# Fire Salvage Project
# For Barney Lake Fire of 2004

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**Fire Salvage Technical Working Group**

**Picture of Barney Lake Fire on August 13, 2004**

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## 1.0 Introduction

The 2004 Yukon fire season was one of the hottest and driest on record. As a result, there were a higher then normal number of large fires on the landscape. Some of these fires were remote while others were located close to existing roads or previously logged areas. Although fire does not represent a risk or threat to the northern boreal ecosystem, these fires do, on occasion, present economic opportunities to salvage wood when they are accessible and provide merchantable product. As a result, forest managers identified a requirement to assess these fires for potential fire salvage opportunities.

In the Kaska Traditional Territory (KTT) there were 44 fires with estimated area of 390000 ha. The Barney Lake and False Canyon Creek potential salvage areas total 5018ha, or 1.3% of the 2004 burned area in the KTT. A reconnaissance report was produced and presented to KFRSC providing recommendations on fire salvage for interim use and considerations for regional planning (Appendix 3). Fires WL-04-04 or False Canyon Fire and WL-04-29 or Barney Lake Fire were chosen for further work and development planning.

The Barney Lake fire estimated area was 51 900ha with an estimated 1043ha or 2% having potential for operational planning. The total gross estimated volume within potential operating units was estimated at 71 000m3. With an estimated 16 000m3 in stands with heights exceeding 17m.

Harvesting from fires requires planning to ensure that the products can be economically extracted without unreasonable environmental or social impacts. In this regard, a good plan will look for opportunities to improve the future use and expectations from the land base.

## 2.0 Objectives and Criteria

### 2.1 Objectives:

- Identify an economic wood supply and opportunity while ensuring that the social and environmental values of the area are respected. The planning objective would be met if the options were "economically viable", "socially accepted" and "environmentally sound".
- Consider fire and the landscape surrounding it. This is important to ensure habitats, key features and linkages are maintained in terms of the environmental and future economics of burned forest and adjacent unburned forest.
- Identify Areas for Operational Planning (site plans).
- Complete Environmental Assessment of Development Plan.

2.2 Criteria:

- Best growing sites first
- Prompt regeneration strategies
- Soil conservation strategies
- Protection of wetlands and riparian areas
- Remnant habitat features protection (fire skips)
- Avoidance of sensitive terrain (complex and steep areas)
- Operable land base identification
- Minimize roads
- Winter logging preferred season of operations

2.3 Principles of Planning:

The following general principles were considered during the planning process.

- Forest fuels burn at differing rates and intensities producing a complex mosaic. On large fires, this provides opportunities to maintain natural areas and some of the original fire attributes while identifying areas for harvesting.

- Fire is a natural disturbance event that has to be considered along with the proposed harvesting which is an additive human caused disturbance.

- Fire Skips are not the only key habitat features in a fire - but they are perhaps the most easily identified. All areas of the fire will likely be valued habitat as successional processes occur.

- Residual trees can be isolated in a patch or scattered over an area as a matrix.

- The operating areas as well as the adjacent remaining forested and non-forested areas have to positively interact for forest ecosystems to exist and function.

- Generally, the salvage opportunity for lumber will decease over a 3 year period. If the interest is fiber, the loss of value is much more gradual and therefore fiber harvest can occur over much longer time frames.

- Access planning requires a vision or considerations beyond the time span required for fire salvage. An initial access into the area will have implications on forest harvesting in the adjacent forested areas as well as potential impacts on other values.

- The land base has been used by other people and care must be taken to protect past values and integrate present and future uses. An archeological potential assessment was undertaken to identify potential heritage sites.

## 3.0 Timber Salvage Planning Process

The assessment was done in 3 steps, namely:

1. **Initial Reconnaissance** to identify potential planning areas based on an initial consideration of wood supply, access and obvious environmental constraints. Two fires were selected for further work. These included the False Canyon Creek Fire #4 and the Barney Lake Fire # 29(Appendix 3).
2. **Development Planning** to define more details of the fire, forest and landscape issues as they pertain to development of the area. This step leads to the identification of operating units and management direction for the maintenance of values.
3. **Operational Planning** - Operational planning occur after the development plan is approved and is the most detail. The operating plan includes specific access and harvesting details based on stand and site information. Example site plan is found in Appendix 2.

The important point with these three steps is that one is very much dependent on the other -that is to say the only fires deemed to have potential at the reconnaissance stage will be considered for development planning, and only areas or fires that have a development plan will be subject to operational planning. This type of process focused our effort to areas of real opportunity, and provides several opportunities to integrate other resource values and interests.

At present, we are at step 2. The Initial Reconnaissance was competed in the fall of 2004 and two fires were selected for further work, these included the False Canyon Creek Fire (WL-04-04) and the Barney Lake fire(WL-04-29). The following information comprises the 'Development Plan' for the Barney Lake fire which is step two.

## 4.0 Fire Characterization and Descriptions:

Barney Lake Fire:

The Barney Lake fire (map1) is located approximately 80km east of Watson Lake. The fire consumed forest on both BC and Yukon. It was first reported on July 4, 2004 and was started from lightning strike(s). The fire was declared out on September 30, 2004. The fire size is estimated at 51 000ha.

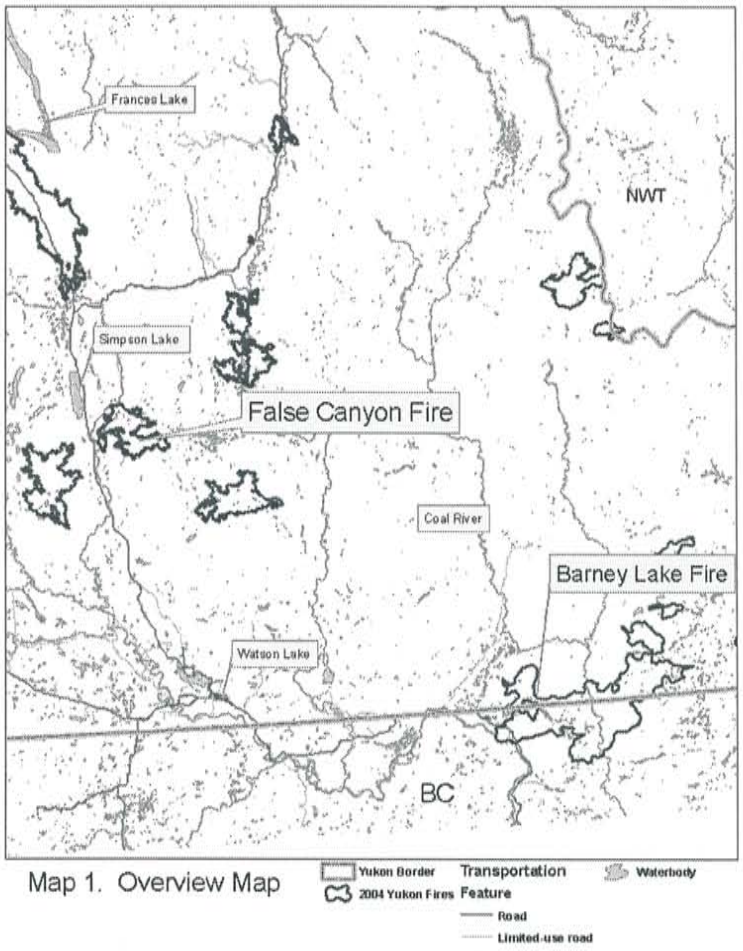
Fire severity is an important factor in assessment of the merchantability of the timber. Three general categories of fire severity occurred.

- Hot (initial starting point of fire) Fire Weather Index (FWI) was extreme, resulting in rapid crowning and expansion of the fire perimeter
- Mid-summer (drought code extreme)- symptoms of this type of fire behavior are consumption of forest floor fuels ( LFH, needles, twigs) and large woody debris.

Fire characteristics were slower rates of spread and more surface fires and spotty crowning.

- End of summer(drought codes high) – drought codes continue to produce fire behavior which consumes forest floor fuels along with fine fuels (needles and twigs), large woody debris no longer burns extensively. Cool nights limit the fire from extensive crowning, fire smolders consuming forest floor fuels, roots and boles of trees. Some candling occurs.

Map 1. Overview of planning regions with respect to Watson Lake.




Map 1. Overview Map

## 5.0 Development Planning Process for Barney Lake Fire

The Barney Lake fire does not have comparable economic opportunities or available information as the False Canyon Creek Fire. The majority of timber is accessible from existing roads on the westerly section of the fire. A total of 2% of the burn area is within potential operating units.

Detailed mapping of the fire severity could not occur, with the heavy smoke and poor fall weather no suitable satellite imagery was available. Similar plan detail as the False Canyon Creek Fire could not occur. Nevertheless, overview flights, personal communication, vegetation inventory, archeological assessment and topographic information were used to direct planning.

