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April 1, 2021

BY EMAIL

To: Regional Executive Directors

From: Allan Bennett, Director, Timber Pricing Branch

Re: Amendment No. 3 to the *Provincial Logging Residue and Waste Measurement Procedures Manual – Interior Version*

I hereby approve Amendment No. 3 to the *Provincial Logging Residue and Waste Measurement Procedures Manual – Interior Version*.

The manual can be found here:

[Provincial Logging Residue and Waste Measurement Procedures Manual – Interior Version](#)

The purpose of this amendment is to update the *Provincial Logging and Waste Measurement Procedures Manual – Interior Version* in order to:

- Update the waste relief application process,
- Update the aggregate plot allocation process, and
- Provide clarity throughout.

Amendment No. 3 comes into effect on April 1, 2021.

Allan W. Bennett, RPF
Director
Timber Pricing Branch

pc: Jim Schafthuizen, Executive Director, Timber Operations and First Nations Division
Patrick Asante, Manager, Timber Pricing
Carissa Logue, Provincial Waste Specialist
Mary Mitchell, Residue and Log Salvage Policy Forester

Amendment No. 3 – Provincial Logging Residue and Waste Procedures Manual – Interior Version Highlights

Section, Table or Appendix Number	Description
Throughout	Minor wording changes
1.1	Added a link to the Waste Assessment Policy location
2.1, 2.2	Updated the waste relief application process
4.3.1	Clarified the applicability of the section
8.4.3	Updated aggregate plot allocation procedures
9.5.2.6	Clarified when waste billings occur on unharvested cutblocks
Glossary	Added definition of partial cutblock
Appendix 7	Map updated

1. Administration

1.1 Introduction

In British Columbia, the right to harvest Crown timber is conferred through the form of agreements under the Forest Act. The Forest Act and subsequent agreements require licensees to carry out waste and residue assessments.

Waste assessments are carried out to quantify the volumes of waste and residue remaining on harvested areas following the completion of harvesting operations. Waste assessments obtain an unbiased estimate of the volume and quality of timber on a cutblock whether standing or felled, that meets or exceeds the timber merchantability specifications which was not removed from the cutting authority area and was not reserved from cutting. The waste volume data compiled from the assessments are used to invoice licensees for monetary and cut control charges.

This manual outlines the administration and field measurement procedures to be used in the assessments and is intended to serve as the reference for industry and government staff who conduct or check waste assessments in British Columbia.

The Waste Assessment Policy can be found online at:

<https://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/forest-residue-waste>

1.4 Responsibility

The responsibilities are as follows:

1.4.1 Timber Pricing Branch

1.4.1.1 Director, Timber Pricing Branch

The Director, Timber Pricing Branch is responsible for:

1. Approving *Provincial Logging Residue and Waste Measurement Procedures Manual* and amendments.
2. Processing and maintaining waste data.
3. Billing licensees by issuing waste invoices.

1.4.1.2 Residue and Log Salvage Policy Forester, Timber Pricing Branch

The Residue and Log Salvage Policy Forester is responsible for:

1. Developing and maintaining standards and procedures for determining and reporting waste.
2. Providing training and technical support.
3. Providing policy interpretation to industry and ministry staff.
4. Maintaining software compilation programs and standards.
5. Conducting technical reviews of Forest Regions and Forest Districts for policy and procedure compliance.

1.4.2 Regional Manager

The Regional Manager is responsible for:

1. Ensuring that district staff adhere to policy and procedures, and where necessary, provide training to district staff.
2. Recommending survey procedure changes where necessary, to the Director, Timber Pricing Branch.
3. Advising industry and forest district staff on matters relating to waste assessments.
4. Processing waste reports and FS 702 for waste monetary billing and cut control where required.

5. Providing Waste System guidance and training to district staff and industry users.

1.4.3 District Manager

The District Manager is responsible for:

1. Conducting check surveys in accordance with manual standards.
2. Implementing and administering the policy and procedures and recommending survey procedure changes where necessary to the Regional Manager.
3. Approving waste assessments and issuing reporting unit numbers in the Waste System.
4. Checking for completeness of licensees submitted reports.
5. Processing waste reports and FS 702 for waste monetary billing and cut control where required.

1.4.4 Timber Sales Manager

Unless otherwise specified in the agreement, the Timber Sales Manager is responsible for:

1. Ensuring BCTS Licensees submit waste assessments in accordance with licence agreements, Waste Policy and the *Provincial Logging Waste Measurement Procedures Manual*.
2. Where a BCTS Licensee does not submit a waste assessment as required under section 1.4.4(1) the Timber Sales Manager may carry out the assessment, and in a notice given to the holder, may require the holder to pay the costs incurred by the Timber Sales Manager in carrying out the assessment.

1.4.5 Licensees

Agreement holders are responsible for conducting waste assessments on their scale based cutting authorities in accordance with the *Forest Act*.

The licensees are responsible for:

1. Submitting waste assessment plans.
2. Conducting waste assessments in accordance with this manual.
3. Submitting waste data into the online Waste System.

Where the above-mentioned work is performed by a contractor or a subcontractor, it is the licensee's responsibility for ensuring that the work is carried out in compliance with Ministry standards and requirements.

2. Waste Relief

2.1 Applications

A licensee may apply, in writing, for waste relief with respect to the timber left on a cutting authority provided the government has not issued a waste assessment (invoice) for the timber to the licensee.

2.1.1 Initiating an Application for Waste Relief

An application for waste relief must include:

1. a written statement from the licensee that:
 - a. identifies the applicable Part of the Waste Relief Policy under which the application is made; and
 - b. explains the basis on which the licensee considers that the circumstances relating to the cutting authority meet the criteria of that Part;
2. any evidence upon which the licensee relies; and
3. data on the timber volumes and grades in relation to which the licensee is seeking the relief (the “supporting data”)
(collectively, the “application”).

The supporting data under paragraph 3 must:

- a. provide an accurate estimate of the timber volume remaining on each cutblock in the cutting authority. The estimate of remaining timber volume may be determined by methods that include, but are not necessarily limited to, one or more of the following:
 - i. a full waste survey conducted in accordance with this manual;
 - ii. a timber cruise with a map showing the locations of the timber included in the application.
- b. be submitted into the Waste System with a notation or comment in the Waste System identifying that the information pertains to an application for waste relief.

The licensee must submit the written statement and evidence to the Area Director of Pricing and Tenures and the supporting data into the Waste System.

2.1.2 Processing of Application

Following receipt of an application that complies with the requirements of section 2.1.1, the Area Director of Pricing and Tenures will direct the preparation of a draft information package that includes:

1. the licensee’s application;
2. relevant additional information on the cutting authority;
3. an estimated waste monetary assessment based on the timber grade profile (for each cutblock in the application as applicable) and the applicable waste rates;

4. if the application is made under Part 2 of the Waste Relief Policy, an assessment of the opportunity for resale of the timber included in the application, including the current market value; and
5. a draft Briefing Note to the ADM providing analysis of whether the application meets the criteria of the Waste Relief Policy and should be approved.

The Area Director of Pricing and Tenures will forward the draft information package in electronic form to the Director, Timber Pricing Branch, Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

The Director, Timber Pricing Branch will review, update, and submit the information package to the ADM for a preliminary assessment.

If the ADM's preliminary assessment following review of the information package is that the application:

1. should not be approved:
 - a. the ADM will disclose to the licensee the evidence and rationale supporting the preliminary assessment and offer the licensee the opportunity to respond within a defined period;
 - b. any response from the licensee must be submitted to the ADM and is appended into the information package;
 - c. if the ADM determines that further clarification is needed, the ADM will offer the licensee the opportunity to provide such clarification within a defined period, and any response from the licensee must likewise be submitted to the ADM and appended into the information package;
 - d. once the ADM is satisfied that no further clarification is required regarding the licensee's response the information package is deemed to be final; and
 - e. the final waste relief determination is made under section 2.1.3.
2. should be approved:
 - a. the information package is deemed to be final, and the final waste relief determination is made under section 2.1.3.

2.1.3 Final Waste Relief Determination

Following review of the final information package, the ADM will approve or reject the application and notify the licensee, with a copy to the District Manager, the Timber Sales Manager in the case of BCTS agreements, and the Area Director of Pricing and Tenures.

If the application is rejected, the waste survey will be processed, and an invoice will be issued for the timber included in the application.

If the application is approved, the waste survey submission status in the Waste System will be updated so that billing will not occur for the timber included in the application.

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3.2 Waste Monetary Billing

Waste volumes are measured and billed monetarily in accordance with the following table.

