ECOFOR
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Archaeological Overview Assessment
Fort St. James Community
Forest Expansion
Witch & Chuchi Lakes Area

Prepared for:

KDL Group
Bag 19
Fort St. James, BC V0J 1P0
Tel: 250-996-8032
Fax: 250-996-8742

Prepared by:

Ecofor Consulting BC Ltd.
PO Box 1270
Fort St. James, BC V0J 1P0
Tel: 250-996-2151
Fax: 250-996-2186

Barbara Horrell

Barbara Horrell, Report Author
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Report distributed to:

KDL Group
Bag 19
Fort St. James, BC V0J 1P0

Archaeology Branch
Ministry of Tourism, Culture and the Arts
PO Box 9816, Stn Prov Govnt
Victoria, BC V8W 9W3

Halfway River First Nation
PO Box 59
Wonowon, BC V0C 2N0

McLeod Lake Indian Band, Land Referral Office
PO Box 87
Chetwynd, BC V0C 1J0

Nak'azdli Band
PO Box 1329
Fort St. James, BC V0J 1P0

Tl'azt'en Nation
PO Box 1317
Fort St. James, BC V0J 1P0

West Moberly First Nation
PO Box 90
Moberly Lake, BC V0C 1X0

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_____
Signature of Copyright Owner

Ecofor Consulting Ltd (Owner)
Affiliation

CREDITS

Report Author
Barbara Horrell, BSc

Researchers
Barbara Horrell, BSc
James Mooney, MA

Preliminary Field Reconnaissance
Jean-Jacques Baillaut, BA
Mike Bayes, Nak'azdli Band
Samara King, BA
James Mooney, MA

Mapping & Modeling
Brian MacDonald, BSc, Dipl. Tech.
Laura McKersie, Dipl. Tech.

Editors
Samara King, BA
Brian MacDonald, BSc, Dipl. Tech.
Laura McKersie, Dipl. Tech.
James Mooney, MA

MANAGEMENT SUMMARY

At the request of KDL Group, an Archaeological Overview Assessment (AOA) was conducted for the proposed Fort St. James Community Forest expansion to the Witch and Chuchi Lakes area (the Project).

The objectives of the AOA are to identify and assess archaeological resource potential or sensitivity within the Project and prepare a written report detailing the results. In order to accomplish these objectives, the biophysical, historic, ethnographic and archaeological documents relative to the Project were consulted. Discussions with First Nations were undertaken as well as a Preliminary Field Reconnaissance (PFR). Gathered background information and available mapping data sets were used to create potential zones for the occurrence of archaeological sites within the Project. The potential for the occurrence of the following site types was analyzed: permanent habitation sites; temporary habitation or subsistence sites; human remains; fishing sites; quarry sites; rock art sites; trails; CMT sites; and historic sites. The majority of the potential within the Project is predicted through the evaluation of landforms in relation to water courses. There is a lack of detailed data within the Project area, which necessitated the creation of a moderately efficient model (Kv=0.82) with 83% effectiveness.

The success of this AOA is only as precise as the information collected. In this case, there are no recorded archaeological sites within the Project boundaries and very few in the surrounding area. To date, no archaeological studies have occurred within the Project boundaries and very little of the terrain has been disturbed. It is hypothesized that the lack of archaeological sites is due to the lack of investigation rather than an actual lack of sites.

Based on the results of the AOA, Archaeological Impact Assessments (AIA) are recommended for high archaeological potential zones and pre-1846 CMT potential zones within the Project area. Preliminary Field Reconnaissance (PFR) is recommended for areas with post-1846 heritage potential where foresters may have obligations under the *Forest and Range Practices Act*. No further work is recommended for remaining areas outside of potential zones.

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1. INTRODUCTION

At the request of KDL Group, an Archaeological Overview Assessment (AOA) was conducted for the proposed Fort St. James Community Forest expansion to the Witch and Chuchi Lakes area (the Project).

1.1 Project Overview

The District of Fort St. James currently holds a Community Forest Tenure which is managed by KDL Group. The Mission Statement regarding the Community Forest is as follows: To facilitate the active participation of the community in the stewardship of the land base and to demonstrate its capability to practice exemplary stewardship of an extremely complex, diverse and rich area while practicing sound and viable use of resources (BCCFA 2009). The current community forest is located off the Cunningham FSR to the south of Fort St. James. In 2009, Minister of Forests and Range Pat Bell gave approval to the Fort St. James Community Forest to increase the annual allowable cut and associated chart area (KDL Group 2009). The Project area encompassed by this AOA represents a possible new chart and expansion area for the Community Forest. It is anticipated that future activities would include blocks for timber harvest as well as road and skid trail development to access and harvest timber.

The Project is located approximately 58 km south of the community of Manson Creek and 80 km north of the town of Fort St. James (as the crow flies, see Figure 1, Appendix A). From Fort St. James, the western end of the Project is accessed from the Inzana FSR via the Leo Creek FSR. The eastern end of the Project is accessed off of the Germansen North Road.

The proposed Project encompasses approximately 14,000 ha of Crown land that has currently seen little development from industry such as forestry or mining. The area is currently used mostly for recreational purposes. The east end of Chuchi Lake is the terminus of the popular Nation Lakes canoe route, with several cabins and boat launches. Witch Lake is one of the few large, remote lakes in the southern half of the district that has exceptional water quality and supports an excellent lake trout fishery (Province of BC 1999).

1.2 Scope & Objectives

The scope of the Project involves an AOA on lands affected by the proposed development. The objectives of the AOA are to:

1. Identify and assess archaeological resource potential or sensitivity within the Project area through a review of the listing of known archaeological sites included in RAAD (Remote Access to Archaeological Data) in addition to a review of the biophysical and topographic mapping; and,

2. Prepare a written report of the overview that fulfills the requirements outlined by the *Archaeological Impact Assessment Guidelines* (1998) and the *Archaeological Overview Assessments as General Land Use Planning Tools – Provincial Standards and Guidelines* (2009).

This report documents the methods and results of the AOA. The study is based on existing information and the professional experience of Ecofor's archaeologists, and is directed solely at determining the potential for archaeological sites, pre-1846 CMTs and historic sites within the defined boundaries of the Project. Based on the determination of archaeological potential, cultural resource management

recommendations are presented. These recommendations may include one of two levels of management action: no further work; or field work in the form of an Archaeological Impact Assessment (AIA) or Preliminary Field Reconnaissance (PFR). While all observations, conclusions and recommendations made in this report are the result of research undertaken by the author, this work may be subject to the review or modification by the Archaeology Branch, Ministry of Tourism, Culture and the Arts.

A Preliminary Field Reconnaissance (PFR) was conducted by James Mooney, Mike Bayes, Samara King and Jean-Jacques Baillaut on November 2, 3, 7, 8, 10, 12 and 13, 2009. The PFR was undertaken to identify points of high and low archaeological potential that would aid in testing the existing archaeological predictive model and developing a revised model for the area. The research that forms the back bone of this study was conducted by Barbara Horrell and James Mooney from November 2009 to February 2010. Research included consulting documents pertaining to the history, archaeology, ethnography, geology and geography of the Project area and well as communicating with people who know the area.

In the Province of British Columbia, all archaeological resources are protected under the *Heritage Conservation Act*, whether located on public or private land. Protected sites may not be altered without a permit issued by the Minister or designate.

1.3 Report Format

The report begins with a basic outline of the Project and the objectives of the work undertaken. Section 2.0 provides background information concerning the biophysical environment. The potential activities that will take place within the Study Area are discussed in Section 3.0 with an emphasis on their potential impact on archaeological resources. Section 4.0 discusses the methodologies employed during the analysis of the Project's archaeological potential. The results of the documentary research, consultation and field reconnaissance are presented in Section 5.0. Section 6.0 discusses the results of model building, including calculations of effectiveness and efficiency. Section 7.0 provides an evaluation of the AOA with recommendations for continuous improvement. Section 8.0 outlines the recommendations for further archaeological work to be conducted within the Project. The final section, Section 9.0, includes a listing of all references cited. Appendix A contains all maps (figures) for the report. Appendix B contains photographs taken during the PFR.

2. STUDY AREA

2.1 Location

The Project is located on the Nechako Plateau of the Interior Plateau, approximately 58 km south of the community of Manson Creek, 80 km north of the town of Fort St. James and 86 km west of the town of Mackenzie (as the crow flies, see Figure 1 in Appendix A). The Project is located within NTS mapsheets 93 N/1 and 93 N/2, and within BCGS mapsheets 093N.007, 008, 018 and 019. The northern boundary of the Project follows the southern shore of the eastern half of Chuchi Lake. The eastern boundary extends south from the east end of Chuchi Lake to the west of Chooyazi Lake and north of Mudzenchoot Lake. The southern boundary extends west from Mudzenchoot Lake to Abas Lake. The western boundary extends north from Abas Lake, along the southern shore of Witch Lake and continues north from halfway along the northern shore of Witch Lake to Chuchi Lake.

The Project is located within the traditional territory of McLeod Lake Indian Band, Nak'azdli Band and Tl'azt'en Nation, and within the Treaty 8 disputed area of the Halfway River and West Moberly First Nations.

2.2 Environmental Setting

The Biogeoclimatic Ecosystem Classification System in British Columbia classifies areas on an ecosystem-specific basis. The classification system combines the biological, geologic and climatic factors of an area and defines fourteen biogeoclimatic zones in the province of British Columbia. The majority of the Project falls within the Sub-Boreal Spruce (SBS) biogeoclimatic zone, as described by Meidinger *et. al.* (1991). The upland areas within southern and southeastern portions of the Project fall into the Englemann Spruce Sub-alpine Fir (ESSF) zone, as described by Coupe *et. al*. (1991).

The Sub-Boreal Spruce (SBS) biogeoclimatic zone dominates the rolling terrain of the central interior of British Columbia. This zone is characterized by seasonal extremes of temperature; cold, snowy winters and relatively warm, short summers. The forests that dominate this zone are typically upland coniferous and consists primarily of hybrid white spruce and subalpine fir. Lodgepole pine, trembling aspen, Douglas-fir, black spruce and paper birch are other species found in various regions within this zone. The understory is comprised of a wide variety of vegetation including black huckleberry, thimbleberry, high bush-cranberry, bunchberry, kinnikinnick, oak fern and devil's club. Wetlands are commonly found within the region within poorly drained, post glacial depressions and river ox-bows. As the climate of this zone includes long, snowy winters, wildlife that inhabits this zone are adapted to either survive or avoid the severe weather. Moose are the most common large ungulate. Smaller mammals include those who burrow under the snow or travel on top of the snow. Most birds migrate south in the winter but a few remain year-round. The established coniferous forests provide shelter from the weather and cover from predators. Mule Deer, Black Bear, Grizzly Bear, Caribou, Gray wolf, Fisher, Marten, Ermine, Red Squirrel, Canada Goose, Northern Flying Squirrel and Deer Mouse are some of the animals that flourish within the ecosystem. Terrain within this zone is primarily used for forest harvesting as it is ill-suited for agriculture because of the adverse climate, topography, bedrock and/or poor drainage. With the abundance of animals in this zone, it is not surprising that fur harvest from this zone is among the highest in the province.

The Engelmann Spruce-Subalpine Fir (ESSF) biogeoclimatic zone is found predominantly in mountainous terrain that is often steep and rugged. The ESSF zone is characterized by a relatively cold, moist and snowy continental climate. Engelmann spruce and subalpine fir are the dominant tree species

in the zone; spruce usually dominates the canopy of mature stands; subalpine fir is the most abundant in the understory. At higher elevations and within poorly drained areas, subalpine fir frequently dominates the forest canopy. The understory is dominated by black huckleberry, black gooseberry, devil's club, oak fern, grouseberry, knight's plume, Saskatoon and fireweed, among others. Wildlife in the ESSF zone face wet, cool summers and long, cold snowy winters and steep topography. Ungulates in this zone include Moose, Mountain Goat, Caribou, Mule Deer, Rocky Mountain Elk, Bighorn Sheep, White-tailed Deer and Stone Sheep. Conifer forests make up the most common habitat in the ESSF and are important for furbearers such as Marten, Fisher, Red Squirrel and Wolverine. Avalanche tracks are a common feature and provide ungulates and carnivores such as the Grizzly and Black Bear with an abundance of lush forage. Terrain within this zone is primarily used for forest harvesting; it is ill-suited for agriculture because of the adverse climate and topography. Like the SBS zone, it is not surprising that fur harvest from this zone is among the highest in the province.

2.3 Topography, Drainage and Geology

As described by Holland (1976), the Nechako Plateau is an area of low relief characterized by expanses of flat to gently rolling terrain. It is bounded by the Hazelton Mountains to the west and the Skeena and Omineca Mountains to the north. Glacial till covers flat to gently dipping lava flows, which cover older volcanic and sedimentary rock. The BC Geological Survey geological map of BC (2005) indicates that the majority of the area is underline by the Takla Group and Tezzeron Sequence, dating to the Triassic and Jurassic. The northeastern portion of the Project is underline by the Lower Jurassic Chuchi Lake Succession and there are small areas of Early Jurassic intrusives.

During the Pleistocene, ice flowed down from the Coast and Cariboo Mountains, meeting near Fraser River, then flowed northeasterly (Tipper 1971). As the ice melted, the pre-glacial drainage channels were blocked with drift and wasting ice, creating ice-dammed lakes at Prince George, Fort St. James and Vanderhoof. Once the ice dams melted, the lakes drained rapidly and major drainage systems were re-established through the deep lacustrine deposits (Tipper 1971). The movement of ice across the plateau surface caused grooves and drumlins oriented parallel to ice flow. Depressions left after the ice retreated created the myriad of lakes found on the plateau. Numerous eskers and meltwater channels were also formed during the ice retreat (Holland 1976).

Chuchi Lake, along the northern boundary of the Project, is the eastern most lake of the Nation Lakes chain. Nation River drains through the lakes, eventually draining into Williston Lake to the east. Witch Lake is located to the south of Chuchi Lake. Witch Creek originates at Abas Lake at the southwestern part of the Project, draining north into the west end of Witch Lake, exiting at the east end of Witch Lake and draining into the east end of Chuchi Lake. A tributary to Witch Creek drains out of Arehead Lake. Several smaller tributary streams and drain through the Project into Chuchi Lake, Witch Lake and Wittsichica Creek (east of the Project).

3. POTENTIAL ACTIVITIES WITHIN THE STUDY AREA

Potential timber harvesting activities within the Project will require removal of trees. Ground disturbance may include disturbance from heavy machinery (bunchers, skidders, processors, etc.); blading and grading for road construction; leveling of areas for temporary use areas and loading areas; and excavating for gravel quarries.

Potential disturbances will be irreversible and it is anticipated that any archaeological sites within the construction zone would be deleteriously impacted if not archaeologically excavated prior to commencement of harvesting activities. If archaeological sites are encountered in these areas, increased ability to access the sites could result in future vandalism or looting. As such, the exact locations of archaeological sites should not be public knowledge.

These ground disturbing activities have the potential to impact archaeological resources. Archaeological records kept at the Archaeology Branch of the Ministry of Tourism, Culture and the Arts will be consulted to determine if any recorded archaeological sites are within the Project boundaries (see Section 5.0). If recorded sites have the potential to be impacted by construction, cultural resource management recommendations will be made (see Section 8.0). Unrecorded archaeological sites could be damaged by construction, and the prediction of their location is the purpose of this AOA. Fieldwork prior to construction will determine whether unrecorded archaeological sites are present within the Project.

4. METHODOLOGY

In order to predict the occurrence of archaeological material within a proposed area, two main objectives are undertaken:

1. The first objective is to characterize the Project area within the context of relevant past research by determining what is known about patterns of native settlement from ethnographic research, what is known about prehistoric settlement patterns from archaeological research, and what characteristics may be considered good indicators of past settlement.

