Historical Resources Impact Assessment Steepbank Mine Project Permit 95-083

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Prepared for:

Suncor Inc.

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952-2307

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This assessment report was prepared for Suncor Inc., Oil Sands Group (Suncor) by Golder Associates Ltd. (Golder) as part of the Suncor Steepbank Mine Environmental Impact Assessment (EIA). Mr. Don Klym was the Suncor project manager and Ms. Sue Lowell was the Suncor project coordinator. Ms. Sue Lowell and Mr. Jerry Walsh were Suncor's task leaders for the historical resources component. Mr. Hal Hamilton of Golder was the EIA project manager.

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EXECUTIVE SUMMARY

On behalf of Suncor Inc., Oil Sands Group, Golder Associates has completed an historical resources impact assessment of the proposed Steepbank Mine located north of Fort McMurray on the east side of the Athabasca River. This historical resources impact assessment was completed in accordance with terms of reference supplied by Alberta Community Development. Archaeologists completed examination of approximately 3,100 hectares of terrain that will be subject to disturbance by the new mine and associated facilities, scheduled to begin ore extraction in 2000.

In advance of the field component of the project, a sensitivity rating was completed of the proposed development area. Based on an analysis of the association of previously recorded sites in the regional study area with landforms and environmental criteria, the local study area was divided into areas exhibiting relatively low, moderate and high potential for historical resources. The model was refined following a low level overflight of the area. Foot traverses accompanied by visual observation and subsurface testing concentrated in the areas exhibiting moderate to high potential for historical resources.

As a result of the investigations, two small prehistoric sites were located. Both HfOu 1 and 2 are prehistoric isolated find sites. One of the sites is located on the upper terrace overlooking the Steepbank River and the other site is located at the head of Leggett Creek. Due to the small size of the sites and lack of temporally or culturally diagnostic artifacts, the thorough examination of the area, shovel testing of the sites and detailed recording is considered adequate mitigation. No further archaeological investigations are recommended at either site.

Although the field program was very thorough (extensive foot traverses were walked and nearly 1,300 shovel tests were excavated), no additional archaeological sites were recovered. The lack of prehistoric sites and evidence of historic use in the form of trails, structures, debris, etc. (other than one occupied cabin adjacent to the Athabasca River), suggests that the area was not extensively utilized in the past. This concurs with the traditional land use study completed on behalf of Suncor Inc., Oil Sands Group by Fort McKay Environmental Services Ltd. (1995). The traditional land use investigations suggest that dense vegetation and difficulty of access were two of the reasons contributing to the limited use of much of the area (Fort McKay First Nations 1994).

It is recommended herein that Suncor Inc., Oil Sands Group be allowed to proceed with developments of the Steepbank Mine without additional archaeological investigations.

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A INTRODUCTION

Golder Associates Ltd. has been contracted by Suncor Inc., Oil Sands Group (Suncor) to complete an historical resources impact assessment on the Steepbank Mine Project near Fort McMurray. This report is one of a series that address potential environmental and socio-economic impacts of the mine development (Figure A-1). Specifically, the historical resources impact assessment is based on testing the following hypothesis:

> *"Significant archaeological, paleontological or historical resources could be affected by the development and operation of the Steepbank Mine."*

This hypothesis (Number 36) and the hypothesis statements for the other reports in the series are presented in Table A-1.

The impact assessment was conducted in accordance with terms of reference verbally supplied by the Archaeological Survey and the Historic Sites and Archives Services, divisions of Alberta Community Development. Regulations administered under the Historical Resources Act and the Guidelines for Archaeological Permit Holders in Alberta were followed. This report describes the procedures and results of the impact assessment completed during the summer of 1995 under Permit 95-083 issued to Rebecca Balcom of Golder Associates. Appendix I contains a Glossary of Technical Terminology.

TABLE A-1
STEEPBANK MINE EIA IMPACT HYPOTHESES SUMMARY LIST

SOCIO-ECONOMIC	
1	The Steepbank Mine Project will contribute additional local, provincial and national benefits through additional employment, the procurement of goods and services required for the project and the payment of local, provincial and national taxes and royalties.
2	Construction-related activities and employment and the associated temporary increase in population will result in increased demands on services and infrastructure within the Regional Municipality of Wood Buffalo.
3	Operations-related employment and the associated increase in population will result in increased demands on services and infrastructure within communities in the Regional Municipality of Wood Buffalo.
4	The social stability and quality of life of communities within Wood Buffalo will be maintained as a result of the continued operation of the Suncor project, through development of the Steepbank Mine.
5	The Steepbank project will contribute to a loss in the traditional resource base of the Fort McKay community and displace some traditional activities.
6	The cumulative demands from the Suncor, Solv-Ex and Syncrude projects combined with the expected demands from existing populations within the Municipality will result in increased demands on local communities and affect the quality of life of those communities.
HUMAN HEALTH	
7	The health and well being of people who live, work or engage in recreational activities within the study area may be affected by changes to Athabasca and Steepbank River water quality caused by water releases resulting from extraction, processing and reclamation of oil sands from Suncor's existing and proposed mines.
8	The health and well being of people who live, work or engage in recreational activities within the study area may be affected by air emissions resulting from extraction, processing and reclamation of oils sands from Suncor's existing or proposed mines.
9	The health and well being of people who live, work or engage in recreational activities within the study area may be affected by cumulative exposure to chemicals associated with water and air emissions from Suncor's activities and other developments within the regional study area.
10	The health of people who in the future may occupy and/or use the land reclaimed from Suncor's Lease 86/17 and Steepbank Mine may be affected by release of chemicals from the reclaimed landscapes.
11	The health and safety of on site workers may be affected by development and operations of the Steepbank Mine and related facilities.
TERRESTRIAL	
12	Valued Ecosystem Components in the Athabasca River valley could be affected by the development, operation and reclamation of the Steepbank Mine and Lease 86/17.
13	Existing and future use of the area's landscapes could be limited by the development, operation and reclamation of the Steepbank Mine and Lease 86/17.
14	Visual integrity of the Athabasca River Valley could be affected by the development, operation and reclamation of the Steepbank Mine and Lease 86/17.
15	Biodiversity could be affected by the development, operation and reclamation of the Steepbank Mine and Lease 86/17.

16	Wetlands could be affected by Lease 86/17 and Steepbank Mine development and operation, including mine dewatering, changes to subsurface drainage, and reclamation release water.
17	Air emissions from the Suncor operation could have an impact on vegetation and soils, as well as aquatic environments.
WILDLIFE	
18	Mine development will result in changes in the availability and quality of wildlife habitat which will bring about a reduction in wildlife populations
19	Disturbance associated with mechanical noise and human activity may result in reduced abundance of wildlife.
20	Direct mortality of wildlife caused by mine development could result in reduced abundance of wildlife.
21	Mine development will disrupt the movement patterns of wildlife in the vicinity of the Steepbank Mine, thereby reducing access to important habitat or interfering with population mechanisms, resulting in decreased abundance of wildlife.
22	Mine development could cause a reduction in wildlife resource use (hunting, trapping, non-consumptive recreational use).
23	Development of the Steepbank Mine could contribute to a loss of natural biodiversity.
SURFACE AND GROUNDWATER RESOURCES	
24	Flows in the Athabasca and Steepbank Rivers could be significantly changed by mine development withdrawals for extraction, upgrading and/or reclamation
25	Ice jams, floods or other hydrological events could cause structure damage and flooding of facilities that will result in subsequent impacts to hydrological/aquatic systems and downstream uses.
26	Navigation along the Athabasca River could be affected by bridge construction.
27	Groundwater quality could be affected by contaminant migration from processing and extraction activities.
AQUATIC RESOURCES	
28	Construction, operational or reclamation activities might adversely affect aquatic habitat in the Steepbank River.
29	Construction, operational or reclamation activities might adversely affect aquatic habitat in the Athabasca River.
30	Water releases associated with construction, operational or reclamation activities might adversely affect aquatic ecosystem health in the Athabasca or Steepbank Rivers.
31	Water releases associated with construction, operational or reclamation activities might adversely affect the quality of fish flesh.
32	Construction, operational or reclamation activities might lead to changes in aquatic habitat and/or aquatic health which might result in a decline in fish abundance in the Athabasca or Steepbank Rivers.
33	Construction, operational or reclamation activities might lead to changes in fish abundance or quality of fish flesh which might result in a decreased use of the fish resource.
34	Construction, operational or reclamation activities might cause changes in Athabasca River water quality which limit downstream use of the water.

AIR	
35	Global climate change could be affected by increased release of greenhouse gases associated with production expansion related to the Steepbank Mine.
HISTORICAL RESOURCES	
36	Significant archaeological, paleontological or historical resources could be affected by the development and operation of the Steepbank Mine.

B PROJECT LOCATION, DESCRIPTION AND POTENTIAL IMPACTS

B1.0 PROJECT LOCATION AND DESCRIPTION

The Steepbank Mine is located on the east side of the Athabasca River, south of the confluence with the Steepbank River and approximately 27 km north of Fort McMurray, Alberta (Figure B1.0-1). The region utilized for preparing the archaeological overview does not have specific geographic boundaries, rather, it is amorphously defined by the relevant archaeological data. It includes the watersheds of the Muskeg, Clearwater and Athabasca Rivers. Site specific archaeological information was gathered from a baseline area, which coincided with that utilized in preparing an environmental impact assessment for the Steepbank Mine project. This area, which covers approximately 93,000 hectares, measures approximately 32 km east - west x 29 km north - south. It includes all or portions of Townships 90, 91, 92 and 93 - Ranges 8, 9, 10 and 11, West of the 4th Meridian.

For the purposes of the historical resources program, the local study area covers the footprint of the new mine and its associated facilities (Figure B1.0-2). The local study area includes the following sections or portions thereof:

- Sections 28, 29, 30, 31, 32, 33 - Township 91 - Range 9 - West of the 4th Meridian
- Sections 4, 5, 6, 7, 8, 9, 10, 17, 18, 19, 20, 29, 30, 31 - Township 92 - Range 9 - West of the 4th Meridian
- Sections 25, 36 - Township 92 - Range 10 - West of the 4th Meridian

The historical resources impact assessment was confined to the geographic extent of the disturbances, defined as of September 1996, approximately 3,100 hectares. Figure B1.0-2 includes these areas.

The proposed site for the Steepbank Mine was selected because of its proximity to existing processing facilities and because the location contains good quality, economically accessible ore.

It is expected that the Steepbank Mine will produce ore for two decades, from 2000 to 2020 (Figure B1.0-3).

The technology and equipment used for site preparation and mining at the Steepbank Mine will be similar to those used at the existing mine (Lease 86/17) located on the west side of the Athabasca River. The development process will begin with the removal of trees and vegetation from initial mining and overburden storage areas and areas where facilities (e.g., roads, barge landing, bridge, buildings and utilities) will be located. Drainage channels will be installed to promote drainage of wet areas.

Overburden removed during the mining process will be used in the construction of tailings dykes disposed into waste areas. Muskeg (and topsoil) is salvaged and stockpiled for future use in revegetation.

The oil sands recovered from the new mine will be transported in a hydrotransport pipeline for processing in the existing plant facilities on Lease 86/17.

As the mine advances, mined out areas will be reclaimed. Figure B1.0-3 illustrates the extent of disturbance which will have occurred at the final planned mine advance in 2020. By the time the mine is no longer active in 2020, approximately 3,000 hectares previously occupied by Lease 86/17 and the Steepbank Mine will be in various stages of reclamation.

B2.0 POTENTIAL IMPACTS

Heritage resources are non-renewable. They occur on and beneath the surface and may be altered, damaged or destroyed by development projects which modify the landscape. Heritage resource disturbance can result from two types of impacts: primary and indirect or direct impacts are those that occur immediately as a result of construction activities. Examples of these impacts include tree clearing, excavation or landform modifications, (e.g., levelling, cut and fill, borrow material removal, etc.). These activities can not only cause artifact breakage but can result in complete destruction of features and contextual information. The value of heritage resources can be damaged even if soil is not removed if, for example, soil layers are compressed by heavy equipment so that

an artifacts or features provenience (i.e., origin) becomes unclear. These impacts are of long term duration, the damage is done immediately during development and there is no recovery.

An indirect impact is one that occurs at a later date as a result of a direct impact. A sub-class of indirect impact is known as user impact. Newly created roads, trails and bridges open up areas which were previously inaccessible or little used. Because more people now frequent the area, the chances increase for vandalism of partially impacted known sites or even discovery and vandalism of unknown sites not originally affected by direct impacts. User impacts are also progressive through time.

All types of impacts must be recognized early in the development planning so that steps can be taken to prevent or mitigate the impacts.

C TERMS OF REFERENCE

Alberta Community Development provided verbal terms of reference for the historical resources impact assessment during a June 20, 1995, meeting between Mr. Brian Ronaghan of the Archaeological Survey, Mr. Dean Wetzel from the Historic Sites and Archives Program and Ms. Rebecca Balcom, Mr. Dave Kerr and Mr. Hal Hamilton of Golder Associates. These terms of reference, which were stated in the permit application that was subsequently accepted, required that:

- A search of the Provincial site database was completed for the area.
- The sensitivity rating for the Study Area be defined.
- A traditional land use study be used to complement the historical resources program.
- An overflight be completed to define the areas of sensitivity.
- Foot traverses be completed throughout the project area, with the level of intensity dependent on the perceived potential for historical resource sites. The foot traverses be accompanied by shovel tests to locate buried sites. The need for deep testing with the aid of a backhoe or other mechanical means was to be determined.
- Sites be recorded and assessed in accordance with current legislation.
- Artifacts be catalogued and analysed. If possible, organic samples be submitted for radiocarbon dating.
- A report be written on the procedures and results of the project. The report was to include a synthesis of the previous research in the area and an updated analysis of site distribution.

The terms of reference issued by Alberta Environmental Protection on August 9, 1995, requested the following:

- Evidence of consultation with the Historic Sites and Archives Service, Alberta Community Development be provided.
- A general overview of the results of any previous heritage resource studies that have been conducted on the subject area be provided.

An outline of the program and schedule of field investigations to assess archaeological, paleontological and historical significance of the proposed development was to be included.

The Tyrrell Museum has not requested a palaeotological impact assessment in advance of the project (Dean Wetzel, Historic Sites and Archives Services, pers. comm. 1996).

D HERITAGE RESOURCE MANAGEMENT

D1.0 OBJECTIVES

The process of historical resource management can be viewed as having three distinct stages. These stages are the overview or baseline data study, the historical resources impact assessment and historical resources impact mitigation. The present study includes the overview and impact assessment. Mitigation, if necessary, would be a separate phase of investigation.

The objectives of the overview are to:

- Gather and review preliminary data (secondary sources, previous research, general background material);
- Identify gaps existing in extant data;
- Identify past, current and future research problems and orientations;
- Study historical resource potential through use of maps, satellite imagery and aerial photographs;
- Plan the future research strategies, including the field component for the current project; and
- Make recommendations for the impact assessment phase of the project.

The primary objective of the historical resources impact assessment is conservation of historical resources. More specifically, the objectives are to:

- Identify and inventory historical resources within the project area;
- Evaluate the significance of the sites with respect to potential impacts;
- Gather data pertaining to ongoing research; and
- Make recommendations for the impact mitigation phase.

A mitigation stage was not completed as part of this project. This is the stage where the objective is to reduce development impact on historical resource sites by gathering data which would otherwise be irretrievably lost.

D2.0 RESOURCE MANAGEMENT

The following section is provided as a means of familiarizing the reader with the variety of archaeological and historic site types found in northern Alberta. This may be of value as background material for the discussion of previous archaeological research in the study area as well as for the sites recorded during this study.

D2.1 PREHISTORIC SITE TYPES

A site is any place, large or small, where traces of past human occupation or activity are found. Sites are most often identified by the presence of artifacts. Several types of prehistoric sites are possible in northern Alberta. These site types are described briefly below.

D2.1.1 Habitation Sites

A habitation site is defined very generally as the locus around which a group of people centred at least some part of their daily activities. Habitation sites can be further subdivided.

a) Base Camps

These sites are assumed to be relatively permanent habitations, occupied either seasonally or in some cases throughout the year. These sites contain a large amount of cultural material scattered over a large area. Often they are marked by evidence of structural remains and fires. These sites are usually located in the most favourable locations in a given area.

b) Transitory Camps

These camps are similar to the above but were occupied for shorter periods of time. These sites may indicate stop-overs for people moving through an area or simply short term campsites where a specific resource was utilized until it was depleted. These sites may also be marked by signs of dwellings and fire, but differ from base camps in that cultural remains are sparsely scattered.

c) **Hunting Camps**

These camps served as a base for hunting parties and are usually transitory in nature, probably being used for no more than several days. These sites have few artifacts, although evidence of dwellings and fires may be present. These sites are frequently marked by the presence of primarily male-associated artifacts, for example, projectile points.

d) **Fishing Camps**

As the name implies, the primary function of these sites was a home camp when utilizing fish resources. The sites are close to good sources of fish and are marked by artifacts associated with fishing (leisters, harpoons, fishknives, net weights, etc). Again, the sites may contain evidence of dwellings, fires and tool making.

D2.1.2 Kill Sites and Processing Sites

A kill site is a location where one or more animals were killed whereas a processing station is where the animal was butchered. These site types may be synonymous or discrete. The majority of kill sites located in the north are isolated. Kill sites and processing sites are often associated with hunting habitation sites where the meat would be taken for processing and consumption.

D2.1.3 Tool Manufacturing Sites

These types of sites provide us with information on lithic technology and, in many cases, on cultural affiliation. These sites are separated into two basic types.

a) **Quarry Sites**

A quarry site is where large quantities of raw lithic material were mined for later use as tools. These sites are found at the source of the raw material and are usually marked by large quantities of roughly worked stone with little or no other associated cultural material. In the regional study area, outcrops of Beaver River Sandstone are of particular significance.

b) **Lithic Workshops**

These sites are found at locations generally removed from the source of the raw material. The function of these sites was to further refine the raw material obtained from the quarry into more useable form. Artifacts consist of the manufacturing process wastage which is often relatively concentrated. Finished or partially finished tools may also be found.

D2.1.4 Ceremonial Sites

Ceremonial sites played some role in the religious or philosophical life of the local people. Again, ceremonial sites can be further subdivided.

a) **Rock Cairns**

These cairns are usually located in prominent locales such as the tops of hills. They may have served a ceremonial function or have marked a burial site. These cairns may also have served as route markers or simply meat caches.

b) **Rock Alignments**

These consist of a linear or representational configurations of stones or cobbles, which may range from simple to complex in design.

c) **Pictographs**

These sites consist of rock paintings, usually with little or no associated cultural material. They may be found on glacial erratics, rock faces or cave walls.

d) **Petroglyphs**

These sites consist of carvings in rock and are similar to pictographs.

e) **Spirit Quest Sites**

These sites are very difficult to find archaeologically since often only the most negligible traces of human use are present. They are found in isolated localities such as hilltops and high cliffs or peaks, served as a place for prayer and meditation.

f) **Burial Sites**

Burial sites are marked by the presence of human remains often associated with grave goods such as pottery or personal tools. They may be marked by cairns or depressions, or may be unmarked. Burial sites can be multiple (associated with a village) or isolated.

D2.1.5 Miscellaneous

Some sites are difficult to classify and are described below.

a) **Lookout Sites**

These sites are found in areas where a good view of the surrounding country can be obtained. They probably served as lookouts for game or human activity. There may be evidence of tool making, fires, and occasionally temporary shelters.

b) **Isolated Finds**

There are sites where a very limited scatter of cultural debris is found, often only individual artifacts. These sites may represent places where tools were secondarily deposited by natural forces such as water.

c) **Unknown**

Often small sites are found whose function cannot be determined on the basis of the archaeological evidence.

D2.2 MITIGATION ALTERNATIVES

Various mitigation options can be employed to protect heritage resource sites from development impacts. The mitigation that is chosen depends on several factors, particularly the type and significance of the site and the type of development. The available options are briefly detailed below.

D2.2.1 Avoidance

Avoidance of heritage resource sites is the most effective mitigative alternative. Avoidance applies to all phases of construction from preliminary geological testing right through to backfilling,

revegetation or landscaping. Avoidance of heritage resources can be considered for those sites which exhibit significance.

In the event that avoidance of heritage resources is not a viable option, other mitigation techniques are available. These techniques are designed to salvage information from the sites which would otherwise be irretrievably lost as a consequence of development.

D2.2.2 Mapping

Mapping is a desirable form of mitigation where prehistoric rock feature sites or historic sites are involved. Mapping can more clearly define the type of site, its lateral extent, its position in the context of the development and where features are poorly defined (in a perceptual sense), to reveal the exact configuration. The need for subsequent mitigation phases, such as complete or partial avoidance or test excavation, can be clarified through detailed mapping.

D2.2.3 Test Excavation

Test excavation involves small scale excavation in a controlled manner with screening of back dirt. The purpose of a test excavation is to evaluate sites determined on the basis of surface indicators or shovel testing to be of such significance that further investigation is warranted. These investigations may be required to explore cultural material concentration/density; site boundaries; chronological/cultural affiliation; vertical extent/number of components; and potential for further excavation (i.e., site significance, sampling procedures, cost/benefit evaluation).

