GOLDEN TSA
VRI GROUND SAMPLING

PROJECT IMPLEMENTATION PLAN

Prepared for:

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R.P.F. Signature

This project has been done to the required standards and completed accurately for the stakeholders of the Golden Timber Supply Area.

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Terry Conville, R.P.F.

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1.0 INTRODUCTION

As per the Ministry of Sustainable Resource Management, Terrestrial Information Branch's website, the Vegetation Resources Inventory is designed to answer two questions:

1. Where is the resource located? And,

2. How much of a given vegetation resource (for example, timber resource) is within an inventory unit?

1.1 Overview of VRI Process

The Vegetation Resource Inventory (VRI) is a photo-based inventory that has some of its attributes adjusted by formal ground sampling. The basic steps of the VRI process are as follows:

1) Aerial Photograph Acquisition: Digital softcopy of hardcopy aerial photograph creation and production,

2) Phase I – Photo Interpretation: Aerial photograph interpretation by certified interpreters – the main tasks include delineation and attribution (of a wide range of attributes including land cover type, tree species, height, age, structure, volume, basal area, density, slope position, ecological site unit, etc.),

3) Phase II – Ground Sampling: Implement ground sampling program based on achieving resultant sampling (standard) error of less than 15% for forest stand volume. Complete random ground samples evenly distributed across the target population (obtain detailed ground inventory and tree productivity measurements, forest health measurements, net volume calculations, grading, and potentially collect ecological data),

4) NVAF (Destructive Sampling): Complete destructive sampling of subclass of the ground sampling plots in order to localize and adjust the ground crew estimates of age, height, and gross and net volume,

5) Compilation & Statistical Adjustment: Compilation and adjustment of estimated ground sample cruiser-calls using the actual NVAF information. Then complete the inventory by statistically adjusting the photo based polygon information (continuous variables only – such as age, height, and volume), in order to achieve a statistically defensible and correct answer for the entire administrative unit.

1.2 VRI Responsibility

It is the licensee's responsibility to implement a VRI and the Ministry of Sustainable Resource Managements responsibility to create the standards and ensure potential projects follow proper sampling principles. As well, the MSRM provides some audit functions.

1.3 Document Objectives

The objective of this report is to outline and describe the Vegetation Resources Inventory (VRI) ground sampling activities to be completed within the within the Golden Timber Supply Area (Golden TSA). It provides some basic landbase information, some background information from the previous Annual Allowable Cut (AAC) Rationale document (Jan. 2000), outlines the ground sampling design and methods used. In addition, this report outlines the implementation plan for the field sampling.

1.4 Landbase

The Golden TSA is located in southeastern British Columbia within the Nelson Forest Region. The TSA is bounded by the Selkirk and Purcell Mountains to the west and the Rocky Mountains to the east. It straddles the Rocky Mountain Trench and the upper Columbia River Valley northward to the Big Bend area near Mica Dam. The TSA is bordered by five National Parks (Kootenay, Yoho, Banff, Jasper and Glacier), as well Hamber Provincial Park and Cummins Lakes Provincial Park is located within the TSA boundary (AAC Rationale document, 2000).

Most of the TSA lies within the interior wet belt of the province. The mountainous environment has a varied climate and growing conditions, resulting in diverse forests. In wetter parts of the TSA, lower elevations are occupied predominately with western red cedar, western hemlock and spruce species, with stands of spruce and subalpine fir occupying most of the higher elevations. Some southern parts of the TSA experience a drier climate, with Douglas-fir forests in valley bottoms and lodgepole pine at higher elevations. Throughout the TSA, mountain peaks are covered by large areas of alpine tundra, rock, snow, and ice. Because of the rugged, mountainous landscape, a relatively small portion of the TSA consists of productive forest land (AAC Rationale document, 2000).

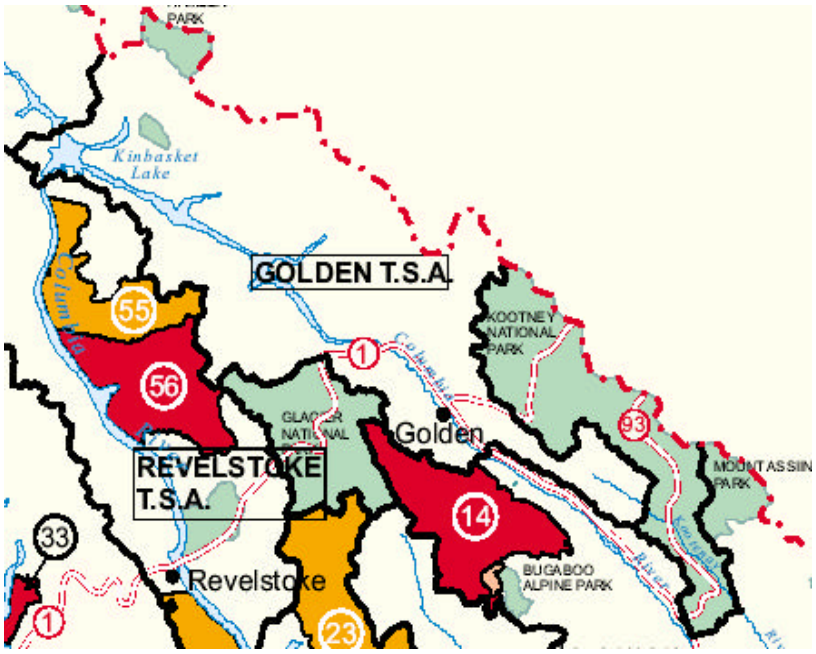

Figure 1: Overview of Golden TSA

The four biogeoclimatic zones located within the TSA include the Interior Cedar Hemlock (ICH) zone, the Engelmann Spruce Subalpine Fir (ESSF) zone, the Sub-Boreal Spruce (SBS) zone, and the Alpine Tundra (AT) zone.

Based on current (May 2003) estimates from the BC Ministry of Forests (MoF), the Golden analysis unit is just over one million (1,185,101) hectares in total area and the TSA area (excluding parks) is just over 900,000 (902,445) hectares.[2] Of this only 186,498 hectares (20 percent) is considered as operable productive forest land, and approximately 153,870 hectares is considered suitable as the Timber Harvesting Land Base (THLB). Table 1 below shows an abbreviated landbase summary as per the May 2003 landbase information. Note that these figures differ to some degree with the VRI database figures in Section 2.4 of this report – as the information below was determined based on historical inventory and operability information.

Table 1: Golden TSA Abbreviated Landbase Summary Estimates (Provided by the Ministry of Forests, Columbia Forest District)

Description	**Area (ha)**
Total Landbase	1,185,101
TSA	902,444
Treed & managed by MoF	351,450
Reductions	*205,281*
Additions	*7,700*
Current Timber harvesting Landbase (THLB)	153,869
Operable Productive Forest Land	*186,498*

The general species breakdown (of the main species within the TSA) of the previous inventory versus the new VRI inventory yields the following comparison (as shown in Table 2).

