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# **Fort St. John Timber Supply Area**

## **Vegetation Resources Inventory**

### **Project Implementation Plan**

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## 1. INTRODUCTION

### 1.1 Background Information

The Ministry of Forests and Range (MoFR) Forest Analysis and Inventory Branch has developed a business plan to ensure the successful implementation of the Vegetation Resources Inventory (VRI) ground sampling and photo interpretation projects. The process includes the preparation of VRI Strategic Inventory plans (VSIPs) and Project Implementation Plans (VPIPs).

A VSIP provides a general strategic direction for implementing the provincial VRI. The VSIP for the Fort St. John Timber Supply Area (TSA) was prepared in January 1999 and should be referred to for details on background information to Vegetation Resources Inventory VRI activities and also for products needed to address the Fort St. John District forest management issues identified by stakeholders in the District.

A VPIP is a working document that details the specific operational activities associated with the implementation and documentation of a VRI project. It identifies the target areas for new photo interpretation, fieldwork, aerial photography, format of base files and project scheduling.

### 1.2 VRI Process

The VRI is an improved vegetation inventory process for assessing the quantity and quality of BC's timber and other vegetation resources. The VRI addresses the inventory design-related issues raised by the Forest Resources Commission in its 1991 report *The Future of Our Forests*. The VRI was designed by inventory specialists from government, industry, and academia, and has been approved by the BC Resources Inventory Committee (RIC) with the objective of developing a common set of standards and procedures for Provincial resources inventories.

The VRI process consists of several components:

1. The BC Land Cover Classification Scheme (BCLCS)
2. Photo-Interpreted Estimates (VRI Phase I)
3. Spatial products including line work (polygon boundaries) and a VRI file database
4. Ground Sampling (VRI Phase II)
  - Timber emphasis
  - Ecology
  - Coarse woody debris
5. Net Volume Adjustment Factor (NVAF) sampling
6. Within Polygon Variation (WPV) sampling
7. Statistical Adjustment

For more information, VRI manuals are available through the internet at <http://srmwww.gov.bc.ca/risc/pubs/teveg/index.htm>.

### **1.3 VRI Planning**

The intent of the VRI planning process is to ensure the inventory baseline products meet a range of applications that are efficiently implemented. After the strategic inventory plan has been prepared, the stakeholders, in the District, can use the VSIP to prepare coordinated VRI Project Implementation Plans (VPIPs), which are working documents that detail the specific operational activities associated with implementing and documenting the inventory activities identified in the VSIP.

The VSIP and VPIPs provide the framework for coordinating the implementation of the provincial VRI over the District, and management inventories over priority areas. The VSIP and VPIPs seek to ensure that VRI products address important issues in priority areas, and support resource-specific management interpretations that address forest management issues. This planning process defines the baseline inventory product needs, ensures the right baseline products are selected to meet a range of applications, and achieves efficiencies in the delivery of the desired inventory products. Coordinated inventory planning also maximizes the value of the inventory data produced over issue areas by ensuring the VRI products are useful for addressing more than one resource issue.

### **1.4 State of Current Inventory**

At the time when the VSIP was prepared in 1999, the existing inventories of the Fort St John TSA were conducted between 1964 and 1989 and were not delineated or classified to current VRI standards. The 1989 inventory was primarily conducted in the south-central portion of the district where most of the predominantly deciduous stands are found. Since the completion of the VSIP in 1999, three inventory projects have been completed in the Fort St. John TSA: the Halfway-Graham, Sikanni-East and Blueberry projects. All three were done using 1:40 000 TRIM II black and white photo in the softcopy environment. The VRI for these projects was also combined with the mapping of basic terrain/surficial material information to help support future Predictive Ecosystem Mapping (PEM) projects. The Halfway project was 532,219 hectares, the Sikanni-East 1,012,572 hectares, and the Blueberry 818,588 hectares for a total of 2,363,379 hectares completed to current VRI standards. This represents 50.3% of the total area in the Fort St. John TSA.

