

## 15.0 HERITAGE RESOURCES

Heritage resources are those resources, both human and natural, created by past human activities that remain to inform present and future societies of that past. Heritage resources include archaeological, architectural (built heritage), and palaeontological resources. Archaeological resources are defined as any physical remnants on or below the ground surface which show evidence of manufacture, alteration, or use by humans from the past. These physical remnants include Pre-Contact resources (*i.e.*, the period between the retreat of glaciers in New Brunswick up to European contact in the early 17<sup>th</sup> Century) and Historic Period resources (*i.e.*, from European contact and settlement to the mid-20<sup>th</sup> Century). Built heritage resources are human-made standing structures that provide evidence of a person, place, event or human use in the past. Palaeontological resources (*i.e.*, fossils) comprise evidence of past multicellular life, including body fossils (*e.g.*, bones, shells and plant stems), impressions (*e.g.*, leaf imprints), and trace fossils. Palaeontological resources are often thousands of years to hundreds of millions of years old and are often the remains of extinct species.



This section discusses the potential interactions of the Options with archaeological resources, built heritage resources, and palaeontological resources.

### 15.1 SCOPE OF THE REVIEW

#### 15.1.1 Why Heritage Resources is a Valued Component

Heritage resources is a VC because of the:

- interest and concerns regarding these resources from the general public as a whole; and
- interest of First Nations in the preservation and management of heritage resources related to their history and culture.

Based on the documented presence of heritage resources within lands (islands and floodplains) submerged under the current headpond and the potential for undocumented heritage resources on flooded land features under the current headpond, as well as potential for undocumented heritage resources within areas subject to ground-breaking activities, each of the Options has the potential to adversely affect some element of heritage resources. In particular, archaeological resources related to the Pre-Contact and early Historic Periods of New Brunswick may interact with the Options.

#### 15.1.2 Regulations and Policies Relevant to Heritage Resources

Known heritage resources in New Brunswick are regulated under the *Heritage Conservation Act*. The regulatory management of heritage resources falls under the New Brunswick Department of Tourism, Heritage and Culture, and is administered by its Heritage Branch. Within the Heritage Branch are the offices of Archaeological Services (responsible for archaeological resources in New Brunswick);

Historic Places (responsible for built heritage); and the New Brunswick Museum (responsible for palaeontological resources).

The review for heritage resources for this VC has been undertaken through the completion of historical, archaeological, architectural, and palaeontological research. The Province of New Brunswick does provide some guidance for conducting heritage assessments, such as the “Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick” (the Archaeological Guidelines, Archaeological Services 2012); however, these guidelines tend to apply to EIAs and pre-construction projects but are not directly applicable to an early planning process such as the CER.

### 15.1.3 Area of Review

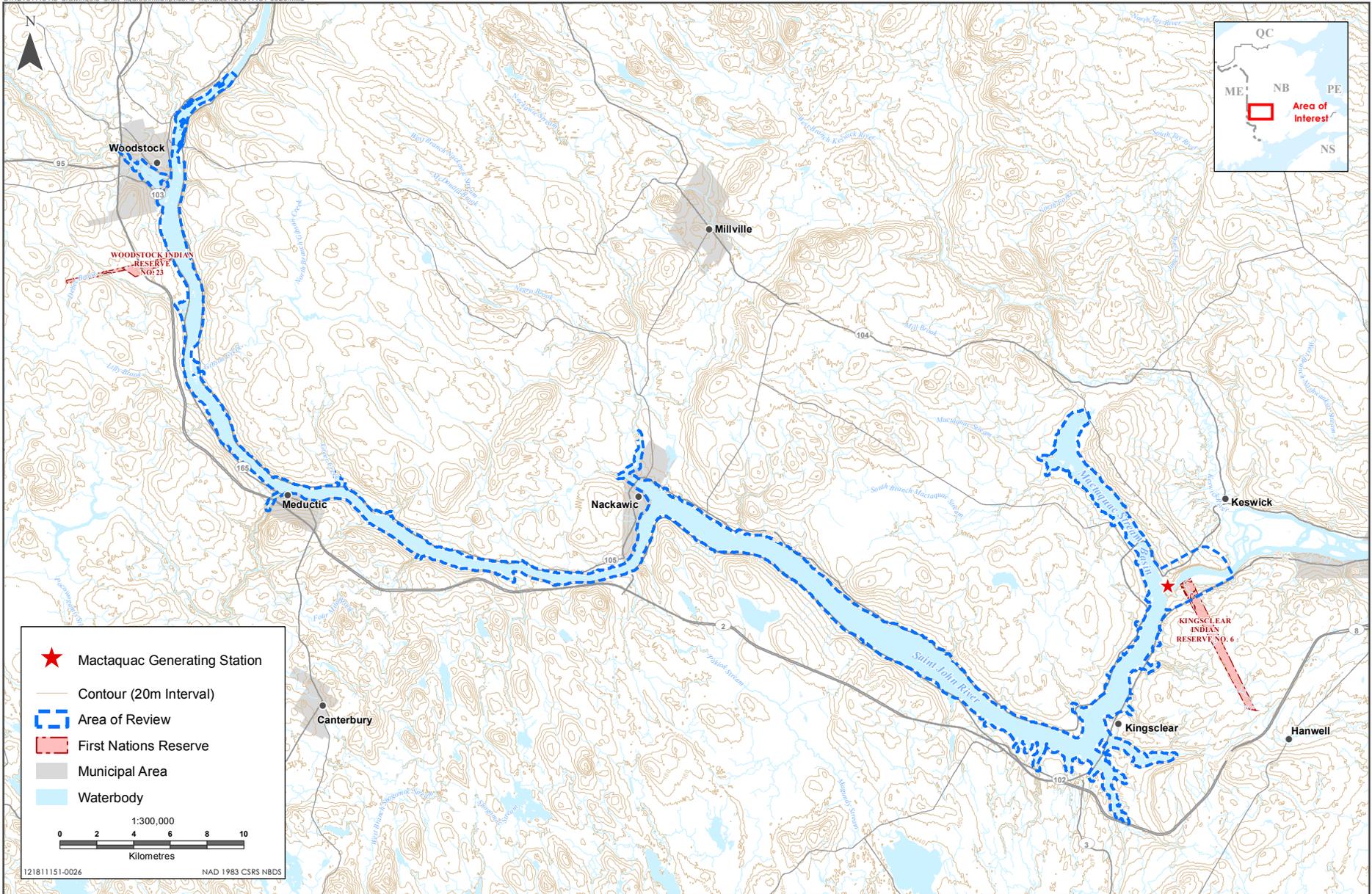
The area of review includes the land features flooded to form the current headpond, which is between the Station and the town of Woodstock (Figure 15.1). The area of review is bounded by a linear distance of approximately 100 m from the current banks of the Saint John River/headpond, as the area with most likely presence of heritage resources that could be affected by the Options through disturbance. It also includes the tributaries in the headpond, such as Kellys Creek and Longs Creek and other waterways (or portions of waterways) where water levels changed because of the creation of the headpond (e.g., Jewett's Creek and Meduxnekeag River). Additionally, the area of review includes the construction footprint for Options 1 and 2 as well as the portion of land downstream of the Station on which the replacement transportation link may be constructed. Due to the construction activities associated with the implementation of the Station in 1968, it is not anticipated that any heritage resources that might have been present at the time would have survived the original construction of the Station.

Heritage resources will not be affected by the Options in the following areas, which are thus excluded from the area of review for heritage resources:

- where water levels did not change appreciably from the creation of the headpond; and
- where water levels are not anticipated to change substantially from implementation of any of the Options, such as the portion of the Saint John River downstream of the Station.

### 15.1.4 Key Issue

Maintaining the headpond water level at or near the current operating level for Option 1 or Option 2 will continue to submerge archaeological and palaeontological resources that were not submerged prior to the construction of the Station. Therefore, maintaining the water levels for Option 1 or 2 may result in continued inaccessibility of, and potential erosion of, any now-submerged archaeological or palaeontological resources within the headpond, and/or potential continued erosion of known archaeological resources that might be exposed along the current shorelines in the headpond. Ground-breaking and earth moving activities during the construction phase for Option 1 or Option 2 have the potential to interact with unidentified heritage resources that might be present where construction activity is to take place.



