

13.0 INFRASTRUCTURE AND SERVICES

13.1 SCOPE OF THE REVIEW

The scope of the Comparative Environmental Review (CER) for potential interactions between the Project Options and infrastructure and services includes:

- change in infrastructure and/or access, including physical structures such as water intakes and wells, regulated sewage and industrial outfalls, and electrical infrastructure;
- change in public services including emergency and health services, schools, and training institutions; and
- change in housing and/or accommodations, including the availability of temporary and permanent accommodations.

13.1.1 Why Infrastructure and Services is a Valued Component

Infrastructure and services refers to public infrastructure and services provided to local populations through public and government funding and programs, and infrastructure in place to meet societal needs. Infrastructure and services examined include: emergency response (e.g., fire, medical, and police and emergency services), ongoing support (e.g., health and social services), public infrastructure (e.g., water distribution systems, schools and training institutions), and housing and accommodations. Infrastructure and services was selected as a VC because the Options could affect the ability of surrounding communities to deliver them at current levels.

All Options will require non-local construction workers, to some extent. This has the potential to place additional demands on infrastructure and services locally.

Option 3, if selected, could produce water level changes which could expose such physical structures, such as water intake structures or municipal culverts. Sediment moving downstream during a drawdown could block or inhibit the function of existing infrastructure (e.g., sewage outfalls and water intakes), and potential for increased risk of ice jam flooding might cause damage to downstream infrastructure.

Change in access to transportation infrastructure, specifically the interruption or removal of a major transportation link at the Station (Routes 102 and 105), could be experienced under all Options. Transportation infrastructure is discussed in Section 14 (Transportation) and is not discussed further in this Section.

13.1.2 Regulations and Policies Relevant to Infrastructure and Services

Municipalities in New Brunswick are governed by an elected local government, including a mayor and council. Each municipality has departments that administer services to the community, including waste, water, sewer, roads and engineering and planning services. Unincorporated communities are included in a number of Local Service Districts (LSDs).

Twelve Regional Service Commissions (RSC) are governed by boards of directors made up of mayors and local service district representatives. The RSCs provide the incorporated and unincorporated areas within their boundaries with services such as: regional planning; planning within LSDs; solid waste management; regional policing collaboration; regional emergency measures planning; regional sport, recreational and cultural infrastructure planning; and cost-sharing. The area under review falls under two RSCs: RSC 11 (York County) and RSC 12 (Carleton County).

Each RSC also serves as the planning district. It provides building inspection, development and planning services to unincorporated areas of New Brunswick within their jurisdiction. Communities in York County are under the jurisdiction of RSC 11. Communities in Carleton County are under the jurisdiction of RSC 12.

13.1.3 Area of Review

The area of review is largely focused to the area between the town of Woodstock and the city of Fredericton at the Princess Margaret Bridge, within a lateral 500-m buffer on both sides of the river and headpond (Figure 13.1). However, the area of review was also extended further downstream of Fredericton to just downstream of the village of Gagetown solely for infrastructure considerations (excluding public services or housing and accommodations) to include consideration of infrastructure in that area (including the new TransCanada Highway bridge as well as intakes and outfalls in the Village of Gagetown), so as to consider potential interactions associated with potential ice jams and/or sediment deposition.

This area of review was selected as it includes the area of physical disturbance associated with the Options as well as potential influences beyond the area of physical disturbance to nearby upstream and downstream communities.

13.1.4 Key Issues

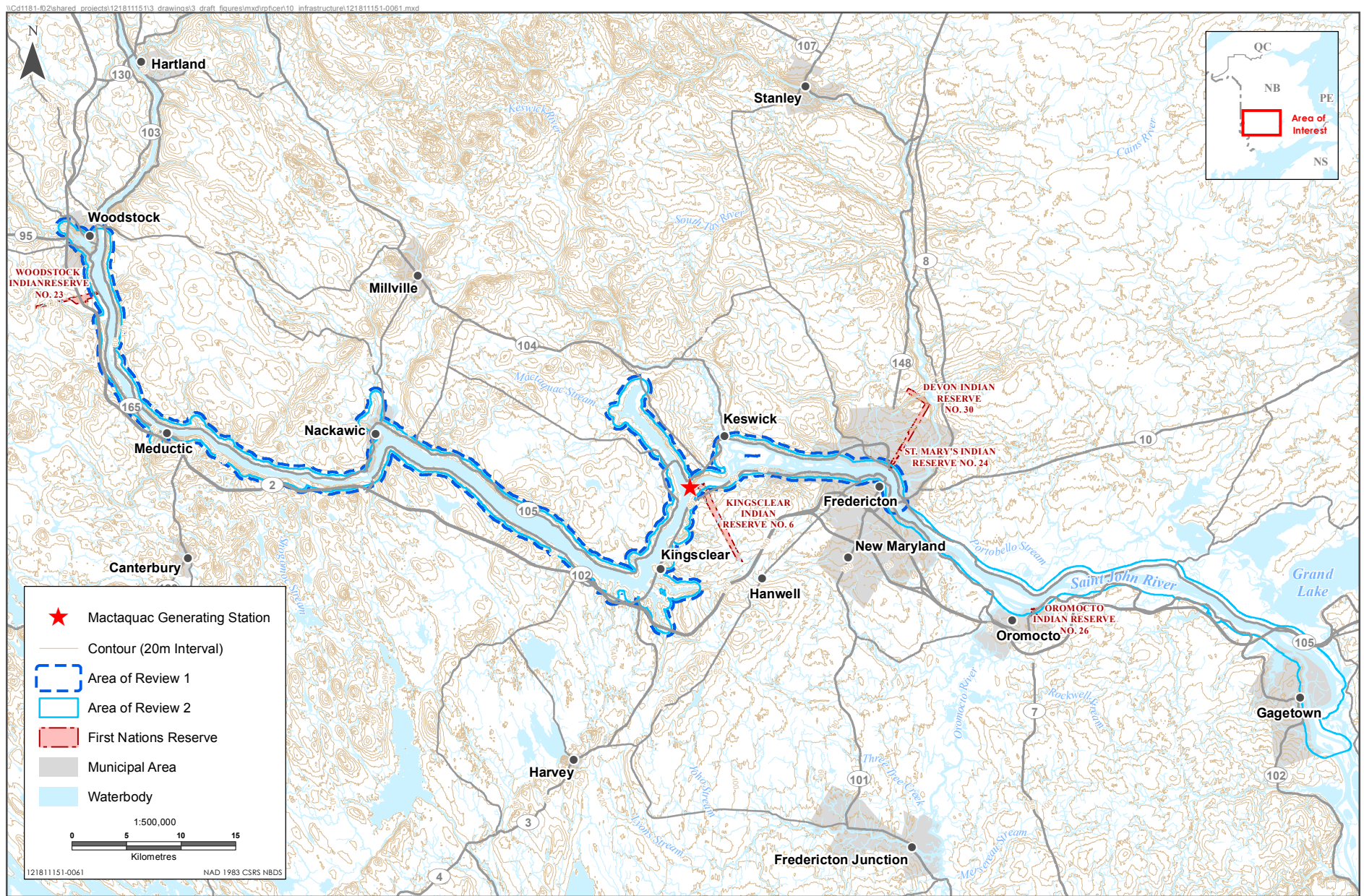
All Options will cause a change in access that has the potential to interact with infrastructure and services.

In addition, all Options will require labour to carry out Project-related activities, and an influx of workers to the area could place additional demands on local public services (e.g., hospital and schools), and housing and accommodations (particularly temporary accommodations).

The key issues of concern for infrastructure and services are listed in Table 13.1.