### **1.5 Document Objectives**

The objective of this VPIP is to outline and describe the VRI Phase I and bio-terrain activities scheduled for completion in the Fort St. John TSA. It provides some basic land base information and some background information from the previous Annual Allowable Cut (AAC) Rationale document (December 1996). This document describes the individual phases of the inventory plan including polygon delineation, field sampling, final attributing and digital mapping. The VPIP also describes the quality control and assurance requirements that will ensure all work is done to provincial VRI and bio-terrain mapping standards.

The VPIP provides a project implementation plan that describes scheduling, air photo type and scale, project personnel and quality assurance.

The focus of this project is to complete a Vegetation Resources Inventory (VRI) along with basic terrain/surficial material information.

In addition to the information provided in this VPIP, other higher level plans and related planning documents have been prepared and are indicated as links under the appropriate headings. Please refer to the documents for the additional information.

## **1.6 Landbase**

The Fort St. John TSA is located in the northeastern interior of British Columbia and covers approximately 4.7 million hectares. The TSA is bounded by the Peace River in the south, the Alberta border in the east, the Fort Nelson TSA in the north, and the continental divide in the west. The forest district is located in the Northern Interior Forest Region and is administered by the Peace Forest District Office in Dawson Creek, BC.

The TSA has four biogeoclimatic zones: the Boreal White and Black Spruce zone in the plateau and lower elevations; the Engelmann Spruce-Subalpine Fir and Spruce-Willow-Birch zones at medium elevations in the mountains and foothills; and the Alpine Tundra zone at higher elevations. White spruce, lodgepole pine, aspen, black spruce and subalpine fir are the dominant tree species in the area.

## **2. PHOTO INTERPRETATION PLAN**

### **2.1 Project Objectives**

The objective of this VRI inventory is to improve the polygon delineation and attributing in the Fort St. John TSA, especially in areas where specific management issues occur. To date, only 50% of the TSA has been inventoried to current Vegetation Resources Inventory (VRI) Phase I standards. The remaining area was done to pre-VRI standards and the delineation is too broad for current inventory standards and forest planning. Similarly, final polygon attributing was done to old forest inventory standard and many VRI attributes are missing or interpreted to a broader standard.

The main areas of concern are:

- The existing inventory is outdated and needs to be brought to VRI standards
- Species composition is inaccurate and especially poor in hardwood and mixed hardwood/softwood stands
- A better inventory of the extensive mixed white and black spruce stands is required
- Individual polygon areas are too large. The average polygon size in the Fort St. John TSA needs to be approximately 11 hectares to achieve management objectives
- Silviculture and free growing information needs significant improvement

The product is a spatial database consisting of unadjusted photo estimates supported by previous and current fieldwork. Ground sampling to check and adjust the photo-interpreted attributes is discussed as a separate process in the Fort St. John District VSIP.

Along with the VRI Phase I inventory, a further project objective is to provide bio-terrain mapping done to Terrestrial Ecosystem Mapping (TEM) standards. Surficial geologists, with a firm local ecological understanding, delineate and describe pure terrain units that are appropriate for both ecological and terrain stability interpretations. The bio-terrain delineation will be seamless with the VRI delineation, to provide a foundation inventory that will support future Predictive Ecosystem Mapping (PEM) of the Fort St. John TSA. The terrain digital mapping and database will form a separate deliverable from the VRI

mapping and interpretations and will be done to the TEM standards.

