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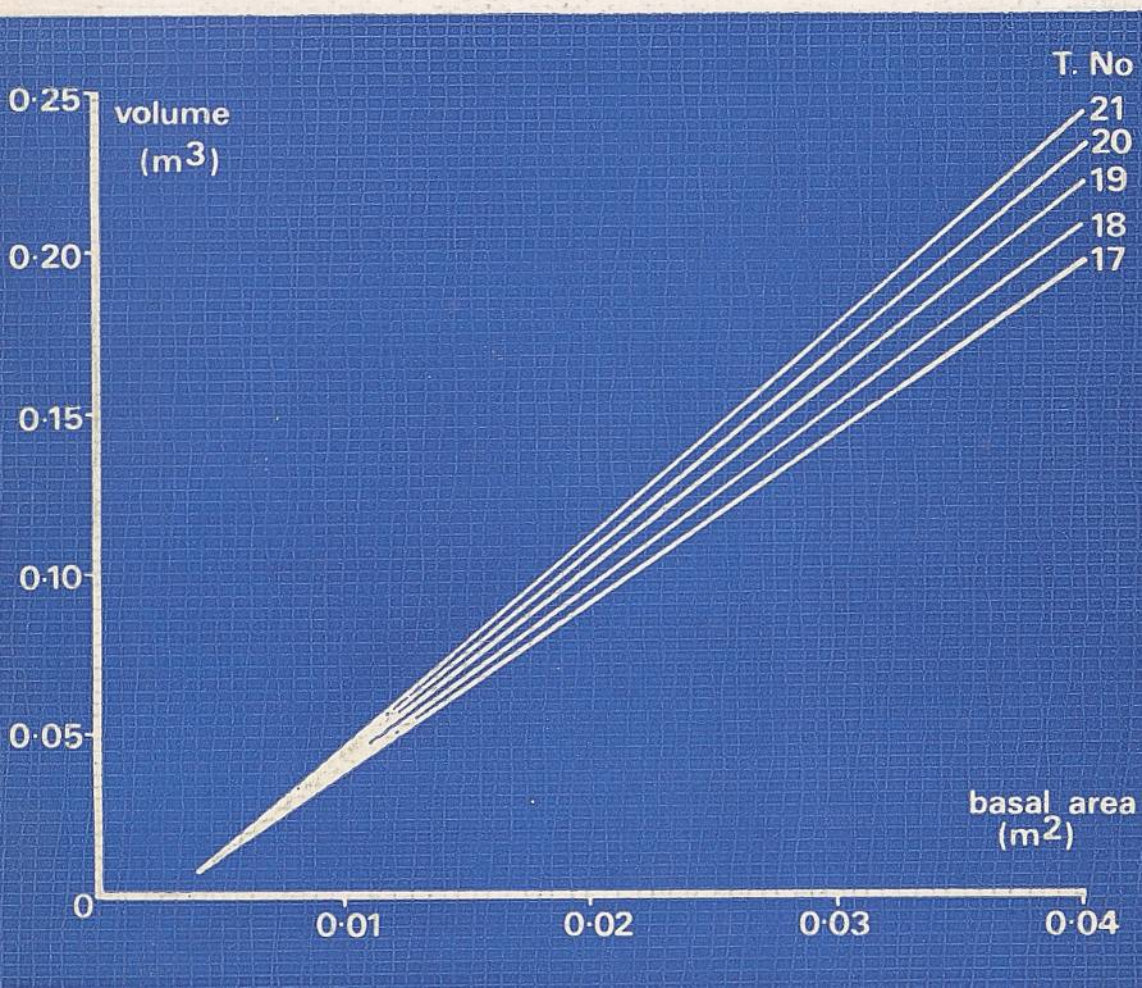
Forestry Commission Booklet 36

Timber Measurement for Standing Sales
using tariff tables

G J Hamilton



FORESTRY COMMISSION

BOOKLET NO. 36

TIMBER MEASUREMENT FOR STANDING SALES

using Tariff Tables

By

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CONTENTS

TIMBER MEASUREMENT FOR STANDING SALES using Tariff Tables

I INTRODUCTION

The methods of measurement described in this booklet are intended to be used primarily in connection with the *sale* of standing timber. The procedures described involve the use of *tariff tables* which have been used for this purpose by the Forestry Commission since 1956. The tariff system of measurement has subsequently proved efficient and reliable, provided that the recommended procedures have been correctly followed. Whereas previously the use of the tariff system was confined to certain clearly defined conditions, it is now considered better to use the tariff system than any other method of measuring standing timber, in almost any kind of crop. The system described here can be applied to both thinnings and fellings.

It cannot be too strongly emphasised that, in order to produce reliable results, each step in the procedure outlined in this booklet must be carried out with care. This entails giving proper attention to detail both in field-work and calculations and requires competent supervision at each stage and in subsequent checking.

II THE TARIFF SYSTEM

(a) Rudiments

There are basically three steps in estimating the volume of a parcel of trees using the tariff system. The first is to count all trees. Secondly, the trees are classified in terms of diameter at breast height (dbh), in most cases by measuring dbh on a sample of the total population. The third step is to convert the tally of trees thus obtained to volumes using an appropriate single-entry volume table, i.e. a table giving a volume for each dbh class. Such tables can be regarded as 'local' volume tables in this context. Tariff tables are simply a series of pre-constructed 'local' volume tables. In order to determine which tariff table is appropriate for a given stand it is necessary to fell a sample of trees and to measure their volume. Though it is more usual, with thinnings, to combine the initial selection and marking of trees in the parcel with the measurement procedure in one operation, these can be carried out separately.

(b) Theory

A feature of any pure even-aged stand is that if the volume of each tree is plotted against its basal area, the points are scattered along a clearly defined straight line. The slope of this line varies with species, age, height, and other factors, but all such lines tend to converge at a common point which, using metric conventions, has been empirically

determined at a volume of 0.005 m^3 for a basal area of 0.004 m^2 (7 cm diameter). (See cover illustration.) Each of these lines can be converted to a single-entry volume table. Each of the tariff tables represents one such line and the range of tariff tables, numbered 10 to 60, covers the range of volume/basal area lines likely to be encountered in British conditions. The higher the tariff number the higher the volume for a given dbh. The practical implications of the volume/basal area theory are first, that since each volume/basal area line has one known point in common, not only is the pre-construction of lines (and hence volume tables) possible, but it is easier to establish which volume/basal area relationship (tariff table) to apply to a given crop than would otherwise be the case. Secondly, the fact that the average tariff number is basically the same for all trees within a given crop irrespective of dbh means that sampling is simplified. Taken together these features enable a suitable volume table to be identified from a relatively small number of felled sample trees and it is this fact that accounts for the efficiency of the system.

(c) Application

The tariff method was originally designed for pure even-aged crops. The principle can, however, be extended to other crop types provided that, in order to attain the normal level of precision (see Note b, page 13), the method of sampling is adapted to suit the conditions. In some circumstances the method of computation also requires modification. In certain cases, crops which are not pure and even-aged can be divided into components each of which by themselves can be regarded as pure and even-aged and each component separately measured. For example, in a mixture of two species of the same age, the volume of each species should be sampled, recorded, and measured separately.

Where it is impracticable to deal with each component separately on the ground, a higher intensity of sampling is required for the crop as a whole, together with a modified method of calculation involving sub-division of the crop on paper.

There are also certain crop types of abnormal variability which require a higher sampling intensity than normal.

The following section describes these situations in greater detail.

III STRATIFICATION AND SAMPLING

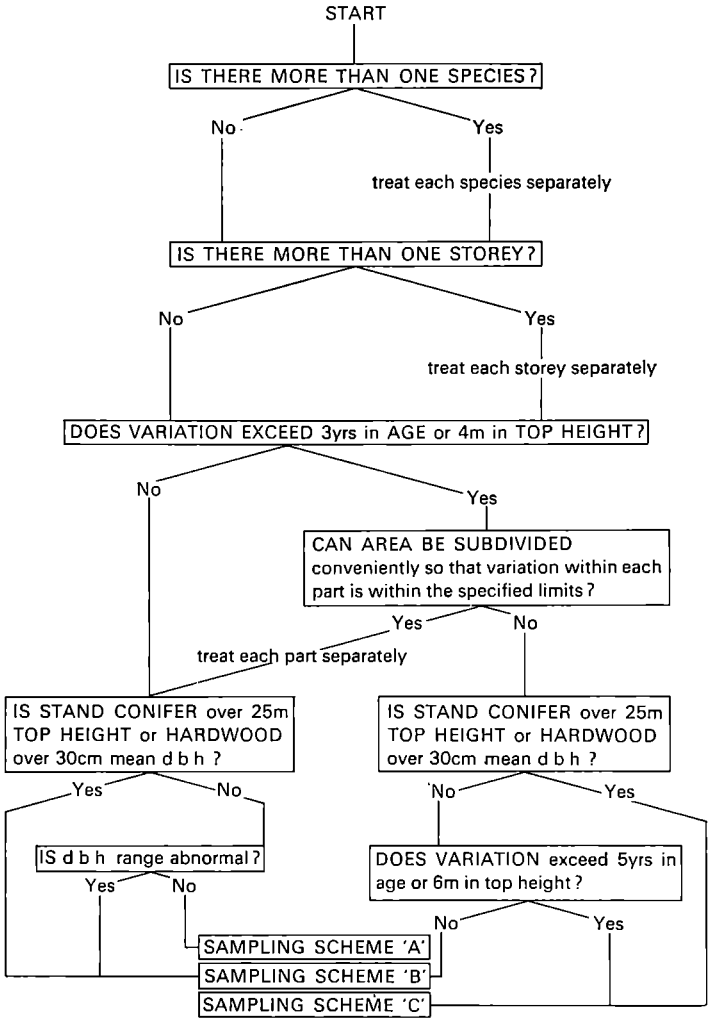
It is essential that the stands to be measured are first *correctly stratified*, ie divided into parts (strata) each consisting of acceptable uniformity. This broadly entails separating species, stories, and areas of different height or age and measuring each of these strata independently.

When the stands have been stratified as far as is practical it is necessary to decide on the level of *sampling intensity* which should be applied to each stratum. Three sampling schemes are provided, designated 'A', 'B' and 'C', the lowest intensity being 'A', the highest 'C'. The selection of the

appropriate sampling scheme is dependent on the nature of the crop in each stratum.

The various aspects to be considered in correctly stratifying and sampling stands are presented in a series of logical steps in the Key below. More detailed notes on each stage of the key are given on page 6.

The sampling scheme appropriate to each stratum is determined from the key and is incorporated in the measurement procedure which is outlined in Section IV, page 9. The sampling schemes are detailed on page 8.



KEY TO SAMPLING SCHEMES

Notes on Key

(*i*) *Is there more than one species?*

Normally each component species will be sampled and recorded separately except when, *from prior experience in that area*, it is known that the tariff numbers of different species of the same age and height are similar. Situations such as this will tend to occur in early pole stage crops of closely related species, eg Scots and Corsican pine. To group species together in this way also assumes that no species differentiation is required in the volume estimate, by the potential buyer for example.

(*ii*) *Is there more than one storey?*

In two-storied crops each component, if not of a different species, will usually be of markedly differing ages. Occasionally situations will arise where a 'two storied' situation has been achieved by thinning. Whenever two 'storeys' can be clearly discerned, then each one should be measured separately.

(*iii*) *Does variation exceed* 3 *years in age or* 4 *m in top height? If so, can area be subdivided . . .? etc.*

This is the final stage in separating out strata to be treated individually, in sampling, recording and computation. Having separated out species and stories, each component must be examined for variation in height or age. Where variation exceeds the specified limits, the area should if possible be sub-divided into parts such that variation within each part is contained within the specified limits. If the variation occurs locally such that sub-division is not practical, then the problem must be tackled by raising the level of sampling intensity. It is advisable also to treat separately stands which have had markedly different thinning histories.

(*iv*) *Is the stand to be assessed a conifer over* 25 *m top height or a hardwood of more than* 30 *cm mean dbh?*

A higher intensity of sampling is required where stands exceed these limits.

(*v*) *Is the diameter range unusually wide?*

A higher sampling intensity will be required in stands where a wider than usual range in dbh is encountered. This situation is more common with crops to be clearfelled, and particularly where little thinning has been carried out, or with thinnings where all sizes of trees are removed, eg line thinnings. A *rough* estimate as to whether the dbh range is exceptional in this respect can be obtained by measuring the dbh of the largest and smallest marked measurable trees (by dbh) in a sample of 20, taken consecutively in a line through the stand. Add the diameters together and consult the table opposite to find the normal maximum dbh range associated with this figure (eg smallest 14 and largest 50, total 64—normal maximum range 27). If the tabulated

range is less than that actually obtained by sampling, ie the difference between the largest and smallest tree measured, then the dbh distribution can be regarded as unusually wide. In the above example the *actual* range exceeds the tabulated value, hence the dbh range is unusually wide. It is advisable to repeat this at least three or four times to get a reasonable impression of the dbh range in a stand.