Table 13.1 Description of Key Issues for Infrastructure and Services

Key Issues	Description
Potential change in infrastructure and/or access	<ul style="list-style-type: none"> Water level changes associated with construction, or dewatering may affect existing water users.
Potential change in public services	<ul style="list-style-type: none"> Construction activities may affect public services (particularly emergency services) due to temporary delays in traffic movements or potential longer travel routes. The influx of workers may stress existing public services locally (e.g., healthcare, emergency services, education).
Potential change in housing and/or accommodations	<ul style="list-style-type: none"> The influx of workers may stress the availability of existing services related to permanent housing and/or temporary accommodations locally.



Drawdown of the headpond under Option 3 could produce a change in existing uses of the Saint John River and headpond. For example, physical structures including water intakes and regulated sewage and industrial outfalls located on the Saint John River and headpond, as well as municipal drainage infrastructure such as culverts, could be exposed or be affected by sediment deposition. In addition, the dam and Station currently have a moderating effect on ice flow and associated floods downstream of the Station, and removal of the dam and Station under Option 3 would remove this physical barrier to ice flow, potentially resulting in an increase in the number and severity of ice jam-related floods and associated damage to downstream infrastructure (e.g., bridges and piers). Exposed shorelines, previously submerged as part of the headpond, may be susceptible to erosion.

13.2 EXISTING CONDITIONS

13.2.1 Sources of Information

Sources of information used to prepare this report included:

- GIS databases;
- published maps and aerial photography;
- data from Statistics Canada;
- information from the Canadian Mortgage and Housing Corporation;
- various departments of the Government of New Brunswick;
- municipal governments, and local and regional authorities and associations;
- public and stakeholder engagement, including local business and enterprise groups, and local heritage groups;
- informal directed interviews with stakeholders and individuals; and
- experience and judgment of the study team.

Bridges and piers on the Saint John River were identified by reviewing a list of bridges prepared by the New Brunswick Department of Transportation and Infrastructure (NBDOT 2006), and current (2014) aerial photographs.

13.2.2 Description of Existing Conditions

13.2.2.1 Infrastructure and Services

All Options will interact with infrastructure adjacent to the Saint John River and headpond. Potentially affected infrastructure includes intakes, outfalls, municipal water supply and drainage, instream culverts, water wells, public boat launches/commercial docks and marinas, and bridges and piers. Interactions with infrastructure related to water and sewage along the banks of the river and headpond include erosion, sedimentation, and ice jams and related flood events. Studies have been completed

identifying regulated intakes and outfalls, and culverts in the area of review, which include preliminary design information on potential modifications to these structures under Option 3.

The Saint John River and headpond have been a valued water resource for many years. Many municipalities bordering the river and headpond, including the town of Oromocto, city of Fredericton, town of Nackawic, Kingsclear and Woodstock First Nations, and town of Woodstock provide wastewater and storm water treatment for residents. Treated wastewater is subsequently released into the Saint John River and/or headpond. In addition, water is pumped from the river/headpond for fire response or for other purposes (e.g., irrigation). Major surface water users (e.g., intakes and outfalls), and their approximate locations are identified and provided in Figures 13.2 and 13.3.

Agricultural operations do not normally require regulatory authorization to withdraw or discharge into the river. The conditions of their intakes or outfalls have not been included in this VC. The use of the Saint John River and headpond as a resource for various land uses including recreation is discussed in Section 12 (Human Occupancy and Resource Use).

Two major highways are located immediately along the river in the area of review: Route 105 on the north side of the river, and Route 102 on the south side. In-river infrastructure includes the Woodstock-Grafton Bridge, Hawkshaw Bridge, Mactaquac Dam, Westmorland Street Bridge, Bill Thorpe Walking Bridge, Princess Margaret Bridge, Burton Bridge, and TransCanada Highway Bridge at Coytown. Several small bridges, culverts and causeways cross tributaries to the Saint John River. Several recreational piers and wharfs, marinas and public recreational access points are located along the banks of the river and headpond (Figure 13.4).

13.2.2.2 Public Services

The following health infrastructure and security and safety services will serve the Project and its employees and their families.

13.2.2.2.1 Community Health

Health Care Facilities and Emergency Services

Health care facilities in New Brunswick are managed by two Regional Health Authorities: Horizon Health Network and Vitalité Health Network. They are responsible for delivering services in hospitals and community health centres, and providing extra mural programs, addictions, mental health, and most public health services. All health care facilities in the area of review are under the jurisdiction of the Horizon Health Network. It operates more than 100 medical facilities and employs approximately 12,400 staff, including 1,000 physicians.

In 2011, the population of New Brunswick was approximately 755,000; approximately half of that number included persons over the age of 45. When combined with a declining birth rates and high out-migration of youth, New Brunswick will experience a substantial demographic shift, and the proportion of people over 65 is expected to increase over the next 25 years (GNB 2013b). Higher numbers of seniors in the Province will likely result in increased demands on health care infrastructure.



York County

Health care facilities in York County serve approximately 97,238 people. They include the Dr. Everett Chalmers Regional Hospital, a 314-bed facility in Fredericton, and four health clinics that provide primary health care services and health promotion programs. One of the clinics serves the francophone population. A nurse-facilitated health clinic is located in Nackawic. It provides diagnostic and educational services to the community and surrounding areas.

The Stan Cassidy Centre for Rehabilitation in Fredericton offers in-patient and out-patient adult and paediatric rehabilitation services, and assistive technology services. The Veterans Health Unit in Fredericton, a 47-bed facility, provides long-term care for veterans.

Carleton County

Carleton County has one community hospital: the Upper River Valley Hospital. It has 45 in-patient beds and delivers a range of acute and long-term health care services to approximately 45,000 people. The hospital employs more than 800 people, including 45 physicians. It also has 115 volunteers.

Emergency Medical Services

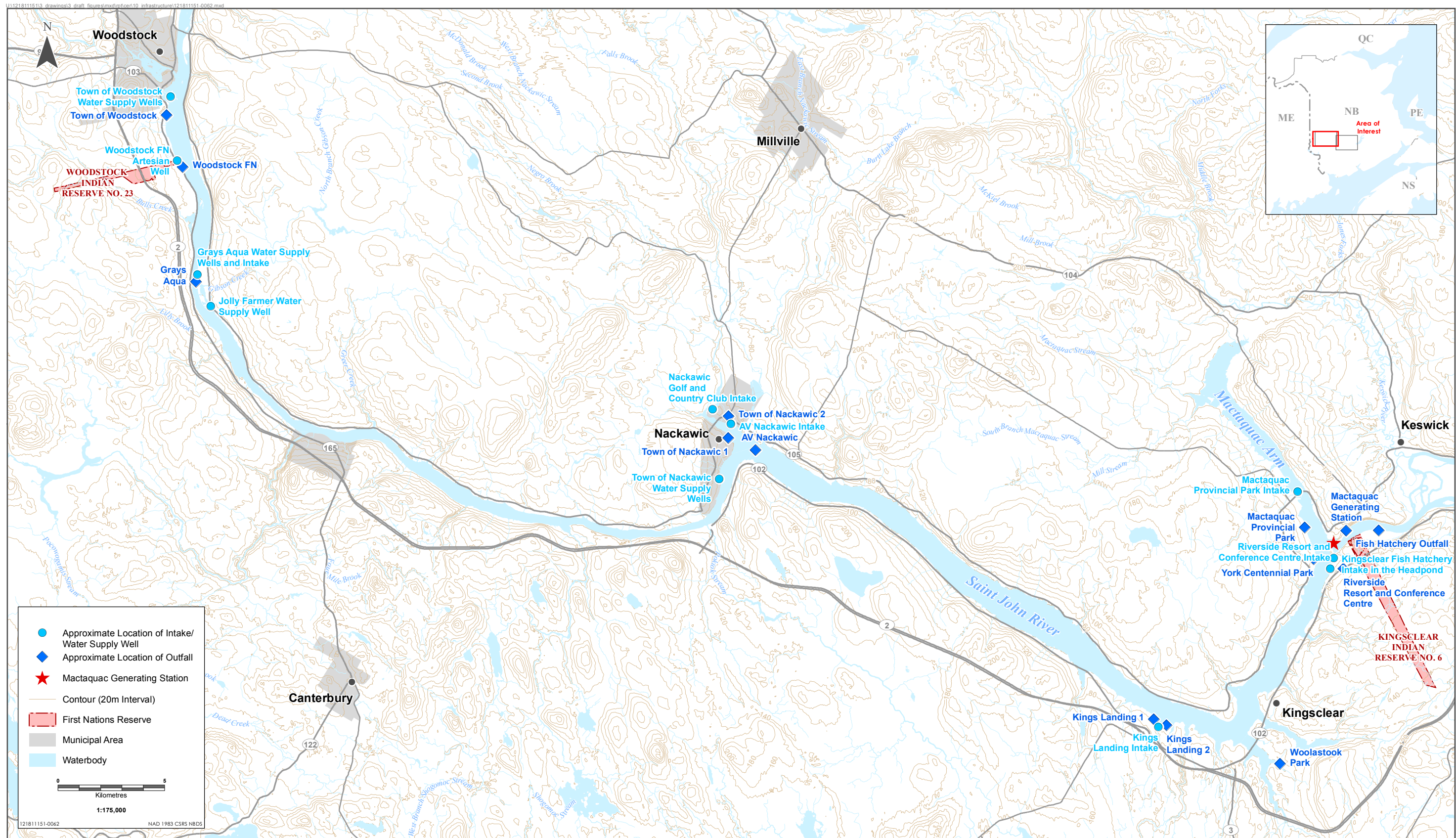
Ambulance services in the Province of New Brunswick are the responsibility of the New Brunswick Department of Health. The department has granted licensing and authority to Ambulance New Brunswick (ANB) to provide these services, employ dispatchers, paramedics and other clinical personnel, and to contract ambulance procurement and air ambulance services. ANB serves a population of approximately 753,900 individuals with a fleet of 134 ambulances, four clinical support units, and two fleet vehicles. The organization operates out of 67 stations, 13 posts and two fleet centres and employs approximately 1,000 people, including primary care paramedics, emergency medical dispatchers, and critical care flight nurses (ANB 2014).