2. The second objective is to evaluate the Project area in terms of a defined set of descriptive variables. These variables commonly include analysis of the biogeoclimatic zones, topography, and proximity to water, aspect, drainage, known archaeological sites and historic settlements. There are several geographic entities that can be linked to specific settlement patterns and resource use, including: stream valleys, stream terraces, lake margins, glacial remnant features, hills or elevated features, remnant dunes and disintegration moraine features.

Methods typically start with background research to extract pertinent data. Information is correlated with digital geographic information to develop two layers: high archaeological potential and low archaeological potential. Areas with high archaeological potential would require an Archaeological Impact Assessment (AIA). Areas with low archaeological potential would require no further work unless suspected archaeological features or artifacts are noted in the field.

4.1 Documentary Research and Consultation

Background research into past lifeways and settlement patterns included reviews of ethnographies, archival journals by early explorers, native oral histories, other anthropological information, direct consultation with elders and other band members from First Nations communities. Records of archaeological sites were also consulted including RAAD (Remote Access to Archaeological Data), provincial site forms, past field reports and articles on proposed archaeological timelines. Topographical, geographical and geological sources consulted include maps and articles regarding bedrock geology, surficial geology, landform classification, glacial history and land use management plans.

4.2 Preliminary Field Reconnaissance

Preliminary field reconnaissance (PFR) was undertaken by crews of two people. Crews recorded information at arbitrarily chosen observation points, which assessed the archaeological potential at the point and the reasons for the assessment. Photographs and GPS points were taken at each location. High potential was described as a place requiring subsurface shovel testing or a place where an archaeological site was found (ie, sites visible on the surface such as cache pits or surface lithic scatters), while low potential was described as a place where no shovel tests required and no visible sites were present. The reasoning for assigning archaeological potential at each observation point included an assessment and description of the following factors:

1. Landform: a description of the terrain at the observation point, ie: terrace, ridge, bench, undulating, continuous slope, flat, etc.
2. Drainage: a description of the saturation in qualitative terms of poor, moderate or well.
3. Aspect: which direction the area faces (north, south, east, west).
4. Slope: the degree of slope in qualitative terms of none, gentle, moderate, steep.
5. Viewpoint: a description of what is visible from the observation point, such as a vista across a lake or over down a valley.
6. Distance to water: how far the observation point is from a lake, river or stream.

7. Forest cover: dominant species, such as pine, spruce, balsam, etc. were recorded to determine potential for CMTs.
8. Rock outcrop: note if any are present and composition as an indication of potential for rock art or quarry sites.

Data collected from the observation points were compared to the Fort St. James Archaeological Predictive Model and to expected outcomes. The data was also used to develop hypotheses on the site types expected within the Project area and to test the results of the project-specific model.

4.3 Model Creation

Archaeological site types that might occur within the model boundaries were reviewed and postulated as to possible locations. The *AOA Guidelines* (2009) requires consideration of the following site types:

1. Permanent habitation sites
2. Temporary habitation or subsistence sites
3. Human remains
4. Fishing sites
5. Quarry sites
6. Rock art sites
7. Trails
8. CMTs (pre-1846 only)

To aid the foresters in planning and help them meet their obligations under FRPA, we will also consider post-1846 sites under a separate mapping layer.

Digital mapping data available for creating the model is essential. The following spatial data were available for creating a model for the Project:

1. TRIM II (Terrain Resource Information Management II)
2. Fish Wizard (stream and lake information)
3. FISS (Fisheries Information Summary System)
4. DEM (Digital Elevation Model created with digital points at 10 m spacing)
5. VRI (Vegetation Resources Inventory)
6. Surficial Geology
7. Ungulate Winter Ranges
8. Biogeoclimatic Zones

LIDAR was not available for use in this Project. Not all of these data sets were useful for model creation; their use is discussed in Section 6.2 below. Mapping layers created from the spatial data were utilized with a 30x30 m raster cell grid.

Integrating the predicted locations of archaeological sites with the digital data requires establishing a set of buffers and values. A weighted value system was not used for this model; instead an on/off or 1/0 was given to each value, similar to the system proposed by Budhwa *et. al* (2007) for the Morice Timber Supply Area. Under this system, any cell within the grid with a value or 1 or higher was assigned high archaeological potential and any cell with a value of 0 was assigned low archaeological potential. Resulting buffers and values are further discussed in Section 6.2.

5. RESEARCH AND CONSULTATION RESULTS

This section presents the results of documentary research, consultation with First Nations and Preliminary Field Reconnaissance (PFR). These results aided in determining zones of archaeological potential within the Project area.

5.1 Ethnography of First Nations Groups

The Project area is represented by three broad groups of First Nations: Carrier, Sekani and Beaver. A summary of their traditional life ways is presented below.

The Carrier (Dakelh-ne) are a major Athapaskan language group occupying most of central British Columbia. Early Carrier often referred to themselves as *daklth*, "people who travel by boat", while many today identify themselves using the word *dene*, "the people" associating themselves with the Dene Nation (Furniss 1993, Hall 1992). The Carrier people were semi-sedentary and fairly mobile in their subsistence. The ethnographic life ways of the Carrier involved extensive seasonal mobility, involving distances of several hundred kilometers (Fladmark 1976). Traditionally, the Carrier people followed a seasonal round of subsistence (Bond and Russell 1992; Carlson and Mitchell 1997; Steward 1977). Settlement patterns reflected the seasonal movements of the people, but their main village sites were always at major salmon bearing locations (Carlson and Mitchell 1997). The Carrier people constructed both surface and semi-subterranean habitations, commonly referred to as "pithouses" or "housepits". Several general habitation types can be identified, such as general living structures (which can be separated to winter and summer habitations); larger buildings used for gatherings such as ceremonial feasts; temporary structures utilised during hunting, fishing or trapping activities; and temporary shelters utilised during socio-cultural transitional events, such as menstrual or puberty huts (Morice 1893).

Social organization of the Carrier people is considered to be of a phratric nature that may have originally been transmitted from the coast via neighbouring Gitxsan peoples (Bishop 1983; Carlson and Mitchell 1997). Phratries are subdivided into clans, such as Caribou, Beaver, Frog, Wolf and Bear. The land was divided into keyohs through the clan system, in which families had access to a variety of resources and were set up as stewards of their land (Carrier Sekani Tribal Council 1998). Although Steward (1977) questioned whether the Carrier utilized the potlatch system and to what degree their society was stratified, there is no written evidence to show exactly how pre-contact Carrier society was organized (Tobey 1981). Bishop (1983) contends that the Carrier people had enough surplus resources that they could maintain a somewhat sedentary existence. It has been suggested that once the fur trade had firmly established itself among the Carrier peoples, the use of a crest-clan system became more common and that the practice of potlatching was adopted at this time in order to validate rank or title (Bishop 1983; Harris and Ingram 1972). This could suggest that social stratification intensified following contact.

Prior to European influence, the Carrier cremated their dead (Hall 1992; Tobey 1981). There are accounts of different customs regarding the treatment of the cremated remains, however, it appears that the remains were gathered and placed in a box. Some accounts describe placing this box in a tree where animals couldn't reach it (Hall 1992), where others describe giving the box to the mother's phratry for one year after which a grave house would be built over the cremation site (Tobey 1981). The practice of widows carrying the remains of their deceased husbands on their backs for the mourning period gave the Carrier their European name (Tobey 1981).

The Sekani occupy the northern interior of British Columbia, generally from Salmon River northwest along the Rocky Mountains to Kechika River (Denniston 1981). Sekani or Tsek'ene means "people on the rocks" (Morice 1906). Social organization consisted of independent egalitarian bands or corporate

groups with bilateral descent; although there were occasions where matrilineal phratries were adopted to facilitate intermarriage with neighbouring Carrier and Gitxsan (Denniston 1981). The Sekani were primarily hunters, exploiting the ungulates and small mammals within their territory, and there are accounts of hunting buffalo on the eastern slopes of the Rocky Mountains (Morice 1906). Jenness (1937) and Black (1955) recorded seasonal movements, indicating that the Sekani spent the winters on the plains and plateaus and the summers moving about the mountains or into neighbouring territories. Winter shelters consisted of conical structures covered in spruce bark while summer shelters were typically lean-tos or conical windbreaks (Denniston 1981). When someone died, Sekani tradition was to cover the person in brush shelters in the place where they had spent their last days and desert the location (Denniston 1981). Influential people might be placed in hollowed logs and raised on a platform or enclosed in natural hollows of standing trees (Denniston 1981). Jenness (1937) recorded daily wailing during the mourning period that could last for months.

The Beaver are Athapaskan speakers who occupy the Peace region of British Columbia, generally east of the Rocky Mountains (Ridington 1981). The Beaver are also known as Dune-zaa or Dunneza, which means "real people". Ridington (1981) describes the Beaver social and territorial unit as a bilaterally extended family band. Hunting and trapping territories were not owned, but groups had defined territorial rights. Group size reflected resource availability, where there were smaller groups in the winter when food was scarce and larger groups in the summer. The Beaver relied on animals for food, especially bison, caribou, and moose. Fish and smaller animals seem to have been considered emergency rations. Shelters consisted of hide covered lean-tos and teepees or log lodges covered in moss and sod.

Beaver and Sekani socio-territorial movements in the historic era have been difficult to document, as they have been influenced by movement, splitting, amalgamation, regrouping and intermarriage with neighbouring groups (Denniston 1981). Permanent or semi-permanent villages were not documented in the historic era, though there are several accounts of Sekani taking up residence in neighbouring territories: Harmon (1957) recorded a Sekani village on Fraser Lake in Carrier territory, and Teit (1909) recorded a story of a North Thompson Shuswap band that annihilated a Sekani village in their territory on the upper Fraser. Just prior to European contact, the Beaver in the Athabasca River region were pushed further west by Cree groups, creating a boundary at Peace River. Jenness (1937) notes that some Sekani groups were displaced by Beaver on the eastern slopes of the Rocky Mountains. Because of this, it can be difficult to distinguish between Beaver and Sekani.

Contact with neighbouring Nations was vital to First Nations economies. Trade occurred to obtain otherwise unavailable items such as oolichan grease, obsidian and moose hides. Trails were an intrinsic part of this economy and traditional subsistence as a whole. Prior to the establishment of the fur trade in the interior, the interior First Nations had access to firearms and metal tools from the intensive trade that was occurring on the plains to the east (Burley *et. al.* 1996) and on the Northwest Coast (Morice 1906). So effective was First Nations' use of these trading networks, that the Hudson's Bay Company was concerned about losing their share of interior furs to coastal traders via traditional trade routes (Carlson and Mitchell 1997; Tobey 1981).

Direct contact between First Nations and Europeans first occurred in the late 1700s and early 1800s, with the arrival of Alexander Mackenzie in 1793 and Simon Fraser in 1806 (Fraser 1960; Mackenzie 1967). The journals of these men record their adventures in northern British Columbia as well as the life ways and history of the First Nations from their own point of view. The Hudson's Bay Company kept detailed records from 1821, describing the seasonal cycle of local native peoples, their subsistence, general health, trading patterns, population and social relations (Klippenstein 1992). Father Adrian Gabriel Morice kept detailed notes concerning the Carrier people and their culture from 1885 to 1904 (Morice 1906). Early maps created by members of the Canadian Geographical Society and by trading companies are also invaluable for interpreting traditional land use.

The fur trade officially came to the area in 1800s with the establishment of Rocky Mountain Portage House (1805), Fort McLeod (1805) and Fort St. James (1806) for the North West Company. The establishment of the fur trade in the central interior had a profound impact on the First Nations inhabitants; traditional settlement and economic structures were altered to incorporate trap lines and trading posts into the seasonal round (Burley *et. al.* 1996). Hudson (1983) suggests that the arrival of direct trade increased the importance of beaver hunting and salmon fishing to supply forts with the goods they desired. In 1858, the Hudson's Bay Company's exclusive trading rights were revoked. With the influx of smaller traders into the areas, the exchange of furs for cash became increasingly common, drawing aboriginal peoples into a cash economy.

In 1860, Proclamation No. 15 allowed for the acquisition of unoccupied, unreserved and unsurveyed Crown land (Indian Claims Commission 2006). Pre-emption of lands by non-natives began almost immediately thereafter. The Omineca gold rush brought Europeans into the western Sekani, northern Carrier and southern Beaver range in 1861 (Denniston 1981). In 1871, British Columbia joined Confederation and the government created reserves for the natives, generally setting boundaries around villages, hunting grounds and fishing stations, and allowing eight acres per family (Klippenstein 1992). Treaty 8 was negotiated in 1899 as part of a plan to develop the economic potential of the Athabasca region (Murray 1998).

By the beginning of the 20th century, many trading posts were closed, as wage labour and a cash economy replaced the fur trade (Carlson & Mitchell 1997; Morice 1906; Tobey 1981). Continuing pressure from missionaries, native police and Indian agents contributed to the deterioration of the traditional hereditary systems (Klippenstein 1992). Keyoh holders were asked to register their traditional lands as traplines, which served to reduce the people's use of the land. It allowed for government bureaucrats to make decisions about resource use and conservation and allowed other people to infiltrate traditional lands, including settlers, farmers and cattle ranchers (Carrier Sekani Tribal Council 1998).

Davidson (1971) recorded some information from Catherine Bird regarding aboriginal occupation of the Nation Lakes. According to Mrs. Bird, in a time before European contact, the Sekani were the inhabitants of the Nation Lakes until the Carrier warred with them and drove them out. She indicated to Davidson that the names of the Nation Lakes (Chuchi, Tchentlo, Indata and Tsayta) are Sekani in origin. Mrs. Bird also told Davidson that prior to World War I, over 100 Carrier lived on the Nation Lakes, but were decimated by an influenza epidemic during the war. Because of this epidemic, there should be around 100 graves along the lakes. No one lived permanently on the lakes following the influenza epidemic; however, Mrs. Bird's father ran a trapline on the lakes until his death in 1960. When Davidson visited the Nation Lakes in 1971, there were two cabins still standing belonging to the Bird family: one on Tchentlo Lake built by Mrs. Bird's father in the 1920s and one built by her grandfather in the 1800s. Catherine Bird was running a fishing and hunting camp out of the eastern arm of Chuchi Lake in 1971.

5.2 First Nations Consultation

Communication with the Bird family (Peter Bird and Mike Bayes) of the Nak'azdli Band was undertaken prior to Preliminary Field Reconnaissance. The Bird family continues to provide guiding services in the Chuchi Lake area, with cabins at the eastern end of Chuchi Lake and at the southern end of Witch Lake. Locations of quad and skidoo trails within the immediate vicinity were communicated, as well as general locations of blazed pedestrian trails.

5.3 Historical Background

The first European passed through central British Columbia in 1793 when Alexander Mackenzie came in to British Columbia from Peace River, headed down the Parsnip, down the Fraser and then followed existing aboriginal trails along West Road River to the coast (Mackenzie 1967). The next European to explore the general area was Simon Fraser, who established forts for the Northwest Trading Company on his journey from the Peace down the Fraser to the coast at present day Vancouver (Fraser 1960). Fur trade continued to be the major economy in the area until the 1860s, when the gold rush caused thousands of people to head north in search of their fortunes. While the majority of gold exploration occurred around Quesnel, some prospectors travelled to Manson Creek, Peace River and Finlay River (Runnalls 1946). The Manson Creek Trail, which allowed travel north from Fort St. James to Germansen Landing, crosses Nation River at the east end of Chuchi Lake, just east of the Project.

From the mid-1900s to the present, the region's economic activity expanded to include logging, big game guiding, trapping, prospecting, and mining activities. In the 1930s, a small placer gold rush occurred along Rainbow Creek approximately 30 km east of the Project. A few of these placer miners also trapped in the winters prior to World War II (Haslinger, personal communication 2007). Development of mineral resources has been a primary focus for new economic developments within the region although trapping activities continue to the present.