Table 2: Species Comparison (previous versus VRI inventory)

Previous Inventory		**VRI Inventory**	
Species	**%**	**Species**	**%**
SB	40	SB	40
F	22	F	26
PL	22	PL	14
Cw	9	Cw	6.5
Hw	7	Hw	7
Other	N/a	Other	6.5
Total	100 %	Total	100 %

This breakdown between the inventories shows generally little difference in the leading species except a switch in the amount of Douglas fir versus lodgepole pine and the addition of other (deciduous) species in the VRI inventory.

1.5 Background and Inventory Issues

The original inventory was completed in 1968 and was last updated in 1994. This existing inventory information was used in the January 2000 AAC determination, however, at that time the Nelson Forest Region was also undertaking the new VRI phase I inventory work.

The VRI aerial photo (Phase I) inventory was completed in December 2001 using 1996 and 1997 1:15,000 hard copy aerial photographs. The document photos are currently kept with the Ministry of Sustainable Resource Management (MSRM) Nelson Regional Office.

The AAC rationale stated a number of issues and uncertainties with respect to the inventory and related forest information. The issues related to the classification of the forest land and deal with uncertainty in the existing forest management related to the inventory.

The specific issues outlined in the rationale document which revolve around the inventory, which should be able to be addressed by this current VRI, include:

1) Deciduous stands were previously excluded from the timber supply analysis. These stands should be included as they may also contain valuable conifer species or contribute to future volume in the TSA;

2) For the previous Timber Supply Review (TSR) the 1989 operability line was used to support the AAC determination. A revised operability line was requested before the next TSR;

3) Although the inventory volumes themselves were deemed acceptable in the inventory audit a new inventory was requested in order to reduce uncertainty, particularly for stands older than 140 years of age;

4) There were potentially significant errors in the species composition – especially the species classification for problem forest types;

5) It was recommended that destructive sampling and testing continued in order to assess allowances for decay waste and breakage for cedar and hemlock stands;

6) Correct site productivity estimates is required for both the low volume cedar/hemlock stands and mature low site index spruce leading stands.

2.0 GROUND SAMPLING PLAN

This portion of the report provides information on the sampling plan prepared for the Golden TSA.

2.1 Ground Sampling Objectives

The main objective of the ground sampling timber emphasis inventory is to install an adequate number of VRI sample clusters in order to statistically adjust the photo interpreted timber inventory attributes (such as height, age, and volume), within the TSA vegetated-treed areas to achieve a sampling (standard) error between 10 and 15 percent with a 95% confidence level.

2.2 Target Population

The target population for the proposed ground sampling inventory is the vegetated treed portion of the TSA located on crown forest land, that is also considered "operable" – as defined by the 2002 operability linework.

LP Engineered Wood Products Ltd. has substantially revised the operability over the last two years – and has stated that the operable area is quite stable. As with other areas in the Province, the operable area within the Golden TSA was considered for ground sampling as it provides for cost effective VRI ground sampling and focuses sampling activities in the portion of the landbase that is particularly important to the stakeholders.

In addition, stands younger than 30 years of age were to be excluded from the ground sampling inventory. The volume estimates for these stands are problematic; as well age and height information is often available from silviculture survey information.

The selection of the target population consisted of first identifying "Vegetated and Treed" polygons (greater than 10 percent crown closure) that are at least touching the operability line. This selection method at least allows for a buffer of potentially operable or borderline high elevation polygons along the designated operability 'line'.

2.3 Sample Size

The sample size for the Golden TSA is determined based on a combination of the sampling error (SE) objective (10-15%) and the expected net volume coefficient of variation (CV) of the population, as determined from the latest inventory audit information. The previous operable inventory volume coefficient of variation (as determined by the 1999 Golden TSA inventory audit) is estimated to be 52 percent. Based on this information, and historical inventories in the region, the Nelson Regional Vegetation Resources Inventory Forester, Chris Mulvihill, R.P.F., estimated that 85 samples might be suitable to meet the sampling error target.

In addition, by using the sample size estimate calculations 85 samples are predicted to yield a sampling error of approximately eleven (11) percent. However, the coefficient of variation of the new inventory will be revised and re-calculated once the initial year of ground sampling is completed – then the proposed sampling error estimates can be better refined.

The preliminary figures for determining the number of samples conducted within the Golden TSA are shown by the calculations below:

Sample Size Estimate

NOTE: CV is from VRI Ratio-of-Means
(ground volume/unadjusted inventory volume)

where n = t^2 * CV^2 / PE^2 (t at alpha/2, n-1)
if t=2 is assumed (for alpha=0.05), n = 4 * CV^2 / PE^2

Sample size for a given CV and PE:

CV= 52.0%
alpha= 0.05 t=2

Error %	**Sample size**
PE	N
10%	108
15%	48

Sample size for a given CV and n:

CV= 52.0%
alpha= 0.05

Sample size	Error %
n	PE
50	14.8%
80	11.6%
86	**11.1%**

100	10.3%
120	9.4%
130	9.0%
150	8.4%

2.4 Sample Selection

The method used for selecting polygons was that of probability of selection proportional to size with replacement (PPSWR). The selection process for Golden TSA followed the procedures outlined in the document, "Sample Selection Procedures for Ground Sampling", which was produced by the Ministry of Sustainable Resource Management, Terrestrial Information Branch, in December 2002.

The data files used for the selection process included the most recent:

1) Golden TSA VRI Phase I inventory database and graphic files (approved by the MSRM in 2002),
2) Administrative boundary coverage (obtained from the Columbia Forest District, MoF, 2002), and
3) Operability overlay linework (2001/2002) obtained from LP Engineered Wood Products Ltd.

The VRI data files were used for preparing the sampling plan for the VRI ground field verification sampling. Most of the information in this database was projected to 2001/2002. A few mapsheets were also obtained from the MSRM that had new inventory information in 2003. Once collated the database files were verified to be clean and free of errors and a 1:1 link with the spatial files was confirmed, then a seamless VRI database (for the entire TSA) was produced. From this database specific attributes were used for the selection process. The attributes used (from the VRI database) for this procedure included:

1) MAP_ID
2) POLY_ID
3) SPECIES_ID
4) SPECIES_CD
5) CROWN_CLOSURE
6) FOR_COVER_RANK_CD
7) SPECIES_PERCENT
8) BASAL_AREA
9) VOLUME, and
10) PROJ_AGE

The qualifying vegetated-treed polygons cover 232,104.7 hectares of the Golden TSA (approx. 25 percent). These polygons were divided into four dominant strata based on the area coverage and similar growth characteristics of the leading tree species. As well, the strata were developed in an attempt to address some of the previous inventory issues.