In 2013/14, ANB responded to 96,492 calls including 911 emergency calls and calls for patient transfers between hospitals. ANB is also responsible for delivering air ambulance services and operates a dedicated fixed-wing aircraft which is provided by Voyaguer Airways Ltd. (ANB 2014). In 2013/14, the air ambulance services made 499 patient transfers (ANB 2014).

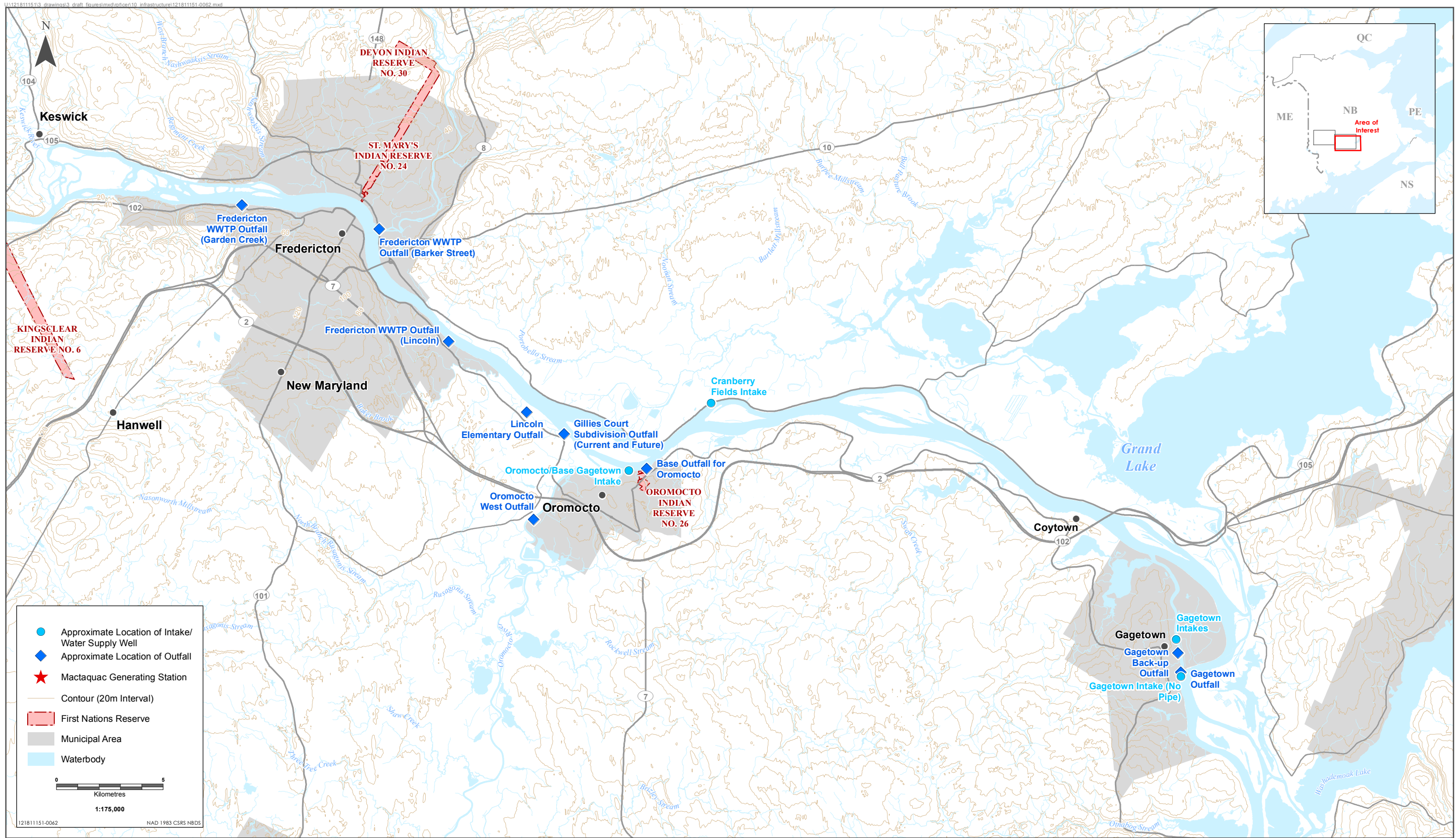
Public Health

The area of review is served by two public health programs, based in Fredericton and Woodstock. These programs promote health in the areas of communicable disease prevention, management and control; maternal, childhood and youth health; immunization; epidemiology and emergency preparedness/response (Horizon Health Network 2015).

Six addictions and mental health services operate within the area of review within York County. Addiction Services has a 10-bed in-patient facility, and provides out-patient care in assessment and crisis intervention, and children, youth, adult, seniors and community care.