D2.2.4 Systematic Collection

In sites where a large quantity of cultural material is present on the surface either through natural or man-made exposures, systematic surface collection is a form of mitigation which seeks to establish provenience for this material or to enable its collection in a controlled, unbiased manner. A procedure which accurately records provenience for all artifacts collected, allows for delineation of material distribution and density and ensures that no significant areas escape collection. Both quantitative and qualitative statistical data can be derived from this approach.

D2.2.5 Salvage Excavation

Salvage excavation is the final mitigation alternative. It is reserved for sites exhibiting exceptional potential for scientific investigation and only recommended when no other alternative is feasible.

E ENVIRONMENTAL CONTEXT

The anthropological theory of environmental determinism suggests that, to a great extent, the environment conditions man's behavioural and cultural adaptations. This theory was first coined by seventeenth century English philosopher John Locke and is one of the basic foundations upon which the first formal definitions of culture were built (Harris 1968:12-13). The northern environment would condition much of the activities in which archaeologists were interested. These include patterns of settlement, resource exploitation, seasonal movement, travel routes and the behaviours these activities imply. Therefore, to gain a perspective on the prehistoric use of the project area and its environs, the appropriate environmental variables must be considered.

Archaeologists are not only better able to find sites when they understand the environmental conditions, but also to interpret them when they understand the context within which they existed. The most pertinent variables are interconnected and consist of the physical aspects of the land (topography, drainage, climate and soils) and resource availability (flora, fauna, lithic materials and water). Linking both are the cultural activities of site selection, travel within and through the area and resource exploitation.

E1.0 PHYSICAL ENVIRONMENT

E1.1 PHYSIOGRAPHY AND BEDROCK GEOLOGY

Physiography, including the bedrock geology and drainage, are hypothesized to have affected choice of travel route, destination and speed of travel for prehistoric hunting groups.

The local study area is located along the Athabasca River at its confluence with the Steepbank River. The regional study area exists within the Clearwater Lowlands physiographic region which can be further subdivided into the Clearwater Plain and the Docer Plain. These Plains are covered by a mantle of glacial drift with bedrock exposures restricted to the deeply entrenched river valleys and the Clearwater Plain. Some important bedrock formations in the region include the Cretaceous aged Clearwater and McMurray formations, and the Devonian aged Waterways formation. These bedrock formations are overlaid by Quaternary deposits including glacial till, glaciofluvial deposits including

kames, outwash and meltwater deposits and more recent aeolian, lacustrine and alluvial deposits. Portions of the McMurray formation occasionally outcrop in the regional study area where the depth of the overlaying sediments is limited.

The Clearwater and Docer Plains also contain an extensive array of poorly drained depressions. Along the dominant river valleys like those formed by the Athabasca River and its tributaries, the terrain is considerably more diverse. There are many large ridges, terraces, knobs and glacial lake beach ridges (Van Dyke and Reeves 1985). The region between the Athabasca and Clearwater Rivers also exhibits slumping.

The upper portion of the lower member of the McMurray formation has been identified as the source of Beaver River Sandstone (Ives 1985; Fenton and Ives 1990). This lithic resource is a light gray, medium to fine-grained quartz sandstone cemented in a silica matrix. It was intensively used by the First Nations people in the area for thousands of years. The identification of the lithic source and the composition of the material is an important step in understanding the settlement patterns of the people who inhabited the region. Examples of the material have been located in sites throughout the region and onto the Northern Plains at sites as old as 9,000 years (Linnamae 1993).

E1.2 CLIMATE

Climates over wide areas as well as specific microclimates within local areas greatly influence the physical environment and the resources available to the people inhabiting the region. The regional study area is part of the Mid Boreal Mixedwood Ecoregion, which is the largest ecoregion in the province (Strong and Leggat 1992:37). This ecoregion occurs primarily north of the 55° N latitude and makes up 31.8 % of the province. It closely corresponds with the moist Subregion of the Boreal Mixedwood identified in other schemes (Strong and Leggat 1992). The region is characterized by having cool wet summers and cold dry winters. The annual precipitation totals approximately 397 mm with July and June being the wettest months. Summer months average approximately 240 mm of precipitation annually. Winter months are considerably drier, averaging only 64 mm of precipitation each year (Strong and Leggat 1992). The average annual temperature is less than 1 °C. Summer temperatures typically range from 7.3 to 19.6 °C, with an average of 13.5 °C. Winter temperatures range from -18.6 to -7.7 °C with an average of -13.2 °C.

The above description is of the present climate, however, climatic variations during prehistory have been documented. By 10 000 B.P. Laurentide Glaciers were relegated to Northern Saskatchewan and Manitoba with some isolated decaying blocks in spots throughout the prairies until 9000 B.P. (Bobrowsky et al. 1990:92). During this glacial retreat, the climate appears to have been characterized by warmer winters, cooler summers, and with less precipitation than present conditions. Severe, cold northerly winds may have also been present at various times during this period. There was a general movement from the south of flora and fauna as glaciers retreated. Premier plants associated with this movement include aspen, sagebrush and birch.

The Hypsithermal or Altithermal period was a general warming period which lasted from approximately 8000 to 5000 B.P. (Bobrowsky et al. 1990). The grasslands reached their maximum northward and eastward extent during this period. This was followed by a general trend towards cooler and moister conditions reaching their prime around 2000 B.P. (Vance 1990).

More important to the topic of prehistoric land use of a particular region is the topic of microclimate. Microclimate is defined as the temperature, precipitation and wind velocity in a restricted or localized area, site or habitat. The identification of favourable microclimates is essential to predicting the location of prehistoric sites. The identification of these areas may also be used in the reconstruction of prehistoric settlement and subsistence patterns. Variables affecting microclimate are elevation, slope in relation to the sun, exposure to the prevailing winds and vegetation.

Microclimatic factors, such as the exposure to the wind and sun, are variables which probably influenced the choice of a particular site locale. Hill top locations are well-drained, are typically level, and receive the most wind (which can serve to keep insects and smells away), while offering a view (of the scenery as for game and/or intruders). South-facing slopes are generally warm and dry while north facing slopes are cooler and the soil is more apt to be moist. These and other factors were important factors in the decision making process when habitation and activity areas were being chosen in the past.

E1.3 SOILS

The soils of an area not only reflect its past climate and geologic history, but greatly influence vegetational patterning which has significant implications in terms of resource availability, as discussed below.

The uppermost sediments of the regional study area consist of aeolian sands as well as sediments deposited by the Athabasca River overlaying glaciolacustrine and glaciofluvial sediments and tills (Fenton and Ives 1990). There is a variety of soil types present in the local study area. Soils along the terraces and slopes of the Athabasca River Valley consist mainly of Orthic Eutric Brunisols, Orthic Gray Luvisols and Orthic Regosols. The texture of the soils is predominantly sandy loam (Leskiw, Laycock and Pluth 1995). To the east and west are undulating organic and lacustrine plains (Strong and Leggat 1992). These upland and midland areas are dominated by Typic and Terric Mesisols (Leskiw, Laycock and Pluth 1995). The ground surface is typically level, although it is often poorly to very poorly drained.

Topography ranges from gently undulating to relatively steep along some river banks. Soil depths are dependent on slope position and exposure.

E2.0 RESOURCE AVAILABILITY

E2.1 VEGETATION

Vegetation is necessary for humans for food and fuel as well as habitat for animals utilized by hunters. Its availability is thought to have influenced prehistoric travel, settlement and subsistence patterns.

The study area is located in the Mid Boreal Mixedwood ecoregion of northeastern Alberta (Strong and Leggat 1992). This woodland is the largest and densest of the forest regimes found in the Boreal Forest region (Meyer 1983:142). It is vegetated by a variety of trees including conifers such as white spruce (*Picea glauca*), black spruce (*Picea mariana*), balsam fir (*Abies balsamifera*) and jack pine (*Pinus banksiana*) and broad-leaved species such as trembling aspen (*Populus tremuloides*),

balsam poplar (*P. balsamifera*) and willows (*Salix* spp.). This area supports a wide variety of plants and animal communities living in a diversity of micro-habitats. The size and location of the habitats are affected by a combination of climate, wind, hydrology, altitude, sedimentation and forest fires (Meyer and Hamilton 1994:99).

The Mid Boreal Mixedwood ecoregion is dominated by trembling aspen and balsam poplar with an understory of herbs and deciduous shrubs like bluejoint (*Calamagrostis canadensis*), wild sarsaparilla (*Aralia nudicaulis*) and prickly rose (*Rosa acicularis*). These latter species tend to decline as the overstory thickens. Left untouched, trembling aspen and balsam poplar are replaced by white spruce and balsam fir. However, due to the frequency of forest fires in the region the presence of these latter species is rare (Strong and Leggat 1992). As trembling aspen and balsam poplar recover relatively quickly from fires and are thus far more plentiful.

Aspen and balsam poplar are usually associated with fine grained, wet soils that are still well drained. The dominance of these trees in the region is limited by the availability of water and the type of soil. Thus, upland areas are characterized by mixed deciduous forest, while lower regions of little moisture content usually support only aspen. Sandy areas contain jack pine with an understory of bearberry (*Arctostaphylos uva-ursi*), blueberry (*Vaccinium myrtilloides*) and a variety of species of shrubs and mosses (Thorpe 1993).

Wetter areas tend to hold more organic nutrients and thus support a different plant regime. Low lying depressions, being quite poorly drained, support peat and muskeg. Vegetation in these areas is dominated by black spruce, Labrador tea (*Ledum groenlandicum*), bog cranberry (*Vaccinium vitis-idaea*), sedges (*Carex* spp.) and mosses. River terraces, lake and stream margins are associated with balsam poplar, willow and sedge. Finally, in extremely wet areas there are sedge meadows.

E2.2 FAUNA

Fauna indigenous to this region includes a variety of large ungulates such as moose (*Alces alces*), caribou (*Rangifer tarandus*), bison (*Bison bison*) and elk (*Cervus elaphus*). However, elk and bison have been greatly reduced in numbers during the historic period. Bison in the area are a subspecies referred to as Wood Bison (*Bison bison athabascae*). The original distribution of Wood Bison is not entirely understood, but they appear to have been restricted to the forested regions of northern

Alberta, northeastern British Columbia, northwestern Saskatchewan and southwestern Northwest Territories. Sub-fossil specimens have also been recovered from Alaska and Yukon territories (Gates, Chowns and Reynolds 1992:140-141). The subspecies of bison known as the Plains Bison (*Bison bison bison*) was present throughout the southern half of Alberta prior to its extirpation by 1885 (Gates, Chowns and Reynolds 1992:140).

Mule deer (*Odocoileus hemionus*) also historically range up to the southern shore of Great Slave Lake and the Liard River, inhabiting open coniferous forest, sub-climax brush, aspen parklands and steep broken terrain (Banfield 1987:390). They do not typically inhabit areas of deep climax coniferous forest and open prairie. White-tailed deer (*Odocoileus virginianus*), although present in the area today are recent arrivals to the area. Their current range extends up the Athabasca River valley to the southern shore of Lake Athabasca. In the past white-tailed deer populations have been restricted to more southerly regions (Banfield 1987:394).

Other historically known large mammals include grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*), wolf (*Canis lupus*), lynx (*Lynx lynx*), wolverine (*Gulo gulo*)and river otter (*Lutra canadensis*). Grizzly bear have been extirpated from the region as they have throughout a large portion of Canada and the United States. Mountain lions (*Felis concolor*) may have been present in the area in the past occasionally, although their recorded range does not extend much beyond the modern Fort McMurray region of the Athabasca River valley (Banfield 1987:348). Smaller mammals in the region include snowshoe hare (*Lepus americanus*), fox (*Vulpes* sp.), badger (*Taxidea taxus*), porcupine (*Erethizon dorsatum*), mink (*Mustela visons*), marten (*Martes americanus*), weasel (*Mustela* spp.), fisher (*Martes pennanti*), striped skunk (*Mephitis mephitis*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*) and a number of squirrel, mouse and vole species.

A wide variety of birds, fish and amphibians were also present in the region. Canada goose (*Branta canadensis*), mallard (*Anas platyrhnchos*), loon (*Gavia* sp.) and pelican (*Pelecanus* sp.) are some of the seasonal water birds in the area. Upland game birds include a variety of grouse and ptarmigan species. Rivers and lakes in the region contain a variety of fish including northern pike (*Esox lucius*), walleye (*Stizostedion vitreum*), yellow perch (*Perca flavescens*), goldeye (*Hiodon alosoides*), longnose sucker (*Catostomus catostomus*), lake whitefish (*Coregonus clupeaformis*) and in some areas arctic grayling (*Thymallus arcticus*).

E2.3 WATER

Water courses were an important factor in regulating prehistoric subsistence and settlement patterns. The area lakes and rivers not only provided water for drinking and cooking, but also supplied food in the way of fish, waterfowl and aquatic mammals. Waterways were also an important travel route for the First Nations people. Rivers and lakes were travelled by canoe in the spring summer and autumn and by foot or dog team in the winter when the ice was solid. During spring breakup and in the autumn while the ice was too soft to be travelled on, the people remained in relatively sedentary camps. Large gatherings were common in the spring and early summer throughout the forest (Meyer and Hamilton 1994). These gatherings may have been held at the same location each year. These areas were intensively utilized and should be highly visible in the archaeological record. Indeed, several of these aggregation centres have been mapped along the Saskatchewan River indicating the prominence of these sites in the boreal forest (Meyer and Thistle 1995).

E3.0 PALEOENVIRONMENT

The reconstruction of the past or paleoenvironments in the north is still in its infancy. Few intensive studies have been completed even though the large array of moist depressions would support intensive research into the paleoclimate of the region. Until such research is completed, paleoenvironmental reconstructions of the area will continue to rely on a few localized studies and the more intensive research now being completed on the Northern Plains and in the parklands ecoregions (e.g., Vance 1990).

Archaeologists have become increasingly interested in the effects of micro-climatic change, changes that vary considerably from between regions. The climatic effects of the waning continental ice sheet combine to produce a complex Holocene paleoclimatic record that differs from place to place. It is only by establishing local independently dated paleoclimatic records that an accurate picture of Holocene paleoclimatology can ever be established (Schweger 1984:5). Only then can archaeologists glean information about how prehistoric peoples may have been affected by changes in the climate.

Saying this, the most commonly used system is still that developed by Blytt (1876). Their research on temperature and precipitation levels resulted in the definition of six episodes in the Holocene. These episodes include the Preboreal, Pleistocene–Holocene transition, Boreal, Atlantic, Sub-Boreal and Sub-Atlantic. It is generally agreed that the transition between these episodes was relatively rapid, though the absolute timing of these transitions still remains in doubt.

Almost all of northern Alberta was under ice during the Wisconsin glaciation in the last part of the Pleistocene. The Wisconsin glaciation was formed by two great glaciers, the Cordilleran, which covered all of British Columbia to the east edge of the Rocky Mountains, and the Laurentide, which covered almost all of Canada east of the foothills of the Rocky Mountains. The timing of the retreat of these glaciers is still under dispute. Denton and Hughes (1981) suggest that the area was deglaciated between 12 000 and 11 000 B.P. Clayton and Morran (1982) believe that the retreat may not have occurred until some 1,000 years later at around 10 500 B.P. Their data is based on the rejection of all non-wood carbon samples due to the possibility of contamination (Vickers 1985:23). Clayton and Moran (1982) believe that lignite and shale fragments may have contaminated the non-wood samples causing the radiocarbon dates to be slightly older. Research by Litchi-Fedorovich (1970) at Lofty Lake and Alpen Siding Lake in northern Alberta supports an early date for deglaciation. A radiocarbon date of 11 400 ± 190 B.P. has been obtained on soils from these lakes (Ives 1985).

By 10 000 B.P. the Laurentide Glacier was relegated to Northern Saskatchewan with some remaining isolated decaying blocks in scattered locations throughout the boreal forest and prairies until 9000 B.P. (Bobrowsky et al. 1990: 92). Carbon dates obtained on basal peat deposits in the Caribou Mountains of 8600 ± 100 B.P. (S-116) suggest that these mountains were a glacial refugia (McCallum and Wittenberg 1962: 74). However, the Birch Mountains were likely fully exposed during the final retreat of the Laurentide ice sheet (Bayrock 1961: 49-50).

With the retreat of the glaciers and the subsequent run-off of large quantities of water, Glacial Lake Tyrrell was formed along what is now the Peace River and Athabasca River Valleys. These conditions left the study area covered with a mantle of glacial till and glaciofluvial deposits. Bedrock exposures are only associated with the major river valleys and the Clearwater Plain (Van Dyke and Reeves 1985).

The Pleistocene-Holocene transition period began with the end of the Laurentide ice sheet. As the glacier retreated northwards, flora rapidly began to form along the newly opened landscape. The first plants to enter this new environment were aspen, sagebrush and birch. For instance, the basal or lowest stratigraphic zone at Lofty Lake is associated with just such a late Pleistocene pioneer forest community (Litchi-Fedorovich 1970).

The end of the Pleistocene also saw the rapid extinction of a number of mammalian species in the New World. Most dramatic is the disappearance of the megafauna, animals like the mammoth, mastodon, camel, horse, giant sloth, giant beaver and saber tooth cats. This extinction occurred over a relatively short time near the beginning of the Holocene Epoch. The reason for these extinctions has generated considerable controversy. Some argue that the changes in the environment brought on by the retreat of the glaciers and the subsequent warming of the continent were responsible. Indeed Webb (1984) has demonstrated a strong correlation between glacial retreats and global extinctions. Others disagree with this hypothesis and have tried to demonstrate that over hunting by early Clovis Culture hunters was responsible (Martin 1984; Martin and Wright 1967). They argue that the glaciers underwent a considerable number of advances and retreats previous to the Holocene with little effect on animal species. They argue that the rapidity of the early Holocene extinctions demonstrates that natural forces alone could not account for the extinctions.

It has been questioned how human hunters could have eliminated such a large number of species in such a short time. It has also been demonstrated that extinctions were not limited to the megafauna; other smaller species like rodents also died out around the same time. It seems more likely that a combination of environmental pressures and over hunting led to the demise of the megafauna (Guilday 1984). These animals would have been under considerable selective pressures with the retreat of the glaciers; smaller animals would have been better adapted to the environmental changes that were occurring. A shorter growth season and a reduction in nutrient diversity would have put extreme adaptive stress on the animals. Hunters would have provided the extra pressure that could have pushed these animals in to extinction.

Soon after the retreat of the glaciers, present day varieties of fauna and flora came to dominate the landscape. The rest of the Holocene is characterized by variations in temperature and precipitation that resulted in sometimes major changes in the ranges of the biotic community. The first of these major changes occurred between 8000 – 5000 B.P. Known as the Altithermal or Hypsithermal, it

was characterized by a general increase in temperature and decrease in available moisture. This period saw a general reduction in lake size and stream flow (Bobrowsky et al. 1990:93). Another result of this warming trend was that the Boreal Forest–Parkland border moved as much as 100 km north of its present day position.

The Altithermal was followed by a general trend towards cooler and moister conditions which reached its peak around 2000 B.P. Modern climatic conditions begin around 1500 B.P. (Vance 1990), though analysis of pollen remains from Lofty Lake shows the present day regimen of spruce, birch and alder (mixedwood forest) was permanently established somewhat earlier in Northern Alberta at around 3500 B.P. (Ives 1985). The climatic optimum of the late Holocene was reached around 1150 - 850 B.P. as a part of the Neo-Atlantic. It was followed by the "Little Ice Age" (400 - 100 B.P.) where the climate was significantly cooler than present. (Meyer and Hamilton 1994: 100).

F CULTURAL SETTING

F1.0 PREHISTORIC PERIOD

Archaeological evidence of Alberta's First People extends back approximately ten thousand years in northern Alberta. Prior to this, the land was covered by the large ice sheets of the last glaciation. The people of Alberta's northern boreal forest were nomadic, travelling by foot, dog team and canoe. Archaeologically, a cultural sequence may be constructed based on the different cultural materials that the people have left behind. The cultural sequence in this region is based primarily on changes through time in projectile point technology (Figure F1.0-1). Ceramic materials are also used to distinguish archaeological cultures, but pottery is not commonly found in the region. The cultural chronology of the boreal forest in this region is not as well understood as the plains region to the south where more systematic archaeological investigations have been completed. The cultural sequence discussed in detail by Van Dyke and Reeves (1985) will be followed in this discussion.

F1.1 THE EARLY PREHISTORIC PERIOD: 10 500 - 7500 yrs. B.P.