Largest + smallest dbh	Maximum dbh range	Largest + smallest dbh	Maximum dbh range	Largest + smallest dbh	Maximum dbh range
18	7	46	19	74	32
20	7	48	20	76	33
22	8	50	21	78	34
24	9	52	22	80	35
26	10	54	23	82	36
28	11	56	24	84	37
30	12	58	25	86	38
32	13	60	26	88	39
34	14	62	27	90	40
36	15	64	27	92	41
38	16	66	28	94	42
40	16	68	29	96	43
42	17	70	30	98	44
44	18	72	31	100	45

N.B. Where "largest + smallest" is an odd number, take next higher even number.

(*vi*) *Is variation greater than* 5 *years in age or* 6 *metres in top height?*

Variation exceeding this requires a higher sampling intensity than would otherwise be the case. The volume estimate may also have to be calculated by subdividing the dbh distribution and calculating the volume of each part of the distribution. This is dealt with in para 26(ix), page 12.

(*vii*) The Sampling Schemes A, B and C are shown on page 8. The sampling scheme appropriate to each separately measured component is determined from the Key and incorporated in the measurement procedure which is outlined in the next section.

Sampling Schemes

ESTIMATED NOS. OF TREES (of 10cm dbh and above)	GIRTH SAMPLING FRACTION A	B	C
100— 150	1:1	1:1	1:1
151— 200	1:1 (15)	1:1	1:1
201— 300	1:1 (15)	1:1	1:1
301— 400	1:1 (20)	1:1 (12)	1:1
401— 500	1:2	1:1 (15)	1:1
501— 600	1:2	1:1 (15)	1:1 (12)
601— 800	1:3	1:2	1:1 (15)
801— 1 000	1:4	1:3	1:2
1 001— 1 200	1:5	1:3	1:2
1 201— 1 400	1:6	1:4	1:3
1 401— 1 600	1:7	1:4	1:3
1 601— 1 800	1:8	1:5	1:4
1 801— 2 000	1:9	1:6	1:4
2 001— 2 400	1:10	1:6	1:5
2 401— 3 000	1:12	1:8	1:6
3 001— 4 500	1:15	1:10	1:7
4 501— 6 000	1:20	1:15	1:10
6 001— 8 000	1:25	1:18	1:12
8 001—10 000	1:30	1:20	1:15
10 001+	1:40	1:25	1:20

Notes

(a) Use the Key on page 5 to determine which sampling scheme to use for each separately measured parcel, ie whether A, B or C.

(b) The girth sampling fraction to use will be determined according to the estimated number of trees in the parcel, eg if the sampling scheme indicated by the key is 'A' and the estimated numbers of trees in the parcel is 1 500 then the appropriate girth sampling fraction will be 1:7, ie every seventh tree in the stand will be girthed.

(c) Normally *every 10th* girth sample tree will be felled and measured for volume. The figures above shown in brackets indicate the exceptions to this, and these concern cases where all trees are girthed. For example, if sampling scheme 'A' is indicated and the estimated number in the parcel is 180 then all trees will be girthed but *every 15th* tree will be selected as a volume sample tree.

(d) For parcels of fewer than 100 trees, see Note (e) (page 14).

IV PROCEDURE

Fieldwork

1. Use the Key on page 5 to ensure that the area has been properly stratified and to determine the sampling scheme(s) to be applied.

2. The measurement team should consist of 1 booker and a number of markers depending on the conditions (see Note **(a)** on page 13). If marking, in the sense of initial selection and blazing of trees, is done separately from measurement, 'marking' of the same trees with scribe, chalk, or crayon etc is still required for enumeration in the measurement procedure.

3. The special assessment form (FC U15) shown on pages 17-19 to illustrate a worked example should be used by the booker for recording the data.

4. The total number of trees of 10 cm dbh and above in each separately assessed parcel must be estimated. Some care taken at this stage may avoid the necessity of extra work later. In this respect it is better to *underestimate* rather than overestimate the numbers. A convenient way of estimating the number of trees is to lay down a series of plots throughout the area counting the trees marked or likely to be marked in each plot, finding the average stocking per plot and deriving a total from the total area of the stand being measured. A plot size of 0.01 ha may be adequate for early thinnings whereas for older crops plots of 0.05 ha may be more suitable. (In the worked example the estimate was 1,900.)

5. The girth sampling fractions $\left(\frac{1}{n}\right)$ is determined from the table on the opposite page using the appropriate sampling scheme and the estimated number of trees. (In the worked example this is 1 : 9, the sampling scheme required being 'A'.)

6. The marking of those trees to be felled proceeds normally. On marking each tree the marker calls 'mark' to the booker who records this in Part B of the form, and returns the call. Trees of less than 7 cm dbh are not entered here, and may either be ignored or, if required, recorded separately. The gate method of recording marked trees is most convenient, and where the sampling fraction is not a multiple of five, trees should be tallied in groups as shown in the worked example.

   The accuracy of the number of trees counted is of fundamental importance and where large numbers of trees are involved it makes it easier for the prospective buyer to check the record of trees marked (Part B) if this is arranged in sections, each section corresponding to an area easily identified on the ground, eg by roads, rides, streams etc.

7. *After* the 'n'th tree is marked and recorded in Part B, the booker calls 'girth'. The dbh of this tree must then be measured by the marker and called to the booker who records it in the appropriate part of Section C, and confirms the measurement by returning the call to the marker.

Normal conventions apply in measuring the dbh of these *girth sample trees* (see Note **(f)**, page 14).

8. After the 10th* girth sample tree has been marked and girthed, the booker calls 'sample', indicating that this tree is a *volume sample tree.* The point at which the diameter was measured *must be scribed,* and the trees numbered above breast height point in the sequence in which they are encountered, and entered in Part D. (Roman numerals are normally more convenient.) These volume sample trees, with the exception of trees of 7, 8 and 9 cm dbh, may either be felled and measured immediately, or alternatively distinctively marked as a volume sample tree and felled and measured later.
9. The volume of each felled sample tree must be assessed, observing the measurement conventions listed in Note **(g)**, page 15. It is important that the rounded-down timber length point and the point at which the mid-diameter is measured should be clearly scribed. (It is customary to scribe the timber point with an arrow and so avoid confusion with chain saw marks.) The timber length(s) and mid-diameter(s) are entered in columns 3 and 4 of part D. Trees of 7, 8 and 9 cm dbh which are selected as volume sample trees must be entered in Part D of the assessment form but their volumes should not be calculated and they should not be used in calculating average tariff numbers. For subsequent checking purposes they should be distinctly marked and numbered.
10. Apart from situations where all trees in the parcel have been girthed, it is necessary to check that a sufficient number of volume sample trees of 10 cm dbh and above have been measured. If the numbers are less than 16 (Sampling Scheme A), 25 (Scheme B), 34 (Scheme C), additional sampling should be carried out (see Note **(c)** page 13).

Calculations

11. Add up the total number of girth sample trees in part C of the assessment form and enter in column 3.
12. Multiply the numbers in each class by the sampling fraction denominator 'n' (in the worked example this is 9) and enter in col 4 of part C, this column providing the dbh distribution of the total number of trees in the stand.
13. The tariff number of each volume sample tree (ie Part D col 6), must be obtained from the tariff tables, using the dbh and volume of each tree. In the worked example, volume sample tree No 1 has a volume of 0.21 cubic metres for a dbh of 18 cm. Reference to the tariff tables shows that the table showing a volume nearest to that of the sample tree for this dbh is tariff table 30 which indicates a volume of 0.208 cubic metres. Tariff number 30 is thus entered in column 6. If the volume falls exactly halfway between two tariffs then the lower tariff number is taken.

**See* Note c under SAMPLING SCHEMES, page 8.

14. The tariff numbers are then summed and divided by the total number of entries in this column to give an average tariff number which should be rounded *down* to the nearest whole number.

15. The tariff table volumes indicated by this average tariff number are then entered in column 5 (Part C) against the appropriate dbh class.

16. The volume in each dbh class (col 6 Part C) is then simply the product of cols 4 and 5.

17. The grand totals in Part C are then completed and transferred to Part A. Average volume per tree is derived by dividing the total volume (col 3) by the number of trees (col 2). Owing to its derivation as a multiple of the number of girth sample trees, the total number of trees shown at the bottom of column 4, Part C, may differ from the total actually marked (Part B). No adjustment should, however, be made to the volume estimate.

18. The final step which may or may not be required is to estimate the volume to 18 cm (col 6) and 24 cm (col 7) top diameter. This information is obtained using the general Stand Assortment Table, (Appendix, p. 30), which is entered using the mean dbh of the marked trees. The figures obtained are to be regarded only as a guide to the volume breakdown and cannot be guaranteed. The mean dbh is that equivalent to the average volume using the appropriate tariff table. (In the worked example the mean volume of 0·202 cubic metres is equivalent to 18 cm dbh.)

19. An estimate of the number of tops of trees, or unmeasurable trees, can be entered in the boxes provided in Part A if required.

20. Checks i-v (page 12) must be carried out as part of the procedure.

21. Where Sampling Scheme 'C' has been used, check (ix) page 12 must be carried out and the volume calculated as indicated if necessary.

Sources of Error

22. **Girthing Standards.** It is imperative that the same standard of girthing should apply to both girth sample trees and volume sample trees. For this reason the procedure must always be such that the dbh should be measured, called and recorded *before* the marker is told that the tree is also a volume sample tree. On no account must the measurement be subsequently changed. Consistent standards are best obtained using a stick of 1·3 m or by attaching a pin to one's clothing at 1·3 m from ground level.

23. **Bias.** If the procedure is followed correctly there will, in general, be little opportunity for biased selection of girth or volume sample trees. The risk of bias is greater if there is only one marker or if the booker attempts to act as a marker. Risk of bias is also related to the sampling fraction $\left(\frac{1}{n}\right)$. Where 'n' is small the marker can more easily be aware that the next tree is a girth sample tree before marking it. Scribing all girth sample trees in these circumstances provides a useful basis for checking the occurrence of bias.

24. Measurement errors. Whilst volume sample tree measurements can be easily checked, girth sample tree measurements are more difficult to check and errors occurring here usually require new girth samples to be taken. Girthing tapes should be checked periodically and those which are found to be inaccurate or worn should be discarded.

Checks

25. The following *routine checks* must be undertaken:

(i) Check all calculations and ensure that the total number of trees, the sampling fraction and the number of sample trees are compatible with one another.

(ii) Check that all trees of less than 7 cm dbh have been excluded from all calculations.

(iii) Check that no trees less than 10 cm dbh have been used in calculating average tariff number.

(iv) Check that any volume sample trees with a timber length of less than 2·5 m have a mid-diameter equal to their dbh.

(v) Check that the average volume is reasonable for the stand in the light of experience and observation.

26. Not all faults can be easily identified but the following *supervisors' checks* may assist where there is some doubt as to the accuracy of the estimate.

(vi) Check that the dbh of each volume sample tree is present in the tally of girth sample trees (Part C). If not this indicates failure to record the volume sample trees as girth sample trees, or that the volume sample trees have been measured on a different basis, eg after felling where the breast height point has been incorrectly estimated as 1·3 m from *the butt*.

(vii) Examine the dbh distribution of the volume sample trees against that of the girth sample trees by tallying opposite the girth sample trees in Part C of the form, and compare the quadratic mean dbh of each distribution (ie the dbh corresponding to the mean basal area).

If marked differences are apparent, the explanation may be either that a different standard of girthing has applied between girth and volume sample trees, or that bias has entered the selection of volume sample trees. The first possibility is more serious.

(viii) Bias in the selection of girth sample trees (if these have not been scribed at breast height) cannot be detected from the assessment form, and can only be checked by undertaking a new sample. Biased selection of girth sample trees is much more serious than bias in the selection of volume sample trees.

(ix) Tally the tariff numbers against dbh in Part C (or plot on graph paper). Check that there is no marked tendency for tariff number to increase or decrease with increasing dbh. If there is, it will be

necessary to split the dbh distribution into two or more parts and to calculate the average tariff number appropriate to each part from the volume sample trees with dbh's falling within each sub-division of the dbh distribution. The volume of each sub-division is simply calculated using the tariff number derived for that part of the distribution. This technique is justified where there are at least 12 sample trees within each sub-division of the group and where the difference between mean tariff numbers of successive sub-divisions exceeds 3.