Table 3-2 The Disposition of Residue and Waste Volumes in Monetary Billing

Table Effective April 1, 2019 (Valid for All Species)							
Waste Type	Grade	Avoidable			Unavoidable		
		Measure / Record	Rate	AAC	Measure / Record	Rate	AAC
Sawlog	1 and 2	Yes	Full \$ ¹	Yes	Yes	\$0.00	Yes
Lumber Reject (Green or Dead and Dry)	4	Yes	\$0.25	Yes	Yes	\$0.00	Yes
Undersize	6	Optional ²	\$0.00	No	Optional ²	\$0.00	No
Firmwood Reject	Z	Optional	\$0.00	No	Optional	\$0.00	No

¹: Full \$ Waste Rate (\$/m³) from section 3.2.2

²: Optional unless required to be measured under Section 9.4.1

3.2.1 Waste Amount Payable

For merchantable Crown timber that is not cut and removed, the amount payable is calculated by multiplying the volumes of avoidable waste reported in a waste assessment by the applicable waste rate.

Unavoidable waste volumes will not result in amounts payable but will be included in the harvested volume for cut control purposes when applicable in accordance with the *Forest Act*.

3.2.2 Waste Rate

The application of a waste rate is dependent on whether there has been timber harvesting on a cutting authority. A waste rate is determined for each waste assessment area in the cutting authority when timber has been harvested.

The waste rate applies to dispersed waste, accumulations, and standing timber within the waste assessment area and will be determined as outlined in this section.

The applicable rates charged will include any bonus bids and levies as applicable.

1. Avoidable coniferous species graded:
 - a. Grade 1 and 2 are billed using the weighted average sawlog stumpage rate for the 12 month period multiplied by the waste monetary reduction factor (WMRF), and
 - b. Grade 4 is billed using the rates established in the *Interior Appraisal Manual*.
2. Avoidable deciduous species graded:
 - a. Sawlog is billed using either:
 - i. The appraised rate, or, if there is no appraised rate,
 - ii. The fixed rate for the species as specified in the *Interior Appraisal Manual*, and
 - b. Other than sawlog is billed using the fixed rate in the *Interior Appraisal Manual*.

3.2.2.1 Waste Assessment Areas with Harvesting

For waste assessment areas with harvesting, the waste rate for coniferous sawlogs is calculated using the weighted average stumpage rate charged for the sawlogs (grade code 1 and 2) in invoices issued during the 12 month period after the ready for survey date for the waste assessment area is achieved.

The formula to be used is:

$$WR=TS/TV$$

Where:

1. **WR**= The waste rate for the cutting authority
2. **TS***= Total billed sawlog stumpage (sum of Upset Stumpage*, and Bonus Bid) for timber harvested under the applicable timber mark for the twelve-month period ending one month after the month the waste assessment area was ready for survey
3. **TV***= Total billed volume (accumulated volume in cubic metres that derived the total billed stumpage for the sawlogs) for the twelve-month period ending one month after the month the waste assessment area was ready for survey
 - a. ***TV** includes silviculture and development levies

Remaining areas of standing timber within a waste assessment area that are left unharvested at the expiry, surrender, termination, or cancellation of the cutting authority are waste billed using the ready for survey date for the cutblock.

4.2.1.2 Submission Requirements for Waste Assessment Areas Not Requiring Site Treatments or Hazard Abatement

Except as specified in section 4.2.1.1, waste assessment areas must be surveyed and submitted as outlined below.

Single Waste Assessment Area or Small Populations (Aggregate)

Where a waste assessment area within the population has a ready for survey date between:

1. January 1st and July 31st, the waste assessment must be submitted no later than September 15th of the same year, or
2. August 1st and December 31st, the waste assessment must be submitted no later than June 30th of the year following the ready for survey date.

In a small population (aggregate), the waste assessment area with the earliest ready for survey date is used to determine the submission timeframe as stated above.

Large Populations

Large populations must be submitted no later than one year, plus 30 days from the earliest ready for survey date in the population.

4.2.2 Submission of Waste Assessments Not Requiring a Field Survey

Waste assessment areas that will have the waste assessment volumes determined through alternate methods (i.e. cutblocks <2.0 ha in a large population) must be submitted no later than thirty (30) days after:

1. The ready for survey date when District Average rates are used, or
2. The data required for completion and compilation of the sample population to be used to generate the required information is available (i.e. compilation of the sample waste assessment area or population).

4.2.3 Overdue Waste Assessments and Reports

Where the holder of an agreement, other than an agreement entered into with the timber sales manager, does not complete the waste assessment and submit it to the District Manager as required under section 4.2, the District Manager may, in a notice given to the licensees, take actions to complete and submit a waste assessment for a block or blocks. The District Manager may require the holder to pay the costs incurred in carrying out the assessment.

Where the holder of an agreement entered into with the Timber Sales Manager that is required by that agreement to conduct a waste assessment, fails to conduct that waste assessment, the Timber Sales Manager may carry out the assessment, and in a notice given to the holder, may require the holder to pay the costs incurred by the Timber Sales Manager in carrying out the assessment.

4.3 Reporting Requirements

Waste assessments must be surveyed and submitted to the Waste System and include the items outlined below:

1. Licensees must enter and submit the data into the Waste System for a waste assessment area as required in section 4.2.
2. A final survey map for each waste assessment area as required in Table 6-3 and area calculations must be included in the submission.
3. The post harvest **standing** tree specifications document (where applicable).
4. If used, the following files must be uploaded into the Waste System:
 - a. The final version of the sample plan,
 - b. The Aggregate Sample Plan,
 - c. The EFW file (for aggregate populations only), and
 - d. The HRC file used for compilation.

Any files emailed to the District **may be accepted at the District's discretion.**

5. If the person submitting the survey information into the Waste System is not a Registered Forest Professional, a signed and sealed cover letter from a Registered Forest Professional accepting responsibility for the submission information must be submitted. This letter must include the Registered Forest Professional's designation and registration number.
6. The agreement between parties when a population contains waste assessment areas from different client codes.

HRC, EFW files, GPS shapefiles, PRP tables, traverse notes, and plot cards will be stored by the Licensee and made available to the Ministry upon request.

4.3.1 Material Disposed of Prior to Waste Assessments

The procedures in this section do not supersede the requirement to complete a survey to the standard described in Chapter 8 of this manual.

If waste materials within any strata of a waste assessment area are disposed of prior to the completion and submission of a waste assessment as specified in section 4.2, the licensee must notify the Natural Resource District and submit waste volumes for the affected strata using the higher of:

1. The district or the licensee waste volume average experienced for the stratum type in the past year, or
2. The best information available to complete the assessment.

6.4.1.3 Standing Trees

Standing trees are trees authorized for harvest under the cutting authority (excepting reserved trees) but at the discretion of the licence holder, are not cut and removed.

Individual standing trees that are found at different locations of the waste assessment area must be stratified, measured, and scaled individually. Standing tree patches must be delineated separately from the dispersed to form their own subpopulation and the volumes determined with methods outlined under section 9.5.2.

6.5 Sample Size and Number of Plots

The sample size (number of sample waste assessment areas or sample plots within a waste assessment area) is based on the sampling system to be used for the population or size of the sample waste assessment area.

The number of sample plots required within each waste assessment area is dependent on the sampling design (single waste assessment area, aggregate or large population plans).

To determine the number of plots within a sample plan:

1. For small population sampling plans, either:
 - a. For single waste assessment area populations, use Appendix 4, or
 - b. For aggregate populations, use the Aggregate Sample Plan to calculate the required number of dispersed, roadside, or spot accumulation plots for the sample population.
 - i. The Aggregate Sample Plan is available **through** Timber Pricing Branch.
2. For large population sampling plans:
 - a. Use Table 6-1 and Table 6-2 to determine the required number of waste assessment areas to be sampled and the number of plots for all strata.

Table 6-1 Minimum Sampling Requirements for Large Populations

Sampling Design	Minimum Waste Assessment Areas to be Sampled	Minimum Number of Plots per Waste Assessment Area					
		Dispersed		Spot Accumulation		Other Accumulation Strata	
		Predict	Measure	Predict	Measure	Predict	Measure
Ratio/Ratio or Ratio / SRS	20, 25, 30*	18	6	12	4	12	4
SRS/Ratio or SRS/ SRS		0	12	0	10	0	10

* The minimum number of samples are determined using Table 6-2.

