
SS	30.1	29.8	0.99	7.0	0.51
TOTAL	23.0	24.3	1.05	39.0	0.82

Table 3.5 VRI site index compared to Young Stand Monitoring site index

	YSM	**VRI SI**	PERC_DIF F	*n*	SE
HW	21.5	24.2	1.13	32.0	0.89

6-4

SS	30.1	31.5	1.05	7.0	2.80
TOTAL	23.0	25.5	1.11	39.0	0.98

Appendix 4 Qualifying managed stand growth and yield curves

Growth and Yield curves combine a variety of elements ranging from site index and stand volume models as well as stand table inputs (e.g. silviculture records, productivity estimates). It is therefore reasonable to question how well the G&Y curves compare to real-life independent measures. Using PSP data from Haida Gwaii, field plot measurements were grouped by field-assigned site series and quartiles of net merchantable volume per hectare[5] were calculated to compare or validate the TIPSY curves over time. While the following graphs do not represent all the site series found on Haida Gwaii, these do represent some of the most common growing sites within the THLB.

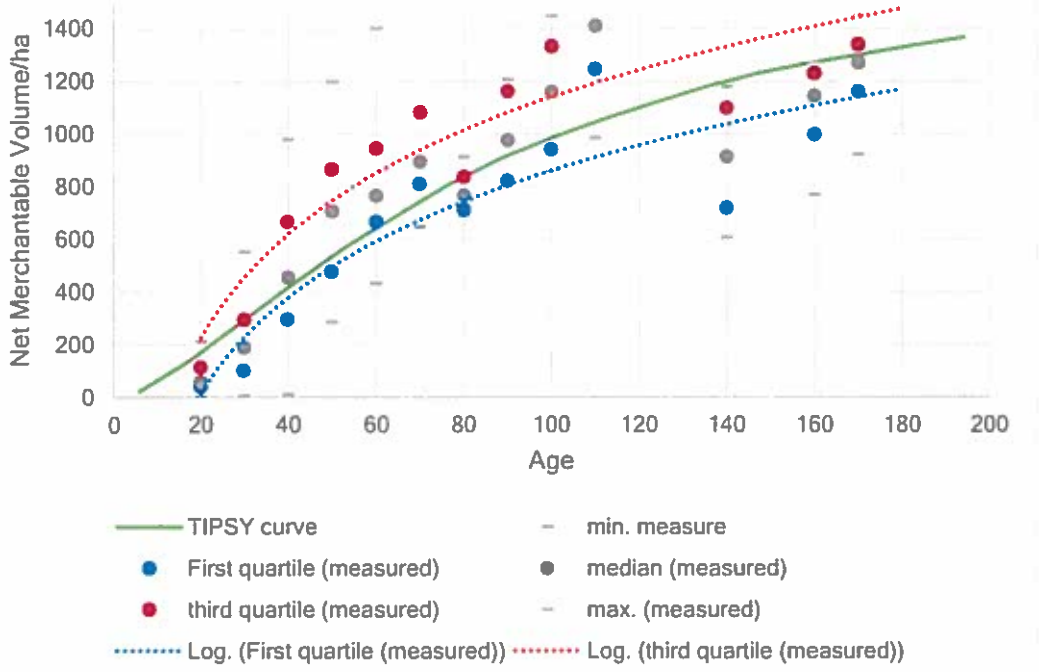

Figure 4.1 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY *future* managed stand curve for CWHwh1 01 site series from 46 plots and 426 re-measurements

[5] Net merch volumes excluding 30cm stump height and 10cm top diameter-inside-bark at 12.5cm utilization (excluding veterans and ingrowth).

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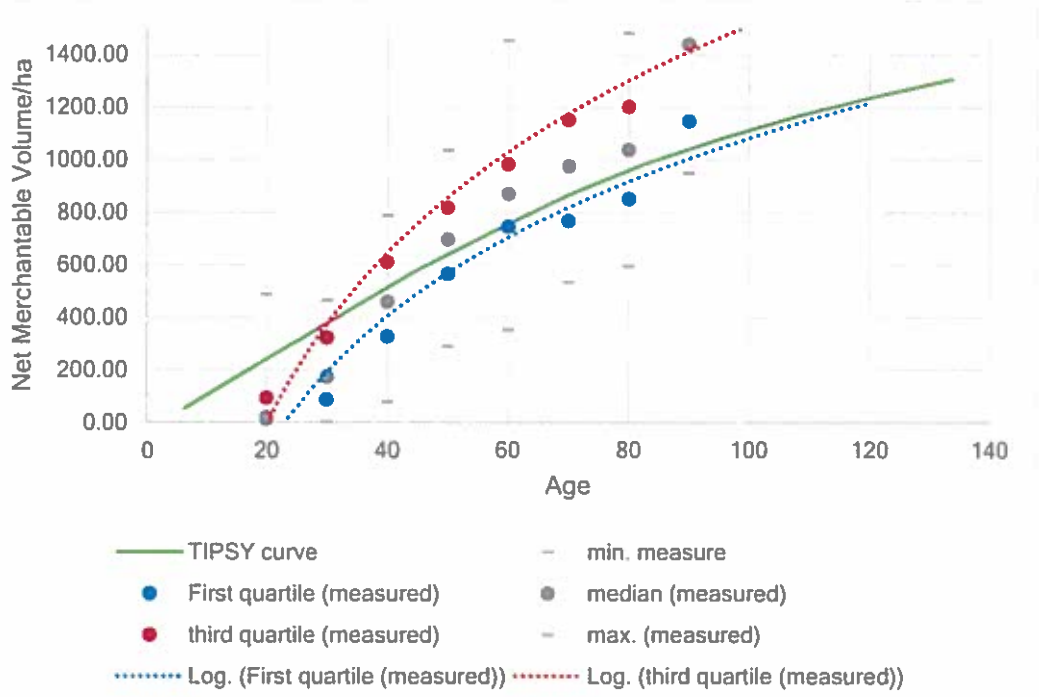

Figure 4.2 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY future managed stand curve f curve for CWHwh1 03 site series from 64 plots and 282 re-measurements

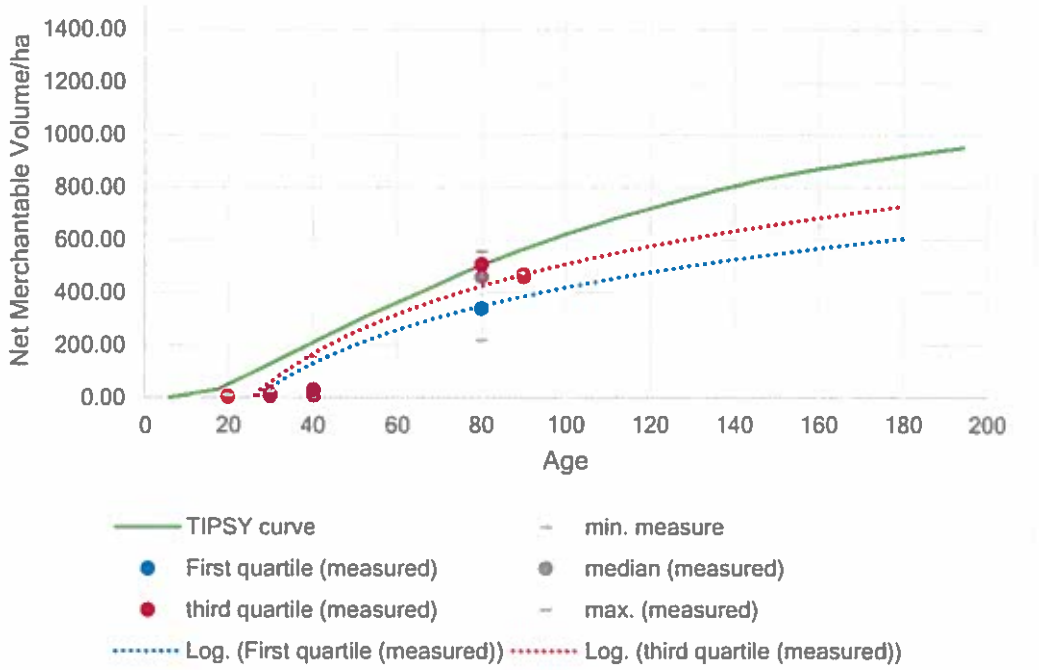

Figure 4.3 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY future managed stand curve f curve for CWHwh1 04 site series from 22 plots and 82 re-measurements

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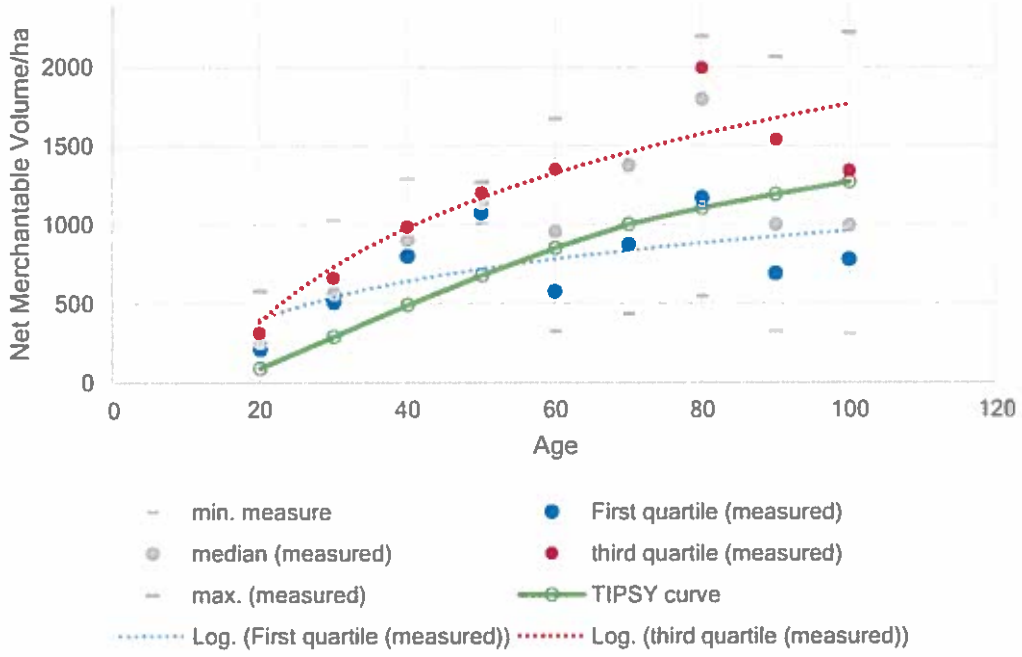

Figure 4.4 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY future managed stand curve f curve for CWHwh1 05 site series from 27 plots and 93 re-measurements

