Keeyask Generation Project

Environmental Impact Statement

Supporting Volume

Socio-Economic Environment, Resource Use and Heritage Resources

KEEYASK

Hydropower Limited Partnership

June 2012

PART 3
HERITAGE RESOURCES

KEEYASK
Hydropower Limited Partnership

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1.0 HERITAGE RESOURCES

1.1 INTRODUCTION

Heritage resources are non-renewable resources; they are tangible objects of human endeavour that have survived the rigors of time and which indicate evidence of past human activities. They provide a vital cultural link between the past and present; they sustain and support, and in turn are supported by an oral tradition of long term occupancy in the vicinity of the Keeyask Project by Keeyask Cree Nations (KCN). To the KCNs heritage resources represent part of the legacy left by ancient people, *Keteyatisak*. As part of the cultural landscape the ancient tools and remnants of campsites remind the KCNs daily of their long presence on the land. UNESCO also reminds us that:

> heritage of indigenous peoples is comprised of all objects, sites and knowledge, the nature or use of which has been transmitted from generation to generation, and which is regarded as pertinent to a particular people or its territory. The heritage of an indigenous peoples includes objects, knowledge and literary or artistic works which may be created in the future based upon its heritage..and..the heritage of indigenous peoples includes all moveable cultural property as defined by the relevant conventions of UNESCO (UNESCO 1995).

ATK shared by the KCNs and the emerging archaeological record have contributed to improving our understanding of the relationship of people to the land and all things.

This section of the Socio-economic Environment, Resource Use and Heritage Resources Supporting Volume (SE SV) is based on the findings of the Heritage Resources Impact Assessment (HRIA) process and focuses on tangible heritage, that is, the range of heritage objects and sites that can be identified according to the Manitoba *Heritage Resources Act* (1986). The intangible aspects of heritage are discussed in the Culture and Spirituality section of the SE SV.

1.1.1 Purpose and Content of the Heritage Resources Assessment

The Heritage Resources assessment examines the effects of the Project on the heritage resources within the environs of the Project. The document presents a characterization of the heritage environmental setting, nature and estimated effects of the Project on heritage resources, mitigation measures to reduce the effects on heritage resources, residual effects that may be anticipated after mitigation has been applied and monitoring plans for heritage resources sites that will be affected by the Project. Each of the above-noted headings is sub-divided into a series of topics that define the study area from a heritage resources perspective.

In Manitoba, all archaeological and heritage investigations are governed by *The Heritage Resources Act* (1986), hereafter referred to as *the Act*. In order to conduct any archaeological investigation a heritage permit is required which sets out the specific terms of the investigation. Moreover, Section 12 (2) specifically states that if the minister (in charge of heritage resources) considers that heritage resources are in danger of being disturbed or destroyed a Heritage Resource Impact Assessment (HRIA) may be required. Furthermore, the Policy Respecting the Reporting, Exhumation, and Reburial of Found Human Remains (Province of Manitoba 1987) provides specific protocols and is concerned only with found human remains as described in *the Act*, where heritage resources are defined.

The intent of Manitoba's *Environment Act* (1988) is to "develop and maintain an environmental protection and management system in Manitoba which will ensure that the environment is protected and maintained in such a manner as to sustain a high quality of life, including social and economic development..and in this regard, this Act is complementary to, and support for, existing and future provincial planning and policy mechanisms and provides for the environmental assessment of projects which are likely to have significant effects on the environment…" (1988 1 (1) (a) and (b)).

The *Canadian Environmental Assessment Act* (1996) (CEAA) requires that consideration must be given to physical and cultural heritage in federal environmental assessments. While the CEAA acknowledges that there are two aspects of heritage: tangible and intangible, only those of a tangible nature are described in detail in the Reference Guide on Physical and Cultural Heritage Resources (CEAA 1996).

Under the CEAA the environmental effects of a project "... on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance" (Section 2(1)) must be considered. Cultural heritage resources are defined as "... human work(s) or a place that gives evidence of human activity or has spiritual or cultural meaning and that has historic value. This interpretation can be applied to a wide range of resources, including, cultural landscapes and landscape features, archaeological sites, structures, engineering works, artifacts and associated records" (Reference Guide on Physical and Cultural Heritage Resources (CEAA) 1996:3).

1.2 OVERVIEW OF ASSESSMENT APPROACH

The assessment of heritage resources was conducted under *the Act* (1986). The assessment examines the effects of the construction and operation phases on heritage resources as defined by *the Act*.

1.2.1 Pre-Project Planning, Joint Keeyask Development Agreement and Adverse Effects Agreements

Historically, three stages of progress took place in the early development of the Project: pre-project planning, the Joint Keeyask Development Agreement (JKDA) and the Adverse Effects Agreements (AEA).

First Nations residing within the Project Study Area of the proposed Keeyask Generation Project have actively participated in the pre-project planning; this has resulted in a limited partnership between Manitoba Hydro and the KCNs (Tataskweyak Cree Nation [TCN], Fox Lake Cree Nation [FLCN], War Lake First Nation [WLFN] and York Factory First Nation [YFFN]). As the Partnership has progressed there has been a shift towards more detailed Project planning and the environmental assessment process.

The JKDA additionally gave shape to the terms of the Project and the Keeyask Hydropower Limited Partnership (the Partnership) between Manitoba Hydro and the KCNs. Referenda held in the four First Nation communities ratified the agreement that was signed in May 2009 at Split Lake, Manitoba.

Further to this, and as a result of the JKDA agreement, each KCNs community negotiated its own Adverse Effects Agreement (AEA) which mapped out a vision for the future of each First Nation. Because of these agreements, the construction of a facility at Split Lake to be known as the Keeyask Cultural Centre is underway.

All tangible artifacts that were recovered during the years of archaeological field studies will be repatriated to TCN and displayed and interpreted in the museum within the Keeyask Cultural Centre. Programs such as mobile heritage educational displays that will be used within the KCNs are being considered. Further to this TCN passed a Band Council Resolution (BCR) on July 8, 2011 approving an educational partnership with the University College of the North, authorizing an archaeological field credit course to be carried out at Clark Lake in the summer of 2012. This six-hour credit course in archaeological field studies has been developed for University College of the North (UCN). Further, a two year Diploma in Cultural Resource Management is being considered by UCN and supported by TCN. This last mentioned program will provide skills and certification to local First Nation post-secondary students to qualify for management of small museums such as that within the Keeyask Centre, assisting in development of mobile heritage educational displays and managing oral history and traditional knowledge programs within the community.

1.2.2 Aboriginal Knowledge in the Heritage Resources Assessment

For the assessment of heritage resources the KCNs have played an important role in guiding archaeological field investigations associated with the HRIA process. The above-noted planning and agreements and other community-driven studies such as the Overview of Water and Land (OWL) processes developed by TCN (2002) and WLFN (2002), clearly expressed the deep historical and cultural relationship that Cree people had and continue to have with the land and the ancient objects that have been left as reminders of the past. The FLCN History Project *Ninan* (FLCN 2009 Draft), Draft Traditional Knowledge Report on Sturgeon (FLCN 2008), the FLCN Draft Traditional Knowledge Study (FLCN 2010) and YFFN Traditional Values, Occupancy and Community History Project (YFFN 2010) provide further detail of the relationships and understanding of the people to the land. In addition to this valuable direction and knowledge, community Members, Elders and youth from the KCNs were actively involved in the HRIA process and associated comparative studies. This is described in more detail in Section 6.4.3.

1.2.3 Heritage Resources Framework

The Heritage Resources section of the SE SV is concerned with the range of heritage resources (as defined in *the Act*) that may be affected by the Project. Figure 1-1 illustrates a general framework of pathways by which the Project could affect heritage resources and acknowledges and considers the AEAs that have been established prior to the environmental assessment. Pathways through the physical and biophysical environments have the potential to directly affect heritage resources that are part of the cultural legacy of people.

The effects of the Project are discussed later in this document under the Construction Phase and Operation Phase Sections.

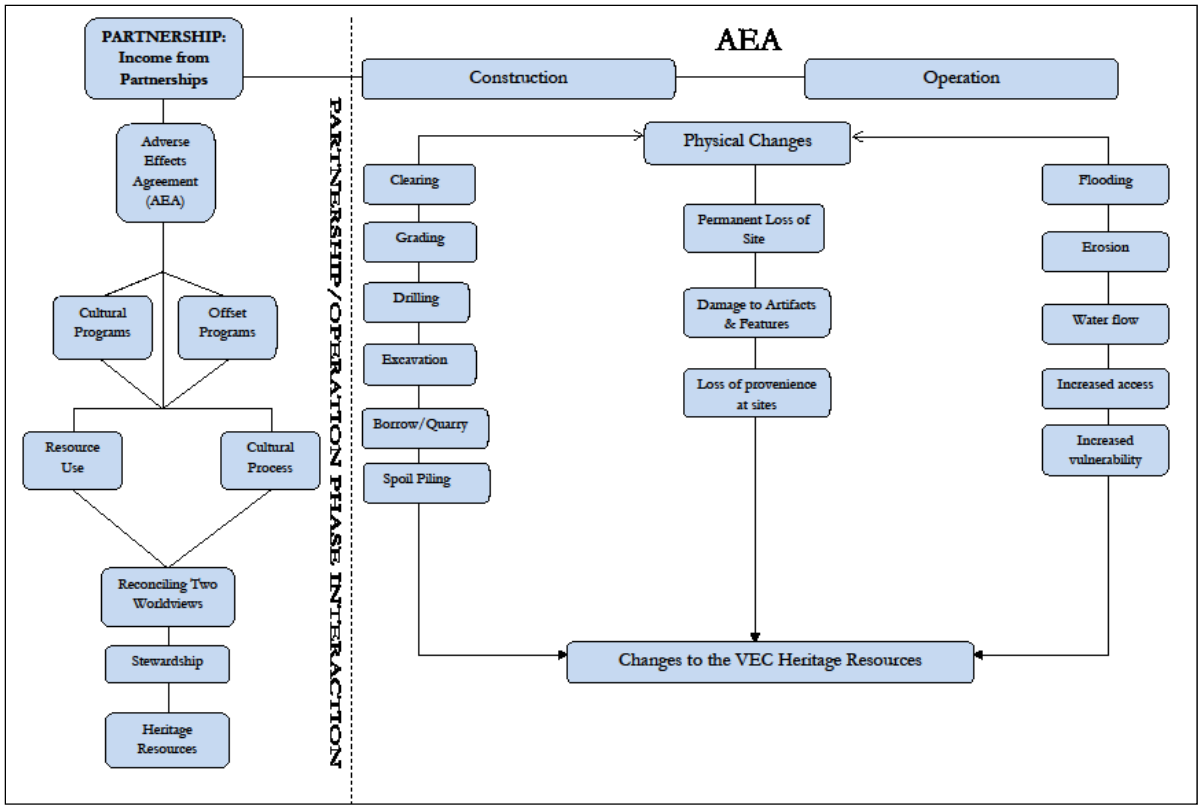


Figure 1-1: Potential Adverse Effects that May Cause Changes to the Heritage Resources

1.2.4 Scope of Heritage Resources

The Project that is discussed in this Heritage Resources Section of the SE SV is described in greater detail in the PD SV and in the Keeyask Generation Project: Response to EIS Guidelines (the EIS). This document does not describe or include the results of the HRIAs conducted for the Keeyask Infrastructure Project or transmission lines to and from the Project or the effects of these associated projects.

Heritage resources are considered a Valued Environmental Component (VEC) that includes tangible material culture, which is valued by people and helps to characterize the effects of the Project. Heritage resources as defined under *the Act* are protected as objects, sites and designated areas that are considered to be of heritage value to the Province of Manitoba. Therefore the Heritage Resources VEC includes categories of: "(i) heritage site, (ii) heritage object, and/or (iii) any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic [Pre-European Contact], historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination thereof" (*Heritage Resources Act* 1986). The intangible nature of heritage resources is captured in the Culture and Spirituality section of the SE SV.

1.2.5 Assessment Methodology

The overall methodology used in assessing the Keeyask Generation Project is found within Section 1 of the SE SV. For the Heritage Resources section, regulatory scoping consisted of provincial legislation, namely

Manitoba's *Heritage Resources Act* and the Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains. Within this context all heritage resources were considered VECs.

The significance of Project effects is not present in this section in order to be consistent with the other supporting volumes in this series. Significance is presented in the EIS which incorporates the full range of biophysical and socio-economic (including heritage) effects of the Project.

1.2.6 Heritage Resources Methods

The fieldwork and assessment phases of the study were guided by *the Act* and heritage resources were defined as by *the Act*, standard archaeological procedures, principles of participatory action research and best practices which were designed to engage Members of the KCNs during the assessment process.

1.2.7 Scope of Methods Used

The heritage resources assessment used triangulation, archaeological and quantitative methods and local ATK to assess the effects on the VEC heritage resources.

- Triangulation was the approach used to ensure that as many data sources as possible were identified prior to field investigation. This technique aids in validating data by cross verification from two or more sources and assists in identifying and filling in knowledge gaps. The existing archaeological data inventory, the historical (documentary) record and the oral tradition (oral narratives and oral histories) for the Regional Study Area were used.
- Archaeological methods included those used in conducting HRIA archaeological field investigations-literature review, characterization and predictive modeling. Field methods ranged from pedestrian surveys, controlled shovel testing along transects (as well as arbitrarily placed but controlled shovel testing), test unit excavation and formal excavation. Post-field laboratory methods included standard artifact processing and analysis. Quantitative methods included assigning a weighted value to archaeological sites within the Heritage Resources Core Study Area and ranking those sites that required follow-up investigations.
- Throughout the years of archaeological investigations TCN played an important role in providing ATK relative to the Local Study Area, identifying areas of potential burials, providing historical reference to abandoned tent frames and documenting Cree historical events. The TCN OWL Summary Report (2003) was an important document that provided an overview of cultural values. This oral narrative was also supported by archival documents of the Anglican Diocese of Keewatin, Keewatin, Ontario.

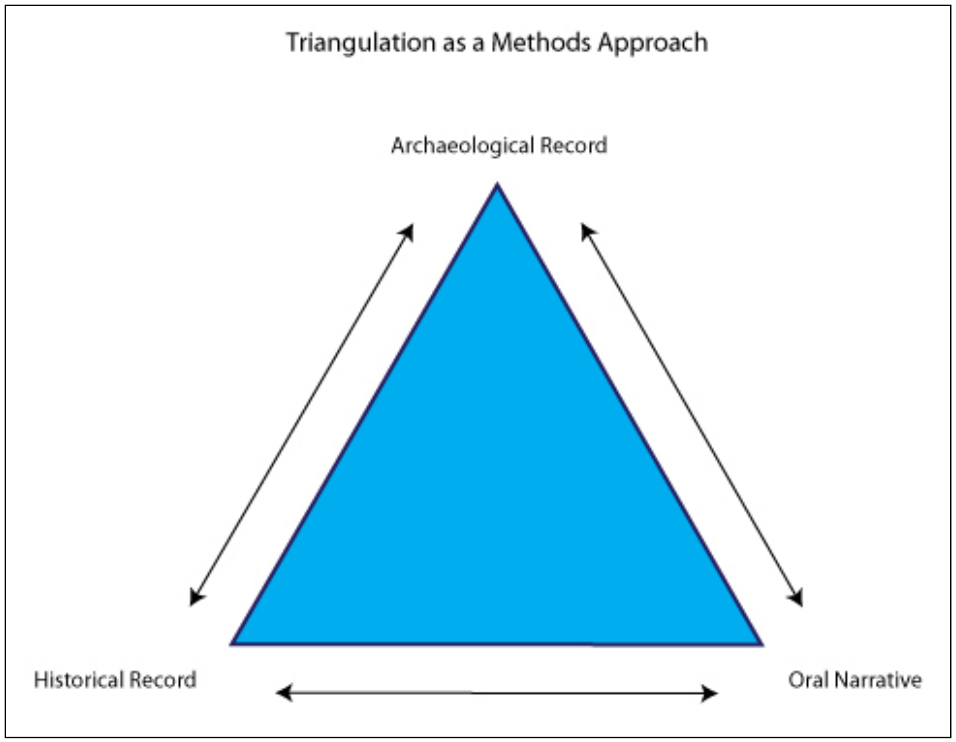


Figure 1-2: Triangulation as a Methods Approach

1.2.8 Uncertainty

There is a degree of uncertainty in predicting the future archaeological environment with and without the Project, however there are certain factors that will contribute to the status of the future archaeological environment. The Heritage Resources section addresses uncertainty in the following manner:

- Identifies the limitations of archaeological predictive modeling and field techniques;
- Identifies the limitations of existing archaeological site data;
- Identifies the limitations of data analysis; and
- Identifies the need for application of a heritage resource protection plan (HRPP) for addressing heritage concerns that may arise during the construction and operation phases.

1.3 STUDY AREA

The extent to which the Project would have an effect on heritage resources is directly related to the proximity of the heritage resource to the Project. For ease of discussion, the study area is divided into three geographic study areas (Map 1-1).

The three geographic zones of heritage resources are:

- Core Study Area - included areas that will be impacted by the Project;
- Local Study Area - provided opportunities for examining proxy sites; and
- Regional Study Area - provided the context for characterization and overview.

For HRIA purposes, locations within all three study areas were examined.

The **Heritage Resources Core Study Area (the Core Study Area)** included the reach of the Nelson River between its outflow at Clark Lake and the inflow into Stephens Lake, which is referred to be the predicted hydraulic zone of influence. The study area also included the actual footprint of the generation facility, borrow areas, dykes and access roads. The Core study area was defined to include areas that will be impacted to varying degrees by the Project. Prior to the Keeyask Generation Project no archaeological sites were registered within the Core Study Area; after the archaeological investigations the total count of heritage resource sites within the Core Study Area was increased to 50."

Prior to the Project no archaeological sites were registered within the Core Study Area; however, after the archaeological investigations were conducted for the Project, the total count of heritage resource sites within the Core Study Area was increased to a count of 50.

The **Local Study Area** examined heritage resources within a broader geographic range that included Clark, Carscadden, Moose Nose, Stephens, Fox, and Kettle lakes and Landing River as well as the Core Study Area. The deteriorated condition of some archaeological sites within the predicted hydraulic zone of influence did not allow for an in-depth understanding of past cultural occupations (see below). Therefore, a plan to examine selected proxy locations within the Local Study Area was initiated. These areas were important as they provided proxy data for assessing the Core Study Area. Clark Lake, for example, was selected as an important proxy site to be investigated because of its geographic location near an important fishery at the mouth of the Assean River, its exceptional archaeological record and the presence of a well-used, adjacent traditional camp area. TCN also requested that further investigation take place at this site because of its proximity to the hydraulic zone of influence.

The **Regional Study Area** encompassed both the Local and Core study areas. It provided the context within which heritage resources of discrete cultural affiliation and chronology were understood. This area included portions of the ancestral and traditional lands of Tataskweyak Cree Nation (TCN), War Lake First Nation (WLFN), Fox Lake Cree Nation (FLCN) and York Factory First Nation (YFFN). For the purpose of this document a decision was made to stay within the Swampy Cree region, while at the same time appreciating the interactions with Upland and Rock Cree. The general archaeological record (*i.e.,* site data from HRB) for northern Manitoba was used to characterize the cultural chronology of the Project area because so few sites were registered within the area identified as the Regional Study Area.

Within the Regional Study Area, the confluence of the Odei and Burntwood rivers was considered by TCN to be of traditional importance, as was the community of Split Lake. Archaeological studies conducted in the 1970s and early 1990s identified 42 heritage resource sites (Dickson 1972; Kroker 1990; Petch 1992; Riddle 2000; Wiersum 1973; 1972) throughout these areas. Further archaeological investigations in 2008 at the confluence of the Odei/Burntwood Rivers and at the community of Split Lake identified 20 archaeological sites. These locations within the Regional Study Area were identified in consultation with KCNs. The total

number of known heritage resource sites before the Project was 42; after the archaeological investigations the total count of heritage resource sites within the Regional Study Area was increased to 162.

1.4 ENVIRONMENTAL SETTING

1.4.1 History of Past Hydroelectric Development

In addition to the usual sources of information regarding the archaeological and historical records, major hydroelectric development reports for northern Manitoba were reviewed. These assisted in understanding the kinds of past effects that were known to have occurred to archaeological/heritage sites.

Several major hydroelectric developments along the Nelson River have been constructed over the past 50 years. Completion dates for these developments are:

- Kelsey Hydroelectric Generating Station (1961) Built by the Manitoba Hydro-Electric Board (MHEB) to supply the power requirements of the International Nickel Company's townsite and mining, smelting and refining operation in Thompson.
- Lake Winnipeg Regulation (LWR) - (1970) A key element of hydropower development on the Nelson River. The outflow from Lake Winnipeg is regulated by a control structure at the Jenpeg Generating Station on the Nelson River near the outlet of the lake.
- Kettle Generating Station (1974) The second hydroelectric generating station to be developed on the Nelson River and the largest in Manitoba at that time.
- Churchill River Diversion Project (CRD) (1976) Began operating in September 1976 when an initial water flow of approximately 283.16 cubic metres per second was released through the Notigi Control Dam. The control dam at Missi Falls on the Churchill River channel from Southern Indian Lake was completed.
- Long Spruce Generating Station – (1979) Went into service with its first unit in October 1979. All 10 of the 98MW units were in service by August 1979.
- Limestone Generating Station – (1991) Officially opened on September 5, 1991, ahead of schedule, and under budget (Manitoba Hydro Website, History and TimeLine).

Heritage resources impact assessments were conducted only for the Limestone Generating Station since Manitoba's *Heritage Resources Act* was not legislated until 1986. The new legislation changed the way in which heritage resources were considered. Between 1985 and 1988, heritage resource assessments, in accordance with the newly legislated *Heritage Resources Act,* were carried out for the projected Limestone Generating Station borrow pits, current activity areas, and the reservoir (Quaternary Consultants 1985, 1986, 1988, 1989a). Mitigation activities were implemented where required (Quaternary Consultants 1988; 1989b). A total of 29 archaeological sites were recorded during this period.