5.4 Archaeological Background

Overall, a documented pre-contact archaeological record of the Interior Plateau is lacking. Very few full-scale excavations have taken place. To date, the majority of archaeological investigations carried out in the Interior Plateau have been motivated by development activities, including forestry, mining, oil and gas exploration and extraction as well as road and hydro line construction. Archaeological consulting companies have completed numerous archaeological assessments in the area, identifying mostly lithic, cache pit and CMT sites.

People likely inhabited post-glacial British Columbia as the landscape stabilized. The research of Bennett *et. al.* (2001) indicates that deglaciation in south-central British Columbia was occurring 12,900-12,400 years before present (BP). This research indicates that the environment from deglaciation to 11,400 BP was cool, moist and cold followed by a period of warm and dry conditions from 11,400 to 7,800 BP. From 7,800 to 5,100 BP, the environment continued to be warm but with modern levels of precipitation. By 5,100 BP the climate had stabilized to its present conditions.

Magne and Matson (2008) propose a projectile point sequence for central and northern interior British Columbia using the following periods:

Early Prehistoric Period (11,000-7,000 BP): Archaeological information from this period in the north-central interior is sparse and can be unreliable as most projectile points from this period are from private collections with unknown context. Recently, several lanceolate points were excavated at Prince George with associated radiocarbon date of 8,770±60 BP, calibrated to 9,550-10,130 BP (Burford *et. al.* 2008).

Evidence of early occupation from adjacent areas include: the Charlie Lake Cave site, north of Fort St. John, which shows human habitation dating to 10,500 BP (Driver 1996); the Pink Mountain sites with projectile points of similar morphology to Charlie Lake Cave and paleoindian sites in Alberta (Wilson 1996); and the Goatfell Complex in the Kootenays dating to 10,500-8,500 BP (Carlson 1996);

Middle Prehistoric Period (7,000-3,500 BP): Magne and Matson contend that this period represents the first substantial occupation of the north-central interior as projectile points share stylistic similarities across a broad area of western Canada. Carlson (1996) interprets the period between 4,000 and 6,000 BP as intermingling of influences from the north, east and south. The climate and glacial drainages began to stabilize in this period, and the streams and rivers became more inhabitable for salmon, which allowed people to depend on the annual salmon runs for a reliable food source (Carlson and Mitchell 1997). By 3,000 to 4,000 years BP, the upper Fraser area saw a shift from nomadic to semi-sedentary lifeways, through the establishment of villages along rivers and lakeshores (Carlson 1996). Stryd and Rousseau (1996) show that the Plateau Pithouse Tradition, typified by use of semi-subterranean pithouses and storage pits with a strong emphasis on salmon fishing, started around 4500 BP. Dated sites supporting such a hypothesis include the Tezli site dating to 3850 BP (Donahue 1978), and the Punchaw Lake site dating to approximately 4000 BP (Fladmark 1976).

Late Prehistoric Period (3,500-100 BP): Magne and Matson (2008) define this period by projectile points that are clearly different from regions to the south. Carlson (1996) has the late period for the province beginning at 2,000 BP, but is marked by little change in culture. Howe and Brolly (2008) identify the transition between the middle and late periods in Northeastern BC at 4,500 BP, based on projectile point morphology around Peace River and Rocky Mountain Trench.

There is some archaeological evidence to suggest that the Carrier people originally arrived from the north, and forced a pre-existing group of people, possibly Salish, further south (Tobey 1981). Scholars (Donahue 1978; Tobey 1981) have debated whether this happened rapidly or slowly enough to permit some degree of cultural assimilation.

5.5 Recorded Archaeological Sites

The proximity of known archaeological sites to a particular area of interest is used as an indicator of archaeological potential. The Project is located on BCGS mapsheets 093N.007, 008, 018 and 019. A search of recorded archaeological sites on these BCGS mapsheets returned only five (5) recorded archaeological sites, summarized in Table 1 below. None of these sites are located within the Project boundaries, although the locations of GgSb-1 and GhSc-3 are not exact.

A search of the surrounding BCGS Mapsheets (093K.096, 096, 098, 099 & 093N.006, 009, 010, 016, 017, 020, 027, 028, 029, 030) which represents approximately 10 km radius around the Project returned an additional 14 sites, summarized in Table 2 below.

Table 1. Recorded Archaeological Sites on BCGS Mapsheets 093N.007, 008, 018 and 019

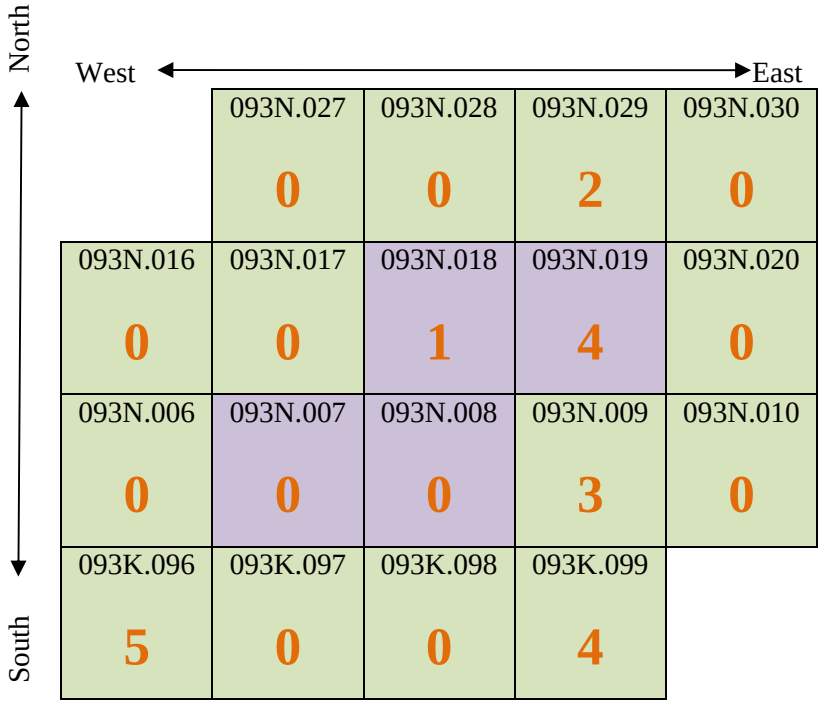
BCGS Mapsheet	Number of Sites	Site Descriptions
093N.007	0	NA
093N.008	0	NA
093N.018	1	GhSc-3: cache pits and house foundation, 1971-037, 200 m from northern boundary
093N.019	4	GgSb-1: cache pits, 1971-037, 3 km east of northeastern corner GgSc-1: grave, cabins, start of trail to Witch Lake, recreational trail along Chuchi Lake shoreline, 1999-292, 875 m east of northeastern corner GhSc-2: lithics, faunal, historic materials, 1971-037 & 1999-292, 3 km north of northeastern corner GhSc-4: Manson Creek Trail, 1-3 km north and east of northeastern corner

Table 2. Recorded Archaeological Sites within 10 km of the Project

BCGS Mapsheet	Number of Sites	Site Descriptions
093K.096	5	GfSf-1: CMT (dated AD 1840-1902), 2001-170 & 2002-122 GfSf-2: CMT (dated AD 1837-1937), 2001-170 & 2002-122 GfSf-3: CMT (dated AD 1777-1857), 2001-170 & 2002-122 GfSf-4: CMT (dated AD 1793), 2001-170 GfSf-5: trap trail through CMT sites GfSf-1, 2 and 3, 2001-170
093K.097	0	NA
093K.098	0	NA
093K.099	4	GfSb-1: Manson Creek Trail, 1998-057 GfSb-2: Esker Trail, 1998-057 GfSb-3: trail, 2006-125 GfSb-5: lithics & fishing weir, 2009-106
093N.006	0	NA
093N.009	3	GgSb-2: cache pit, 2007-137 GgSb-3: lithics, 2007-140 GgSb-4: lithics, 2007-140
093N.010	0	NA
093N.016	0	NA
093N.017	0	NA
093N.020	0	NA
093N.027	0	NA
093N.028	0	NA
093N.029	2	GhSb-1: grave & cabins GhSc-1: CMT (dated AD 1890-1934), 1998-057
093N.030	0	NA

This indicates a fairly low site density within the Project area. Site distribution appears to be concentrated around existing roads and harvested areas. Mapsheets with no recorded archaeological sites appear to have very little industrial development that would have required AIAs or the development occurred before there was a requirement for AIAs.

Table 3. Recorded Archaeological Site Distribution



Purple mapsheets contain the Project. Green mapsheets surround the Project area. Orange numbers indicate the number of recorded archaeological sites within each mapsheet.

Additionally, there are numerous post-1846 sites recorded nearby the Project, which include culturally modified tree (CMT), trail, camp and cultural material sites. The occurrence of these sites indicates historic use of the area and indicates the probability that additional unrecorded sites are present in the area.

5.6 Hydrology

In order to completely and accurately predict site densities in any specific area, water availability is the one overwhelming environmental predictor of archaeological site potential. Proximity to water sources is an important indicator of archaeological potential as water is essential for survival. People normally live close to sources of water and will often use watercourses as travel routes.

Several distinct hydrological features are within the Project area. Fish Wizard (Province of BC 2009) provides the most recent information on British Columbia's lakes, rivers and streams. Fish Wizard identified the following present-day lakes and streams within the Project (Table 4). Stream order and magnitude are indicators of the size of stream, where the higher the number, the larger the stream. TRIM II data identified several small streams that do not show up on Fish Wizard; these may be non-classified drainages (NCDs) or may not be streams at all.

Table 4. Waterbodies within the Project

Waterbody	Stream Order	Stream Magnitude	Fish Species Present
Chuchi Lake			Burbot, lake trout, lake whitefish, largescale sucker, longnose sucker, mountain whitefish, northern pikeminnow, peamouth chub, prickly sculpin, pygmy whitefish, rainbow trout, redside shiner, sucker, white sucker
Witch Lake			Burbot, lake trout, lake whitefish, longnose sucker, mountain whitefish, rainbow trout, redside shiner
Abas Lake			Lake chub, longnose sucker, rainbow trout
Arehead Lake			Lake chub, longnose sucker, prickly sculpin, rainbow trout
Small lake south of Arehead Lake (Lake C)			Lake chub, longnose sucker, prickly sculpin, rainbow trout
Witch Creek	3	28	Rainbow trout, redside shiner, sculpin
Stream draining northeast into Wittsichica Creek	3	10	Rainbow trout, redside shiner
Stream draining north into middle of Witch Lake	2	7	Rainbow trout
Small stream draining north into Chuchi Lake west of Nation Lakes Park	2	2	None
Small stream draining north into west end of Witch Lake	1	1	None
Small stream draining south into east end of Witch Lake	1	1	None
Small stream draining north into Chuchi Lake at Project's western boundary	1	1	None

5.7 Topography

Campsites, temporary use sites and travel routes tend to be located on level, well-drained terrain. Generally, ridges with south-facing aspects have higher archaeological potential, as they receive more sunlight, thereby providing much needed warmth. Terraces and breaks in slope associated with water features also tend to have higher archaeological potential.

According to Davidson (1971), the valleys of the Nation Lakes are overlain by erosional material from the intrusive igneous material of which the surrounding mountains are composed. Davidson postulates that Nation River has meandered and downcutted into the loosely consolidated material, which has resulted in considerable lowering of lake levels over time. He notes several benches along the lakes which represent old lake shores.

A bison skeleton was found eroding out of the bank of Nation River, just east of its outlet from Chuchi Lake and was radiocarbon dated to 30,000-35,000 years old (Harington *et. al.* 1996). The stratigraphy described in the study of these bones indicates that the surface sediments of the alluvial terrace are composed of approximately 1.5 m of crudely bedded sand and gravel, which is interpreted as fluvial

sediments deposited during a period of aggradation at the end of the Fraser glaciation. Below this is well-sorted gray silt and clay deposited by a glacial lake that existed when ice retreated from the area. Below this layer is 2.5 m of diamicton from the Late Wisconsinan glaciation. The lowest layer described at 6.5 m depth is well-laminated silt and clay lacustrine deposits from which the bison bones were extracted.

The general topography in the area features several hills and ridges. Steep slopes are present within the Project boundaries, especially on the north and south sides of Witch Lake and to the south of Chuchi Lake at the northern extent of the Project. The southeastern portion of the Project is mostly upland hills with some rock outcroppings of sedimentary and metamorphic origin.

5.8 Existing Disturbance

The archaeological potential of a specific area is ultimately influenced by the condition of the landscape. Landscape altering activities such as road construction, farming and forestry activities have the potential to destroy both surface and subsurface cultural materials and CMTs. If cultural heritage resources are not destroyed in this process, their context usually is, making it difficult to assess significance and age of the sites.

The majority of the Project has seen very little development or disturbance. The only existing roads within the Project are at the southwestern corner leading to Arehead and Mudzenchoot Lakes. The south side of Chuchi Lake has only seen minimal impact from recreational and traditional land users including some campsites, pedestrian trails, quad trails and cabins.

5.9 Preliminary Field Reconnaissance Results

Preliminary field reconnaissance (PFR) was undertaken on November 2, 3, 7, 8, 10, 12 and 13. The initial plan was to explore the area prior to significant snow-fall; however, a storm in the last week of October deposited 15-30 cm of snow on the area. PFRs consisted of two crews of two people. Crew 1 consisted of James Mooney and Mike Bayes, who accessed areas by boat from Chuchi and Witch Lakes. Crew 2 consisted of Samara King and Jean-Jacques Baillaut who accessed the southwestern area by snowmobile.

Between the two crews, a total of 93 observation points were recorded, which assessed the archaeological potential at the point and the reasons for the assessment. Observation points were largely clustered around the lakes within the Project boundaries due to accessibility. More terrestrial observations were planned; however, the depth of snow coverage prevented exploration into areas without roads. While the data collected is biased towards lakeshores, it is still informative in comparison with the existing archaeological predictive model and in forming a new model for the area.

Table 5 summarizes the number of points observed with high and low potential compared to the modeled potential. Figures 2 and 3 in Appendix A show the locations of the observation point and the heritage resources observed. Appendix B contains the photographs taken during PFR.