Most archaeologists believe that the native people of North America began to move onto the continent during the last ice age while the sea levels were considerably lower than at present. Due to the low sea levels, the Bering Strait was a wide, open plain which extended from Siberia to Alaska. It is believed that populations of people migrated into this previously uninhabited area as animal and plant life became plentiful. The people would have continued to expand their territory into the New World as the ice retreated and adequate food supplies became available. One possible avenue which may have been used to enter the interior of the New World could have been by travelling along the west coast of North America. A second route may have included the use of an ice-free corridor which was present along the eastern edge of the Rocky Mountains as the Keewatin and Cordilleran Ice Sheets began to retreat. Some indigenous people do not believe that their people entered the New World this way and state that they have lived here since creation.

The Early Prehistoric Period is characterized by the presence of spear heads in the archaeological assemblages. Little information from the early part of the cultural sequence has been recovered from the study region. Although Clovis is the first well documented archaeological culture found

in North America, there have been no Clovis sites located in the regional study area. These people were highly nomadic, primarily hunting the mega-fauna of the Late Pleistocene such as mammoth, camel, bison, musk-oxen and horse as well as a variety of smaller game and aquatic resources. The next archaeological culture is Folsom which is well established on the Northern Plains by 10 000 years B.P. Clovis and Folsom projectile points are well crafted spear heads which are thinned with precise flakes taken off of the basal end. These thinning flakes were removed to facilitate hafting the spear head to the shaft and are often referred to by archaeologists as flutes. There have been no fluted projectile points recovered from the regional study area, although one fluted point made of Beaver River Sandstone was recovered near Cold Lake (McCullough Consulting Ltd. 1981). Beaver River Sandstone is a distinct lithic material which has a localized geological source along the Beaver River and parts of the Athabasca River (Fenton and Ives 1990). The presence of a projectile point made from this material suggests that people were at least temporary residents of the region at this time.

Evidence from across northern Canada supports the presence of these people in the recently deglaciated forests and lake edges. The next two phases in the cultural sequence are identified by the presence of unfluted spear points known as Agate Basin and Lusk projectile points which date from about 8500 - 7500 years B.P. (Meyer 1983, Van Dyke and Reeves 1985). Agate Basin projectile points are the earliest cultural materials that have been identified in the Athabasca River valley to date (Fenton and Ives 1990:125). Lusk and Agate Basin points have been recovered from eroding banks of Lake Athabasca as well as Black Lake in northern Saskatchewan (Minni 1976:158). One site in the Wood Buffalo Provincial Park may also contain Lusk points (Stevenson 1981). Projectile points of this type are also found in the Keewatin District of the Northwest Territories (Van Dyke and Reeves 1985). These projectile points are common along Glacial Lake Agassiz beach ridges and similar points appear along beach ridges of the Glacial Great Lakes. These people were fishers and hunters of boreal fauna, not Plains people who moved into the forest.

There is a lack of direct evidence of occupation in the Athabasca River valley immediately after Agate Basin and Lusk. Indirect evidence, based on artifacts found outside the region which are made from local materials suggests that the next occupants of the region are associated with the Cody complex from the plains. Cody complex people were well adapted to life on the plains moved into or just south of the region approximately 9,500 years ago. The people of the Cody complex

were specialized hunters who concentrated primarily on large scale bison procurement. Cultural material from this time period is not common in the Lower Athabasca River valley. One Eden projectile point made from Beaver River Sandstone was recovered at a site near Barrhead, Alberta (Fenton and Ives 1990:124). Indirect evidence of an association in the study area comes from the recovery of two complete projectile points and one basal fragment thought to be made of Beaver River Sandstone from the Heron Eden site (EeOi 11) in Southwestern Saskatchewan (Corbeil 1995). The site has been dated to approximately 9500 years B.P. and is a bison kill/butchering site.

The presence of Beaver River Sandstone artifacts outside of the Lower Athabasca River valley supports that people were present in the area during the Early Prehistoric Period. It is most plausible that the lithic material was traded to groups from outside of the area by the local inhabitants. However, it is unlikely that these specialized bison hunters would have moved into the forest due to the drastic change in lifestyle that it would have entailed (Van Dyke and Reeves 1985). Nor is it likely that people who had a specialized plains adaptation would have the geographical knowledge of the region that would have allowed them to enter the forest and obtain raw materials. Cody complex materials on the Plains began to disappear approximately 8000 years B.P.

F1.2 EARLY MIDDLE PREHISTORIC I: 7500 - Circa 4000 - 3000 yrs. B.P.

The Early Middle Prehistoric Period falls within the Altithermal climatic period which saw an increase in average annual temperatures and a decrease in the average annual precipitation. As previously discussed, this climatic shift drastically altered the boundaries between the major ecological regions in the area. The southern boundary of the boreal forest moved over 100 kilometres to the north in some areas. This climatic change also caused a drop in the levels of many lakes and rivers and likely an increased level of erosion.

The beginning of the Middle Prehistoric Period is characterized by the first appearance of dart points in the cultural chronology. Dart points are typically slightly smaller than spear points and are associated with the advent of the spear thrower or atlatl. The use of spear throwers greatly improved the distance a spear could be thrown. Mummy Cave/Gowen projectile points are typically associated with Early Middle Prehistoric Period sites on the Northern Plains, but are notably absent from the Lake Athabasca and Lower Athabasca region. It has been suggested that the region may have been only sparsely occupied due to low resource values in the environment (Van Dyke and

Reeves 1985). However, the shift in the environment, although disruptive, may not have been as debilitating as the environmental shift which took place in the drier plains regions to the south. Low population is not necessarily the only or the most plausible explanation for the paucity of archaeological sites in the area. The apparent break in the cultural sequence may be associated with environmental factors rather than a decrease in population. The absence of these projectile points from geographical features such as raised beach ridges should not be a surprise due to the lower water levels of the Altithermal. The lakes were considerably lower at this time and any lakeshore sites would now be submerged or eroded.

North of Lake Athabasca several sites relating to a tundra adapted culture known as the Shield Archaic have been documented (Wright 1975). These materials date to approximately 6200 - 3750 years B.P. and are characterized by a series of large side notched dart and spear points. Other materials associated with the Shield Archaic include bifacial and unifacial knives, pièces esquillèes (wedges), and chi thos (Meyer 1983:148). Early Shield Archaic sites are rare in the area and may be inundated by current water levels, but Middle and Late Shield Archaic sites are present, especially along the north shore of Lake Athabasca (Van Dyke and Reeves 1985:83). These latter materials are nearly absent from the south shore of the lake and do not seem to extend south of the lake. Shield Archaic cultures were replaced by another tundra based cultural group around 3500 B.P.

During the occupation of the northern area by the Shield Archaic culture, at approximately 5000 years B.P., the climate shifted again and the treeline began to move south again. By 4000 - 3500 years B.P. current ecological boundaries were essentially established. The fauna of the region also began to shift from being dominated by bison to a wider variety of species such as the moose, elk, deer and caribou which are present today. Three separate cultural traditions border the northeast boreal forest of Alberta during this period. These include two cultures (Oxbow, McKean) typically associated with the Northern Plains and one unnamed forest tradition (Van Dyke and Reeves 1985:82). The McKean complex appears on the Northern Plains at approximately 5000 - 4500 years B.P. McKean points are rare in the boreal forest of Alberta, but are found in the Parkland and boreal forest edge to the south (Van Dyke and Reeves 1985). The Oxbow culture dates to approximately 4500 - 3000 years B.P. Oxbow projectile points have been observed along the Peace River, Lesser Slave Lake, and Lakelands districts (McCullough 1982). Materials from the unnamed boreal forest culture have been observed in sites throughout northern and central British Columbia and Alberta

including parts of the Northern Rockies, Peace River and as far south as the Athabasca River valley (Van Dyke and Reeves 1985:82).

Replacing the Shield Archaic tradition, north of Lake Athabasca, the Arctic Small Tool tradition appeared at approximately 3500 years B.P. The Arctic Small Tool tradition is characterized by small, finely crafted lithic tools (Van Dyke and Reeves 1985). Like the preceding Shield Archaic, sites relating to the Arctic Small Tool tradition are common on the north shore of the lake and only a few small sites appear on the south shore. This cultural complex lasts, in this region, from approximately 3500 - 2700 years B.P.

F1.3 LATE MIDDLE PREHISTORIC: 2650 - 1200 yrs. B.P.

Taltheilei projectile points begin to appear at approximately 2700 B.P. and are divided by archaeologists into a number of more refined periods/complexes. The Early and Middle Taltheilei date to 2650 - 2100 and 2100 - 1200 years B.P. respectively (Meyer 1983:150). They are represented by a variety of large stemmed and occasionally side-notched spear heads and dart points (Wright 1975, Van Dyke and Reeves 1985). Taltheilei projectile points are technologically unrelated to the Arctic Small Tool tradition and appear to relate to an influx of boreal forest adapted people from the south and west, possibly from the Peace River region (Van Dyke and Reeves 1985:92). Materials relating to this culture are found throughout the northern boreal forest of Alberta.

F1.4 LATE PREHISTORIC PERIODS: 1200 - 200 yrs. B.P.

Late Taltheilei assemblages contain large lanceolate points as well as arrow points. Bone projectile points also occur in some Taltheilei assemblages. The introduction of bow and arrow technology is considered the beginning of the Late Prehistoric Period which lasted until the introduction of European firearms. The Late Prehistoric Period begins at approximately 1200 years B.P. in this region. Within the Lower Athabasca region the Taltheilei tradition, as a whole, is the most commonly recognized diagnostic.

The Taltheilei people also appear to be the first in the region to make a large percentage of their lithic tools out of the local Beaver River Sandstone. The Beaver River Sandstone type source was

originally defined as "the siliceous cemented sandstone found at the Beaver River Quarry site (HgOv 29) and the subadjacent Beaver River borrow pit." (Fenton and Ives 1982:175). The type area for this material was stated to be the area surrounding the quarry and gravel pit approximately one township in size with outcrops occurring in localized regions along the Athabasca River (Fenton and Ives 1990). The material is a fine to medium grained, light grey, bimodal, silica cemented sandstone which may contain a low percentage of fine black grains (Fenton and Ives 1982). The name Beaver River Sandstone is used by archaeologists to describe the material that has this specific composition and localized source area. The material found at the Beaver River Quarry is not fully consistent with some archaeological specimens recovered from sites in the region, leading Fenton and Ives (1990:133) to conclude that an additional high quality outcrop has not been recorded.

Beaver River Sandstone has also been called Beaver Creek Quartzite and Beaver River Quartzite. However, because the material is not a quartzite and the adjacent watercourse is not a creek, the term Beaver River Sandstone has been adopted. Geologically, Beaver River Sandstone is situated at or near the top of the lower member of the McMurray Formation which is Lower Cretaceous in age (Fenton and Ives 1984:130-131). The McMurray Formation itself lies unconformably over the karstic topography of the preceding Devonian Age Waterways Formation (Fenton and Ives 1984:130). Beaver River Sandstone bearing portions of the McMurray Formation only outcrop in areas along the Athabasca River and possibly along some its major tributaries. Very little Beaver River Sandstone has been observed in local tills or fluvial deposits. This suggests that the materials used by people in the past likely were quarried from local outcrops rather than being collected from a wider distribution of naturally dispersed materials. Beaver River Sandstone has been reported from sites that range in age from an Early Prehistoric Period site represented by a fluted point found near Cold Lake (McCullough Consulting Limited 1981), all the way to the historic period. The material was often used and makes up to 99 or 100% of the material in some lithic assemblages in the Fort McKay region (Fenton and Ives 1982:176). This is especially true for large sites which are located in close proximity to exposed source locations along the Beaver River.

F1.5 PROTOHISTORIC/HISTORIC PERIOD: 200 - 100 yrs. B.P.

The appearance of European trade items in native occupations marks the beginning of the Historic Period. Taltheilei assemblages represent pre-European contact Dene or Athabascan speaking people in this region. The distribution of Taltheilei sites in the region is relatively consistent with the

known distribution of the Dene people at the onset of the fur trade (Van Dyke and Reeves 1985:92). Thus, Taltheilei sites in the Lower Athabasca region likely relate to the Beaver, Sekani, Slave, and the Chipewyan people. The Taltheilei tradition has also been traced back over 2,600 years to the Yellowknife, Dogribs and the Chipewyan in the Barren Grounds and in the Great Slave-Great Bear Lakes region of the Northwest Territories (Van Dyke and Reeves 1985:91). It is difficult to determine the precise geographical boundaries that separated the different linguistic groups of people who lived in northern Alberta in the distant past although information is available for the borders immediately preceding European contact (Figure F1.0-2).

The Beaver Indians occupied the majority of northern Alberta including the entire Peace River valley below its confluence with the Smoky River, the district around Lake Claire and the Athabasca River valley south to Methy Portage and the Clearwater (Jenness 1963:382-384). MacGregor (1981:16) states that the Chipewyan, the Slaves and the Sekani bordered the Beaver Indians to the east, north and west respectively. Magne (1987:224) in a map showing the locations of Native group distributions, ca. A.D. 1700, does not mention who borders the Beaver Indians on the west. Magne does place the Slave Indians to the north, the Chipewyan to the northeast and the Yellowknife Indians further north, above Great Slave Lake, but also includes the Cree at the eastern edge of the Athabasca River. Like the Beaver Indians, these groups are all Dene peoples. The area along the foothills of the Rocky Mountains, between the upper Athabasca and the upper North Saskatchewan, was inhabited by a fellow Athabascan speaking group, the Sarcee. The Sarcee, despite their linguistic ties to the Athabascan speaking groups to the north, were politically aligned with the Algonkian speaking Blackfoot confederacy to the south (Ives 1985:25).

Prior to European contact, the Beaver Indians were experiencing pressure from the Western Cree who were aggressively expanding their territory (Palmer 1990:9). The Cree pushed the Beaver Indians to the Peace River region to the west. It is usually thought that this territorial expansion was quite recent and a result of the fur trade. Russell (1991) however, states that there is evidence that the Cree were present and had knowledge of the Athabasca region well before the arrival of Europeans in the area. This would mean that the westward migration of the Cree was earlier and not a direct result of the fur trade. The Cree and the Beaver Indians eventually formed an alliance at Peace Point (approximately 80 km by air from Lake Athabasca) and agreed on territorial boundaries. It was decided that Peace Point would serve as the border between the two groups (Russell 1991:164). The Cree are also said to have driven the Slave Indians out of their territory to

the Slave River at approximately the same time as they were pushing the Beaver Indians out of their territory.

F2.0 REGIONAL HISTORY

F2.1 CONTACT PERIOD

Intricate trade networks were established between the native peoples well before the Europeans were brought to the area and trade goods arrived in the region several years before the first Europeans. Anthony Henday, the first European to enter Alberta, observed this trade network during his 1754 trip to an area near present day Red Deer (MacGregor 1981). Henday, who was employed by the Hudson's Bay Company, had travelled west from York Factory on the shore of Hudson Bay with a group of Cree where they met with the local Blackfoot people. During his stay in Alberta, Henday tried to entice the Blackfoot to come to the Hudson Bay to trade or offer, which they declined. In the spring of that year, while traveling back to the Bay with his guides, Henday once again encountered the same group of Blackfoot people. During this second meeting Henday observed the Blackfoot trading furs to his guides. The Blackfoot and the Cree people had already established a trading network in which the Blackfoot procured the furs and the Cree delivered them to the Bay (MacGregor 1981).

The fur trade continued to be the primary reason for Europeans to venture into the interior over the next few decades. These Europeans typically remained on the plains and Parklands, expanding the line of fur trade posts up the Saskatchewan River. Under pressure from the rapidly expanding North West Company, the Hudson's Bay Company began to build inland posts beginning with Cumberland House in 1774. In 1778, Peter Pond built the first fur-trade post to be established in the Athabasca region. Pond, an employee of the North West Company, established the fort about forty miles up the Athabasca River from its mouth (MacGregor 1981:36). Pond was also the first of the Europeans to take trade goods into the Athabasca region over Methy Portage (Palmer 1990:12). Approximately eight years later Pond and his associates built another post at the mouth of the Clearwater and the Athabasca River. In 1788 the North West Company built Fort Chipewyan on Lake Athabasca which became their central post in the Athabasca region.

Alexander Mackenzie used some of the fur trade posts in the region as staging points in his efforts to find a river that flowed west to the Pacific Ocean. In 1789, just one year after the post had been built, Mackenzie left Fort Chipewyan and traveled north along the Mackenzie River to the Arctic Ocean. Later, in 1792, after spending time in England to learn more about the sciences of astronomy and navigation he set out to establish Fort Fork on the Peace River (Russell 1991:31). Fort Fork was built at the confluence of the Peace and the Smoky Rivers and enabled him to get a better start in his effort to reach the Pacific Ocean. Mackenzie left the west permanently after spending the winter of 1793 on Lake Athabasca, seven years after his arrival in the Athabasca region (Russell 1991:31).

Four posts were established at the confluence of the Clearwater and the Athabasca Rivers between 1786 and 1804. In 1821 the last of the posts was shut down. In 1870, however, the region was given another chance and Henry Moberly built Fort McMurray for the Hudson's Bay Company (Palmer 1990:144). The Hudson's Bay Company again discouraged by the lack of trading moved north in 1898 to establish Fort McKay. Several independent traders kept Fort McMurray alive until the arrival of the Alberta and Great Waterways Railway in the early 1920's which eliminated the problem of bringing furs past the rapids on the Athabasca River (Palmer 1990:144-145). The presence of the railway also opened up the Athabasca region for oil and mineral exploration.

F3.0 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Archaeologists have recorded almost 100 historic and prehistoric archaeological sites within the baseline study area (Appendix II). None of these sites previously recorded are located within the Steepbank Mine area. These sites are spread throughout five Borden Blocks (HeOt, HeOu, HfOv, HgOu and HgOv), each of which is 11.2 x 18.5 kilometres in size. Most of these sites are restricted to a narrow strip of land along the Athabasca River and its tributaries. This close association with the river is likely due to a number of factors. The people of the boreal forest, in the past as well as today, use the river as a primary travel route. Sites, therefore, are often situated nearby. Archaeological work in the past has been mainly focused on the land adjacent to rivers as it is expected that there will be a higher number of sites situated in such locations.

One of the first large archaeological studies in northern Alberta took place in the early 1970's. Wright (1975) conducted a survey along the shoreline of Lake Athabasca in 1971 and 1972. In the

process of this survey Wright investigated 28 previously known and unknown sites. Excavations were carried out at ten of the larger sites which served as the basis for the construction of the cultural chronology in the Lake Athabasca region. Projectile points recovered suggest that people have been present in the region for at least 7,500 years. Several sites which Wright investigated had been previously identified and collected by Nero during ornithological research carried out in the early 1960's (Wright 1975:105). Nero's collections were also used by Wright during his analysis.

The history of archaeology along the Athabasca River is very closely associated with the history of development in the region. With the exception of a few projects funded by universities and the Archaeological Survey of Alberta, the majority of archaeological projects in the region are the result of impact assessments conducted to assess the archaeological potential prior to development.

In 1973, Syncrude began an environmental overview which included an archaeological component (Syncrude 1974). This project resulted in the location of over thirty prehistoric sites including the Beaver River Quarry (HgOv 29). The Beaver River Quarry is an important site as it is the largest known lithic quarry in the region. It is located on Lease No. 17 on the Beaver River, a tributary of the Athabasca River. The lithic material which was mined from the quarry (and/or similar nearby locations) is one of the most common material types in local archaeological assemblages and is present in assemblages well removed from the source. The site is protected as a designated site by the Provincial Government of Alberta (Losey 1980, Van Dyke and Reeves 1985).

In 1981 Ives and Fenton began a long term analysis of the composition and geographic range of source material for Beaver River Sandstone (Fenton and Ives 1982, 1984, 1990, Ives and Fenton 1983). This work has led to the identification of the stratigraphic positioning of Beaver River Sandstone and a probable distribution of the source material which is centered along the Athabasca River and the region east of Fort McKay (Fenton and Ives 1990). Their research built on the initial investigations of the quarry site (Syncrude 1974) as well as several other investigators including Losey (1980), McCullough and Wilson (1982) and others.

During some of the earliest archaeological surveys of the Athabasca River and its tributaries, sites were often identified within a close proximity to the major waterways. Losey, Freeman and Priegert (1975) identified five prehistoric sites in the regional study area during the summer of 1974. Sims identified an additional 38 prehistoric sites during a reconnaissance of Shell Canada's Lease 13

(Sims 1975, Sims and Losey 1975). An isolated pictograph panel was later recognized at one of these sites, HgOv 32, during a pipeline survey (Ronaghan 1980). Pictographs are rare along the Athabasca River and its tributaries. Several historic and prehistoric sites were recorded throughout the 1970's in the Fort McMurray area (Forsman 1979, Fromhold 1979). The locations of the various fur trade posts were later revisited and rerecorded in 1982 by Walde as cited in Palmer (1990).

