



Ministry of
Forests

Office of the Minister

MEMORANDUM

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July 31, 2003

To: Ken Collingwood
Regional Manager
Coast Forest Region

From: The Honourable Michael de Jong
Minister of Forests

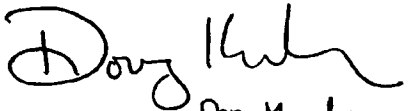
Re: Amendment No. 6 to the *Coast Appraisal Manual*

I hereby approve Amendment No. 6 to the *Coast Appraisal Manual* and attach a copy for your use. The following sections have been amended.

Section 4.1	Clarification of "least cost" principle.
Section 7.3.13	No bid timber sales policy.



This amendment will come into force on August 1, 2003. Further amendments or revisions to this manual require my approval.


Michael de Jong
Minister of Forests



IT'S OUR TIME
TO SHINE

Attachment

pc: Bill Howard, Director, Revenue Branch

All Subscribers, *Coast Appraisal Manual*

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Operating Cost Estimation

4

4.1 Cost Estimates

1. The appraisal least total operating cost estimate is the sum of the trended total logging cost estimate and the trended basic silviculture cost estimate as detailed in this chapter.
2. Phase cost estimates, predictive formulas and most of the tables in this manual are derived from data collected through surveys of logging and forest management costs incurred by licensees and contractors operating in the Coast Forest Region.
3. The surveys collect licensee costs from both licensee and contractor operations: including wages, benefits, overtime, depreciation, fuel, supplies, repair and maintenance, moving assistance, freight, applicable licences, insurance, etc. from a representative sample of coast operations. Contract costs, including contractor profit and risk margins, overhead, crew transportation, etc., are also included.
4. Phase cost estimates reflect average conditions, operating practices, and phase accounting allocations as found in the survey data.
5. With the exception of specified operations listed in section 4.1.1, no additions to or subtractions from the phase cost estimates are permitted.
6. The person who determines the stumpage rate must estimate total operating costs for a cutting authority area in a manner that will produce the appraisal least total operating cost estimate for the cutting authority area.
7. The appraisal estimate of harvesting and transportation costs must be determined by using the criteria for determining the harvesting and transportation costs as set out in this manual.
8. The appraisal estimate of harvesting costs for each part of a cutting authority area must be determined for the method of harvesting referred to in this manual, other than a method that the district manager determines is unsuitable for that part of the cutting authority area, that will produce the appraisal least total operating cost estimate.
9. Regardless of the method of harvesting that the holder of a cutting authority uses or intends to use on the cutting authority area or a part of the cutting authority area, or any other fact or law pertaining to the method of harvesting to be used, the district manager when deciding whether a method of harvesting is unsuitable may only consider:
 - a. the physical features and terrain stability of the cutting authority area and the areas through which access to the cutting authority area may be gained,
 - b. the physical features of the areas outside of the cutting authority area that may be affected by the harvesting in or the transportation of the timber from the cutting authority area,
 - c. visual quality objectives, and

- d. public safety.
10. Regardless of the method of transportation that the holder of the cutting authority uses or intends to use with respect to the cutting authority area or a part of the cutting authority area, or any other fact or law pertaining to the method of transportation to be used to transport the timber, the appraisal estimate of the transportation costs for transporting timber from a part of the cutting authority area to a point of origin must be determined for a method of transportation described in this manual that either the holder of the cutting authority or another person, but not necessarily both, could use to transport any timber from that part of the cutting authority area to a point of origin, that will produce the appraisal least total operating cost estimate.
 11. The point of origin that produces the appraisal least total operating cost estimate must be used when determining the appraisal least total operating cost estimate.
 12. The point of appraisal that produces the appraisal least total operating cost estimate must be used when determining the appraisal least total operating cost estimate.

4.1.1 Specified Operations

1. In addition to the logging phases and systems that are covered by this manual, there are specified operations which require special cost estimates.
2. The following is a complete list of specified operations for which certain cost phase estimates are based on the information on hand rather than on the tables and formulas in this manual. Specified operation cost estimates are combined with associated *Coast Appraisal Manual* phase cost estimates to determine the total operating cost for the cutting authority being appraised.

SPECIFIED OPERATIONS

A-frame Logging
 Blowdown Timber
 Single Tree Selection
 Group Selection
 Skyline Logging
 Lake Transportation
 Skidder Swinging
 Towing to Tie-up Grounds
 (over 10 km Distance)
 Camp Moves (of greater than 10 km)

 Destumping for Root Disease Control

 Tree Crown Modification

AFFECTED PHASE

Tree-to-Truck (section 4.4)
 Tree-to-Truck (section 4.4)
 Tree-to-Truck (section 4.4)
 Tree-to-Truck (section 4.4)
 Tree-to-Truck (section 4.4)
 Log Transportation (section 4.5)
 Log Transportation (section 4.5)
 Log Transportation (section 4.5)

 Administration and Other Costs
 (section 4.6) except Helicopter Logging
 Administration and Other Costs
 (section 4.6)
 Administration and Other Costs
 (section 4.6)

3. In this Manual, single tree selection means the harvest of single trees and the retention of adjacent dominant and co-dominant single trees, resulting in a uniform cut and

leave pattern with at least thirty percent of the volume within each one hectare sub-area of the cutting authority area retained as standing trees.

4. In this Manual, group selection means the harvest of several or many trees that results in a pattern of openings, with no qualifying opening more than 1 hectare in size.
5. The specified operations phase costs are monitored and updated by the regional manager and may not be part of the annual cost collection and analysis process.

4.2 Appraisal and Reappraisal Data Requirements

The cruise and all other pertinent information required for the appraisal must be submitted with the appropriate coast appraisal data submission.

Unless otherwise specified by the director, Revenue Branch, cruise data must be gathered and compiled according to the approved utilization specifications and in accordance with the following ministry of forests publications:

- Ministry of Forests *Cruising Manual*,
- Ministry of Forests *Cruise Compilation Manual*,
- Forest Service Policies (e.g., Timber Utilization Policy & Procedures for the Coast of the Province), and
- Regional Publications (e.g., chapter 9 of *Cruising Manual*).

In order to verify the accuracy of the cruise compilation program, the licensee must provide, on request, photocopies of the tally sheets and a magnetic copy of the compilation in a format required by the regional manager.

The appraisal is done using the net cruise volume of timber. The net cruise volume (m^3) is the gross volume (m^3) less decay, waste and breakage for all the species listed in section 3.3. The cutting authority total net cruise volume is determined by multiplying the net cruise volume per hectare (m^3/ha) by the total merchantable timbered area (ha) to be harvested under the cutting authority. The total merchantable timbered area is determined from the cruise summary.

If the application for a cutting authority is subsequently modified, the cruise submission must be recompiled by the applicant when more than five percent of the total number of compiled plots used in the cruise submission lie outside the boundaries established for the initial appraisal of the cutting authority.

Each reappraisal of a cutting authority area that has been amended after the appraisal must be done using the net cruise volume by species which is determined by adjusting the original cruise volume on the basis of approved amendments after the appraisal. If the accumulated amendments (either additions or deletions of areas containing merchantable timber) made to the cutting authority area exceed twenty-five hectares or twenty-five percent of the area containing merchantable timber, whichever is less, since the most recent cruise compilation or recompilation was used for an appraisal or reappraisal the entire cruise must be recompiled.

Plots located in areas requiring helicopter logging or specified operations are included in the cruise compilation calculation of conventional logging.

4.3 Development

Development costs are estimated for each of two categories:

1. New construction.
2. Reconstruction and replacement.

A unit cost (\$/m³) is calculated for each category of section 4.3.1 and section 4.3.1.1 and these unit costs are totalled to give a total development cost estimate (\$/m³).

In order to calculate the unit costs (\$/m³) by category, the applicable volume will be the total net cruise volume (as defined in section 4.2) or the remaining volume.

The costs for development works may only be allocated to tributary cutting authorities. A cutting authority is considered to be tributary if:

1. Timber from the cutting authority is appraised over the development works in question.
2. The development works occur on a main service road. A main service road is defined as a main access road to the operation necessary to maintain and supply the day-to-day harvesting activities of the cutting authority area being appraised. To qualify, the road must be used on a regular basis for the transport of bulk fuels, supplies, equipment and harvesting crews.

Two methods of estimating development costs are used in the appraisal system:

1. Tabular cost estimates are made for new construction of roads and drainage structures using the applicable tables and formulas in section 4.3.2 of this manual. Tabular estimates are used for an appraisal when physical dimensions and conditions fall within the tabular limitations.
2. Detailed engineering cost estimates are made when the physical dimensions and conditions of a road section or a drainage structure exceed the tabular limitations of the manual. If a tabular estimate cannot be made due to table limitations, then a detailed engineering estimate is made according to section 4.3.3. Projects eligible for this costing method are listed by category in section 4.3.1. Other projects approved by the regional manager also qualify.