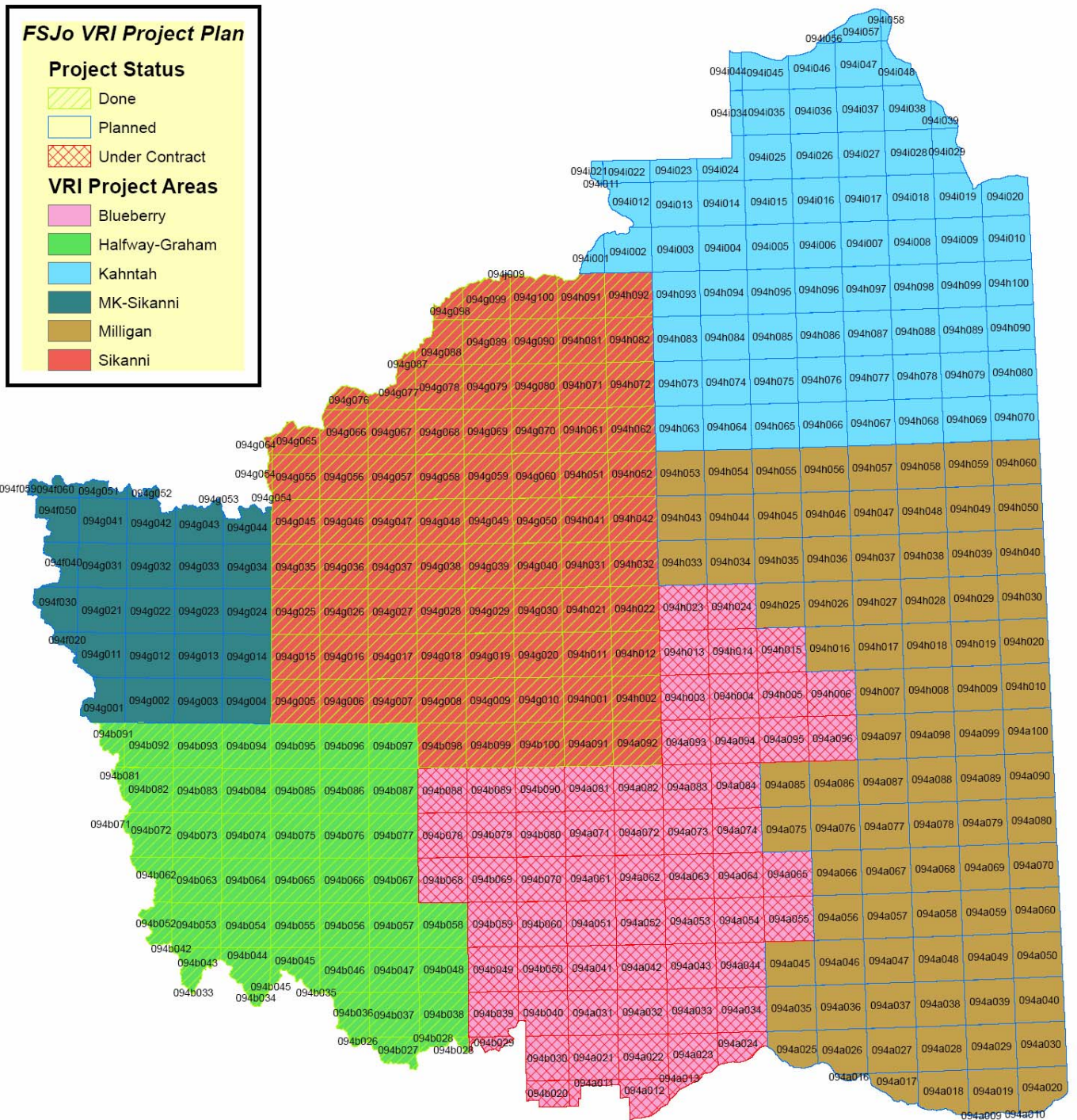
For details on the forest management issues and inventory product needs identified by the stakeholders, please refer to:

- Fort St. John Forest District VRI Strategic Inventory Plan (VSIP), January 1999.
- Fort. St. John Timber Supply Area Rationale for (AAC) Determination, December 1996.
- Fort St. John TSA Timber Supply Review Data Package, July 1997.