Approximate Location of Outfalls and Intakes along the Saint John River from Woodstock to the Mactaquac Generating Station

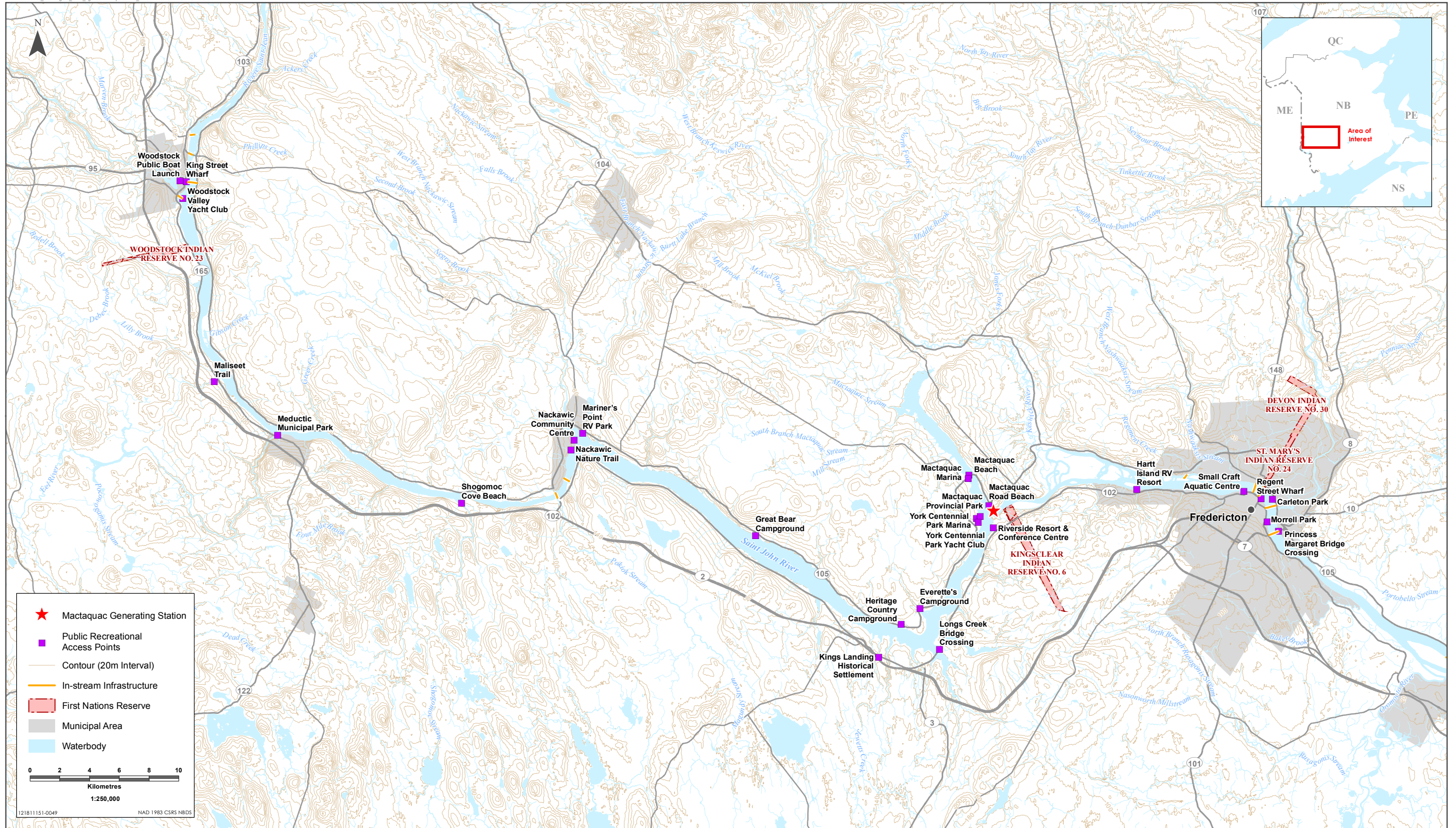


Base Data: Contours, First Nations Reserve and Roads are from SNB and Waterbodies and Watercourses data from NB DNR. All data downloaded from GeoNB.
Project Data: Intakes and Outfalls from NATECH and Stantec.

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



Approximate Location of Outfalls and Intakes along the Saint John River from the Mactaquac Generating Station to Coytown



Base Data: Contours, First Nations Reserve and Roads are from SNB and Waterbodies and Watercourses data from NB DNR. All data downloaded from GeoNB.
Project Data: Digitized from New Brunswick Conservation Council - <http://www.conservationcouncil.ca/our-programs/freshwater-protection/saint-john-river-mapping/>

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

Fredericton operates a Mental Health Services program to promote mental health. It provides services in prevention, assessment, treatment, rehabilitation, crisis intervention, and support. An operational stress injury clinic in Fredericton provides more targeted mental health services to clients who deal with work-related psychological stress and trauma. Two mobile crisis teams, stationed in Fredericton (serving Central New Brunswick) and Perth-Andover (serving the Upper Saint John River Valley, including Woodstock and surrounding areas), provide after-hours services to individuals who experience a mental health crisis that requires assessment and intervention (Horizon Health Network 2015).

Two public health programs, based in Fredericton and Woodstock, promote communicable disease prevention, management and control; maternal, childhood and youth health; immunization; epidemiology; and emergency preparedness/response (Horizon Health Network 2015).

Extra-Mural Programs

The Woodstock Unit Extra Mural Program and Fredericton Extra Mural Program Service Delivery Unit provide acute care, palliative care, chronic care, long-term care, rehabilitation, and home oxygen therapy. These services are provided in the home, at nursing homes, in schools, and in the community. They allow patients to maintain or restore their health in their daily environment or to remain at home during a terminal illness (Horizon Health Network 2015).

13.2.2.2.2 Fire Protection

York County

York County is served by seven separate fire departments.

The Fredericton Fire Department provides emergency response services including fire suppression, first aid, water and rescue, ice/water rescue, hazmat and motor vehicle extrication to Fredericton and surrounding local service districts. The fire department responds from four strategically located stations within the city and has 12 trucks (one rescue truck, three pumper trucks, two ladder trucks, three tanker trucks, one pumper/ladder truck, one pumper/tanker truck and one aerial truck) and two sets of hazmat equipment (City of Fredericton n.d.).



The Upper Kingsclear Fire Department provides emergency fire services on the south side of the Saint John River from Island View to Yoho Lake in the south and Lake George in the west (including the communities of Central Kingsclear, Island View and Longs Creek). The department also serves a section of the Hanwell Rural Community, which was previously serviced by the Fredericton Fire Department (Upper Kingsclear Fire Department n.d.), and now has a fire truck stationed in Hanwell.

The North York Fire Department (previously Keswick Valley prior to a merger with the Millville department) and Keswick Ridge Fire Department serve communities on the north side of the Saint John River. The service area of the Keswick Ridge Fire Department also includes the communities of

Mactaquac, Jewetts Mills, French Village, and Queensbury Parish.

The Nackawic Volunteer Fire Department serves the town Nackawic and the surrounding area, including the rural community of Pokiok (Town of Nackawic 2009).

The Canterbury Fire Department (which serves Canterbury and Canterbury Village) and the Dumfries Fire Department also provide services to communities in the area of review. They are both operated by volunteers (NBAFC n.d.).

Carleton County

The Woodstock Fire Department provides fire response, rescue and medical emergency services; fire prevention education; and bylaw enforcement to the Town of Woodstock and surrounding areas. The department operates out of two fire stations. Both stations are equipped with two aerial trucks, three pumper trucks, a rescue truck and a Superdux rescue boat, and heavy hydraulic machinery that is used in responding to motor vehicle accidents (Town of Woodstock 2014).

13.2.2.2.3 Policing

The Royal Canadian Mounted Police (RCMP), Fredericton Police Department, and Woodstock Police Department manage policing services in the area of review.

The New Brunswick RCMP Headquarters is located in Fredericton. Three RCMP detachments are located in Oromocto, Nackawic and Woodstock, and one satellite office is located in Keswick (RCMP 2013). In 2013, the RCMP employed 1,344 police officers in New Brunswick, a 1.3% decrease from 2012 (RCMP 2013).

The Fredericton Police Department serves approximately 56,223 people in five zones. It is made up of 110 police officers and 17 police civilian members. In 2013, the department responded to 21,814 calls for service, a decrease of 7% from the previous year (City of Fredericton 2013).

The Woodstock Police Department serves approximately 5,254 people in the Town of Woodstock. It has 15 police officers, six auxiliary officers, and three administrative support staff (Town of Woodstock 2010).