In the early 1990s a preliminary archaeological survey was conducted in the Gull Lake/Gull (Keeyask) Rapids area (Kroker 1991). The Project was placed on hold for reasons that are outside the scope of this document. The survey report, however, concluded that the area of investigation did not provide any baseline for past cultural occupation along the Nelson River. No further investigation took place until 2001 when the environmental assessment process for the Project was initiated (NLHS 2001-2010). Between 2001 and 2010, 120 archaeological sites were recorded through HRIA investigations as part of the Project's environmental assessment.

1.4.2 Heritage Resources & Cultural Landscape Characterization

1.4.2.1 Heritage Resources

The characterization of heritage resources is best understood through the cultural chronology of human occupation within the context of northern Manitoba and the Regional Study Area (NLHS 2001-2010). Much of the regional landscape was not habitable until at least 8,500-7,500 years ago (ya) (Dredge 1992; Teller and Clayton 1983; Teller and Leverington 2004). The effects of glacial Lake Agassiz, **isostatic rebound** and to a lesser extent, the former Tyrrell Sea, determined the succession of plants, animals and humans in this area. For general temporal purposes, occupation by people within the Project area is divided into two very broad periods: Pre-European contact (8,500 to 7,500 -350 years ago) and Historical (350-50 ya) (Figure 1-3). Within these periods, specific cultural occupations are identified that are based on artifact typologies. Archaeological investigations conducted for the Project between 2001 and 2010 identified a relative[1] cultural sequence beginning ca. 6000 years ago and continuing to the present [2]. A complete description of the cultural chronology is found in the initial characterization study completed for the Keeyask Project (NLHS 2001) and again referred to in the HRIA and archaeological reports completed for the Project (see Appendix A List of Field Reports for a list of reports).

1.4.2.2 Cultural Landscape

Cultural landscapes are "..living landscapes" (Buggey and Andrews 2008) that Aboriginal people identify as fundamental to the maintenance of their identity and culture. Cultural landscapes are dynamic and changeable processes that are continually shaped by natural and social influences. The term cultural landscape is used to illustrate the ongoing, intimate relationship that the Cree maintain with the land. Within this landscape are certain natural features and areas that contain tangible evidence of past people from which the KCNs Members have descended. Thus these tangible objects, in the forms of artifacts and features, trigger

[1] Relative dating is based on the comparison of diagnostic artifacts with those found at other archaeological sites that have been dated using absolute dating techniques. Absolute dating uses scientific analysis of organic material through radiocarbon (C14) dating such as accelerated mass spectrometry (AMS) dating techniques. BP refers to years before present.

[2] Absolute cultural sequence dating was acquired from the Point West Site by AMS Standard analysis with 2 Sigma Calibration of Cal AD 250 to 410 (Cal BP 1700 to 1540) and 2 Sigma Calibration of Cal AD 390 to 540 (Cal BP 1560 to 1420) (Beta Analytic Inc. 2011).

mnemonic responses that associate with the historical past. In other words, KCNs Members live their history through all interactions with their physical landscape. These statements are reinforced in the KCNs supporting volumes which underline the authenticity of Aboriginal traditional knowledge, both tangible and intangible (see the Culture and Spirituality section of the SE SV for further information).

1.4.3 Community Participation

Community input was provided by reviewing cultural models developed by the KCNs partners. During the early years of the Project, the Overview of Water and Land (OWL) process developed by TCN and WLFN in 2002 and 2003 provided guidance. These cultural statements were based on the First Nations' cultural concepts. Later, FLCN's *Ninan* (2009 Draft) and Draft Traditional Knowledge (TK) studies (2010) and YFFN's Community History Project (2010) provided further understanding of the historic record. The participation of Elders and First Nation assistants provided a greater appreciation of ancient land use practices that were observed within the archaeological record.

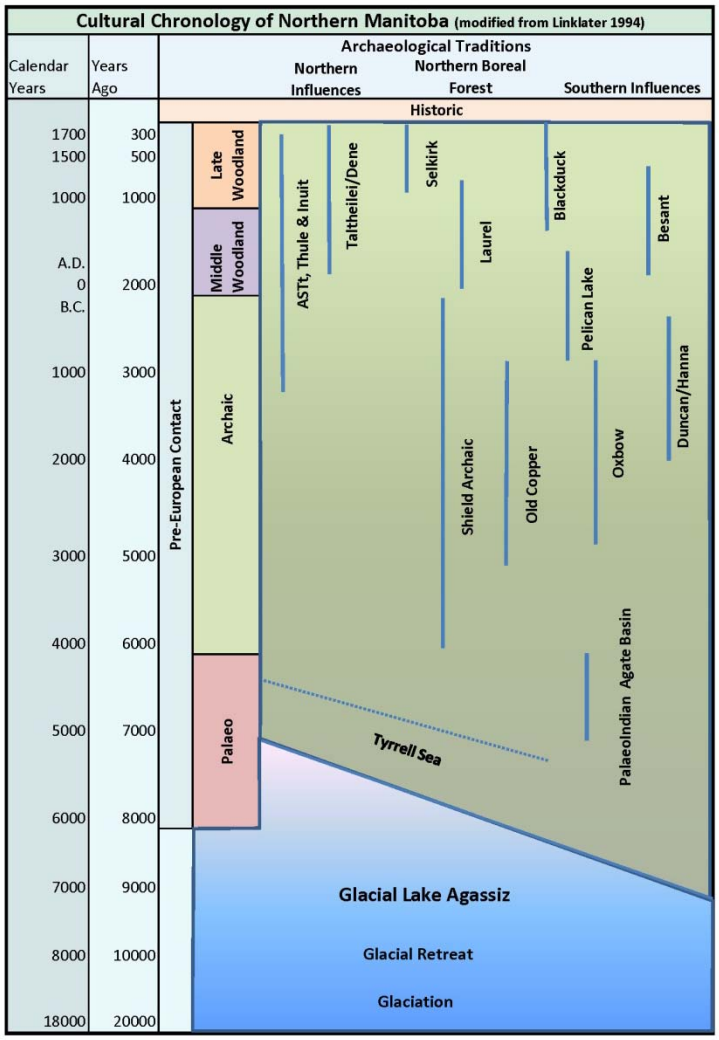


Figure 1-3: Cultural Chronology of the Project Area

Local ATK assisted in documenting recent Cree archaeological sites and knowledge of the Regional and Local Study Areas that could not have been revealed through field surveys alone. Community engagement also provided certain knowledge as to why certain areas would or would not have been used in the past. A number of areas were selected based on informal discussions with Members of TCN and FLCN. For example, TCN Elders commented that most spring/summer camps would be located on the northwest side of Gull Lake in order to watch the coming of the geese (TCN 2004).

Between 2003 and 2006 TCN, WLFN and FLCN Elders and youth participated in archaeological field survey and excavation related to proxy study areas. In addition to community input in planning, field and educational initiatives were established. Further to the support by the KCNs, educational initiatives were established which provided KCNs students with hands-on opportunities and experiences that may never have been possible. Please refer to the 2004 Split Lake Archaeological Project (SLAP) (2006a) and 2005 War Lake Archaeological Research Project (WARP) (2007e).

In 2004, a high school course was developed in cooperation with the Tataskweyak Education Authority. Six high school students from TCN participated in a six-week archaeological program during which students received instruction leading to a high school credit issued through the Tataskweyak Education Authority. The high school credit course consisted of formal classroom instruction and in-field practicum, on-site traditional knowledge instruction from community Elders, regular testing and evaluation. All participating students completed the program and were granted a high school credit. Further to this, two TCN students received training in archival research at the Diocese of Keewatin Archives in Keewatin, Ontario.

In 2005, a similar archaeological field program was initiated with WLFN. Six high school students participated in a six-week archaeological project, receiving formal instruction, and in-field practicum. Five of the students completed the program.

Further field investigations from 2006 to 2010 were conducted at Clark Lake, in particular at the Pointe West Site, as part of the proxy studies for the Heritage Resources Impact Assessment for the EIS with assistance from TCN Members. Community members were trained to participate in excavation of a multi component site. This invaluable participation ensured that the Project goals were accomplished in a timely fashion. Living in the traditional cultural camp at Mamee, adjacent to the Pointe West Site provided excellent opportunities for cultural interaction with community members and the exchange of knowledge.

In 2008, six TCN students from the Chief Sam Cooke Mahmuwee Education Center in Split Lake participated in a three-day archaeological shoreline survey of the Split Lake Reserve. This was carried out in anticipation of pending protective shoreline measures because of shoreline erosion.

Further to the specific student projects, Members of the KCNs provided invaluable services as field assistants, guides, transportation services, bear guards, and food services that were critical to the success of the archaeological field investigations. The attendance and participation of Members at numerous meetings greatly assisted in ensuring that cultural interests and concerns were addressed and acted upon.

Based on early discussion with FLCN, NLHS staff developed a Handbook of Archaeological Sites within the Keeyask Study Area. This easy reference was designed to assist the KCNs to better understand the characteristics of each archaeological site identified in the field surveys as well as the types of archaeological resources that were discovered (NLHS 2009i).

1.4.4 Predictive Modeling

Archaeological predictive models are one of many research tools applied to determine the relative probability of archaeological sites within a specified area. Knowledge of ancient and historic subsistence strategies that could be used in gaining sustenance (food) and resource procurement (fuel and raw materials) is equally valuable in that these activities all reflect how past human groups applied their land use and occupation strategies to particular landscapes (Hamilton 2000).

Since no archaeological sites were registered within the Project area, the development of the predictive model drew from a larger **catchment area**. The basic premise for predictive modeling in archaeology is that certain physiographic attributes in association with economic and cultural characteristics can assist in determining where past people may have engaged in a range of activities. Evidence for past activities is revealed through the identification of archaeological sites on a particular landscape.

Physical environmental variables used for predictive modeling included distance from water, vista, aspect and slope, areas of low, moderate, and high potential for archaeological sites were identified. For detail see Appendix B Methodology and Methods, Predictive Modeling, Site Ranking & Reporting. This tool continues to be refined in terms of the selection of variables. From these data, a valuation process was established and specific areas were flagged for field investigation. Additionally, ATK concerning the historical and present use of certain landscapes, shared during informal discussions, provided further understanding of the possible decision-making processes of past people regarding choice of site.

Predictive modeling allows for efficient and effective analysis of geographic areas prior to field investigations by analyzing those **attributes** that are present at known site locations and those that are absent (Dalla Bona 1993, 1994a, 1994b, 1994c; Hamilton *et al.* 1994; Hamilton 2000; Kvamme 1992). There are some limitations that are noted. For example, river routes can change their course over time. If this is not captured in the study of aerial photos and ortho photos, important sites could be overlooked. Other natural factors such as successive forest fires can destroy the soil matrix, resulting in collapsed soil profiles that obliterate cultural chronologies. The use of **ethnographic analogy** for determining site preference by ancient people will be of little use if changes to the present day landscape mask the ancient landscape. Incorrect interpretation of decision-making models can also limit the accuracy of the model. The methods developed for the predictive modeling are discussed further in Appendix B.

1.5 FIELD INVESTIGATIONS

Archaeological field investigations for the Project began in 2001 and were completed in 2010. All field investigations were accompanied by at least one member of the KCNs. Employment opportunities were made possible through agreements between Manitoba Hydro and the KCNs, which included bear guards, guides, and archaeological field assistants. Elders were also engaged during field studies.

1.5.1 Field Methods

Standard procedures for conducting archaeological field investigations used best practice. Procedures were reviewed prior to field work and were updated during the course of the Project as new technological skills were developed. This ensured consistency in data collection. For example, in the early years of the Project

only the start and end point of pedestrian surveys, shovel tests, transects and sites were recorded by Global Positioning Satellite (GPS). In response to KCNs Elders concerns that the larger area was not being investigated, GPS tracking (**cookie crumb trails**) and GPS cameras were introduced to represent the extensive pedestrian surveys completed. This data was converted and downloaded to Geographic Information System (GIS) technology; accurate geo-referenced locations were transformed into a spatial record of archaeological activities. This provided valuable information to other disciplines, especially the Physical Environment.

When heritage resources or features were found during the initial pedestrian survey, ground markers consisting of pink flags were placed at the specific location. These findings were geo-referenced and recorded by GPS. An arbitrary fixed datum point was established and the location of each artifact was measured by chain and compass method from this fixed point. All diagnostic artifacts were photographed ***in situ*** before being removed from the ground.

Shovel tests (where physically feasible) along transects of 5 - 10m intervals were carried out at locations positive for surface artifacts or features, or in areas that were identified as a high potential site through application of the predictive model. Shovel tests were, on average, 0.5m -x 0.5m square and were excavated to a variety of depths depending on the nature of soils or until sterile sediments or bedrock was encountered. The data were recorded on standard shovel test forms. A detailed site description was recorded using photography and sketch maps in daily field journals.

Where surface collection and shovel testing were physically feasible and proved positive, a 1m X 1m test unit was established. The test unit was excavated in 5 cm increments. Any artifacts recovered during this procedure were two-point **provenienced** unless they were **diagnostic**. Diagnostic artifacts were three-point provenienced and photographed *in situ*. Detailed observations of the surrounding environment were also recorded.

Areas that were formally excavated were subject to rigorous controls and pre-set grid system. All 1m x 1m formal units within the grid, which were identified for excavation, were carefully investigated in 5 cm levels. All back dirt was screened using ¼ inch mesh screen. *In situ* artifacts were subject to 2- and 3-point provenience depending on their nature; soil features were measured, photographed and sketched on level summary forms as were all recovered artifacts.

All artifacts were curated in the same manner: they were placed in individual plastic bags; and all relevant data (stop number, project name, date, geo-referencing, investigator's name, depth below surface (**dbs**), and test number) were marked on the bag. Findings from each site were placed together and set aside for laboratory processing.

1.5.2 Results of Archaeological Investigations

Since 2001, 31 archaeological research and assessment field projects have been conducted within the Regional, Local and Core heritage study areas as part of the EIS. Approximately 195,000m (195km) of pedestrian survey were carried out within the three study areas; 713 shovel test pits were excavated of which 195 (27.5%) were positive for heritage resources. Two formal excavations were conducted in the Local Study Area: Pointe West Site on Clark Lake and Paradise Beach Site on Fox (Atkinson) Lake. As a result of ten field seasons of investigations for the Project, 120 archaeological sites have been identified and recorded within the

Regional, Local and Core Study areas (Map 1-1). As noted above, previous archaeological investigations accounted for 42 sites, for a total of 162 sites within the Regional Study Area (Map 1-1).

Table 1-1: Total Archaeological Sites Identified throughout the Regional, Local and Core Study Areas

Archaeological Site by Cultural Affiliation	Number of Sites
Pre-European Contact – Archaic	2
Pre-European Contact - Middle Woodland	4
Pre-European Contact - Late Woodland	10
Pre-European Contact – Multi Component Woodland	3
Pre-European Contact – Woodland	2
Pre-European Contact – Undated	69
Historic – Early	1
Historic – Late	13
Historic – Cree	8
Historic – Multi-component	8
Multi-component	39
No Cultural Affiliation Provided	3
Grand Total	162

Limitations of existing site data especially site coordinates, was of concern. Over the past 10 years the regular use of GPS hand units for determining location and for field tracking has become a standard practice of archaeology. This technology has reduced the margin of error of site location that was prevalent in earlier field studies. While the provincial archaeological site inventory has sought standardization in its data base, the site coordinates for many sites recorded earlier than the mid 1990s are based on approximation and are limited by the experience and accuracy of the recorder.

1.5.2.1 Archaeological Sites Recorded

The temporal periods associated with the recorded archaeological sites for the Regional Study Area include Archaic (ca. 6,000-2,000ya), Middle Woodland (2,000-1,200ya) and Late Woodland (1,200-350ya), Early, Middle and Late Cree and European Historic (350 to 50ya). Fifty of these sites were identified as multi component that is, containing material cultural of more than one cultural period. The Plano Period (10,000-6000ya) has not been identified in the Keeyask Study Area to date. The absence of cultural material from this period does not eliminate the potential for presence in the area as evidence of the Plano Culture has been identified northwest (Keewatin District, NWT) of the Keeyask Study area (Wright 1976).

1.5.2.1.1 Core Study Area

Of the 50 archaeological sites recorded within Core Study Area 28% were affiliated with Pre-European Contact culture period (n=29). Nine sites (19%) were related to the Historic Period and 12 sites (24%) were

occupied during both the Pre-European Contact and Historic Periods (Figure 1-4).

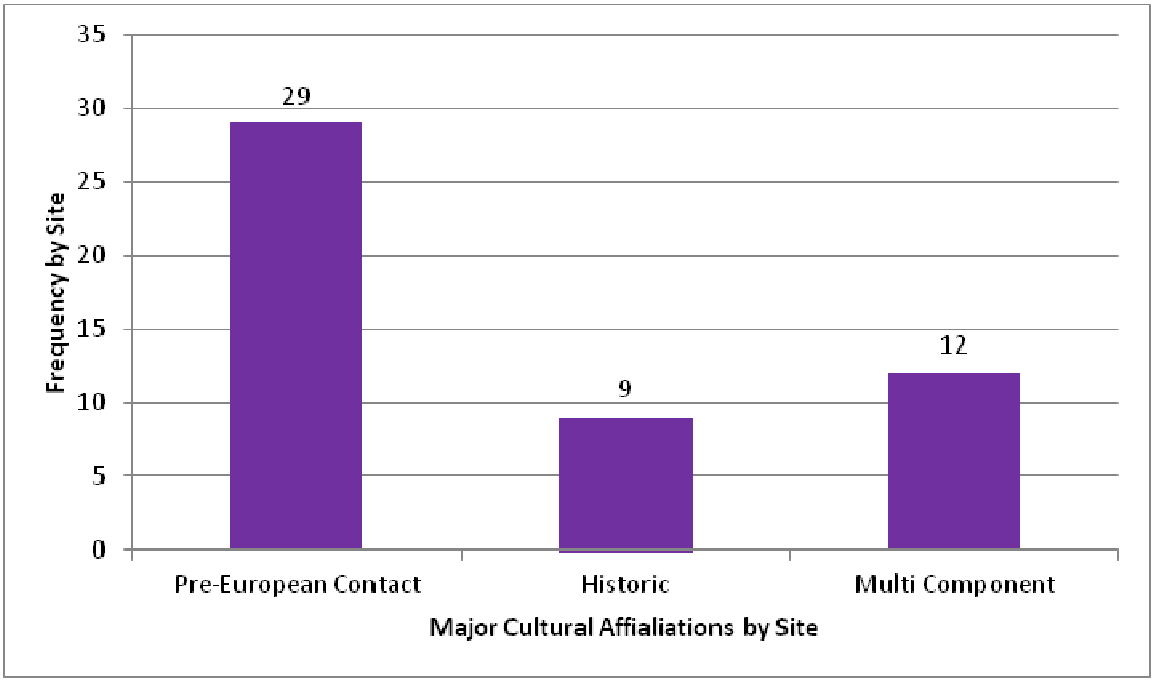


Figure 1-4: Cultural Affiliation of Archaeological Sites within the Core Study Area Categorized by Pre-European Contact, Historic and Multi Component (containing both time periods)

Of the 29 Pre-European Contact archaeological sites recorded within the Core Study Area, 21 were undated, two were associated with the Archaic Period, one was a Middle Woodland Period site and five were occupied during the Late Woodland period. The Historic Period sites located within the Core Study Area were occupied during the Late Historic (n=4) and Historic Cree (n=5). A further 12 sites were multi component (containing occupations from both Pre-European Contact and Historic periods) (Figure 1-5). The numbers represented in this figure will be higher than the heritage site total because sites may contain multiple occupations from different temporal periods.

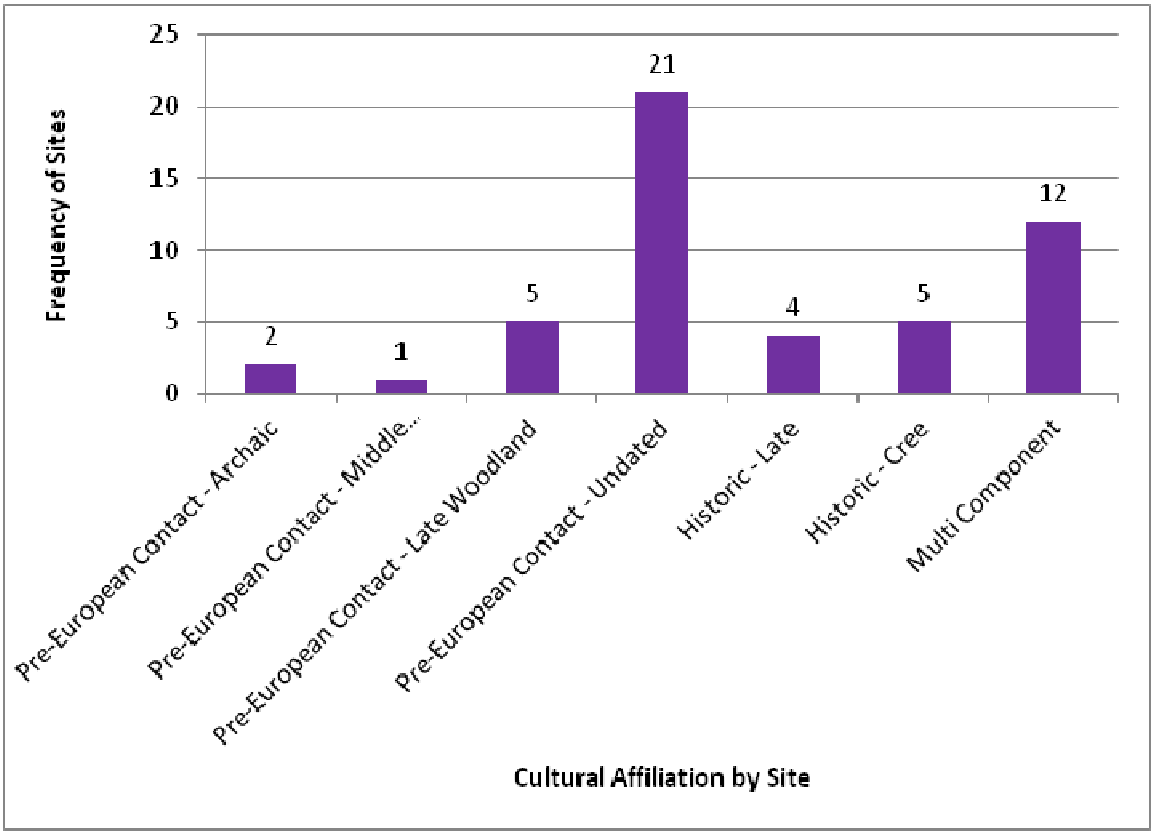


Figure 1-5: Cultural Affiliation by Site throughout the Core Study Area

The frequency of cultural affiliation by temporal period (component) throughout the Core Study Area illustrated that the Late Woodland Period (n=8) was the most common identifiable Pre-European Contact Period occupation. Only two sites were identified with the Middle Woodland Period and three during the Archaic Period. The undated Pre-European Contact period remained the most represented temporal component for site occupation (n=28). The frequency of site occupation during the Historic Period components were Early (n=2), Middle (n=7) and Late Historic (n=14) and Historic Cree (n=6) (Figure 1-6).