Table 5. Observation Point Descriptions

Observation Point	Easting	Northing	Elevation (m)	Location Description	Archaeological Potential	Landform	Drainage	Aspect	Slope	Viewpoint	Distance to Water	Forest Cover	Rock outcrop	Photo	Photo Description
SK1	397654	6101046	1026	Witch Creek SW	High	level terraces around 1-2 m wide stream flowing N	well	E, W	NA	NA	NA	Sp	NA	33	View E of stream/terraces
SK2	397293	6102157	1056	Witch Creek SW	Low	no significant landforms around NCD	poor	NA	NA	NA	NA	Pl/Sp	NA	38	View W of NCD
SK3	398238	6104527	1031	Arehead Lake	Low	no significant landforms around NCD	poor	S	gentle	NA	NA	NA	NA	39	View N of NCD
SK4	398601	6104807	1052	Arehead Lake	Low	consistent E-facing slope	NA	E	Moderate to steep	NA	NA	NA	NA	40, 42	View E of Lake; view W of slope
SK5	396237	6099373	1020	Abas Lake	High	terraces around tributary to Abas Lake	NA	NE, SW	NA	NA	70 m	NA	NA	49	view NE of terrace
SK6	396302	6099295	1010	Abas Lake	Low	terrace to Abas Lake	NA	E	NA	NA	2 m above	NA	NA	50-57; 58	view S to N across lake; view W of terrace
SK7	396355	6099354	1009	Abas Lake	High	small knoll on terrace to Abas Lake	NA	SE	NA	NA	NA	NA	NA	NA	N
SK8	396762	6099915	1024	Abas Lake	Low	level to gently sloping around 1 m wide stream	NA	NA	NA	NA	NA	NA	NA	64	view W to stream
SK9	396284	6101004	1033	Witch Creek SW	High	terrace on NE bank of small stream	NA	WSW	NA	NA	NA	NA	NA	65	view ENE of terrace
SK10	396529	6101026	1020	Witch Creek SW	High	terrace on W bank of small stream	NA	SE	NA	NA	NA	NA	NA	66-67	View WSW; View WNW
SK11	396833	6101073	1016	Witch Creek SW	High	terraces on both sides of 5 m wide creek	well	E, W	NA	NA	NA	NA	NA	68	View W
SK12	397335	6102384	1054	Lake C	High	terrace on N side of NCD	well	S	NA	NA	NA	NA	NA	69	View N of NCD
SK13	397967	6102361	1025	Lake C	Low	gradual slope around unnamed lake	NA	E	gentle	NA	NA	NA	NA	71	View W of W bank
JM1	412635	6113542	870	Chuchi Lake	Low	undulating and low	poor	N	NA	NA	5-10 m	At/Sp	NA	1096	shoreline
JM2	412219	6113576	873	Chuchi Lake	High	narrow bench	well	N	level	small peninsula	5 m	Pl/Sp/At	NA	1097	low bench
JM3	412010	6113679	871	Chuchi Lake	High	small bench	good	N	level	small point	0-5 m	mixed	NA	1098	small bench
JM4	411679	6113839	869	Chuchi Lake	Low	slope	NA	N	steep	NA	0-5 m	mixed	NA	1099	sloped lake edge
JM5	411392	6113900	874	Chuchi Lake	High	bench parallels bay	good	NA	level	NA	0-5 m	Sp/Pl	NA	1100; 1101	bench around bay
JM6	410767	6114256	873	Chuchi Lake	Low	slope	NA	N	steep	NA	0-5 m	NA	NA	1102	small bay
JM7	410531	6114596		Chuchi Lake	Low	small point	NA	N	Moderate	NA	NA	NA	NA	1103	small point

Observation Point	Easting	Northing	Elevation (m)	Location Description	Archaeological Potential	Landform	Drainage	Aspect	Slope	Viewpoint	Distance to Water	Forest Cover	Rock outcrop	Photo	Photo Description
JM8A	410356	6114705	871	Chuchi Lake	High	low bench on point of land	good	NA	level	NA	0-5 m	Sp/Pl	NA	1104	small bench
JM8B	410156	6114700		Chuchi Lake	Low	slope	NA	NA	steep	NA	0-5 m	NA	NA	NA	NA
JM9	409791	6115114	872	Chuchi Lake	Low	low and undulating	wet	NA	NA	NA	NA	NA	NA	1105	swamp
JM10	408200	6116200		Chuchi Lake	High	level bench	good	NA	level to gentle	NA	0-10 m	NA	NA	1106-1107	E side of Park bndry
JM11	401137	6113463	865	Chuchi Lake	High	small terrace b/t lake and stream	good	N	NA	NA	0-5 m	Sp	NA	1109	terrace
JM12	401203	6113483	868	Chuchi Lake	High	small bench on point of land	good	NA	NA	small bay	0-5 m	Sp	NA	1110	small bench
JM13	403034	6114518	870	Chuchi Lake	High	low bench on point of land 1m above water	good	N	NA	NA	5-10 m	Sp	NA	1111	bench
JM14	404175	6114878	871	Chuchi Lake	Low	gradual slope	NA	NA	gradual, gentle	180º	0-10 m	Sp	NA	1112	lakeshore
JM15	404920	6115180	871	Chuchi Lake	High	stream outlet	good	N	level	NA	0-10 m	Sp	NA	1113-1114	stream outlet
JM16	405658	6115551	867	Chuchi Lake	Low	slope	good	N	steep	NA	0-10 m	Sp mix	NA	1116	sloped shoreline
JM17	408951	6116033	870	Chuchi Lake	High	small bench	good	N	level	200º	0-10 m	At/Sp	NA	1117-1118	bench
JM18	410986	6114003	872	E bank Witch Cr	Low	lower bank	poor	NA	level	poor	0-10 m	Sp/B	NA	1125	E bank Witch Creek
JM19	411048	6113778	873	E bank Witch Cr	High	terrace/bench along E side Witch Creek	good	W	level	NA	NA	Sp	NA	1126	View N of bench
JM20	411013	6113760	884	E bank Witch Cr	High	triangular bench above JM19	good	W	level	NA	20 m, 15 m above	Sp	NA	1127	triangular bench
JM21	411004	6113733	899	E bank Witch Cr	High	third terrace to Witch Creek above JM 19 and JM 20	good	N, W	level	300º	25-30 m above	Sp/Pl	NA	1128	View N of corner
JM22	410963	6113660	897	E bank Witch Cr	High	225 m terrace edge above Witch Creek	good	W	level	180º	50 m, 25 m above	Pl/Sp	NA	1129-1130	terrace edge, blazed line
JM23	410964	6113661	897	E bank Witch Cr	High	terrace corner above Witch Creek	good	NW, NE	level	300º	50 m	Pl	NA	1131	View N from corner
JM24	410656	6113551	906	E bank Witch Cr	High	second terrace bench	good	W	level	280º	30 m	Sp/Pl	NA	1132-1133	level bench; CMT
JM25	410694	6113414	902	E bank Witch Cr	Low	third terrace	poor	W	undulating	NA	>80 m	Sp/DC	NA	1134; 1135	View E of stream; View W of devil's club
JM26	410539	6113252	923	E bank Witch Cr	Low	third terrace willow/alder wetlands	poor	NA	NA	NA	NA	Sp	NA	1136	willow/alder wetland
JM27	410069	6113242	968	E bank Witch Cr	High	third terrace	good	S	level	NA	NA	Pl	NA	1140	view W of terrace/knoll

Observation Point	Easting	Northing	Elevation (m)	Location Description	Archaeological Potential	Landform	Drainage	Aspect	Slope	Viewpoint	Distance to Water	Forest Cover	Rock outcrop	Photo	Photo Description
JM28	410044	6113265	953	E bank Witch Cr	High	second small terrace	good	S, W	NA	300º	NA	Pl	NA	1141	terrace
JM29	409937	6113182		E bank Witch Cr	Low	gradual slope	poor	W	gradual, moderate	NA	0-10 m	Sp	NA	1142	E side Witch Cr
JM30	409775	6112894	948	E bank Witch Cr	Low	creek bank	poor	NA	moderate	NA	NA	Sp/willow/ alder/DC	NA	1144	view S of slope
JM31	408926	6111887	940	E bank Witch Cr	High	first terrace small bench	good	S	level	NA	10 m, 8 m above	Pl	NA	1145; 1146	view S of terrace, view NW
JM32	408909	6111790		W bank Witch Cr	High	small knoll	good	NA	NA	excellent	na	pl	NA	1152	knoll and blazes
JM33	408741	6111857	933	W bank Witch Cr	High	large knoll	good	NA	level	excellent	NA	Pl	NA	1153	knoll
JM34	408690	6111871	937	W bank Witch Cr	High	esker ridge N-S running 60-80m	good	NA	NA	NA	NA	Pl	NA	1154	esker ridge
JM35	408999	6112144		W bank Witch Cr	High	second terrace bench	good	E	level	NA	NA	Pl/Sp	NA	1155	terrace
JM36	409163	6112216	930	W bank Witch Cr	High	small knoll on terrace	good	E	level	200º	NA	Pl	NA	1156	knoll
JM37	409297	6112628	944	W bank Witch Cr	High	small bench	NA	N	NA	NA	NA	Pl/Sp	NA	1157	small bench
JM38	409457	6112813	950	W bank Witch Cr	High	terrace edge 80 m long	good	E, SE	level	180º	NA	Pl/Sp	NA	1158	terrace edge
JM39	410021	6113585	936	W bank Witch Cr	Low	terrace edge undulating	good	N	gentle	little to none	na	Pl	NA	1159; 1160	CMT; undulating terrace
JM40	410845	6114004	915	W bank Witch Cr	High	second terrace above Witch Creek and Chuchi Lake	good	NA	level	180º	>100 m	Pl/Sp/At	NA	1161	bench
JM41	410894	6114034		W bank Witch Cr	High	first terrace bench	good	NE	Level	180º	30 m, 15 m above	Pl Sp	NA	1162	terrace
JM42	396145	6104347	929	Witch Lake	Low	creek mouth at SW corner of lake	poor	N	level, undulating	NA	0-5 m	Sp/Pl	NA	1174	creek mouth
JM43	396498	6105017	920	Witch Lake	High	small bench at creek mouth	good	WNW	level	200º	0-10 m	Sp	NA	1175	bench
JM44	396943	6105714	924	Witch Lake	High	first terrace bench on point	good	N, NW, NE	level	220º	0-15 m	Sp	NA	1177; 1178	bench
JM45	397707	6106107	925	Witch Lake	High	small bench	good	N, NW	level, undulating	200º	0-10 m	Sp	NA	1179	bench
JM46	398676	6106624	925	Witch Lake	Low	shore edge	good	N, NW	low	180º	0-5 m	NA	NA	1180; 1181	blaze on game trail
JM47	399431	6107002	917	Witch Lake	High	large bench on point	good	N, NW, NE	level	200º	0-15 m	Sp/Pl	NA	1182	bench
JM48	400299	6107637	921	Witch Lake	High	bench above shore	good	N, NW	level	200º	10-30 m	Sp	NA	1183	bench

Observation Point	Easting	Northing	Elevation (m)	Location Description	Archaeological Potential	Landform	Drainage	Aspect	Slope	Viewpoint	Distance to Water	Forest Cover	Rock outcrop	Photo	Photo Description
JM49	400967	6107937	921	Witch Lake	High	first terrace bench	good	N, NW	level	200º	10-20 m, 10-12 above	Pl/Sp	NA	1184	bench
JM50	401231	6108268	922	Witch Lake	High	first terrace and shore bench	good	N, NW	level	200º	0-15 m	Pl/Sp	NA	1185; 1186	terrace and bench
JM51	403655	6108919	921	Witch Lake	High	first terrace	good	N, NW	level	200º	10-20 m, 10-12 above	Pl/Sp	NA	1187	terrace edge
JM52	403315	6110010	929	Witch Lake	Low	rocky shoreline	good	S	moderate	180º	0-10 m	Sp/Pl/alder	NA	1188	shoreline
JM53	402062	6109773	921	Witch Lake	High	bench	good	S	level	180º	0-10 m, 1.5 m above	Pl/Sp	NA	1189	bench
JM54	404543	6110648	924	Witch Lake	High	low small bench on small bay	good	S	level	180º	0-10 m	Pl/Sp	NA	1190	bench
JM55	407642	6111401	931	Witch Lake	High	low bench	good	S	level	200º	0-15 m	Pl/Sp	NA	1191	bench
JM56	408939	6111047	928	Witch Lake	Low	shoreline, trail head to Chuchi Lake	good	N, NW, NE	moderate	100º	0-10 m	Pl/Sp	NA	1192	trail head
JM57	408600	6110654		Witch Lake	High	first terrace edge	good	N	NA	180º	>10 m	Pl/Sp	NA	NA	NA
JM58	406743	6110343	927	Witch Lake	Low	shoreline	good	N	Moderate to steep	180º	0-10 m	Sp	NA	1194	sloping shoreline
JM59	407498	6111539	943	Witch Lake	Low	gently sloped pine flat; CMT and blazed line	good	S	gentle	NA	NA	Pl/Sp	NA	1197	CMT
JM60	407487	6111662	943	Witch Lake	Low	undulating pine flat	good	S	gentle to moderate	NA	NA	Pl/Sp	NA	1198	
JM61	407444	6111768	965	Witch Lake	High	bench above tributary stream	good	N	level	180º	15 m	Pl/Sp/At	NA	1199	bench
JM62	407445	6111917	965	Witch Lake	Low	gradual slope with CMTs	good	S	gentle to moderate	low	NA	Pl/Sp	NA	1200; 1201	CMT; possible CMT
JM63	407376	6111996	977	Witch Lake	Low	gradual undulating slope with CMT	good	S	gentle to moderate	NA	NA	Pl/Sp/At	NA	1202	CMT
JM64	407540	6112114	967	Witch Lake	Low	gradual slope with CMT	good	NE	gentle	NA	NA	Pl/Sp/At/B	NA	1203	CMT
JM65	407672	6112240	949	Lake A	Low	lake and wetland shoreline	good	N	gentle	180º	0-10 m	Sp	NA	1204	S shore of wetland/lake
JM66	407830	6112080	947	Lake A	Low	gradual slope along lakeshore	poor	N	gentle	NA	0-100 m	Sp	NA	1205	slope
JM67	407995	6111900	951	Lake A	Low	undulating shoreline at SE corner	good	N	moderate	good	10-20 m	Pl/Sp	NA	1206	slope

Observation Point	Easting	Northing	Elevation (m)	Location Description	Archaeological Potential	Landform	Drainage	Aspect	Slope	Viewpoint	Distance to Water	Forest Cover	Rock outcrop	Photo	Photo Description
JM68	408039	6111860	948	Lake A	High	terrace edge and ridge	good	W, E	level	NA	10-15 m	Pl/Sp	NA	1207	terrace edge
JM69	408076	6111837	945	Lake A	Low	undulating pine with CMT	good	NA	undulating	NA	NA	Pl/sp	NA	1208	CMT in pine stand
JM70	408061	6111795	949	Lake A	High	small knoll	good	NA	level	360º	NA	Pl/Sp	NA	1209	small knoll
JM71	407815	6111559	940	Witch Lake	Low	lakeshore	good	S	moderate	NA	50-100 m	Pl/Sp	NA	1210	moderate slope
JM72	408987	6111051	938	Witch Lake	Low	lakeshore	good	NA	moderate	NA	20 m	Pl/Sp/At	NA	1211	box trap on trail Witch Lake to Chuchi Narrows
JM73	409245	6110879	961	Lake B	Low	hillside quad trail	good	W	moderate	NA	150 m	At/Sp	NA	1212	box trap on trail to Lake B
JM74	409543	6110924	984	Lake B	Low	sloping quad trail	good	W	NA	NA	NA	At/Sp	NA	1214	box trap on trail
JM75	409482	6110797	973	Lake B	Low	undulating upland	poor	NA	NA	NA	NA	At/Sp	NA	1215	undulating upland
JM76	409083	6110832	949	Lake B	High	ridge above Lake B	good	S	level to gentle	360º	150 m	Pl/Sp	NA	1216	ridge
JM77	409050	6110595	950	Lake B	Low	Lake B north shore, gradual slope to grasses and sedges	poor	S	low	180º	0-20 m	Sp/Sb	NA	1217	lakeshore
JM78	408813	6110635	944	Lake B	High	terrace edge	good	W, NW	level	NA	NA	At/Sp	NA	1218	terrace edge
JM79	408807	6110823	946	Witch Lake	High	terrace ridge	good	SW	NA	180º	50 m	Pl/At	NA	1219	terrace ridge

6. MODELING RESULTS

The Fort St. James Forest District utilizes a potential model that has short-comings for use in this particular area. A new model was created for the Project using available digital data. The strategy for developing the model, including a discussion of expected site types and the justification for manipulation of data, is described below.

6.1 Fort St. James Forest District Archaeological Predictive Model

The Fort St. James Forest District Archaeological Predictive Model has been in use within the district since 1999. The model was created in 1999 (Canuel 1999a) and was updated in 2003-2004 (Marshall and Bond 2004). In 2009, an analysis of the model (Horrell 2009) found that it does not conform to the newly created *AOA Guidelines* (2009) and should be updated again.

Figure 3 (Appendix A) is a map showing areas of low, moderate and high archaeological potential created by the 2004 predictive model. Using this model, the majority of the proposed Project area contains moderate to low archaeological potential, with some high potential in association with Witch Creek, Arehead Lake, Abas Lake and a chain of wetlands on the southern portion of the Project. Very little archaeological potential is modeled around Witch and Chuchi Lakes, which seems incongruous.