Table 6-2 Minimum Sample Waste Assessment Area Requirements for Large Populations

Population Size (Waste Assessment Areas)	Minimum Number of Waste Assessment Areas to be Sampled
20 - 100	20
101 - 150	25
151 +	30

6.7.3 Large Population Sample Plans

Sample plans for large populations must be developed using the HRC system.

Until further notice, large population sampling designs are not available for inclusion in any sample plan development.

To create a large population sample plan:

1. Identify the population to be sampled. The population is comprised of waste assessment areas that are expected to be harvested and sampled within the applicable sampling year (as per section 6.3.2).
 - a. The sample plan can contain waste assessment areas where the harvest status is:
 - i. **Complete:** primary harvesting operations are completed and ready for survey status has been achieved,
 - ii. **Active:** harvesting operations have commenced, and the waste assessment area has not achieved ready for survey status, or
 - iii. **Not started:** cutblocks that are planned for harvest completion within the sampling year; however, harvesting operations have not started.
2. Decide on a sampling design (Ratio/Ratio, SRS/Ratio, Ratio/SRS, SRS/SRS) for the population.
3. In HRC, create a sample plan and enter the sample population attributes.
4. Update the sample plan as per section 6.7.3.2.
5. Use HRC to determine the sample waste assessment areas from the population by creating a batch.
6. Confirm the sampling design (Ratio/Ratio, SRS/Ratio, Ratio/SRS, SRS/SRS) in HRC.
7. Confirm or update the sample size (the number of waste assessment areas in the population to be sampled). HRC will default to the minimum sample size. Users can increase it if desired.
8. The sample plan is signed by a Forest Professional in HRC.
9. Users can view the sample plan or create the sample plan report. On the sample plan report, adjust the number of plots in the strata if required.
10. Update the sample plan as needed.
11. Create subsequent batches until all waste assessment areas within the sample plan have been included in a batch.

6.7.3.1 Batch Selection Principles

A sample of waste assessment areas are selected from the population for measurement when a batch is created. Sorting the waste assessment areas in the population by common criteria prior to selecting samples helps to ensure that the sample represents the population.

Sample batches are created from the waste assessment areas where harvesting is complete and ready for survey status has been reached. A sample batch can be created when there are enough waste assessment areas to result in a minimum sample size of five.

The remaining (active or not complete) waste assessment areas are retained in the system for subsequent batches.

Once the first batch has been created, HRC will display the minimum batch size required for subsequent batches to result in a sample size of five. If the minimum sample size is not achieved, and there are enough waste assessment areas in the population to meet the minimum batch size requirement, a batch will not be created until there are enough waste assessment areas in completed status.

Once the number of completed waste assessment areas in a batch cannot meet the minimum batch size requirement, HRC will randomly select waste assessment areas using the Bernoulli selection process.

Example:

A sample plan contains 204 waste assessment areas and 30 will be sampled.

Batch 1 is created with 160 waste assessment areas in completed status.

The sample size for batch 1 will equal $30 (160/204) = 23.5$ (rounds to 24 samples).

The sampling frequency is calculated by dividing the number of waste assessment areas in completed status (160) by the number of samples in batch one.

$$\text{Sampling frequency} = 160 / 23.5 = 6.8$$

The minimum batch size required to result in 5 waste assessment areas to sample in subsequent batches is calculated using the sampling frequency (6.8) * minimum sample size (5) = 34

Therefore, new batches cannot be created until a minimum of 34 waste assessment areas are in a status of complete.

At such time as a batch cannot result in the minimum sample size of 5, the Bernoulli selection process is used.

Table 6-3 Waste Assessment Area Survey Plan Map and Final Waste Submission Map Requirements

Requirements	Waste Assessment Area Survey Plan Map	Final Waste Submission
Tenure, CP, timber mark areas	Yes	Yes
Forest Region and District	Yes	Yes
Cutblock identifier	Yes	Yes
Map scale	Yes	Yes
Harvest boundary (with verifiable reference points such as falling corners)	Yes	Yes
Non-harvest areas (non-productive etc.)	Yes	Yes
Biogeoclimatic zone(s) (Interior)	Yes	Yes
North arrow, declination, map base	Yes	Yes
Cutblock maturity (where applicable)	Yes	Yes
Roads and other NP areas	Yes	Yes
Areas of reserved timber and zones of partial cutting (when identified in a cutting authority and appraisal)	Yes	Yes
Areas of high stump exemptions	Yes	Yes
Strata type lines and identifier	If known	Yes
Waste assessment area and strata net areas	If known	Yes
POC, local grid, baseline, Starting Point Interval Factor (SPIF) , and plot locations	Yes	Yes
Strip line direction of travel	No	Yes
Contour lines - clearly legible	Yes	Yes
Physiographic features	Only if they affect sampling	Only if they affect sampling
Reporting unit number	If known	Yes
Surveyor name(s)	If known	Yes
Sampling design	Yes	Yes

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7. Waste Area Determination

7.1 Principles

The determination of the area to be surveyed is an important component in obtaining the correct waste volume per hectare, the waste assessment area volume, and waste billing.

The waste survey planner must develop waste assessment area survey maps and conduct area calculations to determine accurate areas for waste reporting.

A cutblock can contain areas of reserved timber, non-productive areas (roads), merchantable timber areas (standing timber), and areas outside of the appraised cutblock boundaries (i.e. external landings) that contain waste from the waste assessment area to be sampled.

The area used to calculate waste volumes is the total area of a waste assessment area that was authorized to remove timber and/or will contain waste material from the waste assessment area.

When any changes to harvest or reserve areas have occurred:

1. The correct areas must be used in the sample plan,
2. Prior to completing any field work, updated maps must be given to the waste surveyor, and
3. The correct areas must be documented and uploaded into the Waste System by a forest professional.

7.1.1 Net Waste Area Calculation

1. The net waste area is calculated as follows:
 - a. Determine the gross harvested area
 - b. Subtract any mapped retention from the waste assessment area's gross area
 - c. Add the sum of the area associated with external roads and/or any external landings to the figure determined in step ii
 - d. Subtract the area of all non-productive areas (i.e. built road surface) from the figure determined in step iii.
2. The net waste area reported into the Waste System does not need to and usually will not reconcile with the cutblock net area in other reporting systems i.e. RESULTS, FTA etc.
3. Waste assessment area net areas are increased by adding external areas containing waste volumes attributable to the cutblock (i.e. external landings or road permit areas outside of the cutblock).

8. Waste Assessment Area Planning and Plot Layout

8.1 The Plot Sampling Process

The planning and implementation of plot sampling surveys involves either a single waste assessment area, a group of waste assessment areas within an aggregate, or a group of sample waste assessment areas within a large population sample plan. The following steps are required to complete a waste assessment.