Acquiring imagery when it becomes available will aid in field assessments. It is expected imagery will be available sometime in summer/fall 2005. By acquiring the imagery a more detailed fire boundary and severity could be mapped.

There will be some deviations when the Development Plan is brought down to the operational level. However, it is expected the intent and overall management strategies of the development plan will be met. It is anticipated that deviations will be ' refinements' largely the result of added detail at the stand and site level and these will be reflected in the site and access plans By providing the boundaries for development it is hoped a proponent could conduct field assessments and ground work while directed by the development plan.

## 6.0 Summary of Barney Lake Fire Operating Units

In total an estimated 1043 ha (or 2%) of the burn is within operating units (Table 1). This is the gross area for salvage operations. When operational planning commences the net area harvested will be less.

Table 1. Gross merchantable volume estimates for Barney Lake Fire by operating unit and stands greater than or equal to 17m average height.

| Unit | Total of Operating Unit | | | Stands > 17m | | |
|---|---|---|---|---|---|---|
| | Area(ha) | Volume(m3) | m3/ha | Area(ha) | Volume(m3) | m3/ha |
| 1 | 61 | 3,456 | 57 | na | na | |
| 2 | 151 | 21,054 | 139 | 81 | 15,045 | 186 |
| 3 | 831 | 47,425 | 57 | 8 | 1,416 | 177 |
| Totals | 1,043 | 71,935 | | 89 | 16,461 | |

6.1 General Development Plan Guidelines:

These guidelines are provided to direct operational planning. These are prescriptions based on available information. When site visits and operational planning occurs (i.e. site plans) deviation can be expected. The best management will require integration of these guidelines with stand and site characteristics and as well consideration for retained features such as wetlands and riparian features.

- Operating units will be subject to Timber Harvest Planning and Operational Guideline practices (THPOG, DIAND) for riparian management zones(RMZ). When operational planning occurs, deviation from THPOG and harvest may occur if stand and site characteristics allow. In other words it may be that some of the RMZ can be salvaged logged.

- Stands within operating units identified as having height > 17m will be targeted first for operational planning.

- The remaining stands within the operating unit may contain additional harvestable volume. The vegetation inventory does not identify stands smaller then 25ha. Additional volume may be found within the smaller stands, however would need a field assessment to identify the location and quantity of volume. For this reason the operating units contain low volume stands.

- Area within the burn will be looked at for mortality. It is expected pockets of live trees[1], will be interspersed throughout the burn, during a reconnaissance flight in September 2004 the fire boundary was difficult to distinguish with extensive ground fire. Salvage is directed to fire killed stands. Within the fire, areas exist where partial burning may not have killed the entire stand. These areas may not contain sufficient dead volume to be viable for harvest. Partially burned sites require a field assessment to detail the amount of mortality. If the stand has less then 40% mortality it is not considered available for harvest. If more then 40% of the stand will not live longer then 10 years and not remain windfirm, the dead portion of the stand could contribute to salvage.

- Retention ranges are prescribed in section 6.3. Ranges are provided as the quantity of unmerchantable and live trees has not been determined. These are levels expected to occur for the operating units. Ranges are provided as base practices to provide flexibility without limiting potential salvage operations. It is expected that these values will change on an operating unit basis, depending on the quantity and quality of merchantable volume, after field assessment have been

[1] Live Tree: Trees which are not effected by fire, or trees which are effected by fire, however are judged to be windfirm and have green vegetation for 10 years.

completed. It is expected retention will provide potential forage and nesting site for fire associated species (see section 10.0). The retention will help provide habitat and bridge the harvested areas within the remaining burn. Inblock retention is expected to consist of unmerchantable stems and live trees interspersed throughout the block.

- Retention is thought to be more effective if connected to adjacent unharvested forest. Therefore the preference is near partially burned forest, islands of live trees or attached to RMZ.

- When lodgepole pine, birch and aspen occupy the site prior to burning, it is suspected they will re-establish naturally, these tree species are favored after disturbance. However, if spruce or fir occupied the site and no live trees capable of providing seed remain, natural regeneration may not be an option. A 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at previous forest type to establish a similar species mix.

- Seasonal access and winter harvest is required to mitigate soil compaction and erosion often seen following fire disturbance. The frozen ground and snow cover will reduce the impact on mineral soil. No more then 5% of operating unit area should contain roads or landings. By limiting operations to winter, it is hoped vehicles will not be able to travel within the operating areas.

6.2 Sequencing of Operating Units:

There are economic and environmental factors affecting the development of the Barney Lake Fire. Direction is being provided for orderly development of units to limit loss of merchantable timber while allowing time for areas classified as partially burned to indicate the quantity of mortality. This will also provide time to acquire digital imagery so that the fire boundary and severity can be assessed. See development plan map in Appendix 4.

Priority is given to develop areas 1 first, followed by 2 and 3.

6.3 Operating Unit Prescriptions:

Refer to Development Plan Map in Appendix 4.

Labels:

| | |
|---|---|
| White spruce- SW | Black spruce- SB |
| Lodgepole pine- P | White birch- W |
| Alpine Fir- F | Aspen- A |

## UNIT 1

| Unit Number | Area (ha) | Burn Severity | Merchantability | Stands > 17m Area (ha) (%) | Terrain Features | Regeneration | Other Features |
|---|---|---|---|---|---|---|---|
| 1 | 61 | - severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning. | - Low volume is expected in westerly section of unit. A portion of the unit has sawlog volume. A ground assessment would be required to validate volume and burn characteristics. Additional volume is expected outside > 17m stands. | 0 | - 1 stream crossing required on older access road.<br>- If identified Riparian Management Zone required as per THPOG.<br>- Excessive slopes on southerly section towards Barney Lake. | - previous stand are mix of pine with remaining a mix of SW and SB.<br>- Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed. | - Target retention to RMZ.<br>- check old blocks and roads for decommissioning and planting.<br>- Seasonal access on old road system. |

Operating Unit 1 Prescription:

Operating unit retention levels are expected to range from 10 to 50% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger than 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required ( i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

## UNIT 2

| Unit Number | Area (ha) | Burn Severity | Merchantability | Stands > 17m Area (ha) (%) | Terrain Features | Regeneration | Other Features |
|---|---|---|---|---|---|---|---|
| 2 | 151 | - severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning. | - Target > 17m stands first. A ground assessment would be required to validate volume and burn characteristics. Additional volume is expected outside > 17m stands. | 81(54%) | - 1 stream crossing required on older access road.<br>- If identified Riparian Management Zone required as per THPOG. | - previous stand are mix of pine with remaining a mix of SW and F.<br>- Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed. | - Target retention to RMZ.<br>- Seasonal access on old road system. |

Operating Unit 2 Prescription:

Operating unit retention levels are expected to range from 10 to 30% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger than 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. . Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required.. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required ( i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

## UNIT 3

| Unit Number | Area (ha) | Burn Severity | Merchantability | Stands > 17m Area (ha) (%) | Terrain Features | Regeneration | Other Features |
|---|---|---|---|---|---|---|---|
| 3 | 831 | - severity and exact fire boundary has not been determined, Overview flights suggested a mosaic of ground fire interspersed with patchy crowning. | -- Target > 17m stands first. A ground assessment would be required to validate volume. Additional volume is expected outside > 17m stands. | 8(1%) | - no stream crossing.<br>- lake on westerly section and stream on requires RMZ.<br>- If identified Riparian Management Zone required as per THPOG. | - previous stand are mix of pine and SB leading with remaining a mix of SW and F.<br>- Natural regeneration is likely comprising of P, W, AS. Adjacent stand and live trees may provide spruce seed. | - Target retention to RMZ.<br><br>- High potential for archeological sites surrounding lake on west section of planning area. If soil disturbance is to occur in high potential areas a detailed heritage assessment is required. |

Operating Unit 3 Prescription:

Operating unit retention levels are expected to range from 10 to 50% as portions of the unit are expected to have islands and unmerchantable stands. When possible, operating unit retention should be in patches larger then 4ha having 10 trees/ha > 20cm DBH. Inblock retention is expected to consist of unmerchantable stems and live trees distributed in small patches or single stems. Preference for retention is near partial burn or attached to RMZ. Partial burn areas require additional survey for % live trees. Partial burn areas require additional survey for % live trees. If < 40% dead and dispersed throughout the stand then defer harvest; if aggregated, target harvest into clumps. If > 40% dead consider dead portion for harvest. A live tree is categorized as windfirm and likely to exist for 10 years. With lodgepole pine occupying the site prior to burning, it is suspected pine will re-establish naturally, a 5 year post harvest regeneration survey is required to confirm establishment. If poor regeneration, look at prior forest type to establish a similar species mix. Seasonal access with winter harvest is required. Review archeological assessment (Appendix 2) for potential areas, if soil based activity is to occur in high potential areas a detailed assessment is required ( i.e. scarification, ground and soil disturbance). No more then 5% of operating unit area should contain roads or landings.