Once the strata were defined, the standards required that each of the strata be further separated in sub-strata, based on volume. The target was less than 15 substrata overall with a maximum of three substrata (low to high volume), per main species strata. Table 3 shows a summary of the area, percent coverage, and number of polygons within each strata class. As well the proposed number of ground sampling plots are shown for each strata and the number of substrata classes are presented.

Table 3: Golden TSA Sampling Strata

SPECIES	AREA	PERCENT	# POLYGONS	# Plots per strata	# of Substrata
FPL	93,868.5	40.4%	5,817	31	3
SB	93,356.0	40.2%	6,786	31	3
CH	31,662.2	13.6%	2,110	15	2
Dec	13,218.0	5.7%	804	8	1
Total	**232,104.7**	**100.0%**	**15,517**	**85**	**9**

The justification for the separate and smaller deciduous sample is to isolate the impacts of these deciduous leading polygons on the other strata – and to attempt to keep the other strata somewhat homogenous. The deciduous polygons tend to have less accurate information, and when compared to the ground information, they produce more extreme adjustment factors. As well, at this time the deciduous strata has limited inventory significance, therefore a disproportionate allocation of samples is proposed (per. Comm. S. Otukol, MSRM, 2003).

Once the substrata were determined, the individual substrata polygon areas were accumulated and then individual polygons were randomly selected from this list according to the proportional area of each substratum.

2.5 Quality Assurance Process

Once the potential ground sampling polygons were selected the proposed target sample was compared against the entire Golden TSA population. This comparison is critical to ensure that the selected samples represent the range of inventory attributes that exist in the population. For this comparison a number of attributes were used, including strata (species) group, volume class, age class, height class, and site index (see Figures 2 through 6 respectively).

Figure 2: Species Group Comparison/Summary

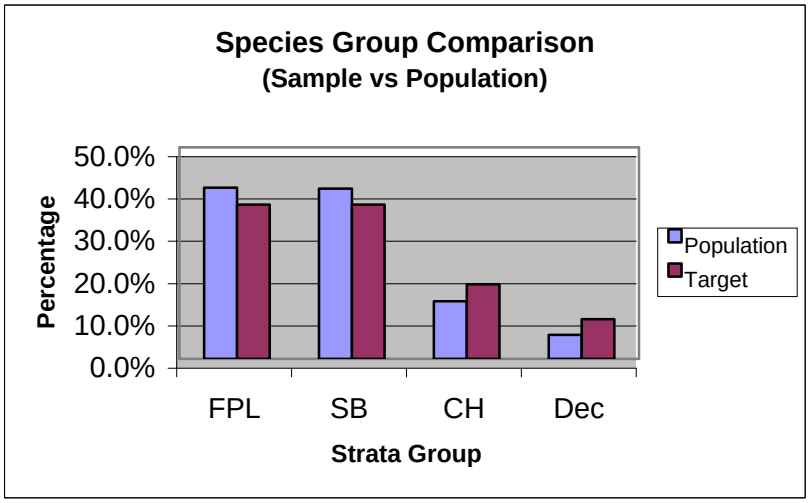

Figure 3: Volume Comparison

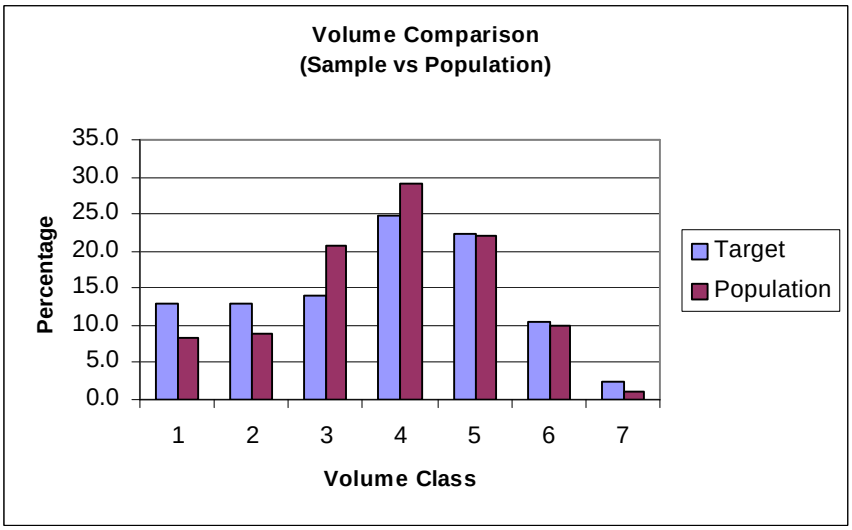

Table 4: Volume Class Codes

Volume Class	Values (m^3)
1	0 to 50
2	51 to 150
3	151 to 250
4	251 to 350
5	351 to 450
6	451 to 550
7	551+