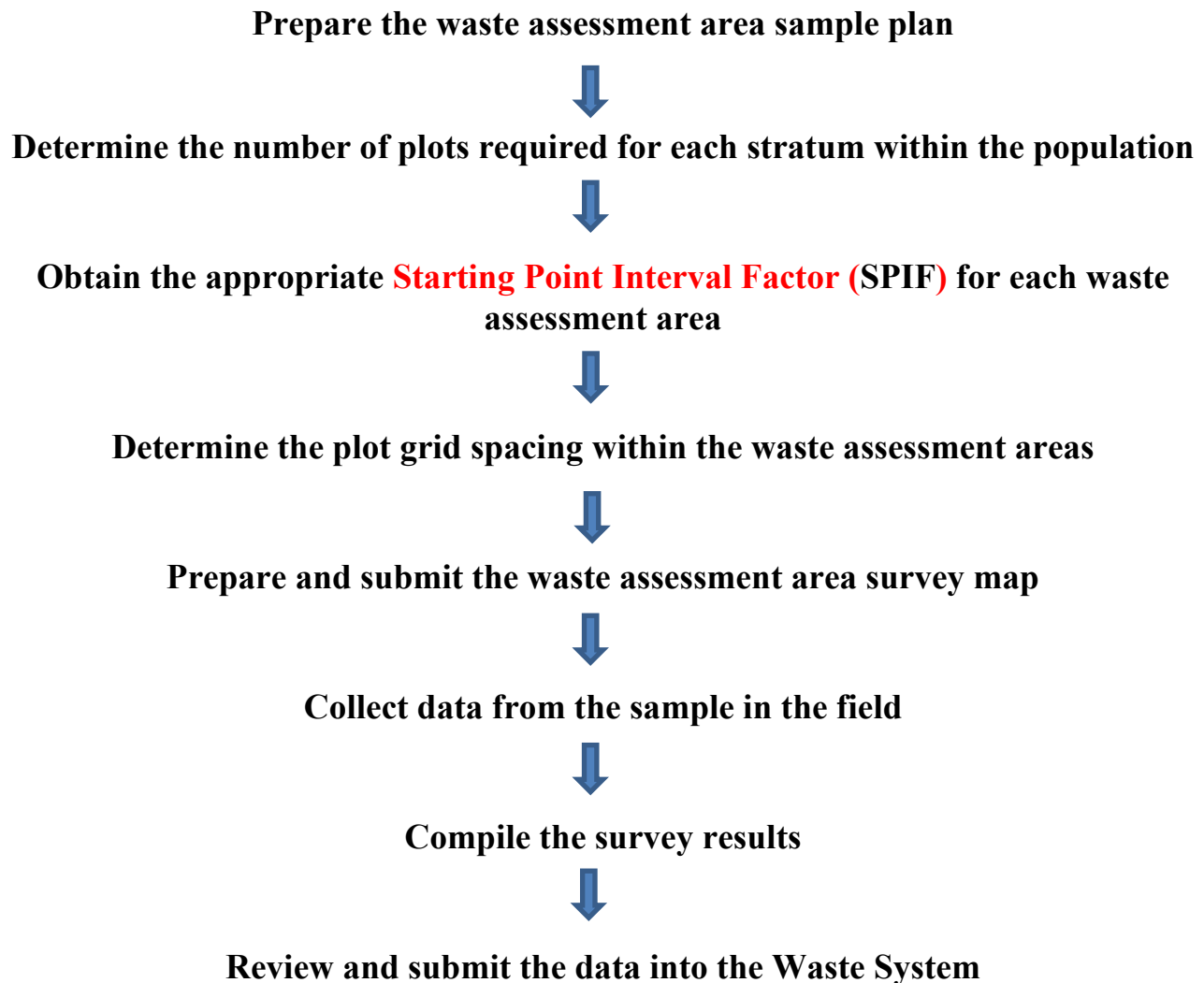
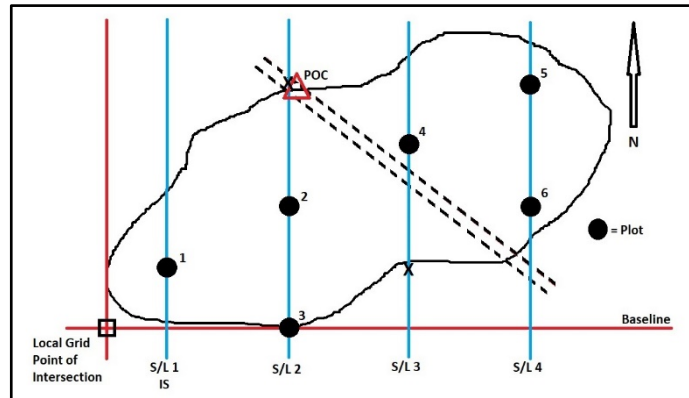


Figure 2 provides an example of the dispersed plot design.

Figure 2 Example Strip and Plot Placement Using a 50% SPIF



8.4.3 Aggregate Plot Allocation

When, after adjusting the GSD, the exact number of plots listed on the Aggregate Sample Plan cannot be located on the survey map:

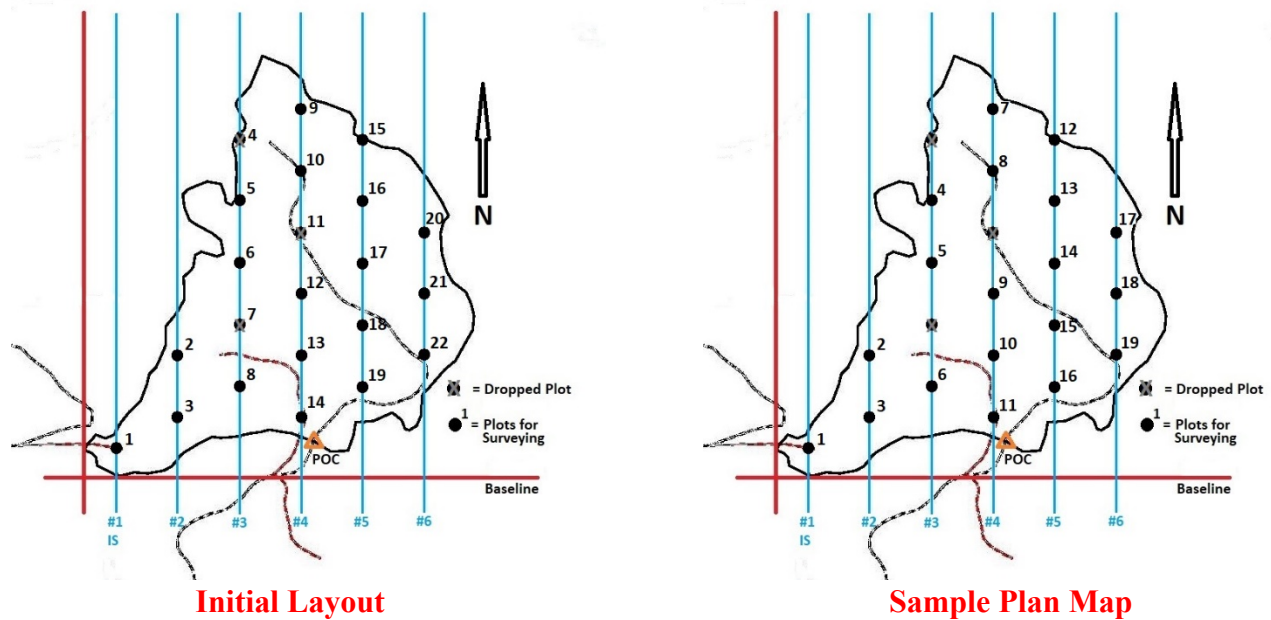
1. Adjust the GSD interval in ten (10) metre increments until the number of plots is greater than the number of plots required, and
2. Apply the following rules in order to reduce the number of plots until the desired number of plots is achieved.
 - a. The first dropped plot will be determined by multiplying the total number of plots in the waste assessment area by the SPIF for the ready for survey month of the waste assessment area.
 - b. The second dropped plot will be determined by multiplying the total number of plots in the waste assessment area (prior to dropping any plots) by the previous month's SPIF.
 - c. Continue using step b to determine further dropped plots until the desired number of plots is achieved.
 - d. For each step, use the rounding rules as described in section 9.4.3.(1)(a).
 - e. Renumber the remaining plots using the procedure in section 8.4.2.

Example:

Waste assessment area with 22 plots on the map, and 19 plots are required. The ready for survey date is October 20, 2020.

1. First dropped plot = $22 \text{ plots} * \text{October 2020 SPIF } 50\% = \text{plot } 11$
2. Second dropped plot = $22 \text{ plots} * \text{September 2020 SPIF } 30\% = \text{plot } 7$
3. Third dropped plot = $22 \text{ plots} * \text{August 2020 SPIF } 20\% = \text{plot } 4$

Figure 3 Example of Aggregate Plot Allocation Process



9.3.3.2 Examples of Avoidable Waste

1. Stub trees that have not been identified in the cutting authority and appraisal or the retained volume was not accounted for in the appraisal of the cutting authority.
2. Chunks on a skidding trail used to support the machinery that resulted in the breakage of pieces greater than the minimum log length. Such pieces are classified as avoidable and are graded according to the characteristics of the whole original piece.
3. Helicopter bucking waste. Incorrect estimation of log weights may result in having to buck the logs shorter after attempting to lift them. Such waste is always regarded as avoidable.
4. Pieces bucked from a log to ‘zero’ the processor.
5. Bucking waste cut from a log to remove a defect that extends beyond the effect of the defect.

9.3.4 Piece Estimates

Waste pieces are often partially obstructed by branches, soil and other loose debris. The correct measurement of waste pieces is dependent on the ability of the surveyor to view a piece and confidently measure dimensions and observe defects affecting volume and grade. Surveyors are expected to attempt to clear loose debris to facilitate measurement and classification of pieces.

A reasonable effort must be made to measure as much as possible even if one end of the piece cannot be seen and must be estimated.

In order to correctly establish the grade of a log, at least one end must be visible or the piece should not be recorded.

9.3.5 Measure Factor

In strata where piling or deep accumulations exist, pieces in a plot may be unsafe to measure, obstructed, or inaccessible, therefore it may not be possible to measure or estimate each piece within a plot. Only in these cases, a measure factor can be applied to the plot. The measure factor adjusts the plot volume to account for pieces that were not measured or estimated by the surveyor within the plot.

