

FINAL REPORT

**ASSESSING CURRENT TIMBER HARVESTING
VALUE IN THE CENTRAL COAST**

Submitted to:
Ministry of Forests, Vancouver Forest Region

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EXECUTIVE SUMMARY

The Ministry of Forests (MoF) is developing a methodology for assessing the current value of timber harvesting in the Vancouver Region. This project has been designed to develop and implement this methodology in the Central Coast area within the region. The specific deliverables are a set of GIS and analytical models to serve as *strategic planning tools* within the region, and analyses to provide estimates of current value, based on existing inventory, cost and value data available for the study area.

The geographic resolution of the analysis is at the “Woodshed” level. A woodshed for this purpose is defined as an area of forest serviced by one or more, closely related, wood gathering points. For each woodshed, the objective is to estimate the current value index (CVI), based on the difference between mean delivered wood cost/cubic meter (DWC) and mean timber value/cubic meter (TV).

Achieving the project objective entailed development of a GIS database for the study area, defining woodshed boundaries, existing and proposed roads, and existing inventory and timber harvesting landbase parameters. The GIS database was developed from a set of ArcInfo coverages provided by MoF Vancouver Region. A significant proportion of the overall effort entailed an engineering overview assessment of the study area, to ensure that the definitions of woodshed boundaries, road access, and harvest system requirements were operationally realistic. A Microsoft Access application was developed to determine DWC, TV and CVI parameters for each woodshed.

Individual woodshed reports can be generated which include tabular summaries of inputs into both the cost and value models, as well as a breakdown of the costs, and values, which determine the current value index. The Access application provides a menu to select alternative report formats and landbase scenarios. In addition, the ArcInfo database facilitates generation of thematic map outputs based on the woodshed DWC, TV and CVI values generated using the Access application.

Using existing inventory, cost and timber value data based on the April 1, 2000 coastal appraisal parameters, an analysis was completed for the study area. Based on the analysis documented in this report, the overall Current Value Index (CVI) is negative, indicating that, if all of the volume above age 60 on the 158 woodsheds identified were harvested today, the costs of doing so would average \$99.10 per cubic meter, while the average value would average \$92.46. The average value would have to increase by approximately 7 percent to offset this. **However, there is considerable variation around these averages**, with 58 woodsheds showing a positive CVI. The current published Coast Mean Value Index for April 1, 2000 is \$-7.30, indicating general agreement with the results of this analysis.

Current AAC levels and future timber flow requirements will determine the rate at which timber is harvested within the study area. This analysis is merely a snapshot of current conditions. As such, it does not consider changes in inventory, markets, labor and capital costs, or harvesting technology. Furthermore, there are significant limitations associated with the data available for use in the analysis. These include the resolution of grade distribution and inventory data, and access cost estimates such as engineered bridge and road costs.

It should be noted again that results are based on log values and cost parameters, which are updated and published quarterly. As appraisal parameters change, the tools provide for re-evaluation of the cost estimates.

While the reliability of the analyses presented in this report is affected by these issues, the utility of the analysis tool is not. It serves as a framework to organize and assess the best information available. As data inputs improve, so will the confidence surrounding the results.

A number of recommendations are presented in the final section of the report, addressing issues surrounding improvements to information sources, further analysis, and future model development.

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The project was completed with the kind assistance and support of the following organizations and individuals, who provided considerable input during all phases of the data preparation and analyses.

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1. BACKGROUND

The Ministry of Forests (MoF) is developing a methodology for assessing the current value of timber harvesting in the Vancouver Region. This project has been designed to develop and implement this methodology in the Central Coast area within the region.

A set of GIS and analytical models has been developed to serve as ***strategic planning tools*** within the region. They have been designed with the following principles in mind:

- Input data must be readily available in all management units within the region;
- Model resolution must be consistent with this strategic application;
- Models must accommodate changes in input variables to broaden application and facilitate updates and alternative scenario evaluation; and
- Output resolution and format must facilitate alternative policy evaluation and presentation.

In order to initiate development of these tools, a Request for Proposals (RFP) was initiated by the MoF Vancouver Region. Through a competitive bidding process, Timberline Forest Inventory Consultants, in partnership with R.S. Rogers Consulting Inc. was awarded a contract to undertake this study. The project has been successfully completed, and this report represents the final deliverable under the terms of the contract.

2. METHODOLOGY

The geographic resolution of the analysis is at the “Woodshed” level. A woodshed for this purpose is defined as an area of forest serviced by one or more, closely related, wood gathering points. For each woodshed, the objective is to estimate the current value index (CVI), based on the difference between mean delivered wood cost/cubic meter (DWC) and mean timber value/cubic meter (TV).

$$CVI = TV - DWC$$

Achieving this objective entailed completion of the following tasks:

1. Develop GIS database for the study area;
2. Develop DWC and TV sub-models;
3. Develop CVI model;
4. Generate initial CVI scenarios; and
5. Prepare final report and recommendations.

2.1 Develop GIS database

The purpose of this phase of the project was to delineate the woodsheds and compile the boundaries using ArcInfo GIS to create a seamless digital coverage. This coverage was then used to define the individual woodsheds and generate the appropriate woodshed attributes for input into the DWC, TV, and CVI models. This, in turn, entailed the following steps:

1. Produce working maps;
2. Define preliminary woodshed boundaries;
3. Undertake engineering overview of each woodshed;
4. Digitize final woodshed boundaries and road access requirements;
5. Develop extended landbase boundaries;
6. Assign maturity and quality attributes;
7. Review maps and develop final coverages; and
8. Unload woodshed attributes.

2.1.1 Produce Working Maps

In order to delineate the woodshed boundaries and the projected road networks, 1:50,000 NTS “working maps” were produced with the following GIS planimetric and thematic data:

Table 1. GIS themes and sources

Feature or theme	Data Source
Water features, coastline	1:250,000 NTS base mapping
Administrative boundaries and ownership	1:250,000 MOELP mapping (coverage: qprv_cc)
Landscape Units	1: 250,000 MOELP/MoF (coverage: qflu_cc)
Timber harvesting landbase	1:250,000 MoF (coverage: qthlb_cc)
Operability	1:250,000 Generalized TFL/TSA Inventory. MoF/LUCO
Existing roads and wood gathering points	MoF/Licensee seamless road coverage as identified in RFP.

2.1.2 Delineation of Woodshed Boundaries and Projected Road Systems

The boundary of a woodshed is defined by one or more wood gathering points and their associated road system(s). Because a road system is often limited to an individual drainage, the height of land (HOL) can be used as a basis for defining the boundary of the woodshed. These HOL boundaries are often coincident with the Ministry's Landscape Unit (LU) boundaries. The approach therefore was to use the LU boundaries and the existing roads systems (including wood gathering points) to initially map the woodshed boundaries.

2.1.3 Engineering Overview of Woodsheds

Subsequent to the preliminary delineation, forest engineers familiar with logging and road construction requirements in the Mid Coast reviewed each woodshed, considering engineering constraints such as:

- Terrain (steep ground);
- Sensitive soils;
- HOL; and
- Major water features.

Specifically, the objective was to identify:

- Logical subdivision/amalgamation of individual woodsheds;
- Additional road access requirements;
- Additional wood gathering requirements;
- Average haul distance for logging cost calculations;
- Estimated proportion of helicopter vs. conventional operations; and
- Road reactivation requirements.

A good deal of subjectivity was employed in this overview assessment, as time and budget restrictions did not permit even broad aerial or ground reconnaissance and mapping, beyond that already completed as part of ongoing inventory and operational programs in the districts. Nevertheless, given the generalized, strategic nature of the analysis, this overview was deemed sufficient, and absolutely necessary to provide a measure of operational credibility to the results.

Subdivision/amalgamation

In general, the purpose of this task was to subdivide very large woodsheds, and to amalgamate small woodsheds with adjacent ones in the most logical manner. In general, the objectives were to maintain a minimum woodshed size of approximately 250 hectares, and limit the maximum size to areas with common access and wood gathering systems.