13.2.2.2.4 Search and Rescue

York County

York Sunbury Search and Rescue (YSSR) is responsible to assist police with search and rescue activities. The team has more than 100 volunteers and provides services to York, Sunbury, Queens and Northumberland counties. In 2014, the YSSR responded to eight calls, which included assisting with evidence searches and searches for missing persons (YSSR 2013).

Carleton County

Carleton Ground Search and Rescue assists local police over an area of approximately 733,000 ha from the Canada–U.S. border near Perth-Andover to Plaster Rock, to Nackawic in the south and Forest City in the west (CGSR n.d.).

In 2013, 518 new dwellings were constructed. They included single units, two-unit dwellings, basement apartments, apartment units, and townhouses. Several new developments for single family houses, and apartment units were registered with the City of Fredericton. Most of these new developments were located on the north side of the city, where developable land is more plentiful than on the south side. The City of Fredericton issued 1,151 building permits in 2014 (Madore, J., pers. comm., 2015).

Between 2013 and 2014, single-detached housing starts in Fredericton decreased by 19.1% (CMHC 2015). The average house price was \$265,334 in the fourth quarter of 2013, but dropped by 6% to \$249,808 in the fourth quarter of 2014.

In 2014, local developers slowed the pace of construction in the rental market, most likely in response to an excess in inventory. Between 2009 and 2013, apartment starts averaged nearly 250 units annually, and more than 200 completed units (on average) were added to the local rental market each year. Over the previous two decades, annual apartment starts averaged 145 units; completions averaged 144 units. In addition, at the end of 2013, 209 additional units remained under construction. Excess inventory in the local rental market resulted in a historically high vacancy rate of 5.8% in the fall of 2014. During the previous 5-year period, the vacancy rate averaged 3.1%. By 2016, reduced rental market construction is expected to push the local vacancy rate to 6% (CMHC 2014).

Nackawic

In 2011, Nackawic had 430 occupied private dwellings; 78% were single-detached houses. The average house price in 2011 was \$131,198; the average monthly rent was \$586 (Statistics Canada 2013d).

Carleton County

Carleton County (excluding Woodstock, discussed separately below) had 8,595 occupied private dwellings in 2011; 81% were single-detached homes. The average house price in 2011 was \$120,071; the average monthly rent was \$576 (Statistics Canada 2013d).

In 2011, RPDC issued 144 construction permits in Carleton County. In 2010–11, there were plans to develop 85 subdivisions; the largest had four lots (Euteneier, T., pers. comm., 2011).

Woodstock

In 2011, Woodstock had 2,300 occupied dwellings; 61% were single-detached houses. The average house price in 2011 was \$148,782; the average monthly rent was \$606 (Statistics Canada 2012c; 2013d).

Between 2009 and 2010, the number of building permits issued in Woodstock decreased by 18%, and the number of new subdivisions developed declined by 16% (Rural Planning District Commission 2010). In 2010–11, RPDC received plans to develop seven lots in Woodstock Parish; it issued 46 building permits in 2011 (Euteneier, T., pers. comm., 2011).

13.2.2.4 Temporary Accommodations

Temporary accommodations are short-term, temporary or transient accommodations, such as a hotels, motels, bed-and-breakfasts, or boarding houses.

New Brunswick's Department of Tourism, Heritage and Culture collects tourism/accommodation data for the Saint John River valley region, which includes the area between Woodstock and Fredericton. In 2014, the occupancy rate for temporary accommodations in this region was 50%, up 1% from the previous year (New Brunswick Department of Tourism, Heritage and Culture 2015a).

As of 2015, Fredericton had 31 hotels, motels, resorts, bed-and-breakfasts, inns and tourist homes. There were also four campgrounds in the Fredericton area. Nackawic had an inn, a motel and a campground; Woodstock had eight bed and breakfasts, inns, hotels, motels, cottages, and three campgrounds (New Brunswick Department of Tourism, Heritage and Culture 2015b). There is one hotel in Mactaquac, the Riverside Resort and Conference Centre, which has 85 rooms.

The occupancy rate for temporary accommodations in the Fredericton area was 57% in 2011; it dropped to 55% in 2014. The occupancy rate in the area between Woodstock and Fredericton remained at 42% between 2011 and 2014 (New Brunswick Department of Tourism, Heritage and Culture 2012, 2015b).

13.2.2.5 Potential for Flooding

Historical incidences of ice jam-related flooding were discussed in Section 6 to provide an understanding of risks of such floods occurring if Option 3 were selected.

In addition, flood risk and historical flood mapping (NBDELG 2011) and property attribute information (SNB 2014) were reviewed to identify infrastructure potentially at risk from flooding. The flood risk and historical flood mapping show flood lines based on predictive modelling (e.g., 1:100 year or 1:20 year flood lines) or maximum flood levels during previous flood events in Fredericton (e.g., in 1973 and 2008). Properties with infrastructure at or below the 1:20 year, 1:100 year, Year 1973 or Year 2008 flood lines were considered to be low lying and at potential risk of flooding. Property attribute data were used to distinguish between properties built before and after 1968 (*i.e.*, the year the Station was commissioned). In total, 466 properties between the Station and Princess Margaret Bridge in Fredericton were identified as having buildings or other infrastructure in the previously identified flood risk areas (Table 13.2).

Table 13.2 Properties with Infrastructure in Flood Risk Areas

Property Category	Number of Properties			
	Buildings Constructed in/after 1968	Buildings Constructed before 1968	Unknown Age of Buildings	Total
Residential	161	215	16	392
Commercial	18	21	5	44
Institutional	4	6	1	11
Recreational	2	3	–	5
Industrial (e.g., water treatment, sewage treatment)	7	1	5	13
Farm (Mactaquac fish hatchery)	–	1	–	1
Total	192	247	27	466

Most properties with infrastructure at risk of flooding are residential (84%); 41% of those were constructed after 1968. It is not known if any of these buildings or infrastructure were constructed with consideration of potential flooding events, or to what extent.

Other infrastructure potentially at risk of flooding include several commercial or institutional buildings (e.g., retail, office), water supply wells for the Kingsclear First Nation (reportedly casings have been raised to mitigate flooding), the Mactaquac fish hatchery, a sewage treatment plant, and two water treatment plants. Of the 74 non-residential properties identified as having infrastructure potentially at risk of flooding, 42% have buildings constructed after 1968.

13.3 SUMMARY OF STANDARD MITIGATION FOR INFRASTRUCTURE AND SERVICES

Standard mitigation and practices relevant to infrastructure and services will be implemented for each Option if selected. These measures are based on normal operating procedures and regulatory requirements and are discussed in Section 2.6, which may mitigate interactions with infrastructure and services. Some examples are below.

- Various environmental protection and management measures will be used to guide Project planning, design, construction and operation, regardless of the Option selected. They include, but are not limited to and Environmental Protection Plan, and Environmental Management Plan and Emergency Response Plan.
- A public, stakeholder and Aboriginal engagement program will be implemented to identify and address Project concerns.
- Erosion and sediment controls will be implemented throughout the duration of construction activities completed to protect infrastructure.

Various government departments and private sector organizations are responsible for managing and providing Infrastructure and services. NB Power will consult regularly with these agencies and organizations. It will provide them with Project information, will identify and address potential Project-related implications for local services and infrastructure, and will support these organizations in planning for, adapting to, or benefitting from, any changing demand.

13.4 POTENTIAL INTERACTIONS BETWEEN INFRASTRUCTURE AND SERVICES AND THE OPTIONS

Table 13.3 provides an overview of how the Options might interact with infrastructure and services.