Notes

(a) Team organisation

The most efficient system is that where initial selection of trees, marking and measurement are combined. In most cases the measurement of volume sample trees will be undertaken at a later stage, thereby avoiding the necessity of transporting a power saw and stump protection equipment throughout the operation.

The number of markers which one booker can cope with depends on the stand conditions, ie whether the stand is being thinned or being clear felled, and the stocking of marked trees. It is recommended that there should be a minimum of two markers. The optimum number will probably be 3 markers in thinnings whereas in clear fellings, marking is more rapid and as a result 2 markers will give a balanced team.

In traversing an area where variation (within the limits specified in Chapter III) follows a detectable gradient, the traversing should be done at right angles to the gradient. For example, where variation exists between the top and bottom of a slope, the team should work across the slope.

(b) Precision of volume estimate

Assuming measurement errors are minimal and that the procedure has been properly carried out the true volume will be within the range $\pm 10\%$ of the volume estimate, at the 95% probability level. In other words there is *at least* a 19 to 1 chance against the possibility of the true volume lying outide the 10% limits. This level of precision may not apply to parcels of fewer than 100 trees.

(c) Procedure if insufficient volume sample trees measured (page 10)

If, because of an overestimate of the number of trees to be marked in a parcel, the sampling fraction used has resulted in insufficient volume sample trees being selected, then additional samples should be taken. The simplest way of doing this is to follow a diagonal line through the area, girthing every marked tree on the line, and taking every tenth tree as a volume sample tree. This can be repeated with a second *complete* diagonal if need be. In line thinning it may be necessary to sample in a similar manner marked lines taken at random. Whichever method is used, the samples can never be truly representative of the stand, short of repeating the exercise from scratch, but

some effort should be made to cover as much of the area as possible in selecting the additional volume sample trees.

The additional girth and volume sample trees should be entered in Parts C and D of the assessment form respectively but, of course, the marked trees will have already been counted and entered in Part B. The mean tariff number is calculated using all volume sample trees and the total number of girth sample trees is tallied in col 3 of Part C as usual. To find the total number of trees in each class multiply each entry in col 3 by the factor obtained by dividing the number of marked trees in the stand by the total number of girth sample trees. As a result of taking additional girth sampling trees, this fraction may prove rather awkward, and this is yet another reason why efforts should be made to avoid the need to select further samples by making careful initial estimates of numbers of trees.

(d) Line thinning

A modified method of sampling is permissible in first line thinnings but only in uniform conditions where rows are clearly defined and evenly spaced, and where the line thinning pattern is strictly regular. In these situations a less costly method of sampling is to derive the total number of trees by sampling a proportion of the lines to be removed. (This proportion should not be less than 20%, ie a maximum interval of every fifth marked line.) The dbh distribution can be derived by measuring the dbh of all or a proportion of trees in these lines. For example, if the indicated girth sampling fraction is 1 : 10, every fifth line would be sampled and the dbh assessed of every second tree of 7 cm dbh and above in the line. For a girth sample of 1 : 8, every fourth row would be sampled and the dbh of every second tree in the line measured, and so on. In these circumstances it should be noted that the total number of trees is *estimated* and by implication this may require modification to sales contracts. The prospective buyer must be informed of such a departure from the normal method of sampling.

(e) Parcels of fewer than 100 trees

Where the parcel being assessed contains fewer than 100 trees the method of assessment remains the same except that it is usually uneconomic to fell a sufficient number of trees in order to attain the normal level of precision attached to the volume estimate. (See Note b.) The dbh of all trees should be measured. Where there are 50–100 trees, every tenth tree should be taken as a volume sample tree. Where there are fewer than 50 trees, 5 volume sample trees should be selected systematically by means of an appropriate sampling fraction. The volume and tariff number of each of these should be calculated, a mean tariff number derived and thereafter the volume of the parcel calculated in the manner described above.

(f) Dbh measurement conventions

(i) *Diameters* will usually be measured with girthing tapes calibrated in centimetres diameter and will be rounded down to the nearest

whole centimetre. (Rounding down is achieved automatically with classifying tapes of the type used by the Forestry Commission.)

(ii) Trees of *less than 7 cm dbh* are considered to have no measurable volume.

(iii) Always ensure that trees are girthed at 1·3 m above ground level, which is the breast height point.

(iv) The diameter tape must be taut and at right-angles to the stem.

(v) On *sloping ground* always measure the diameter at 1·3 m from ground level on the upper-side of the tree.

(vi) On *leaning trees* always measure the diameter at 1·3 m from ground level on the under-side of the tree.

(vii) Where trees are planted on *turfed or ploughed ground*, the diameter should be measured 1·3 m from the root collar or present ground level, whichever is the higher.

(viii) Where a *swelling* occurs at 1·3 m above ground level, measure the girth below the swelling, or deformity at the point where the diameter is smallest.

(ix) Where the stem *forks* below 1·3 m treat each limb as a separate tree. Where a stem is forked at 1·3 m, treat the stem as one tree and measure the diameter below the fork at the point where it is smallest.

(x) *Coppice* crops should be girthed at 1·3 m from ground level, not from stool level.

(g) Volume measurement conventions

(i) The *volume* of felled trees is derived from measurements of timber length and mid-diameter using FC Booklet 26 (*Metric Volume Ready Reckoner*).

(ii) The *minimum top diameter* for volume measurement is 7 cm overbark, or the spring of the crown, whichever occurs first.

(iii) The *length* of the felled tree is measured from the butt to 7 cm top diameter (ie timber length) rounding down to the nearest 0·1 m for lengths less than 10 m and to the nearest whole metre for lengths greater than 10 m.

(iv) On *curved* stems, lengths will be measured along the curvature and not in a direct line from butt to timber length point.

(v) The *diameter* at the mid-point of the rounded down length is measured, rounding down to the nearest whole centimetre.

(vi) If the mid-diameter point falls on a *whorl or swelling*, the diameter should be measured immediately above it (ie towards the small end).

(vii) If the *mid-point* of the timber length *falls below breast height point*, the breast height diameter should be regarded as the mid-diameter and the volume calculated accordingly.

(viii) Where the rounded down *timber length exceeds 20 m* it should be measured in two sections. Measured from the butt end the butt section will be the timber length divided by two but rounded down to the nearest whole metre. The top section will be the remaining length.

Example: Timber length 25 m (rounded down)

$$\text{Butt section } \frac{25}{2} = 12 \text{ m (rounded down)}$$

$$\text{Top section } 25 - 12 = 13 \text{ m}$$

(ix) Where trees are *forked at or above breast height*, the butt will be measured as one log. The volume of the limbs will also be measured and added to that of the butt to give the volume of the tree.

(x) Where trees are *forked below breast height* each limb is treated as a separate tree and will be girthed as such. The volume of the tree is therefore the volume of the appropriate limb. The volume of the butt piece will be ignored, its length being excluded in determining the volume of the tree.

WORKED EXAMPLE

FORESTRY COMMISSION

VOLUME ESTIMATE — THINNINGS / FELLINGS

CONSERVANCY WEST (WALES) FOREST CADER COMPT. NO 68

SPECIES SITKA SPRUCE AREA 6·5 ha. AGE (Yrs) 30 YIELD CLASS 20

SAMPLING SCHEME A DATE MEASURED 4/72 SIGNATURE S. James

A.

Species	Trials		Average vol. per tree m³	Average d.b.h. cm	Volume* m³ to	
	No. of trees	Volume m³			18 cm top diam	24 cm top diam
1.	2.	3.	4.	5.	6.	7.
SITKA SPRUCE	2169	437·8	0·202	18	111·6	7·9

Extra No. of trees to be felled

Sum of girths of trees to be felled

*From assortment tables.

D. DETAILS OF SAMPLE TREES FELLED AND MEASURED

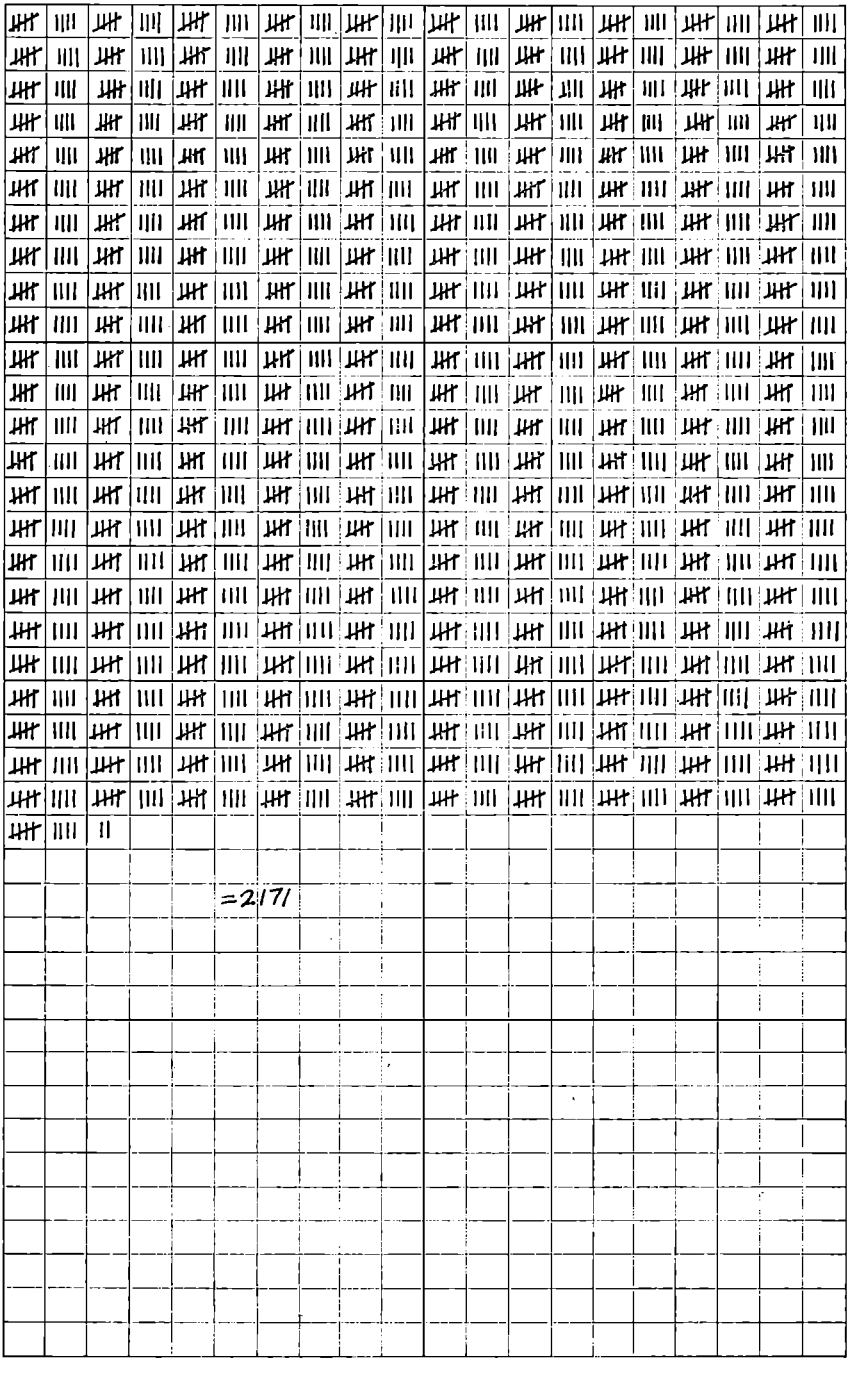
Tree No.	d.b.h. cm	Length to 7 cm top diam	Mid diam cm	Volume m³	Tariff No.
1	18	12	15	0·21	30
2	20	13	15	0·23	26
3	21	13	17	0·30	31
4	15	8·9	13	0·118	26
5	21	14	17	0·32	33
6	25	15	18	0·38	26
7	19	14	15	0·25	32
8	17	11	13	0·15	24
9	15	10	13	0·13	29
10	19	13	15	0·23	29
11	18	12	15	0·21	30
12	20	14	16	0·28	32
13	19	13	15	0·23	29
14	17	11	14	0·17	28
15	14	9·4	12	0·106	28
16	9	–	–	–	–
17	12	9·5	10	0·075	30
18	24	15	18	0·38	29
19	20	14	15	0·25	28
20	16	12	13	0·16	30
21	18	13	14	0·20	29
22	18	11	15	0·19	27
23	16	12	13	0·16	30
24	27	18	20	0·57	34
25					
Total c. fwd					670

Tree No.	d.b.h. cm	Length to 7 cm top diam	Mid diam cm	Volume m³	Tariff No.
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
Total b. fwd					
GRAND TOTAL					670