Additional road access and wood gathering requirements

For those woodsheds where all roads had not been built to access available timber, projected road system and wood gathering points were delineated on the working maps. A review of 5-Year Development Plan maps assisted in this process, as did discussions with MoF district staff and licensees. These projected road systems were then digitized.

Average haul distance

For each woodshed, a point was plotted which represented the average distance from the identified wood gathering points. Subsequently, average haul distances were calculated based on these points.

Helicopter vs. conventional operations

Percentage assignments were based on terrain, and distance from water and roads. In addition, information obtained from forest development plans and discussions with licensees was used to develop these estimates.

Road reactivation

As the engineering overview proceeded, it became obvious that a significant number of existing mapped roads had been deactivated, and that costs would be incurred to reactivate these roads in order to extract remaining timber. To address this issue, MoF district staff reviewed individual woodsheds and identified, subjectively, the estimated percentage of existing roads which are currently deactivated. This information was then used by the engineers in determining the proportion of deactivated roads requiring future reactivation.

Once this initial overview was completed, meetings were held with MoF regional and district staff to review the woodshed boundaries and projected roads. Ministry staff then provided recommendations for changes based on their operational knowledge of the study areas.

2.1.4 Final Digitizing of Woodshed Boundaries and Projected Road Systems

The final delineated woodshed boundaries, projected roads and wood gathering points were digitized from the working maps. All of the digitized features were feature coded, to distinguish:

- Existing roads on MoF maps;
- 5-year development plan roads;
- Timberline proposed roads;
- Average haul points; and
- Wood gathering points.

Quality control procedures that were implemented during the digitizing included:

- Check plotting and comparison of digitized data to the source maps on a light table;
- Edge matching between the 1:50,000 map sheet coverages as part of the compilation of the seamless coverage;
- Ensuring clean topology and polygon numbering for the polygonal woodshed coverage;
- Ensuring clean intersection topology for the roads coverage; and
- Running quality assurance routines to check for feature coding errors.

2.1.5 Extended Landbase Definition

The *regular* timber harvesting landbase (THLB) was determined by MoF regional and district staff. The THLB is the productive forest land within Timber Supply Areas and Tree Farm Licences that is currently considered feasible and economical for timber harvesting. Environmentally sensitive areas and areas reserved to protect important wildlife, recreation, and cultural values are not included in the THLB. This was based on classifications developed for the Central Coast Land and Coastal Resource Management Planning project for all but the Mid Coast TSA, which was based on the recent Timber Supply Review. The THLB was incorporated into the GIS resultant database. In addition, two extended areas were also defined based on the following criteria:

a) *New conventional*

- Outside THLB;
- Within conventional operability line; and
- Within 2 km of existing or proposed roads.

b) *New helicopter*

- Outside THLB;
- Outside conventional operability line;
- Within 2 km of existing or proposed roads; and
- Minimum 500 m³/ha coniferous volume.

The 2 km criterion was addressed by generating a 2 km buffer in the GIS around all existing and proposed roads.

2.1.6 Assign Inventory Volume Attributes

The CVI model was designed to assign different grade distributions and timber values based on maturity. In addition, grade distributions are expected to differ depending upon the quality of the stands supporting timber volumes. Maturity designations were based on the following criteria:

- Mature (M): Inventory type identity code = 2.
Immature (I): > age 60 and inventory type identity code <> 2.

Only volumes from stands > age 60 were included in the analysis.

Site index categories were used to define quality classes for the mature category, as follows:

- Poor (P): site index 7.5 - 17.5
Medium (M): site index 17.5 - 27.5
Good (G): site index > 27.5

All immature stands were assigned to one quality class (A).

2.1.7 Map Review with the MoF and Preparation of Final Coverages

After digitizing, new 1:50,000 plots were produced for final review of woodshed boundaries and roads with MoF Regional staff. The suggested edits were then digitized and incorporated into the final seamless woodshed and roads coverages.

2.1.8 Unload Woodshed Attributes

The following attributes were unloaded from the GIS resultant coverage:

- Woodshed ID and name;
- Inventory type group;
- Maturity;
- Quality;
- Volume (regular, new conventional and new heli);
- Area (Total, net, new conventional and new heli);
- Road length (existing and proposed); and
- Average haul distance.

2.2 Current Value Index (CVI) Model

For each woodshed, the objective was estimate the current value index (CVI), based on the difference between mean delivered wood cost/cubic meter (DWC) and mean timber value/cubic meter (TV).

$$CVI = TV - DWC$$

2.2.1 Delivered Wood Cost Submodel

This is the estimated average cost (excluding stumpage) of harvesting and transporting timber from the woodshed. The specific computations are consistent with methodology set out in the Coast Appraisal Manual.

$$DWC = \text{Development cost} + \text{Tree-to-truck costs} + \text{Log transport costs} + \text{Administration costs}$$

Specifically, the following costs were incorporated:

- Bridge construction;
- Road construction;
- Road reactivation;
- Road maintenance;
- Tree-to-truck;
- Loading/hauling;
- Reloading;
- Boom and barging;
- Dump/sort/scale;
- Crew transportation;
- Camp/accommodation;
- Silviculture; and
- Management overhead.

Costs were determined through references to the Coast Appraisal Manual, discussions with MoF staff and licensees, and assessment of cutting permit appraisal data. These sources were also employed to localize road construction costs.

2.2.2 Timber Value Submodel

This model was designed to determine average timber value and total merchantable volume for the woodshed. In this case, value was based on current standing inventory estimates and current selling prices. Estimation of grade distribution is critical to generating reliable estimates of timber value. Application of district averages to individual woodsheds may mask critical differences in grade distributions, which in turn could mask current value differences between woodsheds. Therefore, where available, cutting permit-specific appraisal data was utilized to localize grade distributions.

The computations are implemented using a Microsoft Access application. Inputs necessary to drive the DWC and TV submodels are stored in a set of 8 Access database files (Figure 1).

1. Road attribute table (GIS sources): RAT_GIS
2. Volume attribute table (GIS sources): VAT_GIS
3. Woodshed attribute table: WAT
4. Road attribute table (Engineering data): RAT_ENG
5. Unit cost table: UCT
6. Grade distribution table: GDT
7. Unit timber value table: UTVT
8. Inventory type group table: ITG

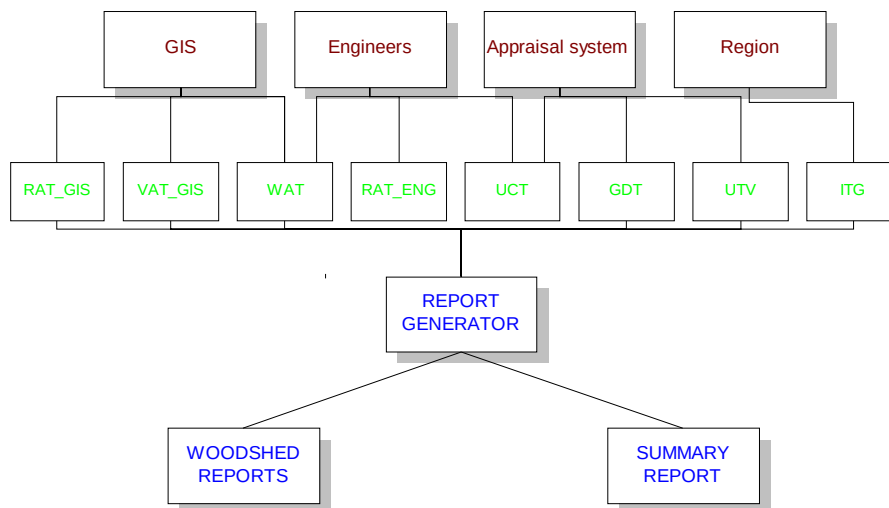


Figure 1. Data sources and file organization

The following tables (2 through 9) describe the input files in more detail. Data sources are coded as:

Gis: GIS resultant database
 Eng: forest engineers
 Man: Coast Appraisal Manual

The Woodshed Attribute Table (Table 2) contains information specific to each woodshed. This information is derived from the GIS resultant database, and supplemented with qualitative information developed during the engineering overview phase.