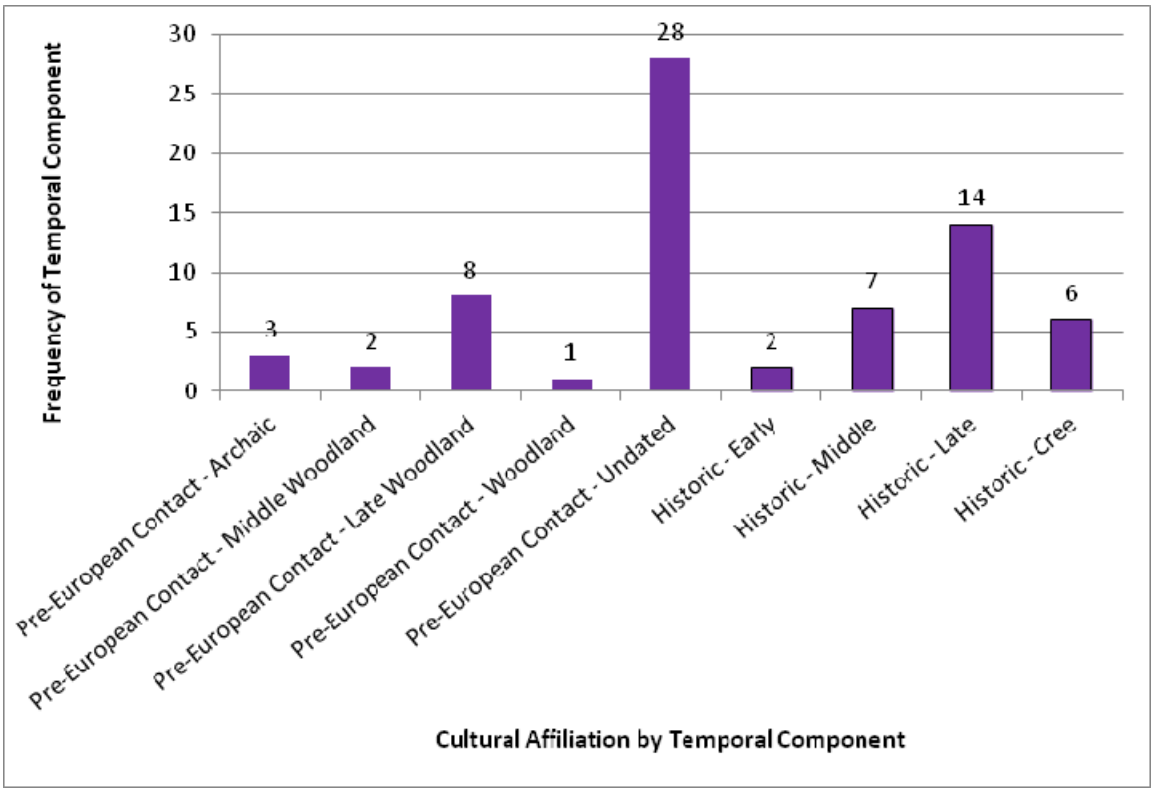


Figure 1-6: Site Occupation by Individual Cultural Affiliation Periods throughout the Core Study Area

The numbers represented in this figure will be higher than the heritage site total because sites may contain multiple occupations from different temporal periods. In addition to cultural and temporal periods, sites can be categorized by site type. Site type indicates the types of activities occurring at a site, or use of a particular area for cultural purposes. Of the 50 archaeological sites recorded in the Core Study Area, 22 were identified as campsites, 17 as workshops, six were isolated finds and a further three sites were recorded as burials. An additional two sites were listed as portage routes (Figure 1-7).

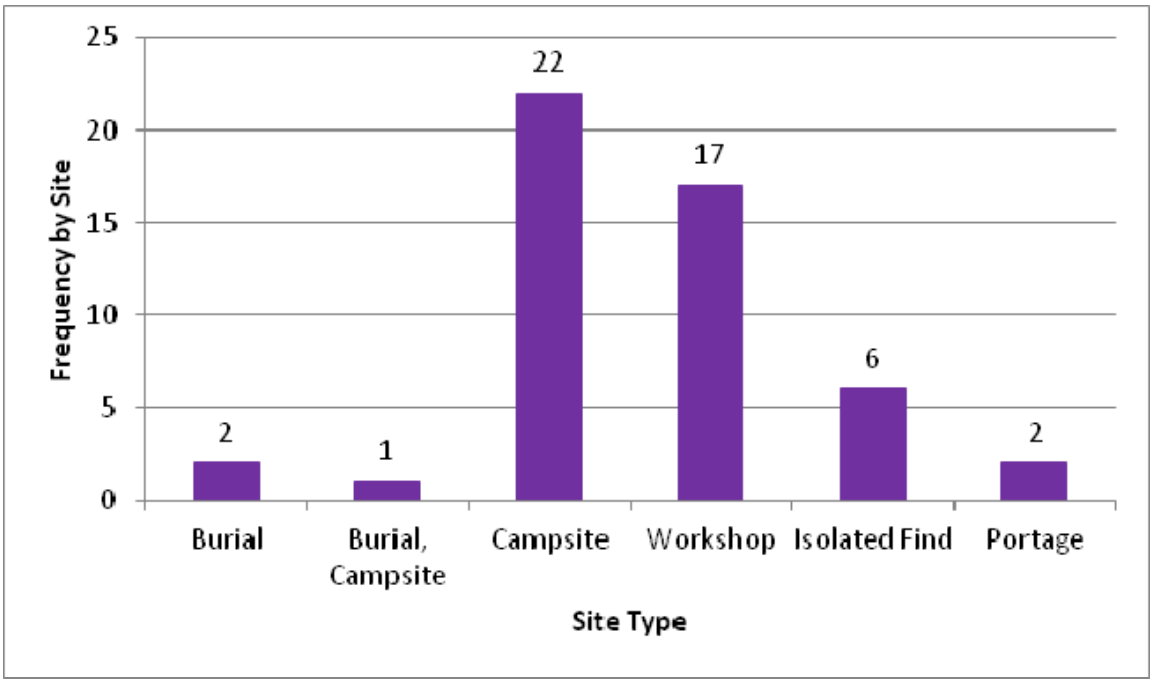


Figure 1-7: Frequency of Site Types within the Core Study Area

1.5.2.1.2 Local Study Area

A total of 100 sites were recorded within the Local Study Area, which includes the Core Study Area. Of these sites: 59% (n=59) represent the Pre-European Contact Period (6,000-350 ya) component; and 16% (n=16) were related to the Historic Period (350-50 ya). Twenty-four sites were multi component and one had no identifiable Cultural Affiliation (Figure 1-8).

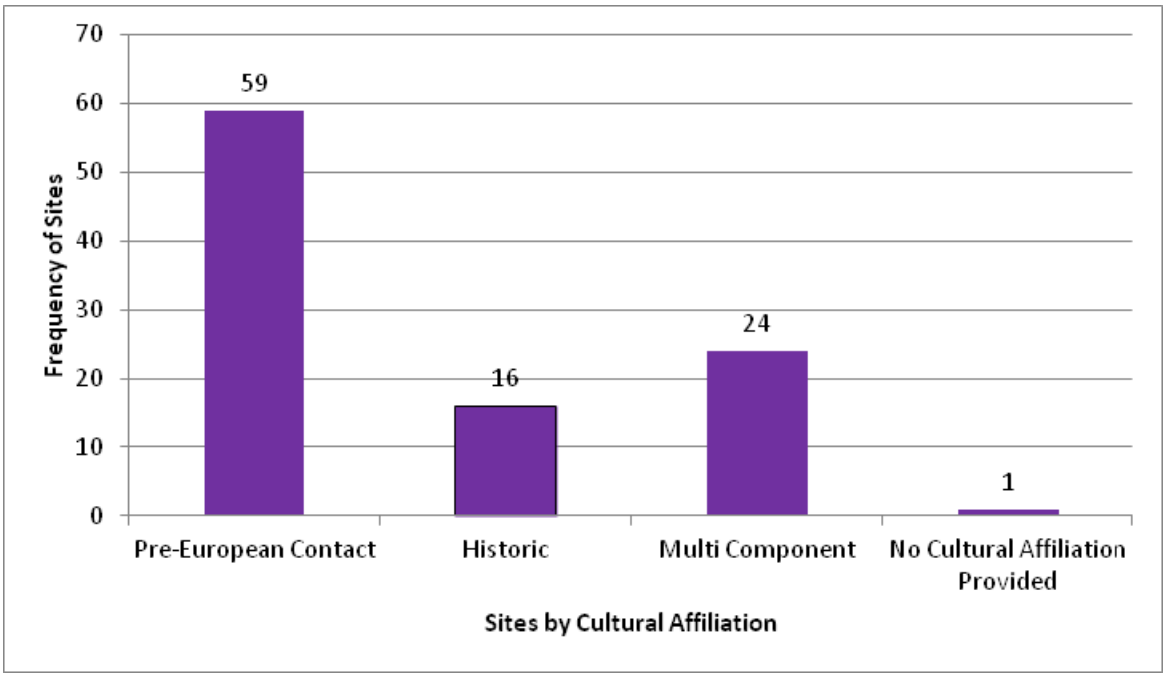


Figure 1-8: Cultural Affiliation of Archaeological Sites within the Local Study Area Categorized by Pre-European Contact, Historic and Multi Component (containing both time periods)

Within the Local Study Area the undated Pre-European Contact period was the most represented component (n=48). The Late Woodland Period remained the most frequent identifiable Pre-European Contact temporal period (n=5), followed by the Middle Woodland period (n=3) and Archaic (n=2). The only Historic Period sites located within the Local Study Area were Late Historic (n=8) and Historic Cree (n=6). Twenty-four multi component sites (containing occupations from both Pre-European Contact and Historic periods) were also recorded (Figure 1-9).

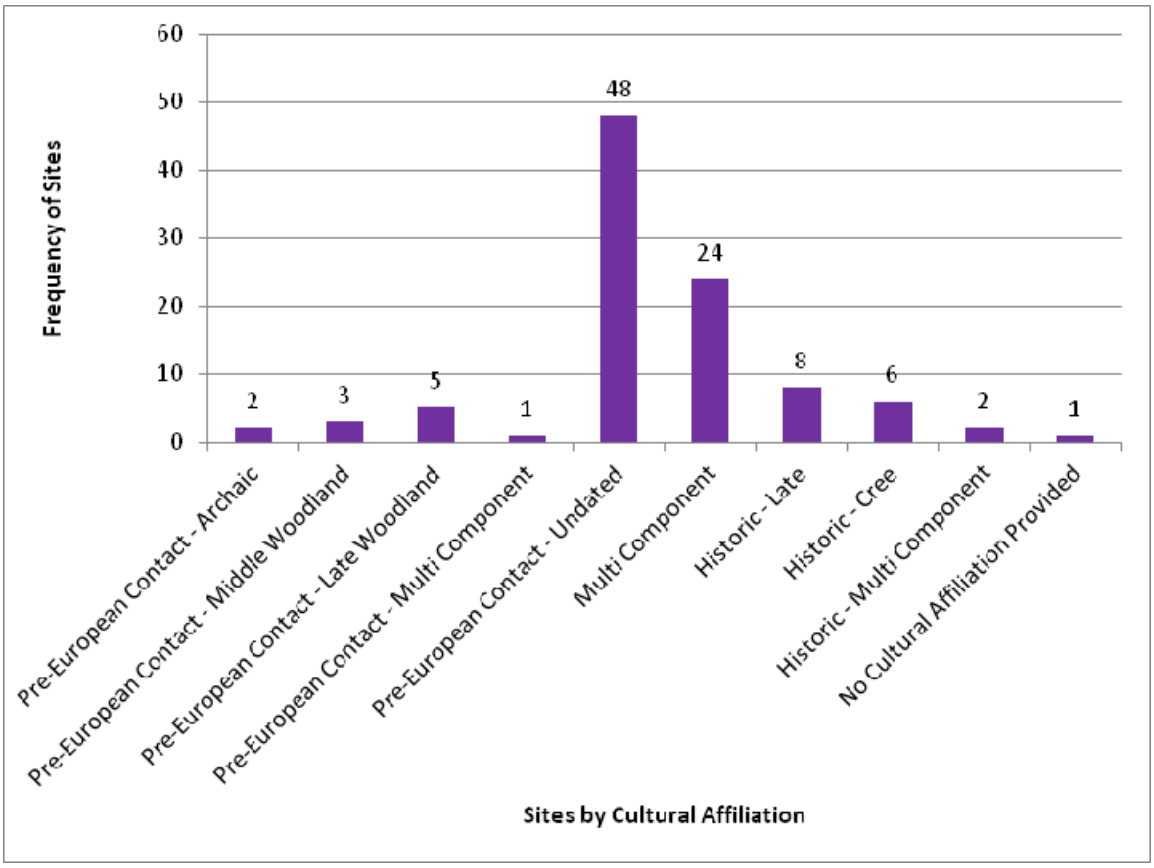


Figure 1-9: Cultural Affiliation of each Site within the Local Study Area

Frequency of cultural affiliations by temporal period (component) throughout the Local Study Area (Figure 1-10) showed that the undated Pre-European Contact period remained the most represented temporal component (n=64). The Late Woodland Period was the most frequent identifiable Pre-European Contact temporal period (n=13), then Middle Woodland period (n=8) and Archaic (n=4). Site occupation during the Historic Period spanned from Early (n=4), Middle (n=15) to Late Historic (n=28) and Historic Cree (n=10). One site had no cultural affiliation in the Local Study Area (Figure 1-10). The numbers represented in this figure will be higher than the heritage site total because sites may contain multiple occupations from different temporal periods.

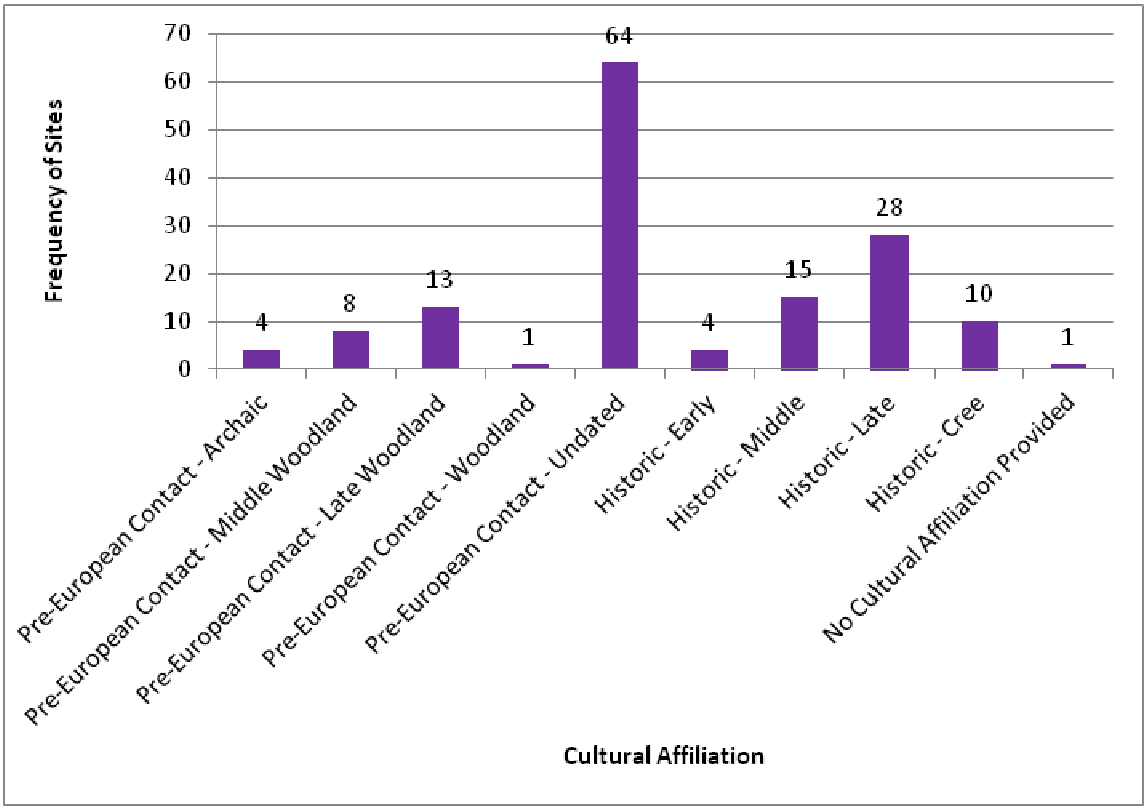


Figure 1-10: Frequency of Cultural Affiliation of Archaeological Sites by Component throughout the Local Study Area

In addition to cultural and temporal periods, sites can be categorized by 'Site Type'. Site type indicates the types of activities occurring at a site, or use of a particular area for cultural purposes. Of the 100 recorded archaeological sites in the Local Study Area, 51 were utilized as campsites, 31 as workshops, 11 were isolated finds, four contained burials and two were portages. A single site was uninterpreted to a specific type of use (Figure 1-11).

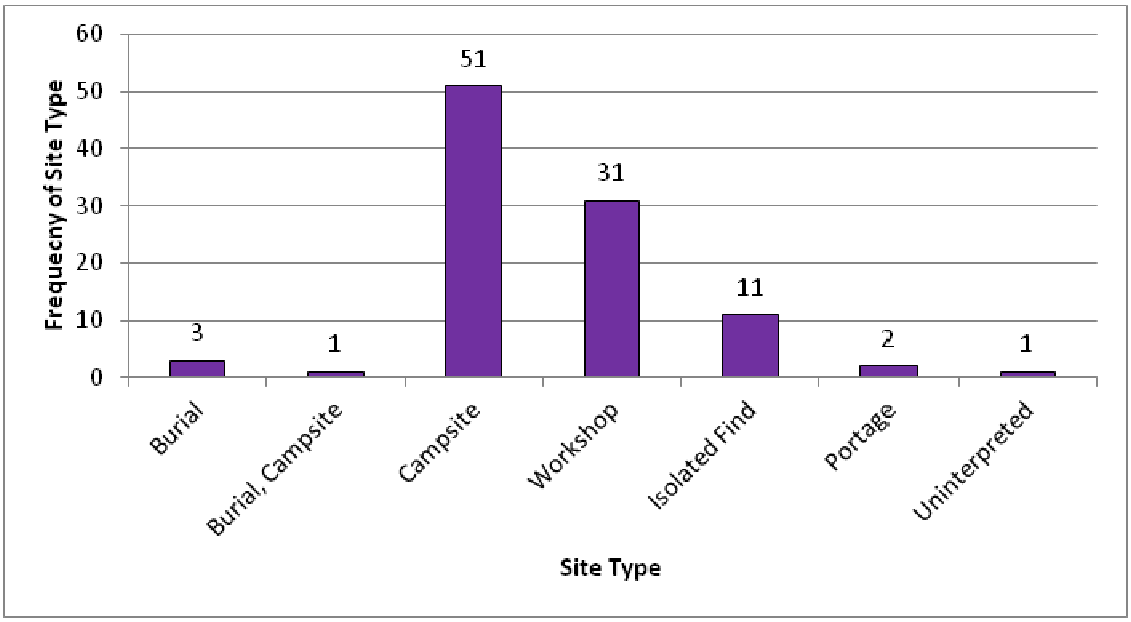


Figure 1-11: Frequency of Site Types within the Local Study Area

1.5.2.1.3 Regional Study Area

Within the Regional Study Area 162 sites were recorded (42 by previous field investigation and 120 during the Keeyask Project HRIA field investigations). Of the total sites: 54% (n=87) of the identified archaeological sites represent the **Pre-European contact Period** (6,000-350 ya) component; and 14% (n=22) of sites were associated to the **Historic Period** (350-50 ya). A further 31% (n=50) of the sites were multi component and 1% (n=3) were not identified to any cultural affiliation (Figure 1-12).

