BCTS
BC Timber Sales
Skeena

Operating Guidelines

# GUIDELINES FOR HELICOPTER LOGGING IN NORTHWEST BC

August 2009

## Introduction

During the past 15-20 years, helicopter logging operations have been conducted in northwest BC by major licensees. BCTS (i.e., SBFEP) has also developed and sold some helicopter-based TSLs there. During that 15-20 year period, many improvements in equipment and techniques have been introduced. These improvements have helped to make timber extraction by helicopter more efficient, safer, and less costly.

Despite these advances, helicopter logging continues to be a topic of concern among forest professionals (including those within BCTS) as helicopter logging is often linked to high grading of timber (taking only the best). Safety is also a concern. To avoid getting involved in questionable harvesting practices, some forest professionals prefer not to use this method of timber extraction. There are however, situations where helicopter logging is the best option if harvesting is to be carried out.

Helicopter logging is normally used where there are high-value trees and where building access road is either too costly or is not practical because of difficult terrain and other factors. Since helicopter logging usually targets high-value trees there is always a potential for high grading. These guidelines recognize and address the potential for high grading, the need for improvements in timber and stand management, and the need for better utilization of the lower-value trees or tree species.

In NW BC, the cruising and layout work for helicopter blocks is usually done by major licensee employees (or their contract crews). However, the felling of trees and the extraction of timber is usually done by companies that specialize in helicopter logging (e.g., VIH Helicopters, Bear Creek Contracting, Coulson Helicopters).

These guidelines provide information on where helicopter logging operations can and should be used by BCTS. They are intended for use by layout contractors and by BCTS Planning and field staff for operations when helicopter logging is being considered. They incorporate various aspects of best management practices for BCTS activities.

The guidelines do not provide information on all aspects of helicopter logging. They focus on planning and layout of a TSL (for example – a discussion on helicopter logging with chokers vs a grapple – is not included).

This document consists of two main parts:

**Part A: The Guidelines** provide the basic information needed for planning helicopter logging in NW BC.

**Part B: The Checklist** provides a question and answer format that can be used to guide decision making for specific situations and specific timber stands.

## Part A: The Guidelines

### Access by Road vs Helicopter Logging

Helicopter logging is an expensive method of extracting timber:

- If an access road can be built to the timber, it will usually provide a lower cost timber extraction method, as compared to using a helicopter (this assumes adequate timber volume).
- It may be advantageous to build road access (even if it is at a higher total cost than helicopter logging) if the road provides future access to other timber. Note: timber access roads have sometimes been built through areas previously logged by helicopter.
- One option (that may provide the lowest overall cost) is to is to build an access road part of the way to the timber, and then to use a helicopter to extract the logs to the end of the road.

### Timber Volume and Timber Values for Helicopter Logging

**Timber Volume required**:

The minimum (threshold) timber volume required for a helicopter TSL can vary considerably. However, 10,000 m3 is a reasonable minimum amount for a "consolidated" TSL for NW coastal conditions. Consolidated in this case means the amount of helicopter logging that can be done on one or more blocks at the same time in the same geographic area. This minimum amount takes into account the cost of planning, reconnaissance, cruising and layout work, and the advertising of the TSL.

The threshold amount can vary. If the timber is concentrated in a small area and is of very high value, the threshold amount for a helicopter operation can be reduced. In general, more volume is better, as the overhead costs (e.g. cost of moving, setting-up, and dismantling the operation) can be spread over more m3, which reduces the overall (per m3) cost. Other factors to consider include:

- The lift capacity and "straight-up" lift capability, the lift mechanism (type of choker or grapple) and type of helicopter.
- The availability of accommodation, fuel, and services.

**Timber Values required:**

Currently (April 2009), the *Coastal Appraisal Manual* provides an appraisal allowance of about $60/m3 for "regular" helicopter logging. When the cost of stumpage, log processing and scaling, barging/towing, access, waste and residue assessments, silviculture and overhead is added, the "appraisal cost" of logs (at the sawmill) per m3 for helicopter logging is usually over $100/m3.

Helicopter logging in NW BC is usually feasible only if there is a significant component of high-value timber in a stand, typically consisting of cedar, and (in some situations) large-diameter, old-growth spruce. The following **example** is based on a TSL where the average value of logs (delivered to mill) is $165/m3 for cedar/large spruce logs, and an average value of $75/m3 (delivered to mill) for the other species. It assumes that all the merchantable trees in the block are extracted by helicopter. Table 1 provides the percent of cedar/large spruce required for various stand values. In this scenario, if we assume that helicopter logging requires a minimum average stand value of $100/m3, the minimum content of cedar/ large spruce will be about 30% (see shaded line in Table 1).