Throughout section 4.3 the term "roads" is meant to include both roads, and drainage and other pertinent structures.

4.3.1 Development Cost Categories

Development cost allocation (section 4.3.1.1) applies to all cost estimates made under this section.

1. New Construction

New construction is defined as the following construction phases: subgrade construction, placement of additional stabilizing material and the construction and installation of drainage and other pertinent structures.

New construction costs are allocated to the first tributary cutting authority.

a. Road Cost Estimates

i. Tabular cost estimates

Each road section cost estimate is determined from the appropriate tables (section 4.3.2.1). These section costs are totalled to give a road cost estimate for each road. For each road the total approved cost estimate is divided by the total net cruise volume to give a unit cost (\$/m³). The unit costs (\$/m³) for all roads are then totalled to give a unit cost (\$/m³) for tabular roads.

ii. Detailed engineering cost estimates

Each project cost is estimated according to section 4.3.3. These projects may include:

- new construction and upgrading of main access roads that meet the criteria and conditions provided in the *Ministry of Forests Main Access Roads Policy*,
- road construction on uphill side slopes that are over 150 percent,
- road construction on terrain with two or more gullies over 10 m deep at centreline in a 300 m section,
- end haul construction requiring removal of excavated material to a spoil area,
- overland construction to provide a roadbed by trucking in material for extensive fill sections, and
- switchbacks with over 10 000 m³ excavation volume to complete the designed grade percent and horizontal alignment.

The total of the estimated costs for each project is divided by the total net cruise volume to give a unit cost (\$/m³) for engineered roads. For new construction

costs that occur during the term of the cutting authority, those costs are applied against the remaining cutting authority volume at reappraisal.

b. Bridge Cost Estimates

Each bridge cost estimate is determined either from the appropriate table (section 4.3.2.2) or as a detailed engineering cost estimate (section 4.3.3).

Where bridge materials are reused by the original purchaser at a second or subsequent location, the cost estimate will include dismantling, transport and installation at the new site. The initial materials cost and delivery costs are excluded.

Where used bridge materials are purchased from a legally non-associated party, the cost of purchase and shipping those materials will be included in the cost estimate. The requirements of section 4.1 still apply.

The total of the estimated costs for all bridges is divided by the total net cruise volume to give a unit cost ($\$/\text{m}^3$) for bridges.

The unit costs ($\$/\text{m}^3$) for tabular roads, engineered roads, and bridges are totalled to give a unit cost ($\$/\text{m}^3$) for new construction. For new construction costs that occur during the term of the cutting authority, these costs are applied against the remaining cutting authority volume at reappraisal.

2. Reconstruction and Replacement

Reconstruction and replacement are defined as replacement or repair of a major drainage structure, or major reconstruction or resurfacing of a section of road, required because:

- of extensive "wear and tear",
- the road has been permanently or semi-permanently deactivated previously,
- the road has been abandoned, or
- of a water or slope failure "event".

A water or slope failure "event" is the result of an irregular natural occurrence which leads to the blockage or destruction of a road or bridge making the road or bridge impassable for vehicular traffic. The repairs required should be grouped, if linked by event, into one project cost estimate (see Appendix II) via a detailed engineering cost form.

The costs approved under section 4.3.1, (2.) must not qualify under routine maintenance as described in section 4.5.3 or be eligible for reporting under the routine maintenance portion of the coastal logging cost survey.

Bridges replaced on forest service roads that are funded by the Forest Renewal B.C. five year “Bridge Replacement Program on Forest Service Roads”, or are otherwise funded by the Crown, will not be included in any appraisal.

The cost estimate may be allocated, by the licensee, to any individual proposed or existing tributary cutting authority that is in the licensee's approved forest development plan at the time of the project. The licensee must identify this cutting authority when submitting the detailed engineering cost estimate.

Reconstruction and replacement cost estimates will be determined on an individual project basis as detailed engineering cost estimates (see sections 4.3 and 4.3.3) and must be approved by the district manager.

These projects may include:

- bridge structural maintenance including redecking (ties and decking) or replacement of a major drainage structure,
- reconstruction of a road,
- resurfacing of a road, with a minimum loose depth of 0.1 m over a continuous length of 0.5 km or greater, or
- replacing pipe culverts larger than 0.9 m in diameter.

Where bridge materials are reused by the original purchaser at a second or subsequent location and they qualify as engineered estimates, the cost estimate will include dismantling, transport and installation at the new site. The initial materials cost and delivery costs are excluded.

Where used bridge materials are purchased from a legally non-associated party, the cost of purchase and shipping those materials will be included in the cost estimate. The requirements of section 4.1 still apply.

To determine the unit cost (\$/m³) for reconstruction and replacement, the total approved costs are divided by the total net cruise volume. For reconstruction and replacement projects that occur during the term of the cutting authority, those costs may be applied against the estimated remaining volume at the effective reappraisal.

4.3.1.1 Development Cost Allocation

Where proration is required for sections 4.3.1.1.1, 4.3.1.1.2 and 4.3.1.1.3:

$$\text{Crown share} = \text{Total Estimated Cost} * \frac{\text{Appraised Timber Volume}}{\text{Total Timber Volume}}$$

Where:

Crown share (\$)	=	dollar amount to be allocated to stumpage-bearing timber in the cutting authority being appraised.
Total Estimated Cost (\$)	=	dollar amount of the total development cost estimate.
Appraised Timber Volume (m ³)	=	volume of appraised timber tributary to the project and under the control of the licensee or a company legally associated with the licensee, including volume in all areas contributing to the allowable annual cut determination.
Total Timber Volume (m ³)	=	total volume tributary to the project and under the control of the licensee or a company legally associated with the licensee.

In all cases, volumes are estimated from the latest approved operational or inventory cruise data and maps of the area within the drainage to the height of land.

The Crown share is a dollar amount which is included in the appraisal of a tributary cutting authority.

Development cost estimate is allocated according to the outline below (see also Appendix III).

4.3.1.1.1 Development Cost Estimates on Crown Lands

1. Development providing access to appraised timber only:

Total estimated costs are included in the appraisal.

2. Development providing access to non-appraised timber only:

Cost estimates are not included in the appraisal.

3. Development in appraised timber areas providing access to both appraised and non-appraised timber held by the licensee or a company legally associated with the licensee:

All costs are prorated between appraised and non-appraised timber. The appraised timber portion is then included in the appraisal.

4.3.1.1.2 Development Cost Estimates for Full Appraisal on Timber Licence (TL) Cutting Authorities

1. New development will be allocated as in section 4.3.1.1.1.

2. Unamortized development on the TL that is required for access to the cutting authority area will be included in the appraisal of that cutting authority. Unamortized development is defined as:
 - a. the development started after January 1, 1988,
 - b. development cost estimates were not included in any prior appraisal calculation for Crown timber (or were considered as zero), and
 - c. having had no non-appraised timber transported over the development (excluding right-of-way timber).

Costs for this type of existing development are exempt from section 4.3.1.1.4.

Cost estimates for these existing roads will be derived from the nearest appraised cutting authority area by:

1. Establishing the average road cost per kilometre from that appraised estimate, excluding bridges and pertinent structures.
2. Multiply that \$/km by the kilometres of tributary road in the TL cutting authority area.

Cost estimates for bridges or pertinent structures will be determined according to section 4.3.2.2, or from the detailed engineering estimates as defined in section 4.3. At reappraisal, these initial cost estimates for existing development will be trended as provided for in section 4.9, but will not otherwise be revisited.

4.3.1.1.3 Development Cost Estimates on Private Land

When a new or reconstructed road or structure on private land is required for Crown timber extraction, the estimated cost of the road or structure will be included in the appraisal of a tributary cutting authority according to the procedures of section 4.3.1.1 and the following guidelines:

1. Development provides access to appraised timber only.

The total estimated costs are included in the appraisal.

2. Development provides access to non-appraised timber only.

Cost estimates are not included in any appraisal.

3. Development provides access to both non-appraised and appraised timber.

All cost estimates are prorated between non-appraised and appraised timber (section 4.3.1.1) and then the Crown allocation is included in the appraisal.