Base Data: Contours, First Nations Reserve and Roads are from SNB and Waterbodies and Watercourses data from NBDNR. All data downloaded from GeoNB. Project Data: All Heritage Resources data from Archaeological Services.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.



For Option 3, the decommissioning of the Station will result in the lowering of the water levels in the headpond which could result in changes in heritage resources due to their exposure from what was previously submerged under water and/or potential erosion of the soils that may contain such resources.

Accordingly, the key issue is potential change in heritage resources, as detailed in Table 15.1.

**Table 15.1 Description of Key Issue**

Key Issue	Description
Potential change in heritage resources	<ul style="list-style-type: none"> <li>• Loss or alteration of known or unknown archaeological resource sites (Pre-Contact and Historic Period) and context.</li> <li>• Loss or alteration of standing built heritage structures, or a change in setting that alters their intrinsic value.</li> <li>• Loss of fossil information and its relationship with the surrounding rock.</li> </ul>

## 15.2 EXISTING CONDITIONS

This section provides an overview of the results of the background research undertaken to determine known heritage resources within and along the headpond.

### 15.2.1 Sources of Information

The following sources were consulted in order to gather an understanding of the general and specific history in the area of review:

- published, unpublished, and on-line works about local history, the environment, and previous archaeological work carried out in the area;
- regional experts in historical information, including the possibility for palaeo-shorelines (experts consulted, including their affiliation, are provided in Table 15.2);
- archaeological potential map of the area of review, provided by Archaeological Services, showing areas with high and medium potential for Pre-Contact Period archaeological sites, based on anthropological, geographic, and geological data;
- provincial archaeological sites database;
- representatives from Archaeological Services; and
- documents in the New Brunswick Archives.

It is noted that Aboriginal traditional knowledge can sometimes be an important source of information on heritage resources, particularly for Pre-Contact archaeological resources. However, since engagement of Aboriginal communities was at an early stage during the initial preparation of the CER, and because a Traditional Knowledge/Traditional Land Use study had not been completed at the time this report was finalized, the existing conditions summary below does not include input of First Nations relating to the potential presence of important Aboriginal archaeological resources or sites in the area of review. Further information would be gained through the Traditional Knowledge/Traditional Land Use

study currently being conducted, as well as through further engagement to be conducted for the EIA of the Preferred Option.

**Table 15.2 Experts Consulted for Heritage Resources**

Name of Expert	Affiliation
Dr. David Black	University of New Brunswick, Department of Anthropology
Dr. Susan Blair	University of New Brunswick, Department of Anthropology
Dr. David Keenlyside	PEI Museum and Heritage Foundation (formerly Canadian Museum of Civilization)
Dr. Chris Turnbull	NB Provincial Archaeologist (retired)
Dr. Matthew Betts	Canadian Museum of History
Mrs. Francesca Holyoke	University of New Brunswick, Archives and Special Collections
Archaeological Services Staff Members (various)	Archaeological Services – New Brunswick Department of Tourism, Heritage and Culture
Mr. Tom McCaffrey	Supervisor, Government Records Archives, Provincial Archives, Fredericton, New Brunswick
Mr. David Myles	NB Power
Dr. Randall Miller	Curator, Geologist, New Brunswick Museum

### 15.2.2 Historical Overview

The information provided here focuses on some of the places, events, and communities that may have left some physical remains from the past that may interact with the Options. The following is not intended to provide a comprehensive historical overview of the area of review.

While this section discusses settlement up to the flooding to create the headpond in 1968, only features that will be 100 years or older by the current end of service life of the Station (i.e., by 2030) are considered to be heritage resources, in accordance with the “Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick” (Archaeological Services 2012).

#### 15.2.2.1 Pre-Contact Period

While knowledge from oral histories can be used to understand information on past ways of life of Aboriginal peoples, the most widely used method for gathering information on the Pre-Contact Period in New Brunswick is through archaeological research. The construction of the Station in 1968 has disturbed the area near the Station and flooded previous shorelines and low-lying areas, thereby preventing potential archaeological research to now be carried out using modern methods in the area now occupied by the headpond. This construction occurred at a time when modern regional archaeological research was just starting in New Brunswick. Prior to this time, sporadic surface-collection and excavations had been conducted by natural historians during the late-19<sup>th</sup> and early-20<sup>th</sup> Centuries and, later, by amateur archaeologists.

The Pre-Contact Period is often divided into four general cultural periods:

- Palaeo-Indian Period (11,500–9,500 years before present (B.P.));
- Archaic Period (9,500–3,000 years B.P.);
- Maritime Woodland Period (3,000–500 years B.P.); and

- Proto-historic Period (approximately 600-400 years B.P.)

### **The Palaeo-Indian Period (11,500–9,500 B.P.)**

The Palaeo-Indian Period was the earliest period of human occupation in New Brunswick. It occurred during a time of extreme environmental and geographic change in the region immediately following the melting of glaciers in New Brunswick, the exact nature of which is not well understood. At the end of the last glaciation, a general warming trend began and the glaciers that covered all of the lands that would become New Brunswick began to break apart. By 12,000 years B.P., most of the interior portions of New Brunswick, including the current location of the headpond, were ice-free (Shaw *et al.* 2006). The mixture of forest and open habitats during this period created favourable conditions for caribou herds (Newby *et al.*, 2005) and a number of other small and large mammals, which are believed to be the primary food sources for Palaeo-Indian peoples that were moving into, and living in, what is now central New Brunswick at that time.

Following the melting of the glaciers, and possibly due to the changes in sea levels and land elevations, there was a large in-land water body, called Glacial Lake Acadia, in what is now central New Brunswick, generally centred over the current Grand Lake area (NBDNR 2007). While it does not appear that the shorelines of this large lake reached as far as the area of review, the water level in the Saint John River was much higher during that period than it was in the centuries before the Station was constructed. In fact, the current headpond levels are likely at a similar level to where the river was during the period immediately following the deglaciation of the Maritimes.

Within the Paleo-Indian Period, the only confirmed artifact from the headpond area is a single fluted point recovered near Kingsclear by a private collector (Turnbull 1974; Erickson 2007). This “Kingsclear point”, as it is known, is associated with the Early Palaeo-Indian Period (Bradley *et al.* 2008).

### **The Archaic Period (9,500–3,000 years B.P.)**

The Archaic Period starts with the end of the Palaeo-Indian period and extends until the introduction of Aboriginal pottery at approximately 3,000 years B.P. The Archaic Period is further subdivided on the basis of changes in material culture, particularly tool type, into different periods (Early, Middle, Late, and Terminal). The Archaic Period is usually identified by the presence of tools that differ from those of the Palaeo-Indian Period. A higher proportion of ground stone tools relative to flaked stone tools are characteristic of the Archaic Period (Robinson 1992). Stone artifacts from the Archaic Period were located in the current headpond along the shorelines of the Saint John River (Pearson 1968) before the construction of the Station.

In the Middle Archaic Period, slate tools, choppers and net weights first appeared (Robinson 1992), while in the Late Archaic Period, an increased proportion of knives, plummets, and slate points (Sanger 2006) were introduced. Large, side-notched projectile points were also adopted during the Late Archaic Period. The Terminal Archaic (or Susquehanna Tradition) Period is characterized by the appearance of stemmed projectile points, flaked stone drills, endscrapers, soapstone pottery, and distinctive grooved axes (Sanger 2008).

Numerous artifacts from the Late Archaic Period have been found in the portion of the Saint John River now occupied by the headpond (McIntosh n.d.). One of the most significant Late Archaic Period finds in the headpond was from a terrace opposite the mouth of the Eel River at Meductic. In fact, this rich

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archaeological site served as one of the most important Wolastoqiyik (Maliseet) settlements on the Saint John River and was used for an extensive time period, including the Pre-Contact, Proto-Historic and Historic Periods. Prior to the flooding of this location, Pre-Contact artifacts could be found eroding from virtually every point along the shoreline at this location, where *“literally thousands of chippings, many whole and broken artifacts, pottery shards, fire and food pits, [and] burned beach stones”* could be found (Clarke 1970, p. 41–42). Clarke also notes that *“on practically every yard of the three terraces one finds flint flakes and fire-stones where wigwams once stood”* (Clarke 1970, p. 43). Other archaeological sites from the Archaic Period have also been documented within the head pond including near the mouth of the Nashwaak River where three grooved axes were found (Wintemberg n.d.), Nashwaak Point, and at the outlet of Lane’s Creek, located north of Woodstock, *“literally bushels of large broken and chipped flint stones”* were found (Clarke 1970, p. 152).