Table 2. Woodshed attribute table: WAT

Table	Column	Source	Detail
WAT	WSHD_ID	Gis	Unique Woodshed ID number
	NAME	Gis	Woodshed Name
	DISTRICT	Gis	Use predominant if more than 1
	SUP_BLK	Gis	Use predominant if more than 1
	ISOLATED	Eng	A = accessible, I = isolated
	TOT_AREA	Gis	Total Area of Woodshed (ha)
	NEW_CONV	Gis	Additional operable area within 2 km buffer (ha)
	NEW_HELI	Gis	Additional inoperable area within 2 km buffer (ha)
	NET_AREA	Gis	Net THLB area (ha)
	CONV_%	Eng	Conventional area (%)
	HELI_RD_%	Eng	Heli road drop area (%)
	HELI_WA_%	Eng	Heli water drop area (%)
	OTHER_%	Eng	Other systems area (%)
	CREW_DIST	Eng	Distance to community (km)
	HELI_RD_DIST	Eng	Distance to road drop (km)
	HELI_WA_DIST	Eng	Distance to water drop (km)
	HAUL_DIST	Gis	Average haul distance (km)
	RELOAD_%	Eng	Reload (%)

The volume Attribute Table-GIS sources (Table 3) contains volume data for each woodshed organized by Inventory Type Group, maturity and quality classes. Separate records are created for each operability category (regular, new conventional and new heli).

Table 3. Volume attribute table-GIS sources: VAT_GIS

Table	Column	Source	Detail
VAT_GIS	WSHD_ID	Gis	Unique Woodshed ID number
	ITG	Gis	Inventory type group code to link to ITG table
	MATURITY	Gis	I or M (Immature or Mature)
	QUALITY	Gis	A-All, G- Good, M-Medium, P-Poor, L- Low
	REG_VOL	Gis	Regular volume on THLB (m3)
	NEW_CONV_VOL	Gis	Amount of New conventional Volume (m3)
	NEW_HELI_VOL	Gis	Amount of New Heli Volume (m3)
	SWITCH	Na	Value set by application.

The Road Attribute Table-GIS sources (Table 4) contains road length information for each woodshed. Separate records are created for existing and proposed roads.

Table 4. Road attribute table-GIS sources: RAT_GIS

Table	Column	Source	Detail
RAT_GIS	WSHD_ID	Gis	Unique Woodshed ID number
	CLASS	Gis	Two classes (EX = existing, PR = proposed)
	LENGTH	Gis	Length in km

In addition to the road data obtained from the GIS resultant database, additional subjective data was captured during the engineering overview phase. This is contained in the Road Attribute Table – Engineering (Table 5).

Table 5. Road attribute table (Engineering sources): RAT_ENG

Table	Column	Source	Detail
RAT_ENG	WSHD_ID	Gis	Unique Woodshed ID
	CLASS	Gis	Only two classes (EX = existing, PR = proposed)
	RD_ADJ_FACT	Eng	Factor to inflate road class to account for unmapped roads
	ACT_%	Eng	Active roads (existing only) (%)
	DEACT_TMP_%	Eng	Temporarily deactivated roads (existing only) (%)
	DEACT_PRM_%	Eng	Permanently deactivated roads (existing only) (%)
	ENG_%	Eng	Engineered roads (proposed only) (%)
	TAB_%	Eng	Tabulated roads (proposed only) (%)
	LENGTH_GIS	Gis	Read-Only GIS Length (value taken from RAT_GIS)

Grade distribution data was obtained from a database provided to Timberline by the MoF Revenue Branch. This database summarized historical grade distributions by timber mark. In order to georeference this information to the woodsheds, each timber mark was georeferenced base on the BCGS mapsheet(s) covered by that timber mark. Area-weighted grade distributions were then generated for each BCGS mapsheet. Area-weighted grade distributions for each woodshed were then derived based on the mapsheet areas found within that woodshed. A number of woodsheds did not contain any mapsheets covered by timber marks in the database. In these cases, overall average grade distributions were used to populate the Grade Distribution Table (Table 6).

Table 6. Grade distribution table: GDT

Table	Column	Source	Detail
GDT	WSHD_ID	Gis	Unique Woodshed ID
	SPECIES_CODE	Gis	Species Code
	MATURITY	Gis	I or M (Immature or Mature)
	QUALITY	Gis	either A - All (only for Immature) the rest are only for Mature , G- Good , M-Medium , P-Poor, L- Low
	A..M,U,X,Y	MoF	Percent of Grade A..M,U,X,Y (one column per grade) each row must sum to 100

The inventory database provided for this project included volumes by Inventory Type Group (ITG), rather than individual species. Therefore, it was necessary to distribute this volume by species. This was done using average species distribution by ITG data provided by MoF regional staff. This information was used to develop the Inventory Type Group Table (Table 7).

Table 7. Inventory type group table: ITG

Table	Column	Source	Detail
ITG	ITG	MoF	lookup table – species percentages by ITG

Applicable costs are captured in the Unit cost Table (Table 8). Some of these are based on specifications contained in the Coast Appraisal Manual. In addition, average bridge and road construction costs were developed by engineers based on examination of existing cutting permit appraisal data.

Table 8. Unit cost table: UCT

Table	Column	Source	Detail
UCT	WSHD_ID	Eng	Unique Woodshed ID
	BRIDGE_ENG**	Eng	Lump sum cost for engineered bridges
	BRIDGE_TAB**	Eng	Lump sum cost for tabulated bridges
	PE	Eng	Fixed cost/km for building a proposed engineered road
	PT	Eng	Fixed cost/km for building a proposed tabulated road
	DT	Eng	Fixed cost/km to activate temporally deactivated road
	DP	Eng	Fixed cost/km to activating permanently deactivated road
	CONV_TTT	Man	Fixed cost/m3 for Conventional Tree To truck
	OTHER_TTT	Eng	Fixed cost/M3 for Other Truck To truck cost
	HELI_RD	Man*	Cost/m3 = $57.69 + 5.66 * heli_rd_dist + 0.076 * \%hembal$
	HELI_WA	Man*	Cost/m3 = $57.69 + 5.66 * heli_wa_dist + 0.076 * \%hembal$
	LOAD/HAUL	Man*	Cost/m3 = $3.61 + .076 * average\ haul\ dist\ (exclude\ heli_water)$
	DUMP/SORT/SCALE	Man	Fixed cost/m3
	BOOM/BARGE	Eng	Fixed cost/m3
	ROAD_MAINT	Man	Fixed cost/m3
	RELOAD	Eng	Fixed cost/m3
	MGMT	Man	Fixed cost/m3
	CREW_TRANS	Man*	Cost/m3 = $1.5976 + .0395 * average\ haul\ distance$
	CAMP	Man	fixed cost/m3
	ACCOM	Eng	fixed cost/m3
	SILVICULTURE	Eng	Fixed cost/m3
	ADMIN	Eng	Fixed cost/m3
	OTHER	Eng	Fixed cost/m3
	TREND	Eng	to be applied as a scale factor to total cost – default to 1

* No Input Required (Calculated Field) – these equations should be revised as necessary

** In this analysis, average bridge costs were incorporated into road construction costs on a per km basis. Therefore, no values appear in these fields.

Unit timber values by species and maturity are included in the Unit Timber Value Table (Table 9.). These are based on current published coast appraisal data.

Table 9. Unit timber value table: UTVT

<i>Table</i>	<i>Column</i>	<i>Source</i>	<i>Detail</i>
UTVT	MATURITY	Man	I or M (Immature or Mature)
	SPECIES_CODE		Species Code
	SPECIES_NAME		Species name
	A-M,U,X,Y		TimberValue \$/m3 for each Grade A-M,U,X,Y (one column per grade)

Note: After the analysis was completed, it was determined that timber values for yellow cedar grades K,L,M were not included in the published data used in the analysis. However, there are grade percentages reported in some cases for these categories. As the amount of yellow cedar reported in these categories was minor, the impact on the results reported here is negligible. The UTVT has been corrected in the Access application.

2.2.3 Reporting

Using the data sources and model inputs defined above, two report formats can be produced. Individual woodshed reports can be generated which include tabular summaries of inputs into both the cost and value models, as well as a breakdown of the costs, and values, which determine the current value index. An example of the woodshed report format is presented on the following page.