Donahue (1976) identified a large number of historic and prehistoric sites during a broad archaeological reconnaissance of areas along the Clearwater and Athabasca Rivers within the regional study area. Donahue also initiated reconnaissance in the Birch and Caribou Mountains. The Birch mountains are a prominent upland that are located slightly to the west of the regional study area (approximately 100 kilometers northwest of the local study area). The Caribou mountains are further removed from the study area, located north of the Peace River (approximately 300 km northwest of the local study area). This produced the first regional overview of the Athabasca River valley and surrounding area (Donahue 1976). Fourteen sites were located along the Clearwater and Athabasca Rivers, south of McClelland Lake which is near the northern boundary of the regional study area. Two of these sites were identified along the Clearwater River and twelve along the Athabasca River (Donahue 1976: 49-57). Other projects which had a broad geographic focus were also carried out in the late 1970s. These included a regional research design for the Athabasca Oil Sands area as part of the Alberta Oil Sands Environmental Research Program (Millar 1977) and an overview of the Clearwater River basin which runs through the southern most portion of the regional study area (Pollock 1978). Data for these broad scoped projects were collected through field research carried out as part of the projects as well as through several other projects which were being conducted at the time.

Some of these other projects include investigations along the Beaver and Athabasca Rivers and excavations at the Gardiner Lake Narrows site, HjPd 1 (Sims 1976a, 1976b). Excavations were carried out the following year at several other regional archaeological sites at Wentzel Lake in the Caribou Mountains (Conaty 1977) and at HkPa 4 in the Birch Mountains (Ives 1977a, 1977b). This material, originally produced as a Master's thesis, was later published (Ives 1985) by the Archaeological Survey of Alberta. This site is one of the few sites in the region which have produced radiocarbon dates for the occupations. One date was obtained of 1030 ± 110 (DIC-720). Several archaeological projects were conducted throughout 1978 including an historical resources impact assessment of the western portion of Syncrude Lease No. 17 (McCullough and Reeves

1978a), as well as a few highway surveys (McCullough and Reeves 1978b, Gryba 1978). Gryba (1979) returned to one of the sites the following year to test the site more fully. The site contained prehistoric as well as historic materials. Two projectile points were recovered that are listed as possible Pelican Lake and Duncan phase points, which date to approximately 2500 and 3500 years B.P. respectively (Gryba 1980a, 1980b).

Significant is the work completed by Van Dyke and Reeves (1985) at Syncrude Lease No. 22 in 1984. The study included a comprehensive literature review and history of the archaeological work in the region to date. During the course of this work, 32 previously undocumented prehistoric sites and five historic sites were recorded and six previously identified archaeological sites were revisited and updated. One of these previously unrecorded prehistoric sites, HgOv 77, was later revisited and 10 m^2 were excavated.

Numerous other projects have been conducted in the region throughout the past thirty years (McCullough 1981a, 1981b, 1981c, 1981d, 1981e, McCullough and Fowler 1982, McCullough and Fedirchuk 1982, Fedirchuk 1983, Gibson 1986, McCullough and Fedirchuk 1989, Head and Van Dyke 1990, Damkjar 1993, Van Dyke 1980a, 1980b). These projects were largely heritage resource impact assessments of road and pipeline right of ways as well as post-impact assessments of Bituminous Sand Leases throughout the region. Site locations and cultural affiliations recorded during these smaller scale projects have greatly enhanced the archaeological knowledge in the region. Sites located in the region are primarily small lithic scatters and single find locations.

A large scale overview was recently completed by Fedirchuk McCullough and Associates (Bovar-Concord Environmental 1995). It was centred along the east side of Highway 63 and in the Solv-Ex Development area in Lease Number 5. Surveys of the area recorded no previously undocumented sites. Twenty-eight sites were to be impacted by the utility corridor. Three sites, HhOv 3, HhOv 7 and HhOv 16 had been previously subject to additional assessment and/or limited excavations. One of these sites (HhOv 7) has recently been incorporated into HhOv 16, the Cree Burn Lake site (Bovar-Concord Environmental 1995). Seven other sites were also recommended for further investigations.

The previous studies conducted within the region area have identified a low frequency of sites within terrain similar to that of the local study area. Few sites were recorded as a result of the surveys

conducted during the Alsands (Conaty 1980, Ronaghan 1981), the Canstar (McCullough and Wilson 1982) and the Syncrude Lease 22 (Van Dyke and Reeves 1985) projects. The density of sites recorded during the Canstar project averaged 0.10 sites per square kilometre. Site densities were only slightly higher for the Alsands and Syncrude surveys which averaged 0.14 and 0.16 sites per kilometer respectively (Van Dyke and Reeves 1985).

Van Dyke and Reeves (1985) determined that increases in site density within their study area could be best achieved through the use of a judgemental approach to site discovery. Testing programs which relied heavily on systematic approaches such as shovel testing, did not discover the same density of sites as testing programs which relied more judgemental and opportunistic techniques such as examinations of high potential areas. Shovel testing has proven inefficient as a method of identifying archaeological sites in portions of the boreal forest (Van Dyke and Reeves 1985). The amount of field work was also seen as an important factor in site discovery.

Terrain conditions and vegetation cover were also stated as important factors in determining site recovery (Van Dyke and Reeves 1985). In areas of level terrain, with limited vegetation, systematic sampling programs may provide one of the best methods for site discovery. Natural and cultural exposures of the subsoil such as erosional exposures, road cuts, bulldozer pushes and clearcuts are invaluable for locating sites in the boreal forest. Close to 30% of the sites discovered during the Syncrude project were surface exposures (Van Dyke and Reeves 1985). The dense vegetation cover of the boreal forest can severely inhibit the recognition of archaeological sites.

In 1994, a Traditional Land Use and Occupancy Study was conducted by the Fort McKay First Nations (1994). This study did not include an archaeological review of the region, but did include the recording and mapping of the known trails, cabins, historic sites as well as spiritual and grave sites in the Fort McKay area. The study also included the recording of the traditional environmental knowledge of the elders in the community. Fort McKay Environmental Services Ltd. also undertook a study of the traditional land uses on the Steepbank Mine (1996).

G PROCEDURES

At the onset of the historical resources impact assessment, a search was completed of prehistoric and historic site files maintained by the Archaeological Survey and Historic Sites and Archives Services in Edmonton. Copies of the site forms for all previously recorded sites within the regional study area were obtained and the relevant data regarding topographic features and environmental criteria tabularized. The preliminary background research for the development of the sampling strategy included a review of all previous archaeological investigations completed in the region. Subsequently, 1:50 000 topographic maps, air photographs and 1:10 000 pedological and muskeg distribution maps were examined to complete a preliminary rating of archaeological sensitivity for the study area. Well drained areas such as knobs, ridges, escarpments, shorelines, benches, terraces and banks were identified. Attempts at locating potential outcrops of specific lithic sources, primarily Beaver River Sandstone were also undertaken. Once this initial data was accumulated, a stratified archaeological site potential map was produced utilizing a GIS system. This stratification of the prehistorical potential within the project area was designed so as to focus field investigations within areas exhibiting high and moderate potential for historical resources (Figure G-1).

As new information was obtained on the study area, the sensitivity rating was enhanced. A digital elevation model was created for terrain characteristics. Terrain was divided into three separate categories comprised of slopes from 0 to 5 degrees, 5 to 15 degrees and 15 plus degrees. All major topographic breaklines were located including escarpment fronts, drainage bottoms and river terraces. All present wetlands, standing water bodies and paleo-drainages were incorporated. The drainage status was then produced which determined potentially poorly drained areas. A contingency analysis of these factors was then conducted to determine areas of potential historical resource locations. Low potential site areas were recognized as those situated on slopes greater than 15 degrees, areas of poor drainage, open water or wetlands. Moderate potential site areas were deemed to exist on slopes of 5 to 15 degrees, on escarpment or river terraces and in well drained areas within 100 m of standing water. High potential site areas were classed according to the presence of level or nearly level topography containing slopes of 0 to 5 degrees, river terraces, well drained areas up to 1 km back from upper escarpment edges and within 100 m of present shoreline

and river benches. Once in the study area, an overflight was completed to refine the areas of sensitivity.

Based on this information foot traverses were completed within selected portions of the project area. These were most intensive in those areas deemed to exhibit moderate to high potential for archaeological sites. Dense vegetation, characteristic of the area, forced transect spacing to be variable. All of the transects walked within the project area were completed with a minimum of two people to ensure maximum coverage. Subsurface testing in the form of shovel tests (approximately 0.5 m on a side and excavated until glacial soils were encountered) were excavated in areas judged to have potential to contain buried heritage resources. The locations and contents of shovel tests were recorded on standard forms and plotted on aerial photograph mosaics while in the field. Sites located were also shovel tested as an aid in evaluating their significance. Sites were photographed, sketch maps were drawn, the locations were plotted on a 1:20 000 topographic map and the relevant details were recorded on Alberta Archaeological Site Inventory Data forms.

The cataloguing and analysis of the artifacts recovered during the course of this study was done in accordance with the procedures set out by the Archaeological Survey of Alberta in the "Guidelines for Archaeological Permit Holders in Alberta" (Archaeological Survey of Alberta 1989). Subsequent to completion of the project, the artifacts will be submitted to the Provincial Museum of Alberta for curation.

The Archaeological Survey asked that a traditional land use study be completed, preferably prior to the field portion of the impact assessment such that the data could be utilized to refine the historical resource site predictive modelling scheme and could be ground truthed. Unfortunately, the traditional land use study was delayed until after the archaeological field work was completed. However, the results of the study are utilized herein to enhance our knowledge of native use of the study area.

The Fort McKay First Nations conducted a survey of the community Elders and established a preliminary traditional land use data base for the region. The survey compiled information regarding the traditional trails and cabins, spiritual (grave) and historical sites, fur bearers, big game, fish, birds, berries, trees and plants, place names and traplines and reproduced them in map form. The

database was established as an initial listing of the major plant and animal species that have traditionally played important roles in the lives of the First Nations people.

H RESULTS

H1.0 PRELIMINARY ANALYSIS

A total of 95 archaeological sites have been previously recorded within the baseline study area. This, as well as other northern archaeological data, provided a good basis for the predictive modelling scheme. The majority of the sites are artifact scatters, followed closely by isolated finds. Both of these site types show an affinity towards terrace landforms. Campsites and workshops, also common site types in the regional study area, also tend to be associated with terrace features. Ridges also have a high incidence of sites. Common between these two landforms is the fact that they are well drained and the vegetation is fairly open.

The predictive modelling completed in advance of the field investigations resulted in the study area being subdivided into areas of high, moderate and low potential for historical resources. Approximately 1,344 hectares were classified as exhibiting high potential for historical resources, 634 hectares were classified as exhibiting moderate potential, and 1107 hectares exhibited low potential. Upon completing several aerial transects over the study area with the aid of a helicopter, the senior project members (Balcom and Damkjar) concluded that the potential for archaeological sites was probably overall lower than our predictive modelling scheme indicated. This was due to dense vegetation, more poorly drained areas than were predicted, many areas where the microtopography was sloping and overall poor access to either the Steepbank or Athabasca Rivers. The transects were refined daily to reflect observations.

H2.0 FIELD COMPONENT

A crew of five completed the field component of the historical resources impact assessment over a period of nine days. Extensive foot traverses were accompanied by a total of 1,134 shovel tests (Figure H2.0-1). As a result of the historical resources impact assessment, two archaeological sites were recorded in areas that were predicted in advance to exhibit high potential for archaeological sites. The site forms and maps for these sites are contained in Appendix III and the sites are described below.

H2.1 HfOu 1

Site HfOu 1 is an isolated find of unknown prehistoric age recovered from a single shovel test at a depth of 8 cm below ground surface (Plate 1). The artifact recovered is a Beaver River Sandstone secondary flake. The site is associated with a level bench overlooking a remnant drainage to the south and east. The site area is on the west upper terrace of the Steepbank River. Grass and shrubs predominate with small aspen cover. A total of 24 shovel tests were excavated on the landform and adjacent area. The soils were deep aeolian sands overlain by a thin (0 to 3 cm deep) vegetation cover. The flake was recovered from a light gray sand layer with increasing pebble content as 10 cm below surface was approached. This layer was underlain by orange and brown sand with pebbles.

H2.2 HfOu 2

Site HfOu 2 is an isolated find recovered from the surface of an existing bulldozer cut (Plate 2). The artifact recovered is a chert biface of unknown prehistoric age. The site is situated approximately 25 m north of Leggett Creek and 3 m east of a ravine edge on the east side of the Athabasca River. Thirteen shovel tests were conducted in the area with negative results. Again the soils were deep aeolian sands overlain by a thin (0 to 3 cm deep) vegetation mat. Poplar and spruce predominate with bearberry undergrowth.

Dense vegetation covers much of the study area (Plates 3 and 4). Dense vegetation not only inhibits walking, both now and in the past, but makes finding archaeological sites very difficult. Archaeological sites are also rarely found in poorly drained areas, such as those found in the proposed Steepbank Mine (Plate 5). The northern portion of the lease which is adjacent to the Steepbank River has low lying, poorly drained terraces which are not conducive to occupation/utilization (Plate 6). However, the east bank of the Steepbank does exhibit excellent terrace development, some distance above the river however (Plate 7). These areas were extensively shovel tested. Potential for historical resources along the Athabasca River is sporadic (Plates 8, 9 and 10). Foot traverses and shovel testing were completed in areas exhibiting good drainage and near drainages emptying into the Athabasca. However, some of the more open areas along the upper terrace edges of the Athabasca appear to exhibit good potential for archaeological sites and were extensively tested. Areas with good visibility afford opportunity for testing and many within the proposed Steepbank Mine were examined and tested (Plates 11 and 12).

Although variation was observed in composition, texture and coloration of the soils, there was general consistency in that they tended to be shallow. Pebbles/cobbles were frequently encountered at depths of 10 cm below surface. The deepest shovel tests were approximately 40 cm below surface. Paleosols were observed in less than 30 shovel tests. Deeply buried soils were not encountered during the testing program. It is unlikely that there would be any deeply buried soils within the local study with the exception of the Athabasca River floodplain. Backhoe testing for archaeological sites is not warranted in this area as it is rated as having low potential for archaeological sites.

H3.0 TRADITIONAL LAND USE

Through a review of the initial traditional land use investigations completed by the Fort McKay First Nations, a table indicating the use of the plant and animal species was created (Table H3.0-1). This table assists in understanding First Nations' use of their environment. Rankings (high, medium and low) were given to the individual species based on the number of times a species name was referred to and the number of times a species was indicated within a given region on the traditional land use maps. These rankings are not meant to infer that some species are not important, only that some species are more commonly harvested in certain regions. The names of plants and animals used in this section are common names as used by the people.

The people who traditionally occupied the regional study area utilized a wide variety of plant and animal species which are found throughout the region. These species were (and still are) harvested for a wide variety of uses including food, drink, medicines, firewood, smoking and curing food, clothing and building materials. Recently, some of the traditional practices have become modified with the increased accessibility of some regions. For example, people traditionally used established trails for traplines and travel routes. Now people more commonly travel along seismic lines. Participants in the survey often stated that certain plants or animals were important resources, but harvesting locations and some types of uses were not always recorded. The absence of data in certain regions, therefore, does not necessarily imply that the area was not traditionally used.

TABLE H3.0-1
TRADITIONAL RESOURCE USE

Species	Type of Use							* Use Ranking
	Food	Medicine	Spiritual	Hunting	Trapping	Fishing	Other (specify)	
Vegetation								
Blueberry	X							High
Cranberry (Lowbush)	X							High
Cranberry (Bog)	X							High
Saskatoon	X	X					Wood	Medium
Pincherry	X	X						Medium
Chokecherry	X	X					Hard Wood	Medium
Raspberry	X	X						Medium
Dwarf Raspberry	X							Medium
Trailing Raspberry	X							Medium
Red Currant	X	X						Low
Black Currant	X	X						Low
Strawberry	X	X						High
Gooseberry	X	X						Low
Rose Hip	X	X						High
Twisted Stalk	X							Low
Kinnikinnick (Bearberry)	X		X					High
Dogwood (Bunchberry)	X							Medium
Common Juniper	X	X						Low
Buffaloberry	X	X						Low
Hazelnut	X						Dye/Arrows	Medium
Balsam Fir		X					Construction	High
Tamarack		X					Construction/Dye	High
Birch - White	X	X					Construction/Fire Starter	High
Birch - Red (Bog Birch)		X						Rare-Med.
White or Black Spruce		X		X			Construction	High
Black Poplar		X					Construction	High
Frying Pan Plant		X						Medium
Green Frog Plant		X						Medium
Rat Root (Sweet Flag)		X						High
Wild Mint	X	X						High
Muskeg (Lab. Tea?)		X						High

Species	Type of Use							* Use Ranking
	Food	Medicine	Spiritual	Hunting	Trapping	Fishing	Other (specify)	
Moss		X					Chinking, smudges, diapers,dressing	High
Nettles	X	X						Medium
Fungi - dry dead wood							fire starter/ insect repellent	High
Ground Fungus - Puffball		X						High
Seneca Root		X						Low
Willow Fungus		X						Medium
Sweet Grass		X	X					High
Fish								
Pickerel	X					X		High
Northern Pike	X					X		High
Whitefish	X					X	Dog food	High
Lake Trout	X					X		High
Grayling	X					X	Localized use	Medium
Perch	X					X	Localized use	Medium
Ling Cod	X					X		Medium
Sucker	X					X		Medium
Goldeye	X					X	Localized use	Medium
Chub	X					X		Medium
Wildlife								
Moose	X			X				High
Caribou - Woodland	X			X			Localized use	Low
Bison	X			X			Localized use	Low
White-tailed Deer	X			X				High
Mule Deer	X			X				Low
Elk	X			X				Low
Lynx	X				X			High
Hare	X				X			High
Wolf					X			High
Coyote					X			Medium
Marten					X			Medium
Fisher					X			High
Red Fox					X			High
Wolverine					X			Rare-Med.
Beaver	X	X			X			High
Muskrat					X			High
River Otter					X			High
Skunk		X	X		X			High
Mink					X			High
Red Squirrel					X			High
Tree (flying) Squirrel					X			High
Least Weasel					X		Fur	High

Species	Type of Use							* Use Ranking
	Food	Medicine	Spiritual	Hunting	Trapping	Fishing	Other (specify)	
Short-tailed Weasel					X		Fur	High
Long-tailed Weasel					X		Fur	High
Black Bear	X		X	X	X			High
Grizzly Bear	X		X	X				Low
Canada Goose	X						Insulation/stuffing/ wing duster	High
Ross Goose	X						Insulation/stuffing/ wing duster	Medium
Snow Goose/Blue Goose	X						Insulation/stuffing/ wing duster	Medium
White-fronted Goose	X						Insulation/stuffing/ wing duster	Medium
Canvasback	X							High
Mallard	X							High
Pintail (Sharptail)	X							Low
Redhead	X							High
Teal	X							High
Greater Scaup	X							High
Lesser Scaup	X							High
Goldeneye	X							High
Scoter	X							High
Ruddy Duck	X							High
Merganser	X							High
Grebe	X							High
Loon	X						Waterproof bag	High
Pelican							Waterproof bag (Pouch)	Low
Cormorant								Low
Swan								Low
Seagull								Medium
Owl	X						Wing Duster	High
Sandhill Crane								High
Eagle								High
Great Blue Heron								Low
Pintail Grouse	X						Fan/decoration	High
Spruce Grouse							Fan/decoration	High
Ruffed Grouse	X						Fan/decoration	High
Ptarmigan	X						Fan/decoration	Low

*Refers to the number of times a species name was referred to and the number of times a species was indicated on traditonal land use maps.

H3.1 FLORA

Tree species that are often mentioned include both deciduous and coniferous trees. Coniferous species include lodgepole pine, jack pine, tamarack, balsam fir, white and black spruce. The deciduous tree species include balsam poplar, aspen, poplar, paper birch, willows and alders. The interviewees speak of these species being utilized both currently and in the past for medicine, food, drink, construction supplies, firewood, curing and smoking meat. Birch bark is used as a fire starting material and syrup is made from the sap. Willow bark is boiled for a tea and used as a medicine to relieve colds, headaches and stomach ailments. Portions of the balsam fir, jack and lodgepole pine, birch, and poplar trees, among others were also listed as having medicinal properties. Log cabins are constructed primarily out of coniferous wood, although birch and black poplar are also used as building materials. Bear traps are also commonly constructed out of large coniferous logs.

Shrubs and grasses have traditionally been used for food, drink, medicinal and spiritual purposes. Small plants have also been used to make functional items such as twine and basketry. Some of the plants which were frequently referred to by the Fort McKay elders include blueberry, cranberry (bog and lowbush), strawberry, rose, bearberry (kinnikinnick), rat root, wild mint, muskeg (Labrador tea), moss, sweet grass and certain types of fungi. Many of these plants (blueberry, strawberry, cranberry, etc.) were often eaten raw or as sauce or jam. Some were also boiled and consumed as tea (Labrador tea). Rosehips, juniper, sweet grass and rat root were some of the most widely used medicinal plants. Other medicinal plants include gooseberry, raspberry, chokecherry, saskatoon, nettles, green frog plant and seneca root. Sweet grass, and the inner bark of the red willow are important ceremonial plants as well. Fungi found on dead logs and moss are often used in smudges and insect repellents. Other berry bushes and aquatic plants (Table H3.0-1) are also part of the traditional environmental knowledge of the Fort McKay First Nations people although they are not used as often.