A recent analysis of the 2004 predictive model (Horrell 2009) found that it had a Kvamme's gain statistic of 0.63 for the high potential layer. The Archaeology Branch requires models to fall between 0.80 and 1.00 Kvamme's gain statistic for the model to be acceptable as an efficient model. The same analysis found that the high potential layer is 76% effective at capturing archaeological sites, which is acceptable to the Archaeology Branch's standards. The efficiency and effectiveness evaluations cannot be performed on the model specifically within the Project boundaries because they rely on utilizing recorded archaeological sites. There are no recorded archaeological sites within the Project boundaries. Therefore, observation point data collected during the PFR is substituted to perform a preliminary analysis.

A total of 93 observation points were observed, of which 53 were observed as having high archaeological potential (requiring shovel testing) and 40 were observed as having low archaeological potential (no shovel testing required). Table 6 below presents the observed points in relation to their modeled potential. There were 53 observation points with assessed high archaeological potential. Of those 53 points, only 25 were captured by the high potential layer, which results in an effectiveness rate of 47.17%. Kvamme's gain statistic is calculated as 1-(%area / %sites); but it can only be used for testing the efficiency of the model when 70% or more of sites are captured by the model.

The observed high potential points were roughly evenly distributed between the modeled high and moderate layers in the 2004 model. This would suggest that the moderate potential layer should be treated more like a high potential layer within the Project boundaries and would negate the recommendations for use of the moderate layer as described in Marshall and Bond (2004: 100):

> When the development area contains no areas of high potential and it is classified as moderate, moderate/low or low, then there is no cultural heritage concern and the licensee is clear to proceed with the development without an AOA or AIA.

The 2004 forest district model is not up-to-date with Archaeology Branch guidelines and appears to be inaccurate in predicting archaeological potential in this area; therefore, a separate model was created for this Project Area.

Table 6. Archaeological Potential: PFR Results Compared to 2004 Model

	Area		Points with Observed High Potential			Points with Observed Low Potential			Observation Points Totals	
	Hectares	Percent	Number	% of Total Points (n=93)	% of High Points (n=53)	Number	% of Total Points (n=93)	% of Low Points (n=40)	Number	Percent (n=93)
Modeled High Potential	828.3	5.96%	25	26.88%	47.17%	19	20.43%	47.50%	44	47.31%
Modeled Moderate Potential	5,968.9	42.93%	27	29.03%	50.94%	20	21.51%	50.00%	47	50.54%
Modeled Low Potential	7,107.7	51.12%	1	1.08%	1.89%	1	1.08%	2.50%	2	2.15%
Total	13,904.9	100.00%	53	56.99%	100.00%	40	43.01%	100.00%	93	100.00%

6.2 Project-specific Model

A model was created that is specific to the Project boundaries. The data collected during the PFR is utilized to analyze areas of potential. Available digital mapping is used to isolate areas of potential for archaeological sites within the Project boundaries.

6.2.1 Site Types

The Archaeology Branch categorizes sites into seven broad site types: permanent habitation sites; temporary habitation or subsistence sites; human remains; fishing sites; quarry sites; rock art sites; and trail sites. The probability of the distribution of each of these site types are presented below. Culturally modified trees (CMTs) and historic sites are also analyzed.

Permanent Habitation Sites

Permanent habitation sites would indicate prolonged or repeated occupation of a site, which may be represented by several house pits, cache pits, buried paleosols and/or a variety of tools. Identified village sites in the Northern Interior are rare, but their locations can shed light on where additional sites might be found. Recorded permanent habitation sites have been located on lakes, the junction of major rivers and along major travel/trade routes. Based on this archaeological evidence and ethnographic background presented above, it is possible that village sites might be located along the shorelines of Chuchi and/or Witch Lakes, most likely near outlets or mouths of major rivers and streams.

Temporary Habitation or Subsistence Sites

These sites tend to be associated with resource gathering activities, such as hunting or fishing and are represented by cache pits, lithic tools or production, and possibly faunal remains. Ceremonial sites related to puberty and shamanistic rituals may be part of this site type, represented by cairns, isolated hearths and lithics. These site types are likely to be discovered within the Project as there are abundant areas for hunting of ungulates such as deer, moose and caribou as well as varied landscapes for plant gathering.

Human Remains

Prior to European influence, Carrier peoples cremated their dead. The remains were then gathered and well-marked. People who died while travelling were buried at the place of cremation, close to where they died. Therefore, there is always a possibility that human remains could be encountered. The Sekani buried or covered their dead in spruce bark or hollow logs. The acidic nature of forest soils would likely decompose any skeletal elements left from the cremation or burial, so it is likely that the only evidence of human remains found today would be grave markers. Historic grave sites have already been recorded on Chuchi Lake approximately 900 m east of the Project and there may be additional historic graves from the influenza epidemic that occurred during World War I.

Fishing Sites

Fishing sites typically include fish weirs or natural narrowing of major rivers and streams where fish could be caught more easily. Given that there are several fish-bearing lakes and streams within the Project Area, it is entirely possible that fishing sites could be present.

Quarry Sites

These sites include areas where natural stone was quarried for the fabrication of stone tools. The Project is underlain by lava flows. Basalt and cherts may be present; however, thick layers of glacial till cover the rocks, making access to it very difficult. Therefore, it is unlikely that quarry sites are located within the Project.

Rock Art Sites

Previously recorded rock art sites within the Fort St. James Forest District have been found on outcroppings along the shores of large lakes (Stuart, Trembleur, Takla). Rock art also tends to occur around the territorial boundaries of neighboring bands. The Nations Lakes area may be a historic area of dispute between Carrier and Sekani bands. Based on reconnaissance results, no rock outcrops were observed on Witch or Chuchi Lakes. A search of available surficial geology data found rock outcrops could occur within the Project but was too vague to pinpoint locations. Harington *et. al.*'s research (1996) on ancient bison bones at the east end of Chuchi Lake found 6.5 m of soils and sediments below surface, which may be indicative of the amount of glacial sediments that overlie the bedrock in this area. Therefore, it is unlikely that rock art will be located within the Project.

Trails

Trails are pedestrian travel routes that may be marked by a well-worn trail bed, blazes, other CMT types and/or cairns. Trails tend to follow animal routes and/or water sources. Mike Bayes and Eddie Antoine of the Nak'azdli Indian Band have previously found trails in the area. The site form for GgSc-1 indicates a trail heading from Chuchi Lake to Witch Lake and a trail running along the south side of Chuchi Lake, neither of which was fully recorded. The historic Manson Creek trail runs just east of the Project Area at the east end of Chuchi Lake. Several quad trails and trap trails were identified during the PFR, indicating post-1846 use of the area. This information points to a high likelihood of trails being present within the Project Area, but the age of the trails is unknown at this time.

CMTs

CMT sites in the Northern Interior Plateau tend to be cambium stripped pine, although other CMT types, such as blazes and arborglyphs, may occur within the Project Area. Timber stands that have an age class of 8 or higher indicate that the stand is over 141 years old; therefore, there is a possibility that these stands may contain pre-1846 cambium strippings. Pine stands that have an age class of 6 or 7 are 101-140 years old and may contain post-1846 cambium strippings. Post-1846 CMTs may require consideration under the *Forest and Range Practices Act.*

Historic Sites

The *Heritage Conservation Act* only automatically protects sites that pre-date 1846. Post-1846 aboriginal or traditional use sites might include camps dating up to World War I, CMTs, trails, traps, and resource gathering areas. It is likely that any European historic sites identified would post-date 1860 (after the Omineca gold rush) and might include mineral prospecting; land surveying; trails and camps related to trapping; recreational or guiding related structures, camps and trails. While these sites are not protected by the *Heritage Conservation Act*, the *Forest and Range Practices Act* has provisions for their protection and/or management.

It is difficult to estimate the number of sites that might be identified within the Project; however, it is anticipated that sites would be concentrated around the lakes, creeks and streams within the Project. The scientific, public and economic significance of sites that might be identified within the Project depends on the types found and variability of the sites in relation to other identified sites in the district. Ethnic significance of sites can only be determined through consultation with First Nations. Most First Nations place high significance on all archaeological sites.

6.2.2 Archaeological Potential

The locations of recorded archaeological sites were extracted as a shape file from RAAD (Remote Access to Archaeological Data). The sites closest to the Project (GhSc-3 and GgSc-1) were further examined to determine the accuracy of the RAAD data. RAAD locations for these two sites were compared to the maps and descriptions on the site forms and in the permit reports (Davidson 1971; Canuel 1999b). The RAAD location of GgSc-1 is accurate.

The RAAD location for GhSc-3 is not very accurate, but this is a result of the information collected when the site was recorded. The RAAD location for GhSc-3 is currently located approximately 400 m from the Chuchi Lake shoreline. The Davidson (1971) report map is large scale and not very detailed. The description of the site location places it 75-100 feet southeast of the traveler's campsite on Martha's Point. There is a campsite in this general vicinity called Indian Point in the same general spot. The campsite is on the lakeshore, so it is likely that GhSc-3 is 70-90 m from the lakeshore somewhere on this point. This site should be re-located in the field to confirm its location.

The following data sets were considered in creating the model for the Project. LIDAR was not available for use in this Project.

1. TRIM II
   TRIM II provides locations of lakes, creeks, streams and wetlands within the Project. Available data did not include classification information.

2. Fish Wizard/FISS
   Fish Wizard provides a provincial database on fish-bearing lakes, rivers and streams. FISS provides data on obstructions and fish observed locations. Fish Wizard identified three fish-bearing streams within the Project.

3. DEM
   The digital elevation model provides landform information using points taken every 10 m. Queries to the DEM found that it was too coarse to pick up breaks in slope, small knoll features or ridges.

4. VRI
   Vegetation Resource Inventory provides information on forest cover types and ages. It was utilized to isolate areas of black spruce (indicating wet, saturated ground) and non-commercial brush (NCBr, typically willow fens and/or saturated ground) as areas of low archaeological potential. Pine-leading and pine-secondary stands with age classes of 8 (141-250 years old) or 9 (250+ years old) were isolated as areas with potential for pre-1846 CMTs.

5. Surficial Geology
   Plouffe's (2001) digital data on surficial geology was utilized to isolate bedrock outcrops that might have been used for rock art or quarry sites. The only bedrock outcrop found within the Project boundaries was located in the southeastern portion of the Project, composed of materials unsuitable for stone tool manufacture. The till veneer category can contain abundant bedrock outcrops, however, this category covers large areas of the Project and the bedrock outcrops were not pinpointed nor were their parent material described. For these reasons, the data is considered too coarse for this study and was not included in the model.

6. Ungulate Winter Ranges
   The information within this data set is too coarse for the small area being modeled, as winter ranges covered nearly all the Project. The information could not point to particular areas of potential; therefore, it was not included in the model.

7. Biogeoclimatic Zones
   There are only two zones within the Project: SBS mk1 covers the majority of the Project while ESSF mv3 covers the uplands in the southeastern portion of the Project. This data set is too coarse to provide specific information within the Project and was not included in the model.

Examination of expected site types indicates that archaeological sites tend to be located on distinct landforms (terraces, knolls, ridges) in association with hydrological features (lakes, rivers, streams, creeks, wetlands). The exception is quarry sties, which would be located where there is available stone. There is no reliable data for isolating landforms within the Project boundaries; therefore, we have to rely mostly on proximity to water features to create buffers that would capture landforms in association with the hydrology. Aspect was not utilized as a predictor for archaeological sites as several areas with archaeological potential were observed on north-facing features during the PFR. From these data sets, the following layers were extracted. Raster cells are 30 x 30 m in size.

1. Proximity to lakes
   Utilizing lake locations from TRIM II and fish-bearing information from Fish Wizard, the following was created:
   a. All cells within 100 m buffer of fish-bearing lakes were given a value of 2;
   b. All cells within 50 m of other lakes were given a value of 2;
   c. All other cells within the layer were given a value of 0.

   Initial runs of the model assigned the lakes a value of 1, but found that they were being under-represented. A value of 2 was assigned to ensure that slope would not adversely affect the potential of lakeshores.

2. Proximity to streams
   TRIM II information provides the locations of several streams and seepages within the Project. Ecofor's past field experience has indicated that often what is indicated on a map as a "stream" is actually just an area of saturated ground in the field with no running water or archaeological potential. It would benefit the archaeologists and the planning foresters if these smaller "streams" could be identified and assigned the appropriate archaeological potential. Unfortunately,

available data for the Project does not include stream classification information; therefore archaeological potential could not be assigned based on stream size or flow. FISS and Fish Wizard indicated that three stream are fish-bearing. Professional biologist Jason Casselman indicated that without field visit, streams are defaulted as fish-bearing when they are located on less than 30% slope, as fish have difficulty traveling upstream on slope over 30%. This information helped us eliminate some streams from the high archaeological potential zone. The archaeologists on the team consulted and came to the conclusion that archaeological sites along small streams tend to occur within a certain distance from adjacent larger lakes or rivers. Using all of this information, the following were created:

a. All dashed streams (seepages) and stream in areas over 30% slope were excluded from the stream layer;
b. All streams located over 750 m from fish-bearing streams and over 1 km from fish-bearing lakes were excluded from the stream layer;
c. All cells within 150 m of known fish-bearing streams (from Fish Wizard) were given a value of 1;
d. All cells within 50 m of remaining streams were given a value of 1.
e. All other cells within the layer were given a value of 0.

3. Proximity to wetlands
   TRIM II data was utilized for locations of wetlands within the Project, creating the following:
   a. All cells within 50 m of all wetlands were given a value of 1.
   b. All other cells within the layer were given a value of 0.

4. Slope
   DEM data was used to determine slope within the Project. Flat areas were separated from sloping areas as follows:
   a. All cells with a slope of 0-15% were given a value of 1;
   b. All cells with over 15% slope were given a value of 0.

5. Automatic low potential
   A problem with the 2004 Fort St. James Forest District model is that areas within lakes and wetlands are modeled high, even though these areas are obviously under water. These areas become part of the overall percentage of area modeled high, which skews the accuracy of the model. Another issue is areas that have saturated ground are often difficult to identify. This was addressed by isolating areas identified as black spruce (Sb) and non-commercial brush (NCBr) on forest cover information. These areas tend to feature saturated ground and have low archaeological potential despite any surrounding features. In order to address these issues, the following criteria were applied:
   a. All cells within Sb and NCBr polygons were given a value of 0 that overrides all other values from other layers.
   b. All cells within wetlands and lakes were given a value of 0 that overrides all other values from other layers.

All the above grids were combined to create the archaeological potential map (Figure 5, Appendix A) where pink areas represent high archaeological potential (cells with a value over 1).

An evaluation of the effectiveness and efficiency of this model through capturing existing archaeological sites is not possible because there are no previously recorded archaeological sites within the Project. Instead, the data collected during the PFR will be used to evaluate the model, where the 53 points with observed high archaeological potential will be used to test the efficiency and effectiveness of the potential

layer within the model. It can be assumed that because these points were assessed in the field as requiring shovel testing then they should be captured by the high potential layer.

Table 7. Effectiveness and Efficiency Calculations

	Percent Area	Number observed high captured (out of 53)	Percent observed high captured	Kvamme's gain statistic 1-(%area/%high)
High Potential Layer	15.2%	44	83.0%	0.82

The model captures 83% of the observed high potential points. Nine points with observed high potential were not captured: JM36, JM37, JM38, JM41, JM70, JM76, JM78, SK9 and SK12. Of those nine, six are located within 50 m of a high potential zone; they may have only been excluded from the zone due to the accuracy of the GPS point taken in the field. Three points lie well outside of high potential zones, consisting of landforms a distance from water.