Figure 4: Height Class Comparison

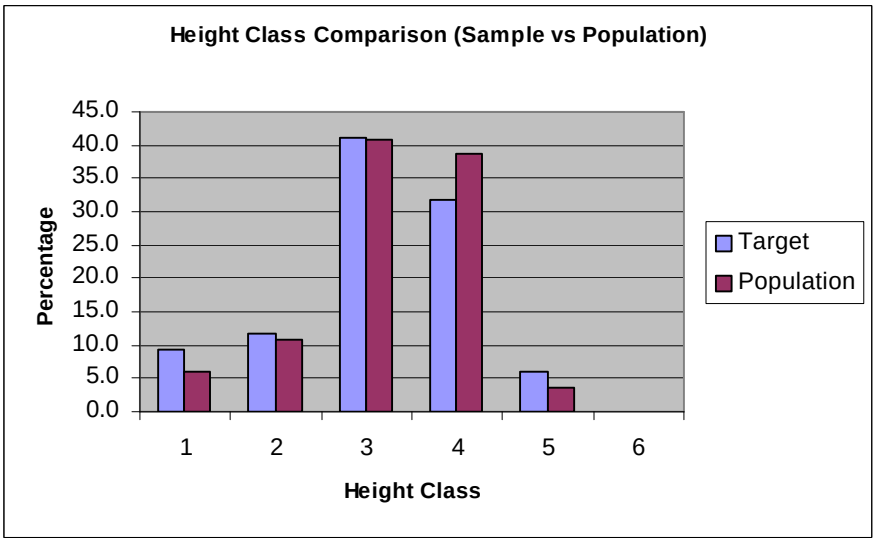

Figure 5: Age Class Comparison

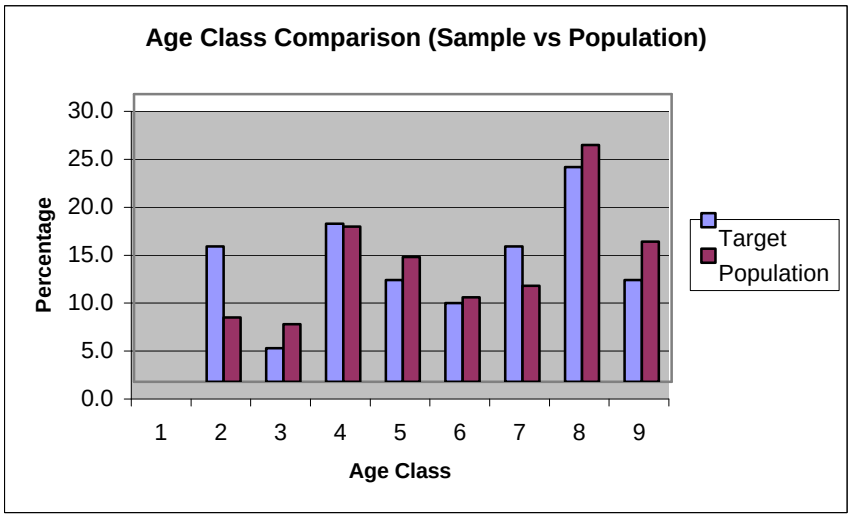

Figure 6: Site Index Comparison

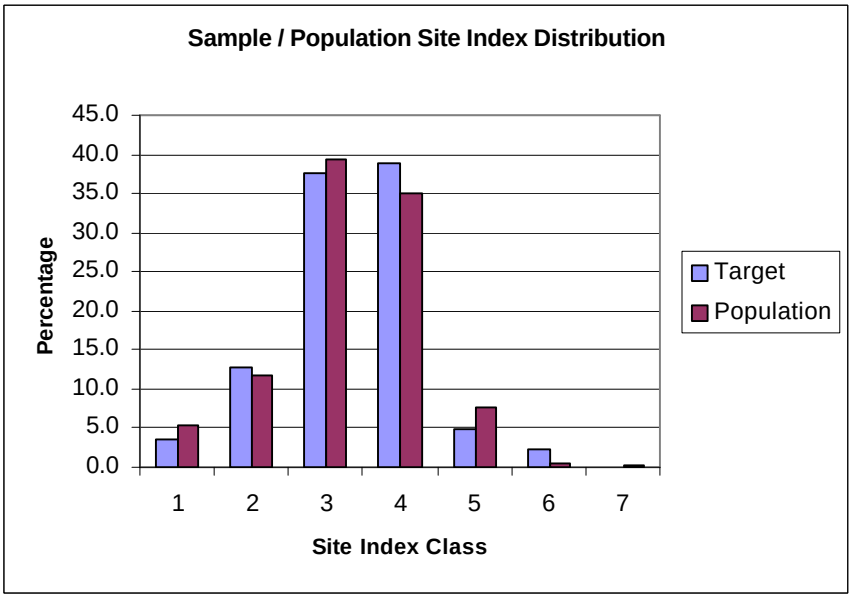

Table 5: Site Index Codes

SI Class	Values
1	0 to 10.0
2	10.1 to 12.5
3	12.6 to 17.5
4	17.6 to 22.5
5	22.6 to 27.5
6	27.6 to 30.0
7	30.1+

2.6 Sample Point Selection

Once the polygons were chosen then the sample point within each target polygon was selected. The official provincial 100-meter grid was digitally overlaid over each selected polygon, and then every grid point within each selected polygon was retained. After which, a random point generator was used to select the sample point location for each of the selected polygons.

2.7 Sampling Approach

Due to Forest Investment Account (FIA) budget limitations the ground sampling activities will be completed over two years beginning in the fall of 2003, with completion scheduled for the summer of 2004. Both the regular timber emphasis sampling and the net volume adjustment factor (NVAF) enhanced cruising will be conducted. It is anticipated that the NVAF ground samples be given priority so they can be used to develop the NVAF destructive sampling contract in early 2004. In this way the NVAF destructive sampling can then also be completed in the summer/fall of 2004 – thereby allowing the stakeholders to potentially complete the final inventory adjustment work in the fall/winter of 2004/2005 for the Golden TSA.

2.8 Sample Type

The ground sampling for this inventory will use Timber Emphasis Plots (TEPs) with selected enhanced cruising of selected auxiliary plots for the purpose of future NVAF destructive sampling.

The inventory sample design is a five-point cluster consisting of an Integrated Plot located at the centre of the cluster, and up to four auxiliary plots located in cardinal directions around the main integrated plot center. The integrated plot center is the location around which the detailed sample information will be collected. All attributes are attached to the plot centre point. Data is collected on the following major items:

- tree attributes – including mensuration, damage, loss, gross and net volume, and grades (variable and/or fixed area)
- site tree information (fixed area - 5.64 m radius)
- wildlife tree attributes (variable or fixed area)
- small trees and stumps (fixed area - 2.50 m radius)

Plot type for each of the proposed ground samples have already been determined and (as per the standards) are either variable or fixed radius plots.

2.9 Measurements

The data collection for each attribute will follow the current VRI ground sampling standards: “Vegetation Resources Inventory, Ground Sampling Procedures”, version 4.3 prepared by Ministry of Sustainable Resources Management, Terrestrial Information Branch, March 2002.

For the TEP’s, the measurements will be recorded using either the VRI field cards 1-3 and 8-11 or handhelds; in either case, the digital data will be submitted in an acceptable and clean format (TIMVEG or VIDE formats) to the MSRM.

For the NVAF cruising 23 samples (and 60 auxiliaries) will be sampled. VRI field card number 11 (or alternatively cards 8 and 9) will be used for data collection.

VRI certified timber emphasis samplers will conduct all measurements – and all sampling will meet or exceed current VRI standards.

2.10 NVAF Activities

As per the MSRM standards, the net volume adjustment factor (NVAF) sampling is mandatory for the inventory. NVAF sampling involves detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume; it will be used to statistically adjust the estimate of net merchantable volume of VRI ground samples.

The objective of the NVAF portion of the inventory is to complete destructive tree sampling and obtain local information for hidden decay, waste, and stem taper in order to statistically adjust the cruiser calls for net volume.

In the ground sampling phase of the NVAF process, ground sampling crews will provide detailed enhanced cruising (net factoring and call grading) of all the trees (live, dead, standing or fallen) within the selected auxiliaries at the same time as they are conducting regular timber emphasis sampling within the TSA. Once the enhanced data is collected then the NVAF enhanced tree data will be compiled in a tree matrix and a sample design for selected trees will be developed.

All NVAF planning and implementation will follow the Net Volume Adjustment Factor Sampling Standards and Procedures, MSRM, Version 3.0, March 2002

The ground sampling NVAF selection process for the Golden TSA is described below in the following steps:

Step 1) Gather the information of selected (85) ground samples:

Sample tree stratification is based on polygon attributes (polygon age, leading species)

Step 2) Stratify the ground samples by age group:

Immature: equal or less than 120 years old.

