

EMEND **FINAL** Harvest Layout and Extraction Pattern



The following describes the harvest extraction method for all Vegetation Types within the northern Alberta, Boreal Plains EMEND PROJECT.

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Harvest Pattern Description

Clear-cut Treatment: THE OBJECTIVE OF THIS TREATMENT WAS TO DO NORMAL OPERATIONAL LOGGING WHILE PROTECTING THE ELLIPSES. This treatment was conventional full tree logged using feller bunching and direct route skidding. The same techniques that are used in operational logging will be deployed in this treatment. One to two percent of the live trees (single trees and clumps) were randomly distributed throughout the cut block. Two ellipses are located within each clear-cut. The trees in these ellipses were not harvested. Landings are distributed along the main access route(s) as they would in operational logging.

Retention Harvesting Treatments at 75, 50, 20 and 10 % levels: THE OBJECTIVE OF THESE TREATMENTS WAS TO MAINTAIN A CONSTANT HARVESTING PATTERN ACROSS ALL TREATMENTS WHILE VARYING THE HARVEST INTENSITY BETWEEN TREATMENTS. Harvest method was a feller buncher/forwarder (skidder) full tree system using designated machine corridors as the only extraction route. All corridors were 100% removal with various levels of removal within the retention strips adjacent to the machine corridors (see attached diagram and table). The feller buncher reached from the machine corridor **only** for inter-corridor (retention strip) extraction. All tree bunches were placed on the machine corridors and skidding was restricted to these corridors. The machine corridors are spaced @ 20 m centres and have a prescribed average width of 5 m. The effective extraction reach of the feller buncher was 10 metres from the machine corridor centreline.

All corridors are oriented in a north - south direction perpendicular to the direction of prevailing wind. This allows for consistent wind effect along the retention edges (*wood extraction and topography limited*). The extraction route (landing and trucking) consistent with each stand or replication to allow for consistent wind influence (if the prevailing winds influence the extraction route or designated machine corridors all compartments will be equally effected). Each rep. or stand had a consistent extraction directional pattern for consistency in post-harvest environmental effect. **If the landings and extraction**

routes were laid out parallel with the prevailing wind, retention buffers were maintained (see diagram) every 45 metres to mitigate internal compartment environmental variability.

A full tree stroke delimeter was used at the landings to remove branches and tops. The landings are 30 metres in width and 40 metres long. The landings are oriented perpendicular to the machine corridors and parallel to the roads. Attempts were made to minimize the area consumed by the roads and landings.

Two ellipses (no cut patches) were established within each 10, 20, 50 and 75 percent retention level compartments as well as in the clearcuts. These patches are positioned within each compartment in a relatively similar location relative to compartment shape. The shape of the patches are elliptical with one patch being 40 metres wide by 60 m long (approx. .2 ha) and the second 60 metres wide by 90 m long (approx. .4 ha). The ellipses are edged on a designated machine corridor and run parallel with the machine corridors (see diagram). The large ellipse is located on the north side of the compartments and to the eastern side. The eastern edge of the small ellipse was prescribed at 80 metres west of the western side of the large ellipse and parallel to it.

Machine corridors were established based on the ellipse locations. All centrelines were located from the narrowest point of the ellipse to the outside edges of the compartments.

Resulting retention level and distribution:

Retained individual trees are evenly distributed throughout the retention strips to the prescribed level, excluding the uncut ellipses. Distribution was prescribed by stem removal to total stem ratio (i.e. 2:3 or 2 removed of every 3, etc.). The machine corridors represent ~25% net removal and the retention strips have various levels of removal summarized as follows:

Retention Level %	Machine Corridor (% of Net Area*)	Individual Stem Removal Ratio	Retention Strip (% Net Area*)
**75 %	25%	- no individual stem extraction	75%
50 %	25%	1 removed of every 3	75%
20 %	25%	3 removed of 4	75%
10 %	25%	7 removed of 8	75%

*Net area of a compartment excludes the area retained in ellipses

**75% rather than 70 to match operating pattern

EMEND: Detailed Harvesting Specifications

The following specifications apply to all retention harvesting completed in the EMEND study site. This includes 10, 20, 50 and 75% retention level treatments prescribed for all four vegetation types.

Basic Objectives were as follows: (*See attached diagrams*)

- restrict ground traffic to the machine corridors only and to a prescribed width of 5 metres;
- minimize damage to the retained stems adjacent to the machine corridors and conifer understorey;
- retention strips will be systematically harvested based on the following removal ratios (10%-7 of 8 trees, 20%- 3 of 4 trees, 50%- 1 of 3 trees and 75 %- no retention removal (only machine corridors are harvested));
- consistency in treatments across the whole study is required (between compartments, reps and stands);
- harvesting will be completed in each rep/stand before the operations move to the next rep/stand;
- landings will be limited to 45 metres wide by 30 metres deep;
- 15 metre retention buffers between each landing will be established to minimize wind damage adjacent to the roads and landings;
- all wood harvested from an individual compartment will be decked on landings within the compartment and all softwood and hardwood will be separated during harvesting (bunches) and at the landings.