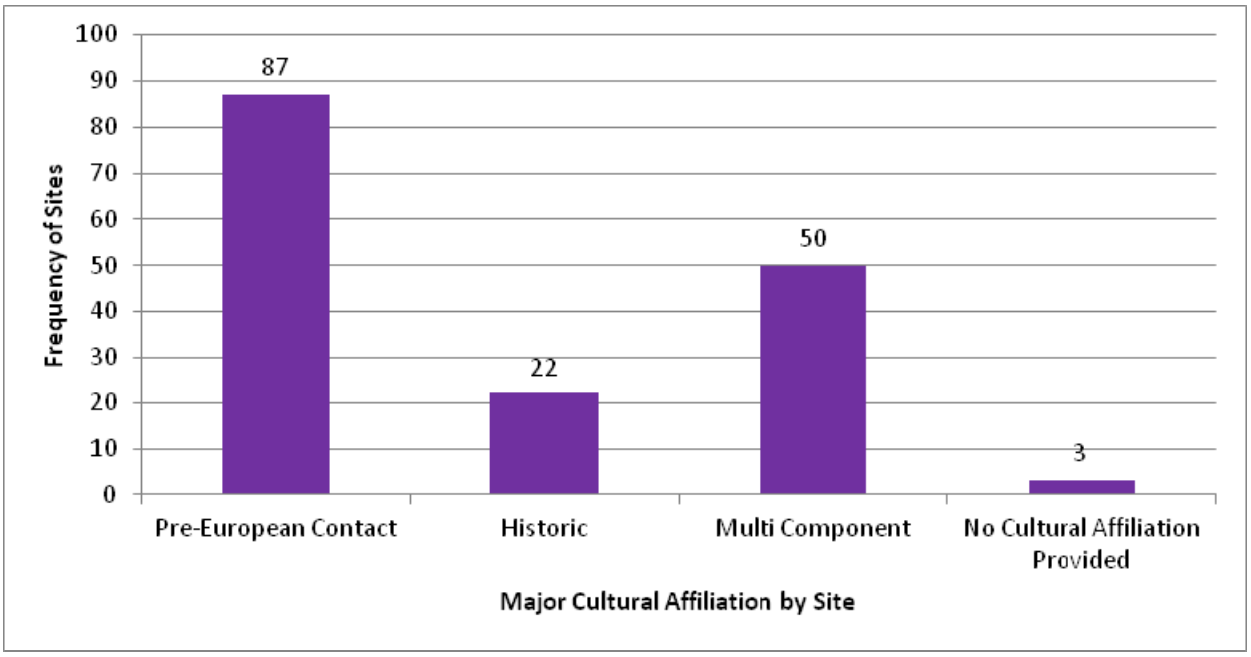


Figure 1-12: Cultural Affiliation of Archaeological Sites within the Regional Study Area

Of the 162 recorded sites in the Regional Study Area, 69 contain un-datable Pre-European Contact Period (6,000-350 ya) lithic material. Two sites (HcKt-01 & HbKu-24) were identified as Archaic Period (6,000-2,000 ya) based on projectile point typology and AMS dating on human remains (4,300 BP) recovered from Gull Lake in July 2010 (NLHS 2010, Smith pers. comm. 2010); four sites were assigned to the Middle Woodland Period (2,000-1,200 ya) and 10 sites were considered to be Late Woodland Period (1,200-350 ya). An additional five sites were identified as general Woodland Period (2,000-350 ya), because of the absence of diagnostic Pre-European Contact artifacts. A further 39 sites are multi component (the site was occupied during more than one temporal period), and 30 were identified as belonging to various stages during the historic period (350 – 50 ya). Three remaining sites were not identified to any cultural affiliation (Figure 1-13).

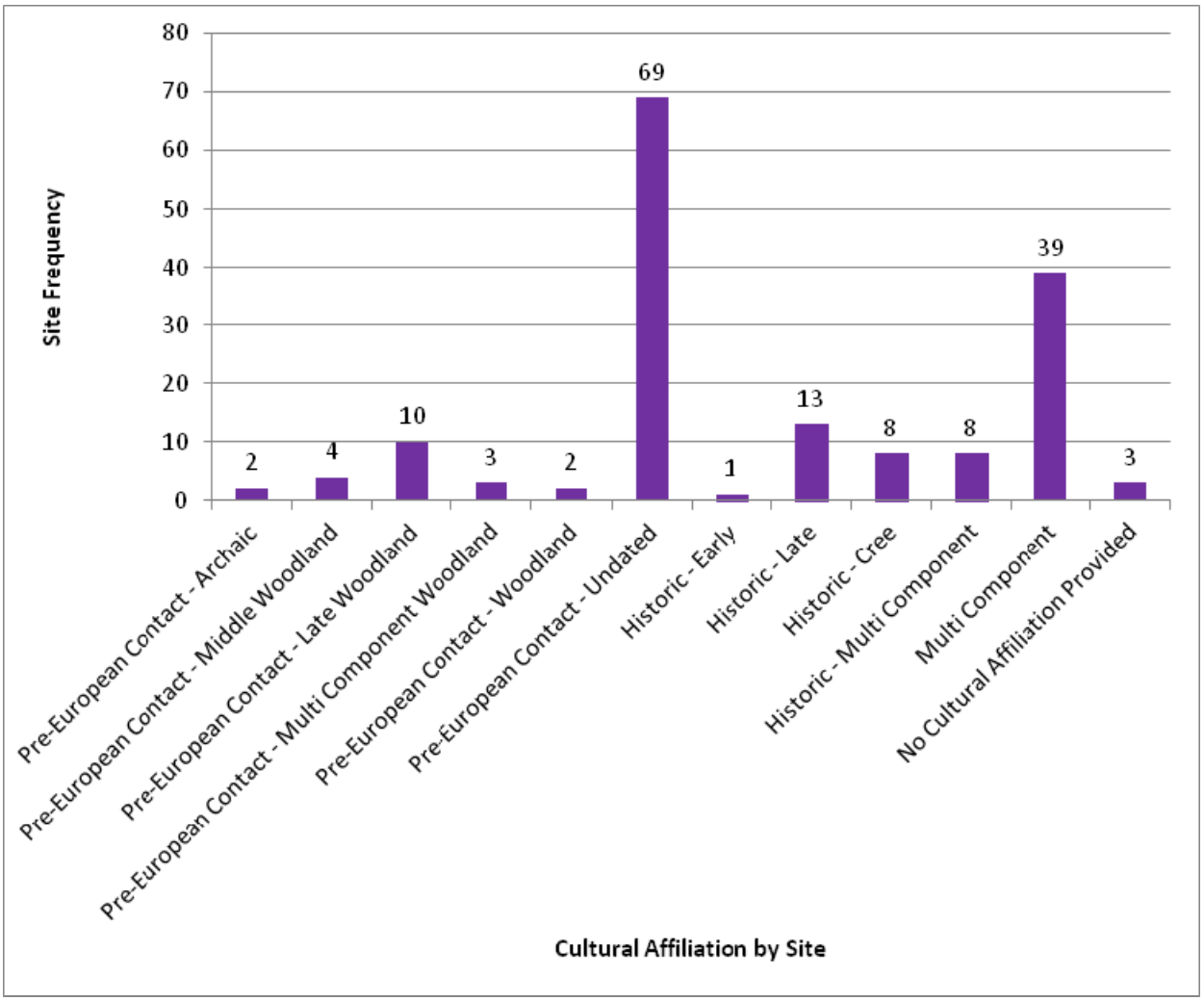


Figure 1-13: Cultural Affiliation of Each Site within the Regional Study Area

Examination of cultural affiliation throughout the Regional Study Area by temporal period (component) indicated consistency with the single occupation site cultural representation noted earlier (Figure 1-14). The undated Pre-European Contact period was the most represented temporal component (n=88). The Late Woodland Period remained the most frequent identifiable Pre-European Contact temporal period (n=28), followed by the Middle Woodland period (n=14) and Archaic (n=4). The Historic Period site occupation increased in frequency from Early (n=11), Middle (n=31) to Late Historic (n=54). The numbers represented in Figure 1-14 will be higher than the heritage site total because some sites may contain multiple occupations from different temporal periods.

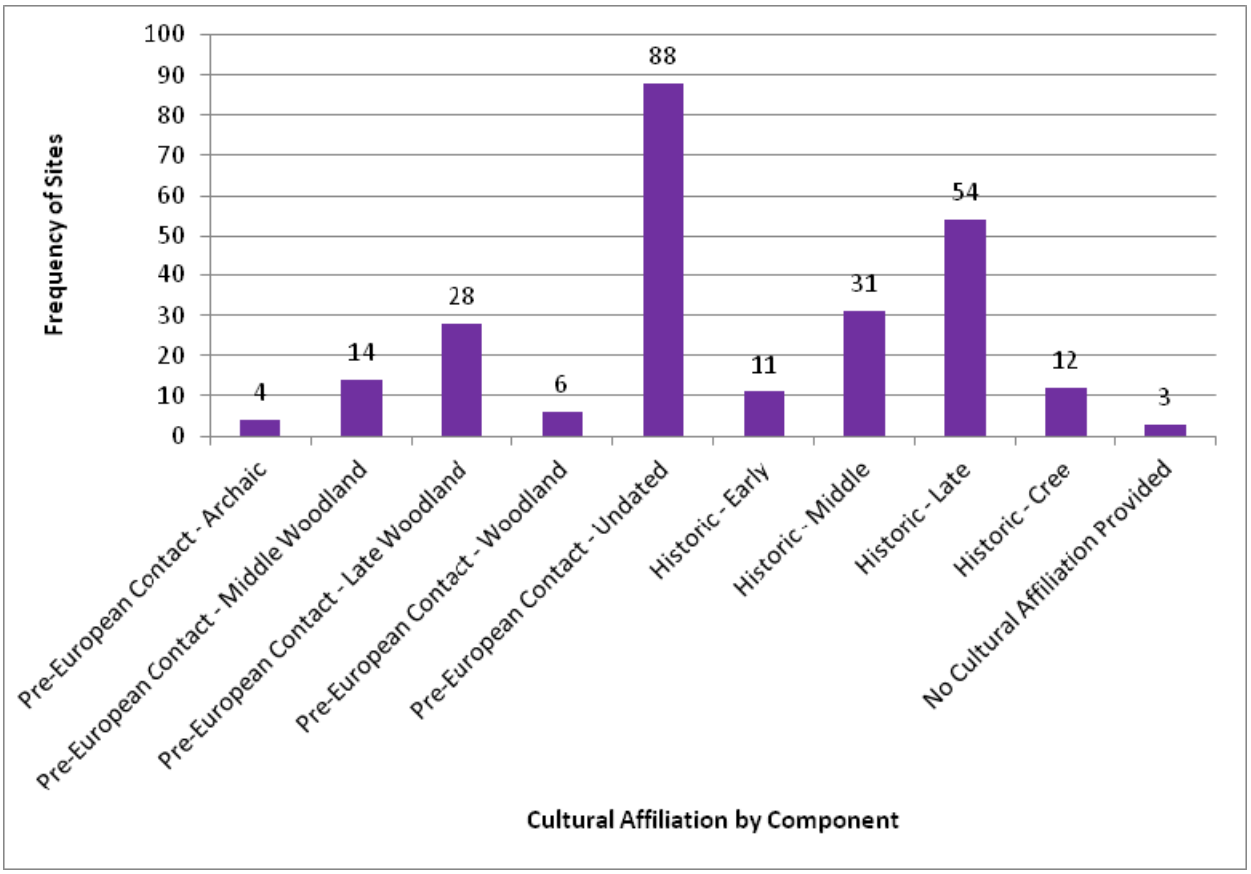


Figure 1-14: Cultural Affiliation by Component within the Regional Study Area

In addition to cultural and temporal periods, sites can be categorized by site type. Site type indicates the kinds of activities occurring at a site, or use of a particular area for cultural purposes. Of the total 162 archaeological sites recorded throughout the Regional Study Area (see Figure 1-15), campsites (n=99) and workshops (n=34) were most prevalent site types identified. Isolated finds (n=15) and burials including burial/campsites (n=6) combined for the next most frequent types. The historic period sites include fur trade outposts associated with York/Split Lake post or historic Cree settlements. The Anglican Church archival records indicate that Cree people were living in the Gull Lake area as evidenced by several burial records that indicate place of death as the Gull Lake area. For example, George Nepatobo died at Gull Lake on November 5, 1900 of consumption at 18 years of age (Diocese of Keewatin – Split Lake St. John the Baptist Church Death Records). During the summer of 1809, Peter Fidler, a surveyor and explorer for the Hudson Bay Company, mapped and documented the section of the Nelson River that runs through the Local and Core Study Areas (HBCA 1809). Local First Nations guides were instrumental in sharing their knowledge of resources and culture with Fidler.

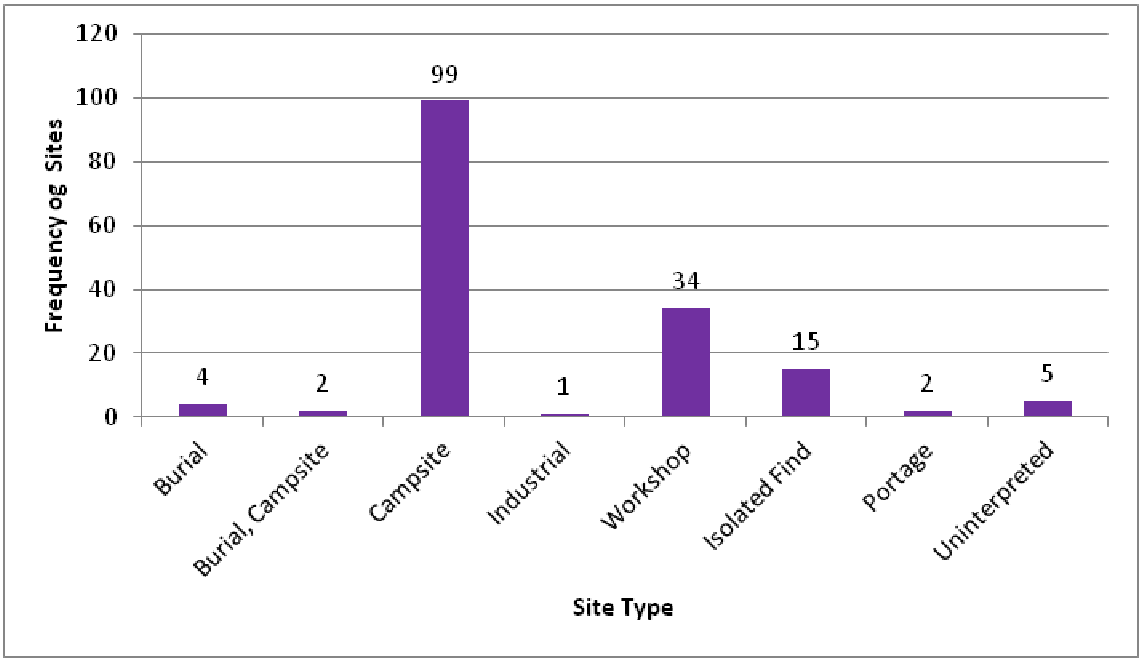


Figure 1-15: Frequency of Site Types within the Regional Study Area

1.5.2.2 Archaeological Site Ranking

The 100 archaeological sites within the Core and Local Study Areas were recorded during HRIA investigations to fulfill requirements for the EIS; the majority of sites in the Regional Study Area were recorded during archaeological surveys not related to the Keeyask EIS but requested by Members of the KCNs. Therefore the focus of the archaeological site ranking and subsequent data is the 100 archaeological sites within the Local Study Area. These sites were quantitatively ranked according to a set of values derived from the categories established by the Historic Resources Branch of Manitoba Culture, Heritage and Tourism (NLHS 2009). Site valuation included 19 variables which quantified the site against all others within the study area. The sites were then grouped according to archaeological importance as Low, Medium or High. A table listing the ranking values for the 100 sites within the Local Study Area is located in Appendix B, Table 2-9. Low valued sites may be disturbed sites, with minimal or non-diagnostic heritage resources which do not provide elaboration of cultural knowledge. Sites valued as Medium may indicate sites that have a considerable assemblage of heritage resources but may be affected by natural erosion or other disturbances. Sites valued as High may contain intact archaeological remains, a burial location, or any site with diagnostic or a substantial collection of heritage resources or features, which will add to Provincial heritage knowledge. These sites would require future monitoring and mitigation. Site ranking statistics for the 100 archaeological sites located within the Local Study Area were: High = 17; Medium = 63; and Low = 20.

1.5.2.3 Artifacts Recovered During Archaeological Investigation

A total of 25,017 artifacts were recovered during field investigations related to the Project. The Pre-European Contact Period was represented by 9,521 artifacts (*e.g.,* **lithic** tools and **debitage** flakes; ceramics). Over 1,000 artifacts were associated with the Historic Period (*e.g.,* nails, ammunition and gun parts, ceramics and glass;

smoking pipe fragments; buttons; etc). Faunal remains (*e.g.,* bone and bone fragments) accounted for 14,274 of the artifacts recovered. These spanned both temporal periods with 24 bone tools identified (Figure 1-16). Radiocarbon dates on two samples of caribou bone found *in situ* at the Pointe West Site were recently dated by AMS Standard analysis with 2 Sigma Calibration of Cal AD 250 to 410 (Cal BP 1700 to 1540) and 2 Sigma Calibration of Cal AD 390 to 540 (Cal BP 1560 to 1420) (Beta Analytic Inc. 2011).

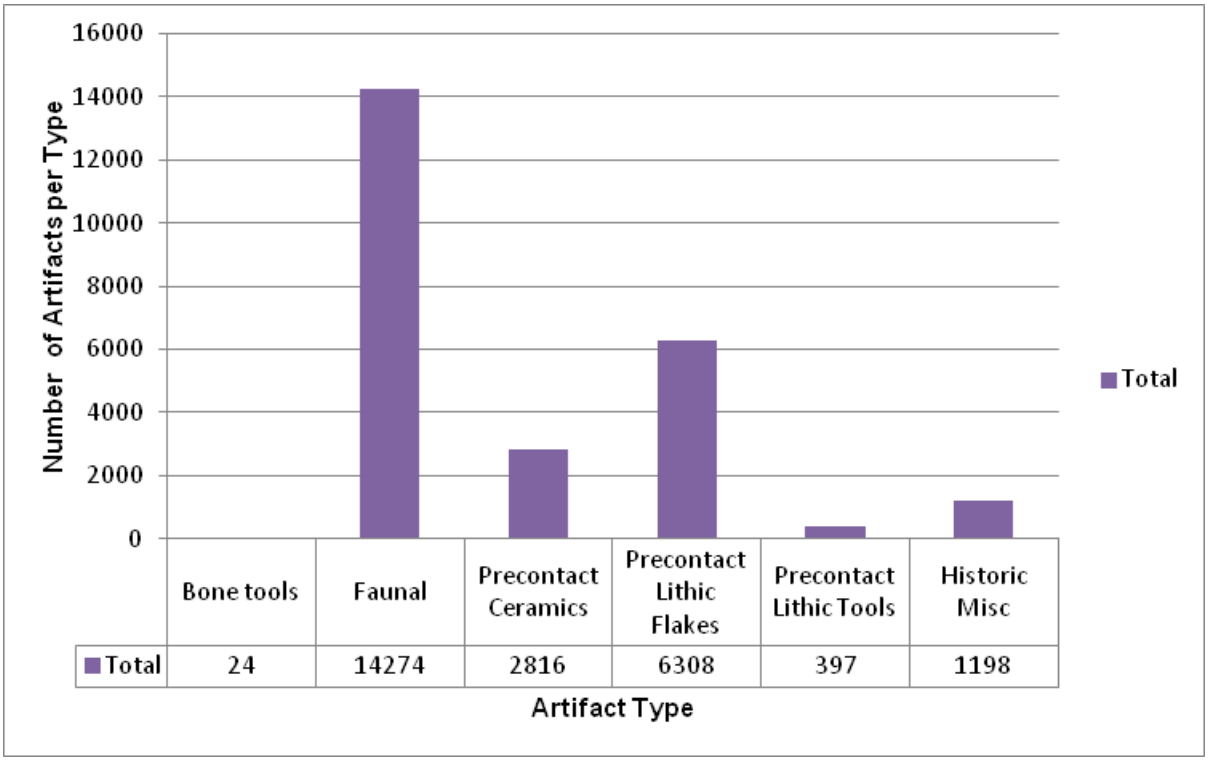


Figure 1-16: Frequency of Artifact Types Recovered from all Sites within the Regional Study Area

Unfortunately, only a small number of the total faunal assemblage was identifiable to species (n=1194) because of the fragmented and fragile condition of bone. Analysis of the faunal material indicated a subsistence economy that included: caribou (*Rangifer tarandus*); moose (*Alces alces*); bearded seal (*Erignathus barbatus*) or ringed seal (*Pusa hispida*); beaver (*Castor canadensis*); black bear (*Ursus americanus*); otter (*Lutra canadensis*); porcupine (*Erethizon dorsatum*); red fox (*Vulpes vulpes*); snowshoe hare (*Lepus americanus*); muskrat (*Ondatra zibethicus*); marten (*Martes americana*); mink (*Mustela vison*); lynx (*Lynx canadensis*); Canada goose (*Branta canadensis*); tundra swan or whistling swan (*Cygnus columbianus*); duck species; bald eagle (*Haliaeetus leucocephalus*); spruce grouse (*Falcipennis canadensis*); sturgeon (*Acipenser fulvescens*); walleye (*Sander vitreus*); jackfish (*Esox lucius*); and long nose sucker (*Catostomus catostomus*).

The most common identifiable mammal species within the Project's faunal assemblage was caribou (n=303) with moose (n=92) being the second most common identifiable large mammal species. Other identifiable(either moose or caribou) and unidentifiable ungulates were also recorded (n=67). The dominant representation of **ungulate** species suggests large game hunting for food, hides and tools. The presence of medium sized mammals such as fox (n=99) and beaver (n=70) represent trapping for fur and small mammals

such as snowshoe hare (n=124) represented trapping for both meat and fur (Table 1-2).