In addition, a summary report can be generated which provides a one-line summary for each woodshed. To facilitate analysis, this report can be exported as a spreadsheet. Appendix 2 contains a full spreadsheet listing of the summary report

Four different landbase scenarios can be analyzed:

- regular
- regular + new conventional
- regular + new heli
- regular + new conventional + new heli

The Access application provides a menu to select the report format and landbase scenario.

Name Calvert District: Mid-Coast Supply Block: na Area (ha): 18,693 Net Area (ha) 944 ID: 2

Volume Summaries

	DR	B	CW	AC	YC	FD	HW	PL	S	PW	Total
Immature (m3)	0	0	0	0	0	0	0	0	0	0	0
Mature Good (m3)	0	1,140	555	0	6	30	2,737	10	6,155	0	10,633
Mature Average (m3)	0	12,800	68,611	0	15,427	519	32,360	435	10,912	0	141,064
Mature Poor (m3)	0	16,346	199,519	0	46,027	740	63,856	1,288	8,081	0	335,856
Mature Low (m3)	0	3,973	6,363	0	765	663	16,833	16	6,430	0	35,042
Sub- Total Mature (m3)	0	34,259	275,048	0	62,225	1,952	115,786	1,749	31,577	0	522,595
Total Volume (m3)	0	34,259	275,048	0	62,225	1,952	115,786	1,749	31,577	0	522,595
Selling Price Imm. (\$/m3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selling Price Mat. (\$/m3)	0.00	76.97	132.71	0.00	129.43	106.52	67.12	36.95	120.90	0.00	113.00
Timber Value Imm. (\$)	0	0	0	0	0	0	0	0	0	0	0
Timber Value Mat. (\$)	0	2,636,834	36,500,803	0	8,053,712	207,881	7,771,561	64,622	3,817,706	0	59,053,119
Total (\$)	0	2,636,834	36,500,803	0	8,053,712	207,881	7,771,561	64,622	3,817,706	0	59,053,119

Delivered Wood Cost Summary

	Amount	Rate (\$)	Cost (\$)		Amount	Rate (\$)	Cost (\$)
Bridges			0	Dump/Sort/Scale	522,595 m3	10.67 \$/m3	5,576,094
Road Building	33.06 km	0 120,814 \$/km	3,994,565	Boom/Barge	522,595 m3	6.30 \$/m3	3,292,352
Road Activation	0.00 km	0 \$/km	0	Road Maintenance	522,595 m3	2.29 \$/m3	1,196,744
Conventional Tree to Truck	418,076 m3	20.18 \$/m3	8,436,781	Management	522,595 m3	13.70 \$/m3	7,159,558
Other Tree to Truck	0 m3	20.18 \$/m3	0	Camp	522,595 m3	12.13 \$/m3	6,339,083
Heli Road Tree to Truck	52,260 m3	0 68.36 \$/m3	3,572,571	Accommodation	522,595 m3	4.21 \$/m3	2,200,127
Heli Water Tree to Truck	52,260 m3	0 65.53 \$/m3	3,424,876	Silviculture	522,595 m3	2.59 \$/m3	1,353,522
Load/Haul	470,336 m3	0 4.19 \$/m3	1,968,587	Other	522,595 m3	0.00 \$/m3	0
Reload	0 m3	0.00 \$/m3	0				
Crew Transportation	522,595 m3	0 1.69 \$/m3	881,960	TOTAL			49,396,620

1) Based on Weighted Average of Road Costs.

2) Based on Heli Bal percentage and Heli Road distance of 1.50 km

3) Based on Heli Bal percentage and Heli Water distance of 1.00 km

4) Based on Average Haul distance of 7.57 km

* This report was made with no additional Buffered Areas

Current Value Index \$18.48 /m3

3. RESULTS

A total of 158 woodsheds were defined for the study area. Based on the input parameters developed during the project, the following statistics were generated.

Table 10. Analysis statistics (as of April, 2000)

Number of woodsheds:	158
Total net area (ha):	671,093
Average net area (ha):	4,247
Total volume (m3):	279,811,455
Average cost/m3:	\$99.10
Average value/m3:	\$92.46
Average CVI:	\$-6.64

Figures 2-4 show the range of costs, values and current value indices determined for the individual woodsheds. Woodshed ID is merely a numerical code assigned to each woodshed. Unit costs and values relate to the regular volume supported on the THLB.

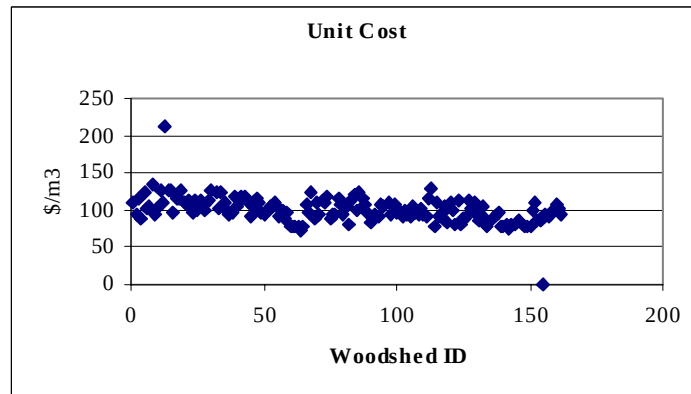


Figure 2. Unit costs by woodshed

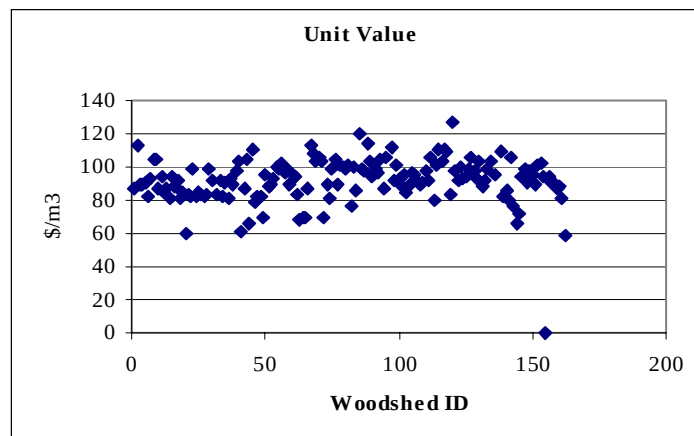


Figure 3. Unit values by woodshed

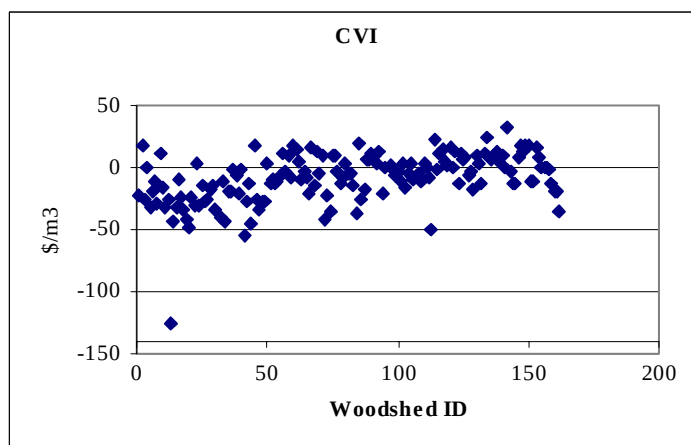


Figure 4. Current value indices by woodshed

With the exception of two “outliers” a reasonably consistent range of values is evident. The two woodsheds which fall out of this normal range are 13 and 155 (see Table 11). Woodshed 13 supports only a small harvestable volume relative to its area. The fixed costs are therefore unusually high relative to the volume to be extracted. Woodshed 155 has no harvestable volume.