4.3.1.1.4 Existing Roads and Structures

The following are defined as existing roads for the cutting authority being appraised and are not eligible for inclusion in development cost estimates:

1. Costs of constructed roads that have been previously considered in appraisals of Crown timber within another cutting authority.
2. Roads, drainage and other pertinent structures previously constructed to develop, and used to haul non-appraised timber (excluding right-of-way).
3. Roads previously constructed all or in part for purposes unrelated to logging the cutting authority area being appraised.

4.3.1.1.5 Extended Road Amortization

For new appraisals where the untrended development cost estimate exceeds \$14.00/m³, a written agreement may be made which apportions a development cost estimate to two or more tributary cutting authorities.

The agreement is subject to the following conditions:

1. Each cutting authority area must be in the licensee's approved forest development plan or woodlot licence area.
2. The agreement must be signed by the licensee and the regional manager or the regional manager's designate.
3. The apportionment ratios will not be revisited.
4. The agreement will only be valid under CVP and confers no obligation on the Crown to compensate licensees for any unamortized costs.

4.3.2 Tabular Road and Bridge Cost Estimates

Tabular road cost estimates are based on average logging road construction practices, generally single lane width roads with turnouts and landings. These roads may or may not require placement of additional stabilizing materials.

Weighted averages for each variable (uphill side slope, rock, etc.) are applied to each road section. Averages are obtained by weighting the cross-section measurements taken at representative points along the road by the applicable road section length. The length of bridges and end haul sections (that are appraised under section 4.3.3) occurring in the section are excluded.

4.3.2.1 Subgrade Construction

The estimated cost per kilometre for subgrade construction is provided for each combination of construction category and uphill side-slope for two rock mass classification categories, "RMC 5 Only" and "Other RMC's".

1. Construction category (CC) is determined on the basis of the percent rock in relation to the total volume of all materials.

The percent rock is determined as follows:

$$\% \text{ rock} = \frac{h^2}{H^2} * 100\%$$

Where:

h = the vertical cut height of all rock measured from the bottom of the ditch

H = the total vertical cut height of all materials including organic layers, glacial till and hardpan measured from the bottom of the ditch

Construction category may show a range of variation ($\pm$ one CC) within any section length, and is recorded to the nearest integer. Hardpan is CC1, whether drilled and blasted or not. Rippable rock and boulders may occur in CC2 to CC6.

The following table defines the construction categories.

Table 4-1: Construction Categories

Construction Category (CC)	1	2	3	4	5	6
% rock	0	1-12	13-37	38-62	63-87	88+

2. Rock mass classification (RMC) is based on the physical characteristics of rock encountered in forest road development and is the subject of a report commissioned by the Forest Engineering Research Institute of Canada in 1978 and prepared by Piteau & Associates/Geotechnical Consultants.

Rock can be classified into five types referred to as rock mass classification (RMC) values and identified as RMC 1, 2, 3, 4, and 5.

The steps taken to determine RMC values and apply these to road development cost estimates are:

- a. examine and record surface hardness, weathering, and block diameter in the field,
- b. determine subsurface hardness from the table in Appendix IV with this title,
- c. determine RMC value from the table Appendix IV with this title, and
- d. apply selected RMC values to applicable tables and formulas for road cost estimates.

The text and tables in Appendix IV have been derived from the report prepared by Piteau & Associates. These tables are used to determine the RMC-based factors required for road cost estimates.

In all circumstances where a complete interpretation of the rock mass classification system is required, the Piteau & Associates report is to be consulted directly.

3. Subgrade cost estimates are determined as follows:

- a. all section lengths must be 0.3 km or longer, with the exception of short spurs and those sections which do not qualify under Subsection 3.b. Lengths are recorded to the nearest 0.001 km,
- b. In general each section should consist of a length of road wherein:
 - i. variations in slope percentage measurement are within ± 15 percent of the average slope measured in the section. The uphill slope percent is measured at right angles to the road centreline, parallel to the ground of the uphill slope and recorded to the nearest percent (no rounding permitted). Where the road is located on a bench, the slope of the bench is used,
 - ii. construction categories vary by no more than ± 1 construction category about the average construction category in the section,
 - iii. one rock mass class predominates,
 - iv. all stabilizing material is trucked or no stabilizing material is trucked,
 - v. stabilizing material is either all gravel or all rock.
- c. All sections with 60 percent or more (by length) of RMC 5 are designated as "hard".
- d. If the total length of all "hard" sections is greater than 90 percent of the total length of sections containing rock (i.e., CC 2-6), then the cost table for RMC 5 Only is applied to all roads in the appraisal.

- e. If the roads do not qualify under 'c.' and 'd.' above, then the subgrade construction cost estimate table for other RMC's is applied to all roads in the appraisal.

The subgrade construction cost estimate includes clearing and grubbing, stripping, stump removal, incidental log decking, ditch construction, landing and turnout construction, material costs and installation of pipe culverts (with diameters up to and including 0.9 m) and single log abutment culverts with spans less than 3.5 m. Right-of-way felling and loading is excluded from the road construction phase but included in the tree-to-truck phase.

Table 4-2: Subgrade Construction Cost Estimate

(Thousands of Dollars per Kilometre)

a) RMC 5 ONLY						
Uphill Side Slope %	Construction Category					
	CC1	CC2	CC3	CC4	CC5	CC6
0-4	27.3	36.2	59.9	85.8	108.1	123.4
5-14	28.3	37.9	63.1	90.3	113.6	129.5
15-24	29.6	40.0	67.0	95.7	120.1	136.8
25-34	30.7	42.0	70.7	100.8	126.3	143.7
35-44	31.7	43.8	74.2	105.7	132.2	150.3
45-54	32.6	45.5	77.5	110.3	137.9	156.3
55-64	33.4	47.2	80.8	114.8	143.3	162.6
65-74	34.2	48.8	83.9	119.1	148.5	168.4
75-84	35.0	50.3	86.8	123.3	153.6	174.1
85-94	35.6	51.8	89.7	127.3	158.4	179.5
95-104	36.3	53.2	92.5	131.1	163.2	184.9
105-114	36.8	54.6	95.2	134.9	167.8	190.0
115-124	37.4	55.9	97.8	138.5	172.2	195.1
125-134	37.9	57.2	100.4	142.1	176.6	200.0
135-144	38.4	58.4	102.8	145.5	180.8	204.8
145-150	38.8	59.6	105.3	148.9	185.0	209.5

b) OTHER RMC's						
Uphill Side Slope %	Construction Category					
	CC1	CC2	CC3	CC4	CC5	CC6
0-4	27.3	34.0	51.9	72.0	89.6	101.9
5-14	28.3	35.5	54.5	75.5	93.9	106.6
15-24	29.6	37.3	57.6	79.7	98.9	112.2
25-34	30.7	39.0	60.6	83.7	103.7	117.5
35-44	31.7	40.6	63.4	87.5	108.3	122.6
45-54	32.6	42.1	66.0	91.1	112.7	127.5
55-64	33.4	43.5	68.6	94.6	116.9	132.1
65-74	34.2	44.9	71.0	97.9	120.9	136.7
75-84	35.0	46.2	73.3	101.2	124.8	141.0
85-94	35.6	47.4	75.6	104.2	128.5	145.2
95-104	36.3	48.6	77.8	107.2	132.2	149.3
105-114	36.8	49.7	79.9	110.1	135.7	153.3
115-124	37.4	50.8	81.9	112.9	139.2	157.2
125-134	37.9	51.9	83.9	115.7	142.5	161.0
135-144	38.4	52.9	85.8	118.3	145.8	164.7
145-150	38.8	53.9	87.7	120.9	149.0	168.3

4.3.2.2 Drainage Structures

Cost estimates are made for bridges where their necessity is substantiated by field data.

Crib back-fills and all site preparation and bridge protection features are included, as well as material supply and erection. Except where noted below, no adjustment of table values is permitted.

Input data within table boundaries is rounded to fit; no interpolation of values is permitted.

4.3.2.2.1 Log Bridges

Cost estimates for log bridges are based on span lengths (distance between the centres of the top sill logs) and average crib height (distance from the bottom of the bottom sill log to the point where the stringer rests on the top sill log as measured along the centre line of the bridge) from Table 4-3. The average crib height is the numerical average of the crib heights on both banks of the water course.

Table 4-3 is used for estimating costs of all timber-decked and gravel surfaced log bridges with span lengths from 3.5 to 20.4 m and crib heights from single log to 5.4 m.

4.3.2.2.2 Permanent or Portable Bridges

Cost estimates for permanent or portable bridges, built of any material except logs, are based on total span length and average abutment height (distance from the ground surface interface to the bottom contact point with the girders) from Table 4-5. Each bridge abutment must be measured at the mid-point, from the ground surface interface to the bottom contact point with the girders. Each measured abutment height is then added together and averaged to get a resultant abutment height.