H3.2 FAUNA

Animal species also form an important part of the traditional land use. Large game animals in the region include moose, bison, caribou, white-tailed and mule deer. Barren Ground caribou were seen in the region of the Steepbank River as recently as 1955 (Fort McKay Environmental Services Ltd. 1996). Wapiti were formerly present in the Athabasca region although they currently are

extirpated from this portion of their range. White-tailed deer are likely recent arrivals into the region. White-tailed deer and moose are now numerous in the Steepbank mine area although hunting has always been limited in the area near the proposed mine site. The east side of the Athabasca River had poor accessibility which reduced the amount of hunting in the area (Fort McKay Environmental Services Ltd. 1996). Other large game animals that were hunted in the region include black bear. These animals were traditionally hunted using traps made out of several large logs. The bear meat was eaten, the fur used for clothing and the grease for cooking and making soap. Black bear was also listed by some of the Fort McKay Elders as an important spiritual animal (Fort McKay First Nation 1994). Grizzly bear are also spiritual animals, although they are not as plentiful as the black bear. Grizzly bear signs have been seen in the Saline Creek area as recently as 1990 (Fort McKay Environmental Services Ltd. 1996).

The First Nations people used all portions of these large game animals. The meat was used for food and the hides were used as clothing as well as blankets, mattresses and robes. Bones and antlers were used to make tools such as leather punches, knife handles, hide fleshers and billets. Sites where these animals were killed or processed differ in size and location depending on whether the hunted animal was normally solitary (e.g., moose, bear) or travelled in herds (e.g., bison, caribou), and where the animal was typically found.

Some of the smaller fur bearers were also important to the people of the region. Beaver, muskrat and snowshoe hare were hunted for their meat and pelts (Fort McKay Environmental Services Ltd. 1996). The beaver is still regarded as a staple in the diet of some area residents. Beaver castor is also used as a medicine. Skunk were also trapped and used for spiritual and medicinal purposes. Skunk oil was (and still is) used for warding off and curing colds (Fort McKay First Nations 1994). River otter, mink, lynx, wolf, fisher, fox and weasels were also traditionally trapped by the people of the region.

The Athabasca River valley is an important migratory route for several types of birds including ducks, geese, cranes, loons, grebes and gulls (Fort McKay Environmental Services Ltd. 1996). Waterfowl were traditionally hunted by the people of the region during the spring and fall migrations as well as harvesting eggs in the spring. The spring is the best time for hunting migratory birds as their feathers and meat are in the best condition. The feathers are often used for clothing and bedding. The wings from owls and geese are also used for dusters and brooms. Tail feathers from

grouse and ptarmigan were often fanned out and used as a fan or decoration. The pouch from pelicans and loon skins were often used as waterproof bags. Large owls such as the great horned and great grey owls were also hunted for food. Upland game birds including ptarmigan, spruce, pintail and ruffed grouse were hunted easily and harvested opportunistically. Long bones were traditionally made into beads and small whistles.

Fish in the region were used for food for both people and their dogs. Large numbers of fish were taken annually from the Athabasca River, between Tar Island and the Suncor Steepbank mine site (Fort McKay Environmental Services Ltd. 1996). White fish were caught in the autumn and hanged to dry for winter dog food. Thousands of fish may be needed to feed dogs through the winter depending on the number of dogs. Up to 2,000 fish could be caught and hung in a week. Grayling were caught in the Steepbank River and the Leggett Creek, but on a much smaller scale (Fort McKay Environmental Services Ltd. 1996). White fish, pickerel, northern pike, chub, lake trout, ling (burbot), goldeye, suckers, perch and grayling were all used by people in the area. Some fish such as the goldeye, grayling and perch were not available throughout the entire regional study area and, therefore, had only local importance. Fish bones were also boiled to extract the grease. Little or no mention was made to the importance or traditional uses of amphibians and reptiles of the region. The region has a limited number of red-sided garter snakes, but frogs and toads are quite common.

One location adjacent to the local study area that likely had abundant archaeological materials is Tar Island. Tar Island, located across the river from the Steepbank mine location, was used as a summer/autumn gathering location until approximately thirty years ago. The island was used by the people of the Fort McKay region as a camping area while conducting summer/fall hunting, fishing, and plant gathering activities. Moose and occasionally caribou were hunted on the islands and river banks surrounding Tar Island. The area was also a good fishing and bird harvesting area. This location, however, was abandoned and subsequently destroyed after the establishment of a tailings pond at the site (Fort McKay Environmental Services Ltd. 1996).

Traditional land use research suggests that the regional study area contains a diverse array of plants and animals which were utilized by the First Nations groups. Hunting and trapping in the areas inland from the Athabasca and the Steepbank Rivers may have been limited. Hunting is currently difficult due to the muskeg and peat bogs which are present throughout the area (Fort McKay Environmental Services Ltd. 1996). Traditional trails were maintained in the area by local trappers

and hunters until the construction of winter roads and seismic lines. These trails may be one area with higher potential for archaeological materials. Harvesting of plant materials is reported to have been carried out in the area. This type of activity, however, typically leaves behind little or no archaeological evidence and would be essentially invisible.

I SUMMARY AND CONCLUSIONS

Subsequent to completing the background research for the regional study area, criteria were identified that appear to associate with prehistoric archaeological site locations. These criteria were utilized to produce maps indicating areas of high, moderate and low potential for archaeological sites. While such models are of value in guiding the field program, the inherent gaps in the database of known archaeological sites are such that they cannot be considered perfect.

The field component was restricted to the area proposed for disturbance by the new mine and associated facilities. An initial overflight and helicopter access into the area allowed for continual refinement of the predictive modelling. Transects via boat were also completed along the west bank of the Athabasca River throughout the length of the local study area and as far along the Steepbank as possible. Extensive foot traverses were undertaken within the study area and shovel testing to expose buried sites was rigorous.

As a result of the historical resources impact assessment two archaeological sites have been recorded, both of which are contained within the proposed impact zone. Both sites are isolated finds, HfOu 1 consists of a Beaver River Sandstone secondary flake and HfOu 2 consists of a chert biface. Due to the fact that both sites consist of only one artifact, the sites are considered to be of minor significance in that the loss is restricted to an artifact with no associated artifacts or features. Temporal and cultural affiliation cannot be assigned to either site. The impact is considered to be negative, of long term duration, of local geographic extent with a low degree of concern to archaeologists.

The field component of the archaeological investigations is considered to have been relatively rigorous. A total of 1,134 shovel tests were excavated within the 31 km^2 local study area. Since the investigations were primarily restricted to areas considered to exhibit high to moderate potential for potential for historical resources, the intensive study area was further reduced to about 1978 hectares or 20 km^2. As a result of the impact assessment then, 57 shovel tests were excavated per km^2 with a result of 0.1 sites per km^2 being found (without adjusting for the low potential areas, there were 37 shovel tests per km^2 and 0.06 sites per km^2). Using the examples stated in the previous section, this compares favourably with the site density at Canstar but is less than the number of sites

recovered at the Alsands and Syncrude leases. A total of 39 shovel tests per km^2 were excavated at the Syncrude Lease No. 22.

In spite of the limitations of working in a dense forested environment, archaeological sites of a large size should have been found if they were present. The Fort McKay First Nations land use studies also indicate that the proposed Steepbank Mine was not heavily utilized in the past, due to the dense vegetation and the difficulty in accessing the east side of the Athabasca River. This perhaps explains the lack of archaeological sites. The lack of outcrops of Beaver River Sandstone throughout the local study area may also contribute to the lack of archaeological sites.

J RECOMMENDATIONS

No further investigations are historical resource investigations are recommended in advance of construction at archaeological sites HfOu 1 and 2. The two sites are isolated finds of low significance. No additional investigations to search for archaeological sites within the area proposed for disturbance are recommended. No traditional resource use sites have been identified to date within the proposed study area, hence there is no requirement for ground truthing in that regard. Monitoring during or after construction is not recommended. As the mine plan advances it will be necessary to determine the need for additional historical resources impact assessments. A review will be necessary of areas such as the overburden dump which has now been identified just outside the study area as defined by this permit (Figure B1.0-3).

It is important to consider the direction of future archaeological investigations in the Fort McMurray region. Based on the results of this project, and in considering the results of previous projects, it is important to continue to improve efforts at locating sites. Predictive models should be utilized to focus research efforts within the study areas. The predictive model utilized for this project is considered to have been successful in that two sites were found in areas rated as exhibiting high potential. Both sites are associated with terrace landforms. With respect to the predictive models however, the potential ratings need to be considered in relative terms and cannot be directly compared with sensitivity models which are constructed for different environmental zones where previous occupation may have resulted in a much denser archaeological resource base. While the fact that one of the sites recovered as a result of this project was found in a shovel test and the other was a surface find does not allow for elaborate discussion, there is no question that surface exposures have aided archaeologists working in this area in locating sites. It is recommended that this be taken into account during the planning of future impact assessments in the region.

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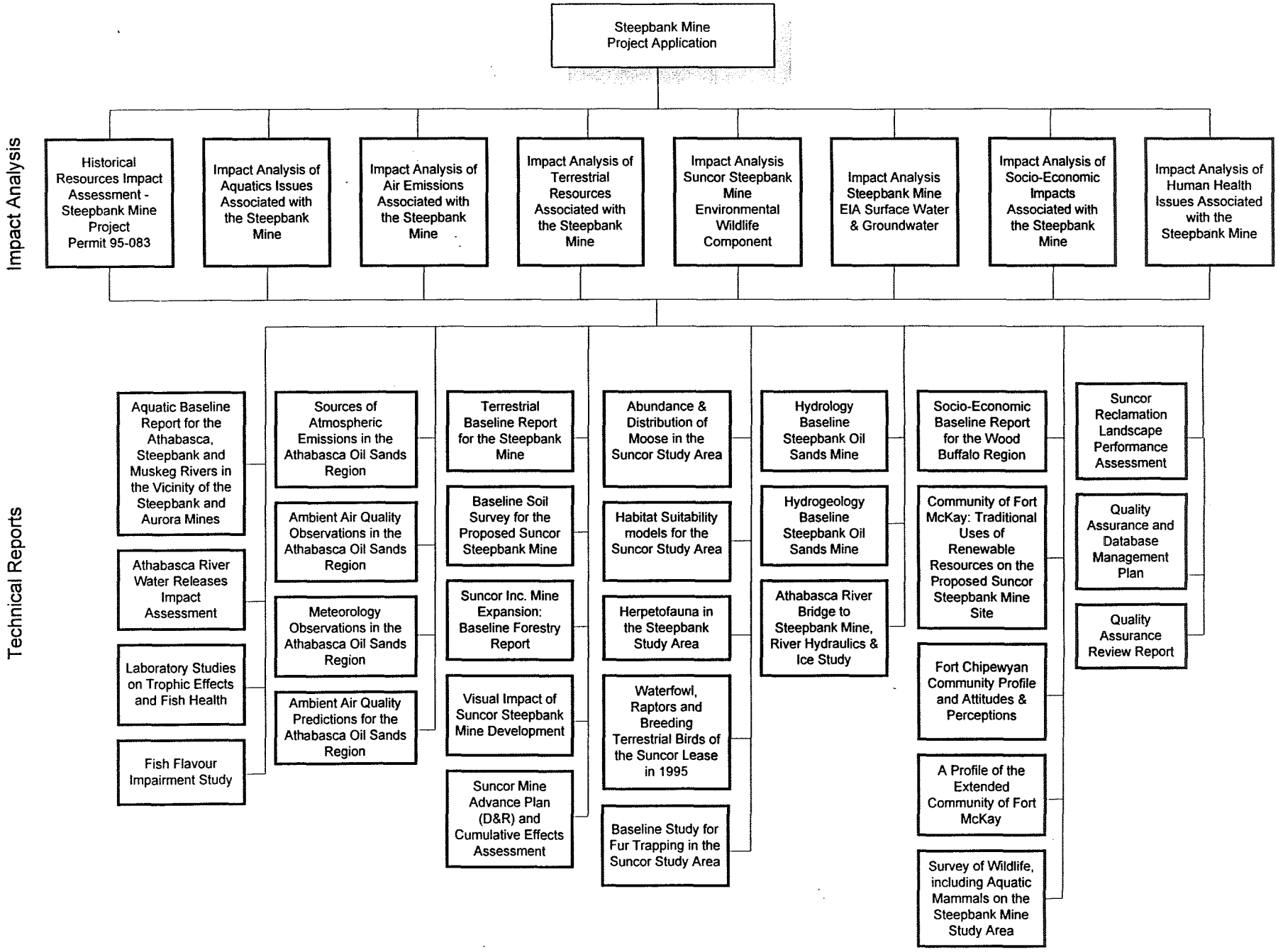

Figure A-1 Reports Prepared for the Steepbank Mine Environmental Assessment

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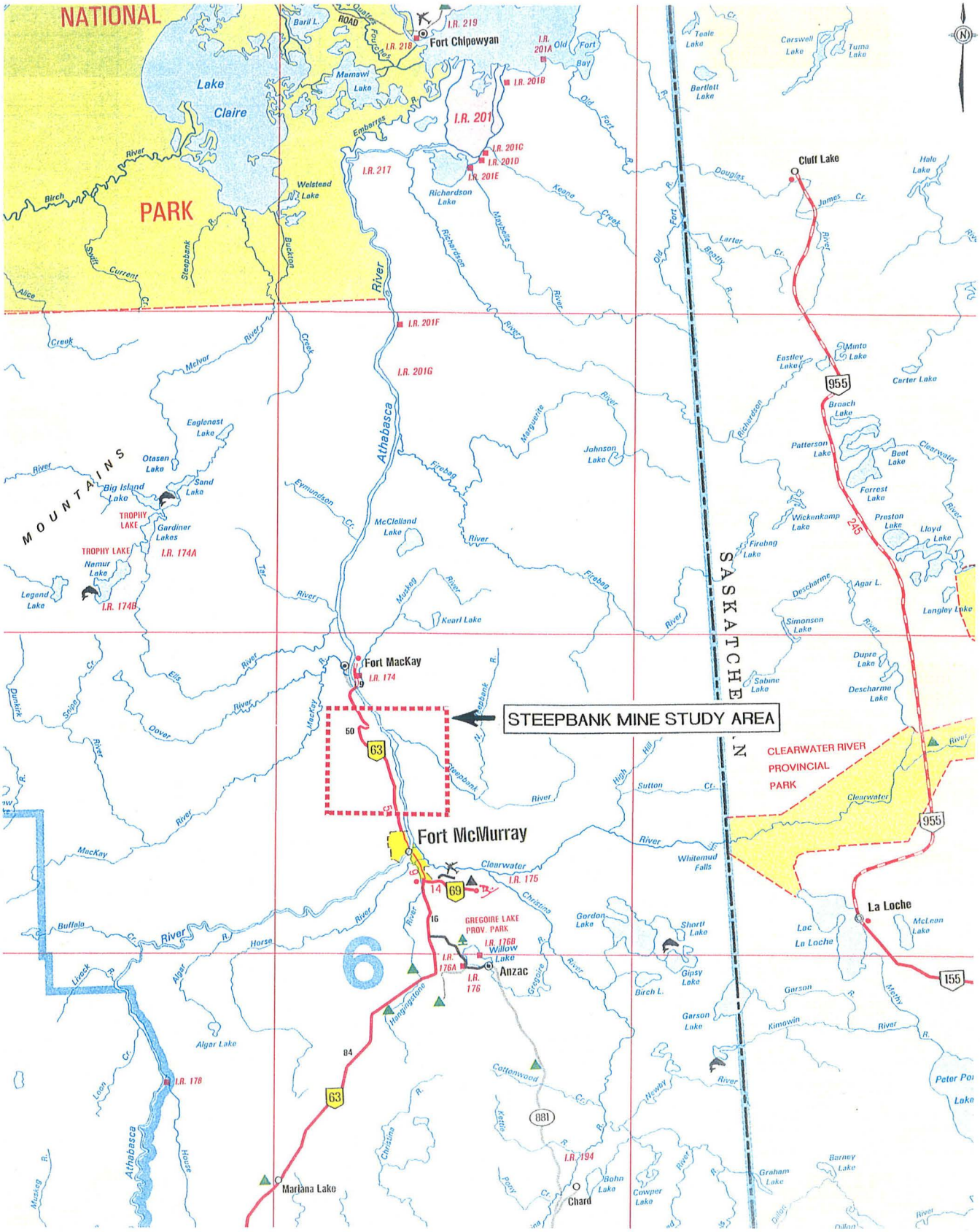
Suncor (Steepbank)
Baseline Data Study Area

Figure B1.0–1



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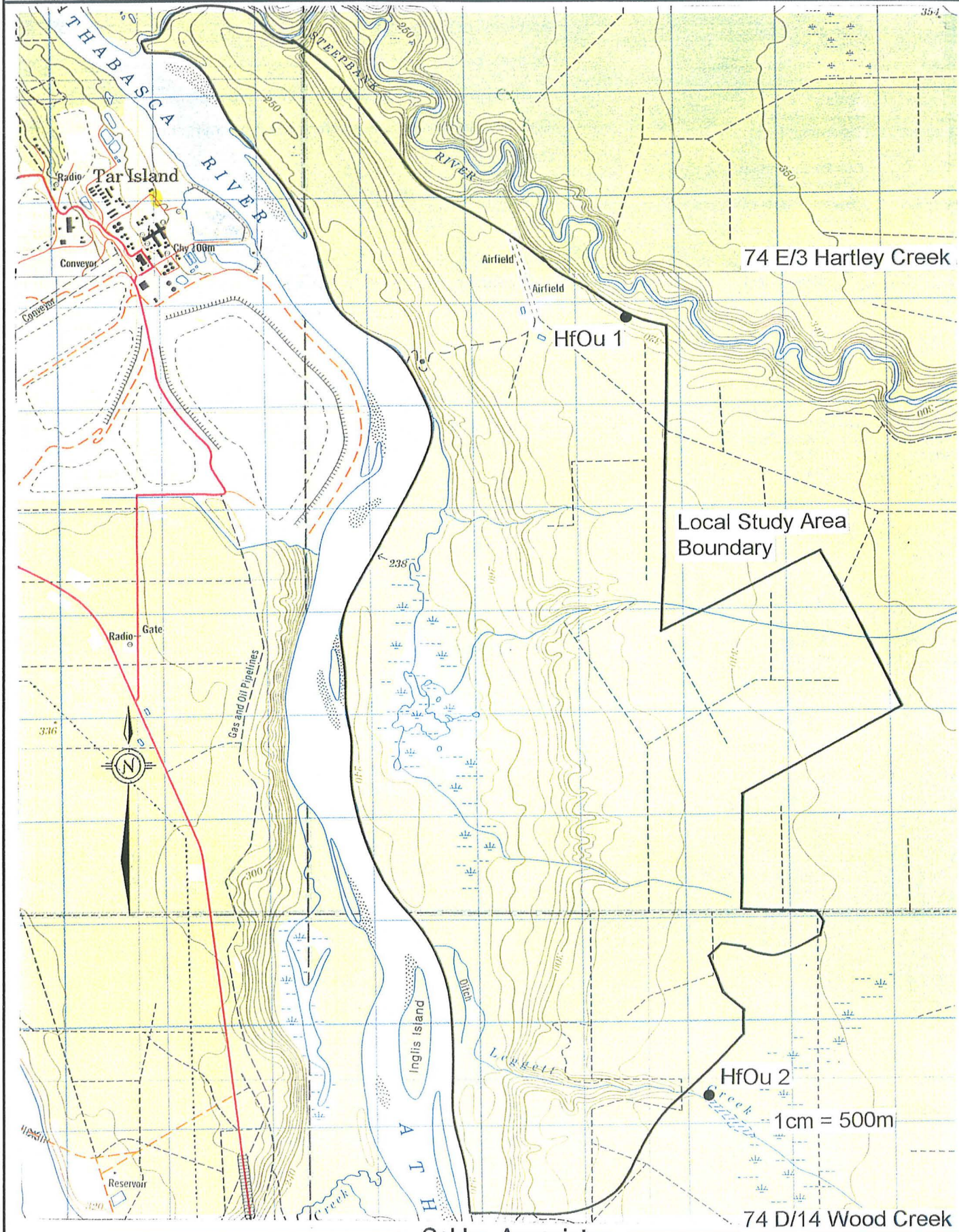
Golder Associates