Currently (April 2009), the prices for high-value sawlogs and "other" sawlogs are low. As a result, many NW coastal stands do not meet the economic threshold for helicopter logging. When the value of sawlogs increase, more timber stands will meet the minimum "threshold" required for helicopter logging. Table 2 provides the industry log prices for (as of April 2009) for the previous 3 months and 6 months for coastal BC. The prices shown are for logs delivered to the mill (Table 2 information provided by A. Orr-Ewing & Associates).

**Table 1. Cedar & other high value timber and its effect on average stand values***

| Percent of Stand | | Average Stand Value ($/m3) |
|---|---|---|
| Cedar & other high value timber | Other species | |
| 0% | 100% | $75 |
| 10% | 90% | 84 |
| 20% | 80% | 93 |
| 30% | 70% | 102* |
| 40% | 60% | 111 |
| 50% | 50% | 120 |
| 60% | 40% | 129 |
| 70% | 30% | 138 |
| 80% | 20% | 147 |
| 90% | 10% | 156 |
| 100% | 0% | 165 |

* based on: Cedar and other high value timber = $165/m3; Other species = $75/m3.

**Table 2. Coastal BC industry log prices (in $/m3, delivered to mill) for April 2009**

| **Mature (old growth)** | Industry 3 month | Industry 6 month | | **Immature (2nd growth)** | Industry 3 month | Industry 6 month |
|---|---|---|---|---|---|---|
| **cedar** | | | | **cedar** | | |
| higrade | $330 | $345 | | sawlog | $130 | $145 |
| Sawlog | 130 | 145 | | shingle | 80 | 90 |
| shingle | 120 | 130 | | gang | 125 | 130 |
| gang | 120 | 130 | | chip/saw | 55 | 60 |
| pulp | 5 | 5 | | pulp | 5 | 5 |
| | | | | | | |
| **hemlock** | | | | **hemlock** | | |
| higrade | 140 | 140 | | sawlog | 55 | 55 |
| sawlog | 65 | 65 | | gang | 50 | 50 |
| gang | 50 | 55 | | chip/saw | 40 | 40 |
| pulp | 37 | 38 | | pulp | 37 | 38 |
| | | | | | | |
| **balsam** | | | | **balsam** | | |
| higrade | 100 | 100 | | sawlog | 55 | 55 |
| sawlog | 65 | 65 | | gang | 50 | 50 |
| gang | 55 | 60 | | chip/saw | 40 | 40 |
| pulp | 37 | 38 | | pulp | 37 | 38 |
| | | | | | | |
| **spruce** | | | | **spruce** | | |
| higrade | 300 | 300 | | sawlog | 55 | 55 |
| sawlog | 65 | 65 | | gang | 50 | 50 |
| gang | 55 | 60 | | chip/saw | 40 | 40 |
| pulp | 37 | 38 | | pulp | 37 | 38 |
| | | | | | | |
| **cypress** | | | | | | |
| higrade | 200 | 225 | | | | |
| sawlog | 120 | 120 | | | | |
| gang | 75 | 35 | | | | |
| pulp | 5 | 5 | | | | |

**The "Take or Pay" Requirement**:

In NW BC, helicopter logging usually targets high-value cedar and large spruce. BCTS operating areas with cedar/spruce usually have these species as a minor component of the stand. Hemlock, and to a lesser degree, coastal balsam, usually forms the main component of the stand.

The hemlock and balsam logs in old-growth stands usually do not have enough value to allow their extraction by helicopter. If these trees are not harvested, under the "*Take or Pay*" requirement of the *Regulations* of the *Forest and Range Practices Act*, the tenure holder will pay a waste and residue assessment (fine) based on a survey of avoidable waste in the block. This penalty must be paid on all avoidable waste from felled trees that exceeds 35m3/ha (for old growth in the North Coast District) or 20 m3/ha (Kalum District). Standing trees in a clearcut are 100% billed.

Non-utilized trees that are left in the cutblock will likely present problems for access for planting, post-harvest surveys, and for other activities. It may also limit the number of spots available for planting trees.