Table 13.3 Potential Interactions between Infrastructure and Services and the Options

Phase	Option 1			Option 2			Option 3		
	Potential Change in Infrastructure and/or Access	Potential Change in Public Services	Potential Change in Housing and/or Accommodation	Potential Change in Infrastructure and/or Access	Potential Change in Public Services	Potential Change in Housing and/or Accommodation	Potential Change in Infrastructure and/or Access	Potential Change in Public Services	Potential Change in Housing and/or Accommodation
Construction (New facilities, Option 1 or Option 2)	✓	✓	✓	✓	✓	✓			
Demolition (Existing structures, Option 1 or Option 2)	✓	✓	✓	✓	✓	✓			
Operation (Option 1 or Option 2)	NI	NI	NI	NI	NI	NI			
Decommissioning (Option 3)							✓	✓	✓
Notes: ✓ = Potential interactions. NI = No interaction. Shaded cells are not applicable to the particular option and phase.									

Option 1 or Option 2 is anticipated to require temporary workers to meet the Project employment requirements. If not available locally, an influx of these workers to the area could lead to an increased demand on public services to varying degrees.

Under the operation of Option 1 or Option 2, the maximum water level and minimum drawdown level will be maintained at roughly the same levels as with the operation of the existing Station. Consequently, no interactions with infrastructure and services are expected during operation of either Option 1 or 2.

Once construction and demolition activities are completed, workers will likely relocate elsewhere. Any additional demand placed on community services and housing will have been managed through careful planning during construction and demolition. Consequently, no unmanageable increase in demand is anticipated during operation of Option 1 or Option 2.

13.4.1 Potential Change in Infrastructure and/or Access

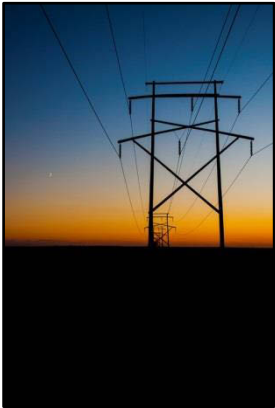
13.4.1.1 Option 1 or 2

Option 1 or Option 2 will result in considerable changes to infrastructure and/or access related to local transportation near Mactaquac, thereby potentially affecting road access and travel times by residents and commuters. That issue is discussed in Section 14 (Transportation). Under all Options, effective public communication about scheduled activities and work plans will help reduce disruptions in traffic flow as a result of changes in access, unnecessary delays and increased wait times. Highway signage about construction, demolition or decommissioning activities will be posted near the Station to notify

motorists about changes in transportation (e.g., construction zones, temporary or new alignments, access point changes).

Under Option 1 or Option 2, water levels during construction and operation will be largely similar to those at the existing Station: the maximum water level will remain at approximately 40 m. Therefore, levels of the Saint John River downstream of the Station are expected to be relatively similar to current levels, although variations in the daily or seasonal discharge may change because newer and more efficient equipment would be used. As a result of the stability in existing water levels, neither Option 1 nor 2 is expected to interact substantially with infrastructure in the area including upstream and downstream bridges, structures, intakes, outfalls, or other infrastructure. Exclusion zones for boaters will remain as a safety measure.

Option 1 or Option 2 may require the movement of one or more transmission line towers on the south bank of the Saint John River at Mactaquac, to make way for temporary facilities associated with construction of those options. If needed, NB Power will relocate the affected towers as required to meet the needs of the selected Option. This is a routine activity by NB Power and will be carried out safely without affecting local infrastructure and/or access to electricity by local residents.



13.4.1.2 Option 3

13.4.1.2.1 Water Levels and Water Quality

Under Option 3, the headpond will be dewatered. As a result, the channel upstream of the Station will narrow and faster flowing, similar to what may have existed under pre-dam conditions. Drawdown of the headpond will expose previously submerged slopes down to the riverbank, some of which may be susceptible to erosion or slumping without mitigation. Submerged infrastructure (e.g., intakes and outfalls) could also be exposed, affecting mixing, and released sediment could deposit near intakes and outfalls immediately following drawdown, causing temporary operational concerns. Interactions with respect to change in water quality and change in landscape are discussed in Section 6 (Surface Water) and Section 12 (Human Occupancy and Resource Use), respectively.

Reduction in water levels could strand outfalls used for discharging wastewater (i.e., water that has been used; it may contain various contaminants depending on its use). Concentrations of effluent (liquid waste or sewage that is discharged into a body of water) in the restored river may increase because less water would be available for dilution. Outfall structures may need to be upgraded to comply with effluent discharge regulations. Stranded or blocked outfall infrastructure may have to be extended into the river channel. Additionally, some users may have to install a diffuser (i.e., a section of an outfall that has relatively small holes or

Did you know?

Wastewater is simply water that has been used. It may contain various contaminants, depending on what it was previously used for.

Did you know that **wastewater treatment** is a process to purify water and improve water quality? It removes some or all of the contaminants and makes the water fit for reuse or discharge back into the environment. Treated water may be discharged as surface water to rivers or the ocean, or to groundwater beneath the land surface. Properly treating wastewater assures that acceptable water quality is maintained.

Effluent is liquid waste or sewage discharged into a body of water.

A **diffuser** is a section of an outfall with relatively small holes or ports, to assist with mixing and dilution of effluent.

ports) at the end of the discharge pipe to improve effluent mixing capabilities (NATECH 2015a). Studies have been completed identifying regulated intakes and outfalls, and culverts in the area of review. These studies include conceptual design outlining how these structures could be modified under Option 3. Further discussion of change in water quality and effluent guidelines is found in Section 6 (surface water).

Option 3 would allow the Saint John River to revert to near-natural flow conditions, similar to what may have existed prior to original construction of the Station. Water level changes in the headpond could interact with nearby groundwater wells. Wells within 300 m of the edge of the headpond, and shallow wells in particular (*i.e.*, wells less than 30 m below ground surface), are expected to be the most affected by Option 3. Due to reduced water levels under Option 3, recharge of these wells may not be sufficient for them to operate at full capacity. Mitigation could include deepening existing wells, replacing wells or providing indoor water storage tanks. Changes in groundwater quality and quantity are discussed further in Section 7 (groundwater).

Dewatering of the headpond will expose the submerged riverbanks. This could reduce slope stability (*i.e.*, the potential for a soil-covered slope to withstand movement) and cause slope failure of the banks. Slope instability can be caused by erosion (a natural process involving the removal of soil particles by water, wind or ice). Steep banks may be more likely to fail than gentle slopes. Drawdown of the headpond, especially when done rapidly, could cause bank soils to become weak and unstable, which could result in slope failure. Parts of the banks could slide onto the floodplain or into the river. Slope failure could make shoreline infrastructure (*e.g.*, buildings) vulnerable to damage.

Potential mitigation to reduce the potential of slope failure could include shaping and grading the banks to create a flatter slope, placing materials (*e.g.*, rip-rap [rock or other materials used to protect shorelines against erosion]) near the bottom of the bank to control slope movement and prevent erosion, inserting reinforcement bars, and/or installing a retaining wall to protect the banks that currently support shoreline infrastructure.

A geotechnical stability assessment (*i.e.*, an assessment of the engineering behaviour of earth-type materials, such as soils) has been completed to determine the stability of riverbanks in high risk areas. The assessment identifies areas where slope stability is questionable during drawdown and includes conceptual design to protect and stabilize these slopes. Specific mitigation measures will be applied to areas that are potentially vulnerable to slope failure. These measures will include slope stabilization methods, which will be determined on a case-by-case basis.

Volume and fate of sediments is a common problem with hydropower dams. Under Option 3, sediment that has accumulated upstream of the Station could be transported downstream during dewatering of the headpond. Deposits of sediment could block infrastructure (*e.g.*, water intakes), reducing operational reliability and efficiency. The MAES assessed sediment conditions in the headpond and completed modelling to determine the potential fate of these sediments during the dewatering. Two scenarios were initially considered for dewatering: an accelerated drawdown intended to mimic a spring freshet, and a slow drawdown intended to reduce movement of sediments downstream. The accelerated

Did you know?