## **2.2 Target Area**

As identified in the VSIP, the target area for photo interpretation is the entire Fort St. John TSA. To date, approximately 50% of the TSA has been completed (or is currently in progress) to VRI standards. The Halfway-Graham project consisting of 532,219 hectares was completed in 2001, the Sikanni-East project is 1,012,572 hectares and was completed in 2003, and the Blueberry project is 818,588 hectares and will be completed by Forest Dimensions Inc. (FDI) in 2006. This VPIP provides the inventory plan to complete the remaining 50% of the Fort St. John TSA, which includes the Milligan, Kahntah, and MK-Sikanni units. Both completed and uncompleted areas are indicated on the map of the Fort St. John TSA provided in Figure 1.

Figure 1: Map of Fort St. John TSA with Project Areas



### **2.3 Polygon Delineation**

Bio-terrain polygons will be delineated first by surficial geologists with particular attention paid to the delineation around organic or wetland sites from the adjacent upland sites. This will allow the VRI polygons to coincide, where possible, with the terrain polygon boundaries. It is expected that the terrain specialists will delineate an average of 350-550 polygons per mapsheet. The VRI photo interpreters will then subdivide, revise or replace the bio-terrain polygons into appropriate VRI polygons resulting in VRI maps of approximately 1200 polygons (11 ha average). Hard terrain lines are to be maintained by the VRI interpreters where terrain features are significant such as ridges, edges and cliffs but soft terrain lines may be modified, as required. Final VRI delineation will be based on the BC Land Cover Classification Scheme and will current VRI standards.

For silviculture openings, internal and external boundaries will be delineated as per new photos for vegetation and terrain. Silviculture opening numbers will be maintained. Silviculture information provided by Canfor or MoFR will be used as reference material to assigning the most appropriate polygon attributes.

Canfor and MoFR will provide a list of free growing polygons and these areas will re-delineated with the free growing information utilized as reference material for polygon descriptions.

All new roads and landings will be digitized and kept on a separate layer and provided to BMGS for updating the TRIM II base.

All delineation will be quality control checked and audited to ensure adherence to project objectives and MoFR Standards.

### **2.4 Calibration Data Sources**

Calibration data sources are field data reference points established across the land base such as ground calls, air calls, ground observations, ground samples and cruise plots. Field data measurements or estimates at these points are used to assist in the delineation and interpretation of forest vegetation and terrain types. Previous or historical data sources will also be reviewed and considered by the photo interpreters for their potential to be added to the project reference points. All pertinent historical data sources must be considered during the fieldwork planning stage to facilitate the most efficient use of new fieldwork.

### **2.5 Field Calibration**

It is the intention for classifiers to complete the delineation, fieldwork and final attributing of the mapsheets assigned to them. In the Fort St. John TSA, calibration fieldwork will be completed in the form of ground calls, ground observations and air calls in priority areas such as:

- stands having complex species composition
- second growth types
- height class 2-3 lodgepole pine stands
- deciduous-coniferous mixes
- deciduous stands with possible coniferous in-growth
- stands not previously sampled
- polygons larger than 20 ha in size
- multi-layered or uneven aged stands



- a cross-section of stand stages of development
- all significant terrain types
- some vegetated treed and non-treed wetland types

In the Halfway-Graham, Sikanni-East and Blueberry projects, 1740 ground calls and 3510 air calls were established. These projects included bio-terrain mapping and VRI mapping, with approximately 50% of the ground calls being terrain/ecology enhanced. It is planned to conduct the same amount of calibration on ground and air calls in the remaining 50% of the TSA. Ground and air calls will be established according to VRI fieldwork procedures and standards and delivered in both hardcopy and a digital format acceptable to MoFR.

Terrain fieldwork will be done simultaneously with the VRI data collection on approximately 50% of the ground calls. The TEM standard Ground Inspection Form (GIF) will be used to collect enhanced soils and ecological information including: dominant and indicator plants, site series, site modifiers, and structural stage. The terrain specialists will also dig a small soil pit at each GIF enhanced ground call to confirm the terrain classification. The original hardcopy ground Inspection Forms (GIF) and a digital copy of GIFs entered into Venus version 4.2 will be delivered to both the licensee and the MOFR.