Using this percentage capture as a replacement for percentage of recorded sites captured, a Kvamme's gain statistic of 0.82 is achieved which falls into a moderately efficient model.

6.2.3 Pre-1846 CMT Potential

A separate layer was created to identify areas with potential for pre-1846 CMTs. The preponderance of CMTs within the Fort St. James Forest District is cambium stripped pine. Therefore, two criteria had to be isolated: forests with pine trees (Pl for lodgepole pine) and trees that are at least 164 years old. VRI data was queried for pine-leading stands (ie, PlS) and pine-secondary stands (ie, SPl) that are within age class 8 (141-250 years old) and 9 (>250 years old). This resulted in 2.4% of the Project having potential for pre-1846 CMTs (see Figure 6, Appendix A). Kvamme's gain statistic was not applied as no pre-1846 CMTs have been recorded within the Project yet.

6.2.4 Historical Resources Potential

Historic resources that post-date 1846 are not automatically protected by the *Heritage Conservation Act*; however, CMTs and significant trail systems are considered cultural heritage resources and may require management considerations "to conserve, or, if necessary, protect cultural heritage resources that are the focus of a traditional use by an aboriginal people that is of continuing importance to that people, and not regulated under the *Heritage Conservation Act" (Forest Planning and Practices Regulation Sec. 10* under *FRPA)*. As such, it is useful to planning foresters and First Nations communities to know where historic resources might be located within the Project.

A separate historic resources map was created (see Figure 7, Appendix A) which includes the following:

1. Potential for post-1846 CMTs (pine-leading and pine-secondary with age class 6 [101-120 years old] and 7 [121-140 years old]);
2. Ground-truthed post-1846 CMT locations;
3. Locations of cabins and structures within and around the Project;
4. Estimated and ground-truthed trail locations (pedestrian and quad trails);
5. Trap locations.

7. EVALUATION AND DISCUSSION

The Fort St. James Community Forest Expansion has areas exhibiting archaeological potential, as determined through background research presented in Section 5.0 and model creation presented in Section 6.2. Areas with low archaeological potential have been restricted to steeply-sloping terrain, areas a distance from watercourses and areas with high saturation. Areas with high potential include landforms associated with streams, lakes and wetlands.

As more detailed mapping information becomes available, such as stream classification, this model can be updated and may become more efficient and effective. As archaeological studies are completed, such as PFRs and AIAs, the database of locations recorded archaeological sites and areas with archaeological potential will increase, which will also affect efficiency and effectiveness calculations. The lack of known archaeological sites within the Project area can be attributed to the lack of archaeological work previously conducted in the area, rather than a lack of sites present. Further archaeological work in the Project Area will help establish a greater knowledge of the terrain and settling patterns of the Interior Plateau in addition to increasing our general knowledge of the peopling of the province of British Columbia.

Very little of the Project Area has been previously impacted. While soil disturbance does not necessarily remove cultural materials from an area, it has the potential to destroy the materials and hinder in its recovery. Depending on the degree of soil disturbance, the soil matrix can be altered, thereby most likely destroying the context in which cultural material would be found. Disturbance activities may also result in the creation of pseudo-cultural material; materials that look cultural but have been artificially created (for example, cat-shatter on geophysical lines).

Please note that while the major areas of archaeological potential have been identified as a result of this AOA, additional, smaller areas of archaeological potential may also be present. Archaeological potential will be refined in the future through field work to examine terrain and water features, as well as through continued communication with First Nations.

8. RECOMMENDATIONS

The objectives of this study were to identify and assess archaeological potential with the Project Area through a review of known archaeological sites, biophysical characteristics and topographic variability in relation to ethnographic and historic sources; and to prepare a written report of the overview that fulfills the requirements outlined in *Archaeological Impact Assessment Guidelines* (1998) and *AOA Guidelines* (2009). Specific recommendations for each potential type are outlined below.

Ecofor encourages consultation between First Nations groups and the Proponent. The results of this AOA and any ensuing AIAs and PFRs will be sent to the First Nations listed at the beginning of the report. Additional future feedback from First Nations may alter the recommendations herein.

The recommendations outlined within this AOA are subject to approval by the Archaeology Branch, Ministry of Tourism, Culture and the Arts.

8.1 High Archaeological Potential

Areas with modeled high archaeological potential as depicted on Figure 5, require further archaeological investigation. It is strongly recommended that further archaeological work in these areas be undertaken in the form of an Archaeological Impact Assessment (AIA). This work needs to be conducted at ground level prior to harvest and associated construction activities and include a pedestrian traverse of the identified areas.

High archaeological potential areas will be surveyed according to the methodology presented in the AIA permit application. Survey routes should be oriented parallel to natural topographic features, and/or along pre-determined arbitrary bearings to assess the nature of the landforms within the Project area. Subsurface testing should be conducted to locate cultural deposits such as lithics, hearths, fire-altered rock, and faunal remains. Surface inspection should be conducted to locate surficial artifacts, rock art, cultural depressions, trails, culturally modified trees, blazes, burials, human skeletal remains, fish weirs and canoes. Ground surface exposures are ideal for locating cultural remains; therefore, erosional banks, road cuts, and tree throws should be visually inspected. Site locations should be accurately mapped, recorded, and assigned temporary site numbers. A photographic record of each site should be kept and sites should be marked in the field.

If protected archaeological sites are found within the proposed development areas, then the following schemes may be employed:

1. Avoidance: Create buffer zones of at least 10 m around the site areas, where no machinery, skid trails, or ground-altering development will be allowed.
2. Relocation of development boundaries: depending on site locations it may be possible to change development boundaries to avoid the site.
3. Mitigation: Recommend management level, systematic recording of artifacts and features, and data recovery of a site through excavation (Heritage Investigation Permit).
4. Alteration Permit: Where the site cannot be avoided and excavation is not warranted, recommend the client apply for an Alteration Permit to disturb or destroy the site.

8.2 Pre-1846 CMT Potential

Areas identified on Figure 6 as having potential for pre-1846 CMTs should be surveyed as part of an AIA under a Heritage Inspection Permit. Permitted AIAs allow for the extraction of increment cores from CMTs to determine their age and protection status. If protected pre-1846 CMTs are identified, then the following schemes may be employed:

1. Avoidance: create retention areas around the site where no tree harvest will take place.
2. Relocation of development boundaries: depending on site locations it may be possible to change development boundaries to avoid the site.
3. Alteration Permit: Where the site cannot be avoided, recommend management level, systematic recording of trees, as well as stubbing or removing stem round samples to either preserve the feature or obtain an adequate sample of dates from the site.

8.3 Historic Resources Potential

Areas with potential for historic post-1846 resources are depicted on Figure 7. Non-permitted Preliminary Field Reconnaissance (PFR) may be required to record any sites present. PFRs can be conducted by an archaeologist or someone with training in recording the site types. For example, First Nations representatives who are familiar with the area might be best to record traditional use sites such as trails, trapping sites or CMTs. Records of post-1846 sites should be submitted to a central repository, such as the Archaeology Branch or the Forest District.

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APPENDIX A: MAPS

PROPOSED DEVELOPMENT LOCATION OVERVIEW MAP

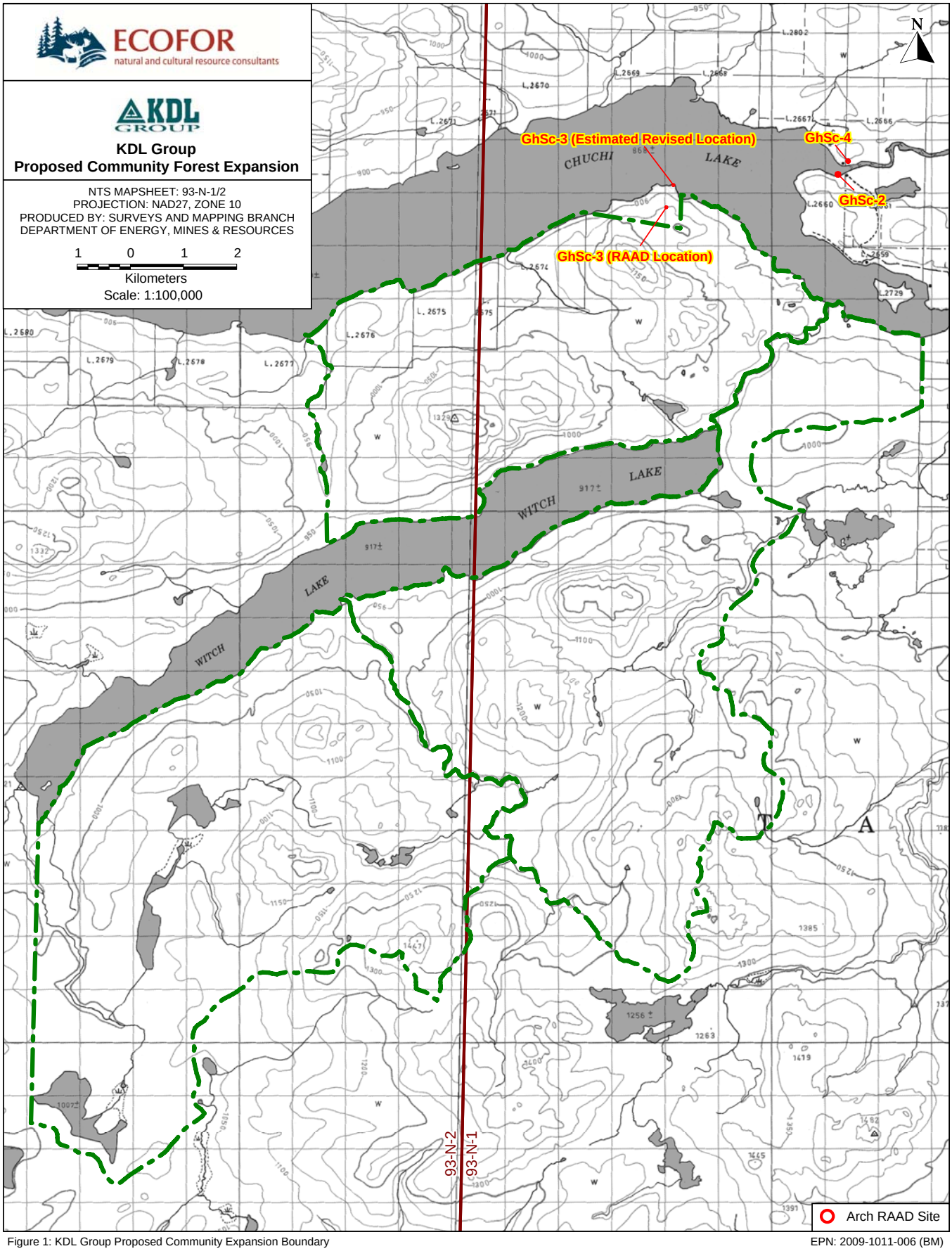
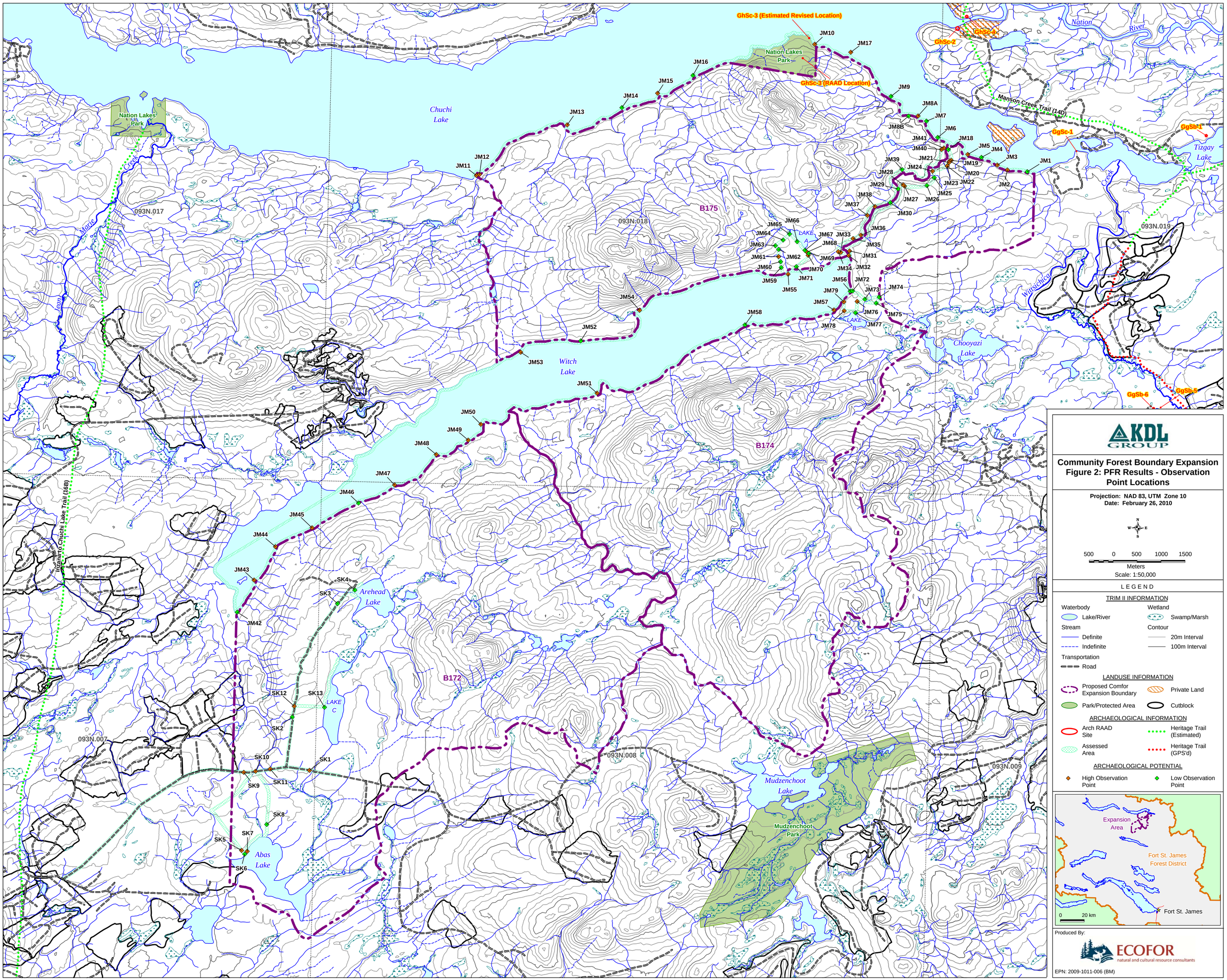


Figure 1: KDL Group Proposed Community Expansion Boundary

EPN: 2009-1011-006 (BM)



Community Forest Boundary Expansion
Figure 2: PFR Results - Observation Point Locations