Mature: greater than 120 years old.

For this inventory there are 45 immature samples & 40 mature samples.
MATURE - 40 samples

Step 3) Determine the number of NVAF sample trees – both overall and by strata:

The NVAF requires that a minimum of 10 immature and 5 dead trees be destructively sampled, in addition to a minimum of 30 live mature trees per stratum. Therefore, after careful consideration, it was recommended that 75 trees would likely may be an appropriate balance between the number of sample trees required while minimizing overall and individual stratum sampling error.

In summary the NVAF destructive sampling stratum will include -

- *Immature = 10 trees*
- *FPL mature = 30 trees*
- *Other mature = 30 trees*
- *Dead trees = 5 trees*
  TOTAL = 75 trees

Step 4) Select the NVAF samples from the 85 ground samples for each NVAF stratum:

For each stratum sort by leading species, then by sample number
Dead trees will be randomly selected in the field from the selected enhanced auxiliaries.

Step 5) Random auxiliary selection:

In an effort to balance time and NVAF sample size only up to three auxiliaries would be selected per NVAF selected sample. See Table 6 for a listing of the ground samples and randomly selected

Table 6: Selected NVAF Samples and Auxiliaries

Sample #	Auxiliaries
15	N, E, S
53	N
64	S
61	N, E, S
13	E, S, W
17	N, E, S
21	E, S, W
27	N, E, S
45	N, E, W
11	N, E, S
14	N, S, W
20	N, W
47	N, E, S
51	N, S, W
65	S, W
69	E, S, W
71	S, W
73	N, S, W
75	N, W
77	N, E, W
79	N, S
81	N, E, S
84	E, S, W

3.0 IMPLEMENTATION PLAN

This section of the document outlines the activities needed to implement the proposed ground sampling project.

3.1 Scheduling

The Golden TSA ground sampling activities are scheduled over two years. In the first year (fall 2003) it is expected that approximately 50 ground samples will be established. However, all of the planned NVAF enhanced plots (23) will be completed in this first year to allow for NVAF destructive sampling to occur in the summer of 2004.

After the first year of sampling the coefficient of variation (CV) will be re-calculated based on the standard error of regression for net volume. This will help direct the amount of sampling to complete in 2004. Table 7, shown below, provides a list of activities and the proposed completion date.

Table 7: Schedule of Activities for the Golden TSA

ACTIVITY	Completion Date
Project development	Jun-03
Sample plan preparation	Jul-03
Package preparation	Jul-03
VPIP	Aug-03
Ground sampling (GS) RFP	Aug-03
GS Contract initiation	Sep-03
Ground sampling (~50 samples) - yr 1	Oct-03
GS QA (10%)	Oct-03
GS data compilation	Dec-03
NVAF sample matrix	Jan-04
Preliminary analysis (re-calculate CV)	Jan-04
NVAF destructive sampling RFP	Jun-04
NVAF contract initiation	Jun-04
Ground sampling (~35 samples) - yr 2	Jul-04
GS QA (10%)	Jul-04
NVAF destructive sampling	Aug-04
NVAF QA	Aug-04
GS data compilation	Sep-04
NVAF data compilation	Nov-04
Final inventory adjustment	Jan-05

3.2 Sample Packages

Atticus prepared the sample packages for all 85 samples, with each package containing:

- copies of Phase I document photos
- 1:10,000 scale orthophoto sample location maps
- 1:20,000 scale forest cover maps with the most recent Forest Development Plan information included.

Pioneer Forest Consulting will provide the successful contractor with the packages plus overview maps (at 1:60,000 scale) for the entire Golden TSA area.

3.3 Roles and Responsibilities

3.3.1 Project Coordination

Pioneer Forest Consulting provides the overall project coordination of the Golden TSA ground sampling inventory. Atticus Resource Consulting Ltd. was responsible for developing all the phases of the sampling plan, from data assembly and design to sample packages preparation. Sample size was developed based on information provided by Chris Mulvihill, R.P.F., the Nelson Regional Vegetation Resources Inventory Forester (MSRM). The MSRM, TIB staff is responsible to review the Vegetation Project Implementation Plan (VPIP), and eventually approve the plan before ground sampling commences. As well, they have provided valuable insight and assistance with various sections of the sampling plan preparation.

Ground sampling crews have not yet been selected for this work. The request for proposals will be sent to eligible VRI contractors. The chosen contractor will be responsible for all phases of the ground sampling work and will ensure that every aspect of the ground sampling phase will be completed to the latest VRI standards. The contractor will be responsible for the overall sampling logistics and delivery of the project to Carole Dascher, R.P.F., of Pioneer Forest Consulting Ltd.

3.3.2 Project Support

Atticus will provide the sample list to Pioneer Forest Consulting, which will include: sample number, mapsheet, polygon number, UTM coordinated (Northing and Easting) as well as Lat/Long coordinates and basic access information. A backup sample list will also be provided.

Pioneer Forest Consulting Ltd will provide sample packages, including copies of document photos and field maps to the contractor. It is expected that the successful contractor will provide the plot supplies (field cards, aluminum stakes, paint, ribbon, and drinking straws for tree cores) in enough quantities to complete 85 ground samples.

3.3.3 Fieldwork

The fieldwork will be completed with VRI certified crews following the VRI measurement protocols as detailed by Vegetation Resources Inventory Ground Sampling Procedures Version 4.3 – March 2002. The fieldwork will include locating and completing a VRI timber emphasis cluster sample. At each plot the crew will record the field data either on a TIMVEG handheld computer program or on standard VRI data cards provided by the MSRSM. In addition, each crew will collect GPS information (where possible), take 35mm photographs of the plots, and collect tree ages for microscopic office age counting.

The sample plots will be completed in batches suitable for quality assurance checking by a third party.

3.3.4 Quality Assurance

Following the latest MSRM standards, a separate (third party) contractor will complete the Quality Assurance (QA) of at least 10 percent of the ground samples. It is expected that the minimum number of QA samples will be 9, however, it is likely that at least 10 samples would be completed (based on an initial batch of only 5 samples for each crew – if three crews were being used on the project). It is unknown at this time if the MSRM, Nelson Regional Vegetation Resources Inventory Forester (Chris Mulvihill), will be available to complete the QA portion of this work.

The Vegetation Resources Inventory Ground Sampling Quality Assurance Standards Version 1.1 will be followed.

3.3.5 Data Compilation, Analysis and Adjustment

The selected contractor will complete data entry, GPS corrections, and microscopic office age counts immediately after the field season. All final data and materials will then be provided to Pioneer Forest Consulting.

At the end of the first year of field sampling new coefficient of variations (CV's) will be calculated and will be used to adjust and direct sampling efforts in 2004.