Table 1-2: Table of Identified Species from Faunal Remains Recovered during Archaeological Research throughout the Local Study Area

Class	Identified Species	Total
Bird	Bald Eagle (*Haliaeetus leucocephalus*)	1
	Canada Goose (*Branta canadensis*)	10
	Duck species (*Anatidae*)	9
	Herring Gull (*Larus argentatus*)	1
	Whistling Swan (*Cygnus columbianus*)	1
	Northern Shoveler Duck (*Anas clypeata*)	1
Mammal	Bear (*Ursus americanus*)	2
	Beaver (*Castor canadensis*)	70
	Caribou (*Rangifer tarandus*)	303
	Caribou/Moose	67
	Lynx (*Lynx canadensis*)	1
	Marten (*Martes americana*)	1
	Mink (*Mustela vison*)	2
	Moose (*Alces alces*)	92
	Muskrat (*Ondatra zibethicus*)	13
	Porcupine (*Erethizon dorsatum*)	5
	Red Fox (*Vulpes vulpes*)	99
	Seal/Sea Mammal (*pinniped*)	11
	Snowshoe Hare (*Lepus americanus*)	124
	Wolf (*Canis lupus*)	1
Fish	Long Nose Sucker (*Catostomus catostomus*)	1
	Northern Pike (*Esox lucius*)	3
	Sturgeon (*Acipenser fulvescens*)	66
	Walleye (*Sander vitreus*)	298
Mollusk	Fresh water clam (*Pelecypoda*)	12
	Grand Total	**1194**

Archaeological investigations at the Pointe West Site (HbKx-02), a proxy site on Clark Lake, identified seven seal elements as well as other common faunal remains during excavation. The Pointe West Site is located approximately 215km inland (up river) from the Nelson River estuary at Hudson Bay. Seals have been sighted as far inland on the Nelson River as Gillam Island and sightings of seal have been reported inland along all major water systems draining into Hudson Bay. For example, seal have been observed at Great Island on the Seal River, on the Hayes River and on the Thlewiaza River at Edehon Lake, over 100km inland (Petch, pers. comm. 2010). Seal may have been hunted and processed at Clark Lake or perhaps hunted, butchered and transported from the Hudson Bay coast to Clark Lake. According to local tradition meat was mostly used for dog food. "Cree people could not stand to eat seal meat even though they knew that the 'people of the north' ate it" (Wokes & Thomas 1983). However, no gnaw or cut marks were noted on the seal bone that was recovered during the archaeological investigations.

The Clark Lake proxy project comprised 67% of the entire artifact assemblage (n=16,799) for the Project. To date, 89% (n=15,016) of the Clark Lake artifact assemblage was recovered from the Pointe West Site (HbKx-02). The large accumulation of artifacts recovered from Clark Lake (and especially the Pointe West Site) suggests frequent seasonal use of an important resource area by ancient, historic and present-day people.

Limitations of analysis included the lack of organic material available for absolute dating and residue analysis within the Core Study Area. These data would have provided further temporal evidence for occupation. However, the dating of the human remains at Gull Lake (*ca.* 4300 BP) within the Core Study Area and caribou bone at the Pointe West Site (*ca.* 1630-1700 BP) within the Regional area provide absolute dates that support the dates of diagnostic tools recovered from both areas.

1.6 SUMMARY OF KEY PROJECT RELATED EFFECTS

The Project will create physical changes that will adversely affect the conditions of sites within the Heritage Resources Core Study Area. The loss of land and important cultural landscapes which have sustained the transmission of culture and heritage from generation to generation will affect the ability of transmission of cultural knowledge.

However, a positive effect of the Project in terms of archaeology is likely the increase of knowledge about the area's ancient and historic past. Prior to the Project, little was known of the archaeological record for the Nelson River. In fact, no archaeological sites were recorded between the inflow of the Nelson River into Clark Lake and the river reach down river to Stephens Lake. The ATK of the KCNs also would not have been shared in the same manner and many explanations about the cultural landscape would have gone unnoticed. Thus, the understanding of heritage resources is greater because of the ATK and archaeological field studies that have occurred as a result of the Project.

1.6.1 Construction Phase Effects

1.6.1.1 Assessment of Potential Effects

The construction phase of the Project will adversely affect known heritage resources within the Core Study Area and this will result in the loss of heritage resources.

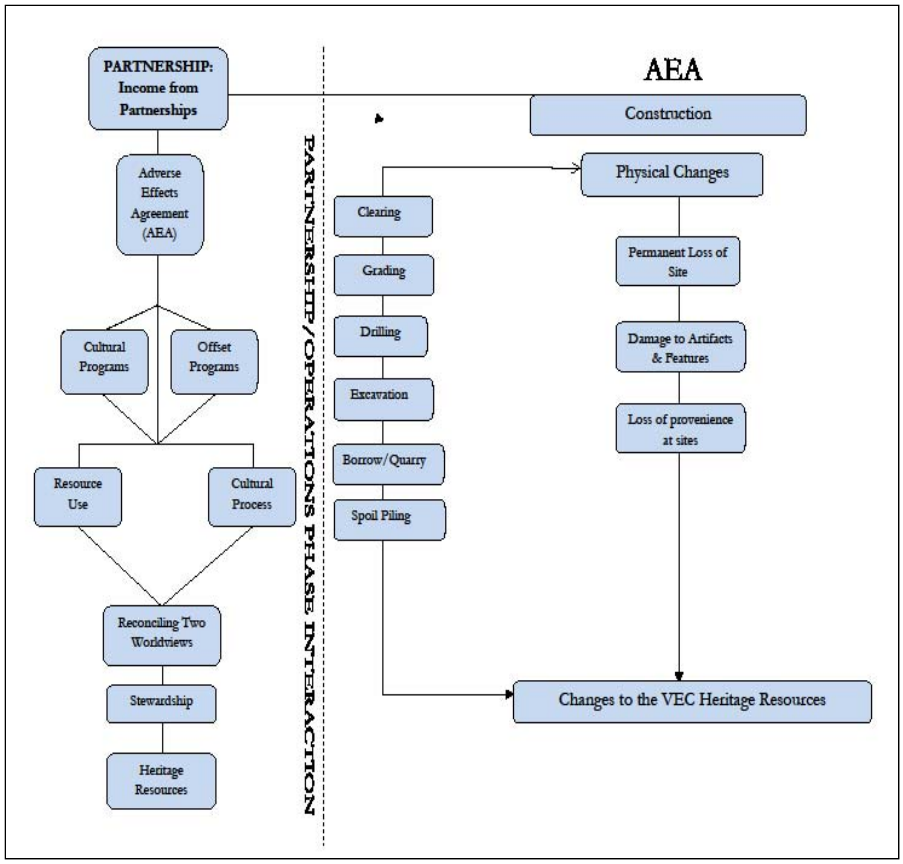


Figure 1-17 identifies the effects that could result from physical changes to the natural environment during the construction phase. Map 1-2 identifies the location of archaeological sites that likely will be affected by planned construction phase activities in a variety of places including the Project's borrow areas.

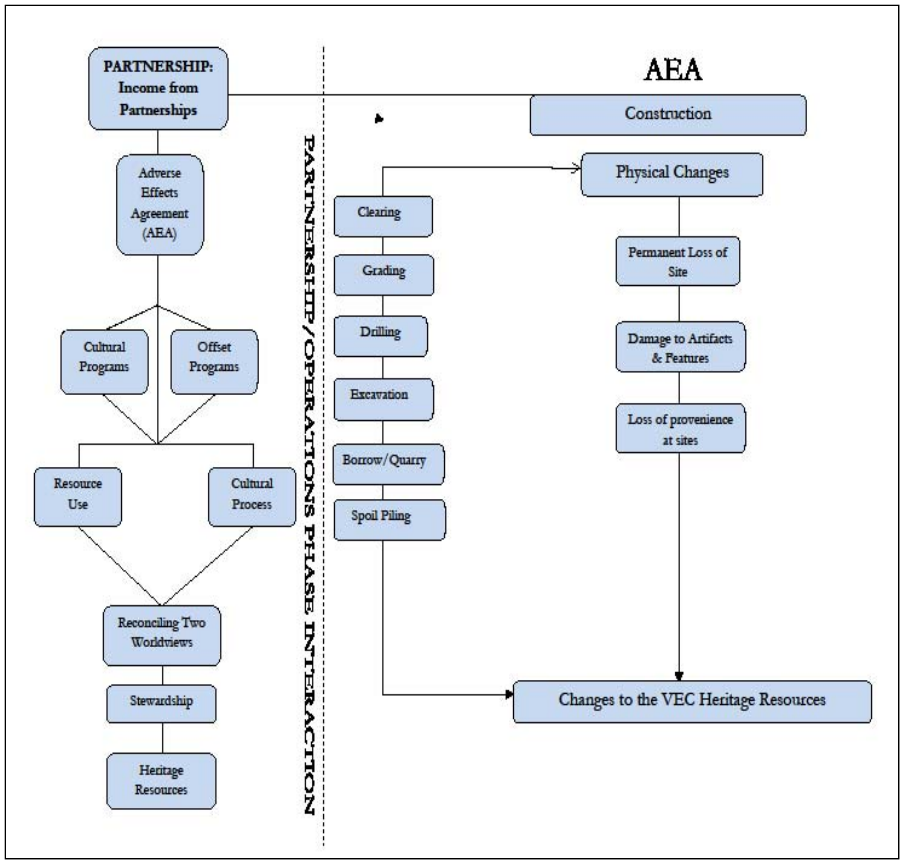


Figure 1-17: Construction Effects on Archaeological Sites within the Local and Core Study Areas

Project construction activities that will cause changes to the physical environment and which have the ability to affect known and undiscovered heritage resources include:

- Clearing of trees with dislodgement of heritage resources within tree roots;
- Grading for access roads across land features may cut through heritage resources sites;
- Drilling for foundations and potable water sources which may dislodge or change the provenience of heritage resources;
- Excavation of soils that may contain heritage resources and/or burials;
- Borrow/Quarry excavation of gravel pits and destruction of rock features that may contain heritage resources and which may be culturally sensitive;
- Disposal or storage of excavated soils, rock *etc.* which may damage unknown or known heritage resources below surface;
- Construction of supporting infrastructure and principal structures;

- Installation of the ice boom up river from the generating station may accelerate loss of heritage resources;
- Dewatering of areas within cofferdams may expose heritage resources; and
- Clearing of the vegetation in the area that is to become the reservoir has the potential to affect known and unknown heritage resources.

These changes will be most notable in the Core Study Area specifically where construction of structures, dykes, access roads and other Project infrastructure will occur. Areas containing heritage resources upriver of the development will experience less noticeable changes. Clearing of the vegetation in the area for the intended reservoir has the potential to affect known and unknown heritage resources. At the same time, clearing may provide opportunities to visualize features otherwise under vegetative cover. In addition to the potential loss of registered archaeological sites, KCNs Elders have noted that there are burial sites within the Core Study Area. While these have not been located to date, they may be affected by initial clearing, grading, drilling, excavation and spoil piling.

Within the Local and Core study areas, nine (n=9) known archaeological sites located between the outlet of the Nelson River at Clark Lake to Gull Rapids may be affected during the construction phase of the Project. Construction activities can cause the following effects to heritage resources:

- Permanent disturbance/destruction of heritage resources and burial sites:
  During the course of construction, including dewatering with coffer dams, many of the heritage resources that are currently recorded may be irreparably disturbed or destroyed;
- Permanent loss of future heritage resources data:
  The loss of heritage resources and burial sites may occur instantly with little time to record pertinent data;
- Permanent loss of heritage objects or sites:
  Heritage objects and sites are non-renewable resources and loss of same will result in an incomplete historical record;
- Permanent changes in the interpretive capacity of the region reduces the ability to provide a complete record of both Manitoba and Cree history; and
- Permanent loss of cultural landscapes and the ability of the KCNs to orally recount history may have an effect on the culture and spirituality of KCNs Members.

All known sites are located within 100 metres of the present shoreline. Eight sites are in proposed borrow areas and one site is located within an area planned for construction of the Keeyask Generation Station at Gull Rapids. Known sites that will be severely damaged or permanently lost due to construction activity are listed and described in Table 1-3. An additional site, HcKt-01, is located approximately 200m west of Borrow Area S-18 and may be impacted if the borrow area is expanded or the location is used as an access point or equipment storage.

Table 1-3: Sites which may be Affected by the Construction Phase

Borden Number	Temporal Period	Site Type	Source of Impact
HcKt-01	Pre-European Contact-Archaic to Late Woodland; Historic – Early, Middle, Late	Campsite	Borrow Area N-6
HcKt-02	Pre-European Contact - Undated	Workshop	Construction
HcKt-03	Pre-European Contact - Undated	Isolated Find	Borrow Area N-6
HcKt-04	Pre-European Contact – Undated, Historic Middle, Late	Campsite	Borrow Area N-6
HcKt-05	Pre-European Contact – Archaic	Workshop	Borrow Area N-6
HcKt-06	Pre-European Contact - Undated	Isolated Find	Borrow Area N-6
HcKt-08	Pre-European Contact – Undated; Historic - Late	Campsite	Borrow Area S-18
HbKu-24	Pre-European Contact - Archaic	Burial	Borrow Area S-5
HbKu-12	Pre-European Contact - Woodland	Campsite	Borrow Area S-5

No heritage resources were noted during investigations in the areas of the South Access Road and the north and south dykes. Human remains found at low water levels during 2010 field investigations on the south shoreline of Gull Lake near the edge of S-5 borrow area were removed in accordance with *The Heritage Resources Act*. These remains were temporarily reinterred by TCN in the backshore approximately 90m inland from the water's edge[1]. Additional human remains may be situated in this area and therefore the area will require ongoing monitoring.

Heritage resource sites identified within the Local Study Area at Clark, Stephens, Moosenose, Kettle, Fox, Carscadden and Cache lakes and the Landing River will not be affected by the construction phase of the Project.

1.6.2 Construction Phase Mitigation Measures

The best form of mitigation is avoidance; however, this will not be possible in some areas that will be disturbed by the Project. Activities during the construction phase of the Project that cause disturbance to the ground surface have the greatest potential to impact *in situ* heritage resources within the Core Study Area, in particular the locations of structures, borrow/quarry sites, dykes and access roads.

During the archaeological assessments of heritage resources, artifacts were regularly collected by controlled methods to ensure that a thorough record of past cultural occupations was achieved. During the construction phase this process will continue through the development of a Heritage Resources

[1] The human remains were temporarily reinterred by TCN clergy pending permanent re-burial grounds, to be located by the KCN, for these and any future found human remains associated with the Project.

Protection Plan (HRPP) within the Environmental Protection Plan (EnvPP). The HRPP outlines step-by-step procedures designed to protect heritage resources or human remains that are discovered during the construction phase. The Plan will ensure that provincial legislation (Manitoba's *Heritage Resources Act,* 1986) and *Policy Respecting the Reporting, Exhumation, and Reburial of Found Human Remains* (1987) and any requirements established by the KCNs to ensure proper management of affected heritage resources are fully observed. The Project archaeologist will advise and provide field support should any heritage concerns be raised during construction.

Environmental Officers will be trained to conduct basic identification and assessment of found heritage resources. The Environmental Officer will be on-site to ensure that all found heritage resources and features are reported immediately to the Project Manager and Project Archaeologist. Additionally, Phase 1 of the Waterways Management Program (Schedule 11-2 in the JKDA) consists of measures to work with the KCNs to identify and contribute to impact management measures at high priority heritage sites that will be flooded.

Increased human traffic due to the Project is expected to have an adverse effect on known and unknown heritage resources. Key mitigation measures will involve education to increase the awareness of Project workers as to the nature of heritage resources in order that the HRPP can be effectively implemented upon the potential discovery of any heritage resources.

The nine known heritage sites affected by construction will require monitoring during the construction phase in order to identify and plan appropriate protective or reclamation measures. In particular, monitoring will be required at the north shore of Gull Lake at the location of the N-6 borrow area where sites were identified as Archaic, *ca.* 6,000 BP[1]. A Woodland site was recorded during earlier investigations. If artifacts and heritage resources are discovered during any component of the construction phase they will be and removed by a process of salvage techniques. A small crew, with local field assistants who are familiar with archaeological fieldwork will perform the procedures in a timely and controlled manner. In addition, a series of shovel tests will be carried out to determine the extent of the find. Any archaeological sites that are identified during the construction period will be subject to full investigations. These procedures will be set out in the HRPP.

In the event that previously unknown heritage resources are unearthed or exposed during construction, the terms of *the Act* and HRPP will prevail. In addition, the Policy Respecting the Reporting, Exhumation and Reburial of Found Human Remains will be implemented should human remains be discovered during Project construction.

In general, if previously unknown heritage resources are unearthed or exposed during construction, the Environmental Officer will secure the area (cordon off and flag) where heritage resources have been found, and contact the Project Archaeologist. When required, the Project Archaeologist will arrive on-site to confirm the find and will conduct controlled salvage collections and documentation. If burials or human remains are encountered the Environmental Officer will immediately halt all construction in the

[1] The S-5 borrow near the bay where the Archaic human remains *ca.* 4800 BP[1] (1 Sigma A calibrated (Cal BC 2920 to 2890 (Cal BP 4870 to 4840 284758 2010 Beta Analytic Inc. 2010).) was recovered in 2010.

vicinity, the area will be secured. The Project Archaeologist will verify, if possible, whether the remains are human or non-human. The Project Archaeologist will contact the Historic Resources Branch and KCNs representatives. The Historic Resources Branch will proceed to contact the RCMP.

If the remains are determined to be forensic the RCMP and the Chief Medical Examiner will have jurisdiction over the area of the find and the remains. If it cannot be determined immediately whether the remains are forensic or non-forensic, the recovery and custody of the remains will be placed under the jurisdiction of the RCMP and the Chief Medical Examiner for further study until it is determined whether the remains are forensic or non-forensic.

If the human remains are determined to be non-forensic the Heritage Resources Act and Policy Concerning the Reporting, Exhumation and Reburial of Found Human Remains will be followed.

Key mitigation during any additional construction activities will require thorough and on-going monitoring of all surface and sub-surface activities by the Project Archaeologist. Regular on-site archaeological monitoring and re-evaluation of known sites throughout the course of all construction will be required.

In addition to monitoring during the construction phase, the dewatering process for the cofferdam will require an archaeological salvage of the exposed river bed to recover any heritage resources that may be present.

1.6.3 Reservoir Impoundment and Operation Phase Effects

1.6.3.1 Assessment of Potential Project Effects

The reservoir impoundment and operation phase of the Project will commence with preparation of the Project footprint for reservoir impoundment and the production of first power by the Keeyask Generation Station. This phase will adversely affect known heritage resources within the Local and Core study areas, especially within the reservoir area and will result in the continued loss of heritage resources within this area. Figure 1-18 identifies the effects that could result from physical changes to the natural environment during the operation phase. All known archaeological sites within the reservoir will be directly affected by flooding as well as associated erosion; other sites could be affected by ongoing shoreline erosion caused by flooding or fluctuating water levels over a prolonged period.

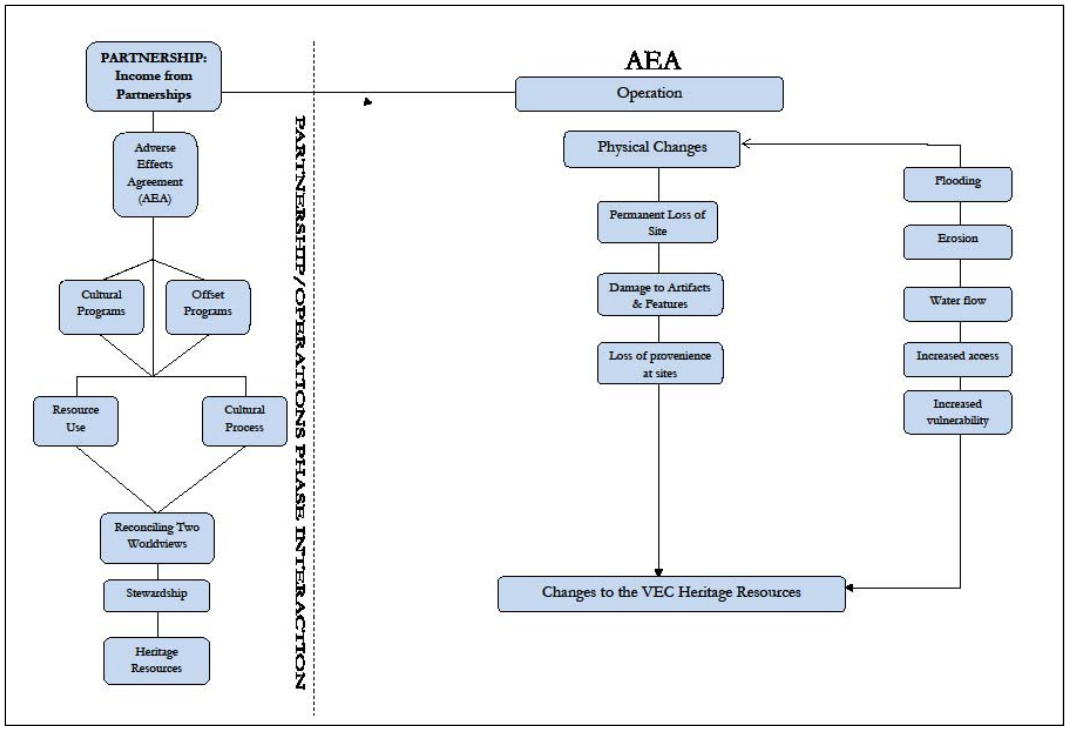


Figure 1-18: Reservoir Impoundment and Operation Phase Effects on Archaeological Sites within the Local and Core Study Areas

Table 1-4 identifies the number of archaeological sites that will be affected by physical change during the operation phase by temporal period, site type and Map 1-3 identifies the location of archaeological sites that will be affected during the operation phase. Project operation will affect 43 sites causing the following types of effects to heritage resources:

- Permanent disturbance/destruction of heritage resources and burial sites: within the first year of operation all of the heritage resources that are currently recorded will be irreparably disturbed or destroyed;
- Permanent loss of future heritage resources data: the loss of heritage resources and burial sites may occur instantly with little time to record pertinent data;
- Permanent loss of heritage objects or sites: heritage objects and sites are non-renewable resources and loss of same is comparable to ripping a page out of the KCN's history book;
- Permanent changes in the interpretive capacity of the region reduces the ability to provide a complete record of both Manitoba and Cree history; and
- Permanent loss of historically-known cultural landscapes and the ability of the KCNs to identify certain areas and to orally recount history may have an effect on the culture and spirituality of KCNs Members.