Mean Tariff Number = $\frac{\text{Grand Total of T. Nos.}}{\text{No. of sample trees}}$ (Omit trees of 7, 8 and 9 cm d.b.h.) $= \frac{670}{23} = 29{\cdot}1 = 29$ (rounded down)

U15

B. RECORD OF TREES MARKED · By Gate method – one gate to each square



C. TREES GIRTHED

d b h cm	Tally of girth sample trees	Sample total No.	Stand total No.*	Vol. per tree† m^3	Vol. of class (Cols. 4 x 5) m^3
(1)	(2)	(3)	(4)	(5)	(6)
9	𝍸	4	36	0·028	1·0
10	𝍸 I	6	54	0·041	2·2
11	𝍸	4	36	0·056	2·0
12	𝍸 𝍸	9	81	0·073	5·9
13	𝍸 𝍸 I	11	99	0·091	9·0
14	𝍸 𝍸 𝍸 III	18	162	0·110	17·8
15	𝍸 𝍸 𝍸	14	126	0·131	16·5
16	𝍸 𝍸 𝍸 𝍸 𝍸	25	225	0·153	34·4
17	𝍸 𝍸 𝍸 𝍸 𝍸 II	27	243	0·176	42·8
18	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 I	31	279	0·201	56·1
19	𝍸 𝍸 𝍸 𝍸 𝍸 III	28	252	0·228	57·5
20	𝍸 𝍸 𝍸 II	17	153	0·256	39·2
21	𝍸 𝍸 II	12	108	0·28	30·2
22	𝍸 𝍸 I	11	99	0·32	31·7
23	𝍸	4	36	0·35	12·6
24	𝍸 II	7	63	0·38	23·9
25	𝍸 I	6	54	0·42	22·7
26	II	2	18	0·45	8·1
27	I	1	9	0·49	4·4
28	II	2	18	0·53	9·5
29	II	2	18	0·57	10·3
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
Grand Totals		241	2169		437·8

*(Col. 4) Multiplication factor =

$$\frac{\text{No. of trees in stand}}{\text{No. of trees in sample}} \quad \frac{2171}{241} = 9$$

†(Col. 5) Volume per tree is obtained from the Tariff Tables using column appropriate for mean Tariff number

TARIFF TABLES

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 10	11	12	13	14	15	16	17	18	19	20	DBH CM
7	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	7
8	0.009	0.009	0.009	0.010	0.010	0.011	0.011	0.011	0.012	0.012	0.012	8
9	0.013	0.014	0.014	0.015	0.016	0.017	0.018	0.018	0.019	0.020	0.021	9
10	0.017	0.019	0.020	0.021	0.023	0.024	0.025	0.026	0.028	0.029	0.030	10
11	0.023	0.024	0.026	0.028	0.030	0.032	0.033	0.035	0.037	0.039	0.040	11
12	0.028	0.031	0.033	0.035	0.038	0.040	0.042	0.045	0.047	0.049	0.052	12
13	0.034	0.037	0.040	0.043	0.046	0.049	0.052	0.055	0.058	0.061	0.064	13
14	0.041	0.045	0.048	0.052	0.055	0.059	0.063	0.066	0.070	0.074	0.077	14
15	0.048	0.052	0.057	0.061	0.065	0.070	0.074	0.078	0.083	0.087	0.092	15
16	0.056	0.061	0.066	0.071	0.076	0.081	0.086	0.091	0.097	0.102	0.107	16
17	0.064	0.070	0.075	0.081	0.087	0.093	0.099	0.105	0.111	0.117	0.123	17
18	0.072	0.079	0.086	0.093	0.099	0.106	0.113	0.120	0.127	0.133	0.140	18
19	0.081	0.089	0.097	0.104	0.112	0.120	0.127	0.135	0.143	0.151	0.158	19
20	0.091	0.099	0.108	0.117	0.125	0.134	0.143	0.151	0.160	0.169	0.178	20
21	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	21
22	0.11	0.12	0.13	0.14	0.15	0.16	0.18	0.19	0.20	0.21	0.22	22
23	0.12	0.13	0.15	0.16	0.17	0.18	0.19	0.21	0.22	0.23	0.24	23
24	0.13	0.15	0.16	0.17	0.19	0.20	0.21	0.22	0.24	0.25	0.26	24
25	0.15	0.16	0.17	0.19	0.20	0.22	0.23	0.25	0.26	0.27	0.29	25
26	0.16	0.17	0.19	0.20	0.22	0.24	0.25	0.27	0.28	0.30	0.31	26
27	0.17	0.19	0.20	0.22	0.24	0.26	0.27	0.29	0.31	0.32	0.34	27
28	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.37	28
29	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.37	0.39	29
30	0.21	0.23	0.25	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	30
31	0.23	0.25	0.27	0.30	0.32	0.34	0.36	0.39	0.41	0.43	0.45	31
32	0.24	0.27	0.29	0.32	0.34	0.36	0.39	0.41	0.44	0.46	0.48	32
33	0.26	0.28	0.31	0.34	0.36	0.39	0.41	0.44	0.46	0.49	0.52	33
34	0.28	0.30	0.33	0.36	0.38	0.41	0.44	0.47	0.49	0.52	0.55	34
35	0.29	0.32	0.35	0.38	0.41	0.44	0.47	0.50	0.52	0.55	0.58	35
36	0.31	0.34	0.37	0.40	0.43	0.46	0.49	0.53	0.56	0.59	0.62	36
37	0.33	0.36	0.39	0.43	0.46	0.49	0.52	0.56	0.59	0.62	0.65	37
38	0.35	0.38	0.41	0.45	0.48	0.52	0.55	0.59	0.62	0.66	0.69	38
39	0.36	0.40	0.44	0.47	0.51	0.55	0.58	0.62	0.66	0.69	0.73	39
40	0.38	0.42	0.46	0.50	0.54	0.58	0.61	0.65	0.69	0.73	0.77	40
41	0.40	0.44	0.48	0.52	0.56	0.61	0.65	0.69	0.73	0.77	0.81	41
42	0.42	0.47	0.51	0.55	0.59	0.64	0.68	0.72	0.76	0.81	0.85	42
43	0.44	0.49	0.53	0.58	0.62	0.67	0.71	0.76	0.80	0.85	0.89	43
44	0.47	0.51	0.56	0.61	0.65	0.70	0.75	0.79	0.84	0.89	0.93	44
45	0.49	0.54	0.58	0.63	0.68	0.73	0.78	0.83	0.88	0.93	0.98	45
46	0.51	0.56	0.61	0.66	0.71	0.77	0.82	0.87	0.92	0.97	1.02	46
47	0.53	0.59	0.64	0.69	0.75	0.80	0.85	0.91	0.96	1.01	1.07	47
48	0.56	0.61	0.67	0.72	0.78	0.83	0.89	0.95	1.00	1.06	1.11	48
49	0.58	0.64	0.70	0.75	0.81	0.87	0.93	0.99	1.04	1.10	1.16	49
50	0.60	0.66	0.72	0.78	0.85	0.91	0.97	1.03	1.09	1.15	1.21	50

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 10	11	12	13	14	15	16	17	18	19	20	DBH CM
51	0.63	0.69	0.75	0.82	0.88	0.94	1.01	1.07	1.13	1.20	1.26	51
52	0.65	0.72	0.78	0.85	0.92	0.98	1.05	1.11	1.18	1.24	1.31	52
53	0.68	0.75	0.82	0.88	0.95	1.02	1.09	1.16	1.22	1.29	1.36	53
54	0.70	0.78	0.85	0.92	0.99	1.06	1.13	1.20	1.27	1.34	1.41	54
55	0.73	0.80	0.88	0.95	1.03	1.10	1.17	1.25	1.32	1.39	1.47	55
56	0.76	0.83	0.91	0.99	1.06	1.14	1.22	1.29	1.37	1.45	1.52	56
57	0.79	0.86	0.94	1.02	1.10	1.18	1.26	1.34	1.42	1.50	1.58	57
58	0.81	0.90	0.98	1.06	1.14	1.22	1.31	1.39	1.47	1.55	1.63	58
59	0.84	0.93	1.01	1.10	1.18	1.27	1.35	1.44	1.52	1.61	1.69	59
60	0.87	0.96	1.05	1.13	1.22	1.31	1.40	1.49	1.57	1.66	1.75	60
61	0.90	0.99	1.08	1.17	1.26	1.36	1.45	1.54	1.63	1.72	1.81	61
62	0.93	1.02	1.12	1.21	1.31	1.40	1.49	1.59	1.68	1.78	1.87	62
63	0.96	1.06	1.16	1.25	1.35	1.45	1.54	1.64	1.74	1.83	1.93	63
64	0.99	1.09	1.19	1.29	1.39	1.49	1.59	1.69	1.79	1.89	1.99	64
65	1.02	1.13	1.23	1.33	1.44	1.54	1.64	1.75	1.85	1.95	2.06	65
66	1.06	1.16	1.27	1.38	1.48	1.59	1.70	1.80	1.91	2.01	2.12	66
67	1.09	1.20	1.31	1.42	1.53	1.64	1.75	1.86	1.97	2.08	2.19	67
68	1.12	1.23	1.35	1.46	1.57	1.69	1.80	1.91	2.03	2.14	2.25	68
69	1.15	1.27	1.39	1.50	1.62	1.74	1.85	1.97	2.09	2.20	2.32	69
70	1.19	1.31	1.43	1.55	1.67	1.79	1.91	2.03	2.15	2.27	2.39	70
71	1.22	1.35	1.47	1.59	1.72	1.84	1.96	2.09	2.21	2.33	2.46	71
72	1.26	1.38	1.51	1.64	1.77	1.89	2.02	2.15	2.27	2.40	2.53	72
73	1.29	1.42	1.55	1.69	1.82	1.95	2.08	2.21	2.34	2.47	2.60	73
74	1.33	1.46	1.60	1.73	1.87	2.00	2.13	2.27	2.40	2.54	2.67	74
75	1.37	1.50	1.64	1.78	1.92	2.06	2.19	2.33	2.47	2.61	2.75	75
76	1.40	1.54	1.69	1.83	1.97	2.11	2.25	2.39	2.54	2.68	2.82	76
77	1.44	1.59	1.73	1.88	2.02	2.17	2.31	2.46	2.60	2.75	2.89	77
78	1.48	1.63	1.78	1.93	2.07	2.22	2.37	2.52	2.67	2.82	2.97	78
79	1.52	1.67	1.82	1.98	2.13	2.28	2.44	2.59	2.74	2.89	3.05	79
80	1.55	1.71	1.87	2.03	2.18	2.34	2.50	2.65	2.81	2.97	3.13	80