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

500 0 500 1000 1500
Meters
Scale: 1:50,000

LEGEND

TRIM II INFORMATION

Waterbody
- Lake/River

Wetland
- Swamp/Marsh

Stream
- Definite
- Indefinite

Contour
- 20m Interval
- 100m Interval

Transportation
- Road

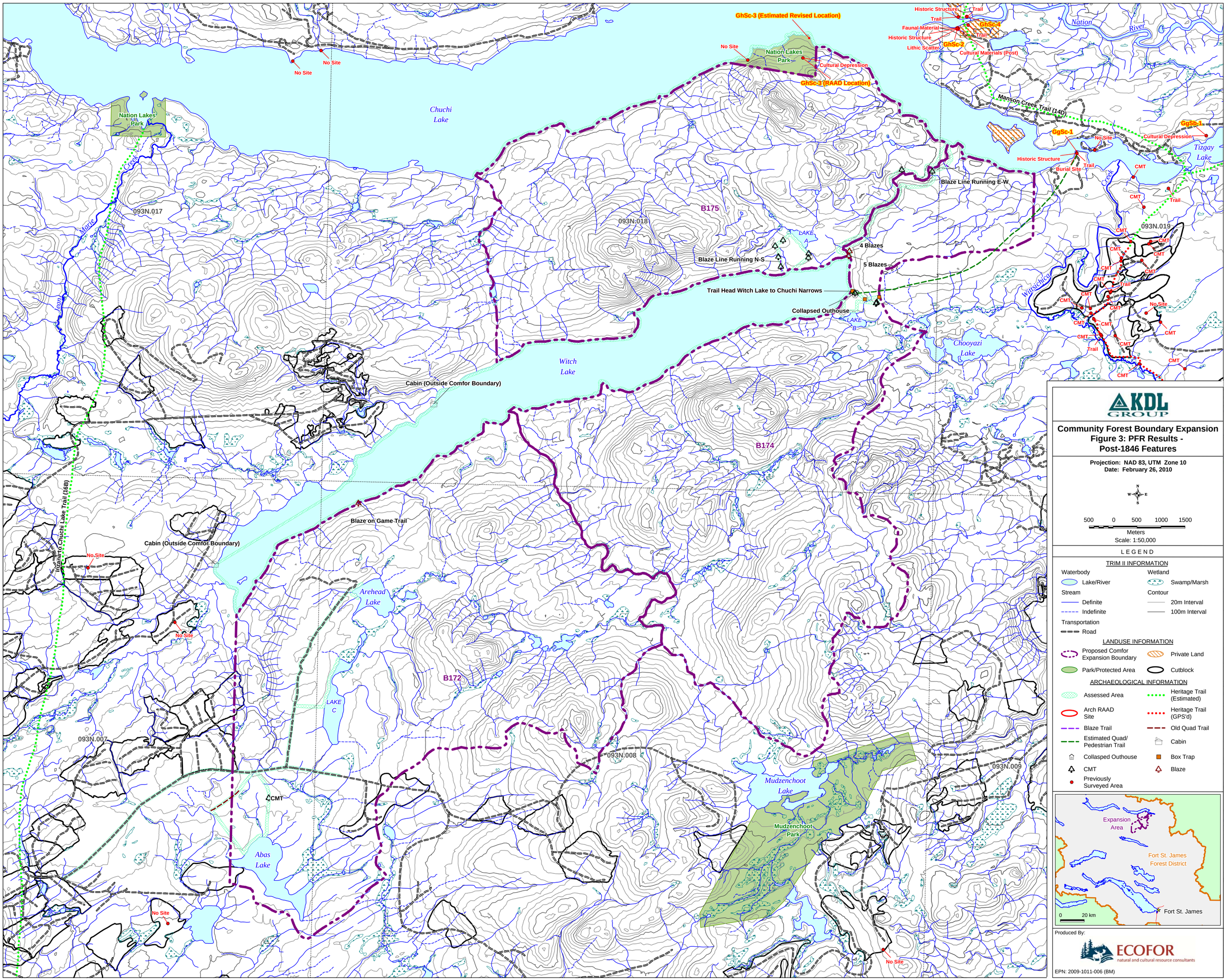
LANDUSE INFORMATION
- Proposed Comfor Expansion Boundary
- Park/Protected Area
- Private Land
- Cutblock

ARCHAEOLOGICAL INFORMATION
- Arch RAAD Site
- Assessed Area
- Heritage Trail (Estimated)
- Heritage Trail (GPS'd)

ARCHAEOLOGICAL POTENTIAL
- High Observation Point
- Low Observation Point

Produced By:

EPN: 2009-1011-006 (BM)



Community Forest Boundary Expansion
Figure 3: PFR Results - Post-1846 Features

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

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Meters
Scale: 1:50,000

LEGEND

TRIM II INFORMATION

- Waterbody: Lake/River
- Wetland: Swamp/Marsh
- Stream: Definite, Indefinite
- Contour: 20m Interval, 100m Interval
- Transportation: Road

LANDUSE INFORMATION

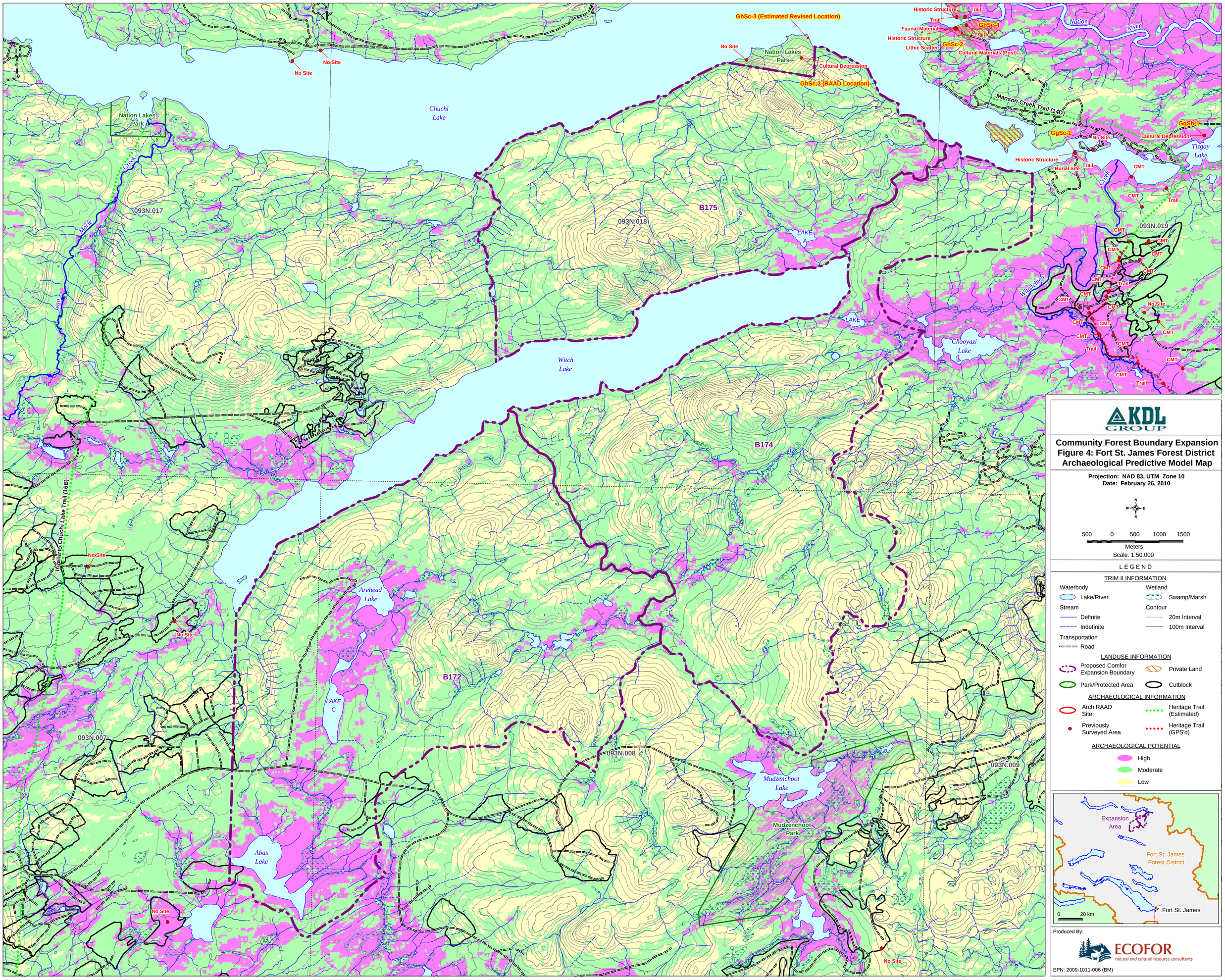
- Proposed Comfor Expansion Boundary
- Private Land
- Park/Protected Area
- Cutblock

ARCHAEOLOGICAL INFORMATION

- Assessed Area
- Heritage Trail (Estimated)
- Arch RAAD Site
- Heritage Trail (GPS'd)
- Blaze Trail
- Old Quad Trail
- Estimated Quad/ Pedestrian Trail
- Cabin
- Collasped Outhouse
- Box Trap
- CMT
- Blaze
- Previously Surveyed Area

Produced By:
ECOFOR
natural and cultural resource consultants

EPN: 2009-1011-006 (BM)



Community Forest Boundary Expansion
Figure 4: Fort St. James Forest District Archaeological Predictive Model Map

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

500 0 500 1000 1500
Meters
Scale: 1:50,000

LEGEND

TRIM II INFORMATION

- Waterbody: Lake/River
- Wetland: Swamp/Marsh
- Stream: Definite; Indefinite
- Contour: 20m Interval; 100m Interval
- Transportation: Road

LANDUSE INFORMATION

- Proposed Comfor Expansion Boundary
- Private Land
- Park/Protected Area
- Cutblock

ARCHAEOLOGICAL INFORMATION

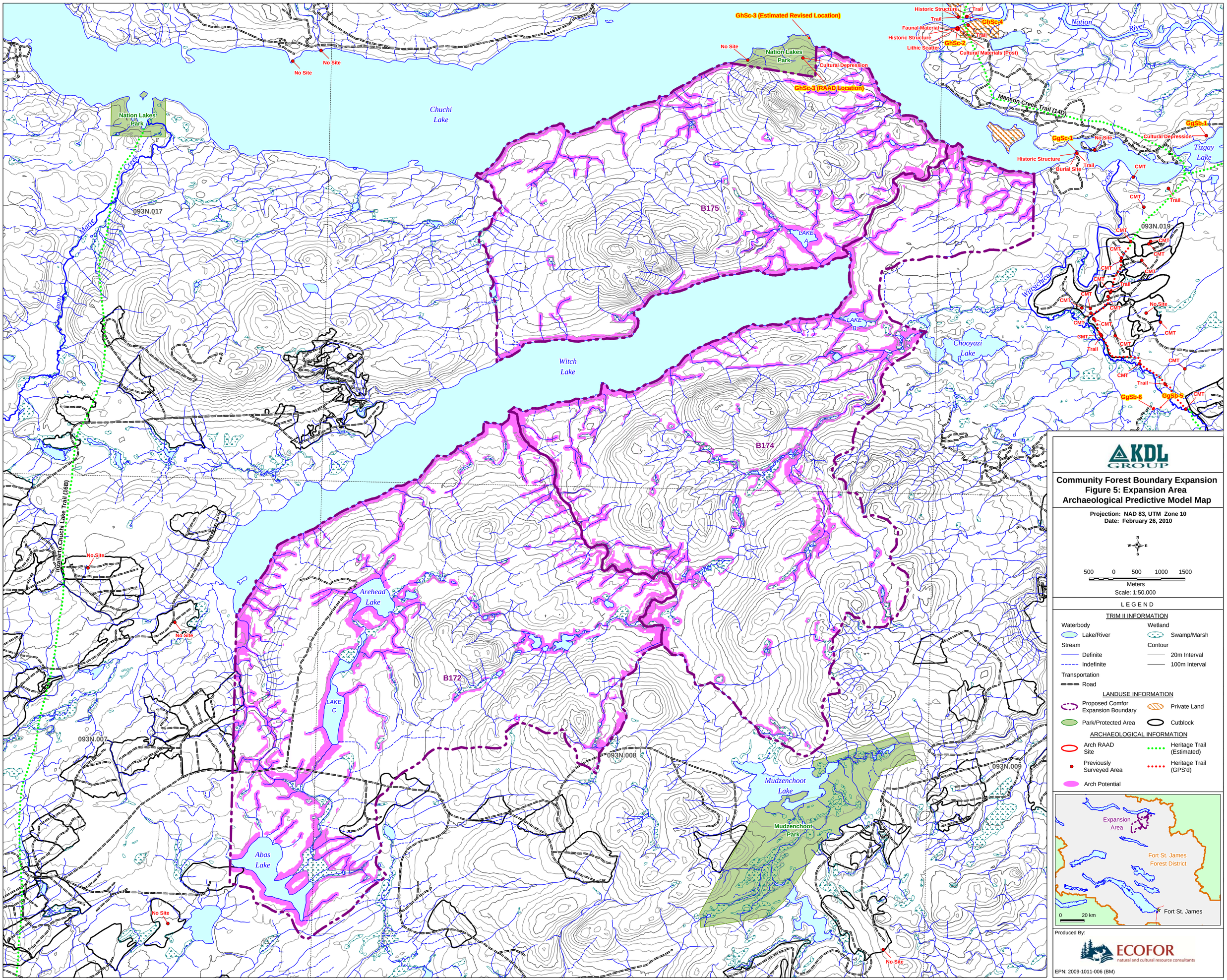
- Arch RAAD Site
- Heritage Trail (Estimated)
- Previously Surveyed Area
- Heritage Trail (GPS'd)

ARCHAEOLOGICAL POTENTIAL

- High
- Moderate
- Low

Produced By:
ECOFOR
natural and cultural resource consultants

EPN: 2009-1011-006 (BM)



KDL GROUP

Community Forest Boundary Expansion
Figure 5: Expansion Area
Archaeological Predictive Model Map

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

500 0 500 1000 1500
Meters
Scale: 1:50,000

LEGEND

TRIM II INFORMATION

Waterbody
- Lake/River

Wetland
- Swamp/Marsh

Stream
- Definite
- Indefinite

Contour
- 20m Interval
- 100m Interval

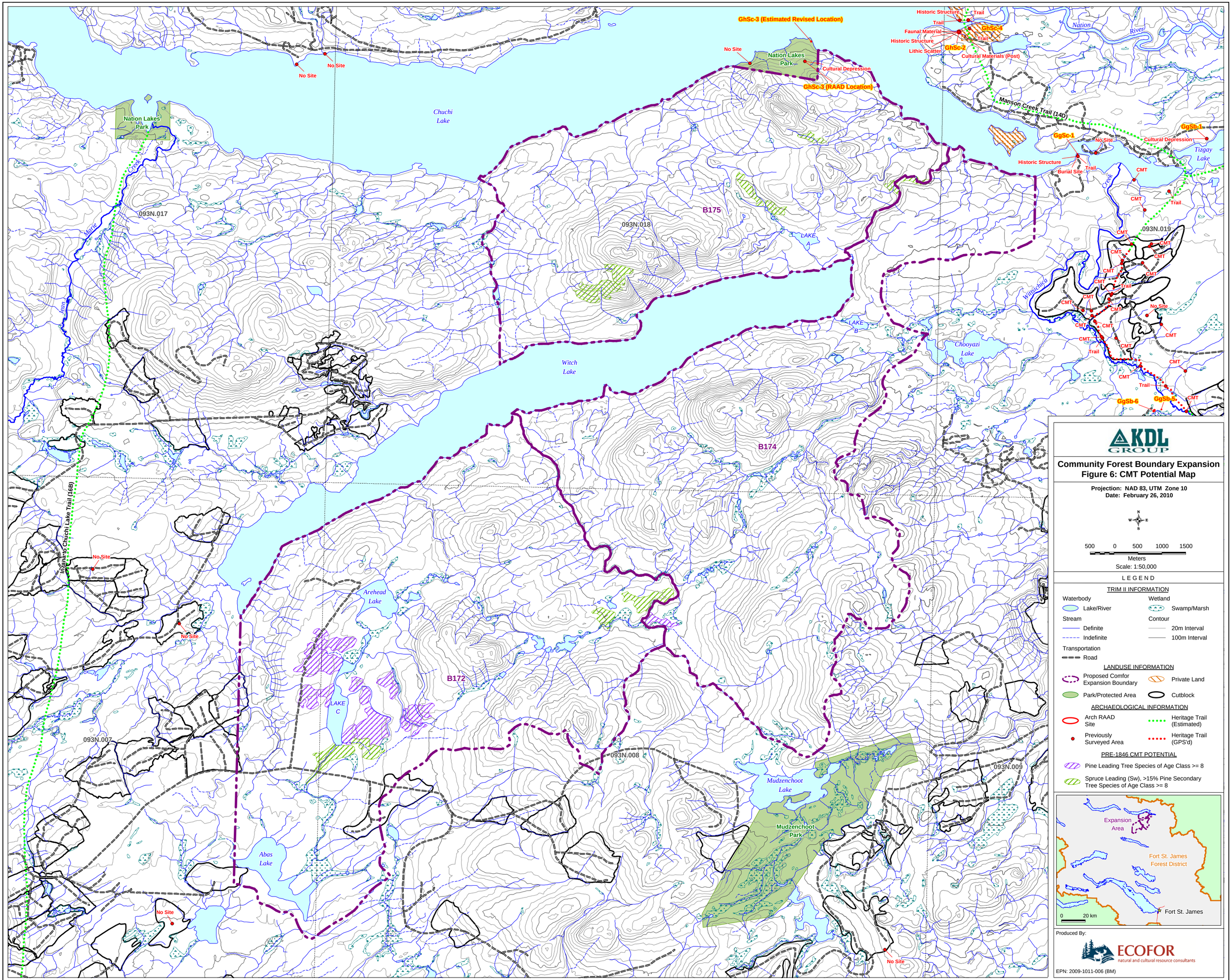
Transportation
- Road

LANDUSE INFORMATION
- Proposed Comfor Expansion Boundary
- Park/Protected Area
- Private Land
- Cutblock