Animal remains recovered from Archaic Period archaeological sites suggest a focus on living near interior waterways and wetlands (Robinson 1992; Petersen 1991; Spiess and Mosher 2006). Other Archaic Period sites are located on the floodplains of major watercourses and on the margins of lakes and wetlands (Suttie 2005; Tuck 1993).

**The Maritime Woodland Period (3,000–500 years B.P.)**

During the Maritime Woodland Period (Woodland Period), New Brunswick’s climate is believed to have been largely similar to present-day conditions. The majority of archaeological sites in the province have been dated to this period, based on the type of stone tools identified as well as evidence from style and dates of pottery found (Petersen and Sanger 1993; Rutherford 1993).

One of the richest known Woodland Period sites located along the shoreline of the historical Saint John River is the site at Meductic, which stood at the end of an ancient portage route. Here, historian

Dr. George Frederick Clarke recovered *“many pottery shards, part of the bowl of a stone pipe, a large stone knife, arrowheads, knives, and a fine spearhead”* and several copper objects including *“bits of copper, two arrow or drill points...and a cylindrical bead of copper”* (Clarke 1970, p. 42).



Another Woodland Period site is located on the southwestern tip of Eqpahak Island, (located approximately 7 km northwest of Fredericton). Here, *“...a stone ax, arrow heads, of chips giving evidence of an Indian encampment having been situated here in former times”* (McIntosh n.d.). As well, Archaeological Services surface-collected *“...pottery fragments, three flakes, a water-worn axe, a chopper and a hammerstone”* and an excavation unit yielded *“a scraper made of red material and a few fire cracked rocks”* (Ferguson 1982, p. 4–5).

Pearson (1960–1962) reports that an Aboriginal gravesite near Woodstock was destroyed during gravel removal, uncovering human remains and corner-notched projectile points. Another possible burial was located by Clarke at Lane’s Creek, north of Woodstock on the east side of the Saint John River. Here, Clarke reports finding *“fifteen knives and arrowpoints and one spearhead”* in an ashy deposit within a 1.8 m radius (Clarke 1970, p. 152). He describes the “spearhead” as corner-notched, suggesting a Late Woodland Period affiliation.

### **The Proto-historic Period (approximately 600-400 years B.P.)**

The period from approximately 600 to 400 B.P. is known as the Proto-historic Period (Whitehead 1993), which usually refers to the culture of Aboriginal people during this timeframe, as opposed to early European explorers. During this time, Portuguese, French and English fishers and explorers made expeditions into the Maritimes and thus this period is considered a transitional period between Pre-Contact and First Nations living in the Historic Period (where Aboriginal culture appears to be dominated by European culture). Although there is little documentation around the degree of contact Europeans had with local Aboriginal peoples (including the Wolastoqiyik) contact is anticipated to be extensive. During this time, the introduction of European trade goods, diseases, and religion began to have profound effects on Aboriginal lifeways.

The headpond and Station is within the traditional territory of the Wolastoqiyik (Maliseet) people. Much of the livelihood efforts of the Wolastoqiyik were focused on major river systems because this was a primary mode of travel. Wolastoqiyik people used the rivers and streams as their highways, travelling up the smallest of watercourses to access food and other resources. Due to its size and the fact that it covers such a large land area, the Saint John River was considered the main travel route. It provided access to a vast territory of land but also, through it and its tributaries, to virtually any location in what is now known as Maine and the Maritimes, including the Bay of Fundy and Gulf of Saint Lawrence. It also provided bountiful resources for hunting, fishing, trapping, and other subsistence activities for Aboriginal people.

Called the *Wolastoq*, meaning the “beautiful river”, the Saint John River was the site of villages, camps, and an incredibly diverse lifestyle represented by a variety of archaeological site types, located throughout the Saint John River watershed (Wallis and Wallis 1957). Several Aboriginal village and camp sites occupied during the Proto-historic Period have been identified in the portion of the Saint John River that is now submerged by the headpond, including at the mouth of the Meduxnekeag River (i.e., present-day Woodstock), Meductic, Middle Southampton, Kingsclear, Eqpahak, Sainte Anne's Point, and Saint Mary's (Ganong 1899). The most important Wolastoqiyik settlement during the Proto-historic Period was at Meductic. Several writers in the 17<sup>th</sup> Century describe an Aboriginal fortification, village, and burial ground at this location (Ganong 1899; Brodhead 1855; Webster 1934; Gyles 1736).

Salvage excavations at Meductic undertaken by Louis R. Caywood of the United States National Parks Service prior to the construction of the Station (Rick 2006) during the 1960s uncovered numerous fire-pits, burned rocks, and post-molds, marking the remains of Aboriginal wigwams from the Historic Period (Caywood 1969). According to oral tradition, several battles were fought at Meductic and the remains of the dead were buried on both sides of the river (Raymond 1897).

#### **15.2.2.2 Historic Period**

The Historic Period starts in 1604 following the first contact of Aboriginal peoples with European explorers (and later settlers), but there was little non-Aboriginal settlement in what is now the headpond area until much later (described in the sections below).

## French Settlement

The earliest examples of European presence in the headpond area are the French missionaries who worked with Aboriginal peoples at Fort Meductic (located near the confluence of the Eel River and Saint John River) under the support of the Bishop of Québec. Although originally established by the Maliseet First Nation, Meductic had been transformed into a Jesuit mission by the end of the 17<sup>th</sup> Century (Historic Places 2008). By 1716, the French had established a mission at Meductic, and the first church on the Saint John River was constructed adjacent to the burial ground (Raymond 1897). A school was established at Meductic in 1788 (Raymond 1897). The remains of this school, along with an earlier trading post, were uncovered during salvage excavations funded by the New Brunswick Electric Power Commission in the 1960s (Caywood 1969). Excavations conducted near the burial ground at Meductic in 1964 by George Frederick Clarke (Clarke 1970) uncovered a large stone fireplace, hand-wrought nails, broken glass, and numerous metal artifacts, which may be the remains of either the church or the residence of the priest. By the 20<sup>th</sup> Century, the church was no longer standing and its exact location was unknown at the time of the creation of the headpond (McIntosh n.d.).

Literature suggests that the headpond area would likely have been a stopping place between Québec and the French outposts located along the Saint John River at and downstream of what is now Fredericton (McIntosh n.d.). No evidence exists to indicate there was any permanent French or Acadian settlement or buildings in the headpond area except for Meductic (McIntosh n.d.). Following the expulsion of the Acadians in 1755, most if not all of the Acadian settlements along the Saint John River were destroyed by 1758 (Gordon and Grant 1975). Some Acadians fled to Maugerville, and later to what is now Keswick Ridge ("The French Location"). Traces of former Acadian presence exist in the form of place names and family names in areas such as Keswick Ridge (Gordon and Grant 1975); however, there does not appear to be documentation demonstrating physical evidence of settlement in the headpond area.

## Planters

Following the expulsion of the Acadians in 1755, there was a strong desire to have people loyal to the British settle in these now "unoccupied" lands. Many of these people settled in the City of Saint John and surrounding areas. The so-called Planters established trading posts and fishing stations in Saint John. They brought farming experience from the New England colonies and had knowledge of other industry such as milling (Gordon and Grant 1975). However, it is not believed, or at least not documented, that any of these Planter families established homesteads upstream of the Maugerville area (McIntosh n.d.).