## 7.0 Access Management:

Access development is required for timber harvesting to occur. Although access is a necessity, it does come with additive issues some of which are persistent and often more severe than the initial development itself. These access related impacts may include persistent soil problems such as erosion and terrain instability, drainage disruption or siltation and effects on fish and wildlife populations through increased hunter success rates.

Adverse impacts can be reduced by:

- Adhering to best practices during construction and use.
- Managing the use according to weather, season and duration of project.
- Ensuring that the roads and trail are reclaimed consistent with future use.
- By using natural barriers during road development.

The development plan includes several measures to reduce the negative effects and provide consideration of some potential positive implications as well: These include:

- Using existing road network.
- Use of winter road standards throughout planning area.
- Apply seasonal and final reclamation procedures consistent with the project and the identified potential use of the area.
- Consider the access requirements of trappers and wilderness operators that use the area.
- When possible, avoid key features such as wetlands, viewscapes and other identified features.

In total an estimated 15 km of road system is proposed. Depending on operational planning additional winter spur roads will need to be constructed.

The road system presented in the development plan is a draft network based on the available information. The subsequent field works at the operational planning level will likely result in changes in location.

When access crosses areas with high potential for archeological potential values, if ground disturbance is required for construction a field based archeological impact assessment for heritage resources is needed. Areas of high potential are depicted in Appendix 1.

### 7.1 Access Guidelines:

- Minimize stream and corridor crossings.

- Minimize soil disturbance (i.e. cuts)
- Minimize road building through green areas.
- Use seasonal access when ever possible.
- Utilize natural breaks to discourage continued access.
- Minimize building of landings and spur roads.

## 8.0 Heritage and Archeological Assessment:

A heritage potential mapping assessment was completed for the burn (Appendix 2). With extensive winter activity, and recent fire disturbance the probability of encountering and disturbing artifacts is quite low. The Archeological Assessment concentrated on identifying potential areas with buried archeological sites. A copy of the overview assessment is provided in Appendix 1.

**High Potential Areas:**

In the Barney Lake study area, heritage sites may be found on well-drained and elevated hills and terraces over looking wetlands, streams, lakes and ponds. Due to the limitations of the spatial analysis resources available for this study, the consultant cannot pinpoint any specific examples. It is suspected that sites will be located, but not limited to 100m of the waters edge and or edge of a terrace or hill that overlooks streams, wetlands, ponds and lakes.

Where the above is noted or areas identified in Appendix 2 and soil disturbance is prescribed in a high potential area, a field based archeological impact assessment for heritage resources is needed. Areas of high potential are depicted in Appendix 2.

## 9.0 Plan Lifespan:

In time, the burns will start to regenerate. If salvage logging within the burn has not occurred by the time regeneration heights exceeds winter snow pack, the plan will need to be re-visited, as regeneration and timber quality will affect logging practices and economics. It is at this point that new strategies may need to be adopted to protect natural regeneration and provide other harvesting opportunities

## 10.0 Wildlife Fire Specialist Species Management

Within the Yukon, species have adapted to fire, as it is a major forest renewal agent. Some species have become specialist, preferring post fire habitat to forage and reproduce. For example woodpeckers frequent burns to forage on wood boring insects. The 2004

fire season was exceptional and will provide increased habitat supply for fire-associated species.

Management for fire specialist species is focused on these issues (Exerts from Effect of Stand vs Landscape Level Forest Structure Abundance and Distribution, S. Hannon, SFMN, Jan 2005):

1. Fire specialist might be lost if salvage logging removes most dead trees, or fire is replaced by logging on the landscape.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek Fire potential salvage areas total 5018ha or 1.3% of the burned area in the KTT. Within the individual fires 44% of False Canyon fire and 2% of Barney Lake fire respectively are included in potential areas.
Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

2. Trees should be > 20 cm DBH to ensure high use by both insects and woodpeckers. Studies indicate the minimum area of patches where birds may nest is around 4ha (personal communication; Gill, M.).

Management: Retention within operating unit must be represented with > 20cm DBH trees @ 10 trees/ha. The retention would provide better habitat in aggregated clumps which are at least 4 ha is size. This would provide potential breeding habitat.
Conclusion: Stand level retention, corridor and leave areas will provide habitat supply for insects and woodpeckers.

3. Woodpeckers and secondary cavity nesters were more abundant in unsalvaged versus salvaged burns.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek Fires potential salvage areas total 5018ha or 1.3% of the burn area in the KTT. Within the individual fire 44% of False Canyon Creek fire and 2% of Barney Lake fire are included in potential operational planning areas respectively.
Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

4. To retain fire associated species, some recently burned forest should be protected from salvage and salvage should be delayed 3-4 years on others to allow wood pecker reproduction.

Management: Within the KTT approximately 390 000ha of forest burned by 44 fires. The Barney Lake and False Canyon Creek fires potential salvage areas total 5018ha or 1.3% of the burn area in the KTT. Within the individual fire 44% of False Canyon Creek fire and 2% of Barney Lake fire are included in potential operational planning areas respectively.
Conclusion: The magnitude of the 2004 fire season provides habitat for fire specialist species.

## 11.0 Environmental Assessment:

This Development Plan will be subject to an environmental assessment. The additional review and advice from the environmental assessment process will provide direction to government and proponents that are interesting in developing operational plans. Operational plans are identified as phase three of the process, and these plans are the most detail (see example Appendix 3). As well the operational plans are directed to meet development plan constraints and direction.

The advantage of putting the Development plan through the assessment process is that it will ensure that the proponents have a clear understanding on the most appropriate way to develop their individual project and avoid unnecessary negative implications.

As mentioned before, there will be some deviations when the Development Plan is brought down to the operational level, however, it is expected that the intent and overall management strategies of the development plan will be met. It is anticipated that deviations will be ' refinements' largely as a result of added detail at the stand and site level, and these will be reflected in the site and access plans By providing the boundaries for development it is expected that a proponent can conduct field assessments and ground work while bounded by this development plan.

The KFRSC and Yukon Government recognize the value of advancing the fire salvage project in a timely fashion and as result, a 30 day referral is recommended to meet two objectives 1) to provide adequate time to gain additional information from stakeholders and the public to adjust the Development Plan, and 2) to complete the Development Planning process to allow interested parties the time to apply for and develop their individual project during spring and summer, for fall and winter operations in 2005.

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# 1. Archeological Assessment

**Appendix 1: Archeological Assessment**

# Archaeological Overview Assessment for Proposed Timber Harvesting of Fire Killed Stands in the False Canyon Creek and Barney Lake Areas, Southeast Yukon