Suncor (Steepbank)
Local Study Area

Figure B1.0-2



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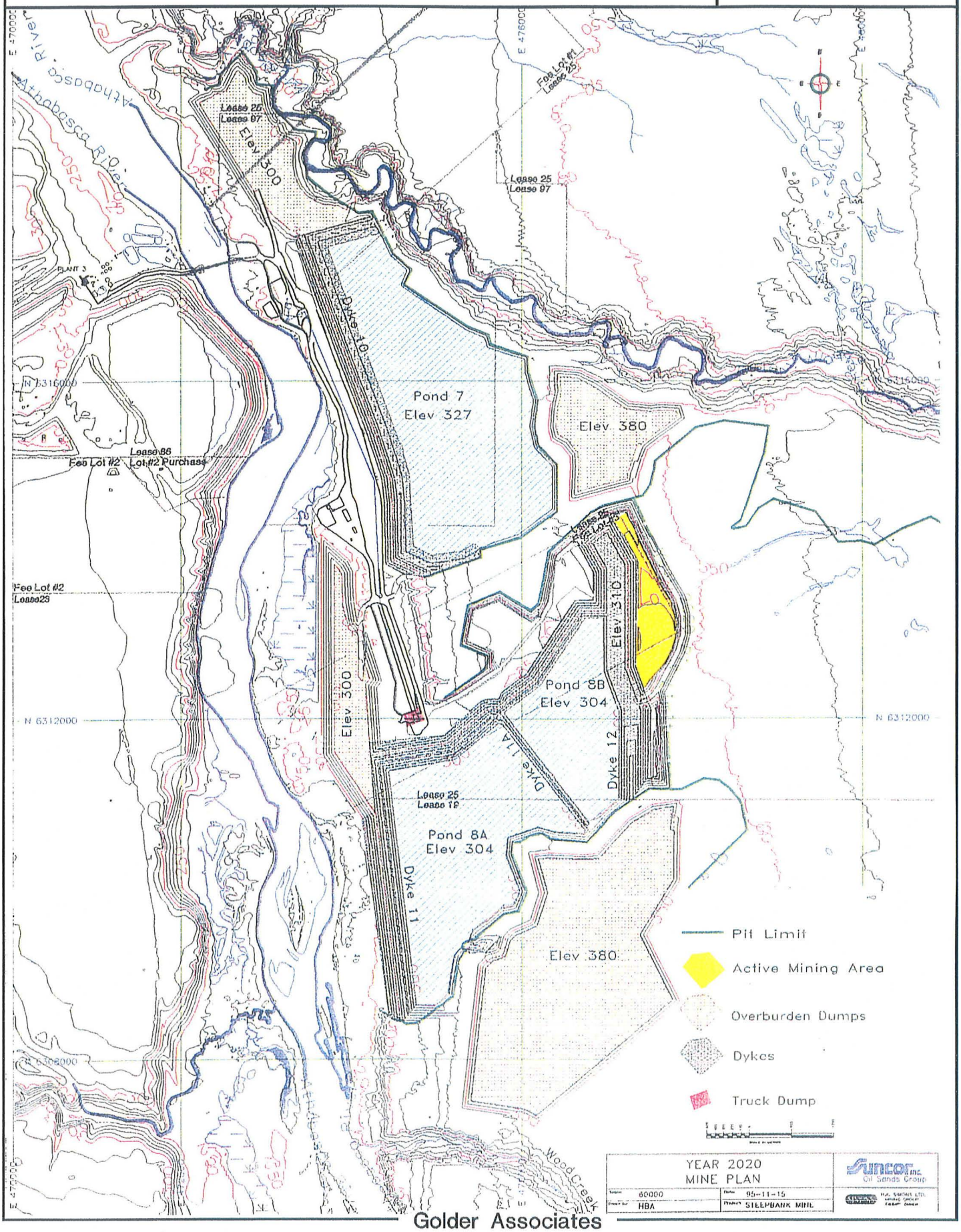
Golder Associates

YEAR 2020 MINE PLAN

Figure B1.0-3



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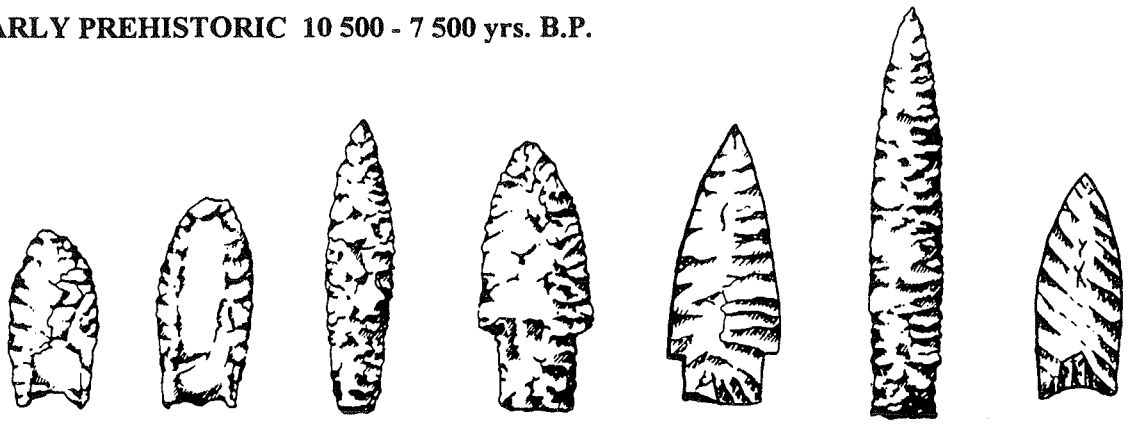
PROJECTILE POINT TYPOLOGY

Figure F1.0-1

EARLY PREHISTORIC 10 500 - 7 500 yrs. B.P.



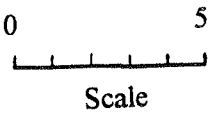
Clovis Folsom Agate Basin Alberta Scottsbluff Eden Lusk

MIDDLE PREHISTORIC 7 500 - 1 200 yrs. B.P.

Mummy Cave/ Gowen | Shield Archaic | Arctic Small Tool | Oxbow | McKean | Duncan | Hanna | Pelican Lake

LATE PREHISTORIC 1 200 - 200 yrs. B.P.

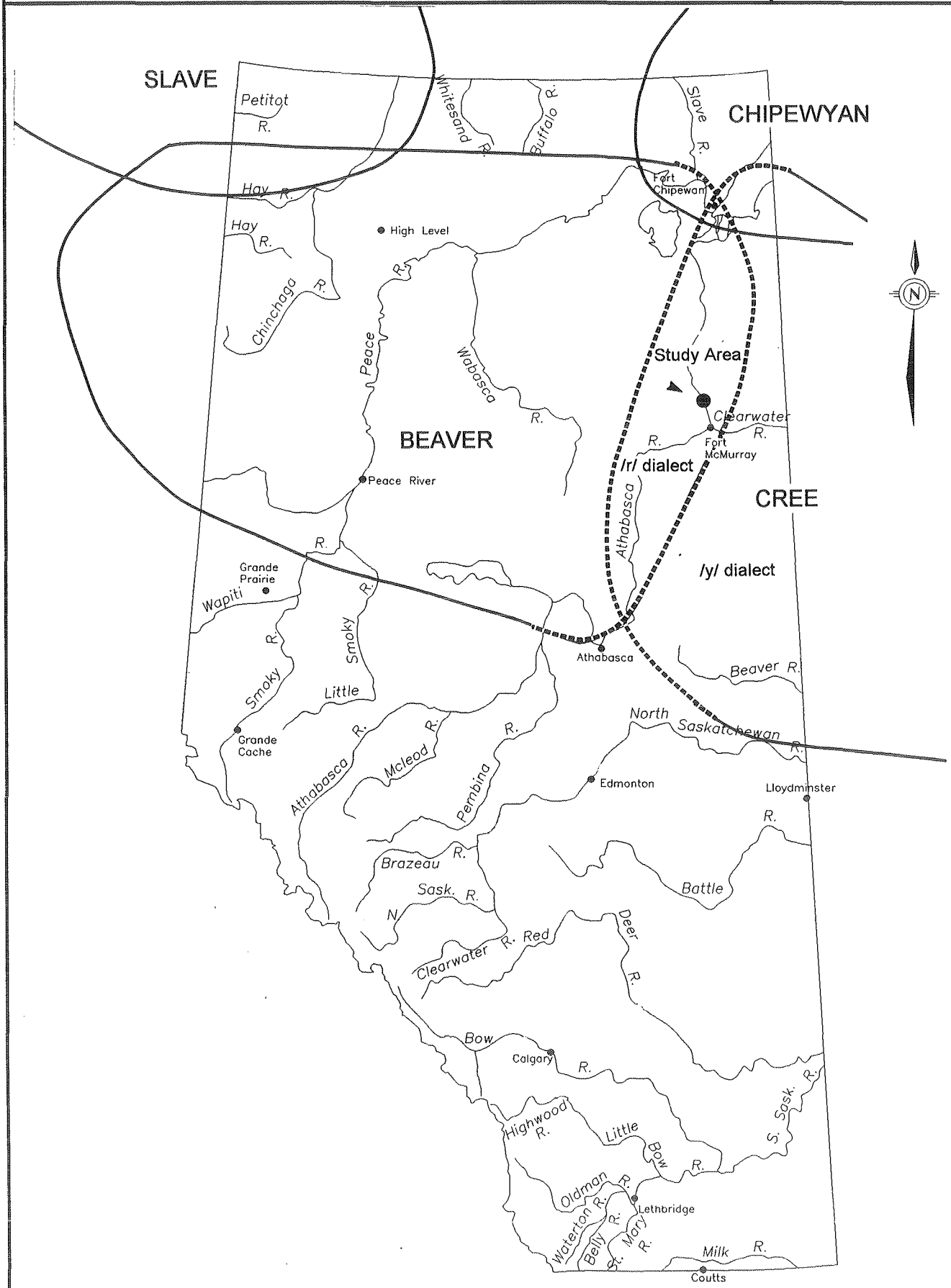
Talthelei



PROJECT 952-2307.5950 DRAWN MVZ REVIEWED DATE 09 FEB 96 locstud

POSTULATED NATIVE GROUP DISTRIBUTION
c.a. A.D. 1750

Figure F1.0-2

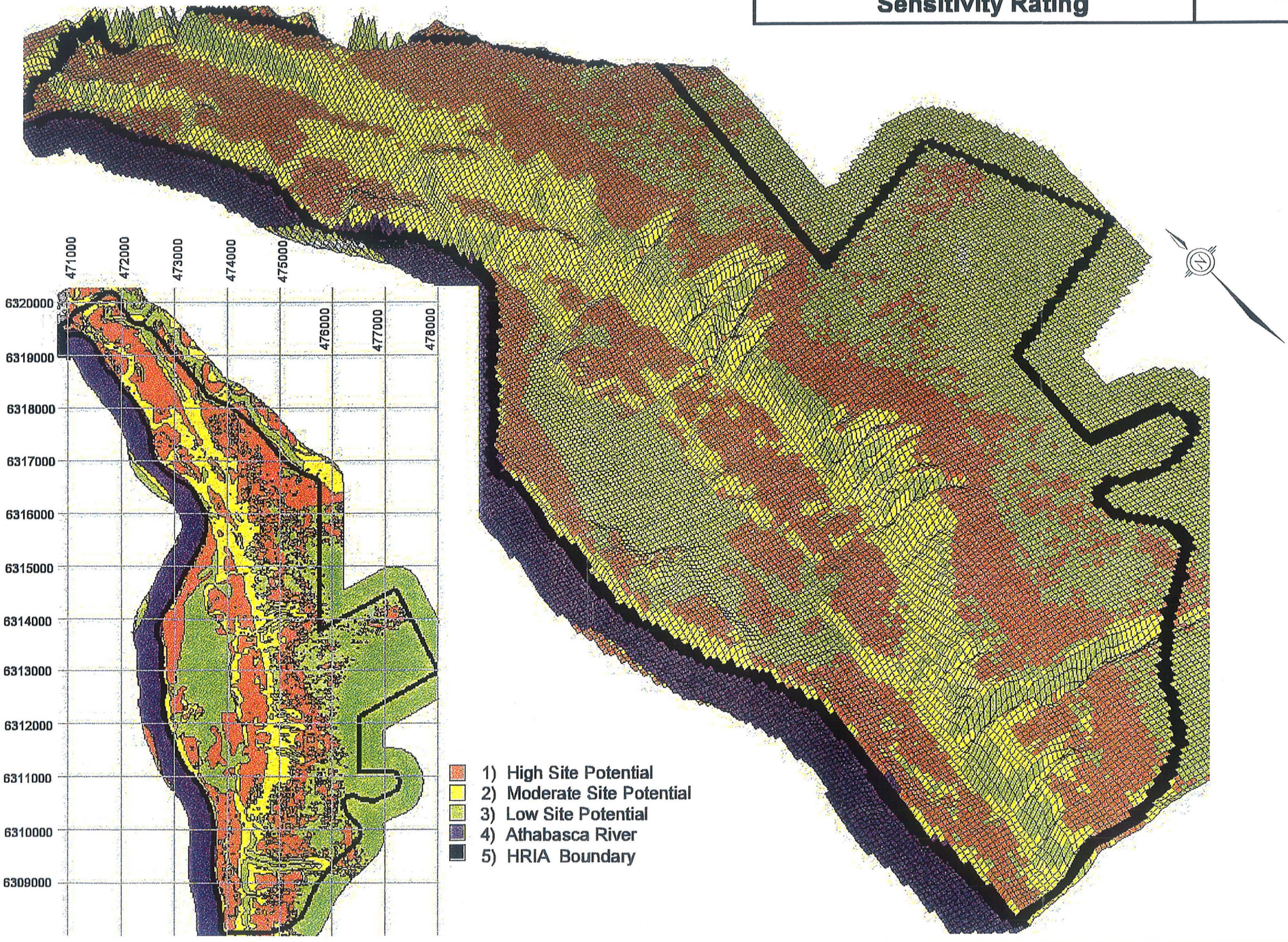


PROJECT 952-2307.5950 DRAWN CG REVIEWED _____ DATE 24 APR 96 native

Golder Associates

Steepbank Mine Archaeological Sensitivity Rating

Figure G-1



Golder Associates			
PROJECT: 952-2307.5950	DRAWN BY: KS / RP	DATE: 9 February 1996	REVIEWED:

952-2307.5950\TRANSECT.dwg

STEEPBANK MINE
ARCHAEOLOGICAL TRANSECT LOCATIONS AND SHOVEL TESTS

Figure H2.0-1

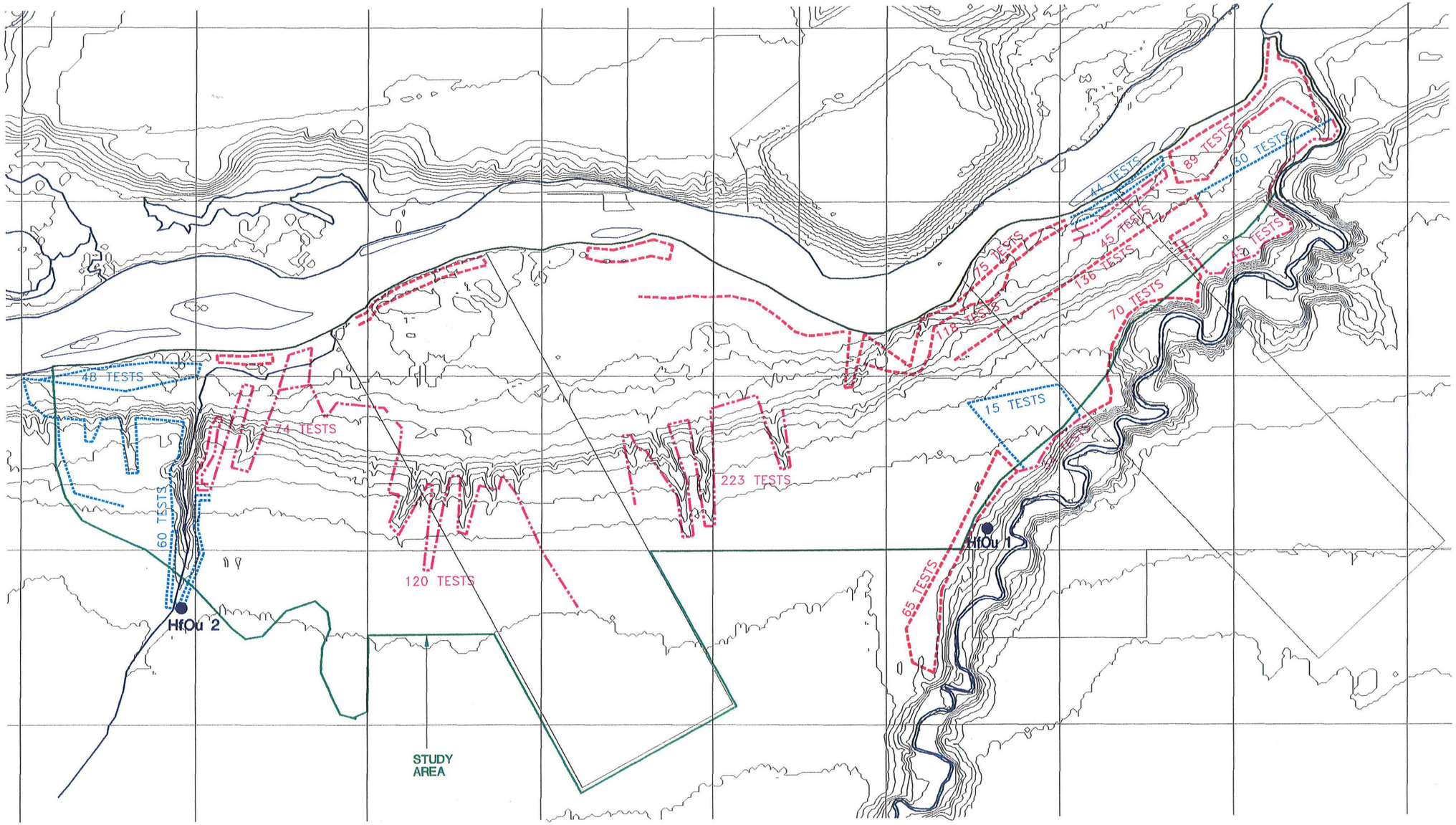
LEGEND

2 PEOPLE

3 PEOPLE

5 PEOPLE

HfOu 1 ARCHAEOLOGICAL SITE



Golder Associates			
PROJECT: 952-2307.5950	DRAWN BY: RK	DATE: 9 FEB 96	REVIEWED:

Plate 1. View to the northwest of the study area showing dense vegetation. Photo taken from extreme south end of the study area.

Plate 2. Vegetation cover prevalent within the study area. View to the south.

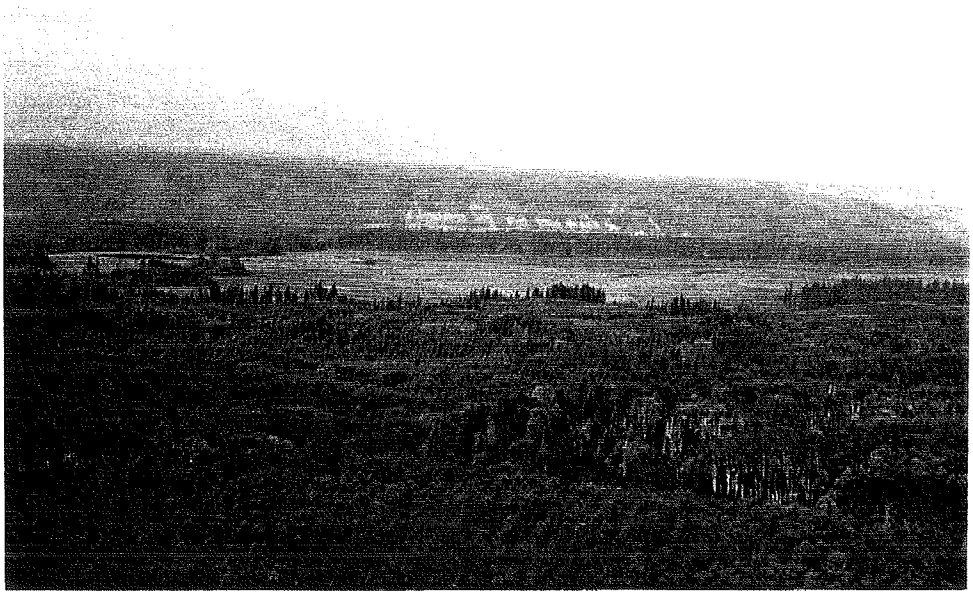


Plate 3. View to the northwest of the study area. Area devoid of trees is Shipyard Lake bordering the east side of the Athabasca River.