Table 11. Summary of outliers

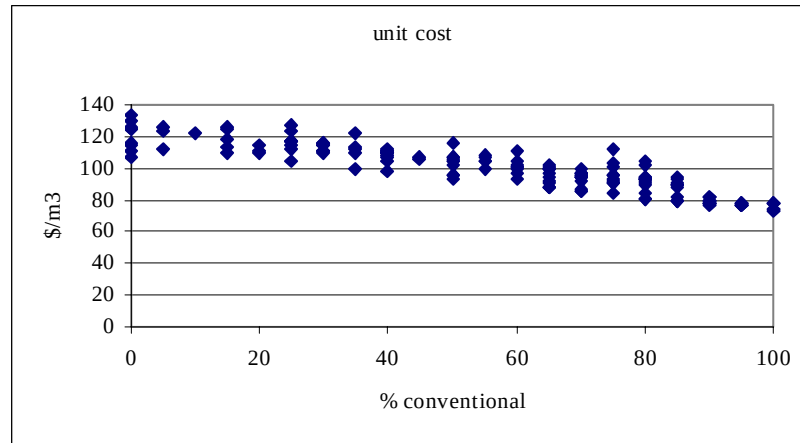
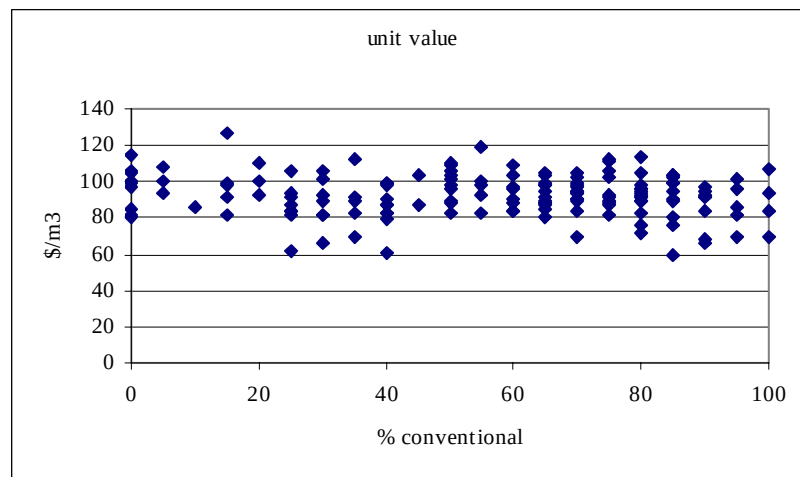
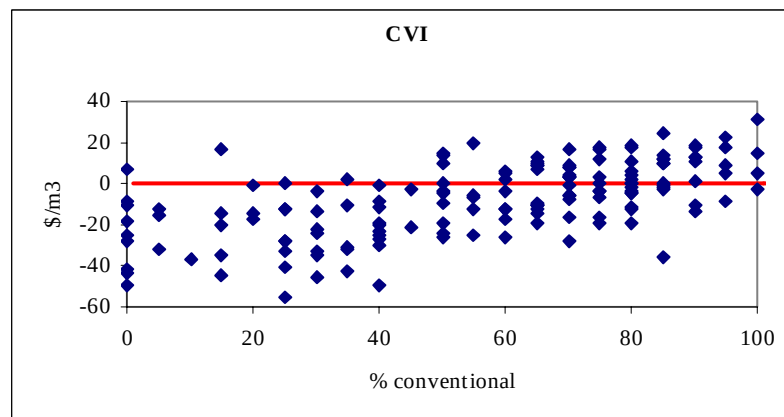
ID	Name	Net area	Volume	Unit cost	Unit Value	CVI
13	L. Klinaklini	14450	155988	213.45	87.10	-126.35
155	Sim NE	833	0	0	0	0

All of the input statistics are based on April 2000 Coast Appraisal Manual parameters. Of the 158 woodsheds, 100 had a negative CVI. The average CVI, as shown in Table 10, is -\$6.64. In other words, the current cost of extracting all of the regular volume exceeds its current appraised value by approximately \$6.64/m³. An increase of approximately 7% in appraised value is required to breakeven. The current published Coast Mean Value Index for April 1, 2000 is \$-7.30, indicating general agreement with the results of this analysis.

While many factors influence the relative costs and values of individual woodlots, harvest method emerges as particularly significant. Figures 5-7 depict the relationship between cost, value and CVI and the percentage of the volume which can be harvested conventionally. The two outliers are excluded from these graphs. Costs are predictably higher in woodsheds where the conventional percentage is low. However, as the timber values do not increase to offset this additional cost, the CVI in these woodsheds drops. If this percentage falls below 60%, the CVI is consistently negative. Between 60% and 80%, CVI fluctuates fairly evenly between negative and positive values, indicating that other factors are more critical in this interval. Above 80%, the CVI is generally positive.

With the exception of the conventional percentage, no other single factor was identified which correlates strongly with CVI. Factors which affect individual woodsheds primarily relate to access, and include:

- Reactivation percentage;
- Engineered road percentage; and
- Average haul distance.

**Figure 5. Unit cost vs.operability****Figure 6. Unit value vs.operability****Figure 7. CVI vs.operability**

4. SENSITIVITY ANALYSES

The CVI model has been developed as a strategic planning tool to test the impact of alternative cost and value factors, as well as alternative landbase scenarios. Numerous sensitivity issues can be explored simply by altering input assumptions. The primary objective of this analysis was to provide this tool to the MoF Vancouver Region, to be used in such analyses.

Several sensitivity analyses are provided here to demonstrate this functionality. These include:

1. landbase changes; and
2. log price changes.

4.1 Landbase Sensitivity

In this case, all four landbase scenarios were analyzed to determine the sensitivity of the CVI to changes in available timber. Specifically, these scenarios were:

- regular;
- regular + new conventional;
- regular + new heli; and
- regular + new conventional + new heli.

The results are summarized in Table 12.

Table 12. Sensitivity results – changes in timber available

	Regular	+ new conv	+ new heli	+ new conv+heli
Total volume (m3):	279,811,455	295,405,848	313,788,590	329,382,976
Average cost/m3:	\$99.10	95.78	100.58	97.30
Average value/m3:	\$92.46	92.70	92.61	92.82
Average CVI:	-\$6.64	-3.08	-7.97	-4.47

Clearly there is little impact on value. One of the limitations of this analysis is the lack of localized, quality-specific grade distribution data. Undoubtedly there are differences in timber quality which should be reflected in changes in value as additional areas are incorporated into the analysis. However, only average values are used in this analysis. Therefore, no significant impacts are observed.

On the other hand, unit costs are significantly impacted, in a predictable fashion. Harvestable volume is increased by six percent with the inclusion of the new conventional area. As the overall proportion of conventional volume is higher, with its attendant lower costs, the overall CVI improves by \$3.56. However, it should be noted that this does not take into account changes in quality.

With the inclusion of the new heli area, the available volume increases by 12% and average cost increases due to the inclusion of higher cost heli volumes.

4.2. Log Price Sensitivity

In this analysis, the regular landbase was employed, and log prices were varied to test the sensitivity of the CVI to fluctuations in Coastal log prices. Prices used were those in effect as of April 1 2000, and each of the preceding five years. A six year average scenario was also generated. All other parameters remain unchanged. In particular, no changes were made to cost assumptions. Therefore, while the analyses provide insight into price sensitivity, they do not provide true pictures of CVI in previous years.

The results are summarized in Table 13.

Table 13. Sensitivity results – changes in log price

	2000	1999	1998	1997	1996	1995	Ave
Average cost/m3:	\$99.10	\$99.10	\$99.10	\$99.10	\$99.10	\$99.10	\$99.10
Average value/m3:	\$92.46	\$84.98	\$104.06	\$105.96	\$112.64	\$114.53	\$102.44
Average CVI:	\$-6.64	\$-14.12	\$4.96	\$6.86	\$13.54	\$15.43	\$3.34
# with CVI < 0	100	120	60	54	31	28	63

The results are self-explanatory. Average log prices over the past six years have fluctuated significantly, and the corresponding CVIs vary by the same magnitude, all other factors being equal. Clearly, the economics of logging within specific watersheds are closely linked to current selling price. Again, it should be noted that these analyses do not take into account changes in costs over the same period. However, if anything costs would have increased somewhat during the six year period, which would only decrease the margin further.