1 March 2005

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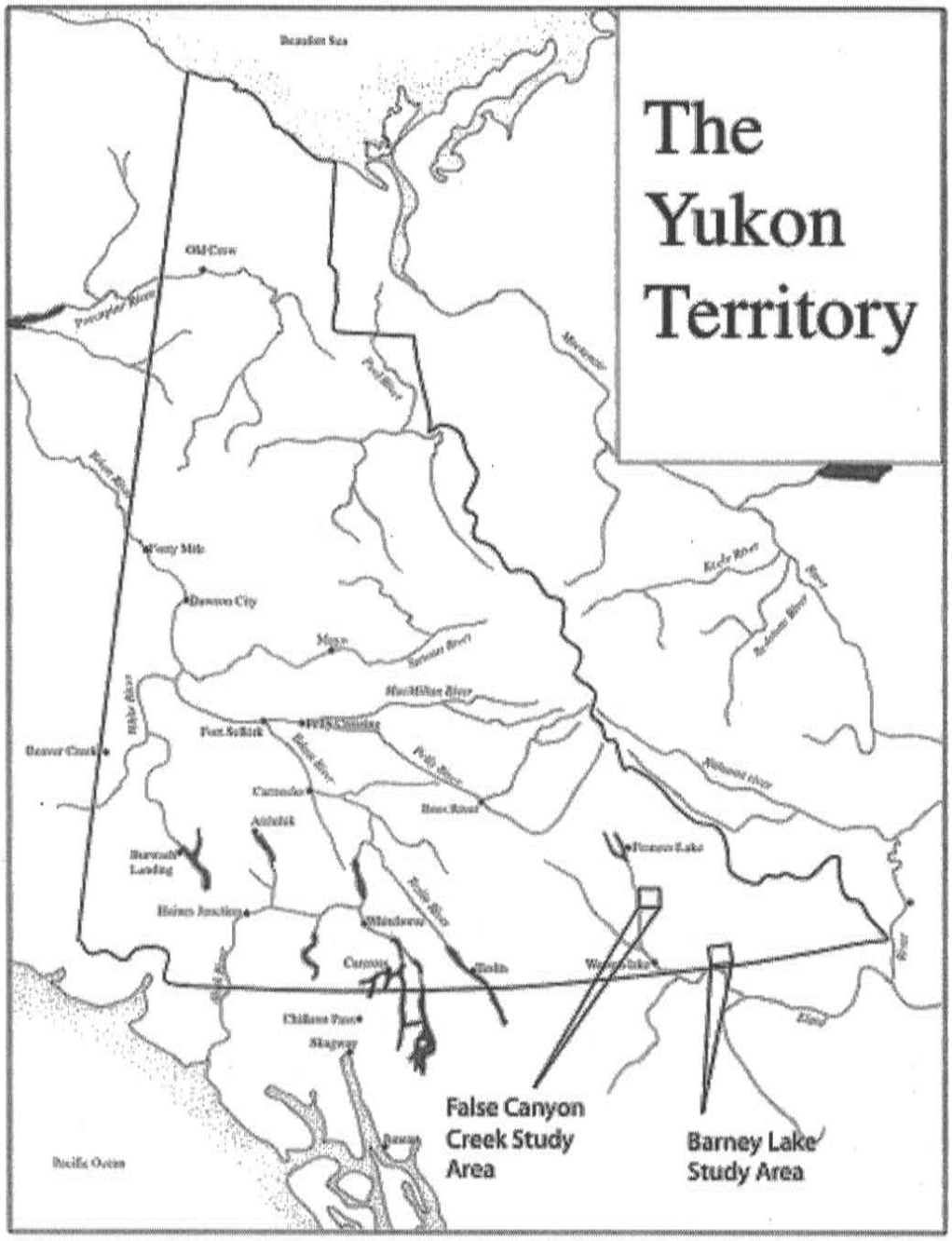


Figure 1: Map of the Yukon highlighting the study areas.

## Introduction

The following report is the result of a desktop heritage overview assessment for two proposed timber harvest areas are located in the southeast Yukon. The first study site is located in Forest Management Unit 3 on the east side of the Frances River to the south of False Canyon Creek (NTS map 105A). Forestry work in this area is designed to harvest

can be identified in the study area. Table 1 lists the type of geophysical/biophysical site type commonly associated with archaeological sites.

| Biophysical/Topographical Feature | Site Type |
|---|---|
| River or stream bank | Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. |
| Confluence of a stream and/or river | Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. Some such locations were targeted as the location of early fur trade era trade forts and as such became local trade centers. |
| Perimeter of a Lake | Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. |
| Lake outlet or inlet | Traditional or pre-contact era fishing or habitation site. May find historic or archaeological remains. Fish bearing lakes usually have a high concentration of archaeological sites. |
| Terraces overlooking significant water bodies. | High terraces often served as good lookouts. Lookouts were either used to spot game, orient ones self on the landscape or search for signs of human activity. Archaeological sites are usually found at this type of location. |
| Hills, knolls and other elevated topographical feature overlooking wildlife habitat associated with lakes, ponds and wetlands | These types of locations were used as hunting lookouts. One usually finds archaeological remains at this type of site. |
| Valleys and water drainages | Historic and prehistoric travel routes followed water drainage systems. Short term habitation sites are found along these routes. These may include brush structures and other types of temporary dwellings. |
| Alpine and sub alpine game trails | There is generally a low potential for the recovery of heritage sites in alpine and sub alpine regions. However, sites include snaring and herding features such as game fences, that are usually located along game trails. |

Table 1: Biophysical/topographical features that have high archaeological potential.

# Background

## *Climate and Environment*

The study area is in the Liard Basin ecoregion that spans the British Columbia-Yukon boundary to incorporate the Liard Plain, a broad, rolling, low-lying area mantled with glacial drift and outwash deposits in which the Liard, Coal and Frances Rivers are entrenched. The mean annual temperature for the area is approximately -3°C with a summer mean of 11°C and a winter mean of -18.5°C. Annual precipitation is 350-450 mm. The ecoregion is characterized by extensive stands of boreal forest composed of lodgepole pine, white and black spruce, and aspen. Dry sites support lodgepole pine; moist sites have black spruce and larch with Labrador tea, horsetail, and moss. Permafrost is scattered, confined mainly to lower north-facing slopes and sphagnum bogs. Characteristic wildlife includes moose, black bear, wood bison, wolf, beaver,

suggesting that there is some form of cultural relatedness spanning many millennia of the Holocene. Certainly, the later archaeological cultures such as Taye Lake and Aishihik are the ancestors of modern First Nations people in the area.

The indigenous inhabitants of the study area are the Kaska peoples that are now living in the modern communities of Watson Lake, Ross River, Faro, Lower Post and Dease Lake. Honigmann (1964) identified five (5) sub-groups of Kaska people living within this territory. These groups are as is described in the following:

1. The Upper Liard Kaska were called *Natitu?a'gotena* which can be translated as the "dwellers at a high sharp mountain where a little river starts" (ibid.:19). Their territories encompassed the upper Liard River drainage and Liard Plain, and are bounded by the Cassiar Mountains to the west and the Simpson Range to the east.
2. The Dease River Kaska was called the *Ki'stagotena*, which is translated as "Mountain Dwellers" (ibid.: 19). These people inhabited the Dease River drainage to the head of Dease Lake and the border of Tahltan territory including portions of the cordillera to the east and west.
3. The Nelson Kaska were called *Tse'lona* or "point at which is located the end of the world" (ibid.: 19) and were known to have occupied areas of the Kechika River and areas of the Liard river to the east of the *Ki'stagotena* people. This group is known to have trade at Fort Nelson, with the Nelson Slavey and Sekani, after it opened in 1800. They later resumed trading within Kaska territory with the opening of such posts as Chee House and Lower Post.
4. The *(E)spa'totena*, "Goat Indians" or "Dwellers among the wild goats" (ibid.: 20) lived in the mountain drainages to the north and northeast of the *Tse'lona*. Their territory encompasses the Beaver, South Nahanni as well as portions of the upper Nahanni rivers. Traditionally this group is known to have traded at Fort Halkett, Lower Post and Fort Liard. Gotthardt (1987: 10) has suggested that the *Espa'totena* could be the same as Campbell's *Abba-hou-eta*, or "Knife Indians." A similar name is rendered as *Abbato-tena* by Dall et al. (1877) for the Kaska who inhabited portions of the upper Pelly and Macmillan rivers. If so, the Espa'tptena territory could be expanded to include regions of the upper Pelly River; as such, they may be related to the "Pelly River Indians," described by Poole Field (MacNeish 1957), who were attacked in a "Mountain Indian" war raid in the 1880s.
5. The Frances Lake Kaska were called *Tu'tcogotena* translated to mean the "Big water dwellers" (Honigmann 1964: 20). These people traditionally occupied the area surrounding Frances Lake and the Upper Frances River. The outward expanse of their territory also included the upper reaches of the Hyland and Smith rivers. *Tu'tcogotena* were know to also have used the upper Pelly basin and probably traded at Pelly Banks and Ross River (Gotthardt 1987).

Summaries of Kaska land use patterns tend to suggest that local populations were composed of small highly mobile groups of people that traveled on seasonal cycles and tended to use larger fish lakes as central habitation/meeting places. Their principal economic activities tended to revolve around hunting, fishing and trapping activities that

Tahltan trail and on to the Kaska trail that led over the Frances River divide into the headwaters of the Pelly River. By this time regular contact between the Kaska and Euro-Canadian peoples was a fairly common event though it would not lead to a pervasive alteration of traditional life ways for another 45 years (Honigmann 1949).

Fur trapping was likely the predominant source of income for the Kaska of the southeast Yukon from 1900 to the early 1950s. The discovery of large deposits of gold in the western subarctic of North America as well as in South Africa effectively ended an economic depression in western Europe and the United States of America by the turn of the 20th century (McCandless 1985). This led to an increase in demand for consumer goods and resulted in massive increases in the value of wild furs. By the winter of 1919-1920 the price of furs was at its peak (ibid). The increased demand for trade furs resulted in significant alterations in indigenous land use patterns, people relied less on subsistence activities and focused more on fur harvest. The shift in economic focus extended trappers ranges greatly to areas that were more valuable for their fur resources than the traditionally valued subsistence resources, such as hunting and fishing sites. In effect, fur trapping shifted from a subsistence activity (cloths and food production) and means of acquiring exotic trade items (as in the northwest coast trade), to a primary means of making a living (Coates 1991). By the end of the Second World War the bottom had fallen out of the fur market. The major market furriers of Western Europe (particularly those in London) had sustained major wartime damage; the European post-war economy focused much of its financial resources on rebuilding and not on consumer goods (McCandless 1985). In the southern United States furriers were using more farmed furs for the production of consumer goods. As a consequence, the demand for Yukon wild furs was greatly reduced.