Existing managed stand curves comparisons with PSP data

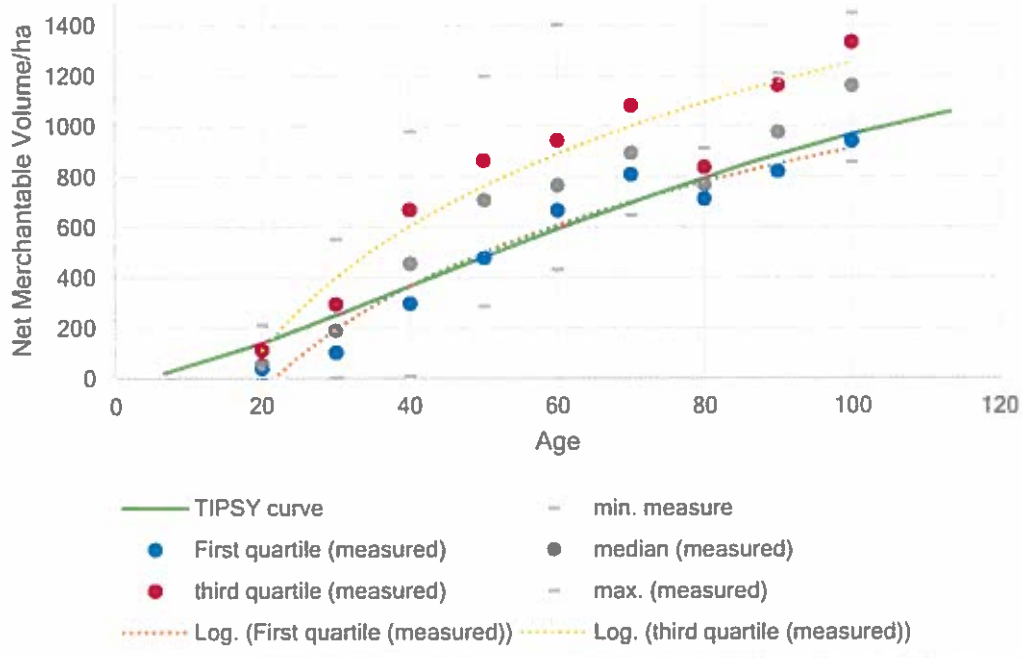

Figure 4.5 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY existing managed stand curve for CWHwh1 01 site series from 46 plots and 426 re-measurements

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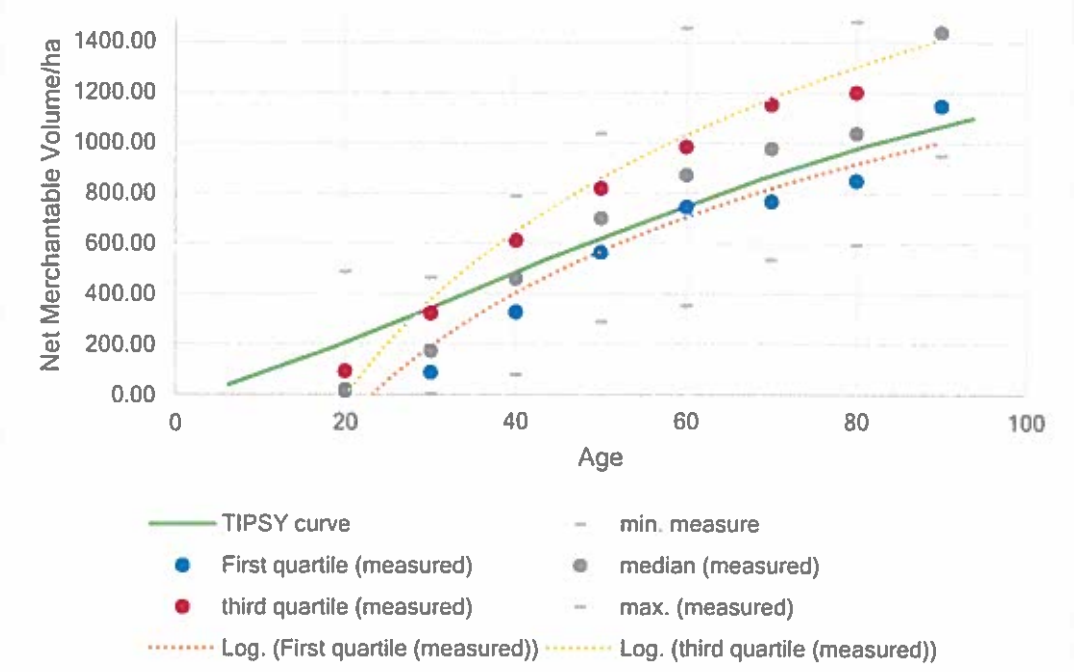

Figure 4.6 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY existing managed stand curve f curve for CWHwh1 03 site series from 64 plots and 282 re-measurements

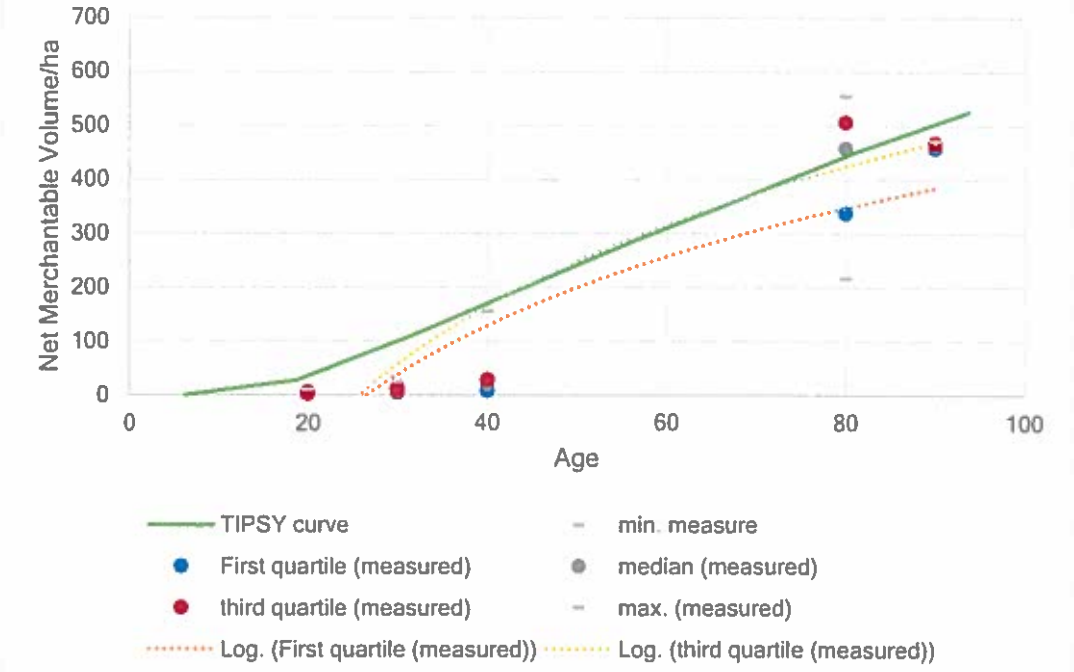

Figure 4.7 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY existing managed stand curve f curve for CWHwh1 04 site series from 22 plots and 82 re-measurements

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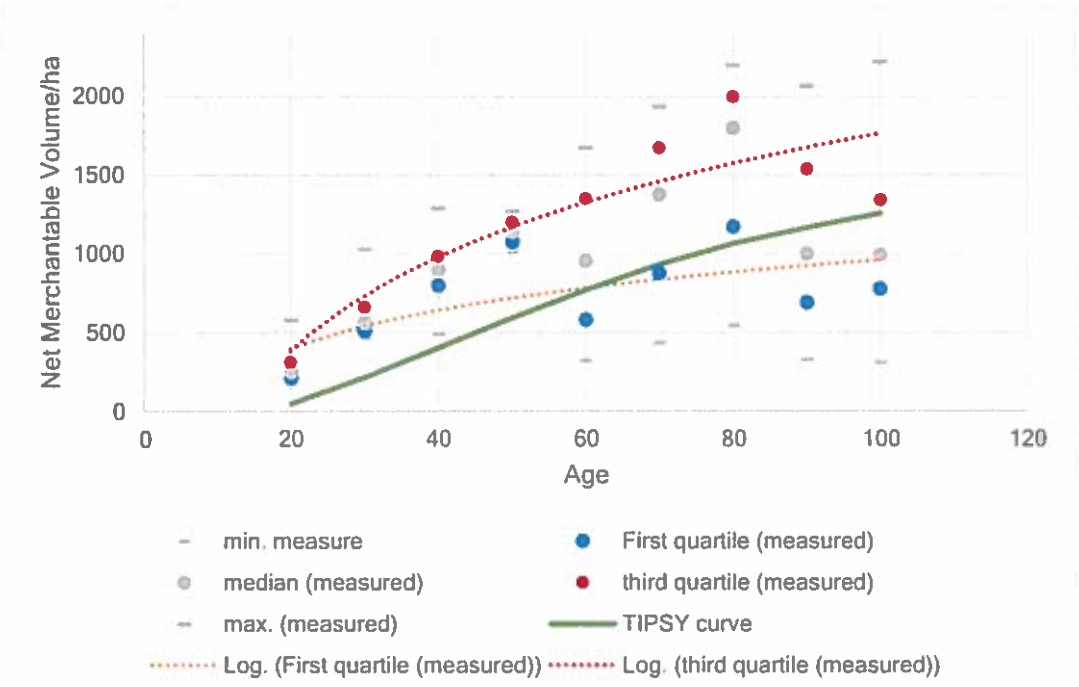

Figure 4.8 Net volume per hectare from measured PSPs (points and logarithmic curves) and TIPSY existing managed stand curve f curve for CWHwh1 05 site series from 27 plots and 93 re-measurements

A similar comparison was done using the 2016 Young Stand Monitoring (YSM) field plots, which are separate field plots then the Permanent Sample Data comparison listed above. The YSM to TIPSY compared ground plot volumes using net of decay, waste and breakage at a utilization level of 12.5cm (deJong, 2017). This comparison uses the ground/field attributes (e.g., species composition, site index) as inputs into TIPSY. As such it does not compare the timber supply analysis specific growth curves with the YSM, but rather a measure of how well TIPSY stand and volume interpolation is relative to field statistics. The results are similar as those found in the PSP to TIPSY comparison above: on average the ground measures are higher than TIPSY outputs, however not statistically significantly different.

Table 4.1 Ground and TIPSY volumes net of decay waste and breakage (utilization 12.5cm). Sourced from Table 18 in deJong (2017).

Strata	N	YSM ground volume	TIPSY volume	Total	p-value
Cw	3	51.0	50.7	0.3± 3.8	0.935
Hw	24	123	100.3	22.7±16.9	0.191
Ss	13	291	279.5	11.9± 13.5	0.395
Total	40	172.3	154.8	-17.5± 11	0.118

G-4

Appendix 5 Evaluation of LEFI volumes using re-compiled cruise data

Objective

The purpose of this analysis was to compare LiDAR Enhanced Forest Inventory (LEFI) net merch volumes with net merch volumes from cruise data. The LEFI volume model is a 20m raster grid whose volumes were area-weighted and aggregated up to match the polygonal net-area to be reforested of a block.

Tree level cruise data was ran through a Haida Gwaii volume compiler model that accounts for regionally specific taper equations for each species. These regionally specific taper equations were also used to derive volumes for the LEFI model, thereby minimizing taper function model error by using the same tree taper assumptions.

The results are a set of descriptive statistics of the observed samples and cannot be inferred to the rest of the population (THLB). While the samples are well distributed across the THLB (figure 1), the samples included in this evaluation were not randomly chosen, but rather incidentally occurring both within an area of overlap of LiDAR and within a specific timeframe (after cruising, after LiDAR acquisition, before logging). Therefore the results could never be used to adjust inventories or growth and yield curves, but can be used to examine trends between ground observations and the LEFI model.

Data inputs

Cutblocks

At the time of the analysis, 32 blocks from Taan Forest and BCTS overlapped with the geographic extent of the LEFI dataset. Cutblock boundaries were sourced from RESULTS, excluding retention area, reserves and management zones. The net area to be reforested (NAR) boundaries matched the cruise design and layout. The total cutblock area was 876 hectares.