5. SUMMARY AND RECOMMENDATIONS

This analysis was based on the costs and values associated with an immediate harvest of all of the volume which is either mature or approaching maturity. It offers a useful approach to assess and compare the relative current value of individual woodsheds, and provides an assessment of the current economic opportunities across the study area.

The analytical model has broad application, in that it is designed as a framework to accept a range of alternative cost and value factors, as well as alternative landbase definitions. The model is set up as a set of stored procedures in a Microsoft Access database (MDB) format. No numeric values are hard-coded into the model. However, as it is designed around specifications contained in the Coast Appraisal Manual, it is limited to application within the coastal forest of BC. Furthermore, several functions used to calculate costs are known to change with revisions to the Coast Appraisal Manual. These are flagged in the documentation of the Unit Cost Table. Therefore, it is essential that the Access application be kept current with any future changes in appraisal criteria.

Based on the analysis documented in this report, the overall Current Value Index (CVI) is negative, indicating that, if all of the volume above age 60 on the 158 woodsheds identified were harvested today, the costs of doing so would average \$99.10 per cubic meter, while the average value would average \$92.46. In other words, the cost would exceed the current value by approximately \$6.64 per cubic meter. The average value would have to increase by approximately seven percent to offset this. However, there is considerable variation around these averages, with 58 woodsheds showing a positive CVI.

It should be noted that the CVI in this analysis is calculated at a time when log prices are particularly low. The weighted average CVI from the analysis is \$-6.64. The current published Coast Mean Value Index for April 1, 2000 is \$-7.30, indicating general agreement with the results of this analysis.

Current AAC levels and future timber flow requirements will determine the rate at which timber is harvested within the study area. Clearly, this analysis is merely a snapshot of current conditions. As such, it does not consider these issues, and the attendant changes associated with:

- timber growth and natural losses;
- changes in markets;
- labor costs; and
- harvesting technology.

Furthermore, there are significant limitations associated with the data available for use in the analysis. The most critical of these are:

- Lack of localized, quality specific grade distribution data;
- Generalized inventory data;
- Subjectivity of access cost estimates such as engineered bridge and road costs, and road reactivation; and
- Additional capital costs associated with currently undeveloped woodsheds.

While all of the data inputs have an implicit degree of uncertainty, the above are considered to be particularly critical. However, the reliability of the analyses presented in this report is affected by these issues, the utility of the analysis tool is not. It serves as a framework to organize and assess the best information available. As data inputs improve, so will the confidence surrounding the results.

The following recommendations are put forward, **in descending order of priority**.

A. Improvements to Information Sources.

As indicated earlier, the model serves as a framework to incorporate current information. The following database improvements should be undertaken to increase the reliability of future analyses:

- 1) Improved georeferencing of existing timber grade data to individual woodsheds.
- 2) Stratification of timber grade data into mature and second growth categories⁽¹⁾.
- 3) Incorporation of species volumes into inventory database.
- 4) Development of woodshed-specific timber quality classifications to replace site index based surrogate.
- 5) Reassessment of road and bridge capital costs associated with access development.
- 6) Identification of specific road reactivation requirements.

⁽¹⁾While grade distribution data does provide this breakdown using the Price Table Parameter (51 vs. 52), the actual data available for this analysis contained only a limited component in the second growth category.

B. Further Analysis

As previously stated, this analysis was based on the costs and values associated with an immediate harvest of all of the volume which is either mature or approaching maturity, providing an assessment of the current economic opportunities across the study area.

The identification of long-term economic development opportunities within the study area is clearly the ultimate goal. To accomplish this, the CVI model must be placed in the context of a forecast of future resource development. The following is an example of how this could be accomplished.

1. Develop general projections of changes in harvestable inventory at specific points in time (ex. 20 year time steps).
2. Establish factors to adjust current costs and timber values to these future points in time.
3. Develop access development scenarios for each woodshed.
4. Apply the CVI model to conditions at each point in time.

Clearly, such an analysis is not a trivial undertaking. However, given the well-established timber supply forecasting methodologies in place in the region, and the utility and flexibility of the CVI model, there is an opportunity to develop credible forecasts of future economic opportunities.

C. Further Model Development

The model is set up as a set of stored procedures in a Microsoft Access database (MDB) format. As such, any individual with a working understanding of Microsoft Office tools (Access and Excel), can use and modify the procedures and data sets. The geographic data is managed in an ArcInfo GIS environment. Again, users familiar with ArcInfo functionality, and the structure of the resultant database provided to MoF, can alter geographic information such as woodshed boundaries, inventory estimates and road access, and re-export data to be imported into the Access database. It is recommended that the process of building new datasets be facilitated by the development of an efficient interface between the two data environments. This interface was included in the original proposal, but MoF budgetary constraints resulted in its removal from the project deliverables.

APPENDIX 1 – DATA GAPS

X = data gap

ID	Name	District	Grade Distributions								RoadCost
			B	CW	FD	HW	PL	PW	S	YC	
1	Taleomey/Asseek	MC									
2	Calvert	MC	X	X	X	X	X	X	X	X	X
3	Sheemahant	MC									
4	Hunter	MC	X	X	X	X	X	X	X	X	X
5	Owikeno East	MC									
6	Ashlulm	MC	X	X	X	X	X	X	X	X	X
7	Machmell River	MC									
8	North Machmell	MC									
9	Sara Island	MC	X	X	X	X	X	X	X	X	X
10	Dallery	MC	X	X	X	X	X	X	X	X	X
11	Neechanz West	MC									
12	Doos Creek	MC	X	X	X	X	X	X	X	X	X
13	Lower Klinaklini	PM									
14	Nekite	MC					X	X			X
15	Kilbella/Chuckwalla	MC					X				X
16	South Bentinck East	MC									
17	Washwash	MC									
18	Saloompt West	MC						X			X
19	Clayton North West	MC						X			X
20	Labouchere NE	MC			X		X	X		X	X
21	Jump Across	MC	X	X	X	X	X	X	X	X	X
22	Bella Coola	MC									
23	Swindle	MC	X	X	X	X	X	X	X	X	X
24	Labouchere	MC						X			X
25	Clayton Mid West	MC									
26	Twin East	MC			X		X	X		X	X
27	Smitley/Noeick	MC									
28	Bentinck North	MC					X				
29	Clayton Mid East	MC									
30	Kwatna	MC					X				
32	Kimsquit	MC					X				
33	Dean/Crag	MC					X	X		X	X
34	Jump Across North	MC	X	X	X	X	X	X	X	X	X
35	Sutslem	MC	X	X	X	X	X	X	X	X	X
36	Swallow Creek	MC	X	X	X	X	X	X	X	X	X
37	Clyak	MC					X	X			X
38	Emily	MC						X			
39	Ellerslie South	MC						X			
40	Roscoe North	MC			X		X	X			X
41	Braden West	MC						X			
42	Braden East	MC					X	X			
43	Nascall	MC					X	X			X

ID	Name	District	Grade Distributions								RoadCost
			B	CW	FD	HW	PL	PW	S	YC	
44	Labouchere Mid	MC					X	X			X
45	Labouchere West	MC					X	X			X
46	Mokst	MC			X		X	X			X
47	King Island	MC									
48	Braden Mid	MC					X	X			
49	Walker	MC			X			X			
50	Denny	MC	X	X	X	X	X	X	X	X	
51	Twin West	MC					X				
52	Evans	MC									X
53	Quatlena River	MC									X
54	Sutslem/Skowquiltz	MC					X	X			
55	Ellerslie North	MC						X			
56	Don Peninsula N.	MC	X	X	X	X	X	X	X	X	
57	Roderick South	MC									
58	Don Peninsula	MC									
59	Yeo Island	MC						X			
60	Estero East	CR									
61	Estero West	CR									
62	Gray South	CR									
63	Hardwicke	CR									
64	East Thurlow	CR									
65	West Thurlow	CR									
66	Sowick	MC	X	X	X	X	X	X	X	X	
67	Nootum/Koeve	MC									
68	Milton River	MC									
69	Hardy Inlet	MC									
70	Moses Inlet	MC									
71	North Fish Egg	MC									
72	Nicknaqueet River	MC						X			X
73	Owikeno South	MC	X	X	X	X	X	X	X	X	X
74	Sholbolt Creek	MC			X		X	X			X
75	Yeo East	MC			X		X	X			X
76	South Fish Egg	MC									
77	Sandell River	MC									
78	Allard Creek	MC									
79	Draney Creek	MC									
80	Sandell Bay	MC									
81	Lockhart Gordon	MC									
82	Sonora Island	CR									
83	Draney East	MC									X
84	Walkum Bay	MC					X	X			X
85	Smith Sound	MC									