ARCHAEOLOGICAL INFORMATION
- Arch RAAD Site
- Previously Surveyed Area
- Arch Potential
- Heritage Trail (Estimated)
- Heritage Trail (GPS'd)

Produced By:
ECOFOR
natural and cultural resource consultants

EPN: 2009-1011-006 (BM)



KDL GROUP

Community Forest Boundary Expansion
Figure 6: CMT Potential Map

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

500 0 500 1000 1500
Meters
Scale: 1:50,000

L E G E N D

TRIM II INFORMATION

Waterbody: Lake/River
Wetland: Swamp/Marsh
Stream: Definite, Indefinite
Contour: 20m Interval, 100m Interval
Transportation: Road

LANDUSE INFORMATION

Proposed Comfor Expansion Boundary
Private Land
Park/Protected Area
Cutblock

ARCHAEOLOGICAL INFORMATION

Arch RAAD Site
Heritage Trail (Estimated)
Previously Surveyed Area
Heritage Trail (GPS'd)

PRE-1846 CMT POTENTIAL

Pine Leading Tree Species of Age Class >= 8
Spruce Leading (Sw), >15% Pine Secondary Tree Species of Age Class >= 8

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natural and cultural resource consultants

EPN: 2009-1011-006 (BM)

Community Forest Boundary Expansion
Figure 7: Historic Resources Map

Projection: NAD 83, UTM Zone 10
Date: February 26, 2010

500 0 500 1000 1500
Meters
Scale: 1:50,000

KDL GROUP

LEGEND

TRIM II INFORMATION

Waterbody
- Lake/River

Wetland
- Swamp/Marsh

Stream
- Definite
- Indefinite

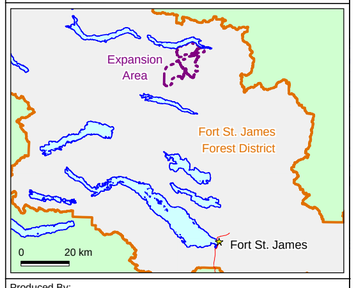
Contour
- 20m Interval
- 100m Interval

Transportation
- Road

LANDUSE INFORMATION
- Proposed Comfor Expansion Boundary
- Private Land
- Park/Protected Area
- Cutblock

ARCHAEOLOGICAL INFORMATION
- Arch RAAD Site
- Heritage Trail (Estimated)
- Blaze Trail
- Heritage Trail (GPS'd)
- Estimated Quad/ Pedestrian Trail
- Old Quad Trail
- Collasped Outhouse
- Cabin
- CMT
- Box Trap
- Blaze
- Previously Surveyed Area

POST-1846 CMT POTENTIAL
- Pine Leading Tree Species of Age Class 6 or 7
- Spruce Leading (Sw), >15% Pine Secondary Tree Species of Age Class 6 or 7



Produced By:
ECOFOR
natural and cultural resource consultants

EPN: 2009-1011-006 (BM)

APPENDIX B: PHOTOGRAPHS

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Chuchi Lake**

Client: **KDL Group** **Date:** **November 2, 2009**

Photo: 1096
JM1
Low potential along poorly drained shoreline

Photo: 1097
JM2
High potential on low bench

Photo: 1098
JM3
High potential on small bench

Photo: 1099
JM4
Low potential along sloping shoreline

Photo: 1100
JM5
High potential on bench within a small bay

Photo: 1101
JM5
High potential on a bench within a small bay

Photo: 1102
JM6
Low potential along sloping shoreline

Photo: 1103
JM7
Low potential at small point

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Chuchi Lake**

Client: **KDL Group** **Date:** **November 2, 2009**

Photo: 1104
JM8
High potential on low bench

Photo: 1105
JM9
Low potential along poorly drained, swampy shoreline

Photo: 1106
JM10
High potential on level bench

Photo: 1107
JM10
High potential on level bench

Photo: 1109
JM11
High potential on terrace

Photo: 1110
JM12
High potential on small bench

Photo: 1111
JM13
High potential on small bench

Photo: 1112
JM14
Low potential on gradual slope down to lakeshore

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Chuchi Lake**

Client: **KDL Group** **Date:** **November 2, 2009**

Photo: 1113
JM15
High potential at stream outlet into lake

Photo: 1114
JM15
High potential at stream outlet into lake

Photo: 1116
JM16
Low potential on north-facing sloping terrain

Photo: 1117
JM17
High potential on small bench

Photo: 1118
JM17
High potential on small bench

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Creek between Chuchi & Witch Lakes**

Client: **KDL Group** **Date:** **November 3, 2009**

Photo: 1125
JM18
Low potential on poorly drained terrain

Photo: 1126
JM19
High potential on bench

Photo: 1127
JM20
High potential on triangular bench

Photo: 1128
JM21
High potential on third terrace to Witch Creek

Photo: 1129
JM22
High potential along third terrace edge

Photo: 1130
JM23
Blazed line

Photo: 1131
JM23
High potential on terrace

Archaeological Survey Photodocumentation

Project: Community Forest Expansion **Survey Area:** Witch Creek between Chuchi & Witch Lakes

Client: KDL Group **Date:** November 3, 2009

Photo: 1132
JM24
High potential on second terrace

Photo: 1133
JM24
CMT

Photo: 1134
JM25
Low potential on poorly drained third terrace

Photo: 1135
JM25
Low potential on poorly drained third terrace

Photo: 1136
JM26
Low potential in willow-alder wetland

Photo: 1140
JM27
High potential on third terrace

Photo: 1141
JM28
High potential on second terrace

Photo: 1142
JM29
Low potential on sloping terrain adjacent to Witch Creek

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Creek between Chuchi & Witch Lakes**

Client: **KDL Group** **Date:** **November 3, 2009**

Photo: 1143
Witch Creek

Photo: 1144
JM30
Low potential on sloping terrain adjacent to Witch Creek

Photo: 1145
JM31
High potential on first terrace

Photo: 1146
JM31
High potential on first terrace

Photo: 1152
JM32
High potential on small knoll

Photo: 1153
JM33
High potential on small knoll

Photo: 1154
JM34
High potential on esker ridge

Photo: 1155
JM35
High potential on second terrace

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Creek between Chuchi & Witch Lakes**

Client: **KDL Group** **Date:** **November 3, 2009**

Photo: 1156
JM36
High potential on small knoll

Photo: 1157
JM37
High potential on small bench

Photo: 1158
JM38
High potential on terrace edge

Photo: 1159
JM39
Low potential on poorly drained terrain, CMT present

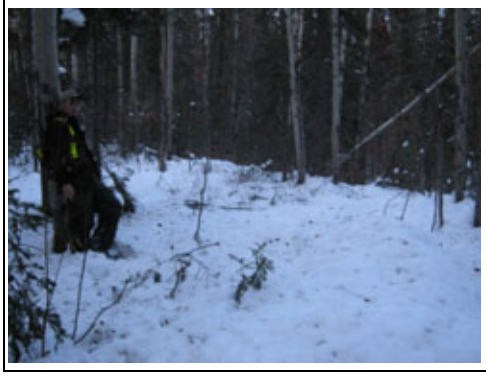


Photo: 1161
JM40
High potential on terrace edge at junction of Witch Creek and Chuchi Lake

Photo: 1162
JM41
High potential on first terrace

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1174
JM42
Low potential on poorly drained terrain at stream mouth

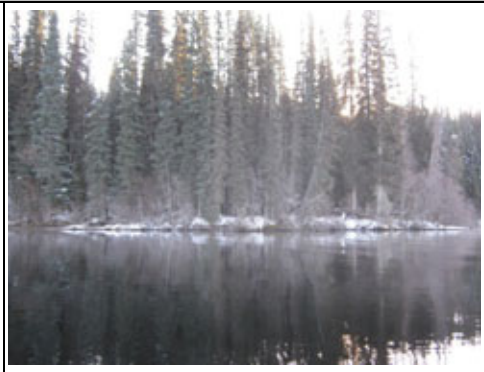


Photo: 1175
JM43
High potential on small bench

Photo: 1176
JM43
High potential on small bench

Photo: 1177
JM44
High potential on terrace on point of land

Photo: 1178
JM44
High potential on terrace on point of land

Photo: 1179
JM45
High potential on small bench

Photo: 1180
JM46
Low potential on gently sloping lakeshore

Photo: 1181
JM46
Blaze on game trail

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1182
JM47
High potential on large bench

Photo: 1183
JM48
High potential on large bench

Photo: 1184
JM49
High potential on first terrace

Photo: 1185
JM50
High potential on first terrace

1186
JM50
High potential on first terrace

1187
JM51
High potential on terrace edge

Photo: 1188
JM52
Low potential on rocky, sloping shoreline

Photo: 1189
JM53
High potential on bench

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1190
JM54
High potential on small bench

Photo: 1191
JM55
High potential on low bench

Photo: 1192
JM56
Trail head to Chuchi Lake
Low potential due to sloping conditions

Photo: 1193
JM56
Trail head to Chuchi Lake
Low potential due to sloping conditions

Photo: 1194
JM58
Low potential due to sloping conditions

Photo: 1197
JM59
CMT
Low potential due to sloping conditions

Photo: 1198
JM60
Blazed line
Low potential due to undulating conditions

Photo: 1199
JM61
High potential on bench above stream

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1200
JM62
CMT
Low potential due to sloping conditions

Photo: 1201
JM62
CMT
Low potential due to sloping conditions

Photo: 1202
JM63
CMT
Low potential due to sloping conditions

Photo: 1203
JM64
CMT
Low potential due to sloping conditions

Photo: 1204
JM65
Low potential along lakeshore/ wetland

Photo: 1205
JM66
Low potential due to slope

Photo: 1206
JM67
Low potential due to sloping and undulating conditions

Photo: 1207
JM68
High potential along terrace

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1208
JM69
CMT
Low potential in undulating pine stand

Photo: 1209
JM70
High potential on small knoll

Photo: 1210
JM71
Low potential due to slope

Photo: 1211
JM72
Box trap on trail between Witch & Chuchi Lakes
Low potential due to slope

Photo: 1212
JM73
Box trap on quad trail
Low potential due to slope

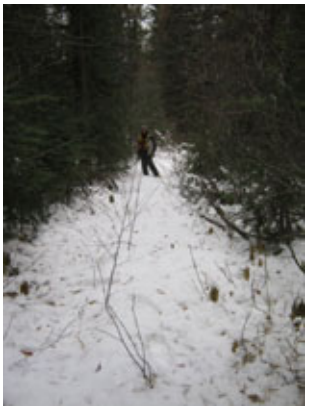


Photo: 1213
JM73
Quad trail
Low potential due to slope

Photo: 1214
JM74
Box trap on quad trail
Low potential due to slope

Photo: 1215
JM75
Low potential due to undulating conditions

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Witch Lake**

Client: **KDL Group** **Date:** **November 7-8, 2009**

Photo: 1216
JM76
High potential on ridge above Lake B

Photo: 1217
JM77
Low potential due to poorly drained conditions

Photo: 1218
JM78
High potential on terrace to Lake B

Photo: 1219
JM79
High potential on terrace/ ridge to Witch Lake

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Abas & Arehead Lakes**

Client: **KDL Group** **Date:** **November 10-13, 2009**

Photo: 1533
SK1
High potential on terraces adjacent to Witch Creek

Photo: 1538
SK2
Low potential around NCD

Photo: 1539
SK3
Low potential around NCD

Photo: 1540
SK4
Low potential due to consistent slope

Photo: 1543
SK4
Consistent slope on west side of Arehead Lake

Photo: 1541
SK4
View east across Arehead Lake

Photo: 1542
SK4
View east across Arehead Lake

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Abas & Arehead Lakes**

Client: **KDL Group** **Date:** **November 10-13, 2009**

Photos: 1550-1557
View east across Abas Lake from SK6

Photo: 1549
SK5
High potential on terraces adjacent to tributary to Abas Lake

Photo: 1558
SK6
Low potential on terrace to Abas Lake

Photo: 1564
SK8
Low potential around stream

Photo: 1565
SK9
High potential on terrace next to stream

Photo: 1566
SK10
High potential on terrace next to small stream

Photo: 1567
SK10
High potential on terrace next to small stream

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Abas & Arehead Lakes**

Client: **KDL Group** **Date:** **November 10-13, 2009**

Photo: 1568
SK11
High potential on terraces to Witch Creek

Photo: 1569
SK12
High potential on terrace to NCD

1571
SK13
Low potential on west bank of Lake C

Photo: 1582
View east across Lake C from SK13

Photos: 1577-1579
View north across Lake C from SK13

Archaeological Survey Photodocumentation

Project: **Community Forest Expansion** **Survey Area:** **Other Photos**

Client: **KDL Group** **Date:** **November 2-3 & 7-8, 2009**

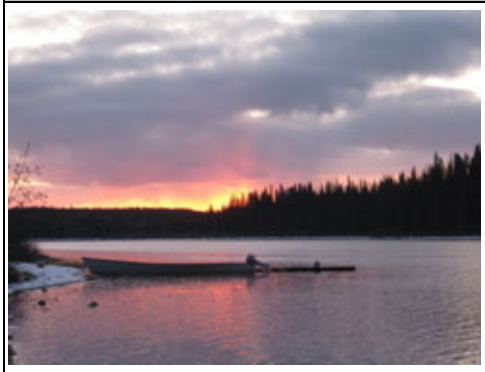


Photo: 1120
Chuchi Lake at sunset

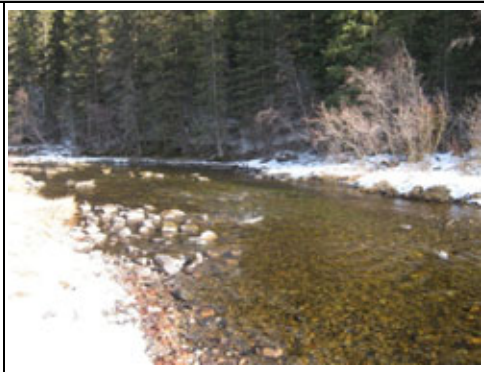


Photo: 1151
Witch Creek at Witch Lake

Photo: 1150
Witch Lake

Photo: 1149
Witch Lake

Photo: 1195
Cabin on north shore of Witch Lake, outside Project boundaries

Photo: 1173
Cabin on north shore of Witch Lake, outside Project boundaries

Photo: 1170
Bird cabin at west end of Witch Lake

Photo: 1123
Bird cabin at east end of Chuchi Lake