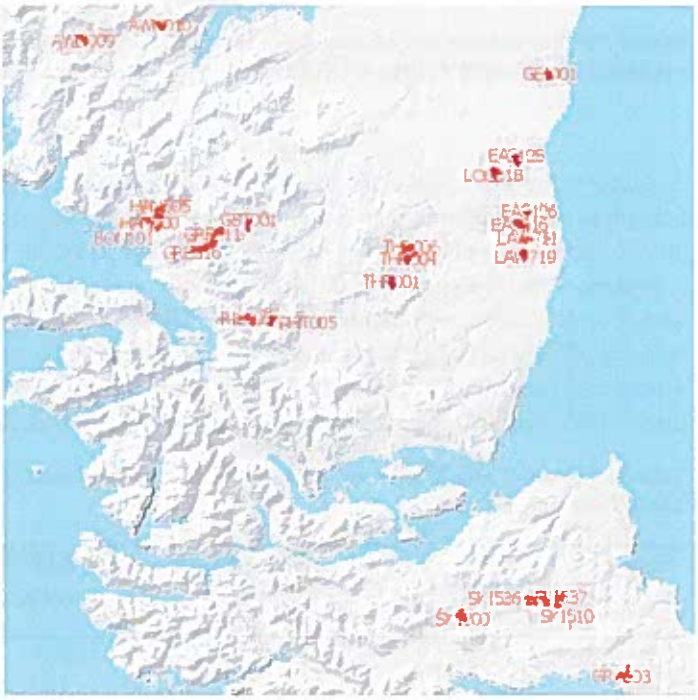

Figure 5.1. map of cutblocks used in the analysis

LEFI 20m grid

The Forest Analysis and Inventory Branch (FAIB) developed an area-based parametric prediction model that was based upon metrics sourced from the LiDAR canopy point cloud data and ground tree measurements (Yuan & Wang, 2017). A total of 84 ground plot tree measurements were used from the VRI audit inventory plots (35 Young Stand Monitoring, 3 Change Monitoring, 46 VRI audit plots). Final inventory parameters that were produced include top height, Lorey height, diameter, basal area, crown cover and whole stem/net volumes and delivered as a 20m x 20m raster product. Height (actual LiDAR output) and basal area/quadradic mean diameter (derived LiDAR outputs from parametric modelling) were computed through FAIB's ground compiler which utilizes the 2002 'QCI' decay, waste and taper equations to calculate volume.

Cruise data

Raw cruise data for the 32 blocks was submitted by licencees and compiled for tree-level data exports (.csv) by FLNRORDs Pricing, Tenures and Mines branch. A total of 754 plots were included within the study area. Dropped plots (as identified in cruise reports) were not used in this analysis.

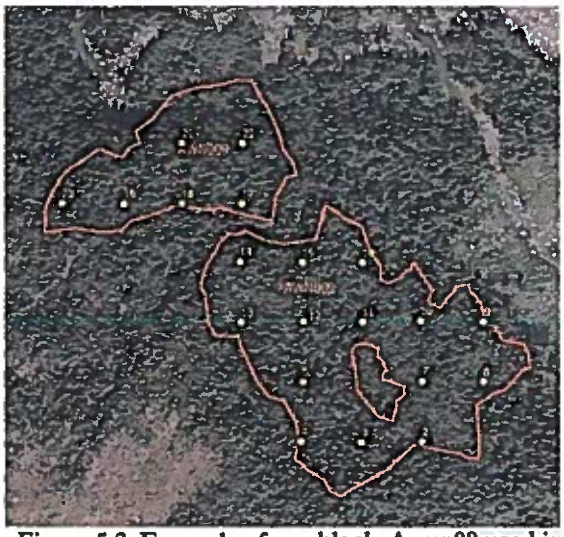

Figure 5.2. Example of one block, Awun09 used in the analysis along with cruise plots.

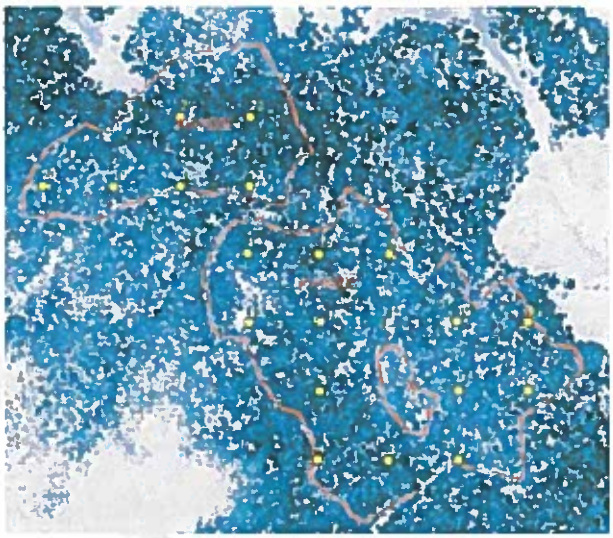

Figure 5.3. Awun09 with LiDAR derived Canopy Height Model (CHM). Height values range from light (0m) to dark (~50m)

Methods

All analysis was conducted in ArcGIS and R statistical program (RStudio Team, 2015).

HG Compiler

Volumes were defined based on close utilization volume net of decay, waste and breakage (DWB). Volume was calculated using local taper functions developed from destructive sampling of approximately 813 trees on Haida Gwaii in the 1990s (Flewelling, 2001), and subsequent Haida Gwaii specific taper equations developed by Kozak (2002). In total 200 red cedar, 323 hemlock, 184 spruce and 106 yellow cedar were analyzed through destructive sampling to fit taper equations. This regionally specific analysis amounted to a significantly smaller than average biases for DBH, inside bark diameter, height, total and merchantable volume than average biases obtained using general BEC Zone equations when originally fitted to the 1994 BEC taper equations (Kozak, 1997). Factor equations and coefficients (table 1) were supplied through Forest Analysis and Inventory Branch's Rene DeJong, RPF. The form of the 2002 BEC taper equation is:

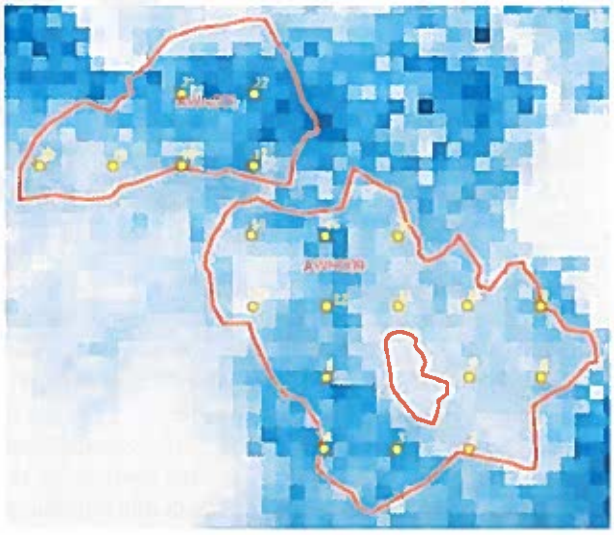

Figure 5.4. Awun09 with LiDAR derived net merchantable volume model (LEFI). Volume values range from light (0) to dark (~1500m³/ha).

$$\hat{d}_i = a_0 D^{a_1} H^{a_2} X_i^{b_1 z_i^4 + b_2[1/e^{D/H}] + b_3 X_i^{0.1} + b_4[1/D] + b_5 H^{Q_i} + b_6 X_i}$$

Where:

$$X_i = [1.0 - (h_i / H)^{1/3}] / [1.0 - p^{1/3}]$$

$$Q_i = [1.0 - (h_i / H)^{1/3}]$$

$p = 1.3/H$

D = outside bark diameter at breast height (cm)

H = total tree height (m)

h_i = height from ground (m)

$z_i = h_i/H$, proportional height from ground

d_i = inside bark diameter at h_i height from ground (cm)

$\hat{d}_i$ = predicted inside bark diameter at h_i height from ground (cm)

$a_0, a_1, a_2, b_1 \ldots\ldots b_6$ = regression coefficients (parameters)

The coefficients from the Haida Gwaii taper and decay study are:

Table 5.1. Coefficients for use in the Haida Gwaii specific taper equations

species	_err	a_0	a_1	a_2	b_1	b_2	b_3	b_4	b_5	b_6
C	1.011184	0.943965	0.962949	0.054259	0.385844	-1.12617	0.693264	3.04716	0.063239	-0.355561
H	1.0103354	0.87323	0.983721	0.040875	0.41579	-0.487686	0.521597	3.06834	0.050408	-0.501109
PL	1.006966	0.936312	1.00412	0	0.323048	-0.941452	0.608207	2.16996	0.060198	-0.422735
S	1	1.055272	0.979499	0	0.261666	-0.643975	0.589574	2.69459	0.08509	-0.666734
Y	1	1.12594	0.972037	0	-0.144764	-0.578112	0.693395	6.50447	0.082599	-1.00605

Compiled volumes (gross, net and net less DWB) were quality checked and matched against HG compiler SAS volume outputs (sourced from FAIB), as well as compared against the original cruise-comp outputs to evaluate model performance.

Merchantable volume

Cruise volumes were compiled using the taper model described above. Trees were segmented into 0.1cm lengths and volume calculated (at diameter inside bark) using Smalian's formula. Utilization matched the Coast Appraisal Manual thresolds of 17.5cm at DBH, with a 0.3m stump height and a 15cm top for all live trees for the re-compiled cruise volumes.

Decay waste and breakage (DWB) factors were calculated by determining the DWB reduction factor for each tree and applying this on a tree-by-tree basis in the re-compilation. The DWB reduction factor is the difference between the gross merchantable volume and the lessDWB volume from the original cruise compilation, or GrossMerch – (lessDWB/GrossMerch). This DWB reduction factor was then applied on the re-compiled live merch volumes to come up with a final live net merch less DWB volume. While DWB was incorporated on a tree-by-tree basis, the following table illustrates the scale of the DWB reduction factors based on the Net Value Adjustment Factor (NVAF) sampling for the trees used in this study.

G1-4

Species	*n*	DWB reduction factor
C	1208	10%
D	1	9%
H	837	10%
PL	120	3%
S	397	4%
Y	248	18%

Plot level cruise data were aggregated to the block level (as per the cruise design) to determine the m^3/hectare values and associated descriptive statistics.

LEFI volumes

The 20m LEFI net merchantable raster grid was extracted by mask in ArcGIS to match the 32 study area blocks. The rasters were then summed or aggregated by weighted area to the cutblock scale to determine the m^3/ hectare values per block.

Data check

A total of 9 trees within the original cruise were removed from the analysis as they had values considered data entry errors (ex. live tree height of 5 m and DBH 180, or height 381m). An additional 3 trees were missing either DBH or height values and were omitted from this analysis.

Results

The cruise data set that overlapped with the LEFI study area (32 blocks) included 754 plots. The total number of trees (live and dead) were 3462, with 2811 live trees. In the end 2798 live trees used to calculate volumes (minus missing or invalid measures).

Area weighted difference between the mean volumes suggest that the re-compiled volumes were 3% higher than the LEFI volumes.

Variances of the mean were evaluated using an F-test (F-test Two-Sample for Variances) that proved the variances as being equal (p= 0.426). A two sample t-test assuming equal variances was conducted with a null hypothesis that the re-compiled cruise volumes are no different than the LEFI volumes (figure 5.5).

	LEFI vol	*Re-Compiled Cruise*
Mean	538	549
Variance	30804	28810
Observations	32	32
df	62	
t Stat	-0.263	
P(T<=t) one-tail	0.397	
t Critical one-tail	1.670	

Figure 5.51. two sample t-test assuming equal variances

The results in figure 5.5 show that the null hypothesis cannot be rejected given the t statistic (-0.263) is less than the t critical one-tailed value (1.670) and the p value is greater than the alpha level chosen (0.05). In other

G-4

words the mean volumes between the LEFI and the re-compiled cruise are statistically equal. Figure 6 illustrates the majority of the LEFI mean volumes fall either within the standard error (SE) of the mean for the cruise data or within a 95% confidence interval of the cruise data.

Figure 5.6. Mean volume comparisons between re-compiled cruise and LEFI volumes. Whiskers are the block-level Standard Error (SE) of the re-compiled cruise plots, dashed lines represent the upper and lower 95% Confidence Intervals of the cruise plots.

Figure 5.7 illustrates a line of best fit through origin equation and co-efficient of determination between both datasets.