ID	Name	District	Grade Distributions								RoadCost
			B	CW	FD	HW	PL	PW	S	YC	
86	Wyclees Lagoon	MC	X		X		X	X	X		
87	Alison Sound	PM									X
88	Alison North	PM									
89	Belize Inlet	PM									
90	Alison South	PM									
91	Nugent Sound	PM									
92	Huaskin	PM									
93	Draney West	MC									X
94	Piper	MC	X	X	X	X	X	X	X	X	X
95	Surf South West	NC						X			X
97	Surf South East	NC			X		X	X			X
98	Tolmie	NC	X	X	X	X	X	X	X	X	X
99	Butedale	NC						X			X
100	Laredo North	NC	X	X	X	X	X	X	X	X	X
101	Green North	NC	X	X	X	X	X	X	X	X	X
102	Chapple	NC						X			X
103	Laredo South	NC	X	X	X	X	X	X	X	X	X
104	Green South	NC	X	X	X	X	X	X	X	X	X
105	Sheep Passage	MC	X	X	X	X	X	X	X	X	X
106	Needle Park	NC	X	X	X	X	X	X	X	X	X
107	Roderick North	MC						X			X
108	Pooley	MC						X			X
109	Mid Roderick	MC						X			X
110	South Wakeman	P M									
111	Kingcome	PM									
112	Charles	PM					X	X			X
113	Whalen North	NC			X		X	X			X
114	Snowdrift	PM									
115	Seymour	PM									X
116	Waump	PM			X		X	X			X
117	Salmon Arm	PM									
118	Surf North	NC						X			X
119	North Wakeman	PM					X	X			
120	Maunsell/Wigwam	PM									X
121	Neepah Lagoon	PM									
122	East Wakeman	PM					X				
123	Wahkash	PM									
124	Ahnuhati	PM					X				X
125	Stafford River	CR									
126	Kakweiken	PM									
127	Glacier Bay	PM					X				
128	Kwalate	PM					X				X

ID	Name	District	Grade Distributions								RoadCost
			B	CW	FD	HW	PL	PW	S	YC	
129	Apple River	CR									
130	Matsiu	PM					X				
131	Phillips	CR									
132	Mount Anthony	PM									
133	Hoeya Sound	PM					X				
134	Blind Creek	PM					X				
136	Loughborough	PM									X
137	Sallie Creek	PM					X				
138	Knight Inlet	CR									
139	Heydon Lake	PM									X
140	Fullmore Mid	CR									
141	Fulmore West	CR									
142	George River	CR									
143	Fulmore South	CR									
144	West/East Cracroft	PM									
145	Turnour/Harbledown	PM									
146	Bonwick/Hanson/Baker	PM									
147	Gilford Island	PM									
148	Broughton Island	PM									
149	Ahta	PM									
150	Lull Creek	PM									
151	Call Inlet	PM									X
152	Miriam	PM									
153	Miriam West	PM					X				
154	Sutlej Channel	PM									X
155	Sim North East	PM					X				
156	Klekane	NC			X		X	X			X
157	Fraser Reach	NC			X		X	X			X
158	Aaltanhash East	NC	X	X	X	X	X	X	X	X	X
159	Khutze	NC	X	X	X	X	X	X	X	X	X
160	Aaltanhash West	NC	X	X	X	X	X	X	X	X	X
161	Cornwall	NC			X		X	X			X
162	Whalen South	NC			X		X	X			X

APPENDIX 2 – WOODSHED ANALYSIS SUMMARY

ID	Name	Net area	Volume	Value	Cost	CVI
1	Taleomey/Asseek	4,560.00	1622107	141218272	179073397	-23.34
2	Calvert	944.00	522595	59053119	49396620	18.48
3	Sheemahant	10,983.00	5707519	510129733	659306554	-26.14
4	Hunter	956.00	420347	37606835	37826807	-0.52
5	Owikeno East	4,500.00	2386700	217552038	292687180	-31.48
6	Ashlulm	885.00	584127	48358329	59457618	-19
7	Machmell River	14,201.00	8274446	767805985	861224204	-11.29
8	North Machmell	879.00	532205	55782265	70902809	-28.41
9	Sara Island	1,320.00	522385	54515227	48752227	11.03
10	Dallery	3,758.00	2444627	212902638	251754795	-15.89
11	Neechanz West	1,615.00	1026284	96600905	130157226	-32.7
12	Doos Creek	2,277.00	1534646	129305619	169369697	-26.11
13	Lower Klinaklini	14,450.00	155988	13586589	33294928	-126.35
14	Nekite	4,545.00	1836700	148862140	230094820	-44.23
15	Kilbella/Chuckwalla	9,853.00	3978904	374547458	503064357	-32.3
16	South Bentinck East	3,456.00	972284	85255001	94727123	-9.74
17	Washwash	5,493.00	2724538	250858061	317172629	-24.34
18	Saloompt West	1,123.00	655311	53305467	75990825	-34.62
19	Clayton North West	1,003.00	433222	36732433	54892953	-41.92
20	Labouchere NE	1,753.00	1113462	67409251	122081287	-49.1
21	Jump Across	1,274.00	715246	59420914	76647420	-24.08
22	Bella Coola	19,872.00	6167187	506696690	692184401	-30.08
23	Swindle	2,277.00	1200639	119277576	115885066	2.83
24	Labouchere	2,541.00	1218365	100442589	138364437	-31.13
25	Clayton Mid West	3,503.00	1192190	101565333	118140080	-13.9
26	Twin East	1,343.00	683414	57386889	76622309	-28.15
27	Smitley/Noeick	7,455.00	2293388	189356460	247763560	-25.47
28	South Bentinck North	1,504.00	750996	62818094	75574398	-16.99
29	Clayton Mid East	931.00	260023	25811708	29534388	-14.32
30	Kwatna	6,034.00	2273058	207730802	285661116	-34.28
32	Kimsquit	13,311.00	7165803	598778257	889875401	-40.62
33	Dean/Crag	7,342.00	3072916	281374841	315058794	-10.96
34	Jump Across North	1,451.00	628897	51465372	78554642	-43.07
35	Sutslem	1,417.00	718572	64947598	78626471	-19.04
36	Swallow Creek	2,106.00	1210994	98083993	121806746	-19.59
37	Clyak	7,534.00	3805736	355188651	359778520	-1.21
38	Emily	2,510.00	1769504	159013293	169411797	-5.88
39	Ellerslie South	2,584.00	1423394	139208506	168183192	-20.36
40	Roscoe North	3,316.00	1521920	157930723	161513749	-2.35
41	Braden West	3,591.00	1700544	104424920	198968619	-55.6