For more information on VRI air call and ground call and GIF ground call procedures refer to:

- Ground Call (Ground Calibration) Data Collection Procedures and Standards (version 3.0, March 2004).
- Air Call (Air Calibration) Data Collection Procedures and Standards (version 2.0, March 2003).
- Standard for Terrestrial Ecosystem Mapping (TEM), May 1998.
- Field Manual for Describing Terrestrial Ecosystems, 1998.

## 2.6 Attribute Estimation

All attribute estimation will be to MoFR VRI standards and it is expected that the same interpreters will complete all phases of work for a particular set of mapsheets. Initial delineation will be re-assessed during the final classification phase to ensure consistency and that VRI standards are met.

Softcopy technology facilitates the measurement of tree heights from the scanned photos. Therefore, tree heights will be measured in 50% of the polygons to assist in the interpretation of stand height. In polygons where there is a significant difference in height (3+ m) between the first and second species, a second height on the next leading species will be taken.

Bio-terrain specialists will assign attributes according to terrain mapping specifications provided in the terrain reference material listed.

All VRI attribute files will be validated through VEGCAPS and delivered to Canfor and MoFR in .mdb format consistent with Ministry standards. All terrain attributes must be validated through the terrain data capture tool available at <http://srmwww.gov.bc.ca/terrain/inventory/capture.html>.

## 2.7 Digital Map Procedures

All VRI and bio-terrain mapping will be done to provincial mapping standards and

specifications. The graphics file will be checked for the integrity of the file structure to guarantee that no corrupt elements or missing pointers internally are present. A check on the parameters entered in each layer or theme will be done. This will confirm that the data meets the criteria defined in the Ministry standards and specifications. A log report will indicate the type of errors found on each level.

Completed VRI digital graphic files will be submitted to Canfor and MoFR in Ministry digital standard IGDS format and all digitizing must be done to TRIM digitizing standards.

The terrain digital graphic files will be delivered as seamless polygon coverage in ArcInfo.e00 format with feature codes on all its arcs and polygons.

In order to produce the Vegetation Information File (VIF), the overlay themes must have closed shapes and unique nodes before information is combined to produce a resultant file.

The following reports will be created with the check plots to verify that all the VRI polygons have node numbers and labels:

- A hard copy hectare report, sorted by text node number, of the area in hectares of all polygons on each level (HEC)
- Each level (UTM node lists)
- A hard copy report, sorted by text node number, of the UTM location of all forest cover text nodes on the log file of the forest cover labels and/or text nodes
- A hard copy report sorted by text node number and overlay level, of all the text nodes and attached attribute key-ins for all overlay levels in the design file (Overlay/Attribute Report).

## **2.8 Inventory Documentation and Archive**

The forest inventory, in much of the Fort St. John TSA dates back to the mid-1960's, and was completed to the forest inventory standards of the day. Also, the NAD 27 base maps were not completed to TRIM I or TRIM II standards. Similarly, polygon line transfer was done via low-order transfer instruments such as the Kail plotter and epidiascope and did not meet the TRIM controlled mapping standards of 1mm at map scale. During the old unit survey inventories a considerable amount of fieldwork was done; however, the original 1:15,840 document photos along with information from the old ground and air calls was lost.

In contrast, the recent vegetation inventories done in the Halfway-Graham, Sikanni-East and Blueberry projects have been done to current VRI standards. Scanned 1:40 000 black and white, TRIM II aerial photography was used for photo interpretation and mapping in the softcopy environment using TRIM II as a base. A further deliverable of these projects was the release of separate bio-terrain mapping that was seamless with the VRI mapping. That is, all polygon lines on the bio-terrain maps will match exactly with polygon lines on the VRI maps. This facilitates the development of other inventory products such as PEM and wildlife modeling.

## **3. PROJECT IMPLEMENTATION**

### **3.1. Scheduling**

It is proposed to complete the VRI/Terrain mapping for the remaining 50% of the Fort St.