In these cases:

1. Measure and/or estimate the waste material that is accessible. Measure as many pieces as possible, even when some dimensions of an individual piece must be estimated.
2. Project the plot boundaries down to the ground and estimate what percentage of the volumes within the plot boundaries were measured. This is the measure factor for the plot.

3. In spot accumulation strata:

- a. For piles equal to or greater than 50 m^2 , record the measure factor on the plot tally card under "Measure %", or
- b. For piles less than 50 m^2 , adjust the measure factor to account for the area that is available for sampling using the following calculation:
(Area of the pile / Area of the plot) * measure factor of the pile.
Record this value on the plot tally card under "Measure %."

The measure factor is applied to measure and prediction plots.

When estimating the prediction plot volume in an accumulation stratum, the total plot volume must include all volume that is not visible or available to be measured. The value entered into EForwasteBC take into consideration the measure factor for the plot. The percent measure field in the prediction plot header must be set to 100%.

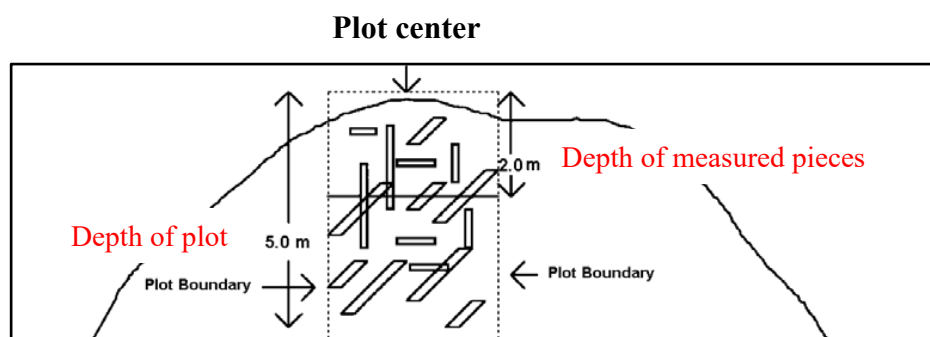
Example:

In the example below, if you were able to measure **all the pieces** down approximately 2 m, you would record a measure factor of 40 percent providing that the volumes of waste were spread evenly through the cylinder within the plot boundaries. The measure factor is derived from $2 \text{ m} / 5 \text{ m} * 100\% = 40\%$.

In a prediction plot, if the volume within the plot is estimated at 2 m^3 :

- To adjust by a measure factor, divide the measure factor percent by 100:
 $40 / 100 = 0.4$
- Calculate the prediction plot value:
 $2 \text{ m}^3 / 0.4 = 5 \text{ m}^3$
- Enter 5 m^3 into EForwasteBC

Figure 5 Measure Factor



9.5.2 Trees

Trees left standing after timber harvesting that are not reserved for silviculture, biodiversity or a forest management reason are measured in a waste assessment and classified as avoidable or, less commonly, as unavoidable waste.

The surveyor must reference appropriate documents such as the cutting authority, the appraisal, and maps as submitted into ECAS to determine the conifer and/or deciduous leave trees identified by species to be retained as reserved timber for the area being waste assessed.

When a waste assessment area contains standing timber, the post harvest **standing** tree specifications must be documented by a forest professional, and:

1. If standing timber is to be reappraised under section 2.2.2 (2) (c) of the *Interior Appraisal Manual*, an assurance statement prepared by a forest professional confirming that standing timber is not to be tallied must accompany the waste submission, or
2. If standing timber is to be tallied as waste, the updated documents (maps, etc.) must be provided to the waste surveyor.

In all cases, **a document detailing the** post harvest **standing** tree specifications **and the updated maps** must be submitted into the Waste System.

A tree must contain a log meeting the minimum timber merchantability length (3.0m) from high side of the stump to the utilization top diameter.

9.5.2.1 Recording Trees

For standing trees, record as "T" under "Kind of Material" and classify the trees as avoidable. For downed trees, record "D" and classify the trees as either avoidable or unavoidable. Enter the dimensions for length, top and butt diameters, end codes, and assign a log grade.

9.5.2.2 Individual Tree Measurements

Individual standing tree volumes that are measured must be stratified out and kept separate from the plot waste volumes. Trees that were left scattered sparingly throughout the cutblock are measured and graded individually.

Tree length is determined using a tape/chain and a clinometer or an electronic measuring device such as a laser instrument. The waste surveyor estimates the location of the timber merchantability specification top diameter, and then measures the length from this point down to the timber merchantability stump height. To record as a piece, the tree must contain a 3 m log that meets the timber merchantability specifications.

Record the timber merchantability specification top diameter in rads as the top diameter. If the top is broken, estimate the diameter in rads at the break.

The butt diameter is the tree diameter at the timber merchantability specification stump height, accounting for flare (see *Scaling Manual* section 6.2.2).

Trees are measured, recorded, and graded as a single piece, they are never pencil bucked into multiple pieces.

9.5.2.3 Trees in Patches

For trees that were left in a patch where individual tree measurement is impractical, the waste surveyor will measure the precise area represented by the tree patch (i.e. perform a closed traverse or traverse using GPS). A patch is defined to be a grouping of trees occupying an area of equal to or greater than 0.1 hectare.

The volume may be determined by:

1. Using the cruise compilation information from the appraisal, or
2. Completing a cruise of the timber. The cruise must be completed to the standards contained within the *Cruising Manual*.

Use the procedures in 9.5.2.4 to determine the volume, species, and grade allocations for the waste submission.

9.5.2.4 Volume, Species, and Grade Allocations for Standing Timber

The cruise net volume per hectare (for the applicable timber type(s)) will be used to determine the volume of timber in unharvested tree patches or waste assessment areas.

To obtain the volumes, use the timber type summary report from the net cruise compilation report for the timber type corresponding to each of the patch location(s) or the block summary report when a patch covers multiple timber types.

The grade allocations for tree patches, are based on the historic billing grade profile of the timber mark for the cutting authority from the Harvest Billing System (HBS). The grade profile can be obtained in HBS by running the mark monthly billing history selection report (billing history) for a twelve-month period ending one month after the month primary logging was completed for the waste assessment area.

Only in the absence of the billing history records, the net cruise volume and species for the waste assessment area being surveyed are used. The grades default to sawlog except for dead potential volumes which are recorded as grade 4.

9.5.2.5 Partial Cut (Variable Retention)

Timber volume that is left in excess of the leave volume and is not included in a reappraisal of the cutting authority will be billed as waste subject to the application of the waste benchmarks.

Surveyors should reference appropriate documents that provide the volume percent reduction by either one or more of species, timber type, risk group/tree class or treatment unit for each individual cutblock within the cutting permit or agreement.

There are two methods for determining the unharvested standing tree volume in a partial cut – by re-cruising the waste assessment area or by tallying the standing timber in fixed area waste plots. Choose a method that is appropriate for the waste assessment area:

1. For a re-cruise, a licensee must put in a sufficient number of cruise plots that will either achieve the sampling error objective as stated in the *Cruising Manual*, or meet the conditions required to waive it.
 - a. Once the unharvested standing tree volume has been derived, the timber scale grades will be assigned using the procedure described in section 9.5.2.4 to obtain the volume, species, and grade profile for the waste submission.
2. If waste plots are used, the plot size should be 200 m². Licensees are encouraged to use a higher sampling intensity than the minimum sampling requirements for the waste stratum.

The survey results for cutblocks that have been harvested using partial cut systems must be sponsored by an RPF or RFT. When there is no standing timber to report, an assurance statement must be submitted into the Waste System by a forest professional confirming that the partial cut timber harvesting requirements stated in the Schedule B or the Percent Reduction Report in the Appraisal Cruise Compilation Submission have been met.

If a field or office review by ministry staff identifies an apparent discrepancy with the species or volume harvested, the licensee or the TSM may be directed by the District Manager to re-cruise or resurvey the residual standing trees.

9.5.2.6 Unharvested Cutblocks

An unharvested cutblock in an expired, surrendered or cancelled cutting permit or authority **where harvest has occurred on the cutting authority will be billed as waste unless a waste relief application has been approved.**

The billings will be made based on the net cruise volume attributed to the unharvested cutblock.

The procedure described in section 9.5.2.4 will be used to obtain the volume, species, and grade profile for the waste submission.

9.5.3 Slabs

A slab is defined as any non-round piece with less than half (1/2) of its original diameter remaining, a minimum thickness of 5 rads (10 cm) and an average diameter equal to or larger than the timber merchantability specification diameter.