In September 2008 the Association of BC Forest Professionals released two reports which are available at:
http://www.abcfp.ca/regulating_the_profession/

- *Guidelines on High-Retention Harvesting and Partial Cutting in BC Coastal Forest.*
- *Guidance for Professional Quality Rationales and Commitments*.

The first report discusses waste and residue problems for sites where not all the timber is extracted (this includes helicopter logging) and recommends that, where this is the case, that a rationale and ancillary document accompany the Site Plan. The second report provides guidance on preparing rationales and commitment statements.

**It is recommended that Site Plans for BCTS helicopter operations include a rationale and an ancillary document.**

It is usually not possible to harvest only the cedar and other high-value timber without impacting the lower-value trees that are present. When low-value species/grades (see Table 2) form a significant part of the stand, and it is unlikely that the low-value species/timber will be extracted. Block layout should try to capture the clumped cedar by using **small blocks**. These small blocks, also called patch cuts, should be 0.5 ha, or greater, in size.

Advantages of small blocks include:

- There is a higher percentage of high-value trees in the blocks.
- The amount of avoidable waste is reduced.
- There is less of a high-grading effect and utilization is improved.

Disadvantages of small blocks include:

- Reduced safety and lower productivity during felling.
- Reduced safety and reduced helicopter productivity during the log extraction phase.
- Reduced light (increased shade) may reduce juvenile tree growth in areas adjacent to the timber.

Operational considerations and safety aspects for small blocks are discussed in the following sections of this report.

**Clearcuts, Patch Cuts, Single-Tree Selection and Standing Stem Harvesting:**

**Clearcuts** usually provide the lowest cost method of extracting timber for helicopter logging. Although more costly than clearcuts (m3 basis), there may be reasons why **patch cuts** and **single-tree selection cuts** are more suitable than clearcuts. Examples are unstable slopes, visual requirements, and high levels of waste and residues on clearcuts.

Operational research of clearcuts, small patch cuts (50% and 25% of treatment area harvested in 0.2-ha to 0.3-ha patches), and single-tree selection using a Sikorsky S-64E Skycrane helicopter equipped for choker logging in the Queen Charlotte Islands *(see FERIC Advantage Vol. 4, No. 19)* indicated that:

- Falling productivity was 9-29% lower in the patch cuts vs clearcuts. Helicopter yarding costs were 4-6% higher for the patch cuts vs clearcuts.
- Falling productivity was 18-42% lower in the single-tree selection cuts vs clearcuts.
- Helicopter yarding costs were 11-17% higher for the single-tree selection cuts vs clearcuts.

The higher falling and helicopter extraction costs for patch cuts and/or single-tree selection can be considered for specific situations.

**Standing stem harvesting** is a special form of single-tree harvesting where the faller is also a tree climber. The tree is delimbed and topped while standing and the stem is partially severed. The helicopter places a grapple on the end of a cable onto the tree to securely grip the tree and then break it off before flying it to a drop-off zone. The main advantage is a reduction in breakage and waste for high-value trees. To date this type of harvesting has not been conducted in NW BC.

**Note:**

- The recommended silviculture system for helicopter logging where the stand is over-mature and decadent, is low retention or patch cutting. This provides adequate growing space and light conditions for a new crop growth. These systems create a productive growing environment as most of the crown canopy will be removed.
- Single-tree selection cuts are not encouraged as they relate to uneven-aged management. Uneven-aged management is difficult to achieve, given the two-storied stand structure of coastal forests and the logistics of re-entry. Uneven-aged management usually requires a re-entry for harvest every 50 years, or less, and the stand should have three, or more, layers.

**Retention Considerations:**

The retention of adequate amounts of higher-value species (e.g., cedar, spruce) must be considered and incorporated into the FSP, Site Plan and TSL document. Retention of these species should be maintained at the landscape level, and at the block level. The amount to be retained will depend on:

- higher level objectives – e.g., visuals, wildlife habitat, EBM and biodiversity.
- the amount of cedar and spruce that exists in the surrounding landscape .
- the condition of the overstory.
- the size of the blocks.

The purpose of retention is to maintain a healthy forest ecosystem by maintaining a sustainable level of all tree species.

Blocks destined for heli logging must have a significant percentage of high-value species to pay for the harvesting (see Table 1) and minimize the amount of waste and residue. Poor quality trees may have to be felled to ensure that enough crown closure is removed for seedling recruitment and growth and to limit regeneration growth loss.