John TSA over the next 3 years as 2 or 3 separate projects. 1:30 000 color aerial photography of the Milligan, Kahntah and MK Sikanni project areas will be acquired in 2005 and 2006. All new photography, scanning and aerial triangulation will be done to BC government specifications. Subject to funding, source transfer and polygon delineation is typically done in January-March, fieldwork sample plan design in April, fieldwork between June 15 and September 30 and final classification and digital mapping from September to March of the following years. Table 1 provides a summary of delivery schedule to complete the VRI in the Fort St. John TSA.

**Table 1 – Delivery Schedule**

Fiscal Year	Project Area	Photo Preparation	Polygon Delineation	Sample Design	Field Data Collection	Polygon Descriptions	Digital Map Production & Deliverables	Quality Control
2006	Milligan	Summer 2005	Jan-March 2006	April 2006	June-Sept 2006	Oct 2006-March 2007	Oct 2006-March 2007	On going
2007	Kahntah	Summer 2006	Jan-March 2007	April 2007	June-Sept 2007	Oct 2007-March 2008	Oct 2007-March 2008	On going
2008	MK-Sikanni	Summer 2006	Jan-March 2008	April 2008	June-Sept 2008	Oct 2008-March 2009	Oct 2008-March 2009	On going

### 3.2 Photo Scale

The photo scale and type used for the Halfway-Graham, Sikanni-East and Blueberry projects was TRIM II, 1:40 000 black and white photos, scanned at 7 or 14 microns for use in the softcopy environment. This scale of photo was acceptable for these units because they are located in the far northern interior of the province.

The photo scale and type for the remaining Kahntah, Milligan and MK-Sikanni units will be 1:30 000 color scanned at 14-15 microns. The photos for the Milligan project area were flown in 2005. The remaining two project areas Kahntah and the MK-Sikanni are scheduled for acquisition in 2006 (See Figure 1).

### 3.3 Project Personnel Coordinator

#### 3.3.1 Project Coordinator

The project coordinator for the upcoming VRI projects will be Jonathan Rowe of Canadian Forest Product Ltd., Fort St. John Division. Contact information:

Jonathan Rowe  
 Canadian Forest Products Ltd.  
 Fort St. John, BC  
 (250) 787-3680

#### 3.3.2 Certified Photo Interpreters

Each of the VRI projects in the Fort St. John TSA will require several VRI photo

interpreters. At least 50% of the photo interpreters must be VRI certified and all non-certified individuals must have successfully completed the Basic VRI Photo Interpretation Course. Non-certified interpreters must also work directly under the supervision of a certified interpreter for training and quality control. All supervising certified interpreters are responsible for the quality of work completed under their certification.

### **3.3.3 Terrain Mapping and Ecological Personnel**

Surficial geologists must complete all surficial terrain mapping. These geologists will be fully qualified and experienced in applying standard provincial terrain classification procedures.

Each field crew member involved in collecting data for the GIF portion of ground calls must be qualified by having completed the Describing Ecosystems in the Field course, having at least one year experience in collection of ecological data in northern BC or being certified to collect VRI Phase II ecological information.

### **3.4. Quality Control and Quality Assurance**

A VRI contractor will be responsible to complete all VRI and bio-terrain mapping to current provincial standards. A certified photo interpreter having at least 5 years of photo interpretation experience in BC and 3 years of softcopy experience will conduct proper quality control on 2-5% of each phase of the project. Documentation of all quality control checks will be maintained in a format acceptable to MoFR and made available to the Project Coordinator and MoFR. The project Terrain Manager will conduct similar quality control of terrain mapping phases with full documentation.

As part of the quality control program, the VRI contractor will hold a field data collection workshop in the project area at the commencement of the fieldwork program. The purpose of the workshop is to make sure that all individuals involved in the field data collection, monitoring and/or evaluation have a common understanding of the standards, specifications, and procedures that will be employed in the Fort St. John TSA. It will also ensure that all vegetation, ecological and terrain attributes are collected in a consistent and accurate manner.