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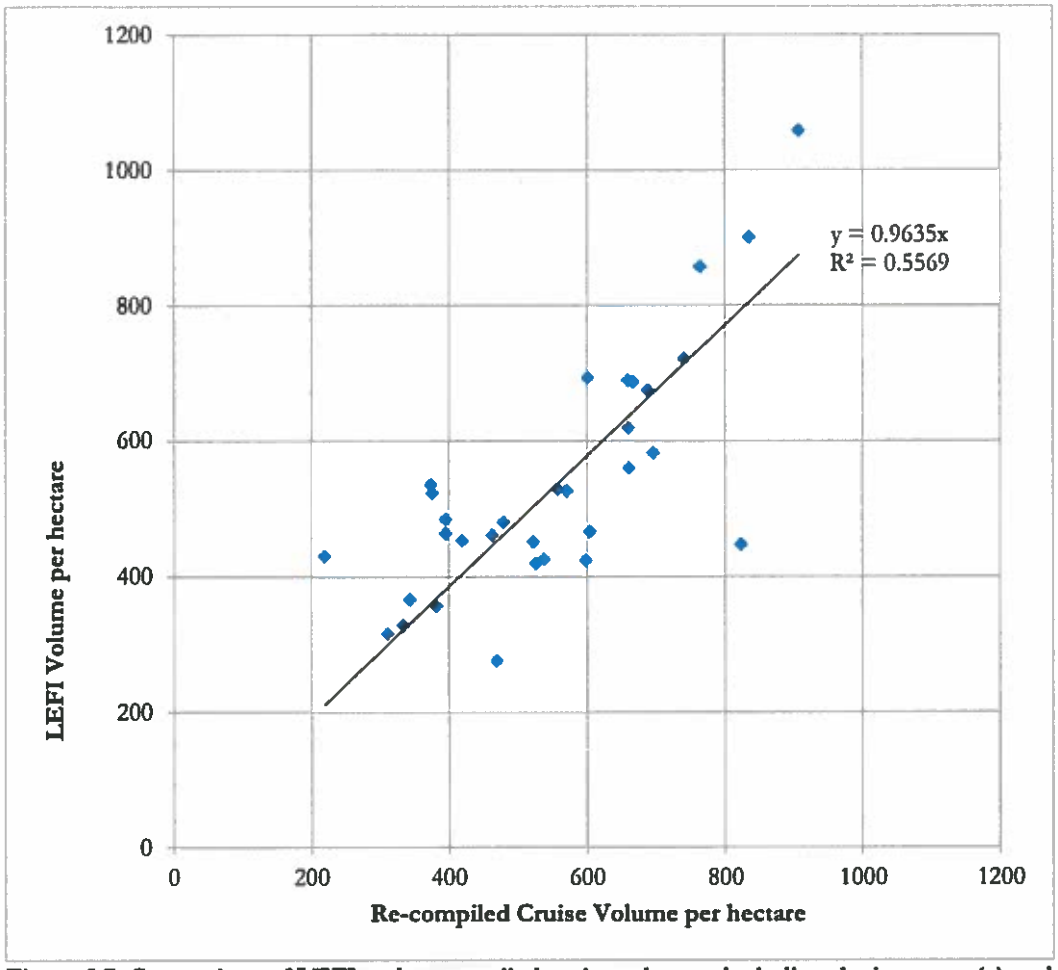


Figure 5.7. Comparison of LEFI and re-compiled cruise volumes, including the intercept (y) and coefficient of determination (R^2)

Cutblock	Area (hectares)	Area weighted LEFI volume	Re-compiled Cruise volume	SD	SE
SKI521	6.9	430.4	219.4	206.0	118.9
GRE316	46.0	316.6	311.6	148.8	38.4
LAW721	20.8	328.8	334.5	192.4	36.4
HAN600	20.1	366.8	344.0	147.4	29.5
BON101	12.8	535.9	374.4	154.4	39.9
SKI535	15.7	523.8	376.2	228.5	57.1
GRE313	65.9	357.5	382.2	213.6	43.6
EAS014	6.9	463.7	395.4	254.4	76.7
SKI506	11.0	484.9	395.6	346.8	104.6
SKI536	27.8	453.6	419.4	306.0	61.2
GEI001	24.1	461.5	463.0	228.4	44.0
GRE511	11.9	276.6	469.6	259.1	86.4
SKI537	33.9	480.7	479.4	388.6	86.9

G-4

Cutblock	Area (hectares)	Area weighted LEFI volume	Re-compiled Cruise volume	SD	SE
SKI510	15.3	451.8	522.3	106.8	40.4
EAS126	11.0	419.8	525.9	276.2	79.7
PHT005	28.8	425.9	538.0	332.0	78.2
GRE507	42.6	529.4	557.5	264.8	49.2
EAS016	34.7	526.7	570.5	280.2	34.8
EAS128	32.2	424.4	598.2	300.9	54.1
THR006	37.4	693.6	600.9	328.4	53.3
LAW719	38.8	466.8	604.1	323.6	58.1
THR004	39.3	689.5	659.2	328.7	54.0
GST001	16.7	619.6	659.6	379.1	105.2
AWN010	24.7	560.5	660.6	407.5	88.9
HAN601	20.8	687.1	666.7	339.8	66.6
LOG018	38.0	674.8	688.0	406.5	93.3
AWN009	19.4	582.6	695.9	379.6	87.1
RIL305	39.6	721.5	740.6	396.1	67.9
THR001	39.4	857.6	764.4	352.6	53.8
GRA003	26.7	447.2	822.9	404.3	77.8
HAN605	22.9	900.3	834.4	368.6	61.4
SKI200	43.4	1058.4	907.1	510.3	117.1

Figure 5.8. Block level results

Conclusion

Based upon the results, there are no statistically significant differences in the means of volume between the re-compiled cruise volumes and the LEFI volumes for the samples analyzed in this study.

Appendix 6 Description of the HG LUOO annual submission spatial dataset and Deriving exclusion factor estimates

HG LUOO annual submission spatial

Throughout the HGLUOO there are objectives for licencees to submit digital spatial data annually to the CHN and Province of BC that represent features and the areas retained to manage those features. Data were submitted in standardized geo-database formats either at the end of the calendar year, or on an application by application basis (for Road Permit, Cut Permit or Timber Sale Licence information sharing) to the Solutions Table.

Data were collated from all licencees and standardized for the purpose of the Timber Supply Review, specifically to determine the net downs on the harvesting land base by objective between the years 2012-2016.

A total of 362 development areas were utilized in the analysis totaling 14,092 hectares of development area between 2012 and 2016. The data set includes 97 development areas for BCTS, 121 for Husby, 104 for Taan, and 48 development areas for Teal Jones. Some descriptive statistics of the dataset include:

Table 6.1 Summary of Development area sizes within the HGLUOO 2012-2016 spatial dataset.

Licencee	Development area average size (ha)	Net Area to be Reforested average size (NAR) (ha)
BCTS	39.4	17.6
Husby Forest Products	38.4	19.3
Taan Forest Products	41.7	21.6
Teal Jones	29.1	13.7
Total	38.9	19.0

The total area logged was 6,889 hectares or 49% of the total Development Areas, the remaining 51% as areas retained to meet the HGLUOO,other legal requirements or operability considerations. 24% of all 'openings' (areas logged within a Development Area) were 2nd growth stands (stands originating after historic logging). All mapped retention areas from the 2012-2016 HGLUOO spatial dataset were excluded from the THLB.

The data set also included a total of 26,549 point features, divided into the following categories:

Table 6.2 Summary of features from the 2012-1026 HGLUOO annual spatial data

Type	Count
Bear Den	26
CMT	439
HTFF Class 1	141
HTFF Class 2[6]	8626
HTFF Class 3	142
HTHF	4
Monumental Cedar	1085
Yew Retention[2]	16226
Other	2

[6] HTFF Class 2 and yew features often include multiple plants/features per point.

6-4

In addition—a total of 360 km of mapped Type 1 and Type 2 fish habitat/streams were included in the dataset and utilized for stream modelling, as described in section 7.11.5 of the data package. The use of these data are described in the following sections.

Deriving exclusion factor estimates

The following section describes how an analysis, informed by empirical licencee data, was done to estimate or project an exclusion factor from the THLB for as-yet-to be identified values.

While the areas retained to meet specific LUO Objectives need to be documented and submitted, there was a general trend of grouping various objectives into singular retention polygons. For example, monumental cedar is often within a riparian management area (RMA) or a Wildlife Tree Retention Area (WTRA), and while the retention for the RMA or WTRA is documented, the specific retention area for the monumental cedar may not be delineated separately. This was common across most objectives throughout the data set. For the purposes of determining the total occurrence of a value for calculating net downs, quantifying the total (gross) area for management by objective was necessary.

Table 6.3 outlines the assumed management areas for those features where retention was established but not specifically delineated in the HGLUOO annual data. Note that these values were used only for the frequency of occurrence analysis for predicting future netdowns for yet-to-be identified features.

Table 6.3 Buffers applied to point features where retention was established but reserve/management zones not delineated

Monumental cedar:	60m	Based on minimum LUO retention assuming 40m tree heights
CMTs:	60m	
Type 1 Fish Habitat:	80m	
Type 2 Fish Habitat:	60m	
Yew features:	20m	Based on the average distance to openings for stand level retention for yew trees.
Haida Traditional Forest Features, Class 2:	20m	

Within the HGLUO, the Development Area is the denominator where most retention objectives are measured. It is defined by areas on a site plan where timber harvesting is carried out and includes stand level retention, management zones, reserves zones, mapped reserves or other areas where timber harvesting is restricted or managed pursuant to the HGLUO or the Forest and Range Practices Act (FRPA). For the purposes of this analysis, retention areas that were outside of a Development Area, but associated (by block name identifier) with the Development Area, were assumed to be part of the Development Area. In other words, for this analysis no retention could be orphaned or outside of a Development Area.

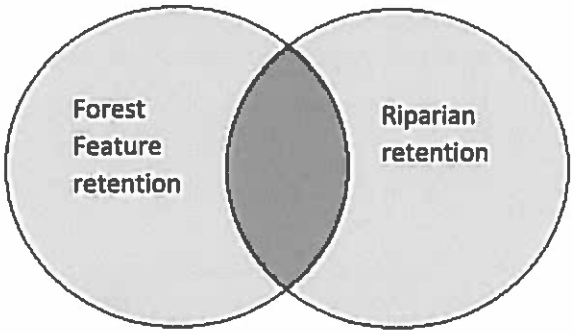
Some features identified during the course of a Cultural Feature Identification survey or engineering, were submitted as digital spatial data, however were clearly outside of any development area and had no retention delineated around them. In these cases, these features were not included in the analysis.

Proportional retention

Many HG LUOO features spatially overlap with each other. As such it is necessary to determine what the total 'net' affect on the THLB is, but also of interest to determine what the 'gross' net effect is. This is done by assigning a 'rank' or spatial hierarchy to track the degree of overlap between values (note that this ranking is expressed in table 6.4, with the higher rows superseding lower rows).

The 'rank' is based on most legally constraining to least legally constraining to track the gross and net occurrences of retention for different values. If a more legally constraining feature is present, then other features would be incidentally retained. For example, where a Forest Feature (ex. Devil's club) retention area incidentally overlaps within a riparian retention area, there is no double counting of the riparian area retention:

6-4



In this example, if the riparian retention and forest feature retention both equal 1 hectare, with a 0.25 hectare overlap (dark grey), then the 'gross' riparian retention would be 1 hectare, and the 'net' riparian retention would be 0.75 hectares, and the forest feature netdown would be 1 hectare.
The following table summarizes the HGLUOO objectives found within the 2012-2016 dataset and the proportional retention for each objective.

Table 6.4 proportional retention within all development areas (across all tenures/licencees).