In 1939 the government of Canada committed to building a chain of airfields across the northwest under the Northwest Staging Route Program. The airfield at Watson Lake (named after California prospector Francis Watson) was a link in this chain and was constructed in 1941. The outbreak of the Second World War resulted in the construction of the Alaska Highway in 1942.

# Overview Assessment

## *Identification of Heritage Potential*

### False Canyon Creek

The analysis of orthographic photos and topographic maps has resulted in the identification of several large areas that have elevated potential for the presence of heritage sites. Orthographic photo coverage of the area was limited to 1:40,000 scale images that have limited the consultant's ability to confidently isolate specific high potential landforms. For this reason recommendations presented herein can only be used in a broad sense as a guideline for prescribing more detailed assessment procedures, limiting the nature of developments within the development area or as a means of excluding regions from the scope of future developments.

likelihood that the proposed development will impact heritage sites if the timber harvest is limited to burned areas.

Figures 2 and 3 highlight several broad areas that are considered to have elevated potential for heritage sites for a number of reasons. Firstly, Barney Lake and several other smaller unnamed lakes to the west and north are considered to be important natural resources that were likely used regularly throughout history for a variety of purposes ranging from semi-permanent habitation sites to seasonal fishing and hunting sites. Included in the study area are several seemingly extensive wetlands that include a multitude of small ponds and kettle-hole lakes. Sheila Greer (1984; 1985) conducted an archaeological survey in the Coal River Springs Park (directly to the north of the present study area) and has located several sites in similar geographical context. Oral history interviews conducted at the time indicated that the area is considered rich beaver habitat and was an important winter resource for local First Nations groups. In recent history these areas would have been used for economic fur harvesting. During the historic period pre-dating the western fur trade it is very likely that areas such as these would have been used for subsistence (food gathering) as well as for fur harvesting related to indigenous trade practices.

In this study area, heritage sites may be found on well-drained and elevated hills and terraces over looking wetlands, streams, lakes and ponds. Due to the limitation of the resources available for this study the consultant cannot pinpoint any specific examples at this time. Where the above noted features are present, it is expected that sites will be located within, but not limited to, 100m of the waters edge and/or the edge of a terrace or hill that overlooks streams, wetlands, ponds and lakes.

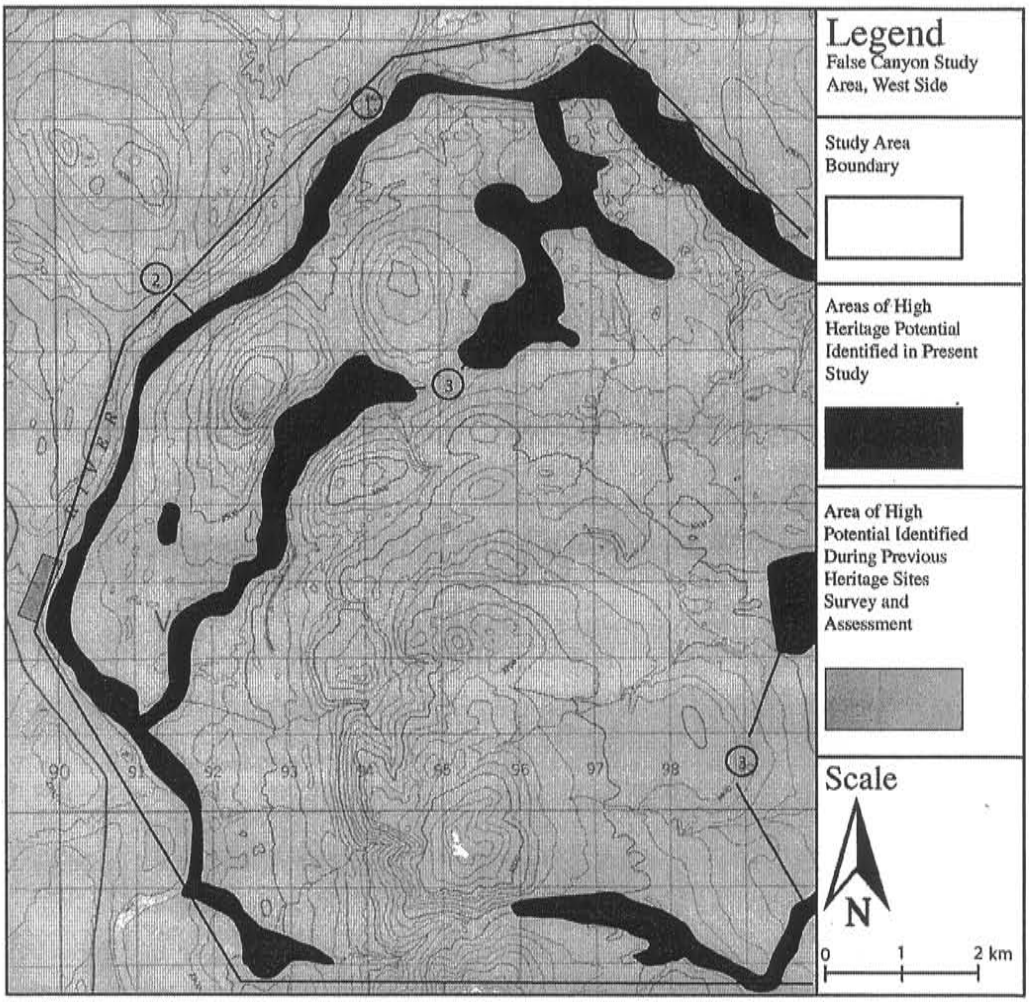


Figure 2: Map of the western portion of the False Canyon Creek study area depicting areas with elevated potential for heritage sites presence.

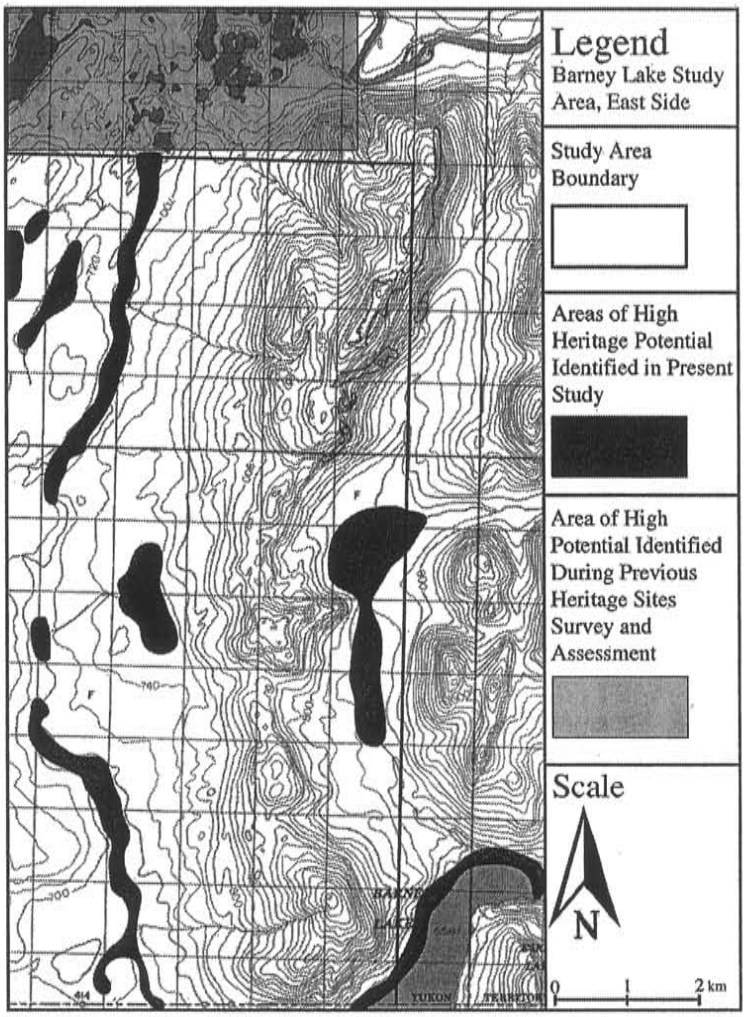


Figure 5: Map of the eastern portion of the Barney Lake study area depicting areas with elevated potential for heritage site presence.