## Loyalist Period

Following the end of the American Revolution in 1783, large tracts of land were made available in Nova Scotia (which at the time included the province now known as New Brunswick) to those forced to leave the United States because of their loyalty to the British Crown. This period marks the first time since the arrival of Europeans to New Brunswick that a concerted effort was made by European-derived peoples to settle the lands within or near the area now known as the Mactaquac headpond. A considerable number of settlers, Loyalists, as well as others of European descent, established themselves up and down the Saint John River valley during this time. They occupied land that is currently beneath the headpond and up to Woodstock, although it appears that no land grants were officially issued for the lands west of Keswick Ridge until 1799 (Gordon and Grant 1975).

By 1783, approximately 1,300 Loyalists had arrived in the Saint John River valley. Within one year, the number had risen to 9,260 (Gordon and Grant 1975). The majority of these settlers were farmers and working in forestry activities. Woodstock, New Brunswick's first town, was established by Loyalist settlers in 1786.

One example of Loyalist settlement from this early time period occurring in the headpond area was at Bear Island, which was settled by two Loyalist regiments in 1787 (Trail 2002). Though the Bear Island itself is now submerged under the headpond, the community was actually on the shoreline of the Saint John River and not on Bear Island or any of the other six small islands at this location within the River, presumably because these islands flooded during the spring freshet.

Two sons of a Planter family from Maugerville, Daniel and Thomas Jewett, moved up-river to Keswick in 1802 on land grants that were applied for previously by Daniel Jewett Senior (Gordon and Grant 1975). There, Daniel and Thomas established themselves at the confluence of the Saint John and Keswick Rivers. The two brothers relocated to Keswick Ridge in 1802, and soon crossed over Keswick Ridge to the west bank of Mactaquac Stream (now the Mactaquac Arm) (Gordon and Grant 1972). Here, Daniel Jewett built a dam to provide water power prior to constructing a log house, rock and timber dam, a saw mill and grist mill. By 1858, the growing Jewett family built a new home of timber frame construction using wood from their own mill. The community prospered further as the third house was built (later called the Ingraham House). The saw mill and grist mill were still operational throughout the growth of the community (Gordon and Grant 1972).

A house built by one of Daniel Jewett's sons, Enoch, was located across the Mactaquac Stream. The house was still standing at the time of the headpond flooding and was relocated on the new road leading from what is now Mactaquac Park to Scotch Settlement (Gordon and Grant 1972). Most of the descendants of these families remained living on the Mactaquac Stream until the construction of the Station.

Gordon and Grant (1972) refer to an early "negro settlement," including a small church that existed between the old Saint John River Road and Jewett's Mills. These may have been black Loyalists who migrated north during the American Revolution (Library and Archives Canada 2012). Gordon and Grant also make reference to an Aboriginal encampment located about 1 km from Daniel Jewett's first home in Jewett's Mills.

Few roads were established during this time because travel was conducted primarily by water (Rees 2012). There was little need for long-distance travelling outside of the Saint John River. Due to the importance of the river as a transportation system, there were many boat landings, local access roads, and wharves built to accommodate this type of transportation along the river in what is now the headpond.

### **Colonial Period to Construction of the Station**

Settlement and occupation in the area now covered by the headpond was continuous from the Loyalist Period until the construction of the Station, and continues today upland of the current shorelines of the headpond. By 1845–1846, the first steamer, the Carleton, was making regular trips on the Saint John River between Fredericton and Woodstock (Gordon and Grant 1975; McIntosh n.d.) until operations were discontinued due to competition from the Canadian National Railway in 1906

(Trail 2002). According to McIntosh (n.d.), the most notable centres for settlement during and after the Loyalist period were at Prince William, Dumfries, Pokiok, Queensbury, Southampton, Meductic, and Woodstock.

By 1866, Bear Island was an established farming community inhabited by 86 families. The population had reached 250 people by 1871 (Trail 2002). Bear Island Congregational Church was erected in 1872 and was demolished with the construction of the Station. A new church was built at the mouth of Scotch Lake Road in 1968 (Trail 2002).

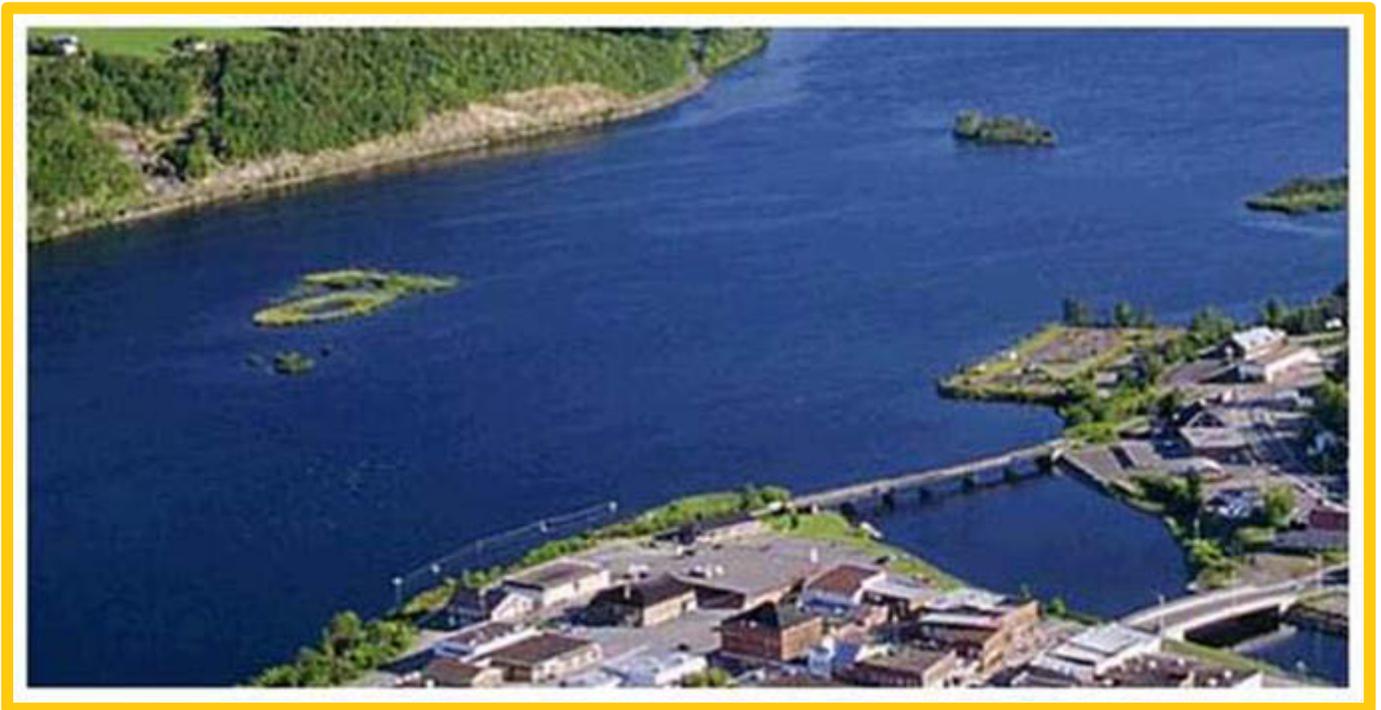
Houses in the Saint John River valley that were constructed out of logs, with chimneys and fireplaces constructed from stones embedded in clay, were being replaced by homes constructed of stone or frame houses built from timber provided by nearby mills (e.g., Jewett's Mills) with brick chimneys (Gordon and Grant 1975). Many of the homes included cellars dug up to at least four feet deep to prevent damage to the foundations from the cold winters and provide for cool storage areas for the harvest (Trail 2002).

A park was established on an island at the mouth of the Meduxnekeag River. Called Island Park (Photo 15.1), it was used by residents of Woodstock as a recreational and amusement park. In addition to Island Park being used for recreational purposes, it was also briefly used as an army cadet camp in the summer of 1942 (Myles, D., pers. comm., 2015; Army Cadet History n.d.). The island is now mostly submerged under the headpond (Photo 15.2).