In coastal stands (prior to harvest) there are two types of Layer 1 trees; trees that will contribute to stocking and trees that will not contribute to stocking – following harvest. Contributing trees will maintain or increase in growth and yield and non-contributing trees will continue to decrease in growth and yield. For stands that have mostly non-contributing trees (assuming there is no reason for high retention) the retention level should be fairly low to create enough growing space and sunlight for residuals, ingress and planted trees. If there are sufficient contributing trees (and the higher-level

objective is for greater retention), then a higher retention level can be prescribed. The condition of in-block trees must be recorded during the reconnaissance phase to help determine the cut/ retention levels.

A tally of contributing and non-contributing trees is to be collected during the cruise. Trees 17.5cm dbh (utilization diam.), or greater, are to be tallied as "**Crop Trees**" or "**Non-Crop Trees**" during the prism sweep. Trees less than 17.5cm dbh are to be tallied using a 3.99m or 5.64m plot radius and also evaluated as well spaced.

Minimum block size should be 0.5 ha to reduce the negative effects of shade along boundary edges (the section Falling and Block Layout Considerations – also discusses block size, but from a safety perspective).

**Site Plan:** Key information to be included in the Site Plans are silviculture system, leave tree characteristics and purpose, forest health, stocking standards, minimum and maximum basal area, and harvest method. **It is important to ensure consistency with this heli-logging guidance document, the FSP, the Site Plan and the TSL document.**

**TSL Document:** The TSL licence document is the plan that is enforced by BC Timber Sales. It must be consistent with the FSP and Site Plan. The TSL licence document includes provisions for plantable spots/ha and for cutting down trees that present forest health concerns (e.g., mistletoe). It should also incorporate minimum and maximum retention levels of Layer 1 trees. For standing waste, the starting point for measuring will be any standing waste greater than the maximum allowable retention. The waste and residue survey is done post harvest by the licensee and/ or BC Timber Sales. The results of the survey can then be evaluated for conformance to the retention level set in the TSL document. Basal area can be converted to m3/ha and vice versa; this can be used to measure retention levels.

**Note:** Stocking standards for variable-retention partial cutting are in progress and are expected to be available for use by December 2009. The premise is that the retention level of Layer 1 trees is reciprocal to levels of Layer 2, 3 and 4 trees. If Layer 1 retention is low, then the density of well-spaced Layers 2, 3 and 4 trees are higher to ensure stocking is achieved. Layer 1 trees are in the same management group and Layers 2, 3, and 4 are managed as a group.

## Operational Planning

### Locating the Drop Zone (Water or Land):

The drop zone is where the logs are dropped; it can be on water or on land.

**Water Drop Zone:** For coastal operations, the water drop zone is usually in salt water adjacent to the logging area, and away from the main boat traffic route. The required water depth in the helicopter drop zone is 30m; for log storage it is 20m. The use of a barge will minimize damage to aquatic life in the drop-off zone. There may be requirements for protecting humpback whales or other aquatic life. Normally a small boat is used to gather up bark and other debris on a daily basis. The debris is piled up on the shore and is later burned. A log boom-type holding area is usually required for log storage purposes.

> For more information, please refer to :
> http://www.coastforest.org/practices_sustain002.html
> *Best Management Practices for Helicopter Log Drop Sites in Marine Waters of British Columbia.*

**Land Drop Zone:** This is usually located on a nearby road or landing. Ideally, it should be within 1 km of the cutblock, but sometimes it is more. The drop zone must have adequate room to safely land and handle logs. It easily gets congested and must be cleared on a regular basis as the logs are dropped off. Usually a log loader is employed for clearing the drop zone.

For re-activating log dumps, please refer to:
http://www.coastforest.org/practices_sustain002.html
*Best Management Practices for Re-activated Log Dumps in Marine Waters of British Columbia.*

**Flight Path and Yarding Distance:**

The flight path should address the following factors:

- Ideally there should be a favourable slope gradient from the cutblock to the log-drop zone. Alternate paths may be required in the event of changing winds or other factors. **Flight path slope gradients** in the range of approximately 20 - 35 % (up to 40 %) are generally preferred due to safety and productivity considerations. The possible range of flight path slope gradients will be dictated by terrain and location. Gradients greater than 35 - 40 % usually require that the helicopter takes a longer less direct flight path to maintain an acceptable balance of travel speed and descent rate.
- There should not be any crew members beneath the flight path at any time.
- **Yarding distance** includes consideration of the horizontal distance from hook-up location to landing, the slope distance from hook-up to landing and the flight distance or actual distance flown between the hook-up site and landing.
  Information on calculating the yarding distance for a cutblock and the average yarding distance (volume weighted) for a multi-block project is provided in *FERIC Advantage Vol. 5, No. 38, p. 20*).
- **Optimal yarding distance** is similar for most helicopters.
  For Skycrane helicopters it ranged from 600 to 800 m (see *FERIC Advantage Vol. 3 No. 19, p. 10*). For Bell 214B helicopters, it was distances under 1000 m (see *FERIC Advantage Vol. 5, No. 38, p.15*).
- **Maximum yarding distance** for any helicopter can be considerably higher than the optimal yarding distance. If log grades and log values are high, it may allow economical yarding distances of up to several kilometers, or more.

**Falling and Block Layout Considerations:**

The falling phase usually begins with the fallers hiking into each block to open sites and build **helipads** for the support helicopter using on-site materials. Once the first helipads are established, a support helicopter can be used to ferry the fallers to and from their falling sites.
Trees are felled, delimbed, and bucked into logs according to grade and weight specifications, while smaller stems are often left as treelengths. This is done to match the helicopter's target payload, which is usually 80-85% of the maximum payload (see Table 3).

**Notes on payload:**

- The rated payload capacity can vary from 2500 to 25,000 lb (see Table 3). The TSL holder will have to decide which make and model of helicopter to use.
- The weight per m3 of the timber species being harvested is an important consideration. For example, a m3 of cedar usually weighs less than a m3 of hemlock.

**Directional felling** is important, especially in smaller patch cuts and in single-tree selection units. Timber lean with respect to the falling face must be addressed by the faller. Felling wedges, and sometimes, hydraulic jacks are used when directional felling.

- The minimum dimensions of an opening are 1.5 X the tree height along the direction of falling face/ contour (along the lower side of the block). For a 60-m tree, the minimum width of the opening is 90m. The minimum depth of the opening is of less concern; it may be 70 m.
- The faller usually begins by falling trees on the lower boundary of the block. He selects the first tree so that it will fall into a natural opening. Then adjacent trees are felled into the newly-created opening, and he gradually moves uphill. Usually, the most dangerous phase is falling trees into standing timber.

- Natural gaps and openings in the timber should be used to facilitate the helicopter's vertical lift, particularly on the low boundary edge of the cutblock. Terrain considerations must address bluffs, gullies, steep slopes and broken slopes when these features are located within or adjacent to the cutblock.
- Helicopter pilots usually start from the lowest elevation in the block and work uphill, taking the lighter trees at the beginning of the cycle while they are carrying more weight in fuel, and then taking the heavier trees as the fuel level decreases. Each work cycle lasts approximately one to one and a half hours, with the helicopter touching down at a service landing for approximately 15 minutes between each cycle for fuel, a safety check of the equipment, and a change/ rotation for the pilot.
- On steep-ground sites, strategically placed high stumps may limit log rolling down steep slopes. These high stumps are non-avoidable waste and require pre-approval by MoFR.
- The fallers should be provided with clear direction on retention and on the latitude for substitution for marked trees, where trees to be felled are marked.
- Felling hazardous trees is required for safety purposes. Hazard trees can be marked for felling or the decision on what trees constitute a hazard and need to be felled can be left to the faller.
- Propeller "wash" is an important consideration for the felling of hazard trees, especially when large helicopters (e.g. Sikorsky S-64E) are used (see Table 3).