9.5.3.1 Recording Slabs

Slabs are measured, graded and recorded as a log (L) if greater than 3.0 m in length and have a minimum thickness of at least 5 rads (10 cm) for at least 3.0 m.

Slabs <3.0m in length are measured as bucking waste (W) if they are bucked at the butt end or both ends and have a minimum thickness of at least 10 cm.

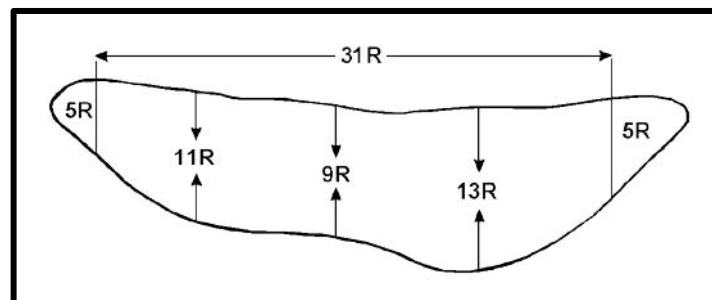
Bucking waste slabs with an average thickness less than 7.5 rads (15 cm) will be downgraded to Grade 4.

Refer to Chapter 5 of the *Scaling Manual* for measurement procedures for slab ends in various shapes (i.e. semi-circle, quadrant, sector, segment, etc.). Alternatively, the following method is accepted for computing slab diameters, for waste purposes.

Using Figure 8, slab diameters are computed using the following steps:

1. Measure and average 3 thicknesses.
i.e. $11 + 9 + 13 = 33/3 = 11$ rads
2. Measure 1 width between 5 rad edges.
i.e. Width = 31 rads
3. Average the thickness and the width.
i.e. $11 + 31 = 42/2 = 21$ rads

Figure 8 Measuring Slabs



10.2 Check Survey Standards and Procedures

Check surveys verify that the sampling plan was developed according to the standards and that the field measurements were collected and recorded correctly.

Check surveys may be comprised of office checks of the survey planning process or checking of the field survey work and data submitted to the Waste System.

Field checking may constitute audits of plot location attributes, waste assessment area strata delineation, piece data audits, or a combination of all.

The check survey will remeasure the attributes that were measured in the original survey. The full survey or parts of a survey of a waste assessment area or a reporting unit can be accepted or rejected based on the results of the check survey.

Field Services staff may check more than the minimum requirement if it is necessary to ensure compliance with the manual standards (i.e. previous check(s) showed borderline acceptable work).

When requested by the Ministry, the licensee must submit the original waste survey data in the format it was collected (either digital format or paper tally cards), a copy of the final survey plan map, area calculations, and any notes related to the survey. Digital plot data must be submitted in a format compatible with Ministry equipment.

10.2.1 Field Check Requirements

In check surveys, the following number of plots are remeasured:

1. Small Populations

- a. In each accumulation stratum, at least 10 percent of the measure plots, or a minimum of two plots, whichever is greater, and
- b. In each dispersed stratum, at least 10 percent of the measure plots, or a minimum of five plots, whichever is greater.

In an aggregate population, the minimum number of plots to be checked are based on the number of plots from the sample plan and any other strata that exist within the waste assessment area being checked. Prediction plots may be checked at the discretion of the auditor. To reject a survey based on prediction plot volumes, at least 10 percent of the prediction plots, or a minimum of five, whichever is greater, must be checked.

In order to reject a waste survey on the basis net volume and value, the auditor will audit the number of measure plots specified above within the sample population.

Otherwise, to reject a survey based on the individual parameters, the minimum number of check plots will include both prediction and measure plots. If fewer plots have been audited and there is mutual agreement between the waste surveyor or licensee representative and the auditor, the survey may be rejected.

10.2.2 Field Checking Standards

10.2.2.1 Maximum Allowable Errors

Measurement of a random selection of samples within a waste assessment area is used to assess the acceptability of the survey results. The items to be checked and their acceptable limits of errors are specified below.

10.2.2.2 Net Volume and Value

Exceeding the parameter for either the net volume or net value of waste (avoidable and unavoidable) is grounds for rejection of the survey.

Table 10-1 Net Volume and Value

Net Volume	The net volume of waste within a waste assessment area or aggregate population must not vary by 10.0 percent from the net volume of waste determined by the check surveyor.
Net Value	<p>The net value of waste within a waste assessment area or aggregate population must not vary by 10.0 percent from the net value of the waste determined by the check surveyor.</p> <p>The net value is derived by multiplying the volume of each species/grade combination by the applicable waste rate.</p>

10.2.2.3 Individual Parameters

Although the net volume and net value are the main determining factors for accepting or rejecting a survey, a survey may be rejected if any of the individual parameters identified below have been exceeded. Additionally, even when the volume and value standards have been achieved within a waste assessment area, if continuous or repeated errors are identified, the District Manager may order a resurvey as required.

11. Appendices

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Appendix 1 Glossary

Words and expressions used but not defined in this Manual, unless the context otherwise requires, have the same meaning as in the Forest Act.

“**AAC**” means Allowable Annual Cut as defined in the *Forest Act*;

“**Act**” means *Forest Act*;

“**Aggregate Waste Submission**” means a waste submission relating to two (2) or more waste assessment areas but not exceeding 19 waste assessment areas;

“**Agreement**” means a form of agreement referred to in section 12 of the *Act*, or a pulpwood agreement;

“**Avoidable Waste**” means wood material that meets or exceeds the Timber Merchantability Specifications that does not fall within the definition of unavoidable waste;

“**Batch**” means a grouping of one or more waste assessment areas selected from a population that have been selected to be surveyed;

“**BCTS**” means BCTS as defined in the *Forest Act*;

“**Bernoulli selection process**” means to sample cutblocks where each cutblock is selected individually for inclusion into the sample, using the same selection probability as in previous batches;

“**Breakage**” means any piece of a tree, meeting the minimum diameter set by the TMS, which has a gross length shorter than 3.0 m in length and is broken at the large end or broken at both ends. This definition is not consistent with the inventory definition of breakage nor is it intended to be;

“**Bucking Waste**” means a portion of a tree or log greater than the top diameter set by the TMS that is less than 3.0 m in length and which has been cut at the large or both ends. To be measured as bucking waste the piece must have originated from a tree or log at least 3.0 m in length;

“**Cardinal direction**” means North, South, East and West. All references to azimuths or bearings mean the “true” value;

“**Cold deck**” means five or more grade 1, 2, 4 or 6 (grade 6 is only counted when required to be measured under the cutting authority document) logs that are mechanically placed together in a deck;

“**Conventional**” means any harvest method that does not use a helicopter;

“**Cruise Based**” means a cutting authority where under section 106 of the *Act* the stumpage payable is calculated using information provided by a cruise of the timber conducted before the timber is cut;

“**Cutblock**” means an area that meets the cutblock requirements as specified in the Interior Appraisal Manual;

“Cutting Authority” means:

1. A cutting permit issued under a Forest Licence, Timber Sale Licence, a Timber Licence, a Tree Farm Licence, a Community Salvage Licence, a Master Licence to Cut, a Forestry Licence to Cut, or a First Nation Woodland Licence;
2. A Timber Sale Licence that does not provide for the issuance of a cutting permit;
3. All other Licences to Cut; or
4. A Road Permit;

“Cutting Authority Area” means the area where timber may be harvested under the cutting authority being appraised, and which has a unique timber mark;

“Deciduous Timber” means timber that is not of a coniferous species;

“Decked Timber” has the same meaning as a cold deck;

“Director” means the Director of Timber Pricing Branch of the Ministry of Forests, Lands and Natural Resource Operations and Rural Development;

“Firmwood” means the amount of solid wood within a log or waste piece after accounting for rot, hole, char and missing wood.