Farms and other operations remained active in the area now occupied by the headpond until the decision to construct the Station in the 1960s when the provincial government encouraged (and eventually forced) those living in the portion of the river valley that was to be flooded to leave the area. Progress reports leading up to the construction of the Station (Resource Development Engineering 1966) indicated that 340 buildings (not including churches and schools) were located within the flood zone needed for the headpond. Some homes were moved to other locations above what would become the high water mark of the current headpond. Some of the more prominent or historic homes and structures were moved to the newly established tourism village, Kings Landing, in an attempt to preserve them and to provide some compensation for flooding of the land through increased tourism potential for the area. Other buildings were either demolished or burned so that there were virtually no standing buildings within the headpond at the time of flooding, with the exception an NB Tel building constructed out of stone (Myles, D., pers. comm., 2015). All bridges within the area now covered by the headpond were demolished, but some remnants remain today, either submerged or visible on the banks of the headpond.



**Photo 15.1** Island Park Prior to Development of the Mactaquac Generating Station



**Photo 15.2** Former Location of Island Park, Now Mostly Flooded by the Mactaquac Headpond

The flooding of the land following the construction of the Station resulted in the widening of the Saint John River and its tributaries including Kelly Brook (now Kellys Creek) and Longs Creek, creating a lake. The flooding resulted in the loss of islands including Snowshoe, Wheeler, Great Bear, and Long Island, and portions of the old TransCanada Highway No. 2, as well as the abandonment of a portion of the Canadian National Railway (H.G. Acres and Company Ltd. 1969). Some of this now submerged infrastructure remains discernible to this day by careful observation of bathymetric records collected by the Canadian Rivers Institute in support of the Mactaquac Project.

Mactaquac Provincial Park was also established following flooding of the headpond, to provide some compensation for flooding of the land through increased tourism potential for the area.

### 15.2.2.3 Cemeteries

At the time of the construction of the Station in 1968, 42 cemeteries, which would be affected by raising the water in the headpond area, were identified and recorded (H.G. Acres and Company Ltd. 1969). In active cemeteries, the remains and grave markers (or the grave markers alone) were moved to a new location, as directed by the church authority or as requested by a direct descendent of the deceased (H.G. Acres and Company Ltd. 1969). Prior to the flooding for the headpond, many of these cemeteries were relocated to areas above the proposed new water line. There were at least three cemeteries located in the community of Bear Island, with the oldest headstone in the Bear Island Union Cemetery dating to 1814. Many cemeteries that were to be affected by flooding were relocated to adjoining properties on higher ground. For example, the Bear Island Union Cemetery and the Anglican Cemetery were relocated to the property where a new Bear Island Cemetery was laid out and constructed and a new church was built on the adjoining property (Myles, D., pers. comm., 2015).

For cemeteries that were inactive or where neglect was rampant, the grave markers were removed and the remains were left in place. In these circumstances, a covering of gravel fill was placed over the cemetery after the headstones were removed to protect the graves during flooding. In some cases, the headstones were reinstalled on land above the high water mark of the headpond, but not in every case. In two cases, the cemeteries were able to remain in the same location as a result of adding earth fill and bank protection (H.G. Acres and Company Ltd. 1969). It is very likely, however, that there were a number of undocumented family plots, particularly from the earlier days of settlement in the headpond area. Prior to the construction of the Station, a small "negro" cemetery was noted in Kingsclear on the right bank near Currier Creek. No gravestones or markers were associated with the cemetery but it is possible the graves are those of black Loyalists (Myles, D., pers. comm., 2015). This cemetery was flooded for the headpond. Prior to the construction of the Station and, in the case of the "negro" cemetery, if there was no way to identify descendants of the deceased, an advertisement was listed in the local newspapers to inform residents about possible reinternment and relocations of the cemeteries. This was done as a last attempt to contact potential family members (Myles, D., pers. comm., 2015).

### 15.2.3 Known Archaeological Resources

Archaeological site summaries presented on Maritime Archaeological Resources Inventory (MARI) forms (Nicholas, M., pers. comm., 2015) were reviewed for information on known archaeological resources within the headpond. These summaries identified over 30 registered archaeological sites in the Mactaquac headpond area that included Pre-Contact Period sites, Historic Period sites and Multi-Component sites (Figure 15.2). In addition, numerous cemeteries, portage routes, and a suspected

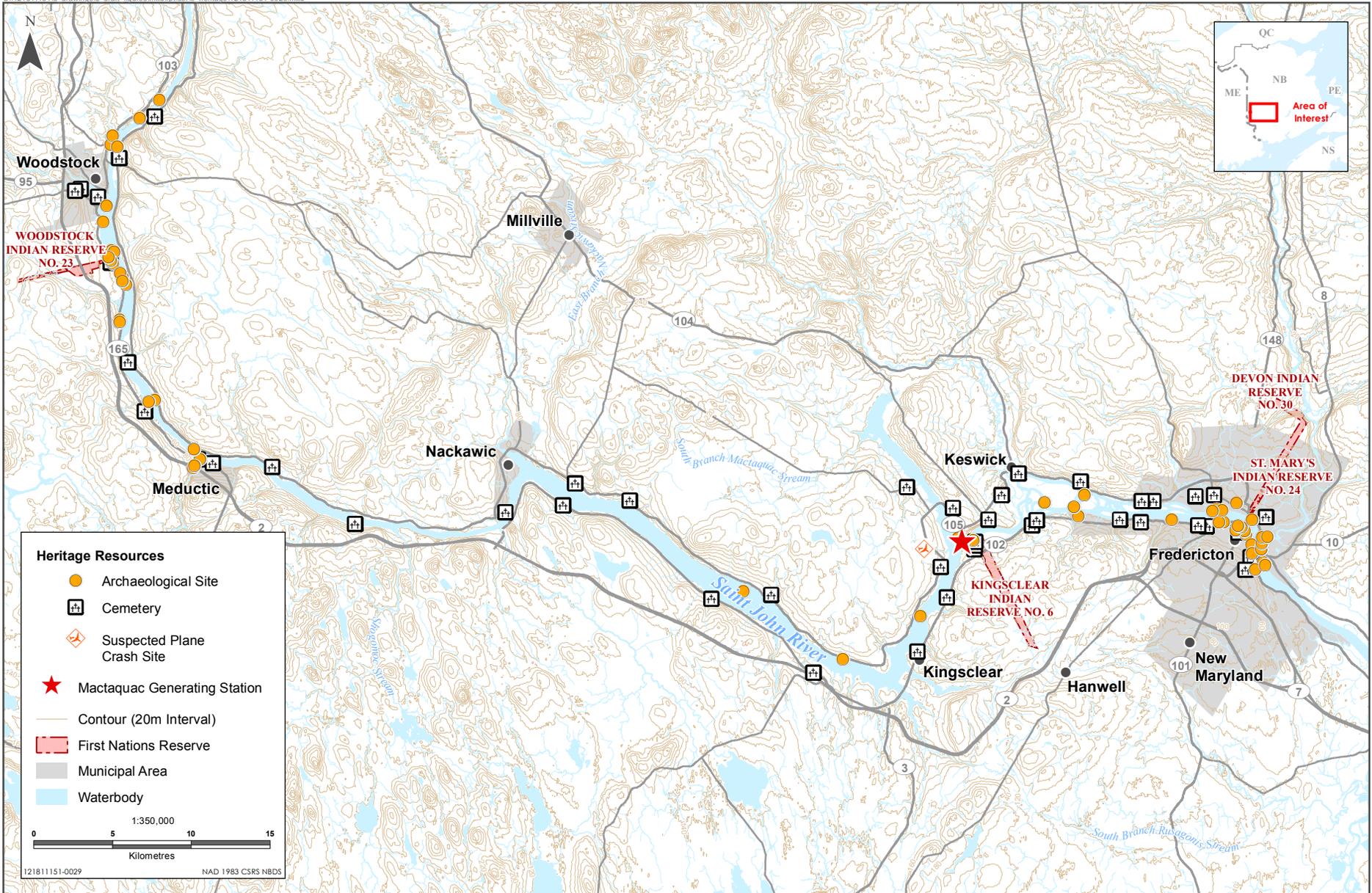
and known plane crash site have been registered within the area of review (Figure 15.2). Some of the archaeological sites and cemeteries were identified during the 1960s by archaeologists commissioned to document unknown archaeological sites in the headpond prior to the raising of the water levels. In other cases, amateur archaeologists identified some of the known archaeological sites within what is now the headpond. For example, multiple Pre-Contact Period sites were identified by Dr. George Frederick Clarke near Woodstock, Meductic (Section 15.2.2.1), and downstream of the mouth of the Meduxnekeag River at Woodstock.