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 20	21	22	23	24	25	26	27	28	29	30	DBH CM
7	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	7
8	0.012	0.013	0.013	0.014	0.014	0.014	0.015	0.015	0.015	0.016	0.016	8
9	0.021	0.022	0.022	0.023	0.024	0.025	0.026	0.026	0.027	0.028	0.029	9
10	0.030	0.031	0.033	0.034	0.035	0.036	0.038	0.039	0.040	0.041	0.043	10
11	0.040	0.042	0.044	0.046	0.048	0.049	0.051	0.053	0.055	0.056	0.058	11
12	0.052	0.054	0.056	0.059	0.061	0.063	0.066	0.068	0.071	0.073	0.075	12
13	0.064	0.067	0.070	0.073	0.076	0.079	0.082	0.085	0.088	0.091	0.094	13
14	0.077	0.081	0.085	0.088	0.092	0.095	0.099	0.103	0.106	0.110	0.114	14
15	0.092	0.096	0.100	0.105	0.109	0.113	0.118	0.122	0.126	0.131	0.135	15
16	0.107	0.112	0.117	0.122	0.127	0.132	0.138	0.143	0.148	0.153	0.158	16
17	0.123	0.129	0.135	0.141	0.147	0.153	0.159	0.165	0.170	0.176	0.182	17
18	0.140	0.147	0.154	0.161	0.167	0.174	0.181	0.188	0.195	0.201	0.208	18
19	0.158	0.166	0.174	0.182	0.189	0.197	0.205	0.212	0.220	0.228	0.236	19
20	0.178	0.186	0.195	0.204	0.212	0.221	0.230	0.238	0.247	0.256	0.264	20
21	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.28	0.29	21
22	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.32	0.33	22
23	0.24	0.25	0.26	0.28	0.29	0.30	0.31	0.32	0.34	0.35	0.36	23
24	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.38	0.39	24
25	0.29	0.30	0.32	0.33	0.35	0.36	0.37	0.39	0.40	0.42	0.43	25
26	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.47	26
27	0.34	0.36	0.37	0.39	0.41	0.42	0.44	0.46	0.47	0.49	0.51	27
28	0.37	0.38	0.40	0.42	0.44	0.46	0.48	0.49	0.51	0.53	0.55	28
29	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57	0.59	29
30	0.42	0.44	0.47	0.49	0.51	0.53	0.55	0.57	0.59	0.61	0.63	30
31	0.45	0.48	0.50	0.52	0.54	0.57	0.59	0.61	0.63	0.66	0.68	31
32	0.48	0.51	0.53	0.56	0.58	0.60	0.63	0.65	0.68	0.70	0.73	32
33	0.52	0.54	0.57	0.59	0.62	0.64	0.67	0.70	0.72	0.75	0.77	33
34	0.55	0.58	0.60	0.63	0.66	0.69	0.71	0.74	0.77	0.80	0.82	34
35	0.58	0.61	0.64	0.67	0.70	0.73	0.76	0.79	0.82	0.84	0.87	35
36	0.62	0.65	0.68	0.71	0.74	0.77	0.80	0.83	0.86	0.90	0.93	36
37	0.65	0.69	0.72	0.75	0.78	0.82	0.85	0.88	0.92	0.95	0.98	37
38	0.69	0.73	0.76	0.79	0.83	0.86	0.90	0.93	0.97	1.00	1.04	38
39	0.73	0.76	0.80	0.84	0.87	0.91	0.95	0.98	1.02	1.06	1.09	39
40	0.77	0.81	0.84	0.88	0.92	0.96	1.00	1.04	1.07	1.11	1.15	40
41	0.81	0.85	0.89	0.93	0.97	1.01	1.05	1.09	1.13	1.17	1.21	41
42	0.85	0.89	0.93	0.98	1.02	1.06	1.10	1.14	1.19	1.23	1.27	42
43	0.89	0.93	0.98	1.02	1.07	1.11	1.16	1.20	1.25	1.29	1.33	43
44	0.93	0.98	1.03	1.07	1.12	1.17	1.21	1.26	1.31	1.35	1.40	44
45	0.98	1.02	1.07	1.12	1.17	1.22	1.27	1.32	1.37	1.42	1.47	45
46	1.02	1.07	1.12	1.17	1.23	1.28	1.33	1.38	1.43	1.48	1.53	46
47	1.07	1.12	1.17	1.23	1.28	1.33	1.39	1.44	1.49	1.55	1.60	47
48	1.11	1.17	1.22	1.28	1.34	1.39	1.45	1.50	1.56	1.62	1.67	48
49	1.16	1.22	1.28	1.34	1.39	1.45	1.51	1.57	1.63	1.68	1.74	49
50	1.21	1.27	1.33	1.39	1.45	1.51	1.57	1.63	1.69	1.76	1.82	50

VOLUMES IN CUBIC METRES OVER BARK.

DBH CM	TARIFF NUMBER 20	21	22	23	24	25	26	27	28	29	30	DBH CM
51	1.26	1.32	1.39	1.45	1.51	1.57	1.64	1.70	1.76	1.83	1.89	51
52	1.31	1.38	1.44	1.51	1.57	1.64	1.70	1.77	1.84	1.90	1.97	52
53	1.36	1.43	1.50	1.57	1.63	1.70	1.77	1.84	1.91	1.98	2.04	53
54	1.41	1.48	1.56	1.63	1.70	1.77	1.84	1.91	1.98	2.05	2.12	54
55	1.47	1.54	1.61	1.69	1.76	1.84	1.91	1.98	2.06	2.13	2.20	55
56	1.52	1.60	1.67	1.75	1.83	1.90	1.98	2.06	2.13	2.21	2.29	56
57	1.58	1.66	1.74	1.82	1.89	1.97	2.05	2.13	2.21	2.29	2.37	57
58	1.63	1.72	1.80	1.88	1.96	2.04	2.13	2.21	2.29	2.37	2.45	58
59	1.69	1.78	1.86	1.95	2.03	2.12	2.20	2.29	2.37	2.46	2.54	59
60	1.75	1.84	1.93	2.01	2.10	2.19	2.28	2.37	2.45	2.54	2.63	60
61	1.81	1.90	1.99	2.08	2.17	2.26	2.35	2.45	2.54	2.63	2.72	61
62	1.87	1.96	2.06	2.15	2.25	2.34	2.43	2.53	2.62	2.72	2.81	62
63	1.93	2.03	2.13	2.22	2.32	2.42	2.51	2.61	2.71	2.80	2.90	63
64	1.99	2.09	2.19	2.29	2.39	2.49	2.59	2.69	2.79	2.90	3.00	64
65	2.06	2.16	2.26	2.37	2.47	2.57	2.68	2.78	2.88	2.99	3.09	65
66	2.12	2.23	2.33	2.44	2.55	2.65	2.76	2.87	2.97	3.08	3.19	66
67	2.19	2.30	2.41	2.52	2.63	2.74	2.85	2.96	3.07	3.18	3.29	67
68	2.25	2.37	2.48	2.59	2.71	2.82	2.93	3.05	3.16	3.27	3.39	68
69	2.32	2.44	2.55	2.67	2.79	2.90	3.02	3.14	3.25	3.37	3.49	69
70	2.39	2.51	2.63	2.75	2.87	2.99	3.11	3.23	3.35	3.47	3.59	70
71	2.46	2.58	2.71	2.83	2.95	3.08	3.20	3.32	3.45	3.57	3.69	71
72	2.53	2.66	2.78	2.91	3.04	3.16	3.29	3.42	3.54	3.67	3.80	72
73	2.60	2.73	2.86	2.99	3.12	3.25	3.38	3.51	3.64	3.78	3.91	73
74	2.67	2.81	2.94	3.07	3.21	3.34	3.48	3.61	3.75	3.88	4.01	74
75	2.75	2.88	3.02	3.16	3.30	3.44	3.57	3.71	3.85	3.99	4.12	75
76	2.82	2.96	3.10	3.24	3.39	3.53	3.67	3.81	3.95	4.09	4.24	76
77	2.89	3.04	3.19	3.33	3.48	3.62	3.77	3.91	4.06	4.20	4.35	77
78	2.97	3.12	3.27	3.42	3.57	3.72	3.87	4.02	4.17	4.31	4.46	78
79	3.05	3.20	3.35	3.51	3.66	3.81	3.97	4.12	4.27	4.43	4.58	79
80	3.13	3.28	3.44	3.60	3.75	3.91	4.07	4.23	4.38	4.54	4.70	80
81	3.21	3.37	3.53	3.69	3.85	4.01	4.17	4.33	4.49	4.66	4.82	81
82	3.29	3.45	3.62	3.78	3.95	4.11	4.28	4.44	4.61	4.77	4.94	82
83	3.37	3.54	3.70	3.87	4.04	4.21	4.38	4.55	4.72	4.89	5.06	83
84	3.45	3.62	3.80	3.97	4.14	4.32	4.49	4.66	4.84	5.01	5.18	84
85	3.53	3.71	3.89	4.06	4.24	4.42	4.60	4.77	4.95	5.13	5.31	85
86	3.62	3.80	3.98	4.16	4.34	4.52	4.71	4.89	5.07	5.25	5.43	86
87	3.70	3.89	4.07	4.26	4.44	4.63	4.82	5.00	5.19	5.38	5.56	87
88	3.79	3.98	4.17	4.36	4.55	4.74	4.93	5.12	5.31	5.50	5.69	88
89	3.87	4.07	4.26	4.46	4.65	4.85	5.04	5.24	5.43	5.63	5.82	89
90	3.96	4.16	4.36	4.56	4.76	4.96	5.16	5.36	5.56	5.75	5.95	90
91	4.05	4.25	4.46	4.66	4.87	5.07	5.27	5.48	5.68	5.88	6.09	91
92	4.14	4.35	4.56	4.76	4.97	5.18	5.39	5.60	5.81	6.01	6.22	92
93	4.23	4.44	4.66	4.87	5.08	5.30	5.51	5.72	5.93	6.15	6.36	93
94	4.32	4.54	4.76	4.98	5.19	5.41	5.63	5.85	6.06	6.28	6.50	94
95	4.42	4.64	4.86	5.08	5.30	5.53	5.75	5.97	6.19	6.41	6.64	95
96	4.51	4.74	4.96	5.19	5.42	5.64	5.87	6.10	6.32	6.55	6.78	96
97	4.60	4.84	5.07	5.30	5.53	5.76	5.99	6.23	6.46	6.69	6.92	97
98	4.70	4.94	5.17	5.41	5.65	5.88	6.12	6.36	6.59	6.83	7.06	98
99	4.80	5.04	5.28	5.52	5.76	6.00	6.25	6.49	6.73	6.97	7.21	99
100	4.90	5.14	5.39	5.63	5.88	6.13	6.37	6.62	6.86	7.11	7.36	100

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 30	31	32	33	34	35	36	37	38	39	40	DBH CM
7	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	7
8	0.016	0.017	0.017	0.017	0.018	0.018	0.018	0.019	0.019	0.019	0.020	8
9	0.029	0.029	0.030	0.031	0.032	0.033	0.033	0.034	0.035	0.036	0.037	9
10	0.043	0.044	0.045	0.047	0.048	0.049	0.050	0.052	0.053	0.054	0.055	10
11	0.058	0.060	0.062	0.064	0.065	0.067	0.069	0.071	0.072	0.074	0.076	11
12	0.075	0.078	0.080	0.082	0.085	0.087	0.089	0.092	0.094	0.096	0.099	12
13	0.094	0.097	0.100	0.103	0.106	0.109	0.112	0.114	0.117	0.120	0.123	13
14	0.114	0.117	0.121	0.125	0.128	0.132	0.135	0.139	0.143	0.146	0.150	14
15	0.135	0.139	0.144	0.148	0.153	0.157	0.161	0.166	0.170	0.174	0.179	15
16	0.158	0.163	0.168	0.173	0.178	0.184	0.189	0.194	0.199	0.204	0.209	16
17	0.182	0.188	0.194	0.200	0.206	0.212	0.218	0.224	0.230	0.236	0.242	17
18	0.208	0.215	0.222	0.229	0.235	0.242	0.249	0.256	0.263	0.269	0.276	18
19	0.236	0.243	0.251	0.259	0.266	0.274	0.282	0.290	0.297	0.305	0.313	19
20	0.264	0.273	0.282	0.290	0.299	0.308	0.316	0.325	0.334	0.343	0.351	20
21	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	21
22	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	22
23	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.44	0.45	0.47	0.48	23
24	0.39	0.41	0.42	0.43	0.45	0.46	0.47	0.49	0.50	0.51	0.52	24
25	0.43	0.44	0.46	0.47	0.49	0.50	0.52	0.53	0.54	0.56	0.57	25
26	0.47	0.48	0.50	0.51	0.53	0.55	0.56	0.58	0.59	0.61	0.62	26
27	0.51	0.52	0.54	0.56	0.57	0.59	0.61	0.63	0.64	0.66	0.68	27
28	0.55	0.57	0.58	0.60	0.62	0.64	0.66	0.68	0.69	0.71	0.73	28
29	0.59	0.61	0.63	0.65	0.67	0.69	0.71	0.73	0.75	0.77	0.79	29
30	0.63	0.65	0.68	0.70	0.72	0.74	0.76	0.78	0.80	0.82	0.84	30
31	0.68	0.70	0.72	0.75	0.77	0.79	0.81	0.84	0.86	0.88	0.90	31
32	0.73	0.75	0.77	0.80	0.82	0.85	0.87	0.89	0.92	0.94	0.97	32
33	0.77	0.80	0.82	0.85	0.88	0.90	0.93	0.95	0.98	1.01	1.03	33
34	0.82	0.85	0.88	0.91	0.93	0.96	0.99	1.01	1.04	1.07	1.10	34
35	0.87	0.90	0.93	0.96	0.99	1.02	1.05	1.08	1.11	1.14	1.16	35
36	0.93	0.96	0.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	36
37	0.98	1.01	1.05	1.08	1.11	1.14	1.18	1.21	1.24	1.27	1.31	37
38	1.04	1.07	1.10	1.14	1.17	1.21	1.24	1.28	1.31	1.35	1.38	38
39	1.09	1.13	1.17	1.20	1.24	1.27	1.31	1.35	1.38	1.42	1.46	39
40	1.15	1.19	1.23	1.27	1.30	1.34	1.38	1.42	1.46	1.50	1.53	40
41	1.21	1.25	1.29	1.33	1.37	1.41	1.45	1.49	1.53	1.57	1.61	41
42	1.27	1.31	1.36	1.40	1.44	1.48	1.53	1.57	1.61	1.65	1.70	42
43	1.33	1.38	1.42	1.47	1.51	1.56	1.60	1.65	1.69	1.74	1.78	43
44	1.40	1.45	1.49	1.54	1.59	1.63	1.68	1.73	1.77	1.82	1.87	44
45	1.47	1.51	1.56	1.61	1.66	1.71	1.76	1.81	1.86	1.91	1.95	45
46	1.53	1.58	1.63	1.69	1.74	1.79	1.84	1.89	1.94	1.99	2.04	46
47	1.60	1.65	1.71	1.76	1.81	1.87	1.92	1.98	2.03	2.08	2.14	47
48	1.67	1.73	1.78	1.84	1.89	1.95	2.01	2.06	2.12	2.17	2.23	48
49	1.74	1.80	1.86	1.92	1.98	2.03	2.09	2.15	2.21	2.27	2.32	49
50	1.82	1.88	1.94	2.00	2.06	2.12	2.18	2.24	2.30	2.36	2.42	50