Sediment is a solid material that is moved and deposited in a new location. Sediment can consist of rocks, soils, and minerals, as well as the remains of plants and animals. Sediment moves from one place to another through the process of erosion. Sediment is a key requirement for healthy and productive ecosystems (*e.g.*, agricultural land near rivers, wetlands).

drawdown is a flush of the water and sediment retained by the dam downstream, occurring over two one month stages. The slow drawdown is a gradual release of water to the river downstream occurring over a much longer period (progressively over 1-3 years). Information from the MAES and preliminary engineering design have led NB Power to prefer an accelerated drawdown in two stages within the same year (the first immediately following the spring freshet, and the second immediately following the fall recharge period). Preliminary results of the MAES indicate that an accelerated drawdown would result in a mass redistribution of sediments downstream of the Station to slower moving areas of the river downstream and to large wetland complexes (e.g., the Grand Lake Meadows), with most sediments flushed out to sea. Monitoring of sediment deposit locations is recommended especially where they coincide with the presence of infrastructure to reduce potential for damage. Although the accelerated drawdown scenario is being used for planning, further evaluation of these scenarios would be required if Option 3 is selected as the Preferred Option.

13.4.1.2.2 Flood and Ice Events

The construction of the Station and subsequent creation of the headpond has allowed a thick, extensive ice sheet to form during winter. The ice sheet is held in the lower reaches of the headpond, immediately upstream of Station, and melts in place during the spring thaw. The Station prevents the movement of large amounts of ice downstream. This prevents ice jams and associated floods from occurring downstream of the Station.

Did you know?

An **ice jam** occurs when pieces of floating ice carried by a stream's current gather at a point where flow is interrupted (e.g., bridge crossings). Ice jams occur most often during the spring as a result of increases in temperature.

An **ice jam flood** is a rapid breakup and accumulation of river ice that results in flooding. As the water level rises, the added input to the river system exerts pressure on the ice cover, forcing it to break up. As the ice moves with the current, it lodges at shallow reaches (e.g., islands) and at instream infrastructure (e.g., bridges and piers).

Option 3 would allow the movement of ice, potentially putting infrastructure downstream of the Station at risk for damage. As discussed in Section 6 (surface water), historically pre-dam floods caused by ice jams have been recorded at multiple locations on the Saint John River. They resulted in extensive damage to in-stream infrastructure.

The most notable change in ice jam events will likely occur at Fredericton, which is approximately 19 km downstream of the Station. River features in the Fredericton reach, such as a river confluence with the Nashwaak River, the presence of islands

both upstream and downstream, a river bend in the downtown Fredericton area, a developed urban centre at its banks, and the presence of in-stream bridge infrastructure make Fredericton's infrastructure more vulnerable to ice jam events and damage. Two bridges in the city (the Westmorland Street Bridge and the Princess Margaret Bridge) act as major transportation links between the north and south sides of the river. The Princess Margaret Bridge, constructed prior to the Mactaquac dam at approximately twice the height of the Westmorland Street Bridge, has not historically been a location of ice jams and reportedly unlikely to cause damages because of the high roadway height (Sullivan D., pers. comm., 2004). Historical ice flows damaged the former Carleton Street Bridge and the old railway bridge in Fredericton, breaking ice flows prior to reaching the Princess Margaret Bridge. Historical data on ice jams may not be representative of the risk of ice jam flood events particular to the Westmorland Street bridge since it was installed after the construction of the Mactaquac dam. Further investigation will be required to understand what risk, if any, is posed at this location under Option 3.

It is expected that any recreational infrastructure downstream of the Station (e.g., Regent Street Wharf) that could be damaged by ice travelling downstream would be removed from the river during the winter and early spring. Therefore, it would not be likely to be structurally compromised by any ice related events. Changes to access for recreational activities are discussed in Section 12 (human occupancy and resource use).

Flood events due to ice jams and related possible mitigation are discussed further in Section 6 (surface water).

13.4.1.3 Recreational Infrastructure

The presence of the headpond has led to the creation of infrastructure that facilitates recreational activities along the riverbank or headpond. This includes commercial recreational infrastructure (e.g., Mactaquac Marina), municipal public recreational access points, the Sea Cadets Training Facility, and private docks. Drawdown of the headpond under Option 3 will affect this infrastructure and recreational use of the area. Loss of access may be mitigated by altering existing facilities (e.g., moving locations) so that access to the headpond area continues and recreational activities are maintained. In addition, ongoing engagement with commercial operators as well as marinas and docks (where licensed) will occur if they decide not to pursue changes in recreational and navigational opportunities following drawdown of the headpond. Changes in economy and employment are discussed further in Section 11 (economy and employment) and changes to access for recreation is discussed in Section 12 (human occupancy and resource use). Under Option 3, additional information will be required to determine mitigation for recreation infrastructure.

13.4.2 Potential Change in Public Services

13.4.2.1 Option 1

During peak construction the labour force for Option 1 is estimated to be 1,750 workers. And the duration of construction is 11 years. Conservatively, it can be assumed that half of these will likely not be local. The influx of non-local workers to the area could lead to an increased demand on public services (e.g., healthcare, emergency services, education). Of the Options, Option 1 could cause the greatest change in public services because it requires the largest number of employees.

Project workers may require medical assistance, including emergency services, while they are in the area. In recent years, local hospitals have been near or beyond capacity in terms of acute care occupancy. However, a number of community clinics provide services to the communities within the area of review. The Horizon Health Authority will continue to monitor the demand for services so that Project-induced demands do not unduly burden the health care system. In addition, mitigation measures such as adaptive management planning will help to address response to demand (e.g., hiring of extra staff). Ambulance response times are mandated by the contract between ANB and the Province, and are currently within the acceptable standard. ANB will determine if additional resources are required in the area of review. Medical assistance available on-site may reduce some of these concerns.

To reduce extra demands on public health and emergency services, employees will receive training in preventing and responding to emergencies, including fires and medical emergencies. On-site

emergency response equipment will be available to reduce the potential strain, including possibly an on-site medical office. NB Power will consult regularly with authorities to communicate Project activities, and to determine if additional mitigation strategies are required to limit the demand on local service providers as a result of the Project.

Temporary workers may or may not be accompanied by their families. Therefore, substantial increased demands on schools in the area of review are not necessarily expected, though some increase could occur. Schools in New Brunswick are under capacity by approximately 60% (Bissett 2012). It is possible that additional demand on schools could be adequately accommodated by existing infrastructure.

Workforce education to encourage healthy lifestyle choices, sensitivity training and strict enforcement of NB Power's health and safety policies will also mitigate adverse social interactions potentially caused by an influx of workers to the area. For example, sensitivity training would raise the workers' level of awareness about the effects they could have on the community and their families due to drug and alcohol use or other societal concerns that may arise with the influx of a large construction workforce to an area. At the workplace, advice and mentoring will be provided regarding money management, alcohol and substance abuse, family adaptation and coping mechanisms, and other issues related to working on the Project. This will help limit demands on policing, health care and other social services. The use of employee code of conduct policies, drug and alcohol policies, Employee Assistance Programs for workers, and security at the Project site will help limit demands on police services and other social concerns.

Scheduling measures can be used to reduce interactions between the workforce and local communities. These types of measures can effectively reduce the amount of traffic traveling to and from the worksite, particularly during peak travel times by local residents. Long work days (11 to 12 hour days), and work rotation schedules, if feasible will limit the amount of workers interacting with the communities at any one time, and will manage the interaction between the workers and the communities in the area.

As construction and demolition activities near completion and operation activities begin, the size of the labour force will decline. Some of the workers and families that moved to nearby communities during construction may stay in the area. However, any additional demands on public services will have already been addressed. In general, changes in public service will decline when construction is completed because most workers will move away from the area. Consequently, it is expected that adverse interactions can be managed by careful planning, discussion with stakeholders and authorities, and mitigation.