Type	Gross (ha)	Net (ha)	Gross % total	Net % total
Forest Reserves	142.8	142.8	1.0%	1.0%
CSA	88.6	88.6	0.6%	0.6%
HTHF	13.6	8.4	0.1%	0.1%
AFU	104.0	52.5	0.7%	0.4%
Type 1	2989	2898	21.2%	20.6%
Type 2	1557	1165	11.1%	8.3%
Forested swamp	0.2	0.2	0.0%	0.0%
Bear	17	13	0.1%	0.1%
CMT	168	139	1.2%	1.0%
HTFF 1	122	92	0.9%	0.7%
Monumental	459	267	3.3%	1.9%
Blue/Red	4	3	0.0%	0.0%
Yew	279	118	2.0%	0.8%
HTFF 2	254	112	1.8%	0.8%
MAMU	117	61	0.8%	0.4%
ECO	76	42	0.5%	0.3%
WTRA	2345	1145	16.6%	8.1%

Figure 6.1 indicates that some values significantly overlap each other, thereby reducing the net occurrence of retention for any one value.

6-4

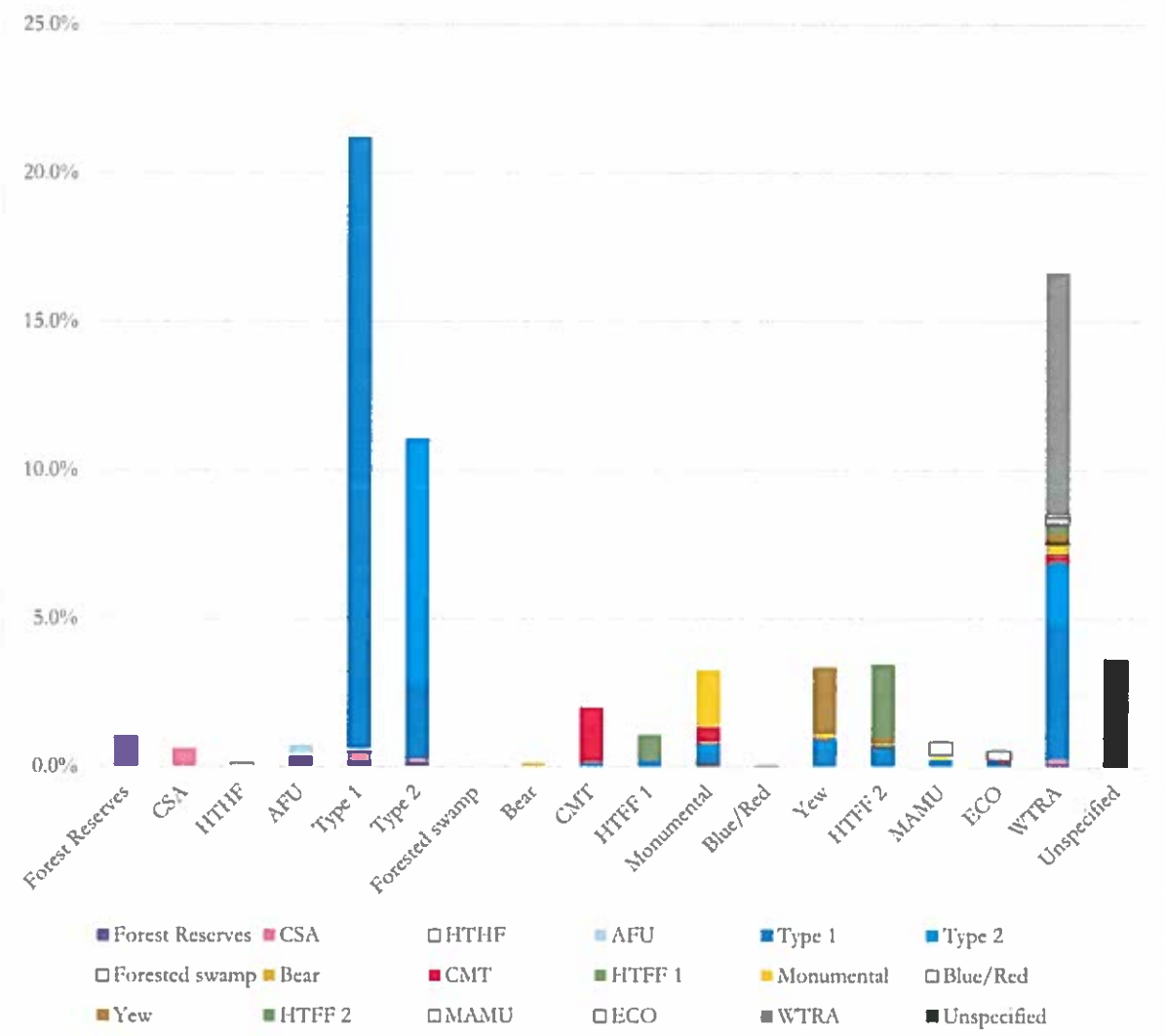


Figure 6.1 Proportional overlap between all values within the 2012-2016 HGLUOO spatial dataset.

Appendix 7 Concepts of hydrologic recovery relative to timber supply and recovery curves.

Timelines for hydrological recovery in hypermaritime environments are uncertain, and variables leading to recovery are incredibly complex. Timelines for each variable may vary between 25 to >250 years after disturbance before they can be considered functionally restored (Banner, LePage, J.Moran, & Groot, 2005) (CIT, 2004).

Post-disturbance watershed response, or hydrologic recovery, is normally associated with tree height (Hudson & Horel, 2007). Stand height is a good predictor for recovery because (i) wind speed experienced within a stand (controlling heat fluxes in Rain-on-snow events) is closely related to tree height, and (ii) shade affects radiation snowmelt (Hudson & Horel, 2007).
Equivalent Clearcut Area, or ECA, is common measure to quantify hydrologic recovery that uses tree heights as a surrogate for hydrologic recovery (B.C. Ministry of Forests, 2001). As cited from Hudson and Horel (2007), *"ECA provides us with an index of the hydrologic function of the post-disturbance canopy relative to that of the original canopy".*

Forest harvesting in watersheds dominated by rain-on-snow events have a higher risk of increasing peak flow hazards than in watersheds dominated by either rain or snowmelt processes (Floyd W. , 2011). In these rain on snow zones small increases in melt have major implications to frequency of peak flows (Floyd W. , 2012).

Forests have a finite ability to intercept rain, thus removal of forest in watersheds generally has a minimal effect on the magnitude and frequency of flood producing rain events. In contrast, forest harvesting has the effect of increasing both snow depth and the energy available to melt that snow, thus rain falling on snow has the potential to have much greater impacts on the magnitude and frequency of floods than rain alone. Since all watersheds in Haida Gwaii have the potential to receive rain-on-snow through all elevation ranges, hydrologic recovery curves designed to represent rain on snow (ROS) dynamics should be used if available.

Relevant data exist for ROS hydrologic recovery from regenerating stands from the Russell Creek Experimental Watershed on Vancouver Island. Research at Russell Creek has attempted to validate these curves using data collected at different stand heights to determine if they represent hydrological recovery during ROS. Results of that research by MFLNR suggests that ROS recovery rates in that watershed are approximated by the snow-on-snow (SOS) recovery, however the recovery curve is slightly different, thus a new ROS curve was developed using the most up to date numbers.

Research results at Russell Creek suggest forests are fully recovered for ROS conditions when they reach a height between 13 and 14m. This level of recovery is based on a comparison of both the mean and frequency of energy available for melt during ROS and different forest types. The dataset was limited in that it did not capture any high melt energy ROS events, associated with warm temperatures and high winds. Based on the physical understanding of forests and snowmelt, trees 14m in height would have limited ability to attenuate high winds, thus the MFLNR Research Hydrologist recommended setting 14m as having an approximate recovery of 90%. He also recommended to allow for recovery past this 90% threshold to a 97.5% cap with the rationale that typical forest rotations of 60 to 100 years will never reach full hydrologic recovery compared to old growth forests.

Some uncertainties remain with modeling hydrologic recovery. With climate change increasing the frequency of storm events, the size and intensity of events amount to decreases in recovery (rates of recovery may change as events become larger) (Floyd W. , 2012). Small increases in intensity can have a 10-fold increase in large flow events.

G-H

Another uncertainty remains regarding the use of the entire drainage basin as a denominator for measuring hydrologic recovery for upland stream areas. Preliminary findings from the *Haikai Institute's* Kwakshua watershed program suggest that bog wetlands act similarly to areas without trees, insofar as bog wetlands don't attenuate flow, and therefore may influence hydrologic recovery differently then previously believed (pers. com W. Floyd). A specific sensitivity analysis is described in section 8 of the data package that explores the effect of these findings.

Table 7.1. Hydrologic recovery curve assumptions used in the TSR

Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery
0.0	0.0	4.6	2.1	9.2	63.6	13.8	86.5	18.4	95.0	23.0	98.1	27.6	99.3		
0.1	0.0	4.7	4.2	9.3	64.4	13.9	86.8	18.5	95.1	23.1	98.2	27.7	99.3		
0.2	0.0	4.8	6.3	9.4	65.2	14.0	87.1	18.6	95.2	23.2	98.2	27.8	99.3		
0.3	0.0	4.9	8.2	9.5	65.9	14.1	87.3	18.7	95.3	23.3	98.3	27.9	99.4		
0.4	0.0	5.0	10.2	9.6	66.6	14.2	87.6	18.8	95.4	23.4	98.3	28.0	99.4		
0.5	0.0	5.1	12.1	9.7	67.3	14.3	87.9	18.9	95.5	23.5	98.3	28.1	99.4		
0.6	0.0	5.2	14.0	9.8	68.0	14.4	88.1	19.0	95.6	23.6	98.4	28.2	99.4		
0.7	0.0	5.3	15.8	9.9	68.7	14.5	88.4	19.1	95.7	23.7	98.4	28.3	99.4		
0.8	0.0	5.4	17.6	10.0	69.4	14.6	88.6	19.2	95.8	23.8	98.4	28.4	99.4		
0.9	0.0	5.5	19.4	10.1	70.0	14.7	88.9	19.3	95.9	23.9	98.5	28.5	99.4		
1.0	0.0	5.6	21.1	10.2	70.7	14.8	89.1	19.4	96.0	24.0	98.5	28.6	99.4		
1.1	0.0	5.7	22.8	10.3	71.3	14.9	89.3	19.5	96.0	24.1	98.5	28.7	99.5		
1.2	0.0	5.8	24.4	10.4	71.9	15.0	89.6	19.6	96.1	24.2	98.6	28.8	99.5		
1.3	0.0	5.9	26.0	10.5	72.5	15.1	89.8	19.7	96.2	24.3	98.6	28.9	99.5		
1.4	0.0	6.0	27.6	10.6	73.1	15.2	90.0	19.8	96.3	24.4	98.6	29.0	99.5		
1.5	0.0	6.1	29.1	10.7	73.7	15.3	90.2	19.9	96.4	24.5	98.6	29.1	99.5		
1.6	0.0	6.2	30.6	10.8	74.2	15.4	90.4	20.0	96.4	24.6	98.7	29.2	99.5		
1.7	0.0	6.3	32.1	10.9	74.8	15.5	90.6	20.1	96.5	24.7	98.7	29.3	99.5		
1.8	0.0	6.4	33.6	11.0	75.3	15.6	90.8	20.2	96.6	24.8	98.7	29.4	99.5		
1.9	0.0	6.5	35.0	11.1	75.8	15.7	91.0	20.3	96.7	24.9	98.8	29.5	99.5		
2.0	0.0	6.6	36.4	11.2	76.4	15.8	91.2	20.4	96.7	25.0	98.8	29.6	99.5		
2.1	0.0	6.7	37.7	11.3	76.9	15.9	91.4	20.5	96.8	25.1	98.8	29.7	99.6		
2.2	0.0	6.8	39.0	11.4	77.4	16.0	91.6	20.6	96.9	25.2	98.8	29.8	99.6		
2.3	0.0	6.9	40.3	11.5	77.8	16.1	91.8	20.7	96.9	25.3	98.9	29.9	99.6		
2.4	0.0	7.0	41.6	11.6	78.3	16.2	91.9	20.8	97.0	25.4	98.9	30.0	99.6		
2.5	0.0	7.1	42.9	11.7	78.8	16.3	92.1	20.9	97.1	25.5	98.9				
2.6	0.0	7.2	44.1	11.8	79.2	16.4	92.3	21.0	97.1	25.6	98.9				
2.7	0.0	7.3	45.3	11.9	79.7	16.5	92.4	21.1	97.2	25.7	99.0				
2.8	0.0	7.4	46.4	12.0	80.1	16.6	92.6	21.2	97.3	25.8	99.0				
2.9	0.0	7.5	47.6	12.1	80.5	16.7	92.8	21.3	97.3	25.9	99.0				
3.0	0.0	7.6	48.7	12.2	80.9	16.8	92.9	21.4	97.4	26.0	99.0				
3.1	0.0	7.7	49.8	12.3	81.3	16.9	93.1	21.5	97.4	26.1	99.0				
3.2	0.0	7.8	50.9	12.4	81.7	17.0	93.2	21.6	97.5	26.2	99.1				

Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery	Ht	Recovery
3.3	0.0	7.9	51.9	12.5	82.1	17.1	93.4	21.7	97.5	26.3	99.1		
3.4	0.0	8.0	52.9	12.6	82.5	17.2	93.5	21.8	97.6	26.4	99.1		
3.5	0.0	8.1	53.9	12.7	82.9	17.3	93.6	21.9	97.6	26.5	99.1		
3.6	0.0	8.2	54.9	12.8	83.2	17.4	93.8	22.0	97.7	26.6	99.1		
3.7	0.0	8.3	55.9	12.9	83.6	17.5	93.9	22.1	97.7	26.7	99.2		
3.8	0.0	8.4	56.8	13.0	84.0	17.6	94.0	22.2	97.8	26.8	99.2		
3.9	0.0	8.5	57.7	13.1	84.3	17.7	94.2	22.3	97.8	26.9	99.2		
4.0	0.0	8.6	58.6	13.2	84.6	17.8	94.3	22.4	97.9	27.0	99.2		
4.1	0.0	8.7	59.5	13.3	85.0	17.9	94.4	22.5	97.9	27.1	99.2		
4.2	0.0	8.8	60.4	13.4	85.3	18.0	94.5	22.6	98.0	27.2	99.2		
4.3	0.0	8.9	61.2	13.5	85.6	18.1	94.6	22.7	98.0	27.3	99.3		
4.4	0.0	9.0	62.0	13.6	85.9	18.2	94.8	22.8	98.1	27.4	99.3		
4.5	0.0	9.1	62.8	13.7	86.2	18.3	94.9	22.9	98.1	27.5	99.3		

Appendix 8 Summary of TSR assumptions

THLB net downs	Description	Data package section
Water	Wetland and lakes defined by TRIM	3.1.2
Low productive forest	VRI- based exclusion of site index <5, and non-treed BC Land Classification units	3.1.2
Small islands	Islands <150 hectares excluded based on TRIM	3.1.2
Roads	TRIM, Licencees, RESULTS, new mapping. 10m (total) buffers on branchlines, 20m (total) buffers on mainlines/permanent roads.	3.1.2
Low volume stands (no MHV)	100% exclusion of stands <250m^3 per hectare (natural and managed stands)	7.1.2
Protected Areas CHN/Provincial	All areas designated as Provincial parks, Ecological reserves, Conservancies removed from THLB	3.1.4
Protected Areas CHN/Federal	Gwaii Haanas National Park and Heritage site removed from THLB	3.1.4
Federal reserves and miscellaneous	Indian Reserves, Military reserves removed from THLB	3.1.4
Provincial reserves (non-timber tenures)	Recreation sites and Land Act section 15/16 reserves 100% netdown. 100m buffers on known trails were 100% netdown.	3.1.4
Private land	Private land identified through the Land Title and Survey Authority	3.1.4
Municipal zonation	Forestry zonation identified in Official Community Plans under the Municipal Act.	3.1.4
Tree length buffers (applies to HGLUOO spatial objectives)	Based on LUOO Schedule 5 and ecosystem mapping	6.11.3
Active Fluvial Units	New LiDAR based mapping, terrain classification mapping, watershed assessment mapping. 1.5 tree length buffers applied. 100% of AFU net down and 90% of management zone net down.	6.11.4
Type 1 and Type 2 Fish Habitat	Enhanced LUOO schedule 4 data based on statistical modelling from empirical field data. 2 tree length (type 1) and 1.5 tree length (type 2) buffers applied. 95% of the type 1 reserves were net down, 80% of the type 2 management zones were net down.	6..1.5
FPPR Riparian buffers	Wetland, S5 and S6 (non-fish bearing streams) based on TRIM and FPPR requirements. FPPR prescribed retention configured to area-based netdowns.	6.13
Red and blue listed ecosystems	Based on LUOO schedule 13 and ecosystem mapping define units and 100% net down.	6.11.8
Common and rare ecosystems	Based on LUOO schedule 10 and ecosystem mapping to define units. Per site series deficit was calculated and used to exclude those units from the THLB proportional to their Landscape Unit occurrence and conservation targets. Net down occurred on a site-series polygon scale.	6.11.9

6-4

THLB net downs	Description	Data package section
Forested swamps	Ecosystem mapping to identify site series and 1.5 tree length buffer applied. 100% of the forested swamp units net down, 70% of the management zone net down	6.11.7
Karst	100% of the Sadler formation was net down	6.3
Forest Reserves	95% net down from each polygon of LUOO schedule 8 forest reserves	6.11.10
Marbled Murrelet reserves	100% net down from block-level LUOO annual submission data.	6.11.11
Northern Goshawk nesting	100% net down from current LUOO schedule 12	6.11.12
Saw whet owl nesting	100% net down from current LUOO schedule 12	6.11.13
Black bear denning	100% net down from block-level LUOO annual submission data.	6.11.21
Wildlife habitat areas	Two northern goshawk WHA's Orders- nesting reserves (6-001, 6-002) and two Marbled Murrelet WHA's Orders (6-041, 6-046) were 100% net down. Forest cover constraint applied to goshawk WHA's post-fledging area based on forest age requirements.	6.2
Haida Traditional Heritage Features (HTHFs), CMTS, Arch sites	100% netdown from 500m buffer around HTHF's; 100% netdown of current LUOO reserve/management zones, 1.5 tree length buffer for all other known CMTs; 1.8% netdown to old forest/natural stand THLB areas to account for unknown CMTs; 100% netdown of current Registered Archaeological Sites	6.11.16
Cedar Stewardship Areas	100% netdown of LUOO schedule 3 CSAs.	6.11.15
Monumental cedar	100% netdown of current LUOO reserve/management zones, 1.5 tree length buffer for all other known monumentals; and random predicted distribution netdown to old forest/natural stand within management unitsareas to account for unknown monumentals.	6.11.8
Haida Traditional Forest Features	100% netdown of current LUOO reserve/management zones, 2.3% per hectare netdown for all old forest and 0.1% netdown for young forest to account for unknown HTFFs.	6.11.19
Yew trees	100% netdown of current LUOO retention areas, 2.2% per hectare netdown for all old forest to account for unknown Yew.	6.11.20
Permanent Sample Plots	100% net down on 100m buffers around active PSPs.	6.6
Landslides	100% net down of mapped landslides	7.4.4
Class IV Terrain	Terrain stability preference ratio netdown of all class IV terrain by management unit. Terrain inclusion factors: TFL 60= 0.48; TFL 58=0.77, TSA=0.46) Areas previously logged post-1996 are included in the THLB.	6.8

6-4

THLB net downs	Description	Data package section
Class V Terrain	Terrain stability preference ratio netdown of all class V terrain by management unit. Terrain inclusion factors: TFL 60= 0.33; TFL 58=0.42, TSA=0.12) Areas previously logged post-1996 are included in the THLB.	6.8
LUOO in-block retention	Broad THLB netdowns described for CMT (1.8%), HTFFs (3.4%), Yew trees(2.3%), unspecified retention (3.6%), HTHF (0.1%), black bear (0.1%). Per hectare netdowns stratified by forest age (young=5.89%, old=10.94%).	App. 6
WTRAs	7% per hectare net down in 2nd growth stands, no netdown for old growth stands (>250 years) due to assumption of overlap with other stand-level retention objectives.	6.5
Roads, trails and landings	100% netdown for 20m and 10m buffers for mainlines and branches respectively. 6.4% per hectare net down for future roads.	6.9

Inventory	Description	Data package section
VRI, LEFI forest inventory and RESULTS	Vegetation Resource Inventory Phase I (species, age, site index for natural stands), LiDAR enhanced Forest Inventory (basal area, heights) for natural stands. RESULTS (silviculture records) updates and 2017 depletion (remotely sensed) data for existing managed stands.	4.1; 4.3
Ecosystem mapping	RESULTS-based site series classification where available, otherwise, TEM for TFL 60, TEM for TSA, PEM for TFL 58.	4.4

Growth and Yield	Description	Data package section
Site index sources	Site index sourced from VRI Phase I for natural stands; Site index sourced from Haida Gwaii enhanced SIBEC and Provincial Site Productivity Layer for managed stands.	5.1
Natural stand yield curves (unmanaged)	LEFI inputs for basal area, height, VRI Phase I inputs for species, age into VDYP7 growth and yield model. 66 Analysis units defined based on leading species, site index class and BEC zone. Data from LEFI-based areas applied to non-LEFI areas.	5.8
Existing stand yield curves (managed)	RESULTS standard-unit inputs (except site index) for TIPSY growth and yield model inputs.	5.6

6-4

Growth and Yield	Description	Data package section
Future managed stand yield curves (managed)	Area weighted averages for RESULTS by site series (except site index) for TIPSY growth and yield model inputs.	5.6

Resource Management (other than THLB)	Description	Data package section
Visual quality	Each polygon within the Haida Gwaii VLI was assigned the plan-view alteration limit for its VQO class. The plan-view alteration limit is also an area-weighted calculation. Each VLI cell within the STISM model based on the alteration limit and mean VEG height.	6.1
Community watersheds	Honna, Jervis, Slarkedus and Tarundl watersheds have 20% hydrologic effective green up constraint or 1% of the watershed per year. Entire watershed (treed/non-treed) forms basis of watershed denominator.	6.4
Upland stream areas	70% hydrologic effective green up on LUOO schedule 6 upland stream areas. Entire watershed (treed/non-treed) forms basis of watershed denominator.	6.11.6
Sensitive watersheds	80% hydrologic effective green up on LUOO schedule sensitive watersheds. Entire watershed (treed/non-treed) forms basis of watershed denominator.	6.11.6
Cedar partition	A maximum annual limit (scaled to 10 years for modelling) on red and yellow cedar was set as: 133,000m³ for TFL 60 32,000m³ for TFL 58 195,000m³ for TSA 25	6.15

Other model parameters	Description	Data package section
Minimum harvest age	The age at which each stand reaches 95% of culmination mean annual increment volume.	7.1
Harvest preference	Relative highest value stand is harvested first.	7.1
Minimum harvest volume	250m³ per hectare on natural and managed stands	7.1
Natural Disturbance	Natural disturbance was applied in a stochastic spatial model, stratified by disturbance type. Black-headed budworm amounts to a 59 hectare per year netdown for hemlock stands, Windthrow amounts to a 70 hectare per year netdown in the Skidegate plateau (SKP) and Queen Charlotte ranges (QCR); landslides amount to 26 hectares per year netdown in the SKP and QCR; and yellow cedar decline	7.4