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 30	31	32	33	34	35	36	37	38	39	40	DBH CM
51	1.89	1.95	2.02	2.08	2.14	2.21	2.27	2.33	2.40	2.46	2.52	51
52	1.97	2.03	2.10	2.16	2.23	2.30	2.36	2.43	2.49	2.56	2.62	52
53	2.04	2.11	2.18	2.25	2.32	2.39	2.45	2.52	2.59	2.66	2.73	53
54	2.12	2.19	2.27	2.34	2.41	2.48	2.55	2.62	2.69	2.76	2.83	54
55	2.20	2.28	2.35	2.42	2.50	2.57	2.65	2.72	2.79	2.87	2.94	55
56	2.29	2.36	2.44	2.52	2.59	2.67	2.74	2.82	2.90	2.97	3.05	56
57	2.37	2.45	2.53	2.61	2.69	2.77	2.84	2.92	3.00	3.08	3.16	57
58	2.45	2.54	2.62	2.70	2.78	2.86	2.95	3.03	3.11	3.19	3.27	58
59	2.54	2.63	2.71	2.80	2.88	2.97	3.05	3.14	3.22	3.31	3.39	59
60	2.63	2.72	2.80	2.89	2.98	3.07	3.16	3.24	3.33	3.42	3.51	60
61	2.72	2.81	2.90	2.99	3.08	3.17	3.26	3.35	3.44	3.54	3.63	61
62	2.81	2.90	3.00	3.09	3.18	3.28	3.37	3.47	3.56	3.65	3.75	62
63	2.90	3.00	3.10	3.19	3.29	3.39	3.48	3.58	3.68	3.77	3.87	63
64	3.00	3.10	3.20	3.30	3.40	3.50	3.60	3.70	3.80	3.90	4.00	64
65	3.09	3.19	3.30	3.40	3.50	3.61	3.71	3.81	3.92	4.02	4.12	65
66	3.19	3.29	3.40	3.51	3.61	3.72	3.83	3.93	4.04	4.15	4.25	66
67	3.29	3.40	3.51	3.62	3.73	3.83	3.94	4.05	4.16	4.27	4.38	67
68	3.39	3.50	3.61	3.72	3.84	3.95	4.06	4.18	4.29	4.40	4.52	68
69	3.49	3.60	3.72	3.84	3.95	4.07	4.19	4.30	4.42	4.54	4.65	69
70	3.59	3.71	3.83	3.95	4.07	4.19	4.31	4.43	4.55	4.67	4.79	70
71	3.69	3.82	3.94	4.06	4.19	4.31	4.43	4.56	4.68	4.81	4.93	71
72	3.80	3.93	4.05	4.18	4.31	4.43	4.56	4.69	4.82	4.94	5.07	72
73	3.91	4.04	4.17	4.30	4.43	4.56	4.69	4.82	4.95	5.08	5.21	73
74	4.01	4.15	4.28	4.42	4.55	4.69	4.82	4.95	5.09	5.22	5.36	74
75	4.12	4.26	4.40	4.54	4.68	4.81	4.95	5.09	5.23	5.37	5.50	75
76	4.24	4.38	4.52	4.66	4.80	4.95	5.09	5.23	5.37	5.51	5.65	76
77	4.35	4.49	4.64	4.79	4.93	5.08	5.22	5.37	5.51	5.66	5.80	77
78	4.46	4.61	4.76	4.91	5.06	5.21	5.36	5.51	5.66	5.81	5.96	78
79	4.58	4.73	4.89	5.04	5.19	5.35	5.50	5.65	5.81	5.96	6.11	79
80	4.70	4.85	5.01	5.17	5.33	5.48	5.64	5.80	5.95	6.11	6.27	80
81	4.82	4.98	5.14	5.30	5.46	5.62	5.78	5.94	6.11	6.27	6.43	81
82	4.94	5.10	5.27	5.43	5.60	5.76	5.93	6.09	6.26	6.42	6.59	82
83	5.06	5.23	5.40	5.57	5.74	5.91	6.07	6.24	6.41	6.58	6.75	83
84	5.18	5.36	5.53	5.70	5.88	6.05	6.22	6.40	6.57	6.74	6.92	84
85	5.31	5.48	5.66	5.84	6.02	6.19	6.37	6.55	6.73	6.91	7.08	85
86	5.43	5.62	5.80	5.98	6.16	6.34	6.52	6.71	6.89	7.07	7.25	86
87	5.56	5.75	5.93	6.12	6.31	6.49	6.68	6.86	7.05	7.24	7.42	87
88	5.69	5.88	6.07	6.26	6.45	6.64	6.83	7.02	7.21	7.40	7.59	88
89	5.82	6.02	6.21	6.41	6.60	6.80	6.99	7.18	7.38	7.57	7.77	89
90	5.95	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95	90
91	6.09	6.29	6.49	6.70	6.90	7.11	7.31	7.51	7.72	7.92	8.12	91
92	6.22	6.43	6.64	6.85	7.06	7.26	7.47	7.68	7.89	8.10	8.30	92
93	6.36	6.57	6.78	7.00	7.21	7.42	7.64	7.85	8.06	8.27	8.49	93
94	6.50	6.71	6.93	7.15	7.37	7.58	7.80	8.02	8.24	8.45	8.67	94
95	6.64	6.86	7.08	7.30	7.53	7.75	7.97	8.19	8.41	8.64	8.86	95
96	6.78	7.00	7.23	7.46	7.69	7.91	8.14	8.37	8.59	8.82	9.05	96
97	6.92	7.15	7.38	7.62	7.85	8.08	8.31	8.54	8.77	9.01	9.24	97
98	7.06	7.30	7.54	7.77	8.01	8.25	8.48	8.72	8.96	9.19	9.43	98
99	7.21	7.45	7.69	7.93	8.18	8.42	8.66	8.90	9.14	9.38	9.62	99
100	7.36	7.60	7.85	8.10	8.34	8.59	8.83	9.08	9.33	9.57	9.82	100

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 40	41	42	43	44	45	46	47	48	49	50	DBH CM
7	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	7
8	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.022	0.023	0.023	0.024	8
9	0.037	0.037	0.038	0.039	0.040	0.041	0.041	0.042	0.043	0.044	0.045	9
10	0.055	0.057	0.058	0.059	0.060	0.062	0.063	0.064	0.065	0.067	0.068	10
11	0.076	0.078	0.080	0.081	0.083	0.085	0.087	0.089	0.090	0.092	0.094	11
12	0.099	0.101	0.103	0.106	0.108	0.110	0.113	0.115	0.110	0.120	0.122	12
13	0.123	0.126	0.129	0.132	0.135	0.138	0.141	0.144	0.147	0.150	0.153	13
14	0.150	0.154	0.157	0.161	0.165	0.168	0.172	0.175	0.179	0.183	0.186	14
15	0.179	0.183	0.187	0.192	0.196	0.200	0.205	0.209	0.213	0.218	0.222	15
16	0.209	0.214	0.219	0.225	0.230	0.235	0.240	0.245	0.250	0.255	0.260	16
17	0.242	0.248	0.254	0.260	0.266	0.271	0.277	0.283	0.289	0.295	0.301	17
18	0.276	0.283	0.290	0.297	0.303	0.310	0.317	0.324	0.331	0.338	0.344	18
19	0.313	0.320	0.328	0.336	0.344	0.351	0.359	0.367	0.375	0.382	0.390	19
20	0.351	0.360	0.369	0.377	0.386	0.395	0.403	0.412	0.421	0.429	0.438	20
21	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	21
22	0.43	0.44	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	22
23	0.48	0.49	0.50	0.51	0.53	0.54	0.55	0.56	0.57	0.59	0.60	23
24	0.52	0.54	0.55	0.56	0.58	0.59	0.60	0.62	0.63	0.64	0.66	24
25	0.57	0.59	0.60	0.62	0.63	0.64	0.66	0.67	0.69	0.70	0.72	25
26	0.62	0.64	0.65	0.67	0.69	0.70	0.72	0.73	0.75	0.76	0.78	26
27	0.68	0.69	0.71	0.73	0.74	0.76	0.78	0.79	0.81	0.83	0.84	27
28	0.73	0.75	0.77	0.78	0.80	0.82	0.84	0.86	0.88	0.89	0.91	28
29	0.79	0.81	0.83	0.84	0.86	0.88	0.90	0.92	0.94	0.96	0.98	29
30	0.84	0.87	0.89	0.91	0.93	0.95	0.97	0.99	1.01	1.03	1.05	30
31	0.90	0.93	0.95	0.97	0.99	1.02	1.04	1.06	1.09	1.11	1.13	31
32	0.97	0.99	1.01	1.04	1.06	1.09	1.11	1.14	1.16	1.18	1.21	32
33	1.03	1.06	1.08	1.11	1.13	1.16	1.19	1.21	1.24	1.26	1.29	33
34	1.10	1.12	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.37	34
35	1.16	1.19	1.22	1.25	1.28	1.31	1.34	1.37	1.40	1.43	1.46	35
36	1.23	1.27	1.30	1.33	1.36	1.39	1.42	1.45	1.48	1.51	1.54	36
37	1.31	1.34	1.37	1.40	1.44	1.47	1.50	1.54	1.57	1.60	1.63	37
38	1.38	1.42	1.45	1.48	1.52	1.55	1.59	1.62	1.66	1.69	1.73	38
39	1.46	1.49	1.53	1.57	1.60	1.64	1.68	1.71	1.75	1.78	1.82	39
40	1.53	1.57	1.61	1.65	1.69	1.73	1.77	1.80	1.84	1.88	1.92	40
41	1.61	1.66	1.70	1.74	1.78	1.82	1.86	1.90	1.94	1.98	2.02	41
42	1.70	1.74	1.78	1.82	1.87	1.91	1.95	1.99	2.04	2.08	2.12	42
43	1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.09	2.14	2.18	2.23	43
44	1.87	1.91	1.96	2.01	2.05	2.10	2.15	2.19	2.24	2.29	2.33	44
45	1.95	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.39	2.44	45
46	2.04	2.09	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.56	46
47	2.14	2.19	2.24	2.30	2.35	2.40	2.46	2.51	2.56	2.62	2.67	47
48	2.23	2.28	2.34	2.40	2.45	2.51	2.56	2.62	2.68	2.73	2.79	48
49	2.32	2.38	2.44	2.50	2.56	2.62	2.67	2.73	2.79	2.85	2.91	49
50	2.42	2.48	2.54	2.60	2.67	2.73	2.79	2.85	2.91	2.97	3.03	50