Table 4-5 is used for estimating costs of permanent or portable bridges with span lengths from 2 to 30.4 m and abutment heights from 0 to 10.4 m.

Table 4-5 includes costs for supervision, design, site preparation, supply and installation, freight and haulage (excluding barging), and rip-rap to flood design. Barging costs are allowed as an add-on to the tabular cost estimate. If the barging of bridge materials is done in conjunction with other equipment/materials, then the cost of barging the bridge material should be prorated by the licensee. This table covers any bridge with L60 to L165 load rating.

Table 4-5 does not apply to:

1. Multi-span bridges: A construction estimate form must be completed.
2. Pile driving: Where piles may be driven to depths of 13 m or more, a construction estimate form must be completed for the bridge construction.

3. Portable bridges that are reused (see section 4.3.1).

Cost estimates for bridge sizes outside the table limits and pipe culverts greater than the aforementioned sizes require detailed engineering data as shown in section 4.3.3.

4. Extra width bridges with one or more additional stringers and/or deck panels installed (i.e., exceeding 4.9 metres in total width between guardrails).

Table 4-3: Log Bridge Cost Estimate

Span Length (m)	(Thousands of Dollars)				
	Single Log Sill	Multi-Log Crib			
		Average Crib Height (m)			
	1	2	3	4	5
4	2.7	7.4	12.1	16.7	21.4
5	4.5	9.2	13.9	18.6	23.3
6	6.4	11.1	15.8	20.5	25.2
7	8.3	13.0	17.6	22.3	27.0
8	10.1	14.8	19.5	24.2	28.9
9	12.0	16.7	21.4	26.1	30.8
10	13.9	18.5	23.2	27.9	32.6
11	15.7	20.4	25.1	29.8	34.5
12	17.6	22.3	27.0	31.7	36.4
13	19.5	24.1	28.8	33.5	38.2
14	21.3	26.0	30.7	35.4	40.1
15	23.2	27.9	32.6	37.3	41.9
16	25.0	29.7	34.4	39.1	43.8
17	26.9	31.6	36.3	41.0	45.7
18	28.8	33.5	38.2	42.8	47.5
19	30.6	35.3	40.0	44.7	49.4
20	32.5	37.2	41.9	46.6	51.3

4.3.2.2.3 Culverts

All pipe culverts up to and including 0.9 m diameter and all single log abutment culverts up to 3.4 m span length are included in the subgrade cost estimates.

Costs for culverts 1.0 m diameter to 1.8 m diameter are estimated using Table 4-4. Culverts less than 1.0 m diameter shown in Table 4-4 are for use in detailed engineered estimates only. Culverts greater than 2.0 m diameter require a detailed engineered estimate (see section 4.3.3).

Table 4-4 Culvert Cost Estimate

Diameter (m)	Cost per lineal metre	Diameter (m)	Cost per lineal metre
0.3	\$40.00	0.9	\$110.00
0.4	\$47.00	1.0	\$155.00
0.5	\$63.00	1.2	\$190.00
0.6	\$78.00	1.4	\$233.00
0.7	\$89.00	1.6	\$320.00
0.8	\$99.00	1.8	\$369.00

Table 4-5: Permanent/Portable Bridge Cost Estimates

Span Length (metres)	Abutment Height (metres) Dollars x 1,000										
	0	1	2	3	4	5	6	7	8	9	10
2	9.3	12.4	15.5	18.7	21.8	24.9	28.0	31.1	34.2	37.3	40.4
3	14.0	17.1	20.2	23.3	26.4	29.5	32.6	35.8	38.9	42.0	45.1
4	18.6	21.7	24.8	28.0	31.1	34.2	37.3	40.4	43.5	46.6	49.8
5	23.3	26.4	29.5	32.6	35.7	38.8	42.0	45.1	48.2	51.3	54.4
6	27.9	31.0	34.2	37.3	40.4	43.5	46.6	49.7	52.8	56.0	59.1
7	32.6	35.7	38.8	41.9	45.0	48.1	51.3	54.4	57.5	60.6	63.7
8	37.2	40.3	43.5	46.6	49.7	52.8	55.9	59.0	62.1	65.3	68.4
9	41.9	45.0	48.1	51.2	54.3	57.5	60.6	63.7	66.8	69.9	73.0
10	46.5	49.7	52.8	55.9	59.0	62.1	65.2	68.3	71.5	74.6	77.7
11	51.2	54.3	57.4	60.5	63.7	66.8	69.9	73.0	76.1	79.2	82.3
12	55.8	59.0	62.1	65.2	68.3	71.4	74.5	77.6	80.8	83.9	87.0
13	60.5	63.6	66.7	69.8	73.0	76.1	79.2	82.3	85.4	88.5	91.6
14	65.2	68.3	71.4	74.5	77.6	80.7	83.8	87.0	90.1	93.2	96.3
15	69.8	72.9	76.0	79.2	82.3	85.4	88.5	91.6	94.7	97.8	101.0
16	74.5	77.6	80.7	83.8	86.9	90.0	93.1	96.3	99.4	102.5	105.6
17	79.1	82.2	85.3	88.5	91.6	94.7	97.8	100.9	104.0	107.1	110.3
18	83.8	86.9	90.0	93.1	96.2	99.3	102.5	105.6	108.7	111.8	114.9
19	88.4	91.5	94.7	97.8	100.9	104.0	107.1	110.2	113.3	116.5	119.6
20	93.1	96.2	99.3	102.4	105.5	108.7	111.8	114.9	118.0	121.1	124.2
21	97.7	100.8	104.0	107.1	110.2	113.3	116.4	119.5	122.6	125.8	128.9
22	102.4	105.5	108.6	111.7	114.8	118.0	121.1	124.2	127.3	130.4	133.5
23	107.0	110.2	113.3	116.4	119.5	122.6	125.7	128.8	132.0	135.1	138.2
24	111.7	114.8	117.9	121.0	124.2	127.3	130.4	133.5	136.6	139.7	142.8
25	116.4	119.5	122.6	125.7	128.8	131.9	135.0	138.1	141.3	144.4	147.5
26	121.0	124.1	127.2	130.3	133.5	136.6	139.7	142.8	145.9	149.0	152.1
27	125.7	128.8	131.9	135.0	138.1	141.2	144.3	147.5	150.6	153.7	156.8
28	130.3	133.4	136.5	139.7	142.8	145.9	149.0	152.1	155.2	158.3	161.5
29	135.0	138.1	141.2	144.3	147.4	150.5	153.7	156.8	159.9	163.0	166.1
30	139.6	142.7	145.8	149.0	152.1	155.2	158.3	161.4	164.5	167.6	170.8

4.3.2.3 Additional Stabilizing Material

Stabilizing material is gravel or broken rock which is placed on the road subgrade to provide stable support and a running surface for logging related equipment using the road. Some stabilizing material may be created on site during subgrade construction. If additional stabilizing material is required it may be obtained from the adjacent cut-bank or trucked in.

1. Stabilizing Cost Estimate

The total cost estimate per kilometre for the stabilizing material is:

$$\text{Cost Estimate (\$/km)} = V * U$$

Where:

- V is the loose volume of additional stabilizing material in cubic metres per kilometre, and
- U is the unit cost estimate for additional stabilizing material in dollars per loose cubic metre.

a. Volume (V)

The volume of rock or gravel in cubic metres required to stabilize one kilometre of roadbed is as follows:

- V is loose volume (VR or VG) of stabilizing material,

Where:

$$V_R = 1000D (W + 1.0D), \text{ using rock}$$

$$V_G = 1000D (W + 1.5D), \text{ using gravel}$$

Where:

- W is stabilized road width in metres = 6.2 (includes turn outs and landings),
- D is loose depth of stabilizing material in metres determined from the following table.

Table 4-6: Additional Loose Stabilizing Material Depths (metres)

Side Slope	Construction Category					
	1	2	3	4	5	6
0-4	0.8	0.8	0.7	0.6	0.6	0.5
5-14	0.7	0.7	0.7	0.6	0.5	0.4
15-24	0.7	0.6	0.6	0.5	0.4	0.4
25-34	0.6	0.6	0.5	0.4	0.3	0.3
35-44	0.5	0.5	0.4	0.3	0.3	0.2
45-54	0.4	0.4	0.3	0.3	0.2	0.1
55-64	0.3	0.3	0.3	0.2	0.1	0.0
65-74	0.2	0.2	0.2	0.1	0.0	0.0
75-84	0.2	0.1	0.1	0.0	0.0	0.0
85-94	0.1	0.1	0.0	0.0	0.0	0.0
95-104	0.0	0.0	0.0	0.0	0.0	0.0
105-114	0.0	0.0	0.0	0.0	0.0	0.0
115+	0.0	0.0	0.0	0.0	0.0	0.0

The factors of 1.0 and 1.5 relate to the slope of the fill material. More gravel than rock is required to stabilize a given kilometre of road (i.e., 1.5:1 fill slopes for gravel and 1:1 fill slopes for rock).