G-4

	amount to 40 hectares per year netdown in the yellow cedar leading strata.	
Economic operability	Relative road cost (least cost spatial model) and stand value model (volume and market value indices) was developed and calibrated to empirical road and block inventories from the last 10 years harvest. Road length to stand value thresholds applied. Additional cover constraints applied to Sewell/Tasu and Louise operating areas, amounting to minimum volume availability of 330,000m^3 over 10-years for Sewell/Tasu and 250,000m^3 over 10-years for Louise Island.	7.5
Adjacency	400m 'soft' buffer between blocks with a preference set to not harvest buffers between blocks until green-up is met. Green-up height is 3m.	7.3
Maximum block size	Target between 20 to 40 hectare block sizes.	7.3

Sensitivity analyses	**Description**	**Data package section**
Cedar	Non-declining cedar timber flows by management units (TFL 58, TFL 60, TSA 25) and by woodsheds Analysis includes +/- 10% of long range average yield targets	8.2.1
Economic operability	High and low market value scenarios using the relative cost/value model. Additional analyses included: -No road operability constraints -No constraints on isolated planning units and exclusion of isolated planning units -exclusion of high cost access areas	8.2.7
Community Forest	Base case runs with proposed community forest tenure	8.2.2
First Nations Woodland Licence	Base case runs with proposed FNWL tenure	8.2.3
Minimum harvestable criteria	Economic rotation age (minimum 30cm diameter harvest criteria); extended rotation age (minimum 150 year rotation age); no minimum harvest age or volume constraint; 350m^3 minimum volume constraint; restrict old growth logging (maximum harvest age 250 years)	8.2.6
Harvest preferences	Prefer the highest relative volume Prefer the oldest stand relative to CMAI Randomized order of harvest	8.2.7
CHN policy	Removed Mosquito lake watershed from THLB and removed Slatechuck watershed from the THLB	8.2.4
Monumental cedar	Netdown projections based on 100% monumental protected with 1.5 tree length buffer (1)	8.2.3.3

6-4

	Netdown projections based on D, F, and H grade cedar protection in old (>250 year) forest Netdown projections including broader age and grade classes and retention levels	
Northern goshawk	200 ha nesting habitat netdown for 25, 38 and 67 predicted territories 5,564 hectares of suitable foraging habitat (65.5% target) retained for 22, 25, 38 and 67 territories. 4,672hectares of suitable foraging habitat (55% target) retained for 67 territories 3,823 hectares of suitable foraging habitat (45% target) retained for 67 territories	8.2.4
Hydrologic recovery	Only forested areas (BC land classification definition) contribute to hydrologic recovery (upland stream area)	8.2.9
Risk managed LUOO	Risk managed variances applied to LUOO objectives	8.2.8
Wildlife Tree Retention Areas	Increase in retention by 7.1% in the TSA and 11.3% in TFL 60 to reflect current practice	8.2.8
Roads	Assume red alder regeneration on branchlines	8.2.8
Terrain stability	Base access to unstable terrain from practices going back to 1996. Terrain inclusion factors for class IV terrain: TFL 60= 0.474; TFL 58=0.76, TSA=0.76. For class V terrain: TFL 60= 0.4; TFL 58=0.23, TSA=0.50	8.2.8
Harvest flow	allow short-term harvest level to increase such that steps to reach mid-term level cannot be more than 10% per decade.	8.2.10

6-4

Appendix 9 Natural Stand Volume adjustment analyses

The following text is sourced from section 5.8 of the TSR data package and the accompanying scatterplots are the primary purpose of this appendix.
LEFI net merchantable volumes, like the other LEFI attributes, are well founded predictions of ground attributes based on compiled forest field plot data and association with LiDAR. The TWG considers the LEFI volumes (which are net of decay waste and breakage at a utilization level of 12.5 cm) the best available information on the current volume of stands. These LEFI net volumes averaged to the VRI polygon are not yield curves. Instead, they represent current volumes. They are useful for adjusting the magnitude of the LEFI based VDYP curves for two reasons.

Firstly, the ground plot volume calculations on which the LEFI volumes are based are compiled using Haida Gwaii specific taper factors and Haida Gwaii specific loss factors for decay, waste and breakage. In contrast, the VDYP7 model uses taper factors and loss factors that are generalized to the entire area of the provincial BGC zones. The forests outside Haida Gwaii are not exactly the same even if in the same BGC zone and so the factors do not match. In this sense the LEFI net volumes are more specific to Haida Gwaii than the LEFI based VDYP curves.

Secondly, in attaining the LEFI net volumes, the LEFI model uses parametric equations to extrapolate from these ground measurements and locally specific compilations. This is a high resolution extension of the ground data that does not involve combining LEFI information with VRI information. In contrast, the LEFI based VDYP curves are produced using VDYP inputs from two very different sources; air photo interpretation and ground plot measurements distributed by the LEFI model. Using the two different sources of information is a creative and carefully considered approach intended to make the best use of the available information, and an improvement over Phase 2 adjustment . Using the detailed LEFI information provides a way of verifying the yield estimates based on LEFI and VRI inputs and the VDYP model.

With the above justification for making adjustments, the methods and magnitude of the adjustments are described next. The current volumes of stands on the LEFI based VDYP curves were compared to the LEFI net volumes in scatter plots created for each leading species (C, P, S, and Y, and for H younger than 250, and H at least 250). For each case, a line of best fit through the origin and a co-efficient of determination (R^2) were generated using MSExcel. The following graphs illustrate the volume comparisons between LEFI based VDYP curves and the LEFI net volumes.

6-4

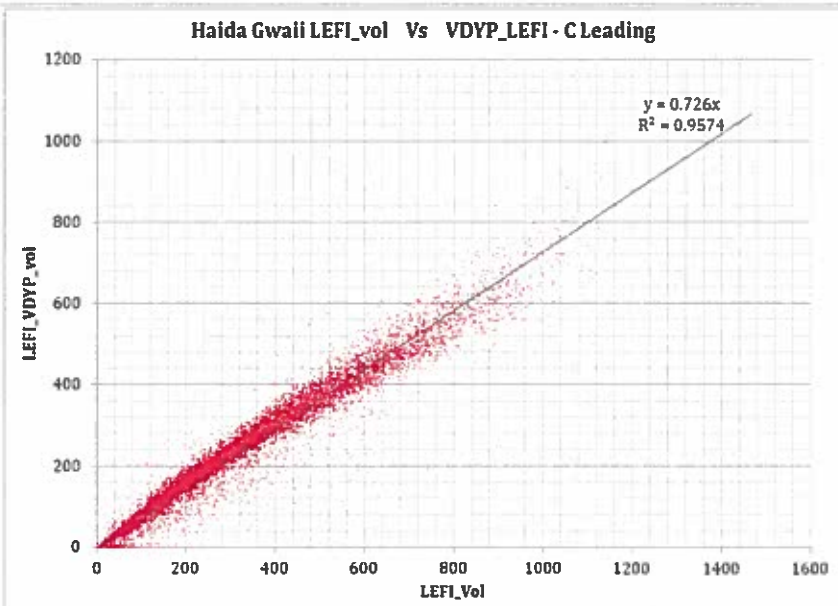


Figure 9.1. LEFI volume vs. LEFI-Based VDYP volume for Cedar leading stands.

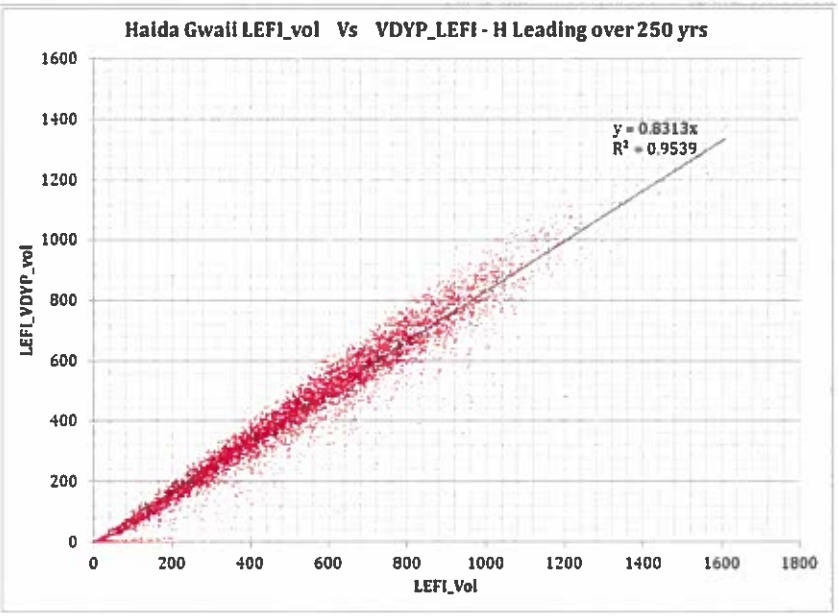


Figure 9.2. . LEFI volume vs. LEFI-Based VDYP volume for hemlock leading stands.

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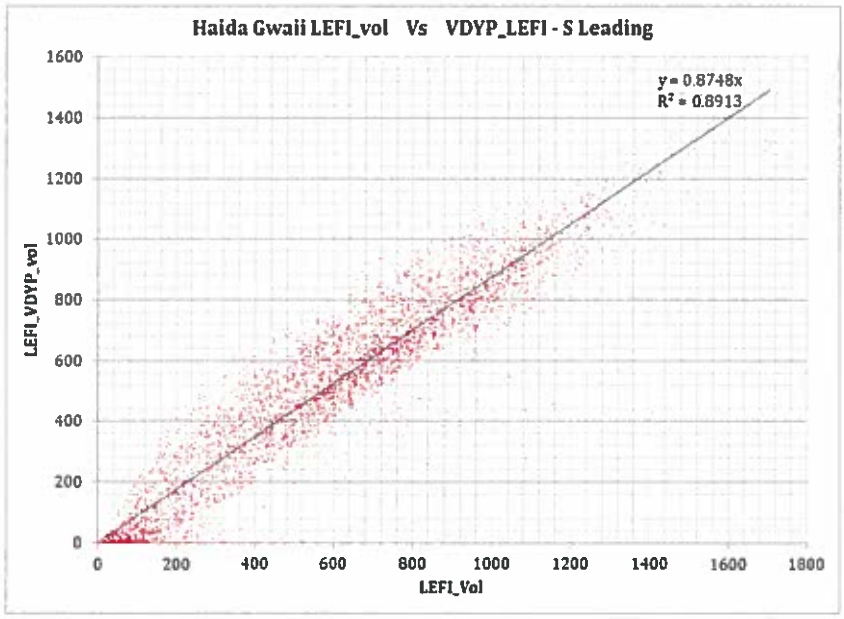

Figure9.3 LEFI volume vs. LEFI-Based VDYP volume for spruce leading stands.

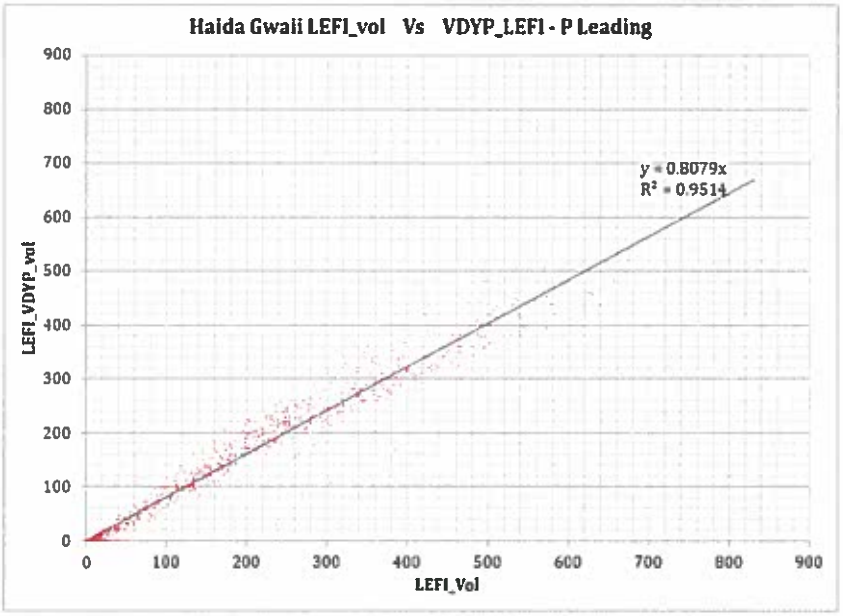

Figure 9.4 LEFI volume vs. LEFI-Based VDYP volume for pine leading stands.