In addition to the efforts of amateur archaeologists, there were some efforts by professional archaeologists to identify and document these resources within the headpond before construction of the Station. Specifically, such organizations as Parks Canada and the National Museum in Ottawa recovered information from some of the major known archaeological sites within the area to be flooded prior to construction of the Station. Parks Canada's participation was part of a larger effort by the federal government to sponsor historic archaeological investigations of Canada's National Historic Sites (Rick 2006) and included archaeological investigations at Meductic (*i.e.*, the Meductic National Historic Site). The results of this work exist as collections of artifacts and unpublished manuscripts available from these and other regulatory agencies and institutions. Therefore, while there was some effort to document and collect archaeological resources within the headpond, these efforts were not comprehensive and are relatively poorly documented resulting in that detailed knowledge of archaeological resources within the headpond area is lacking.

Regardless, the headpond portion of the Saint John River is considered to be rich in archaeological deposits, given the historical central position of the Saint John River for the ancestral Maliseet culture spanning thousands of years and its use for habitation, subsistence, resources for all aspects of life, as a travel and access to all surrounding regions, and the deep connection of the Wolastoqiyik to the Saint John River as an integral part of their identity, culture and heritage. In addition to this, the extensive use of the river valley, and subsequent settlements along the river, by European settlers following their arrival in the 18<sup>th</sup> Century have also left considerable physical evidence of use of the headpond during that period.

A general summary of registered archaeological sites is provided below based on the information contained in the MARI form summaries:

- Pre-Contact Period: there are 12 registered Pre-Contact Period sites between Woodstock and the Station. Details on these archaeological sites are very limited and the occupation period for many of these registered sites are not specified. Many of these sites are identified by either single artifacts or artifact scatters, including formal tools and ceramics.
- Historic Period: there are 12 registered Historic Period sites between Woodstock and the Station. Many of the houses and other historic period features located in the flooded portion of the headpond would not have been considered to be archaeological resources when they were being documented in the 1960s but would be considered so now. Of the Historic Period archaeological sites recorded prior to the flooding of the headpond, a few consisted of bulldozed house foundations, cellars, and early 19<sup>th</sup> Century debris and European ceramics.



Base Data: Contours, First Nations Reserve and Roads are from SNB and Waterbodies and Watercourses data from NBDNR. All data downloaded from GeoNB.  
 Project Data: All Heritage Resources data from Archaeological Services.

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

- Multi-Component Sites: there are 10 Multi-Component Sites registered between Woodstock and the Station. Multi-Component sites consist of one or more features of both Pre-Contact and Historic Period artifacts. According to the MARI form summaries, many of these sites consist of Pre-Contact and Historic period artifact scatters and other evidence of settlement.

Numerous archaeological sites have also been reported downstream of the Station near Fredericton; however, water levels have not changed substantially from the creation of the headpond and are not anticipated to change to any great extent as a result of any of the Project Options. Thus, these sites are not considered further in this review.

The archaeological sites database also identified numerous cemeteries located in proximity to the headpond (Figure 15.2). Little information is provided on the identified cemeteries with the exception of the Old Methodist Cemetery located on the west bank of the Meduxnekeag River. The Old Methodist Cemetery is designated as a Local Historic Place based on its "historic, cultural, and environmental value" (CHRP n.d.), with the oldest burial dating to 1831. Further field investigation and research would be required prior to carrying out any Option, consistent with the Guidelines requirements.

#### **15.2.4 Built Heritage Resources**

There were no buildings or structures left standing within the headpond at the time of its flooding, with the exception of one small brick NB Power communications building; however, its exact location has not been confirmed. It is unlikely the structure is over 100 years old and would therefore not be considered a heritage resource at this time. Several historically and potentially architecturally important buildings were removed from the headpond area prior to its flooding, destroyed or burned. Although there were no standing heritage buildings remaining within the headpond at the time of flooding, numerous features associated with former homesteads remained within the headpond (e.g., cellars and foundations). In addition, there were other structures relating to transportation infrastructure (e.g., bridge abutments, roads, rail beds), some of which may be considered heritage resources. There are currently no known heritage buildings located in areas identified for construction of any of the Options.

#### **15.2.5 Palaeontological Resources**

A Palaeontological Report (Miller 2015), based on known data sources within the construction footprint of the Station, was provided by the New Brunswick Museum. The report states there are no known fossil localities immediately surrounding the Station (*i.e.*, within a 500 m radius and proposed footprints for Options 1 and 2). Miller (2015) does note, however, that previous reports indicate several graptolite fossil localities near the Station. According to a sketch map that was provided prior to the construction of the Station, one fossil location may be located on the south bank of the Saint John River, within the proposed construction footprint associated with Option 1 or Option 2, although Miller (2015) notes that the locality information is unclear on the sketch maps. Other graptolite fossils were collected in the late 19<sup>th</sup> or early 20<sup>th</sup> Century and were given the names of Murray Brook and Murray's Creek (Miller 2015). While the report does not provide the location of these watercourses, according to Miller (2015), it is likely these are general names and the locations are near Burtts Corner Formation near French Village, which is outside of the construction footprint for Options 1 and 2. According to the report, graptolite fossils are considered important because they are used for dating and correlation of rocks and are not

common fossils in New Brunswick. Further field investigation and research would be required prior to carrying out any Option.

### 15.3 SUMMARY OF STANDARD MITIGATION FOR HERITAGE RESOURCES

Standard mitigation and best management practices that are relevant to heritage resources will be implemented for each Option. These are generally based on normal operating procedures and regulatory requirements, which are detailed in Section 2.6, and include mitigation specific to the heritage resources VC, for example:

- Existing infrastructure and previously developed areas will be used where possible, in order to reduce additional clearing and grading;
- The area of physical disturbance will be limited to only those areas required for construction and their boundary will be marked; and/or
- Environmentally sensitive features adjacent to, but not within, the area of physical disturbance will be identified and clearly marked, where feasible (e.g., watercourses, wetlands, areas of high archaeological potential, archaeological sites), in order to avoid disturbance to these features.

### 15.4 POTENTIAL INTERACTIONS BETWEEN HERITAGE RESOURCES AND THE OPTIONS

Table 15.3 provides an overview of how the Options might interact with heritage resources.

**Table 15.3 Potential Interactions between Heritage Resources and the Options**

Phase	Option 1	Option 2	Option 3
	Potential Change in Heritage Resources	Potential Change in Heritage Resources	Potential Change in Heritage Resources
Construction (new facilities, Option 1 or Option 2)	✓	✓	
Demolition (existing structures, Option 1 or Option 2)	NI	NI	
Operation (Option 1 or Option 2)	✓	✓	
Decommissioning (Option 3)			✓
<b>Notes:</b> ✓ = Potential interactions. NI = No interaction. Shaded cells are not applicable to the particular option and phase.			

Due to the extent of the construction activities associated with the development of the existing Station, it is not anticipated that any heritage resource, were they to have existed within the construction area of the current Station, would have survived those activities. Therefore, no interactions with heritage resources are anticipated during demolition phase for Option 1 or Option 2.

No features of the Station, neither the concrete nor earthen components, are considered heritage resources since they are less than 100 years old.

### 15.4.1 Potential Change in Heritage Resources

Because Options 1 and 2 include many of the same activities and are of similar nature and duration, the potential interaction between heritage resources and Option 1 or 2 is expected to be similar for both options. They are thus evaluated together, below.

#### 15.4.1.1 Option 1 or 2 (Construction)

No heritage buildings are located within the construction footprint for Options 1 or 2 and therefore, built heritage resources are not considered further for Options 1 or 2.

The construction of the new facilities (e.g., approach and discharge channel, main spillway, auxiliary sluiceway, powerhouse, switchyard) for Option 1 or 2 will result in ground-breaking and earth moving activities and associated physical disturbance (i.e., grubbing, grading and bedrock blasting) that could affect currently unidentified heritage resources. These initial phases of construction hold the most potential to have an adverse and irreversible interaction with archaeological and palaeontological sites, if they are present in the construction footprint. New facilities will be constructed on the south bank of the Saint John River, as well as within the existing power channel near the north bank. It is also anticipated that laydown areas and controlled access routes will result in additional areas of physical disturbance. Regardless of Option selected and the ultimate location chosen for any new transportation link that might be constructed to connect Routes 102 and 105 (Section 2.6.3 and Figure 2.10), disturbance of the river banks and approaches associated with the construction of this new bridge (if it proceeds) may also affect any heritage resources that might be present in those areas.