“Forest Professional” means a Registered Professional Forester (RPF), a Registered Forest Technologist (RFT) or a special permit holder acting within the scope of their permit, registered and in good standing with the Association of BC Forest Professionals;

“GPS (Global Positioning System)” means a method of determining or relocating a ground position using the signal from several satellites simultaneously. A small portable computer evaluates the time for each signal to reach it and then computes a three-dimensional location;

“GIS Software” means a Geographic Information System designed to capture, store, manipulate, analyze, manage, and present geographical data;

“Harvest” means to cut, cut and remove, or remove timber from a cutting authority, other than on road permit areas within a cutblock;

“Harvest Residue Compiler” means a data compilation software application used to create sample populations and to calculate waste data for input into the Waste system;

“HBS” means the Harvest Billing System administered by the Ministry;

“HDOP” means horizontal dilution of precision, which is a measure of the precision of GPS results related to the satellite positions. As HDOP decreases, the level of precision increases;

“Licensee” means the holder of a cutting authority;

“**Log**” means any near-round piece with more than half of its original diameter remaining and with an average diameter equal to or larger than the timber merchantability specification diameter for at least 3.0m of length;

“**Manual**” means the Provincial Logging Waste and Measurement Procedures Manual-Interior Version;

“**Merchantable Timber**” means timber that meets or exceeds the timber merchantability specifications that are described in Table 3-1 in this Manual. Timber that is graded 6 or Z (Interior) is not merchantable;

“**Minister**” means the Minister of Forests, Lands, Natural Resource Operations and Rural Development;

“**Ministry**” means the Ministry of Forests, Lands, Natural Resource Operations and Rural Development;

“**Net Waste Area**” means the area of a cutblock in hectares reported in a waste submission as the area in which merchantable timber that was authorized to be cut was harvested less any non-productive area created during harvest operations (i.e. roads);

“**North Area**” means Northeast, Omineca, and Skeena Regions excluding that portion that lies geographically within the North Coast Timber Supply Area;

“**Number of Samples**” means the number of samples of either waste assessment areas or plots in a waste survey;

“**Other related sections**” in the context of the *Forest Act*, means sections 13(3)(b)(ii), 14(1)(d)(ii), 20(3)(b)(ii), 22(f)(ii), 30(f)(ii), 33(5)(b)(ii), 35(1)(c)(ii), 43.3(1)(d)(ii), 43.55(1)(d)(ii), 43.7(2)(e)(ii), 43.8(e)(ii), 45(1)(d)(ii), 47.5(1)(a)(ii), 47.5(2)(b)(ii), 47.7(f)(ii), 118(1)(c)(ii);

“**Partial cutblock**” means a portion of a cutblock that is to be surveyed. A partial cutblock submission cannot be only one stratum;

“**PDOP**” means positional (3D) dilution of precision, which is a measure of the precision of GPS results related to the satellite positions. As PDOP decreases, the level of precision increases;

“**Pencil Buck**” means the act of recording bucking waste or stumps as two or more pieces of waste material. Surveyors will divide (pencil buck) the piece of waste at the point where the waste class changes from avoidable to unavoidable waste as a result of a defect in the piece;

“**Pile**” means an accumulation of woody material created by a machine that contains one or more pieces of waste;

1. Roadside Pile means a pile in which the majority of the pile area (footprint) is located adjacent to and within 20 metres of a road edge.
2. Dispersed Pile means a pile in which the majority of the pile area (footprint) is located greater than 20 metres from the road edge.

“Unavoidable Waste” means **waste** that meets or exceeds the Timber Merchantability Specifications that:

1. Is inaccessible or physically obstructed;
2. Could not be felled, bucked or removed due to safety reasons;
3. Could not be felled, bucked or removed due to physical, or environmental reasons;

“Unharvested” means a cutblock where:

- no timber is cut, or
- the timber is cut and not removed to a scale site.

“Volume Estimate” means the determination of a volume of material using sampling principles and measurements in accordance with this Manual;

“Volume Prediction” means a forecast of waste volume at the waste assessment areas or plot level;

“Waste” means timber, whether standing or felled, except timber reserved from cutting, which meets or exceeds the Timber Merchantability Specifications described in this Manual that was not removed from the cutting authority area by the agreement holder;



“Waste Assessment” means an assessment conducted in accordance with the procedures set out in the Manual for determining the volumes of Waste and Residue left on a harvested area following completion of harvesting operations;

“Waste Benchmark” means the volume of avoidable waste, expressed in cubic metres per hectare that can be left on a harvested area without being subject to a monetary waste assessment;

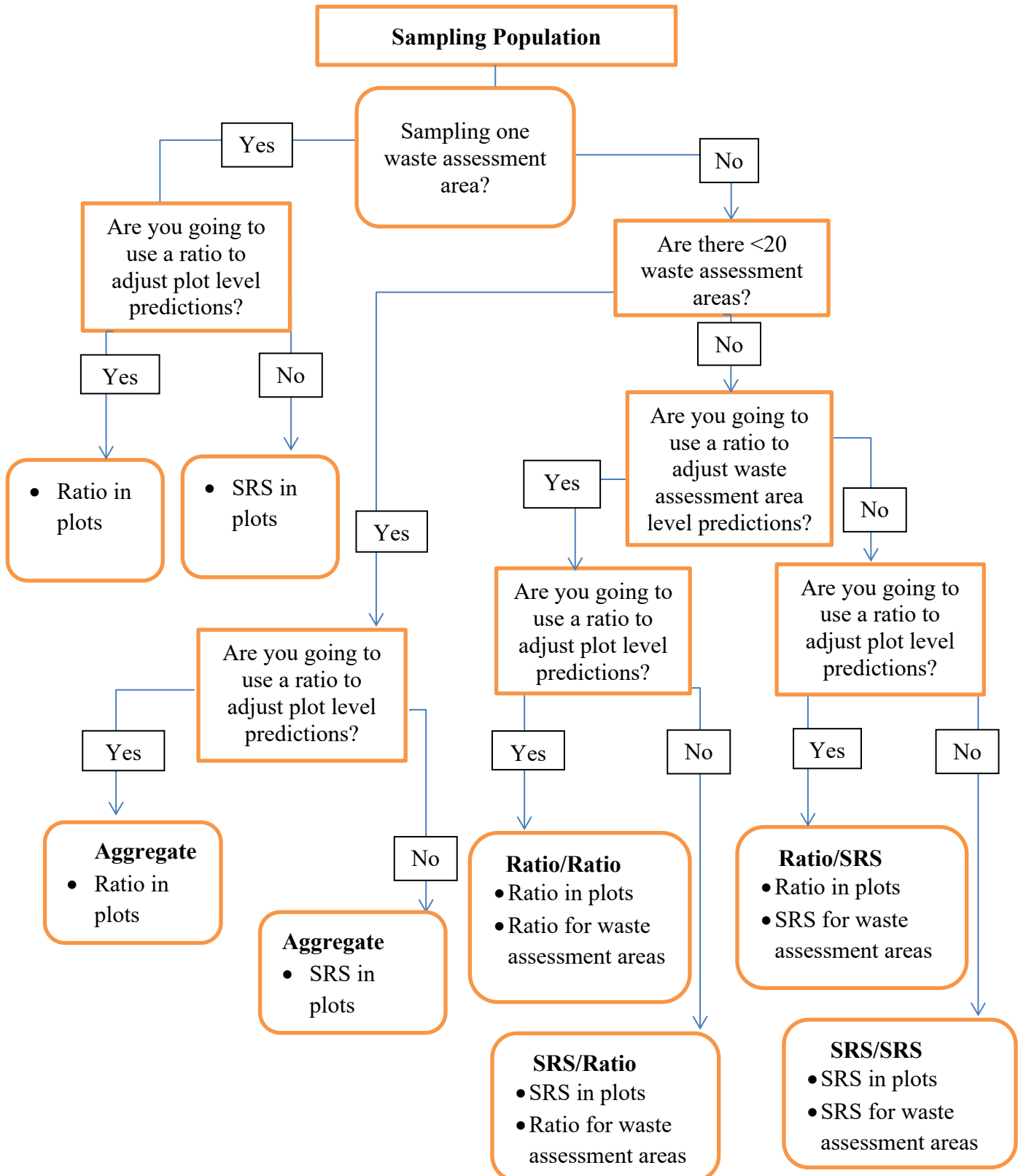
“Waste System” means the online Waste System;

“WMRF” (waste monetary reduction factor) means a factor applied to the waste rate to generate a waste billing rate.