Table 1-4: Sites Affected by the Reservoir Impoundment and Operation Phase

Borden Number	Temporal Period	Site Type	Location
HcKt-01	Pre-European Contact– Archaic to Late Woodland; Historic – Early, Middle, Late	Campsite	Gull Lake
HcKt-03	Pre-European Contact – Undated	Isolated Find	Gull Lake
HcKt-04	Pre-European Contact – Undated, Historic Middle, Late	Campsite	Gull Lake
HcKt-05	Pre-European Contact – Archaic	Workshop	Gull Lake
HcKt-06	Pre-European Contact – Undated	Isolated Find	Gull Lake
HbKt-01	Pre-European Contact – Undated	Workshop	Gull Lake
HbKu-01	Historic – Late	Campsite	Nelson River
HbKu-02	Pre-European Contact – Undated, Historic - Late	Campsite	Gull Lake
HbKu-03	Pre-European Contact – Late Woodland	Campsite	Gull Lake
HbKu-04	Historic – Middle, Late	Isolated Find	Gull Lake
HbKu-05	Pre-European Contact – Late Woodland, Historic – Middle	Campsite	Gull Lake
HbKu-06	Pre-European Contact – Middle Woodland	Workshop	Gull Lake
HbKu-07	Pre-European Contact – Woodland, Historic – Early, Middle	Workshop	Gull Lake
HbKu-08	Pre-European Contact – Undated	Workshop	Gull Lake
HbKu-09	Pre-European Contact – Undated; Historic – Middle, Late	Campsite	Gull Lake
HbKu-10	Pre-European Contact – Undated	Workshop	Gull Lake
HbKu-11	Pre-European Contact – Undated	Workshop	Nelson River
HbKu-12	Pre-European Contact – Late Woodland	Campsite	Gull Lake
HbKu-13	Pre-European Contact – Woodland; Historic – Early to Late	Campsite	Nelson River at Rabbit Creek
HbKu-14	Pre-European Contact - Undated	Campsite	Nelson River at Rabbit Creek
HbKu-15	Historic - Late	Portage	Nelson River

Table 1-4: Sites Affected by the Reservoir Impoundment and Operation Phase

Borden Number	Temporal Period	Site Type	Location
HbKu-16	Pre-European Contact - Undated	Isolated Find	Nelson River
HbKu-17	Pre-European Contact –Late Woodland	Campsite	Gull Lake
HbKu-18	Pre-European Contact – Late Woodland	Campsite	Gull Lake
HbKu-19	Pre-European Contact - Undated	Isolated Find	Gull Lake
HbKu-20	Pre-European Contact – Undated, Historic - Late	Workshop	Gull Lake
HbKu-21	Pre-European Contact – Undated; Historic - Late	Workshop	Gull Lake
HbKu-22	Pre-European Contact - Undated	Workshop	Gull Lake
HbKu-23	Pre-European Contact - Undated	Workshop	Gull Lake
HbKu-24	Pre-European Contact - Archaic	Burial	Gull Lake
HbKv-01	Pre-European Contact - Undated	Workshop	Nelson River
HbKv-02	Pre-European Contact - Undated	Workshop	Gull Lake
HbKv-03	Pre-European Contact - Undated	Workshop	Gull Lake
HbKv-04	Pre-European Contact – Undated, Historic - Cree	Workshop	Gull Lake
HcKt-07	Historic - Cree	Campsite	Gull Lake
HcKt-08	Pre-European Contact – Undated; Historic – Cree	Campsite	Gull Lake
HcKt-09	Pre-European Contact - Undated	Workshop	Gull Lake
HcKu-01	Pre-European Contact – Undated; Historic - Cree	Burial/Campsite	Gull Lake, Effie Bay
HcKu-02	Historic - Cree	Campsite	Gull Lake
HcKu-03	Historic - Late	Burial	Gull Lake
HcKu-04	Pre-European Contact - Undated	Workshop	Gull Lake
HcKu-05	Historic – Late, Cree	Portage	Gull Lake
HbKv-05	Pre-European Contact - Undated	Isolated Find	Portage Creek, Nelson River

Project effects to known and undiscovered heritage resources as a result of Project operation activities include:

- Initial flooding of the reservoir area;
- On-going shoreline erosion;
- Changes to water flow;
- Increased vehicular and pedestrian traffic over areas of unknown and known heritage resources; and
- Any additional disturbances to the physical landscape such as post-project site maintenance.

These changes will be most notable in the reservoir area and along the upriver reach to Birthday Rapids. The 43 sites identified in Table 1-4 that occur within the Gull Lake area will be immediately affected by the creation of the reservoir. Increased erosion due to peat disintegration will rapidly expose existing sites and potential heritage sites which have not yet been discovered. The heritage resources within the upriver reach between Birthday Rapids and the out flow of the river from Clark Lake may experience less noticeable changes.

While Clark Lake is outside the Core Study Area and the predicted **hydraulic zone of influence**, there is concern amongst the KCNs that even the slightest change in water level will negatively impact the heritage resources along lake shores. The sites within Clark Lake are fragile because of their location at the shoreline and TCN and YFFN Members believe these sites will be affected should there the backwater effect of the Project extend beyond the predicted hydraulic zone of influence and into Clark Lake . These concerns can be addressed by monitoring sites outside of the hydraulic zone of influence through the "System-Wide Archaeological Project"[1]. In addition, the Waterways Management Plan, as outlined in the JKDA (Schedule 11-2) contributes to the planning and implementation of protective measures from Gull Rapids to Split Lake.

In addition to the loss of archaeological sites, the KCNs Elders have noted that there are burial sites within the Core Study Area at Caribou Island, Effie Bay and Bechonia that will form the reservoir. Further to this, the oral narrative documents several individuals who drowned in Gull Lake. During July 2010 archaeological field investigations, human remains were recovered from the south shore of Gull Lake during low water levels; as noted above these were radiocarbon dated at 4300 ±40 BP.

Heritage resources at Moosenose, Kettle, Fox, Carscadden and Cache lakes and Landing River will not be affected by the operation phase of the Project. Known and unknown archaeological sites at shoreline on

[1] System-Wide Archaeological Project: Manitoba Hydro and the Historic Resources Branch of Manitoba Culture, Heritage and Tourism entered into an agreement to assess the impacts of past Hydro development projects on the archaeological heritage resources in Manitoba (excluding those areas monitored through the Churchill River Diversion Archaeological Project (CRDAP) or the Sipiwesk Lake Archaeological Project). The System-Wide Archaeological Project is modeled on the highly successful CRDAP. It began in fiscal year 2006-2007, and focuses on inventory and assessment of heritage resources within lands adjacent to hydro impacted waterways.

Clark Lake may experience flooding indirectly related to the Project. Known and unknown archaeological sites on Stephens Lake may experience disturbance or destruction due to changes in water flow.

1.6.4 Reservoir Impoundment and Operation Phase Proposed Mitigation

Of the 50 known heritage resources sites within the Core Study Area, 43 sites will be destroyed or will undergo marked disturbance due to reservoir impoundment and on-going shoreline erosion caused by peat disintegration during reservoir impoundment and the operation phase of the Project. Prior to reservoir impoundment, regular shoreline surveys will be conducted to ensure that as much tangible heritage resources are recovered as possible from the affected area. The Waterways Management Plan, as outlined in the JKDA (Schedule 11-2) contributes to the planning and implementation of protective measures from Gull Rapids to Split Lake.

Key mitigation will be on-going seasonal monitoring of the shoreline within the Core Study Area, particularly the reservoir area by the Project Archaeologist and/or Members of the KCNs who are assigned to the task of shoreline monitoring. This is considered to be of great importance given the on-going discovery and/or exposure of heritage resources in other reservoir areas; for example, Wuskwatim Lake, South Indian Lake and Cedar Lake.

After flooding and during the operation phase, Phase 2 of the Waterways Management Program will provide support services, as required, for periodic shoreline surveys and reclamation of disturbed sites along the shorelines. In the event of discoveries of heritage resources or human remains, the HRPP as part of the EnvPP will continue to manage the protection of known and undiscovered heritage resources during the operation phase. This will ensure that provincial legislation and any requirements established by the EnvPP are carried out. The Project Archaeologist will advise and provide field support should any heritage concerns be raised.

Increased human traffic due to the Project is expected to have an adverse effect on known and unknown heritage resources. Key mitigation measures will involve education and awareness of Project workers as to the nature of heritage resources and management of any heritage resources that may be encountered.

In the event that previously unknown heritage resources are unearthed or exposed during reservoir impoundment and operation, the same procedure will be used to manage the discovered heritage resources as described above for discovery of unknown resources during the construction phase.

1.7 SUMMARY OF RESIDUAL EFFECTS

1.7.1 Construction Phase

Phase 1 of the Waterways Management Program (Schedule 11-2 in the JKDA) consists of measures to work with KCNs to identify and contribute to impact management measures at high priority heritage sites that will be flooded. The HRPP will be designed to mitigate any residual effects to heritage resources that may occur as a result of the construction phase of the Project. Monitoring of surface and sub-surface activities associated with the construction phase will be conducted by Environmental Officers with the

assistance of the Project Archaeologist as required. The nine known heritage sites that may be affected during the construction phase will require monitoring and appraisal during all construction activities that occur within 100 metres of the sites. All found evidence of human occupation will be recovered and processed using standard archaeological methods.

1.7.2 Reservoir Impoundment and Operation Phase

Phase 2 of the Waterways Management Program will provide services, as required, to perform periodic shoreline surveys. The terms of the HRPP will be designed to mitigate any residual effects to heritage resources that may occur as a result of the reservoir impoundment and the operation phase of the Project. Increased erosion due to peat disintegration is expected to continue to expose existing heritage resources sites and those potential heritage resources sites, which have not yet been discovered. The 43 heritage sites within the Core Study Area will be destroyed or disturbed by the reservoir impoundment and operation phase, therefore the monitoring and salvage strategy discussed in Section 1.6.3 should be implemented to mitigate the effects on these sites. All found tangible evidence of human occupation will be recovered and processed using standard archaeological methods.

1.8 MONITORING AND FOLLOW-UP

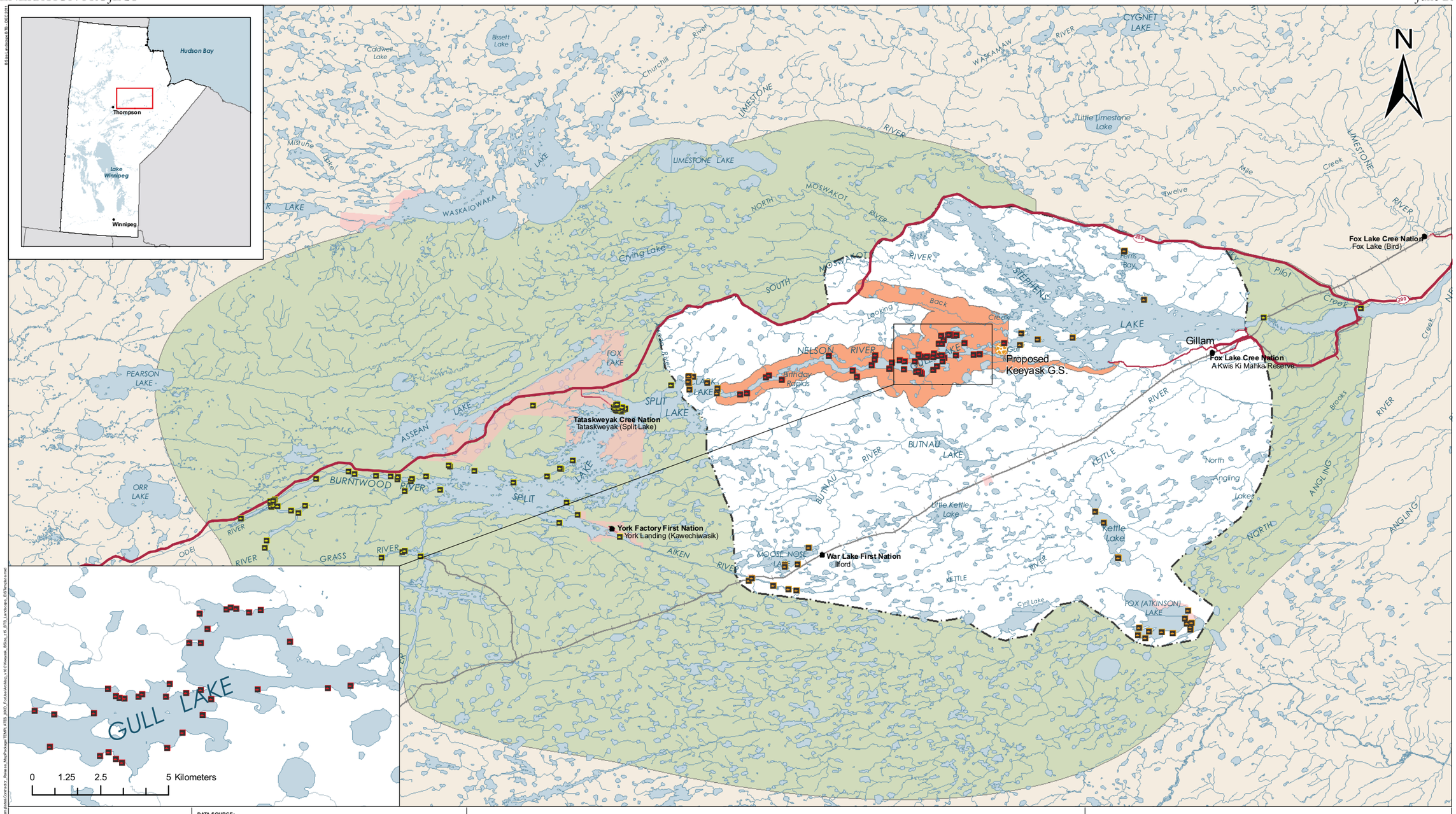
As outlined in the CEAA, monitoring and follow-up are important processes required to verify the environmental assessment and to ensure that the strategies proposed are implemented and effective. As part of the Waterways Management Program and the HRPP, regular and seasonal monitoring of affected shorelines will occur.

1.8.1 Construction Phase

On-going monitoring of heritage resources within the Core Study Area will occur during the construction phase. Unforeseen effects that may arise during construction will be identified and addressed in future planning initiatives. The HRPP will provide direction should any heritage resources (including burial sites) or found human remains be unearthed during the construction phase.

1.8.2 Reservoir Impoundment and Operation Phase

The initial impoundment of the reservoir will occur over the course of one year, however peatland disintegration is projected to persist for up to 30 years. Therefore, yearly monitoring of known archaeological sites affected by the reservoir impoundment and operation phase is required to ensure that previously undiscovered heritage resources may be recorded as they present themselves. Unforeseen effects that may arise during impoundment and on-going shoreline erosion will be identified during the monitoring process and can be used in future planning initiatives. The Waterways Management Program, in conjunction with the HRPP provides protective planning and implementation measures should any heritage resources (including burial sites or found human remains) be unearthed during the reservoir impoundment and operation phase.



DATA SOURCE:
Manitoba Hydro
Historic Resources Branch, Culture, Heritage and Tourism

CREATED BY:
Northern Lights Heritage Services Inc.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	24-MAY-12	24-MAY-12
0 5 10 Kilometres / 0 4 8 Miles	VERSION NO: 1.0	QA/QC: VPP/MKW/ZZZ

Legend

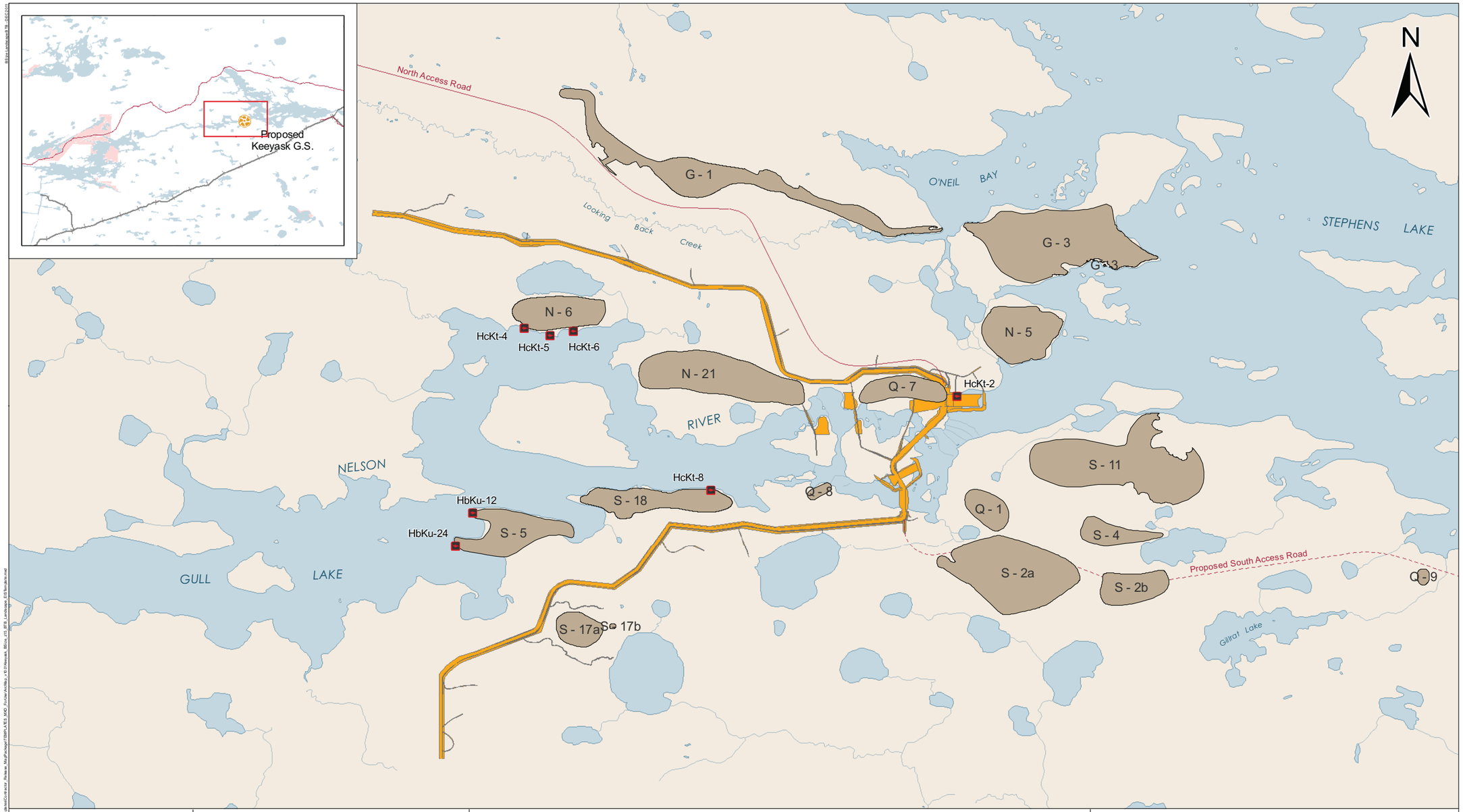
- Archaeological Site (Core), 50
- Archaeological Site (Local), 100
- Archaeological Site (Regional), 162
- Generating Station (Planned)
- First Nation Community
- Town
- Highway
- Rail
- Core Study Area
- Local Study Area
- Regional Study Area
- First Nation Reserve

Note: the number of archaeological sites in each Study Area is cumulative and incorporates sub-regions.