The quantities per kilometre and the depths by construction categories are only used in conjunction with tabular cost estimates.

b. Unit Cost Estimates (U)

The unit cost estimates (\$/m³) for the additional stabilizing materials include:

- borrow pit preparation,
- rock drilling, explosives, loading of explosives and blasting (e.g., compacted or cemented gravel, oversize material, etc.),
- loading gravel trucks when truck haul required, or placement of materials when trucking is not required,
- truck hauling, when required, and
- spreading and compacting material.

The cost estimates assume borrow pits are located adjacent to a road right-of-way. If a new road needs to be constructed to access the borrow pit, then the access road cost estimates are required in addition to the unit cost estimates.

The unit cost estimates are based on two possibilities which are:

i. No trucking of stabilizing material

When a borrow pit is located adjacent to the subgrade to be stabilized and material is to be moved less than 0.1 km, no trucking of stabilizing material is assumed. The unit cost estimates (U) are:

Gravel	$U (\$/m^3) = 5.65$
Soft and Medium Rock	$U (\$/m^3) = 9.03$
Hard Rock	$U (\$/m^3) = 11.86$

Definition: m^3 = cubic metres of stabilizing material

ii. Trucking of stabilizing material

When suitable ballast must be moved a distance of 0.1 km or further, trucking of stabilizing materials is assumed. The unit cost estimates (U) are:

Gravel	$U (\$/m^3) = 7.74 + 0.616 (d)$
Soft and Medium Rock	$U (\$/m^3) = 11.11 + 0.616 (d)$
Hard Rock	$U (\$/m^3) = 13.94 + 0.616 (d)$

Where:

- d is the assumed trucking distance from the source to the mid-point of the road section to be stabilized. The minimum value of d = 0.1 km.

Definitions for in-place and quarry rock RMC (hardness):

"Soft-Medium"	less than 60 percent of the rock from the excavation is RMC 5
"Hard Rock"	60 percent or more of the rock from the excavation is RMC 5

2. Capping

Where the available material consists of large round or broken rock or "dirty" or fine gravel which is unsuitable for normal traffic conditions, the appraisal may include a cost estimate for "capping" of 0.2 m (loose depth) of suitable rock or gravel surfacing on road sections where required and providing the application is substantiated. This material is trucked in from a different borrow pit than the source of the stabilizing material unless the material has been sorted in the pit.

For further information, refer to the surfacing section in the regional manager's standardized methodology (i.e., *Detailed Engineering Estimates for Coast Stumpage Appraisal, Coast Forest Region*).

4.3.3 Detailed Engineering Cost Estimates

The cost for any of the detailed engineering projects identified in section 4.3.1 will be estimated by preparing a detailed engineering cost estimate. The regional manager may approve a standardized methodology to estimate the cost for the following projects:

1. End Hauling.
2. Road Reconstruction and Replacement.
3. Permanent Bridge Construction.
4. Bridge Structural Repair.
5. Regional manager approved projects (construction estimate forms).

When development projects require detailed engineering cost estimates, the district manager shall be advised by the licensee of project details prior to the commencement of construction. This notice is required to facilitate a current cost review of the project for later consideration in an appraisal.

In addition to the prior-to-construction requirement stated above, all cost data required for appraisals must be submitted according to the lead-time requirements of section 2.2.

For appraisal purposes, the project costs are estimated using site specific data (as defined in section 4.3.3.1) and the equipment and labour rates as specified in Appendix I. Where the equipment required is not recognized in Appendix I then the equipment rate can be attained from the 2000 - 2001 *Equipment Rental Rate Guide "The Blue Book"*. All equipment rates are assumed to be for a 3 year old machine using the July 1, 2000 cost base. Some projects will be completed on the basis of arms length competitive bids and may be accepted for costs at the regional manager's discretion.

4.3.3.1 Data Requirements

All detailed engineering design is based on minimizing quantities.

1. The data that may be required for “excavation and fill” cost estimates are:
 - plans, profiles, cross-sections showing the ground and design grade lines,
 - volume summary sheets giving quantities by various soil types,
 - time and materials, equipment and labour, repairs, drainage structures and surfacing where required, and
 - a cost estimate for the project.
2. The data that may be required for reconstruction and replacement cost estimates are:
 - a map showing details of the project including stations, drainage’s, and other information important to the project,
 - time and materials, equipment and labour, estimate for excavation, repairs, drainage structures, reditching, and resurfacing where required, and
 - a cost estimate for the project.
3. The information and data that may be required for bridge and culvert construction cost estimates are:
 - for permanent structures of 30.4 m span or greater: plans, specifications and design for the proposed structure, detailed materials cost estimate, equipment and labour, amount of timber accessed by the structure, and usage in years for harvesting all the timber,
 - for permanent structures of 20.4 m span or less: an economic comparison between a log structure and the permanent structure, and
 - for pipe culverts greater than 1.8 m in diameter: the same information as required for permanent structures of 30.4 span or greater.

4.4 Tree To Truck

The cost estimate for the tree-to-truck phase includes falling, bucking, skidding/yarding, and loading.

All pertinent labour and equipment costs are accounted for. The costs include time lost by fallers due to adverse weather conditions, contractual requirements for falling non-merchantable trees, streambank-management yarding, right-of-way logging, and construction of back spar trails, or rigging of back spars, or cost of the mobile back spar unit.

4.4.1 Conventional Logging

Conventional logging means all logging methods other than helicopter logging and those specified operations listed in section 4.1.1.

The cost estimate for the tree-to-truck (TTT) phase for both isolated and accessible cutting authorities is \$21.94/m³.

4.4.2 Helicopter Logging

The cost estimate given below applies to the net cruise volume that requires helicopter yarding.

Costs include falling and bucking, helicopter yarding, logging truck loading, landing construction, choker chasing, rental/lease/depreciation costs of a barge (if required), bag booming, towing of bag boomed logs to local tie up or sorting area, crew transportation (by air, water, or land), and camp mobilization/demobilization (including barge movement). Costs for these activities may be borne by the licensee or the contractor.

In addition, the following phases, when applicable, are estimated as detailed elsewhere in this manual:

- Development (section 4.3),
- Truck Hauling (section 4.5.1),
- Dump, Sort, Boom and Scale (section 4.5.2.2),
- Towing or Barging (section 4.5.2.3),
- Routine Maintenance (section 4.5.3),

- Road Use Charges (section 4.5.4),
- Specified Operations (section 4.1.1),
- Overhead (section 4.6.1), and
- Accommodation (section 4.6.3).

A cost estimate for the crew transportation phase (section 4.6.2) is not applicable.

4.4.2.1 Helicopter Logging

The tree-to-truck cost estimate for helicopter logging other than the method described in section 4.4.2.2 is \$70.13/m³.

4.4.2.2 Helicopter Single Standing Stem Selection

1. In this manual helicopter single standing stem selection means the harvesting of standing single trees that have been marked, limbed, undercut and wedged and then broken from the stump and removed using a helicopter. It is not a single tree selection or group selection specified operation under section 4.1.1.
2. In addition to the costs identified in section 4.4.2, the cost estimate for helicopter single standing stem selection harvesting shall include the cost of marking, climbing, limbing, undercutting, wedging, breaking and removal of the tree by helicopter.
3. The tree-to-truck cost estimate for helicopter single standing stem selection is \$107.91/m³.

4.5 Log Transportation

4.5.1 Truck Hauling

The truck hauling phase cost estimate is for the movement of logs from the roadside or landing in the woods to the appraisal final off-loading destination selected for the cutting authority. This cost estimate includes all rehaul situations except those involving lake transportation. Both on-highway and off-highway hauling are calculated with the same formula and variable.

1. Distance: The variable used to determine the truck hauling phase cost estimate is distance (km). This is the weighted average one-way haul distance from the centre of the cutting authority to the appraisal log dump where trucks are off-loaded. The weighted average haul distance (D) is estimated by:
 - a. establishing the geographical centre point of each block or cutting area and projecting this point to the nearest road for measurement purposes,
 - b. from this point determining the haul distance to the nearest junction serving all blocks or cutting areas,
 - c. weighting the distance for each block by the volume on the block and determining the average weighted distance to the junction, and
 - d. measuring the haul distance from the junction to the final appraised place of unloading and adding this to the average weighted distance to the junction as outlined above.
2. Formula: Where truck hauling is required, the cost estimate formula for the truck hauling phase for both isolated and accessible operations is:

$$(\$/\text{m}^3) = 3.900 + 0.0813 (D)$$

Where:

D is the weighted average one-way haul distance in kilometres, rounded to the nearest 0.1 km.