Appendix 2 WMRF and Billing Calculations

		INTERIOR Worksheet for Waste Billing Against Benchmarks		Ministry of Forests 																									
To be Completed by Licensees																													
Licence No.		CP No.		Cut Block																									
Timber Mark			Reporting Unit No.																										
Primary Logging Completion Date			Cut Block Net Area ha																										
Location			Stand/Site Type																										
Calculations																													
<p style="text-align: right;">Avoidable waste conifer sawlog _____ M³/ha..... (A) (grades 1 and 2)</p> <p style="text-align: right;">Established benchmark = _____ M³/ha..... (B)</p> <p style="text-align: right;">(A) - (B) = _____ M³/ha..... (C)</p> <p>If (C) < or = 0.0000, stop</p> <p>If (C) > 0.0000, proceed as follows:</p> <p style="text-align: right;">Waste Monetary Reduction Factor (WMRF) = (C)/(A) = _____(D) (to four decimals)</p>																													
To be Completed by Forest Service																													
Processing																													
<p>If (C) is < or = 0.0000, on FS 702, code:</p> <table style="width: 100%;"> <tr> <td style="width: 60%;">Avoidable all species sawlogs (grades 1 and 2):</td> <td style="width: 20%; text-align: right;">\$0.00/m³</td> <td style="width: 20%;"></td> </tr> <tr> <td>Avoidable all species grade 4:</td> <td style="text-align: right;">\$0.25/m³</td> <td></td> </tr> <tr> <td>Unavoidable all species all grades:</td> <td style="text-align: right;">\$0.00/m³</td> <td></td> </tr> </table>						Avoidable all species sawlogs (grades 1 and 2):	\$0.00/m ³		Avoidable all species grade 4:	\$0.25/m ³		Unavoidable all species all grades:	\$0.00/m ³																
Avoidable all species sawlogs (grades 1 and 2):	\$0.00/m ³																												
Avoidable all species grade 4:	\$0.25/m ³																												
Unavoidable all species all grades:	\$0.00/m ³																												
<p>If (C) is > 0.0000, request average sawlog rate from HBS</p> <table style="width: 100%;"> <tr> <td style="width: 40%;">Average coniferous sawlog rate (HBS) =</td> <td style="width: 20%; text-align: right;">\$ _____ /m³</td> <td style="width: 20%; text-align: right;">.....(E)</td> <td style="width: 20%;"></td> </tr> <tr> <td>Deciduous sawlog rate =</td> <td style="text-align: right;">\$ _____ /m³</td> <td style="text-align: right;">.....(F)</td> <td></td> </tr> </table> <p>On FS 702, code</p> <table style="width: 100%;"> <tr> <td style="width: 40%;">Avoidable coniferous species sawlogs (D x E) =</td> <td style="width: 20%; text-align: right;">\$ _____ /m³</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> </tr> <tr> <td>Avoidable deciduous species sawlogs: (F) =</td> <td style="text-align: right;">\$ _____ /m³</td> <td></td> <td></td> </tr> <tr> <td colspan="4">Avoidable all species grade 4: \$0.25/m³</td> </tr> <tr> <td colspan="4">Unavoidable all species all grades: \$0.00/m³</td> </tr> </table>						Average coniferous sawlog rate (HBS) =	\$ _____ /m ³(E)		Deciduous sawlog rate =	\$ _____ /m ³(F)		Avoidable coniferous species sawlogs (D x E) =	\$ _____ /m ³			Avoidable deciduous species sawlogs: (F) =	\$ _____ /m ³			Avoidable all species grade 4: \$0.25/m ³				Unavoidable all species all grades: \$0.00/m ³			
Average coniferous sawlog rate (HBS) =	\$ _____ /m ³(E)																											
Deciduous sawlog rate =	\$ _____ /m ³(F)																											
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Avoidable deciduous species sawlogs: (F) =	\$ _____ /m ³																												
Avoidable all species grade 4: \$0.25/m ³																													
Unavoidable all species all grades: \$0.00/m ³																													
Approved by Forest Officer (signature)				Date																									

Appendix 3 Sampling Population Flowchart

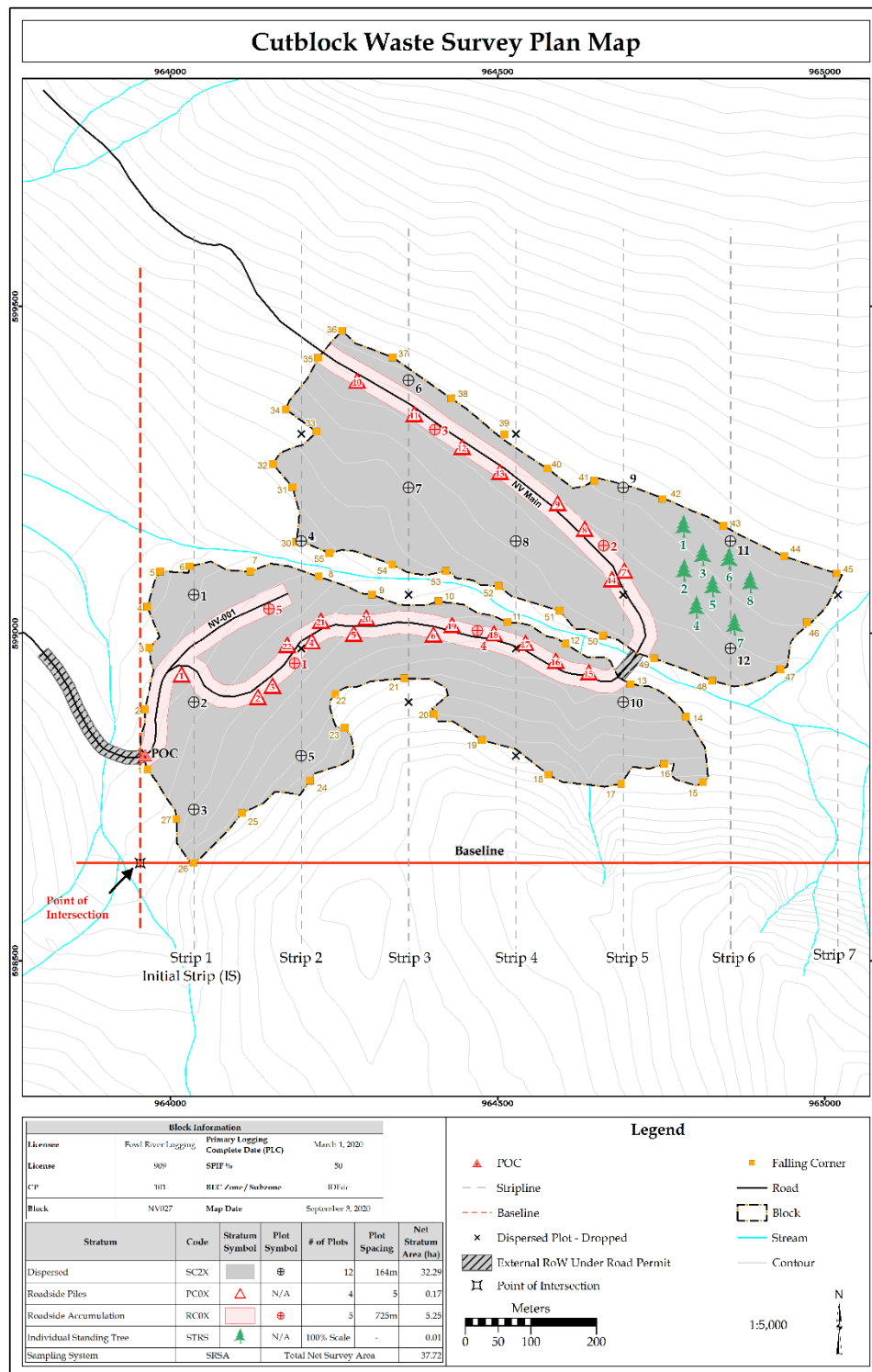


Appendix 4 Plot Table Charts for Single Waste Assessment Area Populations

Spot Accumulation (Pile) Strata - Minimum # of Plots			
Total Number of Piles (greater than or equal to)	# of Measure Plots for SRS	# of Prediction Plots for Ratio	# of Measure Plots for Ratio
1*	10	12	4
13	11	12	4
15	11	13	4
18	12	13	4
20	12	14	5
23	13	14	5
25	13	15	5
28	14	15	5
30	14	16	5
33	15	16	5
35	15	17	6
38	16	17	6
40	16	18	6
43	17	18	6
45	17	19	6
48	18	19	6
50	18	20	7
53	19	20	7
55	19	21	7
58	20	21	7
60	20	22	7
63	21	22	7
65	21	23	8
68	22	23	8
70	22	24	8
75	23	25	8
78	24	25	8
80	24	26	9
83	25	26	9
85	25	27	9
88	26	27	9
90	26	28	9
93	27	28	9
95	27	29	10
98	28	29	10
100	28	30	10
103	29	30	10
108	30	30	10

* If there are more plots required than spot accumulations, evenly disperse **all** plots on the spot accumulation(s) in the waste assessment area.

Appendix 7 Example Waste Assessment Area Survey Map



Appendix 8 Waste Survey Plot Tally Card

[illegible]