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 40	41	42	43	44	45	46	47	48	49	50	DBH CM
51	2.52	2.59	2.65	2.71	2.77	2.84	2.90	2.96	3.03	3.09	3.15	51
52	2.62	2.69	2.76	2.82	2.89	2.95	3.02	3.08	3.15	3.21	3.28	52
53	2.73	2.80	2.86	2.93	3.00	3.07	3.14	3.21	3.27	3.34	3.41	53
54	2.83	2.90	2.97	3.05	3.12	3.19	3.26	3.33	3.40	3.47	3.54	54
55	2.94	3.01	3.09	3.16	3.23	3.31	3.38	3.46	3.53	3.60	3.68	55
56	3.05	3.13	3.20	3.28	3.36	3.43	3.51	3.58	3.66	3.74	3.81	56
57	3.16	3.24	3.32	3.40	3.48	3.56	3.64	3.72	3.79	3.87	3.95	57
58	3.27	3.36	3.44	3.52	3.60	3.68	3.77	3.85	3.93	4.01	4.09	58
59	3.39	3.47	3.56	3.64	3.73	3.81	3.90	3.98	4.07	4.15	4.24	59
60	3.51	3.60	3.68	3.77	3.86	3.95	4.03	4.12	4.21	4.30	4.39	60
61	3.63	3.72	3.81	3.90	3.99	4.08	4.17	4.26	4.35	4.44	4.54	61
62	3.75	3.84	3.94	4.03	4.12	4.22	4.31	4.41	4.50	4.59	4.69	62
63	3.87	3.97	4.07	4.16	4.26	4.36	4.45	4.55	4.65	4.74	4.84	63
64	4.00	4.10	4.20	4.30	4.40	4.50	4.60	4.70	4.80	4.90	5.00	64
65	4.12	4.23	4.33	4.43	4.54	4.64	4.74	4.85	4.95	5.05	5.16	65
66	4.25	4.36	4.47	4.57	4.68	4.79	4.89	5.00	5.11	5.21	5.32	66
67	4.38	4.49	4.60	4.71	4.82	4.93	5.04	5.15	5.26	5.37	5.48	67
68	4.52	4.63	4.74	4.86	4.97	5.08	5.20	5.31	5.42	5.54	5.65	68
69	4.65	4.77	4.89	5.00	5.12	5.24	5.35	5.47	5.59	5.70	5.82	69
70	4.79	4.91	5.03	5.15	5.27	5.39	5.51	5.63	5.75	5.87	5.99	70
71	4.93	5.05	5.18	5.30	5.42	5.55	5.67	5.79	5.92	6.04	6.16	71
72	5.07	5.20	5.32	5.45	5.58	5.70	5.83	5.96	6.09	6.21	6.34	72
73	5.21	5.34	5.47	5.60	5.74	5.87	6.00	6.13	6.26	6.39	6.52	73
74	5.36	5.49	5.63	5.76	5.89	6.03	6.16	6.30	6.43	6.57	6.70	74
75	5.50	5.64	5.78	5.92	6.06	6.19	6.33	6.47	6.61	6.75	6.88	75
76	5.65	5.80	5.94	6.08	6.22	6.36	6.50	6.65	6.79	6.93	7.07	76
77	5.80	5.95	6.10	6.24	6.39	6.53	6.68	6.82	6.97	7.11	7.26	77
78	5.96	6.11	6.26	6.41	6.55	6.70	6.85	7.00	7.15	7.30	7.45	78
79	6.11	6.27	6.42	6.57	6.73	6.88	7.03	7.18	7.34	7.49	7.64	79
80	6.27	6.43	6.58	6.74	6.90	7.05	7.21	7.37	7.53	7.68	7.84	80
81	6.43	6.59	6.75	6.91	7.07	7.23	7.39	7.56	7.72	7.88	8.04	81
82	6.59	6.75	6.92	7.08	7.25	7.41	7.58	7.74	7.91	8.08	8.24	82
83	6.75	6.92	7.09	7.26	7.43	7.60	7.77	7.94	8.11	8.27	8.44	83
84	6.92	7.09	7.26	7.44	7.61	7.78	7.96	8.13	8.30	8.48	8.65	84
85	7.08	7.26	7.44	7.62	7.79	7.97	8.15	8.33	8.50	8.68	8.86	85
86	7.25	7.43	7.61	7.80	7.98	8.16	8.34	8.52	8.71	8.89	9.07	86
87	7.42	7.61	7.79	7.98	8.17	8.35	8.54	8.72	8.91	9.10	9.28	87
88	7.59	7.78	7.98	8.17	8.36	8.55	8.74	8.93	9.12	9.31	9.50	88
89	7.77	7.96	8.16	8.35	8.55	8.74	8.94	9.13	9.33	9.52	9.72	89
90	7.95	8.14	8.34	8.54	8.74	8.94	9.14	9.34	9.54	9.74	9.94	90
91	8.12	8.33	8.53	8.74	8.94	9.14	9.35	9.55	9.75	9.96	10.2	91
92	8.30	8.51	8.72	8.93	9.14	9.35	9.55	9.76	9.97	10.2	10.4	92
93	8.49	8.70	8.91	9.13	9.34	9.55	9.76	9.98	10.2	10.4	10.6	93
94	8.67	8.89	9.11	9.32	9.54	9.76	9.98	10.2	10.4	10.6	10.8	94
95	8.86	9.08	9.30	9.52	9.75	9.97	10.2	10.4	10.6	10.9	11.1	95
96	9.05	9.27	9.50	9.73	9.95	10.2	10.4	10.6	10.9	11.1	11.3	96
97	9.24	9.47	9.70	9.93	10.2	10.4	10.6	10.9	11.1	11.3	11.6	97
98	9.43	9.67	9.90	10.1	10.4	10.6	10.8	11.1	11.3	11.6	11.8	98
99	9.62	9.86	10.1	10.3	10.6	10.8	11.1	11.3	11.6	11.8	12.0	99
100	9.82	10.1	10.3	10.6	10.8	11.1	11.3	11.5	11.8	12.0	12.3	100

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 50	51	52	53	54	55	56	57	58	59	60	DBH CM
21	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	21
22	0.54	0.55	0.56	0.57	0.58	0.60	0.61	0.62	0.63	0.64	0.65	22
23	0.60	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.69	0.70	0.72	23
24	0.66	0.67	0.68	0.69	0.71	0.72	0.73	0.75	0.76	0.77	0.79	24
25	0.72	0.73	0.74	0.76	0.77	0.79	0.80	0.82	0.83	0.84	0.86	25
26	0.78	0.79	0.81	0.83	0.84	0.86	0.87	0.89	0.90	0.92	0.93	26
27	0.84	0.86	0.88	0.89	0.91	0.93	0.94	0.96	0.98	1.00	1.01	27
28	0.91	0.93	0.95	0.97	0.98	1.00	1.02	1.04	1.06	1.08	1.09	28
29	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	29
30	1.05	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.27	30
31	1.13	1.15	1.18	1.20	1.22	1.24	1.27	1.29	1.31	1.33	1.36	31
32	1.21	1.23	1.26	1.28	1.30	1.33	1.35	1.38	1.40	1.43	1.45	32
33	1.29	1.31	1.34	1.37	1.39	1.42	1.44	1.47	1.49	1.52	1.55	33
34	1.37	1.40	1.43	1.45	1.48	1.51	1.54	1.56	1.59	1.62	1.64	34
35	1.46	1.49	1.51	1.54	1.57	1.60	1.63	1.66	1.69	1.72	1.75	35
36	1.54	1.57	1.61	1.64	1.67	1.70	1.73	1.76	1.79	1.82	1.85	36
37	1.63	1.67	1.70	1.73	1.76	1.80	1.83	1.86	1.89	1.93	1.96	37
38	1.73	1.76	1.80	1.83	1.86	1.90	1.93	1.97	2.00	2.04	2.07	38
39	1.82	1.86	1.89	1.93	1.97	2.00	2.04	2.08	2.11	2.15	2.19	39
40	1.92	1.96	2.00	2.03	2.07	2.11	2.15	2.19	2.23	2.26	2.30	40
41	2.02	2.06	2.10	2.14	2.18	2.22	2.26	2.30	2.34	2.38	2.42	41
42	2.12	2.16	2.21	2.25	2.29	2.33	2.38	2.42	2.46	2.50	2.55	42
43	2.23	2.27	2.31	2.36	2.40	2.45	2.49	2.54	2.58	2.63	2.67	43
44	2.33	2.38	2.43	2.47	2.52	2.57	2.61	2.66	2.71	2.75	2.80	44
45	2.44	2.49	2.54	2.59	2.64	2.69	2.74	2.79	2.83	2.88	2.93	45
46	2.56	2.61	2.66	2.71	2.76	2.81	2.86	2.91	2.96	3.02	3.07	46
47	2.67	2.72	2.78	2.83	2.88	2.94	2.99	3.04	3.10	3.15	3.20	47
48	2.79	2.84	2.90	2.95	3.01	3.07	3.12	3.18	3.23	3.29	3.35	48
49	2.91	2.96	3.02	3.08	3.14	3.20	3.26	3.31	3.37	3.43	3.49	49
50	3.03	3.09	3.15	3.21	3.27	3.33	3.39	3.45	3.51	3.57	3.64	50
51	3.15	3.22	3.28	3.34	3.41	3.47	3.53	3.60	3.66	3.72	3.78	51
52	3.28	3.35	3.41	3.48	3.54	3.61	3.67	3.74	3.81	3.87	3.94	52
53	3.41	3.48	3.55	3.62	3.68	3.75	3.82	3.89	3.96	4.02	4.09	53
54	3.54	3.61	3.68	3.75	3.83	3.90	3.97	4.04	4.11	4.18	4.25	54
55	3.68	3.75	3.82	3.90	3.97	4.04	4.12	4.19	4.27	4.34	4.41	55
56	3.81	3.89	3.97	4.04	4.12	4.20	4.27	4.35	4.42	4.50	4.58	56
57	3.95	4.03	4.11	4.19	4.27	4.35	4.43	4.51	4.59	4.67	4.74	57
58	4.09	4.18	4.26	4.34	4.42	4.50	4.59	4.67	4.75	4.83	4.92	58
59	4.24	4.32	4.41	4.49	4.58	4.66	4.75	4.83	4.92	5.00	5.09	59
60	4.39	4.47	4.56	4.65	4.74	4.83	4.91	5.00	5.09	5.18	5.26	60
61	4.54	4.63	4.72	4.81	4.90	4.99	5.08	5.17	5.26	5.35	5.44	61
62	4.69	4.78	4.87	4.97	5.06	5.16	5.25	5.34	5.44	5.53	5.63	62
63	4.84	4.94	5.04	5.13	5.23	5.33	5.42	5.52	5.62	5.71	5.81	63
64	5.00	5.10	5.20	5.30	5.40	5.50	5.60	5.70	5.80	5.90	6.00	64
65	5.16	5.26	5.36	5.47	5.57	5.67	5.78	5.88	5.98	6.09	6.19	65
66	5.32	5.43	5.53	5.64	5.75	5.85	5.96	6.06	6.17	6.28	6.38	66
67	5.48	5.59	5.70	5.81	5.92	6.03	6.14	6.25	6.36	6.47	6.58	67
68	5.65	5.76	5.88	5.99	6.10	6.22	6.33	6.44	6.55	6.67	6.78	68
69	5.82	5.93	6.05	6.17	6.28	6.40	6.52	6.63	6.75	6.87	6.98	69
70	5.99	6.11	6.23	6.35	6.47	6.59	6.71	6.83	6.95	7.07	7.19	70