## *Recommendations*

The consultant recommends that the developer avoid areas where archaeological potential has been assessed. Avoidance is recommended because the limited resolution and absence of quality orthographic photo coverage of the study areas restricts the consultant's ability to present an accurate assessment of archaeological potential. Therefore, any major developments that conflict with high potential localities discussed in this report should be subject to higher resolution assessment study such as aerial reconnaissance or focused in field site inventories.

However, it is the consultant's opinion that timber harvest in both the False Canyon Creek and Barney Lake study areas can proceed as long as certain recommendations are observed. Firstly, since forest fires have likely destroyed any surficial historic sites that would have been sensitive to timber harvest it is the consultant's opinion that actual harvesting of trees will not impact any remaining heritages sites. However, buried archaeological sites may still be impacted by roadway expansion, landing construction

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Heffner, T. A.

# 2. Example Site Plan

## Appendix 2: Example Site Plan

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# FOREST MANAGEMENT BRANCH

## SITE AND HARVEST PLAN

### 1. LOCATION

| District | GEOGRAPHIC LOCATION NAME | | MAPSHEET |
|---|---|---|---|
| Watson Lk | Cosh Creek | | 095-D-04 |
| **FMU** | **LATITUDE** | **LONGITUDE** | **SIS #** |
| Y02 | 60 deg. 01' 47" | 127 deg. 48' 42" | |
| **DEVELOPMENT AREA** | **BLOCK NUMBER** | | **AIR PHOTO NUMBERS** |
| East Hyland | C5 | | IAS(03) 54509 #275/282 |

### 2. ECOLOGY AND SITE CONDITION

| ECO-REGION | VEGETATION TYPE | SOIL TYPE |
|---|---|---|
| LIARD BASIN | V17, V21, V22, V9 | S3/S4 (minor S8/SS5) |

| ELEV | SLOPE % | ASPECT | TERRAIN | SLOPE POSITION | MOIST REGIME | SOIL DRAINAGE | LFH(OM) DEPTH | SOIL TEXTURE |
|---|---|---|---|---|---|---|---|---|
| 750-980m | 2-45% | W-SW | EVEN-HUMMOCK | MID-UPPER | 4-5//C | MODWELL TO IMPER | 7-30cm | L-SiL |

### 3. BLOCK AREA SUMMARY IN HECTARE

| TOTAL AREA | NP NAT | IMMATURE PATCHES | MERCHANT. AREA | RESERVES | PERM. ROADS, | NET AREA TO |
|---|---|---|---|---|---|---|
| 83 | 0 | 0 | 46.7 | 35.5 | 0.8 | 46.7 |

### 4. HARVEST STAND DESCRIPTION

| STAND NUMBER | MERCH. AREA | SPECIES | CROWN CLOSURE | AGE | HEIGHT | AVG. DBH | EST. VOL/HA |
|---|---|---|---|---|---|---|---|
| V17 | 19.10 | SW8F2 | 35.00% | 168 | 21 | 25.80 | 327.00 |
| V21 | 18.00 | P6SW4 | 35.00% | 120 | 21 | 25.80 | 373.00 |
| V22 | 8.60 | P8SW1F1 | 35.00% | 171 | 18 | 22.20 | 306.00 |
| V9 | 1.00 | F7SW2PL1 | 55.00% | 213 | 16 | 20.30 | 180.00 |

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# FOREST MANAGEMENT BRANCH

## SITE AND HARVEST PLAN

### 6. STAND MANAGEMENT OBJECTIVES

| HIGHER LEVEL AND OTHER PLANS |
|---|
| Identify any higher level plans, Resource Reports or other plans with which this prescription must be consistant. |
| This plan is consistent with the INTERIM WOOD SUPPLY PLAN for FOREST MANAGEMENT UNITS Y02, Y03 and Y09 in the KASKA YUKON TRADITIONAL TERRITORY (September 30th, 2003). |
| **STAND-LEVEL OBJECTIVES** |
| Discuss non-timber values that may be affected by the proposed treatment and measures proposed to accommodate these. |
| TRADITIONAL OR FIRST NATION |
| Crewmembers from the local First Nation community assisted in all operational field stages of this project. No observations were made by any of the field crews that would suggest cultural, archaeological, or historical sites were within the vicinity of this block. However, as no formal archaeological assesment has been carried out, harvesting supervisors must be aware of the potential for such sites and cease operations immediately should any be discovered during harvest. |
| Wildlife_Values: |
| The contiguous landscape level Forest Ecosystem Network (FEN) will provide interior forest habitat for late seral species (Marten, Boreal Owls, etc.), while internal reserves and/or dispersed on-block retention provdes stand structural diversity, visual screening, and "edge effect" throughout the harvest area for early seral species (Moose, Bear, etc.). In addition, both dispersed and aggregated retention will provide for biodiversity through "lifeboating", "enrichment" and "connectivity" at the stand level until this block returns to mature forest. Dispersed and aggregated retention also provides transitional elements between late and early seral stand structures that has been shown to increase utility of an area to both early and late seral species. |
| Fish_Water_Values: |
| In addition to any specific actions outlined in section 4.0 (RIPARIAN MANAGEMENT) of this SP, the following general conditions will be applied during harvest: 1) Culverts have been proposed for all non-classifiable drains (NCDs), draws, and streams for road crossings as shown on the SP Map. 2) Narrow draws or NCDs will not be used as skid routes, and skidding will be away from such features, as much as possible. 3) The preferred harvest season will be winter to minimize the overall impact of harvesting on the hydrology of the area. |
| Recr_Visual_Values: |
| Variable Retention harvesting using dispersed and aggregated retetion will minimize the visual impact of this block as shown in the post harvest Visual Impact Simulations of the Cosh Creek area. |
| Other_Values: |
| As the Trapper appears to have been using the Cosh Mainline as a trapping route, this and other harvest blocks should be reviewed with the Trapper so that he can adjust his "sets" accordingly before harvesting commences. |

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# FOREST MANAGEMENT BRANCH

## SITE AND HARVEST PLAN

### 8. SOIL CONSERVATION

ON BLOCK PERMANENT DISTURBANCE CALCULATION TABLE

| DISTURBANCE TYPE (ROAD/LANDING) | IDENTIFICATION (NAME/NUMBER) | ROAD STANDARD | LENGTH (M) | WIDTH (M) | TOTAL AREA L x W / 10,000 (HA) |
|---|---|---|---|---|---|
| ROAD | COSH MAINLINE | CLASS 3 | 300.00 | 10.00 | 0.30 |
| ROAD | C5-4 RD | CLASS 5 | 280.00 | 10.00 | 0.30 |
| ROAD | C5-5 RD | CLASS 5 | 160.00 | 10.00 | 0.20 |
| | | | 0.00 | 0.00 | 0.00 |

| ROAD AREA | LANDING AREA | TOTAL AREA | BLOCK GROSS AREA | BLOCK NET AREA | % DISTURB OF GROSS AREA |
|---|---|---|---|---|---|
| 0.80 | 0.00 | 0.00 | 83.00 | 46.70 | 1.00% |

| DEPTH OF OM | HAZARD RATINGS | | | PERMAFROST OR FROST HEAVING | PROPOSED HARVEST SEASON |
|---|---|---|---|---|---|
| 30cm | HIGH | HIGH | HIGH | LOW | WINTER |

PROPORTION OF TEMPORARY ACCESS WITHIN NET AERA TO BE REFORESTED: (explain rehabilitation measures)

Temporary access is 4.0% of the NAR. Rehabilitation will include, as required: 1) Removal of culverts, cleaning of ditches, and restoration of natural drainage. 2) Ripping of excessively compacted areas. 3) Re-spreading of over-burden & Replanting.

FIRE HAZARD ABATEMENT: (explain measures for slash abatement)

CWD: Leave 2-5 small piles (approx. 3mX3mX3m) randomly in the block for small furbearer habitat. In addition, leave slash scattered throughout the block as widely dispersed as possible to simulate wildfire debris while maintaining reasonable plantibility . Minimize slash piles at the landings by processing at the stump or re-distributing some slash from the landings back over the block. Burn any remaining landing accumulations, as required, to abate the potential fire hazard.

FOREST HEALTH: (explain measures to reduce current and future risk of forest to disease and insects)

No significant forest health issues were noted in this block. Diverse stand structure and ecologically suitable species mixes will, in general, reduce the potential for post-harvest stand health concerns. Windfirmness of the residual stand edges has been considered in the location of all block boundaries.