Detailed Harvesting Specifications: (*use diagrams for visual perspective*)

All harvesting was completed using pre-marked designated machine corridors at 20 metre intervals (centreline to centreline, flagged in yellow) which run parallel in each compartment. All harvesting and skidding was limited to the 5 metre designated machine corridors. Landings of 45 metres wide (parallel with haul road) by 30 metres in depth, are located at either the north or south end of each compartment (depends on location of haulroad), accessible by all designated machine corridors. A 15m wide retention strip was maintained to the haul road between all landings to minimize the wind influence on the treatment compartments. All roads and landings were harvested before compartment harvesting took place. Where two compartments are separated by landings and haul roads, landings were lined up parallel (within reason) to allow the delimeter to effectively operate and maintain the retention strip wind buffers.

Harvest PASS 1 (Machine Corridors): Harvesting was completed in two passes, the first by a 0 tail

swing tracked, feller-buncher, a TIMCO Model T455 which centred itself on a machine corridor beginning at a landing and fell mature stems in its path (5 metres in width) in front of the machine and to the side of the tracks using natural stand openings where possible. This machine cut only the machine corridors. All bunched stems were separated, where possible, by softwood and hardwood, with all butts facing and bunches angled to the landing, accessible to the skidder (forwarder) from the machine corridor only (no ground activity outside of the machine corridor). On completion of the first corridor, (at the compartment boundary) the feller-buncher cut an access trail across to the next corridor and began harvesting back towards the landing. On this corridor the buncher once again only harvested the machine corridor, swung all trees behind the buncher, placed bunches with butts facing the landing in a shingle pattern, on the machine corridor only. **Ellipses:** As seen on the diagrams, two ellipse shaped reserves (flagged in blue) were laid out on each of the treatment compartments. When an ellipse was encountered by the feller buncher on the first pass, as it progressed down the machine corridor it followed the outside edge of the ellipse until it met the first uncut machine corridor. The regular harvest pattern commenced from this point. On the large ellipse (60 by 90m) two corridors are impeded while only one is impeded on the small ellipse (40 by 60m). All ellipse reserves edge on machine corridors. **Skidding:** On completion of harvesting the machine corridor, a grapple skidder backed down the corridors created and skidded the bunches into decks on the landing. All skidder ground traffic was restricted to the 5m wide machine corridor or the landings. Softwood and hardwood stems were decked in separate piles on the landings. This completed the harvesting in the 75 % retention treatments as the machine corridors are 25 % of the total compartment.

Harvest PASS 2: To be completed on 10, 20 and 50 % retention treatments: On completion of the skidding of the machine corridors, a second harvesting pass was completed by a tracked Cat EL300 feller-buncher. This machine walked down the machine corridor to the end of the block (farthest from the landing) and harvested to the landing traveling backwards, systematically harvesting the retention strips on both sides of the machine corridor to the desired treatment prescription level. All machine travel was on the machine corridor only. *Systematically means that the operator counted out the retained or removed trees as they were encountered ignoring the species and size of the stems.* In this manner, an even distribution of the retained trees was achieved. The ratio of trees removed in each treatment is 1 of 3 for the 50%; 3 of 4 for the 20%; and 7 of 8 for the 10 %. All bunching was by species, placed onto the machine corridor in a shingle pattern, and only if additional space was required in the case of the 10 and 20 % retention compartments, into natural openings in the stand where the bunches were angled towards the landing. **Skidding:** The final skidding was completed by the grapple skidders; once again backing down the machine corridors from the landings. Softwood and hardwood stems were separated into different decks on the landings.

Operating Sequence and Timing: The machine corridors (Pass 1 - TIMCO) were harvested during daylight hours only with the retention strip harvest (Pass 2) completed both day and night. The TIMCO harvested clearcuts at night to maintain operation efficiency. If operator visibility was hampered during night operations in the Aspen Dom. with softwood understorey compartments, the Cat 300 was limited to daylight operation only on these compartments. Both felling machines operated in the same rep or stand until all of the felling work was complete (within reason) before moving on to the next rep.

Delimiting: A full tree stroke-delimiter was used to remove tops and limbs from the trees skidded to the landings. Where two compartments are separated by landings and haul roads, landings were lined

up parallel (within reason) to allow the delimeter to effectively operate and to maintain the retention strip wind buffers. When the landings were located on the outside edge of a rep/stand, an additional 10 metre wide access strip was cut adjacent (opposite side of the road) to the landing on the other side of the haulroad to allow the stroker to fully stroke.

Hauling and Wood Measurement: All wood cut and delimbed from an individual compartment, (including landings, haulroads and delimeter access strips) was decked on landings within the compartment in which it was harvested. The haulroad, landing, and even delimeter access strip wood was marked (painted) to separate the measurement from the treated compartment wood. Wood from each compartment was identified and ticketed by the loader operator identifying compartment or handling wood (landings, haulroad and delimeter access strip). Where a haul truck was loaded with wood from two compartments or portions of compartment and handled wood from the same landing, it was identified on the haul ticket with % of load estimated and noted. (i.e. if a truck was loaded with 40% landing wood from compartment 890 it was marked Comp. 890 40% landing/60% treatment block.)

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