Heritage Resources Study Areas

with Registered Archaeological Sites

Map 1-1
SOCIO-ECONOMIC ENVIRONMENT, RESOURCE USE AND HERITAGE RESOURCES
HERITAGE RESOURCES



DATA SOURCE:
Manitoba Hydro,
Historic Resources Branch of Manitoba Culture, Heritage and Tourism

CREATED BY:
Northern Lights Heritage Services Inc.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
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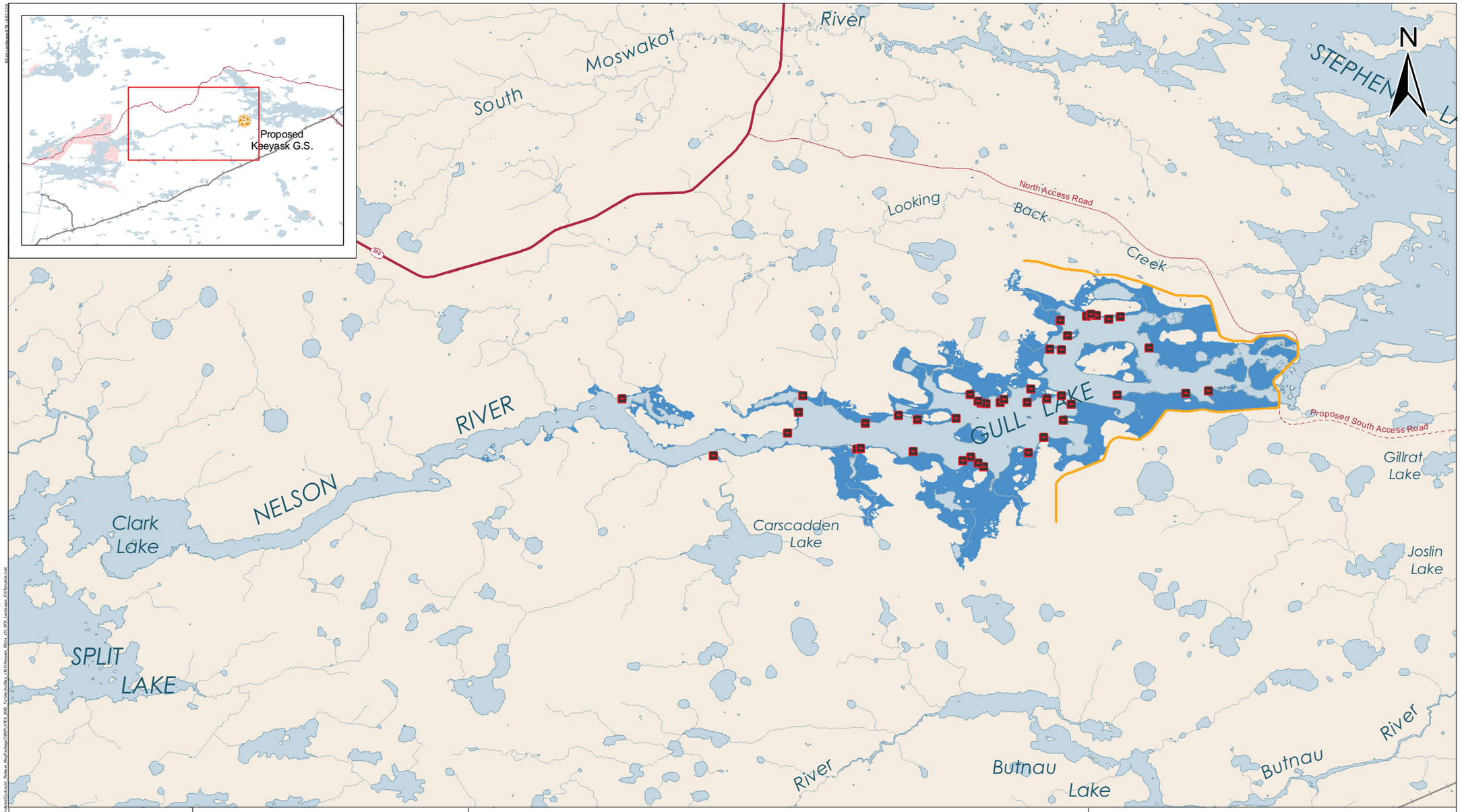
0 0.7 1.4 Kilometres / 0 0.4 0.8 Miles	VERSION NO: 1.0	QA/QC: VPP/MKW/ZZZ

Legend

- Archaeological Site (Potentially Affected), 7
- Keeyask Principal Infrastructure Axis
- North Access Road
- Proposed South Access Road
- Borrow Material Source
- Keeyask Principal Infrastructure

Potentially Affected Archaeological Sites
Construction Phase



KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Historic Resources Branch of Manitoba Culture, Heritage and Tourism
Manitoba Hydro, 0_a9de1/gull-ee-95perc-4327cms-rev3
0_a9dcb/pp-95perc-4327-159-shore-rev5

CREATED BY:
Northern Lights Heritage Services Inc.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	24-MAY-12	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 1.0	QA/QC: VPP/MKW/ZZZ

Legend

- Archaeological Site (Potentially Affected), 43
- Keeyask Principal Infrastructure Axis
- North Access Road
- Proposed South Access Road
- Highway
- Existing Water Surface Area
- Initial Flooded Area (159 m)

Potentially Affected Archaeological Sites
Operation Phase

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1.10 GLOSSARY

Archaeology: The science and/or methods concerned with the recovery, description, analysis and explanation of the physical remains of past human cultures.

Attributes: Physical traits that are characteristic of an object and can be measured or observed.

Catchment Area: A geographic area that serves a given human population.

Cookie-crumb trail: Also known as breadcrumb trail, is a tracking log using a global positioning system unit which records the positions of the traveller at specified time moments and presenting them at a GPS display as a "breadcrumb trail" of position markers.

Dbs: "Depth below surface"; this field specifies the surface or point of reference used to measure the distance or depth from ground level to the point at which the sample was taken or the specimen collected.

Debitage: Debris; waste products or by-products of the tool-making process.

Diagnostic: An object that is indicative of a particular time period and/or cultural group

Ethnographic Analogy: an interpretation of archaeological remains by comparison to historical cultures.

Historic Period: The time period representing European residency in North America. For northern Manitoba, the Historic Period began approximately 350 years ago.

***In situ*:** A Latin phrase meaning 'in the place'. In archaeology, *in situ* refers to an artifact that has not been moved from its original place of deposition.

Isostatic Rebound: the rising or uplifting of the earth's crustal surface following deglaciation. This phenomenon is of particular importance in Manitoba archaeology.

Lithic: Of or pertaining to stone.

Pre-European Contact Period: The time period prior to European exploration and residency in North America. For northern Manitoba, the Pre-European Contact Period begins approximately 7500 years ago.

Provenience: The exact two or three-dimensional location of an artifact or feature within an archaeological site. This differs from *provenance* which includes the entire documented history of an artifact.

Sherd(s): A fragment of any brittle substance, especially pottery.

Surface Scatter: Archaeological materials found distributed over the ground surface.

Ungulate: Referes to any animal that is hoofed,.

Ya: "Years ago".

Appendix A
LIST OF FIELD REPORTS

LIST OF FIELD REPORTS

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
1966	By Wright	N/A			Split Lake	HbLa-01
1972	Churchill River Diversion Archaeological Project: An Archaeological Appraisal of the Rat-Burntwood River Systems	N/A			Burntwood River	GlLg-01, GlLh-01, HaLd-02, HaLd-03, HaLd-04, HaLe-01, HaLf-01, HaLf-02, HaLf-03, HaLf-04
1973	By Hlady	N/A			Split Lake	HaLd-01
1986	By Markowsky	N/A			Nelson River	HcKp-01
1992	Report of Archaeological Field Investigations Along the Proposed Kelsey to Split Lake Transmission Line	A28-92			Split Lake	HaLd-05, HaLd-06, HaLd-07, HaLd-08, HaLd-09, HdLa-10, HcLc-01, HcLc-02
1992	Archaeological Excavation at HaLd-7, Pukatawakan Bay, Split Lake, Manitoba HRIA	A52-92			Split Lake	**Revisit**: HaLd-07

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
1992	Churchill River Diversion Archaeological Surveys, 1990-1993 :The 1992 Survey of the Split Lake Area	N/A			Split Lake	HaLf-05, HaLf-06, HaLf-07, HaLf-08, HaLf-09, HaLf-10, HaLe-02, HaLe-03, HaLd-11, HaLd-12, HaLd-13, HaLc-03, HaLc-04, HaLb-01, HaLb-02, HbLa-03, HaLb-04, HaLb-05, HaLb-06, HaLa-01, HbLb-01 **Revisit**: HaLd-02, HaLd-07, HaLd-08, HaLd-09, HaLc-01, HaLc-02
2001	Keeyask Powistick (Gull Rapids) HRIA	A36-01	Gull Lake			HbKu-01, HbKu-02, HbKu-03, HbKu-04, HbKu-05, HbKu-06, HbKu-07, HbKu-08, HbKu-09, HbKu-10, HbKu-11, HbKv-01, HcKt-01, HcKu-01, KcKu-02, KcKu-03, HcKu-04
2002	Gull Rapids (Keeyask) GS 2002 HRIA (Year 1 Final) FLCN	A27-02		Stephen's Lake		No archaeological sites/heritage materials discovered.

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2003	Keeyask Project 2003 HRIA Arch Survey of Stephens and Fox Lake	A10-03		Stephen's Lake and Fox Lake		HcKr-04, HcKr-05, HcLr-03, GlKr-01, GlKr-02, GlKr-03, GlKr-04, GlKq-01, GlKq-02, GlKq-03, GlKq-04, GlKq-05, GlKq-06, GlKq-07, HaKq-01
2003	Keeyask Project GS 2003 HRIA Gull Rapids Camp	A10-03	Gull Rapids Camp			No archaeological sites/heritage materials discovered.
2003	Gull (Keeyask) Project (2003) HRIA	A10-03	Gull Lake, Gull Rapids, North Access Road			HcKt-03, HcKt-04, HcKt-05, HcKt-06, HbKu-12, **Revisit**: HcKt-01, HcKu-01, HbKu-01, HbKu-10
2004	Keeyask Project GS 2004 HRIA Gull Lake	A07-04	Gull Lake, Borrow Areas			HbKt-01, HcKt-08, HcKt-09, HbKu-14, HcKu-5, **Revisit**: HbKu-12
2004	Keeyask Project 2004 Investigation at the Paradise Beach Site on Fox Lake	A08-04		Fox Lake		**Revisit:** GlKr-03

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2004	Participatory Action Research 2004 TCN Student Archaeology Project	A07-04	Gull Lake, Gull Rapids, Nelson River	Clark Lake		HbKu-13, HbKu-14, HbKu-15, HbKu-16, HbKu-17, HbKu-18, HbKu-19, HbKu-20, HbKu-21, HbKu-22, HbKu-23, HbKv-02, HbKv-03, HbKv-04, HbKw-01, HbKw-02, HbKw-03, HbKw-04, HbKw-05, HbKx-01, HbKx-02, HbKx-03, HcKt-07, HcKt-08, HcKu-05 **Revisit:** HbKu-01, HbKu-02, HbKu-05, HbKu-07, HbKu-08, HbKu-09, HbKu-11, HbKu-12, HcKu-01
2005	Gull (Keeyask) Project GS 2005 HRIA	A30-05	North and South Access Road			No archaeological sites/heritage materials discovered.
2005	Gull (Keeyask) Project GS 2005 Kettle Lake Comparison Study	A31-05		Kettle Lake		No archaeological sites/heritage materials discovered.

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2005	Keeyask GS 2005 War Lake Research Project (WARP)	A33-05		Moose Nose Lake, Landing River		HaKv-01, HaKv-02, HaKv-03, HaKw-01, HaKw-02, HaKw-03, HaKw-04, HaKw-05, HaKw-06, HaKw-07
2006	Archaeology Surface Survey of the Northwest Arm of Stephen's Lake, Manitoba	A28-06		Stephen's Lake		No archaeological sites/heritage materials discovered.
2006	Keeyask (Gull) Project 2006 Bryant's Point Arch Field Investigation Component HRIA	A31-06	Gull Lake			**Revisit:** HbKu-12
2006	Keeyask (Gull) Project 2006 Fox Lake Comparative Study	A30-06		Fox Lake		**Revisit:** GlKq-03, GlKq-05, GlKr-03
2006	Keeyask GS 2006 Arch Field Investigation Component Clark Lake Arch Survey	A32-06		Clark Lake		HbKx-04, HbKx-05, HbKx-06, HbKx-07, HbKx-08, HbKx-09, HbKx-10, HbKx-11, HbKx-12, HbKx-13, HbKx-14, HbKx-15, HbKx-16, HbKx-17, HbKx-18 **Revisit**: HbKx-02, HbKx-03

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2006	Keeyask Project 2006 Arch Survey of Kettle Lake Comparative Study	A31-06		Kettle Lake		HaKr-01, HaKr-02, HaKr-03, HaKr-04
2007	Keeyask GS 2007 Archaeological Field Investigations Component HRIA	A25-07		Clark Lake		**Revisit:** HbKx-02, HbKx-03, HbKx-04, HbKx-07, HbKx-08, HbKx-10, HbKx-12, HbKx-15, HbKx-18
2007	Keeyask GS Carscadden Lake HRIA	A26-07	Pisitif Creek, Nelson River			HbKv-05, HbKv-06
2008	2008 Archaeological Investigation of the Lower Odei and Burntwood Rivers	A38-08			Odei and Burntwood Rivers	HaLe-04, HaLf-11, HaLf-12, HaLf-13, **Revisit:** HaLf-10, HaLf-3, HaLf-06, HaLf-07, HaLf-08, HaLf-09
2008	Keeyask GS 2008 Arch Field Investigation of Component Carscadden Lake Arch Survey HRIA	A34-08		Carscadden Lake		No archaeological sites/heritage materials discovered.
2008	Keeyask GS 2008 Archaeological Field Investigation of Component Clark Lake Arch Survey HRIA	A35-08		Clark Lake		**Revisit:** HbKx-02, HbKx-03, HbKx-07, HbKx-08, HbKx-10, HbKx-12, HbKx-13, HbKx-13, HbKx-15

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2008	Keeyask GS 2008 Archaeological Investigation Pointe West Site HbKx-02 Formal Excavation	A29-08		Clark Lake		**Revisit:** HbKx-02
2008	The 2008 Split Lake Archaeological Shoreline Survey	A30-08			Split Lake	HbLa-02, HbLa-03, HbLa-04, HbLa-05, HbLa-06, HbLa-07, HbLa-08, HbLa-09, HbLa-10, HbLa-11, HbLa-12, HbLa-13, HbLa-14, HbLa-15, HbLa-16 **Revisit**: HbLa-01
2009	Keeyask GP 2009 HRIA Impervious and Granular Borrow Areas	A40-09	Gull Lake, Ellis Esker			No archaeological sites/heritage materials discovered.
2009	Keeyask GS 2009 Caribou Monitoring Report	A41-09	Caribou Island, Gull Lake			No archaeological sites/heritage materials discovered.
2009	Keeyask GS 2009 North and South Retaining Dyke	A42-09	Gull Lake			No archaeological sites/heritage materials discovered.
2009	2009 Keeyask Infrastructure Project 2009 HRIA Startup and Main Camp (Phase 1)	A37-09	Gull Rapids Camp			Revisit: HcKt-02

Year	Report	Heritage Permit #	Footprint	Local	Regional	Sites
2009	Keeyask GS 2009 Pointe West Site Excavation	A32-09		Clark Lake		**Revisit:** HbKx-02
2009	Keeyask Transmission Project	A18-09 A51-09		Stephen's Lake		No archaeological sites/heritage materials discovered.
2010	Keeyask GS 2010 Borrow Areas	A37-10	Gull Lake	Stephen's Lake		HbKu-24, Revisit: HcKt-01, HcKt-02, HcKt-03, HcKt-04, HcKt-05, HcKt-06, HbKu-12
2010	Keeyask GS Archaeological Investigation of Cache Lake	A21-10		Cache Lake		No archaeological sites/heritage materials discovered.
2010	Keeyask GS 2010 Archaeological Investigation Pointe West Site HbKx-02 Formal Excavation	A25-10		Clark Lake		**Revisit:** HbKx-02

APPENDIX B: METHODOLOGY AND METHODS, PREDICTIVE MODELING, SITE RANKING & REPORTING

METHODOLOGY

The primary methodology used in archaeology is that of cultural ecology where the relationship between the natural and cultural environment is viewed as the catalyst for cultural maintenance. In archaeology, the relationship between the natural and cultural environment is observed through relics of past cultural occupations. The key question asked by archaeologists in relation to cultural ecology is "how has each group of humans lived on a particular landscape, or in a particular environment, at a particular past time" (Crumley 2001); and more specifically, what types of evidence may be present to identify these land use patterns. Archaeological methods are based on observed reality (Perez 1999:11-12) which includes the archaeological record, field methods, evaluation, assessment and identification of mitigative measures. . These methods were especially important in conducting archaeological investigations associated with the Heritage Resources Impact Assessment (HRIA) related to the Keeyask Generation Project (the Project) and combines to form the supporting document.

For the Project, a research design was established which provided the framework for all future activities (Figure **Error! No text of specified style in document.**-1). Three categories of research questions were considered: descriptive, differences and relationship. Descriptive questions seek to identify and describe; difference questions focus on contrastive features; and relationship questions strive to find threads of similarities or connections between and amongst cultural groups.

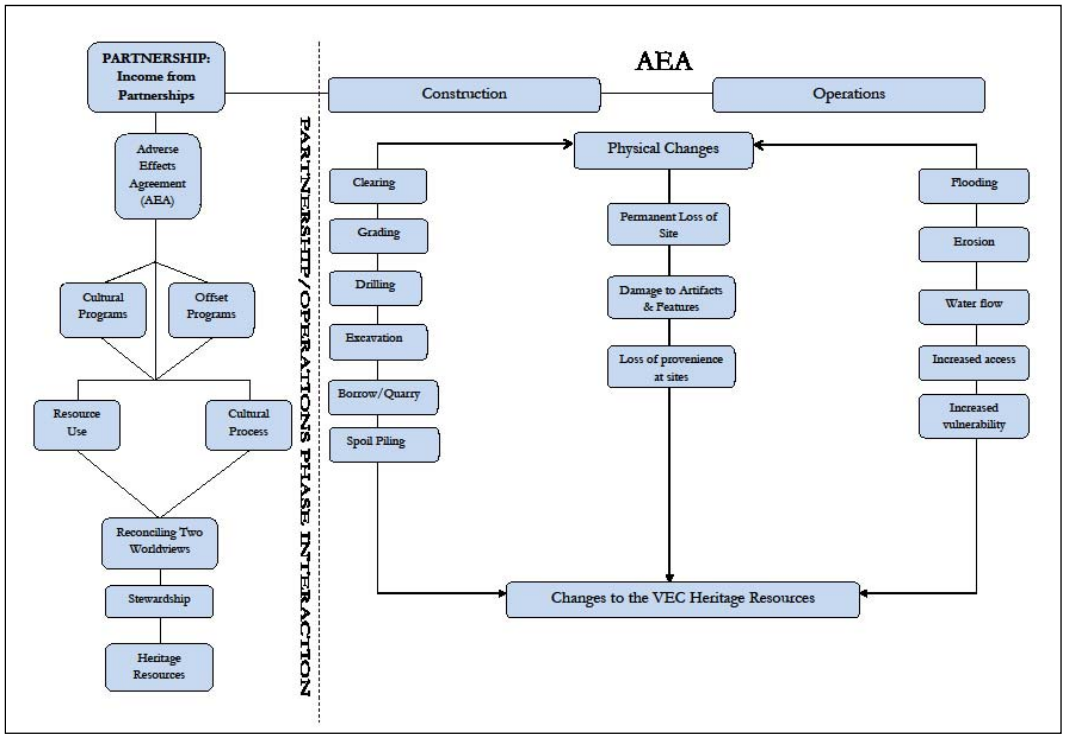

Figure Error! No text of specified style in document.**-1: Framework of archaeological activities**

associated with the EIS process

METHODS

A variety of methods and information sources were employed in preparation for the effects assessment for the EIS. The environmental assessment methods allow for identification of possible environmental effects, and propose measures to avoid or mitigate the possible adverse effects of development on heritage resources. These methods may be divided into four main categories which include:

- Data gathering;
- Predictive modeling;
- Field methods and analysis; and
- Site reporting.

Data Gathering

Data gathering is a vital component that occurs prior to field investigation and continues throughout the project to assist in identifying areas of potential heritage resources and to contextualize the study area and any heritage resources that are found during field investigations. Data triangulation employs a review of contemporary archaeological sources, archival documents which include aerial photos and topographic maps, and local knowledge from community members, which combines to form baseline data on the study area (Figure **Error! No text of specified style in document.**-2).

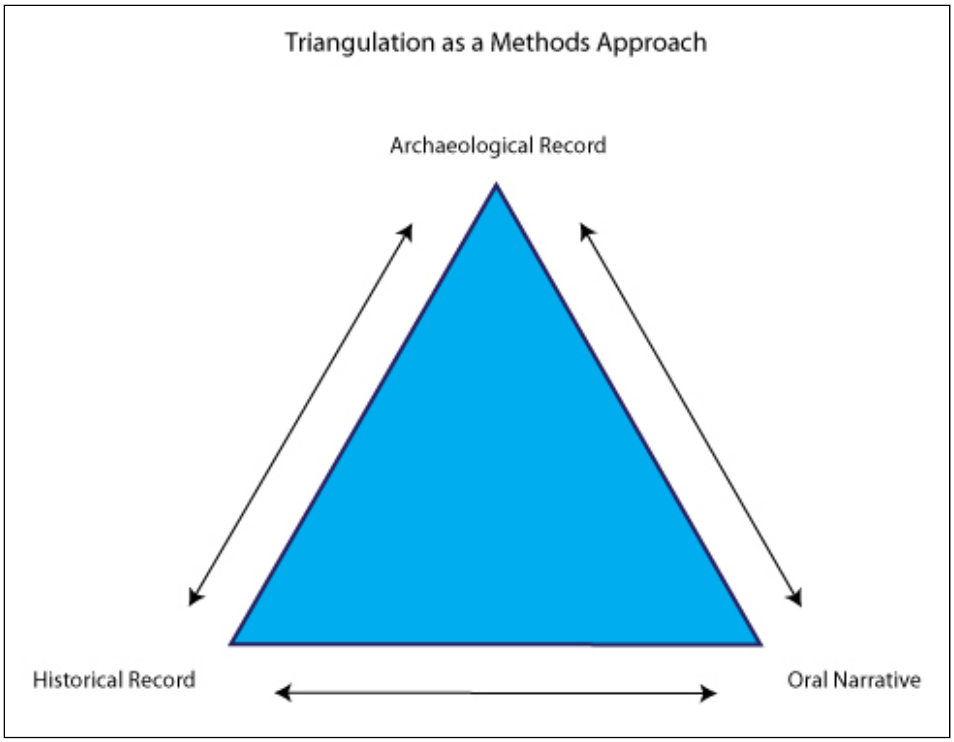

Figure Error! No text of specified style in document.**-2: Triangulation as a Methods Approach**

Archival Sources

A literature review of historical documents was completed as an integral component of the heritage resources assessment. Documents and maps at the Manitoba Archives, including the Hudson's Bay Company Archives (HBCA) and government records, the Manitoba Legislative Library, the universities of Manitoba and Winnipeg, and the Diocese of Keewatin Archives, along with historical, soils, geological, National Topographic (NTS) and aerial photo maps were carefully examined and all relevant data documented.