ADDITIONAL COMMENTS

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# FOREST MANAGEMENT BRANCH

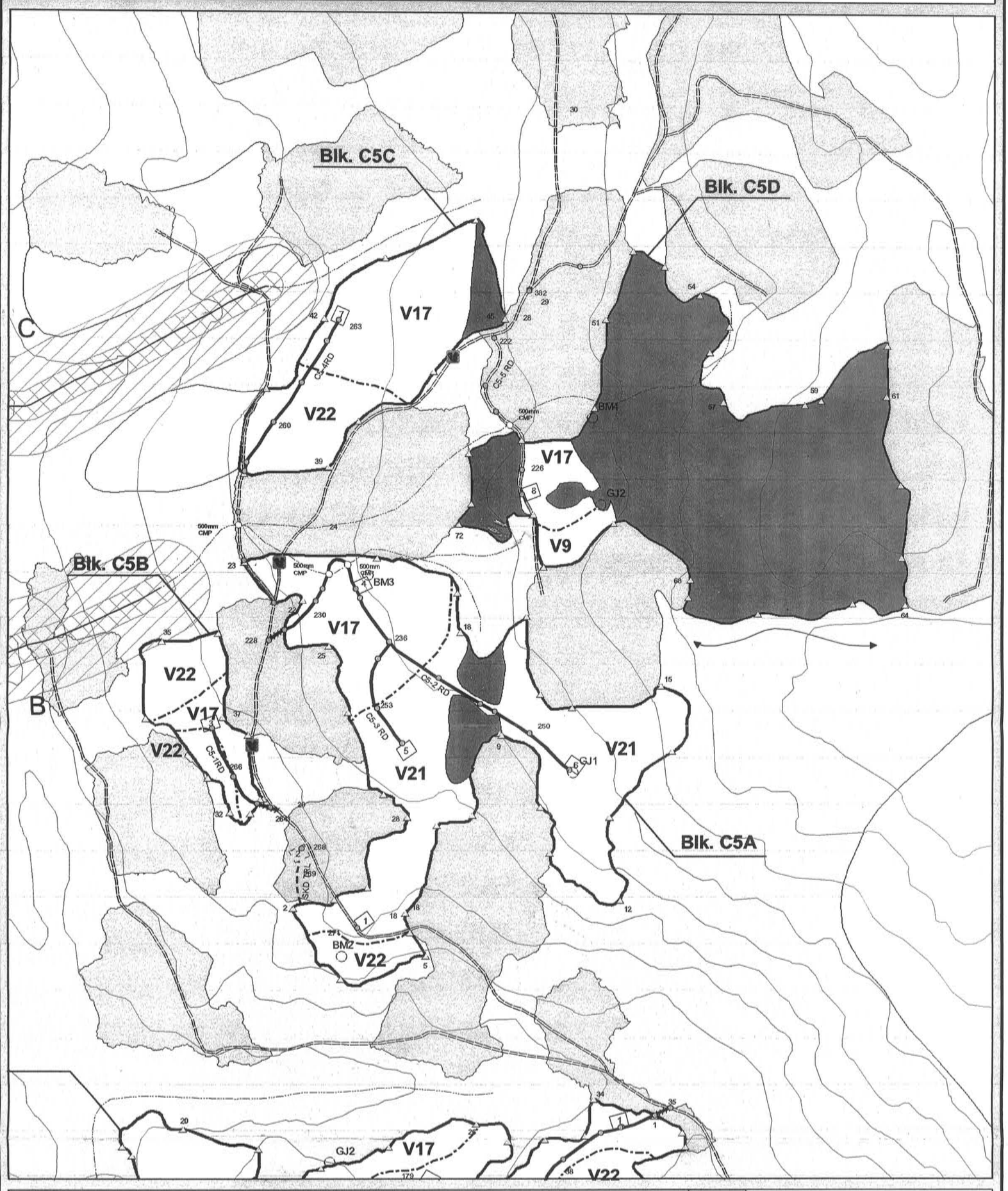
## SITE AND HARVEST PLAN

**10. ATTACHMENTS**

SITE PLAN MAP @ 1:_____

HARVEST PLAN MAP @ 1:_____

# SITE PLAN MAP
## Cosh Creek - Block C5




FOREST MANAGEMENT BRANCH

SPATIAL MAPPING LTD.

I.E.S.

**HARVEST STAND DESCRIPTION**

| STAND NUMBER /V-TYPE | MERCH AREA (ha) | SPECIES COMP | CROWN CLOSURE | AGE | HEIGHT | AVERAGE DBH (cm) | EST. VOL/HA (m3/ha) |
|---|---|---|---|---|---|---|---|
| V9 | 1.0 | F7SW2P1 | 55% | 213 | 16 | 20.3 | 180 |
| V17 | 19.1 | SW8F2 | 35% | 168 | 21 | 25.8 | 327 |
| V21 | 18.0 | P6SW4 | 35% | 120 | 21 | 25.8 | 373 |
| V22 | 8.6 | P8SW1F1 | 35% | 171 | 18 | 22.2 | 306 |

**FIELD MARKING STANDARDS**

| APPPLICATION | PATTERN & COLOUR |
|---|---|
| Harvest Boundary | Orange ribbon with "BLOCK BOUNDARY" |
| | Orange paint |
| | Blue poly ribbon (traverse stations) |
| Roads | Red poly ribbon (recce line) |
| | Pink ribbon with "ROAD" |
| | Yellow poly ribbon (traverse stations) |
| Landings | Pink ribbon with "LANDING" |
| | Yellow poly ribbon (traverse stations) |
| Culverts | Red ribbon with "CULVERT" |
| Skid Trails and Crossings | Blue candy-stripe ribbon with "SKID TRAIL" |
| Machine Free Zone | Orange and black candy-stripe ribbon |
| Riparian Management Zone | Orange with "RIPARIAN MANAGEMENT ZONE" |
| Reserve Zones | Orange ribbon with "RESERVE" |
| Cruising | Blue and yellow poly ribbon for plots and new strips |
| | Blue Paint |
| Reconnaissance Lines | Green poly |

| LOCATION | | ECOLOGY AND SITE CONDITION | | BLOCK AREA SUMMARY | |
|---|---|---|---|---|---|
| DISTRICT | Watson Lake | VEGETATION TYPE | V9, V17, V21, V22 | TOTAL AREA (ha) | 83.0 |
| GEOGRAPHIC LOCATION NAME | Cosh Creek | SOIL TEXTURE | L-SiL | NP NAT (ha) | 0.0 |
| MAPSHEET | 095-D-04 | SOIL TYPE | S3/S4 (minor S8/SS5) | IMMATURE PATCHES (ha) | 0.0 |
| FMU | Y02 | ELEVATION | 750-980m | MERCH AREA (ha) | 46.7 |
| Latitude | 60°01' 47" | SLOPE % | 2-45% | RESERVES (ha) | 35.5 |
| Longitude | 127°48' 42" | ASPECT | W-SW | PERM ROADS (ha) | 0.8 |
| DEVELOPMENT AREA | East Hyland | TERRAIN | Even-Hummocky | NET AREA TO REFOREST (ha) | 46.7 |
| BLOCK NUMBER | C5 | SLOPE POSITION | Mid-Upper | | |
| AIR PHOTO NUMBERS: IAS(03) | 54509 #275/282 | MOIST REGIME | 4-5//C | | |
| ECO-REGION | Liard Basin | SOIL DRAINAGE | Moderately Well-Imperfect | | |
| | | LFH(OM) | 7-30cm | | |

**Legend**

POC/POT Markers
Marten Box Locations
Cruise Plots
BP Plots
Boundary
Culvert
Road
Skid Direction Arrows
Timber Type Lines
Cutblock
External Reserve
Internal Reserve
Existing Openings
FEN
RIMZD
SMZ
Game Trail
Permanent In-Block Built Road
Permanent Out-of-Block Built Road
Skid Trail
Temporary In-Block Proposed Road
Temporary Out-of-Block Built Road
Temporary Out-of-Block Proposed Road
Contours
Alaska Highway
NCD Streams
S3/S4 Streams
Existing Landing
Proposed Landing
LAKE
RIVER
Wetlands
RMZ
RRZ