**Table 3. Specifications for helicopters commonly used for logging in BC [a, b]**

| Manufacturer | Model | Rated payload capacity (lb.) | Engines (no.) | Engine Power [c] (kW) | Diameter main rotor (m) | Diameter tail rotor (m) |
|---|---|---|---|---|---|---|
| Bell | 204B | 4000 | 1 | 820 | 14.6 | 2.6 |
| Bell | 205A | 5000 | 1 | 1044 | 14.6 | 2.6 |
| Bell | 212 | 5000 | 2 | 671 (each) | 14.7 | 2.6 |
| Bell | 214B | 8000 | 1 | 2185 | 15.2 | 2.6 |
| Boeing | V-107 II | 10500 | 2 | 932 (each) | 15.5 | n/a |
| Boeing | CH-234LR | 28000 | 2 | 3039 (each) | 18.3 | n/a |
| Sikorsky [d]<br>Sikorsky [d] | S-64E<br>S-64F | 20000<br>25000 | 2<br>2 | 3356 (each)<br>3579 (each) | 22.0<br>22.0 | 5.0<br>5.0 |
| Eurocopter | SA-315B Lama | 2500 | 1 | 640 | 11.0 | 1.9 |
| Kaman | K-1200 K-Max | 6000 | 1 | 1342 | 14.7 (x2) | n/a |
| Kamov | Ka-32A | 11000 | 2 | 1645 (each) | 15.9 (x2) | n/a |
| Sikorsky | S-58T | 5000 | 2 | 700 (each) | 17.1 | 2.9 |
| Sikorsky<br>Sikorsky | S-61N<br>S-61N Shortski | 8000<br>9000 | 2<br>2 | 1044 (each)<br>1044 (each) | 18.9<br>18.9 | 3.2<br>3.2 |

a. Table 3 is adapted from Appendix 1 of FERIC Advantage Vol. 6, No.34, 2005.
b. Helicopter capabilities will vary with flight conditions and installed options.
c. Engine power at takeoff.
d. Now manufactured by Erickson Air-Crane.

## Safety

Planning and layout personnel should have a good understanding of required safety practices in helicopter logging. The following are recommended:

- *Safe Work Practices for Helicopter Operations in the Forest Industry*, a 34-page booklet available from WorkSafe BC.
- *Setting the Standard: Helicopter Logging*, a 17-minute video from WorkSafe BC.
- *Helicopter Logging in Alaska – Surveillance and Prevention of Crashes*, a 20-page report by J.C. Manwaring and G.A. Conway, from the 2001 Pacific Northwest Skyline Symposium.

**Additional References for Part A:**

*Helicopter logging on the Queen Charlotte Islands: productivities and costs of a Sikorsky S-64E Skycrane in clearcuts, patch cuts and single-tree selection cuts*. R. Krag and C. Evans. 2003. FERIC Advantage Vol. 4, No. 19, 40 p.

*Helicopter logging with the Eurocopter SA-315B Lama and Kaman K-1200 K-Max: clearcut harvesting in the southern interior*. M.T. Dunham. 2005. FERIC Advantage Vol. 6, No. 25, 20 p.

*Helicopter logging with the Bell 214B: group and single-tree selection in low-volume coastal cedar stands*. M.T.Dunham. 2003. FERIC Advantage Vol. 4, No. 33, 19 p.

*Helicopter logging with the Kamov Ka-32A11BC: clearcut harvesting on southern Vancouver Island*. M.T. Dunham. 2005. FERIC Advantage Vol. 6, No. 34, 16 p.

*Helicopter logging in British Columbia: clearcut harvesting with the Sikorsky S-64E and S-64F Skycrane helicopters*. M.T. Dunham. 2002. FERIC Advantage Vol. 3, No. 19, 20 p.

*Helicopter logging productivity on harvesting operations in Southeast Alaska: using ecologically-based silvicultural prescriptions*. L.E. Christian and A.Brackley. 2007. West. J. Appl. For. 22(2). 6 p.

# Part B: The Checklist

This checklist is intended as a guide for layout crews and for BCTS Planning and field staff. It can identify areas of risk and should help with finding solutions that can address most concerns.

1: Access

Does the proposed helicopter logging provide the lowest access cost? Yes___ No___

Is there more timber (beyond the proposed helicopter blocks) that could be accessed if a road was built? Yes___ No___

Has a cost / benefit analysis of the access options been done? Yes___ No___

2: Timber Volume

Is there an adequate amount of cedar and/or other high-value timber for a helicopter TSL (e.g.,10,000m3)? Yes___ No___

3: Timber Values

Does the average stand value (see Table 1 of Part A) of the proposed helicopter blocks meet the minimum threshold for helicopter logging? Yes___ No___

4: Stewardship / Silviculture

Has the prescribing forester prepared a Site Plan that includes a rationale and ancillary document? Yes___ No___

5: Flight Path and Yarding Distance

Is the proposed flight plan and yarding distance doable and realistic? Yes___ No___

6: Target Weight

Has a target weight for the helicopter payload been selected? Yes___ No ___

7: Minimum Opening

Is the minimum opening width on the cutblocks at least 1.5x the dominant tree height? Yes___ No___