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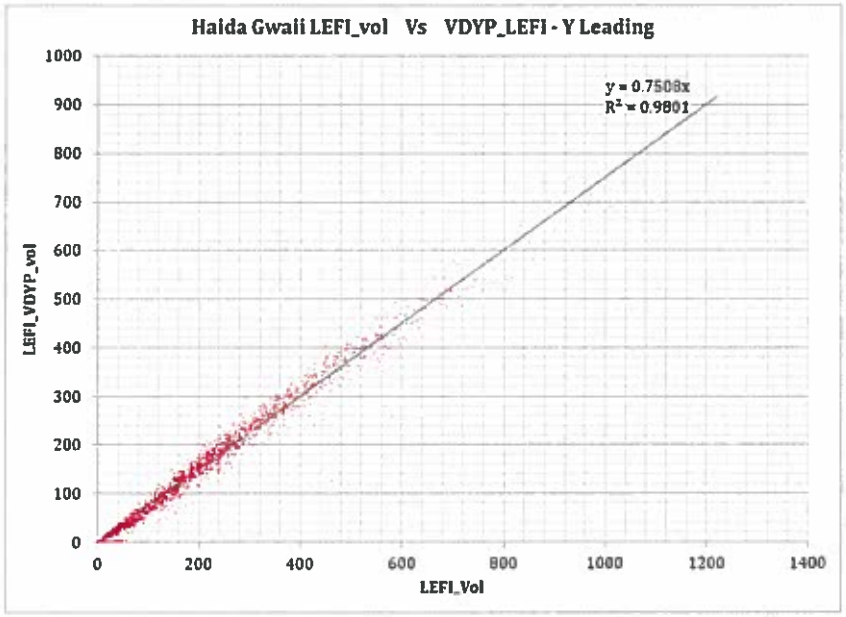

Figure 9.5. . LEFI volume vs. LEFI-Based VDYP volume for yellow cedar leading stands.

6-4

Appendix 10 'First Nation Reserves' under the *Indian Act* on Haida Gwaii

IR Name	Description	Hectares
AIN 6	QUEEN CHARLOTE DISTRICT, AT MOUTH OF THE AIN RIVER, NORTH SHORE OF MASSET INLET, GRAHAM ISLAND	66.4
COHOE POINT 20	QUEEN CHARLOTTE DIST., LOT 2079, ON DIBRELL BAY, EAST OF LANGARA ISLAND, OFF NORTHWEST TIP OF GRAHAM ISLAND	10.1
DANINGAY 12	QUEEN CHARLOTTE DIST., ON WEST SHORE OF VIRAGO SOUND, NORTH COAST OF GRAHAM ISLAND	8.5
EGERIA BAY 19	QUEEN CHARLOTTE DIST., LOT 2080, ON EGARIA BAY, EAST SHORE OF LANGARA ISLAND, NORTHWEST TIP OF GRAHAM ISLAND	10.1
GUOYSKUN 22	QUEEN CHARLOTTE DISTRICT, LOT 2078, AT RHODE4S POINT, WEST COAST OF LANGARA ISLAND	20.2
HIELLEN 2	QUEEN CHARLOTTE DIST. AT MOUTH OF HIELLEN RIVER E. OF TOW HILL PROVINCIAL PARK, MCINTYRE BAY N. COST OF GRAHAM ISLAND	27.4
JALUN 14	QUEEN CHARLOTTE DIST. SOUTHWEST OF NANKIVELL POINT AT MOUTH OF JALUN RIVER NORTH COAST OF GRAHAM ISLAND	7.1
KIOOSTA 15	QUEEN CHARLOTTE DISTRICT ON SOUTH SHORE OF PARRY PASSAGE NORTHWEST TIP OF GRAHAM ISLAND	40.9
KOSE 9	QUEEN CHARLOTTE DIST LEFT BANK OF THE NADEN RVR 4 MLS S. OF MOUTH ON NADEN HARBOUR, GRAHAM ISLAND	3.6
KUNG 11	QUEEN CHARLOTTE DISTRICT ON WEST SIDE OF ALEXANDRA NARROWS NODEN HARBOUR VIRAGO SOUND, GRAHAM ISLAND	28.7
LANAS 4	QUEEN CHARLOTTE DISTRICT AT MOUTH OF THE YAKOUN RIVER YAKOUN BAY SOUTHEAST SHORE OF MASSET INLET	78
MAMMIN RIVER 25	QUEEN CHARLOTTE DISTRICT LOT 2085, AT MOUTH OF THE MAMIN RIVER ON MAMMIN BAY, MASSET INLET, GRAHAM ISLAND	2.5
MASSET 1	QUEEN CHARLOEET DIST ON EAST SHORE OF MASSET HARBOUR BELOW ENTRY POINT NORTH COAST OF GRAHAM ISLAND	299.6
MEAGWAN 8	QUEEN CHARLOTTE DISTRICT AT WIAH POINT NORTH COAST OF GRAHAM ISLAND EAST OF VIRAGO SOUND	19.8
NADEN 10	QUEEN CHARLOTTE DISTRICT ON WEST SHORE AT MOUTH OF NADEN RIVER, NADEN HARBOUR, GRAHAM ISLAND	10.9

G-4

IR Name	Description	Hectares
NADEN 23	QUEEN CHARLOTTE DISTRICT LOT 2084, AT MOUTH OF STANDLY CREEK NADEN HARBOUR NORTH SHORE OF GRAHAM ISLAND	2.6
OWUN 24	QUEEN CHARLOTTE DISTRICT, AT THE MOUTH OF THE AWUN RIVER, AWUN BAY, SOUTH SHORE OF MASSET INLET, GRAHAM ISLAND	3
SAOUCHTEN 18	QUEEN CHARLOTTE DISTRICT, LOT 174, AT ROONEY POINT, WEST SIDE OF MASSET HARBOUR, GRAHAM ISLAND	11.4
SATUNQUIN 5	QUEEN CHARLOTTE DISTRICT, AT STRATHDANG KWUN, POINT ON WEST SIDE OF YAKOUN BAY OF MASSET INLET, GRAHAM ISLAND	3.6
SUSK 17	QUEEN CHARLOTTE DISTRICT, LOT 2083, AT PERIL BAY, EAST OF FREDERICK ISLAND, WEST SHORE OF GRAHAM ISLAND	63.1
TATENSE 16	QUEEN CHARLOTTE DISTRICT, ON S.W. TIP OF LANGARA ISLAND, N. OF PARRY PASSAGE, N.W. OF GRAHAM ISLAND	6.5
TIAHN 27	QUEEN CHARLOTTE DISTRICT, LOT 2082, AT TIAN BAY, W. SHOTE OF GRAHAM ISLAND	2.3
TLAA GAA AAWTLAAS 28		63.7
YAGAN 3	QUEEN CHARLOTTE DISTRICT, AT YAKAN PT. W. OF TOW HILL PROV. PARK, ON MCINTYRE BAY, SOUTH OF GRAHAM ISLAND	34.8
YAN 7	QUEEN CHARLOTTE DISTRICT, ON WEST SIDE OF ENTRANCE TO MASSET HARBOUR, NORTH COAST OF GRAHAM ISLAND	106.8
YASITKUN 21	QUEEN CHARLOTTE DISTRICT, LOT 2081, ON NORTHWEST COAST OF LANGARA ISLAND, NORTHWEST OF GRAHAM ISLAND	20.2
YATZE 13	QUEEN CHARLOTTE DISTRICT, SOUTHEAST OF KLASHWUN POINT, WEST OF VIRAGOSOUND, NORTH COAST OF GRAHAM ISLAND	18.2
BLACK SLATE 11	QUEEN CHARLOTTE DIST, BLK A, SEC. 23, TP 2, ON SLATECHUCK CREEK ABT 2 MLS WEST OF ITS MOUTH ON KAGAN BAY SKIDGATE INLT	17.7
CUMSHEWAS 7	QUEEN CHARLOTTE DIST. ON NORTH SHORE OF CUMSHEWAS INLET WEST OF MCCOY COVE, EAST SIDE OF MORESBY ISLAND	22.6
DEENA 3	QUEEN CHARLOTTE DISTRICT, ON SOUTH SHORE OF SKIDEGATE INLET ON NORTH SIDE OF SOUTH BAY NORTH END OF MORESBY ISLAND	48.2
KASTE 6	QUEEN CHARLOTTE DISTRICT, AT MOUTH OF COPPER CREEK, ON COPPER BAY, NORTHEAST COAST OF MORESBY ISLAND	15.4
KHRANA 4	QUEEN CHARLOTTE DISTRICT, ON THE EAST END OF MAUDE ISLAND IN SKIDEGATE INLET BTWN. GRAHAM & MORESBY ISLANDS	85

G-4

IR Name	Description	Hectares
LAGINS 5	QUEEN CHARLOTTE DISTRICT AT MOUTH OF LAGINS GREEK AT HEAD OF GRAHAM ISLAND, SKIDEGATE INLET	16.2
NEW CLEW 10	QUEEN CHARLOTTE DISTRICT LOT 175, ON NORTH SHORE OF LOUISE ISLAND IN THE QUEEN CHARLOTE GROUP	11.2
SKAIGHA 2	QUEEN CHARLOTTE DIST. ON EAST COAST OF GRAHAM ISLAND AT HALIBUT BAY, 7 MILES N. OF SKIDEGATE MISSION	25.1
SKEDANCE 8	QUEEN CHARLOTTE DISTRICT, ON EAST TIP OF LOUIS ISLAND OF THE QUEEN CHARLOTTE GROUP	68.4
SKIDEGATE 1	QUEEN CHARLOTTE DIST. AT SKIDEGATE MISSION, MOUTH OF SKIDE- GATE INLET, SOUTHEAST OF GRAHAM ISLAND	505.7
TANOO 9	QUEEN CHARLOTE DISTRICT, ON THE EAST SHORE OF TANOO ISLAND, QUEEN CHARLOTTE GROUP	26.3

G-4

Appendix 11 Timber Supply Review Spatial Input Atlas

See separate download document "*Appendix11.pdf*".

6-4

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ACTION ITEMS

#	Date	Description	Lead	Follow up
A30	06-09-2016	Weight Room Upgrades	Administration	Questionnaire distributed on equipment use - Several Turned in.
				Grant Writer to look for opportunities Ruth Bellamy & CAO toured facilities to determine what improvements should be made.
				Grant Writer searching out funding.
	14-03-2019			Councillor Kish contacted Grant Writer about grants. She also spoke to Ruth Bellamy about equipment and removal of non-essential items. Plan to dispose of these items during free tipping day
A36	08-08-2017	Sunset Park Mgmt. Plan	Council	Review recently adopted Management plan in Nov/Dec 2017 and again in Nov/Dec 2018.
	16-04-2019			Draft plan circulated to Council for review.
	03-06-2019			Motion made to hold public hearing and then adopt Management Plan. Staff dealing with scheduling.
	31-07-2019			Requested date for Aug 20/20 - waiting for confirmation
	22-08-2019			Public Meeting held to receive comments on proposed plan and Berry Maze
A-41	2018-09-260	Amend the Campground Bylaw fees		Still in Progress - Still needs to be reviewed
A45	18-11-2019	PCHS Request for Support		to bring back after strategic planning and budget approval
A46	18-11-2019	Staff to accumulate information		Staff to Accumulate all information on location of sewer lines where it impacts current land application - may not be completed & brought back until next year