The literature and document review provided the base for the heritage resources characterization study, which described the chronology of cultural occupation within the area.

The post-glacial physical record played an important role in determining the availability of habitable land. Phenomena such as **isostatic rebound** and the shifting movement of glacial Lake Agassiz and its outlets are considered to have influenced the locations of seasonal human occupation. The Regional Study Area was determined to contain elements of pre-European Contact occupations. Existing information on stone tool manufacture indicated human occupation west and east of the Local Study Area as early as ca. 5,000 years ago (ya) with ongoing evolution of the tool assemblage through to the recent historic period. Inference of early food procurement methods and food sources were based on archaeological field studies conducted west of the Regional Study Area during the 1970s (Dickson 1972; Wiersum 1972).

Archaeological Sources

Archaeological Site Inventory

The Historic Resources Branch manages the Provincial Archaeological Site Inventory as part of its mandate to protect and preserve heritage in Manitoba. An archaeological inventory is a record of found and registered archaeological sites. It provides a list of pertinent information that describes each site. The archaeological inventory is the first component of data gathering prior to field studies. The inventory is available for review by qualified archaeologists who are engaged in archaeological investigations.

Prior to 2001 and the commencement of HRIA investigations related to the Project, no archaeological sites had been registered for the Local Study Area. Archaeological fieldwork conducted prior to 2001 was related to a single archaeological reconnaissance survey of Gull Lake and Gull Rapids conducted in 1991 by Quaternary Consultants Limited (Quaternary Consultants Limited 1991). This fieldwork was undertaken in conjunction with preliminary considerations for the Project. No archaeological sites were recorded during this survey.

The database of the Provincial Archaeological Site Inventory for the geographic area from Split Lake east to the Hayes River, west to the Churchill River and north to the Hudson Bay coastline was acquired, carefully studied and plotted on 1:50,000 maps and computer generated GIS maps.

Archaeological Assessment Reports

While evidence of an archaeological record was lacking for the Local Study Area, some archaeological investigations at Split Lake, the Burntwood River and along the Churchill River Diversion indicated a record of human occupation spanning at least 6,000 years ago. Moreover, upstream at the Limestone Generating Station, 13 archaeological sites were recorded (Quaternary Consultants Limited 1989a; 1989b).

In 1971 Moose, Riddle and Wiersum completed the first major archaeological survey upstream of the Local Study Area at Split Lake as part of the Churchill River Diversion Archaeological Project (CRDAP) (Wiersum 1972, 1973). In 1992, further archaeological investigations were conducted in conjunction with this same project (Riddle 2000). Fourteen sites were found along the Nelson/Burntwood/Odei rivers, and included a range of small campsites or lithic workshops dating to the Pre-European contact Woodland Period (2,000-400 ya) in addition to Historic and recent resource-user camps. The majority of sites were small, surficial collections found in granite pockets along the shoreline. Site reports associated with the archaeological sites suggest that they were relatively small with minimal evidence of material culture. Riddle stated that only relatively small numbers of artifacts were recovered from sites located along the Odei and Burntwood Rivers during his 1992 survey (Riddle 2000). He concluded that the lack of sites on Split Lake (n=12) indicated that "...the Split Lake area was little used in Pre-contact times, and that the limited evidence of human occupation reflected in site and artifact assemblages is an accurate representation of the archaeological resources present in the area" (Riddle 2000). Petch in her 1992 HRIA archaeological field investigations for the Kelsey/Split Lake Transmission Line Project identified a further nine archaeological sites between Kelsey and Split Lake, including a multi-component site at

Pukatawagan Bay (Petch 1992).

Archaeological research currently being conducted at the Pointe West site (HbKx-2) on Clark Lake 20 km downstream from Split Lake has revealed a large, intact, and extremely valuable multi-component site. The Pointe West site, supported by the documentation of numerous small campsites and lithic workshops along the shores of Clark Lake, refutes Riddle's above-cited conclusion that the Burntwood and Nelson rivers near Split Lake were used infrequently. The Pointe West Site and others contribute important evidence to support the long-lived history of the Cree along the Nelson River system. Recent shoreline survey of the Split Lake Reserve provides further evidence of ongoing occupation for several thousands of years. Geophysical survey of Chipay nāya (Ghost Point) verified an abandoned historic Cree cemetery within the Reserve of Tataskweyak Cree Nation (TCN). The lack of findings along the Burntwood/Odei rivers as noted by Riddle may be due in part to the fact that the river acted as a "superhighway" with little resting along the way.

Local Knowledge

Cultural models developed by the Keeyask Cree Nations (KCN) were reviewed as contributing elements to the heritage assessment. The Overview of Water and Land (OWL) process developed by TCN and WLFN was based on the Mother Earth Ecosystem Model first presented by TCN and WLFN.. FLCN's *Ninan* and Traditional Knowledge (TK) studies and YFFN's Community History Project provided further understanding of the historic record. The participation of Elders and First Nation assistants provided a greater appreciation of ancient land use practices that were observed through the archaeological record. Localized knowledge assisted in documenting recent Cree archaeological sites and knowledge of the Regional and Local Study Areas that could not have been revealed through field surveys alone. Community engagement also provided cultural insight as to why certain areas would or would not have been used in the past. Based on informal discussions with members of TCN and FLCN, specific locations within the Local and Footprint Study Areas were selected for further study. For example, Elders spoke of cabin foundations at Clark Lake and Effie Bay on Gull Lake. TCN Elders also indicated that most settlement would occur on the north side of the lake since people could watch for geese flying north across the lake.

Predictive Modeling

The archaeological predictive model is a research tool that can be used to calculate the relative probability of archaeological sites within a specified area. The foundation of the archaeological predictive model in Manitoba is based on ancient and historic human activities that are concentrated on subsistence strategies (food and resource procurement (fuel and raw materials)strategies. These activities are reflective of how past human groups applied their land use and occupation strategies (Hamilton 2000).

The basic premise for predictive modeling in archaeology is that certain physiographic attributes in association with economic and cultural characteristics can assist in determining where archaeological sites may occur. Predictive modeling allows for efficient and effective analysis of geographic territories prior to field investigations by analyzing attributes that are both positively and negatively associated with known

site locations (Dalla Bona 1993; 1994a; 1994b; 1994c; Hamilton et al. 1994; Hamilton 2000).

Since no archaeological sites were registered within the Local Study Area, a predictive model of archaeological site occurrence within the Local Study Area was undertaken. The existing archaeological record for northern Manitoba was acquired. Aerial photographs and 1:50,000 NTS maps were studied for vegetative patterning and topographical features. Using the physical environmental variables of distance from water, vista, aspect and slope, areas of low, moderate, and high potential for presence of archaeological sites were identified. This process was further refined as additional variables such as soils data were introduced. From these data a valuation process was established and specific areas were flagged for field investigation. Added to this was important traditional knowledge about the use of certain landscapes historically and currently as key to understanding the possible decision-making processes of past people regarding choice of site.

Overview

The model utilizes ethnographic analogy to incorporate historic and current culturally-based behaviour to interpret archaeological sites. Predictive modeling examines choices (e.g., decision-making abilities) made by people within their environmental surroundings in order to select an appropriate location to meet their particular requirements (i.e., a workshop, subsistence purposes, campsite or settlement). The choices are linked to specific tangible attributes where each attribute is sub-divided into a series of weighted classes. The weight of each class is based on a sliding scale from the most optimal choice of each environmental attribute (n=5) to the least optimal (n=0). The resultant value of each attribute is then tallied and the total determines the level of potential of the specific area to contain an archaeological site. The higher the total values for a location, the greater the potential to contain an archaeological site.

The Inductive Method is applied to this study, utilizing the Weighted Ranking Analysis approach to predict potential site location. The Inductive Method makes use of existing archaeological and geographic knowledge to forecast trends that are intuitive and/or associative. This method is based on sampling of areas similar to a given area under investigation and is therefore data driven and more accurate than the alternative Deductive Method. The Inductive Method seeks correlations between known archaeological site locations and features of the modern environment; which is also known as pattern recognition. Essentially, this method uses evidence of choices by past humans for site location and applies the data to predict the probability of locating archaeological sites. Conversely, the Deductive Method is based on predicting human behaviour and focuses on how people make choices for land occupation and use. The Deductive Method is a more generalized research tool that is more effective in explaining why archaeological sites are situated where they are recorded. Models using the Deductive Method are generally more difficult to create and validate (Dalla Bona 1993, 1994a; Hamilton 2000).

The Weighted Ranking Analysis approach for the Local Study Area combined cultural, environmental and economic attributes into a weighted ranking system where certain attribute classes were expected to provide greater influence over site selection than other classes. The attributes were environmentally-based; each attribute class was assigned a numeric value in conjunction to importance to site choice for known archaeological sites. For example, the optimal aspect (direction facing) for a site was southeast (value = 5) while the least favourable was northwest (value = 0). These values have been adapted and

modified from predictive modeling developed by Kvamme (1992) and by values assigned to assessment by the Province of Manitoba Historic Resources Branch (1990).

Application of the Predictive Model to the Keeyask Generation Project

Eight physiological variables were selected and used in the predictive model for the Local Study Area: proximity to potable water; soil types; slope; vista; aspect; geographic features; watershed, and water body convergence. The variables were limited to environmental and geological features because no archaeological sites were registered prior to the start of Project investigations. The following is a description of each of the eight variables and of the valuation placed on components of each variable.

Proximity to Potable Water

- Access to potable water was a necessity for survival – it provided food as well as allowed easier access to subsistence and other primary resources.
- The rivers and lakes were the transportation highways of the past, especially in the boreal forest, and as such were important to past cultures. . Archaeological sites within the Local Study Area were most commonly found near water bodies.

Weighted values for proximity to water are shown in **Error! Reference source not found.**.

Table 1: Proximity to Potable Water Weighted Values

Variable	Weighted Value
1-20m from water	5
21-30m from water	4
31-40m from water	3
41-50m from water	2
51-100 m from water	1
100+m from water	0

Soil Types

- Studies on Gull Lake have indicated (on a preliminary basis) that archaeological sites may be located in areas where certain soil types occur. This may be due to the presence of certain types of plants that grow in conjunction with the soil types that may have been attractive to past cultures; and/or suitable water drainage.
- For Gull Lake itself, deep dry mineral deposits are directly linked with the majority of archaeological sites identified.

Weighted values for soil types are shown in Table 2.

Table 2: Soil Type Weighted Values

Variable	Weighted Value
Deep dry mineral deposits	5
Veneer bog	4
Blanket bog	3
Thin mineral	2
Bedrock	1
Other soil types	0

Slope

- Flat surfaces are preferred for human activities.
- Less than a 5° slope is optimal.

Weighted values for slope are shown in Table 3.

Table 3: Slope Weighted Values

Variable	Weighted Value
0º slope	5
1-2º slope	4
3-5º slope	3
6-9º slope	2
10º+ slope	1
Sheer cliffs	0

Aspect

- Represents the foremost direction that a site faces (north/south/east/west);
- Southeast exposure appears most optimal based on the archaeological record. Optimal location was identified as the southeast direction based on longest exposure to sunlight, as well as protection from the harsher northerly winds, and
- Northwest exposure represents the least desirable.

Weighted values for Aspect are shown in Table 4.

Table 4: Aspect Weighted Values

Variable	Weighted Value
Southeast facing	5
South facing	4
East facing or Southwest facing	3
West facing	2
North or northeast facing	1
Northwest facing	0

Vista

- Represents the scenic or panoramic view from a site and ranges from 0° to 359°.
- Having a vista with a wide range is useful for defensive purposes or searching for game;

Weighted values for Vista are shown in Table 5.

Table 5: Vista Weighted Values

Variable	Weighted Value
359 – 270º vista	5
269 – 180º vista	4
179 – 90º vista	3
89 – 45º vista	2
44 – 1º vista	1
Less than 1º vista	0

Geographic Features

- Features such as peninsulas, islands and elevated areas (including eskers, moraines, ridges) were considered most optimal for settlement.

Weighted values for Geographic Features are shown in Table 6.

Table 6: Geographical Features Weighted Values

Variable	Weighted Value
Peninsulas	5
Islands/isthmus	4
Eskers/moraines/promontories	3
Terraces	2
Bays/coves	1
Marsh	0

Water Sheds

- The majority of known archaeological sites in northern Manitoba are near or on water bodies.
- It is assumed that transportation and subsistence strategies were closely tied to access to water bodies.
- The larger the body of water, the higher the weighted value.

Weighted values for Water Sheds are shown in Table 7.

Table 7: Water Sheds Weighted Values

Variable	Weighted Value
Lake	5
River	4
Stream	3
Creek	2
Intermittent water body	1
None	0

Water Body Convergence

- Large sites are most often located at the confluence of two bodies of water.
- The larger the two converging water bodies, the higher the weighted value.

Weighted values for Water Body Convergence are shown in Table 8.

Table 8: Water Body Convergence Weighted Values

Variable	Weighted Value
Lake to river	5
River to river	4
Lake to stream/creek	3
River to stream/creek	2
Stream to creek	1
None	0

All weighted classes of each attribute for the Project predictive model were applied to a formula that calculated the total value of a selected area, based on the criterion listed above. For example, the formula for the attribute Water Body Convergence (Table 2.1-8) is as follows: =IF(J3="Lake-River",5,IF(J3="River-River",4,IF(J3="Lake-Creek",3,IF(J3="River-Creek",2,IF(J3="Creek-Creek",1, IF(J3="None",0)))))). The weighted results assisted in determining probability for the presence of sites at each of these locations. The calculated results were then ranked into high (40-30), moderate (29-20) and low probability (19 and under).

With all attributes in use, the predictive model produced a range of 50-80% positive outcomes over that of chance.

In addition, oral histories and traditional knowledge provided by KCN Elders and community members increased the positive outcome of the applied predictive model. Information provided by KCN members was used to help validate the results of the predictive model. This was accomplished by cross-referencing areas of interest identified by KCN members with the predictive model outcomes of high, medium and low probability ranked regions.

Field Methods

A number of investigative techniques were applied during fieldwork conducted as part of the heritage assessment for the Project. Standardized forms and detailed field notes documented all fieldwork activities.

Prior to the commencement of fieldwork, the predictive model was used to determine which areas should be studied. Access to these areas varied depending on the type of transport available or barriers of physical landforms such as Gull Rapids. The heritage survey began immediately upon arrival at a location with the marking of UTM coordinates from a handheld GPS unit.

Once the GPS start point was established and the crew leader had evaluated the location, field crew members spaced evenly apart from each other conducted a walking survey along the shore to examine the exposed surfaces for evidence of human occupation or activity.

With the introduction of upgraded technology, field methods for archaeological survey progressed from recording the start- and end-point of each pedestrian transect by GPS (using both NAD27 and NAD83) in the early years of survey. In the last two years, new technology has allowed transects to be tracked and a "cookie crumb trail" to be created indicating exactly where fieldworkers conducted their surveys. The GPS data was imported into GIS and overlayed onto digital maps. GPS cameras were also used to document site geo-reference points and data. All GPS data including transect "cookie crumb trails," shovel testing locations and test excavation locations were imported into a GIS. This created a spatial record of archaeological investigations. When heritage resources or features were identified on the surface, ground markers (pink flags) were placed at the specific locations. These findings were also geo-referenced and recorded by GPS. An arbitrary datum point was established and the location of each artifact or artifact cluster was measured by chain and compass method from this fixed point. All diagnostic artifacts were photographed *in situ* before being removed from the ground. Horizontal distances of the **surface scatter** relative to cardinal directions were measured, as were distances of scatter from shoreline and from the vegetated upper terrace.

Shovel testing at either 5 to 10 m intervals was conducted at locations positive for surface artifacts or features or in areas that were identified as a high potential site by the predictive model. Transects were laid out horizontal, perpendicular or radially from an arbitrary datum with shovel testing occurring at either 5 or 10 m intervals depending on the nature of the landscape. Shovel tests were, on average, 0.5 x 0.5 m square and were excavated to a variety of depths depending on the nature of soils or until sterile sediments or bedrock was encountered. The data were recorded on standard shovel test forms. Data recorded included test pit locations , test pit size and depth, one wall profile, distance to previous test, distance to water, dominant vegetation, dominant tree cover and nature of soils. A detailed site description was recorded using photography and sketch maps in field journals.

Where surface collection and shovel testing proved positive a 1 x 1 m test unit was established. The unit was excavated in 5 cm increments. Any artifacts recovered during the excavation were two-point provenienced unless they were considered diagnostic. Diagnostic artifacts were three-point provenienced and photographed *in situ*. Detailed observations of the surrounding environment were also recorded.

Site Ranking Analysis

Archaeological sites identified during the field assessment were assigned Borden numbers by the provincial Historic Resources Branch (HRB). A detailed site form was prepared for each new archaeological site and submitted to the HRB for inclusion in the provincial archaeological site inventory. The provincial priority of each site was based on data entered into a total of 80 prescribed data fields.

Sites were then ranked according to 19 variables. Ranking occurred on all sites recorded within the Local Study Area in order to determine priority of mitigation for sites that may be affected by the Project. Site significance ranking values are divided into three categories: High (100+); Medium (75-99); and Low (0-74). Site ranking of all archaeological sites found within the Local Study Area was as follows: High, 17 sites; Medium, 63 sites; and Low, 20 sites. The result of the site ranking is shown below in

Laboratory Analysis

Laboratory methods conducted following fieldwork consisted of routine techniques that included cleaning, recording of metric and non-metric attributes, identification, analysis, cataloguing, photography, scanning and storage of artifacts. Inorganic objects were cleaned by dry-brushing and gentle water bath; organic objects were dry brushed only. As part of the analytical standard operating procedure, any artifacts such as Pre-European Contact ceramic sherds encrusted with food or carbon residue were not cleaned but set aside for further study and residue analysis. A detailed analysis was conducted for Pre-European Contact ceramic rim sherds and lithic tools, each of these were then compiled into a 'Rim Sherd Analysis' or 'Tool Analysis' form for each artifact.

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Table 9: Site Ranking Analysis Results Based on 19 Variables

Site	Rank Value	Site	Rank Value	Site	Rank Value	Site	Rank Value	Site	Rank Value
HbKt-01	73	HbKu-22	82	HbKx-15	84	HcKt-7	67	GlKq-7	64
HbKu-1	92	HbKu-23	72	HbKx-14	86	HcKt-8	81	HaKq-1	73
HbKu-2	120	HbKu-24	104	HbKx-13	97	HcKt-9	83	HaKv-1	76
HbKu-3	90	HbKv-1	76	HbKx-12	100	HcKu-1	110	HaKv-2	82
HbKu-4	86	HbKv-2	82	HbKx-11	87	HcKu-2	79	HaKv-3	72
HbKu-5	85	HbKv-3	78	HbKx-10	97	HcKu-3	73	HaKw-1	75
HbKu-6	94	HbKv-4	99	HbKx-9	88	HcKu-4	75	HaKw-2	86
HbKu-7	90	HbKw-1	71	HbKx-8	92	HcKu-5	79	HaKw-3	95
HbKu-8	88	HbKw-2	107	HbKx-7	111	HaKr-1	75	HaKw-4	111
HbKu-9	110	HbKw-3	92	HbKx-6	92	HaKr-2	95	HaKw-5	86
HbKu-10	82	HbKu-4	75	HbKx-5	104	HaKr-3	73	HaKw-6	94
HbKu-11	75	HbKw-5	67	HbKx-4	98	HaKr-4	89	HaKw-7	71
HbKu-12	113	HcKr-3	64	HbKx-3	123	GlKr-1	76		
HbKu-13	115	HcKr-4	82	HbKx-2	126	GlKr-2	73		
HbKu-14	98	HcKr-5	78	HbKv-5	72	GlKr-3	120		
HbKu-15	65	HcKs-1	63	HbKv-6	75	GlKr-4	71		
HbKu-16	78	HcKs-2	77	HcKt-1	107	GlKq-1	90		
HbKu-17	101	HcKs-3	69	HcKt-2	91	GlKq-2	64		
HbKu-18	96	HcKs-4	69	HcKt-3	83	GlKq-3	92		
HbKu-19	77	HbKx-18	92	HcKt-4	80	GlKq-4	80		
HbKu-20	92	HbKx-17	92	HcKt-5	98	GlKq-5	116		
HbKu-21	87	HbKx-16	80	HcKt-6	85	GlKq-6	67		

Artifacts are measured with digital calipers, identified by site and sequential numbering using indelible ink and clear varnish, and entered into a detailed artifact catalogue record in MS Excel® format. Analysis of each artifact was done using comparative collections, and reference material. Each artifact was qualified into a number of categories based on an established typology loosely based on the Canadian Heritage Information Network (CHIN) data logging system. Final conservation of all artifacts included packaging in clear sealed plastic bags with an associated catalogue card. Several metallic objects that were recovered during excavation were set aside for professional conservation.

Reporting

At the end of each field season a report of field investigations and findings as part of the HRIA process was produced and submitted to Manitoba Hydro for the record. As part of heritage permitting requirements a report of findings was also submitted to the Historic Resources Branch.

All artifacts were curated using the same manner: they were placed in individual plastic bags and all relevant data (including: stop number, project name, date, geo-referencing, investigator's name, depth below surface (dbs), and test number) were marked on the bag. Artifacts and data for each site were stored together and set aside for processing in the laboratory. Upon completion of the Project, the artifacts will be returned to the Province.