When:

D = 0, then the truck hauling cost estimate is equal to zero.

The appraisal log dump selected for trucks to off load is also the point of origin for the towing or barging phase (section 4.5.2.2).

4.5.2 Water Transportation

This phase covers all operating cost elements from the local tie-up ground to the point of appraisal.

4.5.2.1 Point of Appraisal

1. The point of appraisal that produces the least total operating cost estimate shall be used when calculating the least total operating cost estimate.
2. The Points of Appraisal are:

<u>Points of Appraisal</u>	<u>Location</u>
Alberni	The head of Alberni Inlet.
Chemainus	The vicinity of Chemainus Bay.
Gambier Island	The vicinity of Gambier Harbour on Gambier Island.
Pitt River Bridge	The vicinity of the confluence of the Fraser and Pitt Rivers.

4.5.2.2 Dump, Sort, Boom and Scale

Cost estimates for this phase are based on two log transportation systems:

- towing logs, and
- barging logs.

Barge transportation is recognized where part of the route from local tie-up grounds at the appraised point of origin to point of appraisal is exposed to the open ocean swell.

Only points on the west coast of Vancouver Island north of Port Renfrew, (except those routes totally east of a line drawn from Cape Beale to Amphitrite Point, including Ucluelet Harbour), and all points north of Cape Caution on the mainland are considered to require barge transportation.

Where barge transportation is not recognized, towing of sorted logs or camp-run logs from the local tie-up ground at the appraised point of origin to point of appraisal is assumed.

All on-site and central sort costs related to dump, sort, boom, scale and re-load from dryland sorts where required, are included for the system as follows. Local towing of up to 10 km is also included.

Condition	Cost Estimate for all Operations
Towing	\$9.03/m ³
Barging	\$9.57/m ³

This cost estimate is also applied when neither towing nor barging is required (i.e., when point of origin and point of appraisal are the same location).

4.5.2.3 Towing or Barging

The following tables list the towing and barging cost estimates from specific points of origin. For unlisted points of origin the cost estimates from two adjacent points of origin may be averaged.

Table 4-7: Towing Cost Estimates

Code	Point of Origin	P/A	\$/m3	Code	Point of Origin	P/A	\$/m3
ALBE	ALBERNI	A	0.00	BUIM	M. OF BUTE INLET	G	1.69
CHCK	CHINA CREEK	A	0.73	KIIM	M. OF KINGCOME INLET	G	2.66
COCK	COLEMAN CREEK	A	0.82	KNIM	M. OF KNIGHT INLET	G	2.36
SARV	SARITA RIVER	A	0.95	LOUM	M. OF LOUGHBOROUGH	G	1.89
SPCK	SPENCER CREEK	A	0.85	TOIM	M. OF TOBA	G	1.71
TOBY	TOQUART BAY	A	1.09	NACK	NAKA CREEK	G	2.24
UCHU	UCHUCKLESIT	A	0.90	NOBY	NORTHWEST BAY	G	1.14
UCLU	UCLUELET	A	1.15	PHAR	PHILLIPS ARM	G	1.84
CHEM	CHEMAINUS	C	0.00	PTEB	PORT ELIZABETH	G	2.39
COBY	COWICHAN BAY	C	0.85	PTHD	PORT HARDY	G	2.75
JORV	JORDAN RIVER	C	2.31	PTHV	PORT HARVEY	G	2.23
LADY	LADYSMITH	C	0.75	PTMN	PORT McNEILL	G	2.53
NANA	NANAIMO	C	0.87	PTNE	PORT NEVILLE	G	2.18
SOOK	SOOKE	C	1.39	PORV	POWELL RIVER	G	1.32
VICT	VICTORIA	C	1.19	SENA	SECOND NARROWS	G	0.92
AGAM	AGAMEMNON	G	1.12	SYIN	SEYMOUR INLET	G	3.54
BECV	BEAVER COVE	G	2.45	SEBY	SOUTHWEST BAY	G	2.14
COUR	COURTENAY	G	1.45	SQUA	SQUAMISH	G	0.90
DRIN	DRURY INLET	G	2.85	STIL	STILLWATER	G	1.19
EVRV	EVE RIVER	G	2.18	TEAR	TEAKERNE ARM	G	1.57
FOHA	FORWARD HARBOUR	G	2.01	THIN	THEODOSIA INLET	G	1.57
FRAR	FREDERICK ARM	G	1.79	THSO	THOMPSON SOUND	G	2.51
BUIH	H. OF BUTE INLET	G	2.08	WASA	WAKEMAN SOUND	G	2.81
JEIH	H. OF JERVIS INLET	G	1.52	GAMB	GAMBIER ISLAND	G	0.00
KIIH	H. OF KINGCOME INLET	G	2.86	CHWK	CHILLIWACK	P	1.40
KNIH	H. OF KNIGHT INLET	G	2.86	HALF	FOOT HARRISON LAKE	P	5.33
LOUH	H. LOUGHBOROUGH	G	2.06	PILF	FOOT OF PITT LAKE	P	0.35
SEIH	H. OF SECHELT INLET	G	1.40	HABY	HARRISON BAY	P	1.85
TOIH	H. OF TOBA INLET	G	1.91	HATZ	HATZIC	P	1.03
INAR	INDIAN ARM	G	1.05	HALH	HEAD HARRISON LAKE	P	7.71
KLBY	KELSEY BAY	G	2.04	PILH	HEAD OF PITT LAKE	P	0.95
MNCK	McNAB CREEK	G	0.82	HALM	MID HARRISON LAKE	P	6.88
MEBY	MENZIES BAY	G	1.91	PIRV	PITT RIVER BRIDGE	P	0.00
MESD	MEREWORTH SOUND	G	3.20	SICK	SILVERHOPE CREEK	P	3.66
JEIM	MOUTH JERVIS INLET	G	1.15	WHON	WHONNOCK	P	0.58

P/A = Point of Appraisal as follows:

A = ALBE - ALBERNI
 C = CHEM - CHEMAINUS
 G = GAMB - GAMBIER ISLAND
 P = PIRV - PITT RIVER BRIDGE

Table 4-8: Barging Cost Estimates

Code	Point of Origin	P/A	\$/m3	Code	Point of Origin	P/A	\$/m3
BACK	BARR CREEK	A	5.32	BOIN	BOSWELL INLET /SECURITY BAY	G	6.77
BLBY	BLOWHOLE BAY	A	5.01	CAIS	CAMPBELL ISLAND	G	7.62
CLCK	CLEAGH CREEK	A	6.18	DIBY	DINAN BAY	G	11.85
COHA	COAL HARBOUR	A	6.39	ELHA	ELCHO HARBOUR	G	7.77
CYRV	CYPRE RIVER	A	4.36	FEBY	FERGUSON BAY	G	11.72
EAIN	EASY INLET	A	5.58	RIIH	HEAD OF RIVERS INLET	G	7.08
ESIN	ESPINOSA INLET	A	5.35	SBEH	HEAD OF SOUTH BENTINCK ARM	G	8.28
GORV	GOLD RIVER	A	5.06	HNRV	HONNA RIVER	G	10.75
HEBY	HEAD BAY	A	4.98	KMBY	KEMANO BAY	G	9.79
BESH	HEAD OF BEDWELL SOUND	A	4.46	KHIN	KHUTZEMATEEN INLET	G	10.99
HENO	HECATE CHANNEL - NOOTKA	A	5.02				
HOLB	HOLBERG	A	6.65	KIMS	KIMSQUIT	G	8.39
HORV	HOUSTON RIVER	A	4.93	KLEM	KLEMTU	G	8.06
HUCK	HUSHAMU	A	6.49	KUIN	KUMEALON INLET	G	9.88
INGE	INGERSOLL	A	6.21	KWBY	KWATNA BAY/MINERVA CREEK	G	7.66
JELA	JEUNE LANDING	A	6.36	KWRV	KWINAMASS RIVER	G	10.94
KEIN	KENDRICK INLET	A	4.88	MCBY	McCLINTON BAY	G	11.90
KOHA	KOPRINO HARBOUR	A	6.08	MOIN	MOSES INLET/INRIG BAY	G	7.11
KUCV	KULTUS COVE	A	6.26	NAHA	NADEN HARBOUR	G	11.56
MCCK	McCURDY CREEK	A	5.04	NABY	NASS BAY	G	11.20
MORV	MOOYAH RIVER	A	4.88	NORV	NOOTUM RIVER	G	7.27
OUIH	OUOUKINSH INLET	A	5.66	OCFA	OCEAN FALLS	G	7.66
PLHA	PLUMPER HARBOUR	A	4.83	POIS	PORCHER ISLAND	G	10.16
PTL	PORT ELIZA	A	5.19	PRRU	PRINCE RUPERT	G	10.29
RACV	RANKIN COVE	A	4.59	RESO	RENNELL SOUND	G	10.81
STCV	STEAMER COVE	A	4.49	REPA	RENNERS PASSAGE	G	10.78
TLRV	TLUPANA RIVER	A	4.96	SCRV	SCOTIA RIVER	G	*11.42
TSRV	TSOWWIN	A	4.93	SWIN	SEWELL INLET	G	10.26
WIHA	WINTER HARBOUR	A	6.08	SKIN	SKIDEGATE INLET	G	10.73
ZEBA	ZEBALLOS	A	5.43	SOBY	SOUTH BAY	G	10.81
ALAR	ALICE ARM	G	11.69	STEW	STEWART	G	12.03
ALBY	ALLIFORD BAY	G	10.73	TASU	TASU SOUND	G	10.23
BEAN	BEATTIE ANCHORAGE	G	10.21	TUIN	TUCK INLET	G	10.39
BECO	BELLA COOLA	G	8.05	WECK	WEEWANIE CREEK	G	9.40
BIBY	BISHOP BAY	G	9.04	WOCH	WORK CHANNEL	G	10.99