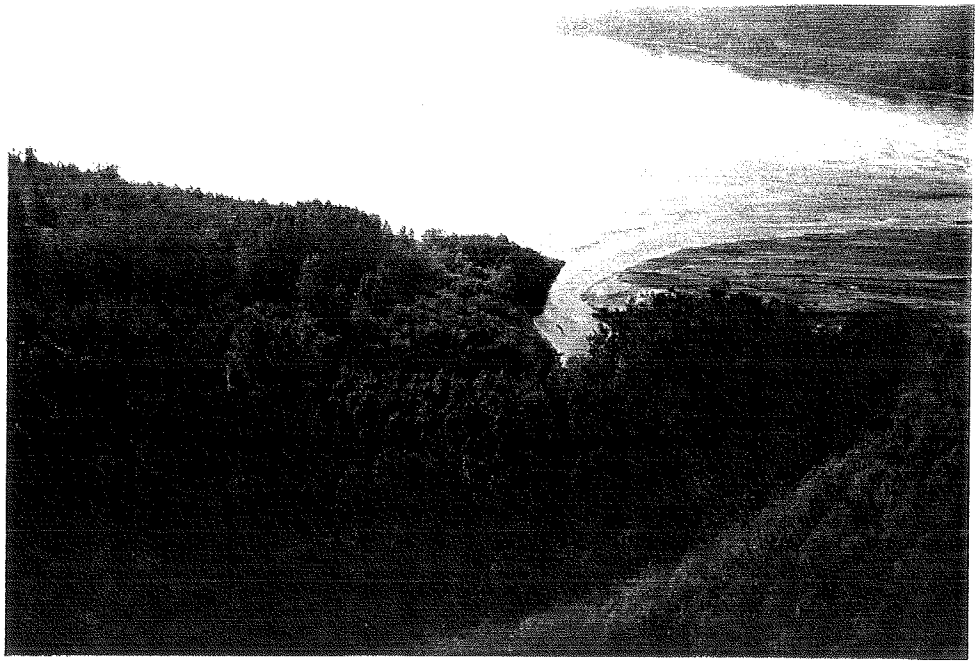


Plate 4. View to the west of the outlet to the Steepbank River.

Plate 5. View to the west of the terrace edge overlooking the Steepbank River.

Plate 6. View to the east of the Athabasca River shoreline near north end of study area.

Plate 7. View to the east of cabin situated on one of the few well drained benches overlooking the Athabasca River.

Plate 8. View to the east of shoreline near south end of study area. Unnamed drainage feeding into the Athabasca River in photo centre.

Plate 9. View to the east of aircraft landing strip. One of the few manmade exposures within the project area.

Plate 10. View to the north of shovel testing in small clearing.

Plate 11. View to the north of isolated find site HfOu 1.

Plate 12. View to the south of isolated find site HfOu 2.

APPENDIX I

GLOSSARY OF TECHNICAL TERMINOLOGY

GLOSSARY OF TECHNICAL TERMINOLOGY

Activity Area	A limited portion of a site in which a specialized cultural function was carried out, such as hide scraping, tool manufacture, food preparation, etc.
Archaeology	The scientific discipline responsible for studying the unwritten portion of man's historic and prehistoric past.
Artifact	Any portable object modified or manufactured by man.
Artifact Scatter	A site with six or more artifacts.
Assemblage	A collection of cultural materials from a sampling area or unit such as a site, pit or level.
Association	Archaeological materials are said to be in association when they are found in close proximity in an undisturbed context.
Atlatl	A hand held wooden implement in which a spear shaft is placed. The resultant extension of the arm increases the velocity and accuracy of a thrown spear.
Basal Thinning	The intentional removal of small longitudinal flakes from the base of a chipped stone projectile point or knife to facilitate hafting (attaching to something, such as a handle).
Beaver River Sandstone	A light gray, medium to fine-grained quartz sandstone cemented in a silica matrix.
Biface	A stone artifact flaked on both sides.

Borden Block	Map units of 10' latitude by 10' longitude used to facilitate site designation.
B.P.	Before Present. 1000 B.P. = 1,000 years before 1950 A.D., or approximately 1000 A.D.
Cairn	Stones intentionally piled by humans.
Chert	A fine-grained siliceous rock. Impure variety of chalcedony which is generally light coloured.
Chi Thos	A large, crudely manufactured scraper made from sandstone. It is typically bifacially worked along a blunted convex edge.
Complex	A consistently recurring assemblage of artifacts or traits which may be indicative of a specific set of activities, or a common cultural tradition.
Conifers	White and black spruce, balsam fir, jack pine and tamarack.
Culture	The sum of man's non-biological behavioural traits - learned, patterned and adaptive.
Disturbance	A cultural deposit is said to be disturbed when the original sequence of deposition has been altered. Agents of disturbance include erosion, plant or animal activity, cultivation, excavations, etc.
Environmental Impact Assessment	A review of the effects that a proposed development will have on the local and regional environment.
Feature	A non-portable product of human workmanship (e.g., hearths, structural remains and clusters of associated objects).

Flake	A fragment removed from a core of cryptocrystalline or fine-grained rock by percussion or pressure. The flake may be utilized as a tool itself if suitable for a particular task or may be formed into a specific tool by further flaking. A typical flake will display a platform or striking surface, bulb of percussion and rings of force radiating from the platform.
GIS	Geographical Information Systems. Pertains to a type of computer software that is designed to develop, manage, analyze and display spatially referenced data.
Historical Resources Impact Assessment	A review of the effects that a proposed development will have on the local and regional historic and prehistoric heritage of an area.
Historical/ Heritage Resources	Works of nature or of man, valued for their palaeontological, archaeological, prehistoric, historic, cultural, natural, scientific, or aesthetic interest.
Isolated Find	The occurrence of a single artifact with no associated artifacts or features.
Lithics	Of or pertaining to stone.
Lithic Scatter	A small concentration of lithic (stone) artifacts on the surface. This term is usually used when there is insufficient information present to identify the function of the site.
Microclimate	The temperature, precipitation and wind velocity in a restricted or localized area, site or habitat.

Paleosols	A paleosol is a soil that was formed in the past. Paleosols are usually buried underneath a layer of sediments and are thus no longer being actively created by soil formation processes like organic decay.
Permit Holder	The director of an Historical Resource Impact Assessment. Responsible for the satisfactory completion of all field and laboratory work and author of the technical report.
Pictograph	Aboriginally painted designs on natural rock surfaces. Rod ochre is the most frequently used pigment.
Provenience	The horizontal and/or vertical position of an artifact in relation to known coordinates.
Secondary Flake	Lithic fragment intentionally removed from a core by percussion or pressure techniques. They vary in size and shape with core types and core preparation. All exhibit platforms and/or other definitive removal characteristics.
Site	Any location with detectable evidence of past human activity.
Stem	An area of decreased width at the base of the point which has straight parallel sides. The stem is often restricted to the bottom 1-2 cm of the point and was made to facilitate hafting the point to a shaft
Thinning Flake	Removed by pressure to rejuvenate the lateral edge of an existing flake. They are characteristically longer than they are wide with a pronounced inward curve to them.
Till	Sediments laid down by glaciers.

Wedge	A piece of rock, wood or metal tapered for insertion in a narrow crevice and used for splitting, tightening, severing or levering.

APPENDIX II

ARCHAEOLOGICAL SITES WITHIN THE SUNCOR BASELINE STUDY AREA

ARCHAEOLOGICAL SITES WITHIN THE SUNCOR BASELINE STUDY AREA

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HeOt 1	SW/SW/14/89/09	12VVT/798/854	Historic: Oil sands quarry	Terrace/slope	Clearwater River	Aspen
HeOt 2	NW/SE/33/88/08	12VWT/870/800	Historic: Cabin	Outcrop	Clearwater River	Poplar
HeOt 3	SW/NE/33/88/08	12VVT/870/810	Isolated find: Biface	Ridge/base	Clearwater River	Mixed Forest
HeOu 1	NW/NE/21/89/09	12VVT/774/884	Historic: Fort of the Forks	Terrace	Clearwater River	Aspen/Willow
HeOu 2	NW/NE/23/89/10	12VVT/708/884	Isolated find: Core	Terrace	Conn Creek	Spruce
HeOu 3	NW/SW/06/90/09	12VVT/732/924	Quarry: Debitage	Terrace/slope	Wood Creek	Poplar
HeOu 4			Isolated find			
HeOu 5	SW/28/89/09	12VVT/769/893	Historic: Cabin	Terrace/clearing	Clearwater River	Aspen
HeOu 5	SW/28/89/09	12VVT/769/893	Campsite: Debitage	Meadow	Clearwater River	Aspen
HeOu 6	SW/SE/33/89/09	12VVT/774/901	Isolated find: Pebble core	Dune		Jack Pine
HfOu 1	SE/NE/20/92/09	12VVU/755/168.5	Isolated find: secondary flake	Bench		Aspen/Spruce/Willow
HfOu 2	NE/NW/28/91/09	12VVU/762/093	Isolated find: biface	Ravine edge/cutline		Aspen/Spruce/Willow
HfOv 1	NW/NW/16/92/10	12VVU/660/158	Campsite: Debitage	Shoreline/slope	Ruth Lake	Grass
HgOu 1	NW/NE/29/93/09	12VVU/752/286	Isolated find: Flake	Ridge/tree throw	Wetlands	Mixed Forest
HgOu 2	NW/SW/30/93/09	12VVU/725/279	Isolated find: Flake	Island/cutline		Mixed Forest
HgOv 1	NW/SW/13/93/11	12VVU/613/245	Isolated find: Uniface	Esker	Wetlands	Spruce/Aspen
HgOv 2	NW/SW/13/93/11	12VVU/613/247	Isolated find: Chithos	Lowland/esker	Wetlands	Spruce/Aspen

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HgOv 3	SE/SE/01/93/11	12VVU/626/211	Campsite: Chithos/debitage	Ridge/edge	Wetlands/ Beaver River	Spruce/Aspen
HgOv 4	SW/SW/06/93/10	12VVU/630/212	Campsite: Scrapers/biface/debitage	Ridge/edge	Wetlands/ Beaver River	Spruce/Aspen
HgOv 5	NE/NE/36/92/11	12VVU/626/207	Campsite: Scraper/debitage	Ridge/edge	Wetlands/ Beaver River	Spruce/Aspen
HgOv 6	SE/NE/01/93/11	12VVU/626/221	Isolated find: Uniface	Ridge/edge	Wetlands	Spruce/Aspen
HgOv 7	SE/SW/12/93/11	12VVU/616/225	Campsite: Scraper/debitage	Terrace/confluence	Beaver River/ drainage	Spruce/Aspen
HgOv 8	NW/SW/24/93/11	12VVU/612/262	Workshop: Debitage	Terrace/confluence	Drainage/ Beaver River	Spruce/Aspen
HgOv 9	NW/NW/13/93/11	12VVU/613/255	Workshop: Debitage	Terrace	Drainage	Spruce/Aspen
HgOv 10	NE/NE/23/93/11	12VVU/608/274	Artifact scatter: Debitage	Lowland/clearing	Beaver River	Jack Pine
HgOv 11	SE/SW/13/93/11	12VVU/616/241	Isolated find: Flake tool	Terrace/back	Beaver River	Jack Pine/Aspen
HgOv 12	SE/NE/12/93/11	12VVU/618/237	Isolated find: Flake	Terrace/back	Beaver River	Jack Pine/Aspen
HgOv 13	NE/SE/12/93/11	12VVU/618/231	Workshop: Bifaces/debitage	Terrace/back	Beaver River	Jack Pine/Aspen
HgOv 14	NW/NW/24/93/11	12VVU/612/273	Isolated find: Flake	Terrace/back	Beaver River	Jack Pine/Aspen
HgOv 15	SE/SW/24/93/11	12VVU/618/261	Workshop: Scraper/core/debitage	Terrace/bulldozer cut	Drainage	Jack Pine/Aspen
HgOv 16	NW/SW/25/93/11	12VVU/612/279	Artifact scatter: Debitage	Terrace	Beaver River	Spruce/Aspen
HgOv 17	NE/SE/26/93/11	12VVU/611/281	Isolated find: Biface	Terrace	Beaver River	Spruce/Aspen
HgOv 18	SE/NE/26/93/11	12VVU/610/284	Workshop: Debitage	Terrace	Beaver River	Jack Pine/Aspen
HgOv 19	NW/NW/25/93/11	12VVU/613/287	Isolated find: Core	Terrace	Oxbow Lake	Jack Pine
HgOv 20	SW/NE/01/93/11	12VVU/619/219	Workshop: Debitage	Ridge/edge	Wetlands	Jack Pine
HgOv 21	SW/SW/31/92/10	12VVU/628/194	Campsite: Scrapers/debitage	Terrace/gully	Wetlands	Aspen

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HgOv 22	SW/SW/30/92/11	12VVU/629/177	Campsite: Projectile point/debitage	Terrace/confluence	Drainage/ Beaver River	Spruce/Aspen
HgOv 23	NE/NE/26/93/11	12VVU/610/287	Campsite: Debitage	Lowland/cutline	Beaver River	Jack Pine/Aspen
HgOv 24	SE/NE/26/93/11	12VVU/608/286	Workshop: Scraper/core/debitage	Dune/cutline	Beaver River	Spruce/Aspen
HgOv 25	SE/NE/26/93/11	12VVU/607/285	Campsite: Debitage	Dune/cutline	Beaver River	Spruce/Aspen
HgOv 26	NW/SE/25/93/11	12VVU/623/281	Campsite: Scraper/debitage	Dune/cutline	Drainage	Spruce/Aspen
HgOv 27	SE/SE/25/93/11	12VVU/626/275	Artifact scatter: Debitage	Dune/cutline		Jack Pine/Aspen
HgOv 28	NE/NE/31/93/10	12VVU/640/207	Artifact scatter: Debitage	Ridge/cutline		Jack Pine
HgOv 29	SE/SE/01/94/11	12VVU/625/305	Quarry: Besant projectile points/debitage	Terrace/remnant channel	Beaver River	Jack Pine/Alder
HgOv 30	SE/SW/36/93/11	12VVU/618/291	Workshop: Biface/debitage	Terrace/slope	Beaver River	Jack Pine/Aspen
HgOv 31	NW/NE/36/93/11	12VVU/620/304	Workshop: Besant projectile point/debitage	Terrace	Beaver River/ wetlands	Jack Pine/Aspen
HgOv 32	NW/NE/36/93/11	12VVU/624/304	Workshop/Pictograph: Debitage	Terrace/edge	Beaver River/ wetlands	Spruce/Aspen
HgOv 33	SW/NE/15/93/10	12VVU/684/249	Artifact scatter: Core/debitage	Shoreline/terrsce	Saline Lake	Spruce/Poplar/Willow
HgOv 34	NW/NE/21/93/10	12VVU/670/271	Campsite: Uniface/debitage	Terrace/remnant channel	Athabasca River	Spruce/Aspen
HgOv 35	NW/SW/28/93/10	12VVU/662/280	Campsite: Debitage	Terrace/remnant channel	Athabasca River	Spruce/Aspen
HgOv 36	NE/NE/29/93/10	12VVU/656/287	Artifact scatter: Chitho/biface/uniface/ debitage	Terrace	Athabasca River	Spruce/Aspen

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HgOv 37	NW/NE/06/94/10	12VVU/637/319	Artifact scatter: Uniface/debitage	Terrace/confluence	Athabasca River/ Muskeg River	Spruce/Poplar
HgOv 38	E/SE/23/94/11	12VVU/611/358.5	Campsite: Debitage	Ridge/ravine	MacKay River	Spruce/Aspen/Jack Pine
HgOv 39	NW/NW/05/94/10	12VVU/645/318	Artifact scatter: Debitage	Ridge/Mackay River	Drainage	Jack Pine
HgOv 40	NW/NW/05/94/10	12VVU/647/319	Isolated find: Flake	Terrace/cutline	Muskeg River	Spruce/Aspen
HgOv 41	NE/SW/09/94/10	12VVU/668/327	Artifact scatter: Debitage	Ridge/cutline		Spruce/Aspen
HgOv 42	SW/SE/07/94/10	12VVU/637/324	Artifact scatter: Debitage	Terrace/edge	Muskeg River	Spruce/Aspen
HgOv 43	NW/SE/08/94/10	12VVU/653/328	Isolated find: Flake	Ridge	Muskeg River	Jack Pine
HgOv 44	SW/NE/22/93/10	12VVU/688/266	Isolated find: Flake	Terrace/edge		Spruce/Aspen/Birch
HgOv 45	NW/NE/22/93/10	12VVU/684/274	Artifact scatter: Debitage	Terrace/edge		Spruce/Aspen/Birch
HgOv 46	NE/SW/27/93/10	12VVU/683/277	Artifact scatter: Debitage	Terrace/edge		Spruce/Aspen/Birch
HgOv 47	SW/SW/23/93/10	12VVU/693/260	Artifact scatter: Debitage	Ridge/cutline	Drainage	Spruce/Aspen
HgOv 48	NE/NE/15/93/10	12VVU/691/255	Artifact scatter: Debitage	Terrace/spring	Saline Lake	Spruce/Aspen
HgOv 49	NE/NW NW/NE/18/94/10	12VVU/636/352	Workshop: Scraper/debitage	Dune	Drainage	Mixed Forest
HgOv 50	NW/NW/06/94/10	12VVU/630/321	Historic: Refuse	Terrace/bench	Athabasca River	Spruce/Aspen
HgOv 50	NW/NW/06/94/10	12VVU/630/321	Campsite: Pelican Lake, Duncan projectile points/ stone tools/bone/debitage	Terrace/bench	Athabasca River	Spruce/Aspen
HgOv 51	SW/SE/01/94/11	12VVU/622/310	Workshop: Biface/cores/debitage			Spruce/Jack Pine
HgOv 52	NW/SE/07/94/10	12VVU/637/326	Artifact scatter: Debitage	Ridge	Athabasca River	Aspen

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HgOv 53	SW/NE/18/94/10	12VVU/638/349	Isolated find: Flake	Dune/rise		Aspen
HgOv 54	SE/SE/01/94/11	12VVU/627/306	Pictograph: Bison head/human figures	Terrace/outcrop	Beaver River	Aspen
HgOv 55	NE/NW/31/93/10	12VVU/632.5/303	Isolated find: Flake tool	Knoll/slope	Wetlands	Spruce/Aspen
HgOv 56	SE/SE/01/94/11	12VVU/627/306	Artifact scatter: Core/debitage	Terrace/remnant channel		Jack Pine/Spruce
HgOv 57	NW/NW/06/94/10	12VVU/631/318	Artifact scatter: Debitage	Terrace/edge	Athabasca River	Spruce/Aspen/Willow
HgOv 58	SE/NE/35/93/11	12VVU/611/300.5	Artifact scatter: Debitage	Terrace/edge	Drainage	Jack Pine/Spruce
HgOv 59	SW/NW/36/93/11	12VVU/613/298	Artifact scatter: Debitage	Knoll/crest	Borrow Pit	Jack Pine
HgOv 60	SE/NE/35/93/11	12VVU/611/301	Artifact scatter: Debitage	Terrace	Drainage	Jack Pine/Spruce
HgOv 61	SE/NE/35/93/11	12VVU/610/302	Artifact scatter: Debitage	Ridge/edge	Drainage	Poplar/Spruce
HgOv 62	SE/NE/35/93/11	12VVU/608/299.5	Isolated find: Flake	Terrace/gully	Drainage	Aspen/Spruce/Willow
HgOv 63	NE/NE/36/93/11	12VVU/627/304	Workshop: Debitage	Terrace/confluence	Beaver River/ drainage	Aspen/Spruce/Willow
HgOv 64	NW/NE/36/93/11	12VVU/623/304	Workshop: Debitage	Terrace/slope	Beaver River/ drainage	Aspen/Spruce
HgOv 65	NE/NE/36/93/11	12VVU/624.5/304.5	Workshop: Scraper/debitage	Terrace/back	Beaver River/ drainage	Aspen/Spruce
HgOv 66	SW/SW/06/94/10	12VVU/632/307	Isolated find: Flake	Terrace/edge	Beaver River/ drainage	Aspen/Spruce
HgOv 67	SW/SE/36/93/11	12VVU/621.5/290.5	Artifact scatter: Debitage	Terrace/bench	Beaver River/ drainage	Aspen/Spruce
HgOv 68	SE/NW/14/94/11	12VVU/602/347	Isolated find: Core	Terrace/edge	Drainage	Aspen/Spruce
HgOv 69	SE/SE/14/94/11	12VVU/611/340	Artifact scatter: Scraper/debitage	Lowland/roadcut	Wetlands	Spruce/Jack Pine

BORDEN #	LEGAL	UTM	SITE TYPE	RELATIVE LANDFORM	WATER SOURCE	ON SITE VEGETATION
HgOv 70	NE/NE/36/93/11	12VVU/624/305	Campsite: Biface/scraper/ flake tool/debitage	Terrace	Beaver River	Spruce/Aspen
HgOv 71	NW/SW/13/94/11	12VVU/613/346	Artifact scatter: Debitage	Knoll/clearing	Wetlands	Aspen
HgOv 72	SW/NE/36/93/11	12VVU/623.5/301	Campsite: Debitage	Terrace/back	Beaver River	Spruce/Aspen
HgOv 73	NE/SW/14/94/11	12VVU/601.5/346	Artifact scatter: Debitage	Ridge/confluence	Drainage/ Drainage	Spruce/Aspen
HgOv 74	SE/SW/14/94/11	12VVU/600/340	Isolated find: Split pebble	Ridge/confluence	Drainage/ Drainage	Spruce/Aspen
HgOv 75	SE/SE/01/94/11	12VVU/628/309	Artifact scatter: Debitage	Terrace	Oxbow/ Beaver River	Spruce/Aspen
HgOv 76	NW/NE/36/93/11	12VVU/620/303	Artifact scatter: Core/debitage	Terrace/back	Beaver River	Spruce
HgOv 77	NW/NE/36/93/11	12VVU/620/302	Campsite: Hammerstone/cores/ debitage	Terrace/edge	Beaver River	Spruce
HgOv 78	SE/NW/36/93/11	12VVU/618/298.5	Artifact scatter: Debitage	Terrace	Drainage	Spruce
HgOv 79	SW/NE/12/94/11	12VVU/621/332	Artifact scatter: Debitage	Ridge/terrace	Wetlands	Spruce
HgOv 80	NE/NE/35/93/11	12VVU/611/303	Isolated find: Core	Ridge	Drainage	Jack Pine/Alder
HgOv 81	NE/SW/25/93/11	12VVU/617/279	Isolated find: Flake	Terrace/edge	Beaver River	Spruce/Aspen

APPENDIX III

SITE INVENTORY DATA

Alberta
CULTURE AND MULTICULTURALISM

Archaeological Survey
Provincial Museum of Alberta

ARCHAEOLOGICAL SITE INVENTORY DATA

Borden No. HfOu 1

Permit No. 95-83

Update/Revisit Date:

Return to: Archaeological Inventory and Permit Coordinator
Archaeological Survey, 8820 - 112 St.
Edmonton, Alberta T6G 2P8

Official Use
Previous Borden No. ☐

1. Site Name:

2. N.T.S. 1:50,000 Map No.: 74 D/14 Name: Wood Creek Air photo reference:

3. Elevation: 325 m

4. U.T.M. Location Grid: 12 Zone: VU Easting: 755 Northing: 168.5

5. Legal Description LSD: 9 Section: 20 T: 92 R: 9 W of: 4 M

6. Land Owner
☐ Government of Canada
☐ Government of Alberta
☐ Municipal Government
☒ Freehold

7. Land Owner Name, Address, and Telephone No.:

8. Access (refer to highway, road number, trail, cardinal directions, landmarks, nearest settlement, distances)

Site is situated on the east side of the Athabasca River, east of the Suncor Oil Sands Recovery plant. An operational airstrip is located 750m west of the site. No vehicle access.