The final compilation of the inventory data including statistical analysis and data adjustment will be conducted in the fall/winter of 2004/2005 after the NVAF destructive sampling is completed in the summer of 2004, subject to budget approval. The analysis will follow the minimum standards as stated in the "VRI Inventory Attribute Adjustment procedures, version 4.4", MSRM, 2002.

Final ground sample and adjusted digital data will be submitted to MSRM, TIB in an acceptable and approved format.

4.0 SAMPLE LIST

4.1 List of Selected Samples

The following table provides a list of the proposed 85 VRI ground samples to be completed for the Golden TSA.

Table 8: List of Selected VRI Ground Samples

Sample	Sample Type	Mapsheet	Polygon	BGC	UTM_X	UTM_Y	Sp1	Sp2	AGE	HT	Vol/ ha	Access Type
1	Timber	082N063	903	ICHmw1	470505.9	5721985.2	AT	PLI	31	6.5	0.1	TRUCK
2	Timber	082N045	216	IDFdm2	495178.3	5696630.6	AT	SE	47	19.8	76.8	TRUCK
3	Timber	082N064	1020	ICHmw1	472463.6	5717599.3	AT	ACT	36	13.6	9.6	TRUCK
4	Timber	082N064	868	ICHmw1	476844.1	5717944.1	AT	FDI	31	12.8	4.3	TRUCK
5	Timber	082N035	874	ICHmk1	492310.3	5692361.6	AT	SE	72	25.1	129.7	TRUCK
6	Timber	082N026	544	MSdk	502316.1	5677666.0	AT	PLI	79	22.8	147.8	TRUCK
7	Timber	082N045	284	MSdk	497602.8	5698234.4	AT	PLI	97	37.7	234.4	TRUCK
8	Timber	082N008	345	ICHmw1	533515.2	5660844.5	W	SE	37	19.8	134.5	TRUCK/HELI
9	Timber	082N081	299	ICHwk1	437483.4	5746796.8	HW	SE	96	20.8	276.3	TRUCK/ATV
10	Timber	082N083	797	ICHmw1	468268.5	5739114.6	CW	HW	30	8.8	22.1	TRUCK
11	NVAF	083D040	229	ICHwk1	427052.7	5799987.5	HW	CW	206	27.2	352.2	HELI
12	Timber	082N043	219	ICHwk1	467541.3	5703610.3	HW	FDI	247	33.2	408.7	TRUCK
13	NVAF	083D009	3	ICHwk1	405122.7	5772933.4	CW	HW	206	31.2	407.2	HELI
14	NVAF	082N043	227	ICHwk1	471822.0	5703968.1	HW	CW	267	31.2	416.0	TRUCK/ATV
15	NVAF	082N062	231	ESSFwc2	452330.3	5725730.2	CW	HW	34	5.9	0.1	TRUCK
16	Timber	083D040	572	ICHwk1	424901.8	5795016.6	CW	HW	126	24.3	289.2	HELI
17	NVAF	082N081	598	ICHwk1	442622.8	5739682.7	CW	HW	326	39.2	547.6	TRUCK
18	Timber	083D009	130	ICHwk1	411185.2	5770643.8	CW	SE	266	33.2	477.6	HELI
19	Timber	082N053	500	ICHmw1	464226.3	5713917.6	HW	SE	266	38.1	593.4	TRUCK
20	NVAF	082M100	147	ICHvk1	421887.3	5759689.5	HW	CW	246	34.2	450.8	HELI
21	NVAF	083D018	235	ICHmw1	402874.2	5780586.1	CW	HW	246	31.2	461.4	HELI
22	Timber	082N043	205	ICHmw1	465046.0	5703023.2	HW	SE	107	31.8	469.0	TRUCK
23	Timber	082N065	424	ICHmw1	488895.7	5723050.7	CW	SE	246	31.2	448.8	TRUCK
24	Timber	082N073	629	ESSFwc2	466551.9	5730459.9	PLI	SE	76	16.7	138.3	TRUCK
25	Timber	082N046	395	ICHmk1	502823.1	5701192.5	PLI	FDI	77	20.8	193.7	TRUCK
26	Timber	082N035	690	ICHmw1	491757.7	5690416.3	FDI	HW	72	18.2	153.3	ATV
27	NVAF	082N009	709	MSdk	548621.0	5658391.2	FDI	PLI	167	21.2	158.4	TRUCK (ATV)
28	Timber	082N064	853	ICHmw1	472936.9	5718143.5	FDI	AT	37	9.5	0.1	TRUCK
29	Timber	082N016	429	IDFdm2	511166.1	5669671.9	FDI		77	21.2	136.6	TRUCK
30	Timber	082N026	510	MSdk	507520.8	5676592.9	FDI	AT	77	22.2	119.4	TRUCK
31	Timber	082N026	863	MSdk	501269.3	5679716.1	FDI	PLI	38	11.1	24.9	TRUCK
32	Timber	082N035	593	ICHmw1	491978.7	5689782.9	FDI	SE	72	14.8	106.1	TRUCK (ATV)
33	Timber	082N045	534	ICHmk1	489785.5	5700953.9	FDI	PLI	77	23.5	211.3	TRUCK
34	Timber	082N046	582	ICHmk1	511230.5	5703841.1	FDI	AT	67	19.3	125.4	HELI
35	Timber	082N035	400	ICHmk1	497850.0	5687616.3	FDI	PLI	77	25.7	249.1	TRUCK
36	Timber	082N073	507	ICHmw1	463885.8	5730903.1	FDI	PLI	146	28.5	272.7	TRUCK