Note: P/A = Point of Appraisal as described on the previous page.

* Includes river towing.

Table 4-9: Barging Distance Estimate for the Market Pricing System

Code	Point of Origin	P/A	km	Code	Point of Origin	P/A	km
BACK	BARR CREEK	A	295	BOIN	BOSWELL INLET /SECURITY BAY	G	462
BLBY	BLOWHOLE BAY	A	259	CAIS	CAMPBELL ISLAND	G	560
CLCK	CLEAGH CREEK	A	394	DIBY	DINAN BAY	G	1047
COHA	COAL HARBOUR	A	418	ELHA	ELCHO HARBOUR	G	577
CYRV	CYPRE RIVER	A	184	FEBY	FERGUSON BAY	G	1032
EAIN	EASY INLET	A	325	RIIH	HEAD OF RIVERS INLET	G	498
ESIN	ESPINOSA INLET	A	298	SBEH	HEAD OF SOUTH BENTINCK ARM	G	636
GORV	GOLD RIVER	A	265	HNRV	HONNA RIVER	G	921
HEBY	HEAD BAY	A	256	KMBY	KEMANO BAY	G	810
BESH	HEAD OF BEDWELL SOUND	A	196	KHIN	KHUTZEMATEEN INLET	G	948
HENO	HECATE CHANNEL - NOOTKA	A	260				
HOLB	HOLBERG	A	448	KIMS	KIMSQUIT	G	648
HORV	HOUSTON RIVER	A	250	KLEM	KLEMTU	G	610
HUCK	HUSHAMU	A	430	KUIN	KUMEALON INLET	G	820
INGE	INGERSOLL	A	397	KWBY	KWATNA BAY/MINERVA CREEK	G	564
JELA	JEUNE LANDING	A	415	KWRV	KWINAMASS RIVER	G	942
KEIN	KENDRICK INLET	A	244	MCBY	McCLINTON BAY	G	1053
KOHA	KOPRINO HARBOUR	A	382	MOIN	MOSES INLET/INRIG BAY	G	501
KUCV	KULTUS COVE	A	403	NAHA	NADEN HARBOUR	G	1014
MCCK	McCURDY CREEK	A	262	NABY	NASS BAY	G	972
MORV	MOOYAH RIVER	A	244	NORV	NOOTUM RIVER	G	519
OUIV	OUOUKINSH INLET	A	334	OCFA	OCEAN FALLS	G	564
PLHA	PLUMPER HARBOUR	A	238	POIS	PORCHER ISLAND	G	852
PTL	PORT ELIZA	A	280	PRRU	PRINCE RUPERT	G	867
RACV	RANKIN COVE	A	211	RESO	RENNELL SOUND	G	927
STCV	STEAMER COVE	A	199	REPA	RENNERS PASSAGE	G	924
TLRV	TLUPANA RIVER	A	253	SCRV	SCOTIA RIVER *	G	944
TSRV	TSOWWIN	A	250	SWIN	SEWELL INLET	G	864
WIHA	WINTER HARBOUR	A	382	SKIN	SKIDEGATE INLET	G	918
ZEBA	ZEBALLOS	A	307	SOBY	SOUTH BAY	G	927
ALAR	ALICE ARM	G	1029	STEW	STEWART	G	1068
ALBY	ALLIFORD BAY	G	918	TASU	TASU SOUND	G	860
BEAN	BEATTIE ANCHORAGE	G	858	TUIN	TUCK INLET	G	879
BECO	BELLA COOLA	G	609	WECK	WEEWANIE CREEK	G	765
BIBY	BISHOP BAY	G	723	WOCH	WORK CHANNEL	G	948

Note: P/A = Point of Appraisal as described on the previous page.

* Distance does not include river towing.

4.5.3 Routine Maintenance and Deactivation

Routine maintenance includes grading, brush control, minor surfacing repairs, sanding, snowplowing, ditch maintenance and repair, replacement of culverts ≤ 0.9 m on active roads, slough removal and all deactivation costs.

Routine maintenance also includes minor repairs to roads due to slides, erosion and flood damage. All road use charges except those recognized in section 4.5.4 are also included.

The cost estimate for all routine maintenance carried out on logging operations, including roads required for basic silviculture and protection, depends on the geographic location of the cutting authority area. Cost estimates do not apply where there are no roads to be maintained.

The routine maintenance and deactivation cost estimates ($\$/\text{m}^3$) by forest district are:

Zone 1 (North)

Queen Charlotte	North Coast
North Island - Central Coast	
<hr/>	
Total Cost Estimate =	\$2.61/ m^3

Zone 2 (South)

Sunshine Coast	Squamish
Campbell River	Chilliwack
South Island	
<hr/>	
Total Cost Estimate =	\$2.64/ m^3

4.5.4 Road Use Charges

1. No road use charge shall be used to calculate a cost estimate, unless:
 - a. the licensee submits to the district manager with the coast appraisal data submission:
 - i. a completed *Request for Approval of a Road Use Charge Form*,
 - ii. a copy of the written road use agreement, and

- iii. written confirmation by the regional manager or their designate that the road use charge specified in the application, or an amount specified by the regional manager or their designate, is approved, and
 - b. the term of the road use agreement is completely within the period for which the appraisal shall apply.
2. The licensee when requested by the regional manager or their designate shall submit copies of auditable monetary transactions evidencing payment by the licensee for road use.

3. Charges as a Share of Road Maintenance

No recognition is made of such charges. The routine road maintenance cost estimate (section 4.5.3) includes all relevant costs whether incurred directly by the licensee or by payment to another party for services performed.

4. Charges for Other than Road Maintenance

There are three main categories of road status:

a. Forest Service Roads

A road that is declared, determined, built, maintained or modified by the ministry, as defined in forest legislation. No road use charges will be considered in appraisals;

b. Permitted Roads

Roads built on Crown land, authorized by road permit or other cutting authority documents. No road use charges will be considered in appraisals;

c. Other Roads

Road use charges for roads on indian reserves or on private land owned by an arm's length third party and not subject to a lease held by the licensee, their affiliate or agent of either, may be considered in appraisals provided there is no lower cost route capable of development through Crown land.

The charges recognized must be reasonable, must not exceed compensation that might be determined under the forest legislation, and must be proven through the presentation of auditable documents.

5. Land Use Charges

No land use charges will be considered in appraisals. These costs are included in section 4.6.1 corporate and forestry overhead.

4.6 Administration and Other Costs

4.6.1 Corporate and Forestry Overhead

Corporate general and administrative overhead cost estimates are compiled from surveyed expenses at the corporate licensee level and include all aspects of executive and administrative support functions at the head office attributable to logging operations, operating and support costs of the logging and log supply departments, all right-of-way easements, foreshore and other land leases necessary for the logging function.

Corporate forestry and engineering is compiled from the surveyed harvesting operations and includes supervisory, administrative and vehicle support functions; it also includes cruising, environmental protection measures (including hydro and other seeding) and the cost of performing residue and waste surveys. Silviculture overheads are also included in this phase. Any costs that will be reimbursed through the *Forest Act*, section 110, or by funding from any Crown agency are excluded except as noted in section 6.5.