9. Site Setting (describe in terms of drainage, slope, aspect, vegetation, landforms)

Site is situated on a level bench overlooking remnant drainage to the north and east. Primary on site vegetation bearberry, surrounding site aspen, spruce and willow. Sandy soil matrix.

10. Site Class
☐ prehistoric
☐ protohistoric
☐ historic
☒ unknown
☐ other

11. Context
☐ surface
☒ buried
☐ stratified
☐ unknown

12. Components (or Cultural Strata)
☒ single
☐ multi (no.:)
☐ unknown

13. Site Type
☒ isolated find
☐ scatter
☐ campsite
☐ stone feature
☐ killsite
☐ workshop
☐ quarry
☐ rock art
☐ human burial
☐ ceremonial
☐ homestead
☐ trade post
☐ industrial
☐ other

Borden No. HfOu 1

14. Features (Frequencies if possible)

stone circle	drive lane	pictograph	foundation	historic dump
cairn	effigy	petroglyph	cabin	other:
medicine wheel	hearth	mound	house	
stone line	pit	depression	other structure	

15. Material (Frequencies if possible)

observed/collected		observed/collected		observed/collected	
__/__	projectile point(s)	__/__	skeletal elements	__/__	human remains
__/__	lithic tool(s)	__/__	- identifiable	__/__	historic ceramics
1 / 1	lithic debitage	__/__	- unidentifiable	__/__	metal
__/__	bone tools	__/__	tephra	__/__	glass
__/__	prehistoric ceramics	__/__	sediment	__/__	other:
__/__	firecracked rock	__/__	macrofossils		

16. Additional remarks regarding materials observed and/or collected:

1 Beaver River sandstone secondary flake recovered from shovel test. Flake recovered from 8cm B.S. 24 additional tests sterile.

17. Estimated Dimensions N-S: .5 m E-W: .5 m Depth: .08 m

18. Means of Estimation ☒ surface inspection ☒ shovel tests ☐ erosion exposure ☐ backhoe tests ☐ other:

19. Estimated Site Portion Intact: 0 %

20. Disturbance Factors (natural, human, current, potential)

Proposed oil sands extraction.

21. Estimated Age ☐ Early Prehistoric ☐ Middle Prehistoric ☐ Late Prehistoric ☐ Historic ☒ Unknown

22. Temporal Control

Calendar Date A.D./B.C.	Radiocarbon Dates	+/-	B.P.	Lab. No.	13 C Corrected

☐ diagnostics, specify:

☐ stratigraphy:

☐ archival:

☐ informant :

☐ other:

23. Collection Repository
- [x] Archaeological Survey of Alberta
- [ ] Private collection, Dispositions File:
- [ ] other

24. Photographs
- [x] yes
- [ ] no

Repository: A.S.A.

25. Principal Investigator/Permit Holder: R. J. Balcom

26. Project Name: Suncor/Steepbank Mine

27. Project Type
- [x] H.R.I.A..
- [ ] mitigation
- [ ] research survey
- [ ] research excavation
- [ ] other:

28. Development Type
- [ ] road/highway
- [ ] gravel/sand pit
- [ ] pipeline
- [ ] wellsite
- [ ] coal mine
- [x] oil sands
- [ ] transmission line
- [ ] reservoir
- [ ] residential area
- [ ] recreation area
- [ ] industrial area
- [ ] other:

29. Observed by: Golder Associates — Date (Y/M/D): 95/09/12

30. Surface collected by: — Date (Y/M/D):

31. Tested/assessed by: Golder Associates — Date (Y/M/D): 95/09/12

32. Excavated/mitigated by: — Date (Y/M/D):

33. Form completed by: T. Hoffert — Date (Y/M/D): 95/11/23

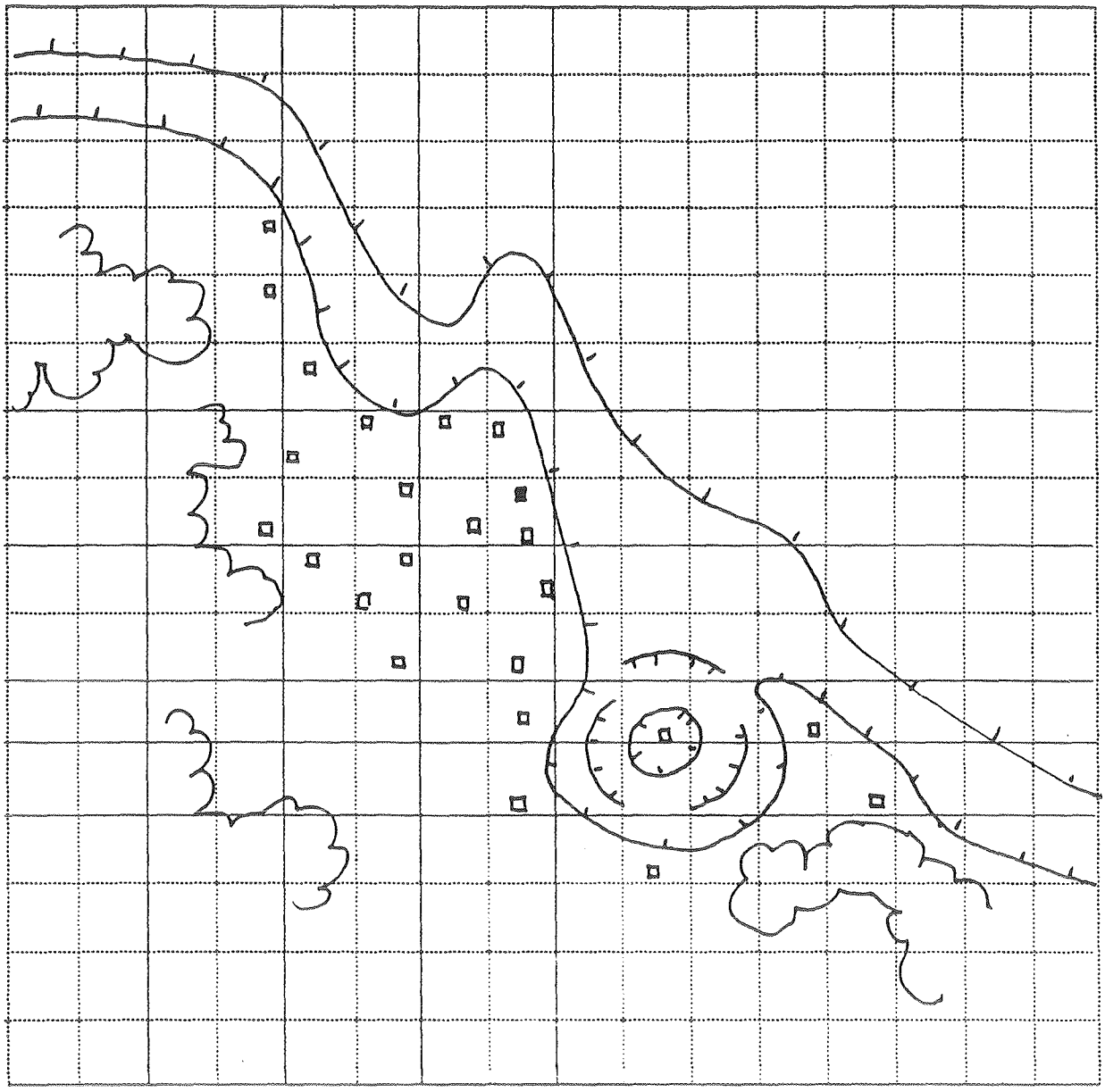
34. Recommendations
- [x] no further concerns
- [ ] additional investigation required (specify):

35. Additional Remarks (previous work, additional references, etc.)

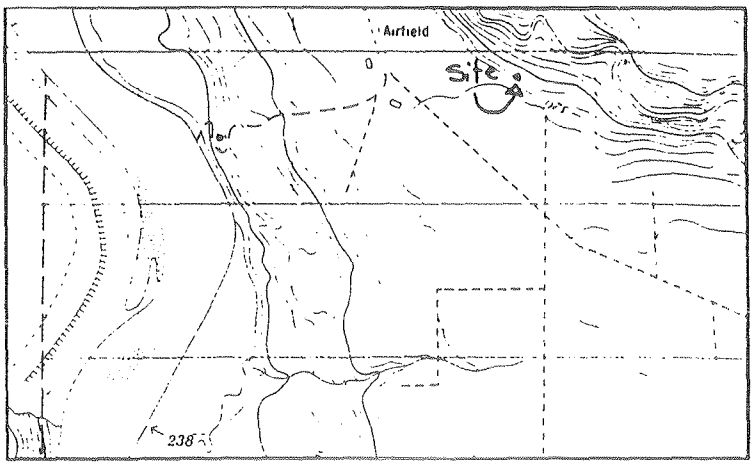
36. Site Map

Borden No. HfOu 1

Permit No. 95-83



N.T.S. 1:50,00 MAP INSET Map No.:



LEGEND

Extent of Site
Building
Foundation
Road
Trail
Fence
Railway
River
Steep Rise

Additional Legend
Shovel test positive
Shovel test negative

N

Scale : 1 cm = 5 m

0

Alberta
CULTURE AND MULTICULTURALISM

Archaeological Survey
Provincial Museum of Alberta

ARCHAEOLOGICAL SITE INVENTORY DATA

Borden No. HfOu 2

Permit No. 95-83

Update/Revisit Date:

Return to: **Archaeological Inventory and Permit Coordinator**
Archaeological Survey, 8820 - 112 St.
Edmonton, Alberta T6G 2P8

Official Use
Previous Borden No. ☐

1. Site Name:

2. N.T.S. 1:50,000 Map No.: 74 D/14 Name: Wood Creek Air photo reference:

3. Elevation: 340 m

4. U.T.M. Location Grid: 12 Zone: VU Easting: 762 Northing: 093

5. Legal Description LSD: 14 Section: 28 T: 91 R: 9 W of: 4 M

6. Land Owner ☐ Government of Canada ☐ Government of Alberta ☐ Municipal Government ☒ Freehold

7. Land Owner Name, Address, and Telephone No.:

8. Access (refer to highway, road number, trail, cardinal directions, landmarks, nearest settlement, distances)

Site lies on east side of Athabasca River, approximately 2.75 km east of south tip of Inglis Island at the head waters of Legget Creek. No vehicle access.

9. Site Setting (describe in terms of drainage, slope, aspect, vegetation, landforms)

Site located 25m north of Legget Creek at the east end of ravine on bulldozed trail, 3m back from ravine edge. Poplar, spruce forest. Sandy soil matrix.

10. Site Class ☐ prehistoric ☐ protohistoric ☐ historic ☒ unknown ☐ other

11. Context ☒ surface ☐ buried ☐ stratified ☐ unknown

12. Components (or Cultural Strata) ☒ single ☐ multi (no.:) ☐ unknown

13. Site Type ☒ isolated find ☐ scatter ☐ campsite ☐ stone feature ☐ killsite ☐ workshop ☐ quarry ☐ rock art ☐ human burial ☐ ceremonial ☐ homestead ☐ trade post ☐ industrial ☐ other

Borden No. HfOu 2

14. Features (Frequencies if possible)

stone circle	drive lane	pictograph	foundation	historic dump
cairn	effigy	petroglyph	cabin	other:
medicine wheel	hearth	mound	house	
stone line	pit	depression	other structure	

15. Material (Frequencies if possible)

observed/collected		observed/collected		observed/collected	
__/__	projectile point(s)	__/__	skeletal elements	__/__	human remains
1 /1	lithic tool(s)	__/__	- identifiable	__/__	historic ceramics
__/__	lithic debitage	__/__	- unidentifiable	__/__	metal
__/__	bone tools	__/__	tephra	__/__	glass
__/__	prehistoric ceramics	__/__	sediment	__/__	other:
__/__	firecracked rock	__/__	macrofossils		

16. Additional remarks regarding materials observed and/or collected:

1 marginally retouched chert biface on surface of bulldozer cut. 13 additional tests in area were sterile.

17. Estimated Dimensions N-S: .5 m E-W: .5 m Depth: 0 m

18. Means of Estimation ☒ surface inspection ☒ shovel tests ☐ erosion exposure ☐ backhoe tests ☐ other:

19. Estimated Site Portion Intact: 0 %

20. Disturbance Factors (natural, human, current, potential)

Proposed oil sands extraction.

21. Estimated Age ☐ Early Prehistoric ☐ Middle Prehistoric ☐ Late Prehistoric ☐ Historic ☒ Unknown

22. Temporal Control

Calendar Date A.D./B.C.	Radiocarbon Dates	+/-	B.P.	Lab. No.	13 C Corrected

☐ diagnostics, specify:

☐ stratigraphy:

☐ archival:

☐ informant :

☐ other:

Borden No. HfOu 2

23. Collection Repository
- [x] Archaeological Survey of Alberta
- [ ] Private collection, Dispositions File:
- [ ] other

24. Photographs
- [x] yes
- [ ] no

Repository: A.S.A.

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- [ ] mitigation
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- [ ] pipeline
- [ ] wellsite
- [ ] coal mine
- [x] oil sands
- [ ] transmission line
- [ ] reservoir
- [ ] residential area
- [ ] recreation area
- [ ] industrial area
- [ ] other:

29. Observed by: Golder Associates Date (Y/M/D): 95/09/14

30. Surface collected by: Date (Y/M/D):

31. Tested/assessed by: Golder Associates Date (Y/M/D): 95/09/14

32. Excavated/mitigated by: Date (Y/M/D):

33. Form completed by: T. Hoffert Date (Y/M/D): 95/11/23

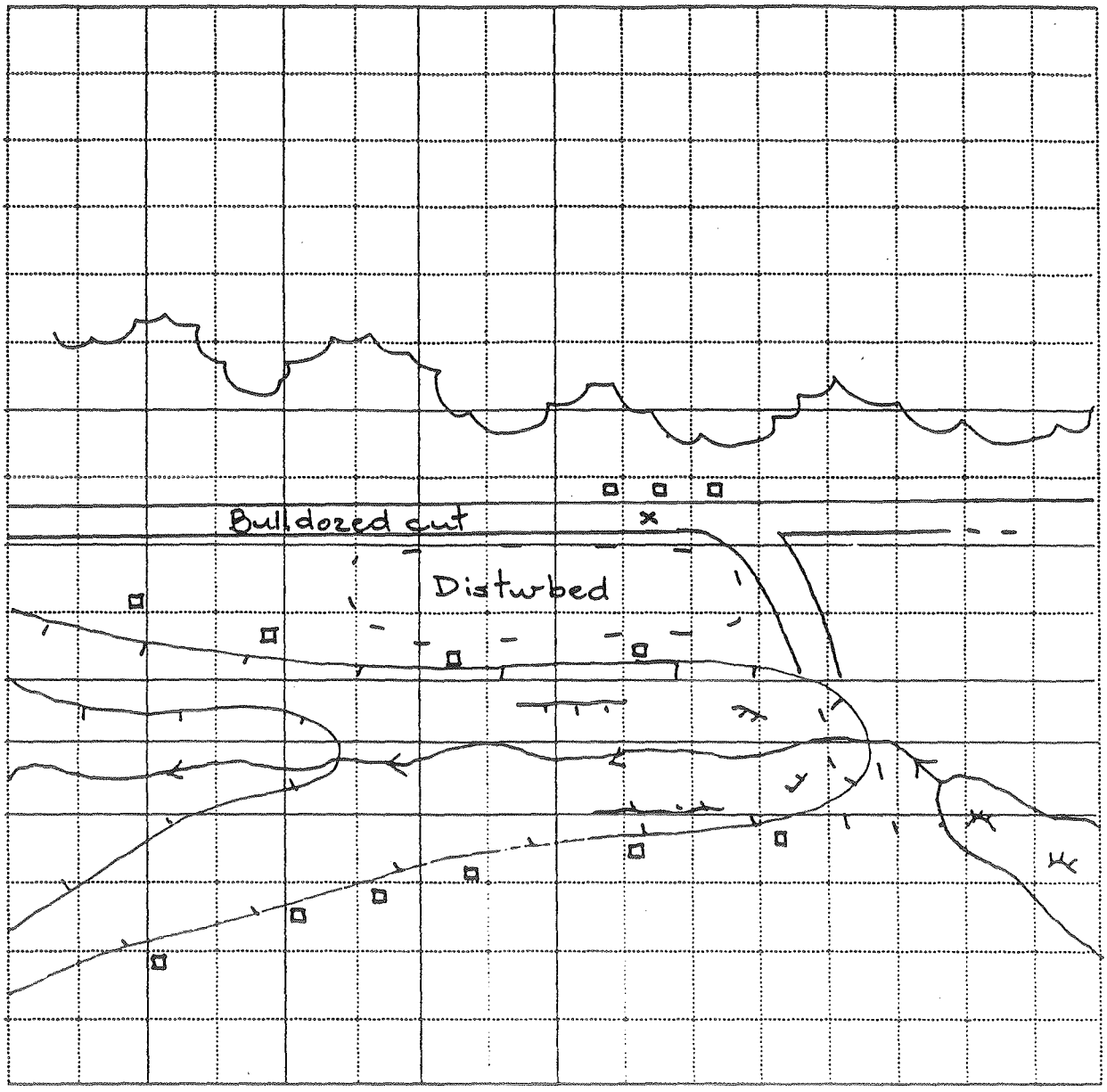
34. Recommendations
- [x] no further concerns
- [ ] additional investigation required (specify):

35. Additional Remarks (previous work, additional references, etc.)

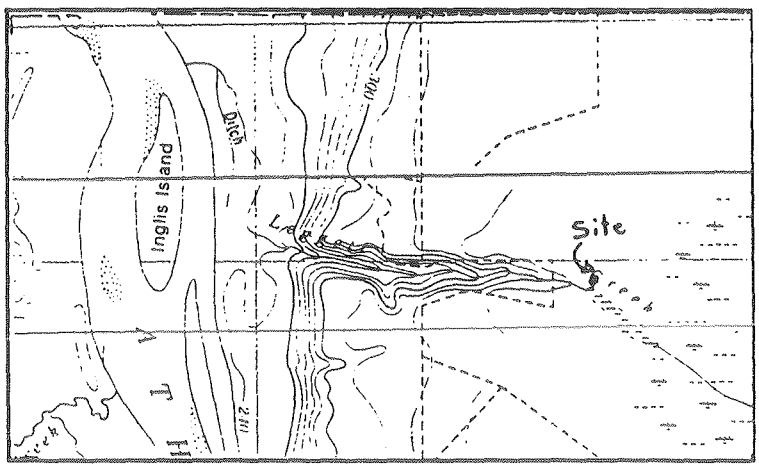
36. Site Map

Borden No. HfOu 2

Permit No. 95-83



N.T.S. 1:50,00 MAP INSET Map No.:



LEGEND

Extent of Site
Building
Foundation
Road
Trail
Fence
Railway
River
Steep Rise

Additional Legend

N

Scale : 1 cm =

0