37	Timber	082N016	189	ESSFwm	505812.4	5667236.3	PA	SE	207	24.2	288.8	TRUCK
38	Timber	082K100	179	MSdk	556800.0	5646100.0	PLI	SE	87	24.8	288.9	TRUCK
39	Timber	082N045	234	ICHmk1	490877.9	5697687.8	PW	PLI	77	26.5	263.0	TRUCK
40	Timber	082N027	657	MSdk	517641.1	5680027.8	PLI	FDI	79	22.2	229.0	TRUCK
41	Timber	082N043	115	ICHmw1	466742.3	5702099.7	PLI	FDI	77	25.1	277.8	TRUCK
42	Timber	082N009	308	ICHmk1	545537.6	5653245.4	PLI	SE	87	24.7	291.8	TRUCK
43	Timber	082N026	975	MSdk	505341.2	5680805.1	FDI	PLI	110	30.8	282.2	TRUCK
44	Timber	082N027	294	ICHmk1	522065.8	5676030.1	FDI	PLI	107	28.8	288.3	TRUCK
45	NVAF	082N045	688	ICHmw1	494964.7	5702808.6	FDI	SE	127	33.7	422.3	TRUCK
46	Timber	082N036	780	ICHmk1	501351.4	5692106.0	FDI	PLI	107	30.1	328.2	TRUCK
47	NVAF	082N009	266	ESSFdk	555963.6	5652806.2	PLI	SE	137	28.2	389.6	TRUCK
48	Timber	082N063	537	ICHmw1	467610.7	5720642.7	PLI	FDI	126	26.2	347.3	TRUCK
49	Timber	082N075	123	ICHmw1	489526.6	5736584.5	FDI	SE	95	35.1	462.0	TRUCK
50	Timber	082N054	34	ICHmw1	472323.5	5705517.0	FDI	PW	107	25.7	300.8	TRUCK
51	NVAF	082N008	183	MSdk	541367.2	5658420.4	PLI	SE	137	28.2	367.5	TRUCK
52	Timber	082N037	66	ICHmk1	516408.3	5685328.2	PLI		107	23.6	305.8	ATV
53	NVAF	082N027	613	ICHmk1	516547.2	5679362.2	FDI	SE	107	27.8	370.2	TRUCK
54	Timber	082N026	1037	ESSFwm	508108.1	5681154.6	FDI	SE	137	33.7	410.2	TRUCK
55	Timber	082N062	286	ESSFwc2	446555.2	5720016.9	BL	SE	86	22.1	213.9	TRUCK
56	Timber	082N046	425	ESSFwm	512213.5	5701294.5	SE	FDI	47	14.6	99.8	HELI
57	Timber	083D019	819	ESSFvv	409186.9	5774733.3	SE	BL	166	22.5	218.1	HELI
58	Timber	082N054	340	ICHmw1	477776.8	5715000.7	SE		35	5.5	0.1	TRUCK
59	Timber	082N061	224	ESSFvc	435718.3	5718078.4	SE	BL	96	22.1	184.4	ATV
60	Timber	082N009	969	ESSFwm	545320.0	5651560.0	BL	SE	52	12.6	89.4	TRUCK (ATV)
61	NVAF	082N093	298	ESSFwc2	465822.2	5756979.0	BL	SE	206	18.2	164.0	TRUCK/HELI
62	Timber	082N054	486	ICHmw1	480913.0	5714295.2	SE	FDI	37	6.1	0.1	TRUCK
63	Timber	082N067	669	ICHmw1	518256.7	5718465.4	BL	SE	34	6.6	4.5	TRUCK (ATV)
64	NVAF	082N034	53	ESSFwm	484853.3	5691606.4	SE	BL	37	7.1	6.8	ATV
65	NVAF	082N075	518	ESSFwc2	488215.5	5734231.7	SE	BL	126	20.7	199.8	TRUCK
66	Timber	083D030	304	ESSFwc2	422761.3	5789338.2	SE	BL	206	29.2	322.4	HELI
67	Timber	082K099	480	MSdk	551500.0	5648500.0	SE	PLI	87	27.3	293.9	HELI
68	Timber	082N009	100	ESSFwm	544622.8	5650843.7	BL	SE	147	26.7	274.4	TRUCK/ATV
69	NVAF	082N084	203	ICHmw1	481661.2	5747580.8	SE	HW	126	24.7	328.4	ATV
70	Timber	082M090	77	ICHwk1	430066.4	5747949.3	SE	CW	266	26.2	359.0	HELI
71	NVAF	082N053	610	ESSFwc2	462555.2	5715039.7	SE	PA	186	28.3	351.2	TRUCK
72	Timber	082N063	213	ICHmw1	462080.6	5721554.4	SE	HW	326	35.1	280.1	TRUCK
73	NVAF	082K100	400	MSdk	557000.0	5647100.0	SE		127	29.8	353.8	TRUCK
74	Timber	082M100	151	ICH wk1	422434.4	5760022.9	SE	CW	126	21.7	258.2	HELI
75	NVAF	082N074	1048	ESSFwc2	480876.8	5728922.3	SE	BL	226	30.2	330.5	TRUCK/ATV
76	Timber	082N054	88	ICHmk1	485069.6	5707408.3	SE	PLI	127	31.7	405.3	TRUCK
77	NVAF	082N092	437	ICHwk1	447119.8	5756656.2	SE	CW	286	40.1	582.4	TRUCK
78	Timber	082N065	223	ESSFwc2	492158.3	5726463.4	SE	FDI	206	32.2	381.4	TRUCK
79	NVAF	082N094	799	ICHmw1	478446.1	5750818.2	SE	BL	286	34.2	401.0	TRUCK
80	Timber	082N091	609	ICHwk1	436580.2	5755486.2	SE	CW	246	36.2	511.3	TRUCK
81	NVAF	082N046	405	ICHmk1	505104.4	5700898.9	SE	CW	127	28.7	372.7	TRUCK
82	Timber	082N062	166	ICHmw1	450285.0	5726295.1	SE	HW	206	34.2	457.9	TRUCK
83	Timber	082N026	64	ICHmk1	505372.6	5672433.9	SE	FDI	97	31.2	379.6	TRUCK
84	NVAF	082N056	486	ICHmk1	510293.9	5712230.2	SE	CW	246	33.2	466.7	TRUCK
85	Timber	083D010	643	ICHmw1	419494.9	5764636.3	SE	BL	306	39.1	449.9	HELI

4.2 List of Back-up Samples

The following table provides a list of the proposed additional back-up VRI ground samples for the Golden TSA.