The cost estimates are:

Corporate, General and Administrative Overhead	(\$/m ³) =	7.38
Corporate Forestry and Engineering	(\$/m ³) =	5.40
Total Corporate and Forestry Overhead	(\$/m ³) =	12.78

4.6.2 Crew Transportation (Labour)

Crew transportation refers to the labour costs associated with moving logging crews by vehicles from the appraisal marshalling area to the centre of the work area in the cutting authority being appraised, and return.

The appraisal marshalling area is defined as follows:

1. In situations where the cutting authority area being appraised is accessible (as determined in section 4.6.3), the licensees' contractually binding designated marshalling area, or in the absence of one, the nearest of (a) a contractually binding designated marshalling area, (b) the camp, (c) the crew vehicle storage area, or (d) centre of the nearest community.
2. In a situation where the cutting authority area being appraised is isolated (as determined in section 4.6.3), the licensees' contractually binding designated marshalling area, or in the absence of one, the nearest of (a) a contractually binding designated marshalling area, (b) the camp or (c) the vehicle storage area.

The appraisal marshalling area need not be the location actually used by a given licensee.

Where more than one appraisal marshalling area or route is reasonable, the area or route chosen for appraisal purposes will be the one that yields the least total operating cost estimate according to this manual.

For the purposes of this section, a "vehicle" may be a motor vehicle or a boat. When "vehicle" is taken to mean boat, the "vehicle storage area" may be a boat dock or wharf where the crew can embark and disembark.

The formula for crew transportation is:

$$$/m^3 = 2.244 + 0.0261 (D)$$

Where: D is the weighted average one way distance in kilometres (rounded to the nearest 0.1 km) from the centre of the appraisal marshalling area to the centre of the work area in the cutting authority area being appraised. In situations where the appraisal marshalling area is a community, D will be measured from the post office of that community.

Where: D=0, the crew transportation cost estimate is equal to zero.

The crew transportation cost estimate includes both crew travel time costs and crew vehicle operator time costs.

The cost of vehicle ownership, lease, rental, maintenance and operations are included in section 4.6.3, camp overhead.

4.6.3 Camp Operations and Overhead

4.6.3.1 General Camp Overhead

The general camp overhead phase cost estimate recognizes two types of logging operations according to the mode of access for logging crews to the highway system:

1. Accessible Cutting Authority

An accessible cutting authority area is one which is connected, or the service landing used to support the yarding of timber from a cutting authority area by helicopter is connected, by a road suitable for motor vehicles to the centre of the nearest community. The nearest community must be a city, district municipality, town or village and must have retail food and gasoline services located nearby. This includes all communities serviced by public ferry.

The cost estimate covers the depreciation, maintenance and operating costs of camp and crew marshalling area facilities non-recoverable costs for cookhouses, freight by air or water, shop and office and other pertinent buildings; and provides for daily and/or periodical commuting costs.

The cost estimate for accessible cutting authorities is: \$12.82/m³

2. Isolated Cutting Authority

An isolated cutting authority area is one which is not 'accessible'.

The cost estimate covers the depreciation, maintenance and operating costs of camp and marshalling area facilities; the non-recoverable costs incurred for cookhouses, bunkhouse, shop and office and other pertinent buildings; daily and/or periodical commuting cost from the camp to residential facilities; and camp and equipment moves of less than 10 km by water.

The cost estimate for isolated cutting authorities is: \$14.37/m³

4.6.4 Low Volume Cost Estimate Additive

All fully appraised cutting authorities may be eligible for a low volume cost estimate additive.

The cost estimate additive is: $\$/\text{m}^3 = 7.38 - [0.00246 (V - 2\ 000)]$

Where:

- V is the lesser of the cutting authority net cruise volume or the licence's allowable annual cut of Crown timber (if applicable),

- V must be less than or equal to 5 000 m³,
- The licence, under which the cutting authority has been issued, has an allowable annual cut of Crown timber not exceeding 10 000 m³,
- The maximum cost estimate is \$7.38/m³.

4.6.5 Clayoquot Sound

A cost estimate of \$19.52/m³ will be included in appraisals of cutting authorities in the Clayoquot Sound area (as defined below).

The Clayoquot Sound area is defined as Hesquiat Peninsula, Esowista Peninsula, the Islands, sea and all lands and waters draining into the Pacific Ocean from the height of land between Escalante Point in the north and Quisitis Point in the south.

4.7 Total Logging Cost Estimate

The total logging cost estimate is the sum of all phase cost estimates identified in chapter 4 for the cutting authority being appraised, including specified operations and least cost methods. Subsequently, basic silviculture costs are added and a trend factor applied to derive a total weighted logging cost.

4.8 Basic Silviculture

Basic silviculture cost estimates are made for all appraised cutting authority areas where basic silviculture is required.

The cost used for basic silviculture treatment carried out on land on which the licensee is required to establish a free-growing crop of trees, as specified in the *Forest Act*, depends on the geographic location of the appraised cutting authority area.

Basic silviculture treatment may not be required on some cutting authorities (e.g., right-of-way, licence-to-cut, commercial-thinning). A basic silviculture cost estimate is not included in the appraisal where this intent has been specified in the licence document, cutting authority or by applicant's agreement. Nor is a basic silviculture cost estimate included in the appraisal if the work is funded through the *Forest Act*, section 110, or by any Crown agency, except as noted in section 6.6.

Table 4-10: District Silviculture Cost Estimates

Forest District	\$/m ³ *	Forest District	\$/m ³ *
Queen Charlotte Isl.	2.89	South Island	2.49
Chilliwack	3.53	Campbell River	2.05
Squamish	2.50	North Island – Central Coast	2.35
Sunshine Coast	3.28	North Coast	2.40

* The dollar per cubic metre (\$/m³) cost estimates are net of overhead.

4.9 Cost Trend

A cost trend factor is separately applied to the total logging cost estimate and the basic silviculture cost estimate at the effective appraisal date and at the date of each stumpage rate adjustment. The factors cover the period from the effective date of the cost base to the effective date of the stumpage rate calculation. Cost trends are shown in the following table.

Table 4-11: Trend Factor by Effective Date

***APPRAISAL EFFECTIVE DATES FROM APRIL 1, 2001
AND BEFORE APRIL 1, 2002 (cost base July 1, 1999)***

All Stumpage Adjustment Dates (or Appraisal Effective Date)	Trend Factor
July 1 to September 30, 2003	1.000
October 1 to December 31, 2003	1.000
January 1 to March 31, 2004	1.000

***APPRAISAL EFFECTIVE DATES FROM APRIL 1, 2002
(cost base July 1, 2000)***

All Stumpage Adjustment Dates (or Appraisal Effective Date)	Trend Factor
July 1 to September 30, 2003	1.000
October 1 to December 31, 2003	1.000
January to March 31, 2004	1.000

***APPRAISAL EFFECTIVE DATES FROM JULY 1, 2003
(cost base July 1, 2001)***

All Stumpage Adjustment Dates (or Appraisal Effective Date)	Trend Factor
July 1 to September 30, 2003	1.000
October 1 to December 31, 2003	1.000
January to March 31, 2004	1.000

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Market Pricing System

7

7.1 Introduction

1. The Market Pricing System (MPS) is the method for determining a stumpage rate for coniferous sawlogs in a cutting authority area, using information which includes the bids for other cutting authority areas that were sold at auction.

7.3.13 Upset Stumpage Rate

1. Subject to subsections (2) and (3) the upset stumpage rate that is determined using the MPS shall be seventy percent of the final market stumpage value (FMSV).
2. Where applications for a timber sale licence with an upset stumpage rate determined under section 7.5.1,(1) have been invited but no applications have been received, the upset stumpage rate shall be equal to the variable cost per cubic metre of preparing the timber for sale when that is requested by the BC Timber Sales manager.
3. Where the director of BC Timber Sales does not anticipate that applications for a timber sale licence with an upset stumpage rate determined under section 7.5.1,(1) will be received because of market conditions, the upset stumpage rate shall be equal to the variable cost per cubic metre of preparing the timber for sale when that is requested by the BC Timber Sales manager.
4. The variable cost per cubic metre of preparing the timber for sale shall be calculated by the BC Timber Sales manager.
5. Notwithstanding anything contained in this section, the upset stumpage rate must not be lower than the prescribed minimum rate.

7.3.14 Total Stumpage Rate

The total stumpage rate is the upset stumpage rate plus any bonus bid.

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