The area of physical disturbance and construction activities for Option 2 are very similar to those associated with Option 1, except that the area of physical disturbance for Option 2 will be somewhat smaller as no powerhouse or switchyard are required and the approach and discharge channel is narrower than with Option 1. If archaeological or palaeontological resources are located within the area of disturbance for either Option 1 or 2, if unmitigated, those interactions would occur during construction.

Most of the areas identified for construction contain large amounts of bedrock. This bedrock could contain fossils on its surface that would be exposed and/or altered during any blasting activities associated with the removal of this material to make way for the new facilities. While there are no fossil reports on record within 500 m of the current Station and proposed footprints for Options 1 or 2, it is possible that some of the bedrock to be affected by construction may contain graptolite fossils. There are reports of fossil locations near the Station, but exact locations are not known (Miller 2015).

To better understand the potential interactions between the Options and heritage resources and to plan for mitigation of any archaeological or palaeontological sites that might be present in the construction areas, it may be recommended that a Heritage Impact Assessment be completed prior to construction for all areas subject to ground-breaking activities or other physical disturbance. It may also be recommended that the Heritage Impact Assessment include a review of the palaeo-shoreline layer that will be provided by the provincial archaeological regulator to determine if palaeo-shorelines are located in areas that may be affected by construction activities. Although the current shoreline at the Station is not the shoreline of the historical Saint John River, it may be close to the palaeo-shoreline of the River from a former time period where water levels were much higher.

It may also be recommended that a plan be developed to include procedures to be followed in the event that archaeological and palaeontological resources are recovered during construction.

It is anticipated that there will be no major lowering of water levels of the headpond to facilitate construction of the new components under Option 1 or 2, and that the water levels will remain relatively similar to current levels. Thus, there will not be an opportunity to examine submerged shorelines and landform for heritage resources during the construction activities associated with Option 1 or 2.

During construction, the interaction is expected to be site-specific to the areas directly affected by ground disturbing, earth moving, and/or blasting activities and will be limited to the duration of activities associated with the early phases of construction). The interaction with heritage resources is expected to be low in magnitude because construction activities under Option 1 or 2 are unlikely to encounter heritage resources following the implementation of mitigation (i.e., Heritage Impact Assessment, avoidance, and mitigation of known heritage resources if discovered). Although ground disturbance associated with construction will be relatively short-term, potential adverse interactions with heritage resources will be permanent because no archaeological site or palaeontological site can be returned to the ground in its original state once it has been disturbed or destroyed.

#### **15.4.1.2 Option 1 or 2 (Operation)**

During operation, the interactions between Option 1 or 2 and heritage resources are anticipated to be largely similar to existing conditions because operating water levels will be maintained at relatively the current levels. For Option 1 or 2, it is possible that maintaining the current water levels during the operation phase may newly expose and damage, or continue to expose and damage, any archaeological sites or heritage resources that may be located in any eroding land features under the headpond. Based on the relatively extensive and intensive settlement (both Aboriginal and European) in the Saint John River valley, it is likely that there are unidentified archaeological sites (in addition to the known sites) within the submerged land features in the headpond. Submerged heritage resources may continue to be subject to deposition or, in particular, erosion due to movement of water, ice, and sediments in the water column within the headpond. Alternatively, heritage resources located in areas where an accumulation of sediment has occurred since the installation of the Station may have some protection because these will continue to accumulate sediment.

Streams and rivers erode, transport sediment, change course, and flood their banks in natural and recurring patterns. Both erosion and deposition are natural phenomena that occur in any river system and their extents depend largely on various factors including water velocities, channel steepness, and channel shape and roughness. The presence of the Station changed the sediment deposition and erosional patterns of the river. Over time, these submerged land features (islands and floodplains) and any heritage resources that might be present within them may be eroded, and partially damaged or completely destroyed in some areas. In other areas, these features may be preserved and covered by depositional sediments and non-oxygenated environments, making them inaccessible for retrieval of the heritage resources. Therefore, it is possible that the continued presence of the headpond could adversely affect known and unknown archaeological and palaeontological resources that might be submerged as a result of the creation of the headpond (e.g., the Meductic site and the numerous cellars and other features associated with former homesteads in the headpond area).

With the continuation of the water levels at the current operating levels within the headpond, there will be no opportunity to examine submerged land features for archaeological resources that were flooded as a result of the raising water levels following construction of the Station. At this time, there is no reasonable mitigation that can be implemented to survey for and/or excavate unknown or potential submerged archaeological resources under Option 1 or Option 2. However, it is reasonable to assume that any such heritage resources that might be present in the headpond would continue to be preserved, as currently, through their ongoing submerged state or from sediment deposition on them. Any such resources that would be subject to erosion would continue to be at risk under Option 1 or Option 2, but this does not represent a change from the status quo.

There may also be archaeological sites located along the current shorelines of the headpond (that are not submerged) and the continued existence of the headpond under Option 1 or 2 may result in exposure and erosion of these archaeological resources. Should the water levels remain similar to current operating conditions (as currently planned) these archaeological sites will continue to be exposed to erosion, as with the status quo. A review of the detailed archaeological site information provided by Archaeological Services (Nicholas, M., pers. comm., 2015) indicates that some of the reported archaeological sites that have been identified since the construction of the Station may have experienced erosion. Sediment and erosion control measures to stabilize soils could be implemented specifically at identified locations to afford protection of the archaeological sites. If stabilization measures are not feasible, it may be necessary to perform archaeological excavation or implement other mitigation, in consultation with the provincial archaeological regulator.

During operation, the geographic extent of a change in heritage resources will be limited to the site-specific location of such resources; however, the exact spatial extent is not known. The duration would be long-term and is anticipated to last as long as the headpond exists. The interactions with heritage resources are expected to be continuous during operation because the continued erosion of sediments over archaeological sites may expose these sites and subject them to continual damage or destruction over time. As stated above, some archaeological sites may be afforded some limited additional protection if sediment is transported over the sites. Potential adverse interactions with heritage resources will be permanent because no archaeological site can be returned to its original state once it has been disturbed or destroyed.

#### **15.4.1.3 Option 3**

Under Option 3, it is assumed that the historical river channel will re-establish itself as the conduit for water flow through this area, or a slightly different river channel will be established (to be determined through ongoing work being carried out by the Canadian Rivers Institute). Formerly submerged land features, such as islands and floodplains, will re-emerge during the dewatering of the headpond. These newly exposed land features may contain unknown Pre-Contact archaeological sites as well as Historic Period remnants (e.g., cellars and foundations) from former homesteads and farms in the area currently covered by the headpond that are now considered heritage resources (*i.e.*, over 100 years old). Other Historic Period structures (e.g., cemeteries, bridge abutments, roads) that were abandoned for the creation of the headpond may also be exposed following dewatering.

While the lowering of the water would allow for an opportunity to study and examine currently submerged archaeological resources, there may be some challenges to identify, protect, and mitigate any newly exposed heritage resources that might be present if the ground conditions in the newly

exposed shoreline areas are unstable. If left unmitigated, removal of the Station could leave unstable and exposed banks that may be susceptible to erosion and slumping. Given that there are likely to be undocumented archaeological resources within these land features, loss of these land features from erosion or slumping could adversely interact with these resources. Mitigation of known or discovered archaeological or palaeontological resource sites would need to be considered to protect these resources from undue erosion or damage from their newfound exposure to the elements. If the ground conditions are relatively stable within the previous flooded areas, it would be important to take measures to protect any archaeological resources in this area, including a comprehensive archaeological assessment of newly exposed areas that may be subject development after the lowering of the headpond.