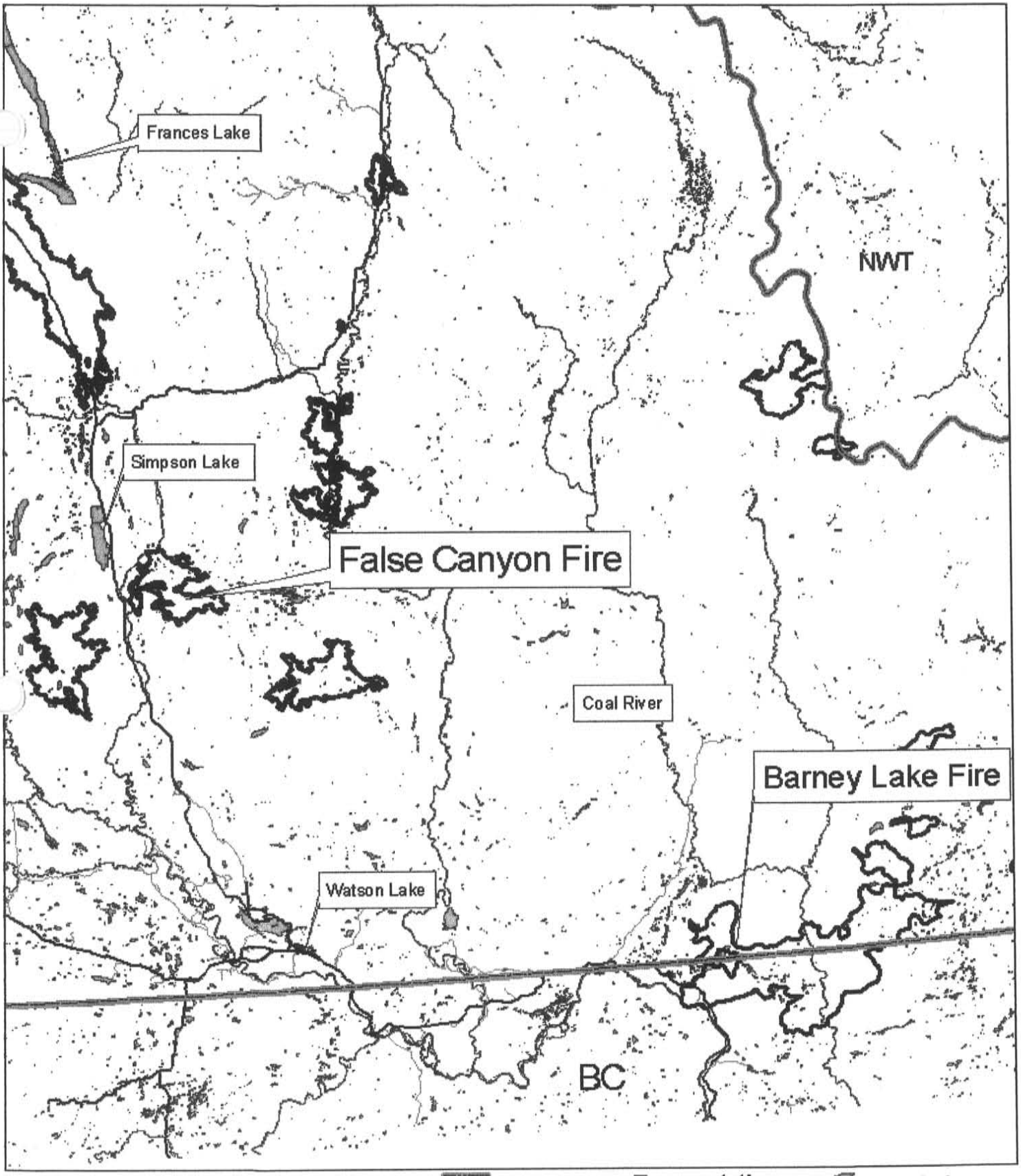
N

0 50 100 200 300 400 Meters

1:7,500

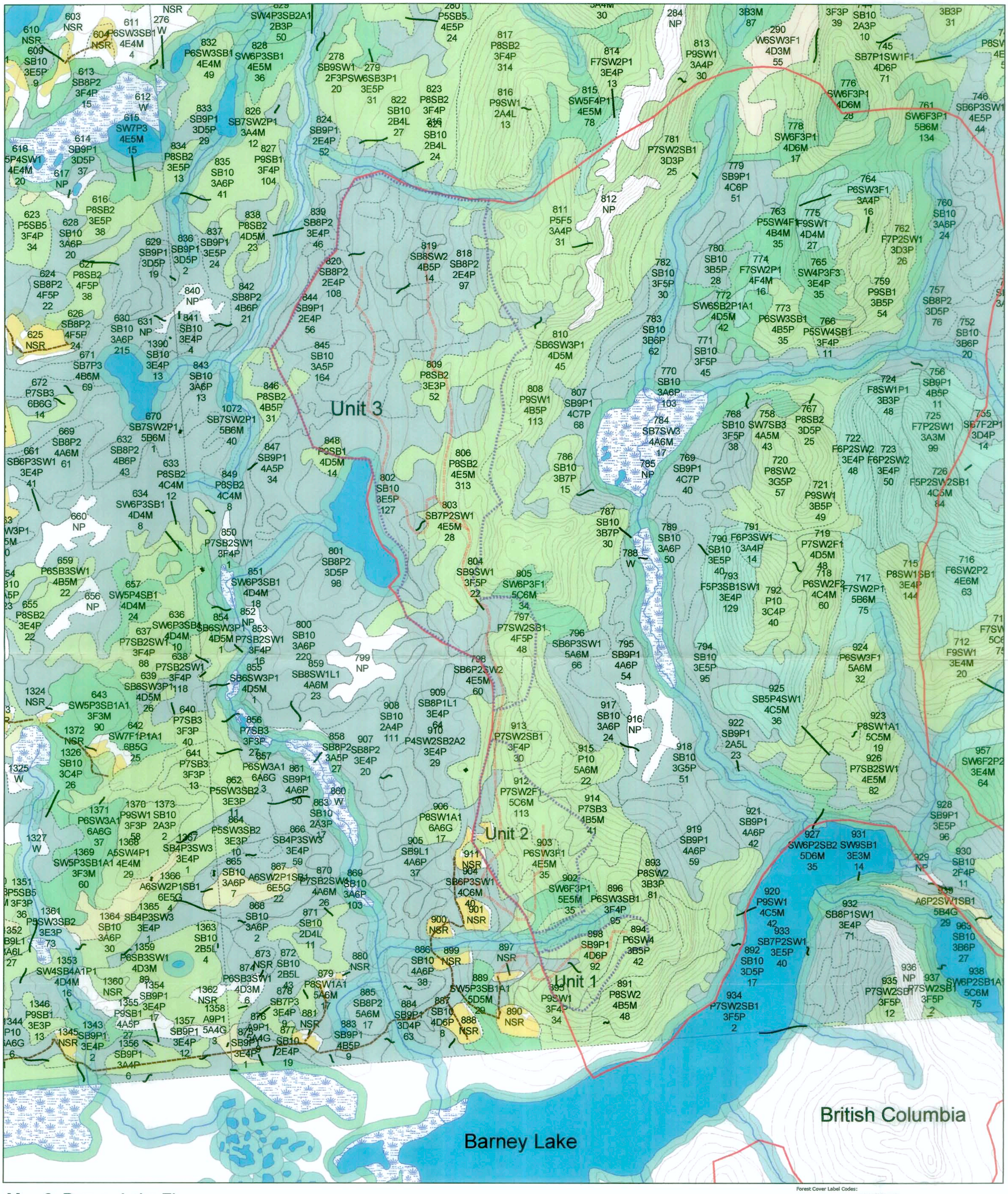
# 3. Development Plan

## Appendix 4: Development Plan




Map 1. Overview Map

# 4. Maps




Map 2. Barney Lake Fire

1: 25 000

- Contour
- Stream
- Wetland
- Waterbody
- Existing Access
- Barney Lake Units
- 2004 Fire Boundaries
- Riparian Management Zone
- White Spruce
- Lodgepole Pine
- Alpine Fir
- Black Spruce
- Balsam Poplar
- Tembling Aspen
- White Birch
- Larch
- Regenerating Cutblocks

Forest Cover Label Codes:

Stand No.
Species and % (up to 4 codes)
Height code, Crown Closure code, Age code, Site Class code
Area (Ha)

| Species Codes: | Height Class: | Crown Closure: | Age Class: |
|---|---|---|---|
| SW: White Spruce | 1: 0-4 m | A: 1-15% | 1: 1-20 yrs |
| SB: Black Spruce | 2: 5-9 m | B: 16-25% | 2: 21-40 yrs |
| P: Lodgepole Pine | 3: 10-13 m | C: 26-30% | 3: 41-60 yrs |
| L: Larch | 4: 14-16 m | D: 31-35% | 4: 61-80 yrs |
| A: Aspen | 5: 17-19 m | E: 36-45% | 5: 81-100 yrs |
| B: Balsam Poplar | 6: 20-24 m | F: 46-55% | 6: 101-120 yrs |
| W: White Birch | 7: 25-30 m | G: 56-75% | 7: 121-150 yrs |
| F: Alpine Fir | 8: 31-35 m | H: 76-100% | 8:151-180 yrs |
| | | | 9: 181+ yrs |

Site Class: L:<10m P:10-14m M:15-19m G:20+m