Attending will be:

- Project Manager and Project Supervisors
- VRI interpreters and terrain specialists
- Contracted resources

Invited to attend will include:

- Canfor Project Coordinator or representative
- Quality Assurance Contractor
- Ministry VRI, ecology and/or terrain specialists

At the beginning of the fieldwork, the project VRI and Terrain Supervisor(s) will accompany each interpreter in the field for a day and check their work as the plots are

being established. Any errors or discrepancies will be corrected on site until the work meets the required standards of the supervisor.

The Project Supervisor will accompany the interpreters on their first flight plan to ensure that air call estimates are complete and correct. All subsequent air calls will be flown with two certified photo interpreters, in the helicopter, so that the second interpreter can check all estimates. The Project Supervisor will also ensure that the photo interpreters establish the air calls and a majority of the ground calls on their assigned mapsheets. GPS locations will be collected in the field for all air calls and ground calls. During final classification, the GPS locations will be used to help confirm that all fieldwork has been accurately located.

An independent contractor will conduct an independent and comprehensive quality assurance program. This contractor will ensure the VRI/terrain contractor produces a consistent and reliable product. The third party Quality Assurance Contractor will have a minimum of 5 years' VRI delineation, fieldwork and final attributing experience in northern BC will check all phases of the VRI s follows:

- Delineation – approximately 2% check of polygons for 80% of mapsheets
- Fieldwork – approximately 7.5% check of ground calls, GIF ground calls and air calls representative of the projects area
- Final Attributing – approximately 2% check of polygons for 80% of mapsheets

Similarly, a third party surficial geologist with similar experience will conduct quality assurance of all phases of the bio-terrain mapping. The objective is to complete a TSA database done to VRI and TEM standards and specifications; where the work produced by one photo interpreter is indistinguishable from the work of another.

The project coordinator will ensure the inventory contractor(s) conducting the inventory provides adequate and ongoing internal quality assurance (QA) of all deliverables. The results of all quality control and quality assurance will be recorded on approved QA/QC forms, as a record for both the individuals performing the work in addition to Canfor and the Ministry.

For more information, please refer to the following:

- Quality Assurance Procedures for Photo Interpretation (version 2.0, March 2004)
- Standard for Terrestrial Ecosystem Mapping (TEM), May 1998.

#### **4. REFERENCE MATERIAL**

Each member of the inventory team will have the following reference material available for the duration of the project:

- Fort St. John TSA VRI Request for Proposal (2005)
- Fort St. John VRI Strategic Inventory Plan (1999)
- Fort St. John VRI Project Implementation Plan (2005)
- VRI BC Land Cover Classification Scheme (2002)
- VRI Photo Interpretation Procedures (2002)
- VRI Quality Assurance Procedures for Photo Interpretation (2004)

- VRI Photo Interpretation Standards (1998)
- VRI Ground Call Data Collection Procedures and Standards (2004)
- Air Call Data Collection Procedures and Standards (2003)
- Standard for Terrestrial Ecosystem Mapping in BC (RIC 1998)
- Guidelines and Standards to Terrain Mapping in BC (RIC, 1996)
- Terrain Classification Manual, Version 2.0
- Field Manual for Describing Terrestrial Ecosystems, 1998
- MSRM Vector Cleaning Specifications (1997)
- MOF Forest Inventory Manual
- MOF Biodiversity Guidebook
- MOF Color Stereogram, Handbook
- MOF Black and White Stereogram Handbook
- Several tree and plant field guide books

## 5. APPROVAL/SIGN-OFF OF VPIP

I have read and concur that the Fort St. John TSA Project Implementation Plan (VPIP), prepared by Forest Dimensions Inc. and Canadian Forest Products Ltd. and dated November 28, 2005, meets current Vegetation Resources Inventory Standards and Ministry of Forests and Range business needs.

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Manager,

Date

Vegetation Resources Inventory Section

Forest Analysis and Inventory Branch

Ministry of Forests and Range