ID	Name	Net area	Volume	Value	Cost	CVI
42	Braden East	2,241.00	1327282	115223934	152632911	-28.18
43	Nascall	2,609.00	1526910	160772035	179478300	-12.25
44	Labouchere Mid	636.00	327810	21601320	36539058	-45.57
45	Labouchere West	2,057.00	1254800	139052678	116291546	18.14
46	Mokst	3,041.00	1812414	143911465	189890341	-25.37
47	King Island	12,050.00	6028818	493003452	692911842	-33.16
48	Braden Mid	1,209.00	698225	57710463	76852555	-27.42
49	Walker	4,717.00	2872966	198647226	279096066	-28
50	Denny	4,067.00	2127708	203131299	197638885	2.58
51	Twin West	2,828.00	983260	86575091	99002222	-12.64
52	Evans	5,809.00	3111990	277509742	308868365	-10.08
53	Quatlena River	5,350.00	2924046	270314344	305751847	-12.12
54	Sutslem/Skowquiltz	2,545.00	1522750	151767975	168538419	-11.01
55	Ellerslie North	6,157.00	3701539	364295372	386899083	-6.11
56	Don Peninsula North	1,194.00	716108	73211765	65033109	11.42
57	Roderick South	1,825.00	1111207	106769722	110437988	-3.3
58	Don Peninsula	6,753.00	4089178	404777320	364660344	9.81
59	Yeo Island	1,856.00	1065887	94865069	102668593	-7.32
60	Estero East	4,676.00	1430487	136778992	111154256	17.91
61	Estero West	3,516.00	190215	17855633	14974695	15.15
62	Gray South	6,437.00	642263	53474399	50173341	5.14
63	Hardwicke	5,910.00	1146400	78362086	90201042	-10.33
64	East Thurlow	7,342.00	2313902	161089791	168504083	-3.2
65	West Thurlow	6,206.00	1528429	105366751	118140242	-8.36
66	Sowick	1,660.00	970805	84564214	104430265	-20.46
67	Nootum/Koeve	26,267.00	15492475	1744301391	1488086682	16.54
68	Milton River	2,544.00	562402	60899060	69502305	-15.3
69	Hardy Inlet	3,502.00	2303855	237558977	206466524	13.5
70	Moses Inlet	2,324.00	1252038	132893374	138074580	-4.14
71	North Fish Egg	1,175.00	576862	59609610	54476861	8.9
72	Nicknaqueet River	2,073.00	753015	52578213	84412296	-42.28
73	Owikeno South	535.00	335536	29900166	37290720	-22.03
74	Sholbolt Creek	937.00	199572	16199987	23397396	-36.06
75	Yeo East	2,879.00	1816376	179222687	160657964	10.22
76	South Fish Egg	5,126.00	2594791	270347452	246274346	9.28
77	Sandell River	1,942.00	1289516	115836772	120139748	-3.34
78	Allard Creek	2,133.00	1301266	131470762	149058191	-13.52
79	Draney Creek	3,069.00	1906947	190102105	206966124	-8.84
80	Sandell Bay	1,404.00	778314	76717229	73707136	3.87
81	Lockhart Gordon	3,009.00	1915445	193211361	201323362	-4.24

ID	Name	Net area	Volume	Value	Cost	CVI
82	Sonora Island	10,160.00	2408022	183869931	194066604	-4.23
83	Draney East	6,494.00	2831628	283090335	323381393	-14.23
84	Walkum Bay	2,083.00	1021237	87401820	124705267	-36.53
85	Smith Sound	5,157.00	2296957	274709706	229134917	19.84
86	Wyclees Lagoon	2,799.00	1202705	119028669	149421727	-25.27
87	Alison Sound	1,448.00	320433	31243396	37062434	-18.16
88	Alison North	1,750.00	508505	58126814	54609407	6.92
89	Belize Inlet	2,552.00	163654	16904341	15865555	6.35
90	Alison South	11,450.00	4522071	426666913	372614903	11.95
91	Nugent Sound	2,358.00	713704	70168086	63176763	9.8
92	Huaskin	18,155.00	5372688	518450676	504435128	2.61
93	Draney West	5,983.00	2057540	216003156	190046880	12.62
94	Piper	2,767.00	1772715	154135155	190999101	-20.8
95	Surf South West	482.00	269328	28570823	28563733	0.03
97	Surf South East	769.00	402206	45110782	44165317	2.35
98	Tolmie	7,962.00	5238398	480031078	488055564	-1.53
99	Butedale	3,307.00	2064110	208021707	221758788	-6.66
100	Laredo North	822.00	502436	46409602	48251263	-3.67
101	Green North	3,487.00	2309811	204455470	228830758	-10.55
102	Chapple	942.00	423498	40324067	39130369	2.82
103	Laredo South	601.00	372169	31331735	37278038	-15.98
104	Green South	1,300.00	941144	84266817	88073143	-4.04
105	Sheep Passage	2,319.00	1372733	132105327	127011517	3.71
106	Needle Park	740.00	452304	43281401	47533862	-9.4
107	Roderick North	3,718.00	2765652	250823602	267605687	-6.07
108	Pooley	2,111.00	1486146	133224675	140165600	-4.67
109	Mid Roderick	2,121.00	1588991	143120908	162240501	-12.03
110	South Wakeman	7,257.00	2576883	250246423	243319859	2.69
111	Kingcome	10,603.00	4488708	412218985	409479287	0.61
112	Charles	2,584.00	947259	100483309	108667655	-8.64
113	Whalen North	493.00	92450	7406984	11969433	-49.35
114	Snowdrift	2,155.00	811715	82219275	63905098	22.56
115	Seymour	2,660.00	422139	46633022	47015914	-0.91
116	Waump	482.00	185059	19056893	16827566	12.05
117	Salmon Arm	2,534.00	1007533	110911376	96315124	14.49
118	Surf North	295.00	166214	18168107	17384325	4.72
119	North Wakeman	1,405.00	1079600	90223272	88771509	1.34
120	Maunsell/Wigwam	2,438.00	415921	52843414	45831929	16.86
121	Neepah Lagoon	3,249.00	1642439	161254127	161908189	-0.4
122	East Wakeman	825.00	617203	56755901	49114856	12.38

ID	Name	Net area	Volume	Value	Cost	CVI
123	Wahkash	2,357.00	817349	82092153	92244722	-12.42
124	Ahnuhati	908.00	462752	43038778	37827231	11.26
125	Stafford River	6,385.00	3603916	341228402	320584520	5.73
126	Kakweiken	5,098.00	2220037	220231040	201071037	8.63
127	Glacier Bay	1,141.00	97254	10292009	10911467	-6.37
128	Kwalate	998.00	242974	23734808	24694227	-3.95
129	Apple River	2,750.00	1202489	111135530	132080815	-17.42
130	Matsiu	822.00	400376	41603877	37471621	10.32
131	Phillips	12,485.00	5822605	513979208	495509052	3.17
132	Mount Anthony	3,780.00	1754104	160714287	182695917	-12.53
133	Hoeya Sound	2,639.00	1334573	131400270	117261329	10.59
134	Blind Creek	1,478.00	1106817	114376869	87739208	24.07
136	Loughborough	5,220.00	1454578	138293885	128230538	6.92
138	Knight Inlet	3,999.00	1544079	168433655	147430197	13.6
139	Heydon Lake	7,142.00	1415371	115759770	108656143	5.02
140	Fullmore Mid	11,066.00	2365328	204301705	182626038	9.16
141	Fulmore West	21,785.00	7008564	562457009	560604818	0.26
142	George River	4,859.00	338884	36055930	25378169	31.51
143	Fulmore South	5,005.00	1615790	123199982	128280322	-3.14
144	West/East Cracroft	10,755.00	1686136	111747657	134806436	-13.68
145	Turnour/Harbledown	7,984.00	1123361	80458059	94696311	-12.67
146	Bonwick/Hanson/Baker	4,837.00	1649784	154723592	140802663	8.44
147	Gilford Island	22,322.00	6633537	652507860	537878708	17.28
148	Broughton Island	13,636.00	5019039	456692458	393395607	12.61
149	Ahta	4,371.00	2323573	225956086	183139663	18.43
150	Lull Creek	924.00	521738	49599434	40329382	17.77
151	Call Inlet	3,054.00	809688	72229198	80823328	-10.61
152	Miriam	3,543.00	1997664	201030236	222453034	-10.72
153	Miriam West	2,311.00	1101358	112891946	94777550	16.45
154	Sutlej Channel	5,609.00	2279537	214972424	197164812	7.81
155	Sim North East	833.00	0	0	1197326	0
156	Klekane	1,927.00	960126	90008263	89614419	0.41
157	Fraser Reach	1,214.00	525070	47845318	47987829	-0.27
158	Aaltanhash East	1,387.00	804740	73141398	74770679	-2.02
159	Khutze	1,712.00	1013590	88488413	101230713	-12.57
160	Aaltanhash West	1,182.00	606519	53174192	64683752	-18.98
161	Cornwall	471.00	280192	22789953	28286336	-19.62
162	Whalen South	227.00	109063	6453292	10340567	-35.64