VOLUMES IN CUBIC METRES OVER BARK

DBH CM	TARIFF NUMBER 50	51	52	53	54	55	56	57	58	59	60	DBH CM
71	6.16	6.29	6.41	6.53	6.66	6.78	6.90	7.03	7.15	7.28	7.40	71
72	6.34	6.47	6.59	6.72	6.85	6.98	7.10	7.23	7.36	7.48	7.61	72
73	6.52	6.65	6.78	6.91	7.04	7.17	7.30	7.43	7.56	7.69	7.83	73
74	6.70	6.83	6.97	7.10	7.24	7.37	7.51	7.64	7.77	7.91	8.04	74
75	6.88	7.02	7.16	7.30	7.44	7.57	7.71	7.85	7.99	8.13	8.26	75
76	7.07	7.21	7.35	7.50	7.64	7.78	7.92	8.06	8.20	8.35	8.49	76
77	7.26	7.40	7.55	7.70	7.84	7.99	8.13	8.28	8.42	8.57	8.71	77
78	7.45	7.60	7.75	7.90	8.05	8.20	8.35	8.50	8.65	8.79	8.94	78
79	7.64	7.80	7.95	8.10	8.26	8.41	8.56	8.72	8.87	9.02	9.18	79
80	7.84	8.00	8.15	8.31	8.47	8.63	8.78	8.94	9.10	9.25	9.41	80
81	8.04	8.20	8.36	8.52	8.68	8.84	9.01	9.17	9.33	9.49	9.65	81
82	8.24	8.41	8.57	8.74	8.90	9.07	9.23	9.40	9.56	9.73	9.89	82
83	8.44	8.61	8.78	8.95	9.12	9.29	9.46	9.63	9.80	9.97	10.1	83
84	8.65	8.82	9.00	9.17	9.34	9.52	9.69	9.86	10.0	10.2	10.4	84
85	8.86	9.04	9.21	9.39	9.57	9.75	9.92	10.1	10.3	10.5	10.6	85
86	9.07	9.25	9.43	9.61	9.80	9.98	10.2	10.3	10.5	10.7	10.9	86
87	9.28	9.47	9.65	9.84	10.0	10.2	10.4	10.6	10.8	11.0	11.1	87
88	9.50	9.69	9.88	10.1	10.3	10.5	10.6	10.8	11.0	11.2	11.4	88
89	9.72	9.91	10.1	10.3	10.5	10.7	10.9	11.1	11.3	11.5	11.7	89
90	9.94	10.1	10.3	10.5	10.7	10.9	11.1	11.3	11.5	11.7	11.9	90
91	10.2	10.4	10.6	10.8	11.0	11.2	11.4	11.6	11.8	12.0	12.2	91
92	10.4	10.6	10.8	11.0	11.2	11.4	11.6	11.8	12.1	12.3	12.5	92
93	10.6	10.8	11.0	11.3	11.5	11.7	11.9	12.1	12.3	12.5	12.7	93
94	10.8	11.1	11.3	11.5	11.7	11.9	12.2	12.4	12.6	12.8	13.0	94
95	11.1	11.3	11.5	11.7	12.0	12.2	12.4	12.6	12.9	13.1	13.3	95
96	11.3	11.5	11.8	12.0	12.2	12.4	12.7	12.9	13.1	13.4	13.6	96
97	11.6	11.8	12.0	12.2	12.5	12.7	12.9	13.2	13.4	13.6	13.9	97
98	11.8	12.0	12.3	12.5	12.7	13.0	13.2	13.4	13.7	13.9	14.2	98
99	12.0	12.3	12.5	12.8	13.0	13.2	13.5	13.7	14.0	14.2	14.4	99
100	12.3	12.5	12.8	13.0	13.3	13.5	13.8	14.0	14.3	14.5	14.7	100
101	12.5	12.8	13.0	13.3	13.5	13.8	14.0	14.3	14.5	14.8	15.0	101
102	12.8	13.0	13.3	13.5	13.8	14.1	14.3	14.6	14.8	15.1	15.3	102
103	13.0	13.3	13.6	13.8	14.1	14.3	14.6	14.9	15.1	15.4	15.6	103
104	13.3	13.6	13.8	14.1	14.4	14.6	14.9	15.2	15.4	15.7	16.0	104
105	13.5	13.8	14.1	14.4	14.6	14.9	15.2	15.4	15.7	16.0	16.3	105
106	13.8	14.1	14.4	14.6	14.9	15.2	15.5	15.7	16.0	16.3	16.6	106
107	14.1	14.4	14.6	14.9	15.2	15.5	15.8	16.0	16.3	16.6	16.9	107
108	14.3	14.6	14.9	15.2	15.5	15.8	16.1	16.3	16.6	16.9	17.2	108
109	14.6	14.9	15.2	15.5	15.8	16.1	16.4	16.7	16.9	17.2	17.5	109
110	14.9	15.2	15.5	15.8	16.1	16.4	16.7	17.0	17.3	17.6	17.9	110
111	15.1	15.4	15.8	16.1	16.4	16.7	17.0	17.3	17.6	17.9	18.2	111
112	15.4	15.7	16.0	16.3	16.7	17.0	17.3	17.6	17.9	18.2	18.5	112
113	15.7	16.0	16.3	16.6	17.0	17.3	17.6	17.9	18.2	18.5	18.8	113
114	16.0	16.3	16.6	16.9	17.3	17.6	17.9	18.2	18.5	18.9	19.2	114
115	16.3	16.6	16.9	17.2	17.6	17.9	18.2	18.5	18.9	19.2	19.5	115
116	16.5	16.9	17.2	17.5	17.9	18.2	18.5	18.9	19.2	19.5	19.9	116
117	16.8	17.2	17.5	17.8	18.2	18.5	18.9	19.2	19.5	19.9	20.2	117
118	17.1	17.5	17.8	18.2	18.5	18.8	19.2	19.5	19.9	20.2	20.6	118
119	17.4	17.8	18.1	18.5	18.8	19.2	19.5	19.9	20.2	20.6	20.9	119
120	17.7	18.1	18.4	18.8	19.1	19.5	19.8	20.2	20.6	20.9	21.3	120

STAND ASSORTMENT TABLE FOR CONIFERS AND SMALL HARDWOODS

Minimum Length 3 metres

Volume to tip and various top diameters **overbark** as a percentage of the **overbark** volume to 7cm top diameter

Mean dbh cm	* To Tip	† 7	To Top Diameters **ob** (centimetres) Minimum length 3 metres. 8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	Mean dbh cm
			PERCENTAGE OF VOLUME																	
7	175.0	100	20.7	7.7	1.8															7
8	155.3	100	35.3	12.8	4.6	0.1														8
9	148.0	100	62.7	20.9	8.4	2.1														9
10	127.5	100	74.9	33.3	13.9	4.8	0.5													10
11	120.1	100	81.2	48.1	21.1	8.4	2.8													11
12	115.5	100	85.3	63.8	30.0	13.6	5.6	0.8												12
13	112.3	100	88.3	72.2	40.8	20.2	8.8	3.1												13
14	109.9	100	90.6	77.7	51.2	28.2	13.2	5.8	1.2											14
15	108.0	100	92.5	81.7	60.9	37.2	18.4	9.1	3.3											15
16	107.7	100	94.0	84.8	68.7	46.6	25.3	13.4	5.9	1.8										16
17	105.5	100	95.2	87.4	74.1	55.1	34.4	18.7	9.0	3.7	0.3									17
18	104.7	100	96.0	89.7	78.3	62.2	43.6	25.5	12.9	6.2	1.8									18
19	104.0	100	96.8	91.3	81.5	67.9	51.5	33.4	17.9	9.3	3.7	0.5								19
20	103.5	100	97.3	92.9	84.3	72.7	58.3	41.2	24.0	13.1	6.2	2.0								20
21	103.0	100	97.8	94.1	86.7	76.8	63.9	48.5	31.2	17.4	9.3	4.0	0.8							21
22	102.7	100	98.2	95.2	88.7	80.2	69.0	54.9	38.5	22.4	12.9	6.3	2.4							22
23	102.4	100	98.6	96.0	90.4	83.1	73.3	60.5	45.4	27.9	17.0	9.2	4.3	0.9						23
24	102.1	100	98.8	96.7	91.9	85.5	77.0	65.8	51.7	34.4	21.9	12.7	6.5	1.3	0.1					24
25	101.9	100	99.0	97.2	93.1	87.7	80.2	70.2	57.2	41.5	27.2	16.4	9.1	4.1	1.1					25
26	101.8	100	99.2	97.5	94.1	89.4	82.9	73.9	62.1	48.2	32.9	20.5	12.0	6.2	2.4	0.2				26
27	101.6	100	99.3	97.8	95.0	91.0	85.3	77.3	66.5	53.8	38.6	25.1	15.4	8.7	4.0	1.1				27
28	101.5	100	99.4	98.1	95.7	92.2	87.2	80.1	70.4	58.7	44.0	30.0	19.5	11.6	6.0	2.3	0.5			28
29	101.4	100	99.4	98.3	96.2	93.3	88.8	82.5	73.9	63.0	49.3	35.6	23.9	14.9	8.3	3.9	1.7			29
30	101.3	100	99.5	98.5	96.6	94.2	90.2	84.5	76.9	66.8	54.3	41.1	28.8	18.6	11.1	6.0	3.1	0.6		30

31	101.2	100	99.5	98.7	97.0	94.8	91.4	86.4	79.4	70.2	58.9	46.4	33.9	22.8	14.5	8.6	4.8	1.8		31
32	101.1	100	99.6	98.8	97.4	95.4	92.4	88.0	81.7	73.2	63.2	51.5	39.0	27.3	18.4	11.7	6.8	3.2	1.0	32
33	101.0	100	99.6	98.9	97.6	95.8	93.2	89.4	83.7	76.0	66.9	55.9	43.9	31.9	22.4	15.0	9.2	5.0	2.1	33
34	100.9	100	99.6	98.9	97.8	96.2	93.9	90.6	85.5	78.6	70.1	59.9	48.5	36.7	26.7	18.6	12.0	7.1	3.4	34
35	100.8	100	99.7	99.0	98.0	96.5	94.5	91.6	87.1	80.8	73.0	63.7	52.9	41.5	31.3	22.5	15.2	9.5	5.1	35
36	100.7	100	99.7	99.1	98.2	96.8	95.0	92.5	88.4	82.8	75.7	67.1	56.9	46.0	35.6	26.7	18.7	12.2	7.0	36
37	100.6	100	99.7	99.2	98.4	97.1	95.5	93.2	89.6	84.6	78.0	70.1	60.7	50.2	40.0	30.8	22.4	15.2	9.3	37
38	100.6	100	99.7	99.2	98.5	97.3	95.9	93.8	90.6	86.2	80.1	72.8	64.1	54.3	44.2	34.8	26.2	18.4	12.0	38
39	100.5	100	99.7	99.3	98.6	97.5	96.2	94.4	91.5	87.6	82.0	75.2	67.1	58.0	48.3	38.7	30.1	21.8	15.1	39
40	100.5	100	99.7	99.3	98.7	97.7	96.6	94.9	92.3	88.7	83.7	77.5	69.9	61.4	52.1	42.6	33.8	25.2	18.3	40
41	100.4	100	99.7	99.4	98.8	97.9	96.9	95.3	92.9	89.7	85.1	79.4	72.4	64.4	55.7	46.3	37.3	28.7	21.4	41
42	100.4	100	99.7	99.4	98.9	98.1	97.2	95.7	93.5	90.6	86.4	81.2	74.7	67.2	59.0	49.8	40.8	31.9	24.4	42
43	100.4	100	99.7	99.4	99.0	98.3	97.4	96.0	94.0	91.3	87.6	82.7	76.7	69.7	61.9	53.0	44.1	35.0	27.2	43
44	100.3	100	99.8	99.5	99.1	98.4	97.6	96.3	94.4	92.0	88.6	84.1	78.5	71.9	64.4	56.0	47.3	38.0	30.0	44
45	100.3	100	99.8	99.5	99.2	98.6	97.8	96.6	94.8	92.6	89.4	85.3	80.0	73.9	66.6	58.8	50.2	40.8	32.7	45
46	100.3	100	99.8	99.5	99.2	98.7	98.0	96.8	95.2	93.1	90.1	86.4	81.4	75.6	68.6	61.1	52.8	43.5	35.2	46
47	100.3	100	99.8	99.5	99.3	98.8	98.1	97.0	95.5	93.5	90.7	87.2	82.6	77.1	70.4	63.3	55.1	45.9	37.5	47
48	100.3	100	99.8	99.5	99.3	98.9	98.2	97.2	95.8	93.9	91.3	87.9	83.6	78.4	72.2	65.2	57.0	48.1	39.6	48
49	100.3	100	99.8	99.6	99.4	99.0	98.3	97.4	96.1	94.3	91.8	88.6	84.4	79.5	73.6	66.9	58.8	50.0	41.5	49
50	100.2	100	99.8	99.6	99.4	99.0	98.4	97.6	96.4	94.6	92.2	89.2	85.2	80.5	74.9	68.4	60.4	51.8	43.3	50
51	100.2	100	99.8	99.6	99.4	99.1	98.5	97.7	96.6	94.9	92.6	89.7	85.9	81.4	75.9	69.7	61.9	53.4	44.9	51
52	100.2	100	99.8	99.6	99.4	99.1	98.5	97.8	96.8	95.2	92.9	90.1	86.5	82.1	76.9	70.8	63.2	54.8	46.3	52
53	100.2	100	99.8	99.6	99.5	99.1	98.6	97.9	97.0	95.4	93.2	90.5	87.0	82.8	77.8	71.8	64.3	56.2	47.6	53
54	100.2	100	99.8	99.6	99.5	99.1	98.6	98.0	97.1	95.6	93.5	90.8	87.5	83.4	78.5	72.7	65.4	57.4	48.8	54
55	100.2	100	99.8	99.6	99.5	99.1	98.7	98.1	92.2	95.8	93.8	91.1	87.9	83.9	79.1	73.5	66.3	58.4	50.0	55
56	100.2	100	99.8	99.6	99.5	99.2	98.7	98.2	97.3	96.0	94.0	91.4	88.3	84.4	79.7	74.2	67.2	59.4	51.1	56
57	100.2	100	99.9	99.7	99.5	99.2	98.8	98.2	97.4	96.2	94.2	91.7	88.6	84.8	80.3	74.9	68.0	60.3	52.1	57
58	100.2	100	99.9	99.7	99.5	99.2	98.8	98.3	97.5	96.3	94.4	91.9	89.9	85.2	80.8	75.5	68.7	61.1	53.0	58
59	100.2	100	99.9	99.7	99.5	99.2	98.9	98.3	97.6	96.4	94.6	92.1	89.2	85.5	81.2	76.0	69.3	61.9	53.9	59
60	100.2	100	99.9	99.7	99.6	99.2	98.9	98.4	97.6	96.5	94.8	92.3	89.5	85.8	81.6	76.4	69.9	62.6	54.7	60

*No minimum length has been used in calculating the To Tip percentages.

†The volume to 7 cm top diameter assumes a conventional minimum length of 1.3 m.

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