Initially, as discussed in the draft CER Report (September 2015), a slow drawdown scenario (over 1-3 years) was envisioned as this presented the most conservative scenario from a cost and timeline perspective. However, the MAES and preliminary engineering design have since determined that an accelerated (quick) drawdown in two stages in the spring and fall of the same year is preferred, and this scenario was used for the advancement of engineering design and planning for Option 3. It is recommended that the implications of this drawdown scenario on heritage resources be considered and that NB Power investigate implementing measures where known heritage resources within the area of review will be adversely affected by the drawdown activities. In eroding or slumping land features, it is recommended that an archaeological survey be conducted and mitigation be considered to address potential adverse interactions to any heritage resources present in eroding or slumping land features. Consideration will need to be given to the potential for erosion, and whether the recommended mitigation could be implemented after the first stage of the drawdown is complete.

Prior to construction of the Station, there were some cemeteries that had markers and gravestones relocated, but the remains of bodies were generally not exhumed. A burial ground is also associated with the now-flooded Meductic site, which contains burials of Aboriginal persons who lived at this site through the 17<sup>th</sup> Century. In addition, there are likely small family burial plots that remained in the flood zone that were associated with homes that were dismantled prior to the construction of the dam.

Given the importance of the Saint John River for habitation, travel, food, resources and all aspects of life for Aboriginal peoples for over 11,000 years, there are likely undocumented Pre-Contact archaeological resources along the shorelines, the islands, and other land features that will be exposed following the dewatering of the headpond under Option 3. Built heritage features (e.g., former cellars and foundations) will also be exposed after dewatering; however, there is no specific mitigation recommended as many of these structures are already documented.

Where modelling to predict the volume and migration of sediments is available, areas where there could be Pre-Contact heritage resources (and where there is also erosion) can be identified. These areas can then be surveyed for heritage resources following dewatering and their condition be evaluated to determine needed mitigation, if any.

During decommissioning, the geographic extent for a potential change in heritage resources will be the entire headpond. The duration could be long-term, depending on how long it takes for the freshly exposed land features and shorelines to stabilize or until mitigation is implemented for archaeological resources. The potential interactions with heritage resources are expected to continue because erosion of some archaeological sites may occur after water levels are lowered. Should any archaeological

resources be adversely affected as a result of erosion or activities undertaken to prevent erosion, the interaction would be adverse and permanent.

### 15.5 SUMMARY OF INTERACTIONS BETWEEN HERITAGE RESOURCES AND THE OPTIONS

Table 15.4 summarizes the interactions of heritage resources with the Options.

**Table 15.4 Summary of Interactions between Heritage Resources and the Options**

Key issue	Is the interaction negative or positive?	What is the amount of change?	What is the geographic extent?	How long does it last?	How often does it occur?	Has additional mitigation been recommended?
<b>Potential Change in Heritage Resources</b>						
Option 1 (construction and operation)	Negative	Low	Site/Headpond	Short/Long	Single/Continuous	Yes/No
Option 2 (construction and operation)	Negative	Low	Site/Headpond	Short/Long	Single/Continuous	Yes/No
Option 3 (decommissioning)	Negative	High	Headpond	Long	Single	Yes
<b>KEY</b> <b>Is the interaction negative or positive?</b> <ul style="list-style-type: none"> <li>Positive.</li> <li>Negative.</li> </ul> <b>What is the amount of change?</b> <ul style="list-style-type: none"> <li>Low – a change that remains near existing conditions, or occurs within the natural variability for heritage resources.</li> <li>Medium – a change that occurs outside the natural variability for heritage resources but does not change the overall status of heritage resources.</li> <li>High – a change that occurs outside the natural range of change for heritage resources that will change the status of heritage resources locally or regionally.</li> </ul> <b>What is the geographic extent?</b> <ul style="list-style-type: none"> <li>Site – the interaction is limited to the immediate area where Project-related activities occur.</li> <li>Area – the interaction is limited to the general area surrounding the Station.</li> <li>Region – the interaction occurs throughout the area of review and may extend to other regions.</li> <li>Province – the interaction affects the entire province.</li> </ul>				<b>How long does it last?</b> <ul style="list-style-type: none"> <li>Short – the interaction occurs for less than 3 months.</li> <li>Medium – the interaction occurs for 3 months – 1 year.</li> <li>Long – greater than a year.</li> <li>Permanent – There is no foreseeable end-date for the interaction.</li> </ul> <b>How often does it occur?</b> <ul style="list-style-type: none"> <li>Single – the interaction occurs once.</li> <li>Multiple – the interaction occurs several times, either sporadically or at regular intervals.</li> <li>Continuous – the interaction occurs continuously.</li> </ul> <b>Has additional mitigation been recommended?</b> <ul style="list-style-type: none"> <li>Yes.</li> <li>No.</li> </ul>		

#### 15.5.1 Summary of Additional Potential Mitigation and Information Requirements

As described in Section 15.4, this review has identified the requirement for some additional potential mitigation and requirements for further study in some areas. These potential requirements are summarized in Table 15.5.

**Table 15.5 Summary of Additional Potential Mitigation and Information Requirements**

Option	Additional Potential Mitigation	Additional Information Requirements
Option 1 or Option 2	<p><u>Construction</u></p> <ul style="list-style-type: none"> <li>• Prior to construction, complete a heritage impact assessment (HIA) for areas subject to ground-breaking activities, according to the Guidelines (Archaeological Services 2012) requirements.</li> <li>• Afford the New Brunswick Museum the opportunity to collect palaeontological resources if fossils are discovered during construction.</li> </ul> <p><u>Operation</u></p> <ul style="list-style-type: none"> <li>• If heritage resources are eroding out of the current shoreline along the headpond, design erosion and sediment control stabilization measures specifically at those locations.</li> <li>• If erosion and stabilization measures are not feasible, perform archaeological excavation or other mitigation in consultation with provincial archaeological regulator.</li> </ul>	<ul style="list-style-type: none"> <li>• Obtain final palaeo-shoreline layer from provincial regulator prior to construction and make recommendations for archaeological survey based on locations of palaeo-shorelines.</li> <li>• Heritage Impact Assessment per the Guidelines (Archaeological Services 2012).</li> </ul>
Option 3	<ul style="list-style-type: none"> <li>• Identify areas of concentrated erosion and areas very susceptible to erosion under the headpond prior to lowering water levels to recommend archaeological survey of those areas.</li> <li>• Planting vegetation and stabilize exposed soils and/or exposed river banks to limit further erosion of archaeological sites.</li> <li>• Implement slope stability measures as outlined in Section 6.0, Surface Water.</li> </ul>	<ul style="list-style-type: none"> <li>• Obtain modelling data to confirm areas that are currently eroding in headpond since the installation of the Mactaquac dam.</li> </ul>

### 15.5.1 Discussion

Based on the presence of known heritage resources and the very high likelihood for unknown heritage resources that might be present in the current headpond, all Options have the potential to adversely interact with heritage resources. Heritage resources are considered to be non-renewable resources, and archaeological or palaeontological resources cannot be returned to their original state once they have been disturbed or destroyed.

Under Option 1 or Option 2, it is possible that maintaining the current water levels may expose or damage any archaeological sites located on land features that may be eroding along headpond shorelines or submerged under the headpond. With the continuation of the water levels at the current operating levels within the headpond, it may not be feasible to examine submerged land features for archaeological resources that were flooded as a result of the raising water levels.

Option 3 may result in the greatest change to heritage resources because all heritage resource types, particularly Pre-Contact artifacts and sites, will be exposed after water levels are lowered, subjecting some sites to continued or accelerated erosion. Mitigation for Option 3 may be extensive if it is determined that large areas under or near the current headpond have eroded or are at risk of eroding.

Option 3 may require additional studies because the nature of the headpond after the water level is lowered is not known. This area may be considered unsafe for implementing archaeological survey or monitoring during erosion and sediment control measures.

### **15.5.2 Assumptions and Limitations**

It is not anticipated that a field assessment will be conducted until the Preferred Option is selected. All Options will require a palaeo-shoreline layer from the provincial regulator, Archaeological Services, which will help determine mitigation for each Option. Prior to physical disturbance of any Option selected, a heritage impact assessment will be required to determine if any heritage resources are present and to plan for appropriate mitigation to be put in place to minimize adverse interactions with such resources.