Table 9: List of Back-up VRI Ground Samples

SAMPLENO	P_LABEL	UTM_X	UTM_Y	BECLABEL	ZONE	SUBZONE	VARIANT
86	082N055.948	487443.17880	5708615.70510	ICH mw 1	ICH	mw	1
87	082N073.935	458637.47477	5730870.89607	ICH mw 1	ICH	mw	1
88	082N026.819	503741.67124	5680910.11007	IDF dm 2	IDF	dm	2
89	082N035.230	499974.97239	5685326.56633	MS dk	MS	dk	
90	082N036.104	500490.54244	5683848.81545	MS dk	MS	dk	
91	082N073.263	461408.78676	5735961.19774	ICH mw 1	ICH	mw	1
92	082N045.649	498919.44030	5702198.98663	ICH mk 1	ICH	mk	1
93	082N054.467	479851.70088	5712314.01349	ICH mw 1	ICH	mw	1
94	082N072.556	456370.38264	5728136.36968	ICH mw 1	ICH	mw	1
95	082N053.420	467507.26517	5711983.80761	ICH mw 1	ICH	mw	1
96	082N063.722	460776.06135	5724747.19813	ICH mw 1	ICH	mw	1
97	082N064.408	479780.31115	5720390.37580	ICH mw 1	ICH	mw	1
98	082N063.142	463657.85848	5722057.82724	ICH mw 1	ICH	mw	1
99	083D018.418	396435.52857	5777576.54991	ICH wk 1	ICH	wk	1
100	083D009.264	417502.11284	5766404.75441	ICH mw 1	ICH	mw	1
101	082N043.152	464387.16884	5702603.68303	ICH mw 1	ICH	mw	1
102	082N067.493	516966.39080	5721757.87418	ICH mw 1	ICH	mw	1
103	082N081.375	440358.54047	5745621.23532	ICH wk 1	ICH	wk	1
104	083D010.728	420981.10534	5763638.85385	ICH mw 1	ICH	mw	1
105	082N072.21	448426.15211	5738534.94750	ICH wk 1	ICH	wk	1
106	082N062.294	450681.52430	5722311.27543	ICH wk 1	ICH	wk	1
107	083D009.216	415382.17285	5767180.71592	ICH mw 1	ICH	mw	1
108	082N053.587	465332.91631	5714683.07132	ICH mw 1	ICH	mw	1
109	082N063.313	462344.71046	5718898.59807	ICH mw 1	ICH	mw	1
110	082N026.327	504799.18984	5675027.83299	MS dk	MS	dk	
111	082N056.99	507758.00549	5707413.98709	ICH mk 1	ICH	mk	1
112	082N056.548	512581.40157	5713549.13360	ICH mk 1	ICH	mk	1
113	082N084.817	473420.64330	5739965.68734	ICH mw 1	ICH	mw	1
114	082N063.313	461624.79521	5718789.32770	ESSFwc 2	ESSF	wc	2
115	082N018.377	528553.94843	5666927.58683	ESSFwm	ESSF	wm	
116	082N046.439	503859.15907	5702974.99101	ICH mk 1	ICH	mk	1
117	082N026.872	505040.70094	5680037.23538	IDF dm 2	IDF	dm	2
118	082N036.272	504204.08567	5685286.43373	MS dk	MS	dk	
119	082N054.336	476368.03944	5716593.48311	ICH mw 1	ICH	mw	1
120	082N091.514	433269.70164	5756415.02084	ICH mw 1	ICH	mw	1
121	082N084.753	479942.03261	5742052.63251	ICH mw 1	ICH	mw	1

122	082N035.562	497321.57736	5688994.90543	ICH mk 1	ICH	mk	1
123	082N084.1026	484141.91205	5740201.64551	ICH mw 1	ICH	mw	1
124	082N026.610	501497.21142	5677569.74989	ICH mk 1	ICH	mk	1
125	082N072.439	452470.66771	5730754.60955	ICH mw 1	ICH	mw	1
126	082N026.973	504995.52936	5681252.79889	MS dk	MS	dk	
127	082N073.213	463596.99098	5737293.94476	ICH mw 1	ICH	mw	1
128	082N056.420	507225.74641	5711112.62106	ICH mk 1	ICH	mk	1
129	082N056.219	508394.42373	5708441.25287	ICH mk 1	ICH	mk	1
130	082N082.544	447841.22427	5741837.43227	ICH mw 1	ICH	mw	1
131	082N062.161	449575.13757	5725478.55808	ICH wk 1	ICH	wk	1
132	082N054.166	482422.46872	5709563.58280	ICH mw 1	ICH	mw	1
133	082N009.879	544376.94893	5660652.72869	MS dk	MS	dk	
134	082N084.846	479059.00974	5741460.09882	ICH mw 1	ICH	mw	1
135	082N009.738	547632.82489	5659325.21668	MS dk	MS	dk	
136	082N062.67	447542.53833	5726142.66259	ICH mw 1	ICH	mw	1
137	082N055.167	498229.73982	5707026.81728	ESSFwm	ESSF	wm	
138	082N053.88	461808.69400	5706867.02529	ICH wk 1	ICH	wk	1
139	082N009.491	549145.38021	5656206.72913	MS dk	MS	dk	
140	082K099.269	554000.00000	5645100.00000	ESSFdk	ESSF	dk	
141	082N067.348	524540.44781	5723404.20869	ESSFwm	ESSF	wm	
142	082N055.406	492714.76897	5711971.28942	ESSFwm	ESSF	wm	
143	082N051.14	440630.72139	5706054.35241	ESSFvc	ESSF	vc	
144	082N046.531	510619.66654	5703012.23414	ESSFwm	ESSF	wm	
145	082N063.672	472227.93325	5721259.83772	ICH mw 1	ICH	mw	1
146	082N093.732	466408.53991	5750549.06821	ESSFwc 2	ESSF	wc	2
147	083D019.819	409311.54713	5774919.14997	ESSFwc 2	ESSF	wc	2
148	082N027.50	526666.10295	5672614.49792	ICH mk 1	ICH	mk	1
149	082N018.289	530665.18931	5664538.51022	ICH mw 1	ICH	mw	1
150	083C012.174	449000.00000	5773700.00000	ESSFwc 2	ESSF	wc	2
151	082K099.361	554300.00000	5646900.00000	MS dk	MS	dk	
152	082N075.505	487162.41770	5734669.66060	ESSFwc 2	ESSF	wc	2
153	082N037.89	514949.30047	5686524.27425	ICH mk 1	ICH	mk	1
154	082K099.159	555900.00000	5643900.00000	MS dk	MS	dk	
155	083D040.182	419083.17616	5800000.27462	ESSFwc 2	ESSF	wc	2
156	082N045.614	488549.90992	5702322.68655	ICH mw 1	ICH	mw	1
157	083D030.498	424616.79113	5787284.26976	ESSFwc 2	ESSF	wc	2
158	082N009.876	544971.84684	5660575.94116	MS dk	MS	dk	
159	082K100.236	557300.00000	5647700.00000	MS dk	MS	dk	
160	082K099.348	553100.00000	5646500.00000	MS dk	MS	dk	
161	083D020.249	421527.26671	5779709.98407	ESSFwc 2	ESSF	wc	2
162	082N073.426	472233.53391	5733865.15182	ESSFwc 2	ESSF	wc	2
163	082N081.439	440689.27121	5744267.62409	ICH wk 1	ICH	wk	1
164	082N051.20	439910.88189	5705944.95665	ESSFvc	ESSF	vc	
165	082N074.571	474886.86167	5733322.58475	ICH mw 1	ICH	mw	1
166	082N072.111	450222.28777	5737598.53093	ICH wk 1	ICH	wk	1
167	082N009.867	546088.09020	5660633.45468	MS dk	MS	dk	

168	082N009.1089	550261.89205	5659388.96317	MS	dk	MS	dk	
169	082N044.236	474112.52867	5699035.83751	ESSF	wm	ESSF	wm	
170	083C002.446	453100.00000	5763400.00000	ICH	wk 1	ICH	wk	1

5.0 SIGN-OFF SHEET

I have read and agree that the procedures outlined in this proposal meet current MSRM minimum standards.

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Manager, Vegetation Resources Inventory
Terrestrial Information Branch
Ministry of Sustainable Resource Management

I have read and agree that the activities and products outlined in this proposal will meet Ministry of Forests business needs.

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Manager, Development and Policy
Timber Supply Branch, Ministry of Forests