13.4.2.2 Option 2

Option 2 would see a lower number of workers than are expected with Option 1. During peak construction preliminary estimates indicate that a work force of approximately 1,000 people would be required for Option 2. This Option will be completed over a period of up to 10 years, with the workforce varying over time based on the activities being conducted. Of the peak workforce under Option 2, it is conservatively assumed that approximately half of those workers will move into the area of review. This could place additional demands on public services, similar to Option 1 but to a much smaller degree. The same mitigation described in Section 13.4.2.1 would be used to manage these increases in demand for services.

13.4.2.3 Option 3

Option 3 would result in a relatively modest workforce, estimated to be up to 300 during peak construction, based on very preliminary engineering considerations at this time. It will be completed over a seven year active timeline and will interact the least with public service, and cause the least increase in demand.

13.4.3 Potential Change in Housing and/or Accommodations

13.4.3.1 Option 1

Many positions related to major construction projects require specialized skills and it is unlikely that these requirements will be fulfilled locally. As a result, many construction workers will likely come from communities outside of the area. In-migrant construction workers generally live in temporary accommodations, such as rental units, hotel and motel rooms, and rooms at bed-and-breakfasts close to the worksite; this would reduce the availability of such accommodation for others (e.g., for tourism). Experience elsewhere indicates that construction workers do not normally relocate on a permanent basis to the area of the Project, particularly where the potential employment period is finite and short-term.

Option 1 construction and demolition will occur over approximately 11 years. However, peak construction is expected to last approximately one year. It is conservatively estimated that 50% of the required 1,750 workers will be from nearby communities. However, due to the limited availability of specialized skills locally, many workers will come from communities outside the area. Workers who are given long-term employment may bring their families with them and look for permanent housing. They will be expected to find their own housing because a construction camp will not likely be provided as part of the Project.

Construction workers will consider housing availability and costs, access to services and infrastructure, and length of commute to the work site when deciding where to live. Fredericton is the largest and closest urban centre to the Project site. It offers more temporary accommodations than the smaller surrounding communities. There are approximately 40 hotels, inns, vacation homes, bed-and-breakfasts, and fishing and hunting lodges in the area; most are in Fredericton. Occupancy rates in the Fredericton area appear to be largely sufficient to accommodate the construction workforce for the Project, but considerable planning and management will be required by NB Power and other agencies to ensure that housing and accommodation availability and affordability are not adversely affected by the Project Options. There are few temporary accommodations in Carleton County and some of the towns just outside the area of review. Construction of the new facilities on the south bank of the Saint John River may disrupt the operation of the nearby Riverside Resort and Conference Centre, potentially affecting the availability of 85 rooms in the area.

The housing market will likely respond to an increase in demand from the construction labour force. Additionally, a surplus of available rental units and a low occupancy rate, particularly in Fredericton, suggests that there may be enough housing to accommodate temporary workers. Once a Preferred Option has been chosen, the availability of accommodation will be further evaluated to determine if it will meet the level of demand expected from the construction labour force.

NB Power will carefully plan and manage the construction work force, and will work with local communities to plan for and mitigate the adverse effects of construction activities on housing and accommodations. Private landowners and developers may build new rental units and hotels. This could benefit residents and visitors to central New Brunswick. Once anticipated employment numbers are finalized for all options, local accommodations will be evaluated and, if necessary, alternative accommodations will be explored. This may include provision of a work camp accommodation if warranted by both employment numbers and housing availability. This could help alleviate labour force demands on local housing and limit potential adverse interactions between the temporary labour force and local communities.

13.4.3.2 Option 2

Under Option 2, construction and demolition activity will last 10 years and require a peak labour force of up to approximately 1,000 workers. As discussed previously, it is conservatively estimated that approximately half of these workers might require temporary accommodations during the peak construction period. This is much less than the labour force required for peak construction under Option 1, and along with mitigation, such as work rotation and transportation arrangements, will place less pressure on the local housing market and temporary accommodations as compared to Option 1. Careful planning and management of the construction workforce will be carried out by NB Power in consultation with local communities to plan for and mitigate the adverse effects of the construction workforce on housing and accommodations.

13.4.3.3 Option 3

Option 3 is anticipated to take seven years and require a peak labour force of up to 300 workers. As a result of the smaller labour force required and short duration of decommissioning as compared to Options 1 or 2, Option 3 is expected to interact least with housing and accommodations. While the availability of housing and temporary accommodations in nearby communities to the Station is expected to be sufficient to meet the anticipated demand under Option 3, there may need to be planning and management measures in place to reduce negative interactions and enhance positive ones. A positive change would result from reduced vacancies in both accommodation types. While this is not expected to be at a level that would result in rate/rent inflation, it is possible that the increased demand for hotel and motel accommodation could result in reduced demand during the tourist season. The effect of this change on the local economy is discussed further in Section 11 (economy and employment).

13.5 SUMMARY OF INTERACTIONS BETWEEN INFRASTRUCTURE AND SERVICES AND THE OPTIONS

Interactions between infrastructure and services and each Option are summarized in Table 13.4.

Table 13.4 Summary of Interactions for Infrastructure and Services

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

13.5.1 Summary of Additional Potential Mitigation and Information Requirements

As described in Section 13.4, this review has identified the potential requirement for some additional potential mitigation and requirements for further study in some areas. These potential requirements are summarized in Table 13.5.

Table 13.5 Summary of Additional Potential Mitigation and Information Requirements

Option	Additional Potential Mitigation	Additional Information Requirements
Option 1: Construction and demolition only	<ul style="list-style-type: none"> Consider use of a work camp if housing and accommodations become stressed. Workforce rotation schedule. Consider medical facility/office on-site. Workforce education to encourage healthy lifestyle choices. Employee code of conduct policies. Security gate, guard house and on-site security staff. Effective public communications regarding changes. 	<ul style="list-style-type: none"> Evaluation of available accommodations to determine if capacity can meet expected demand.
Option 2: Construction and demolition only	<ul style="list-style-type: none"> Workforce education to encourage healthy lifestyle choices. Workforce rotation schedule. Employee code of conduct policies. Security gate, guard house and on-site security staff. Effective public communications regarding changes. 	<ul style="list-style-type: none"> Evaluation of available accommodations to determine if capacity can meet expected demand.
Option 3: Decommissioning	<ul style="list-style-type: none"> Workforce education to encourage healthy lifestyle choices. Workforce rotation schedule. Employee code of conduct policies. Security gate, guard house and on-site security staff. Effective public communications regarding changes. Alteration of existing facilities (e.g., moving locations) will take place to facilitate continued use of Saint John River for recreational activities. Upgrading of outfall structures to comply with effluent discharge regulations. Extending stranded outfalls into the river channel. Installing a diffuser at the end of a discharge pipe to improve effluent mixing capabilities. Shaping and grading of banks, and armouring shorelines to protect infrastructure. Monitoring of sediment deposition near infrastructure downstream of the Station during dewatering. Slope stabilization methods to be determined on a case-by-case basis. Ice control mitigation to protect in-stream infrastructure will likely be required, as is discussed in Section 6, surface water. 	<ul style="list-style-type: none"> Evaluation of available accommodations to determine if capacity can meet expected demand. Ongoing engagement with commercial operators, marinas and docks (where licensed) will occur if they decide not to pursue changes in recreational and navigational opportunities following drawdown of the headpond.

13.5.2 Discussion

All Options will generate employment. Approximately half of the peak workforce for Option 1 or Option 2 will require specialized skills that will likely come from outside of the area of review. This may place pressure on the existing rental market and local hotels and motels as well as other public services.

Option 1 will require the largest workforce with activities expected to last longer than those for the other Options. It will have the greatest interactions with community services, including housing and accommodations. Mitigation will include careful implementation and planning procedures, and ongoing communication between NB Power and the community.

Water level changes to the headpond under Option 3 have the potential to interact with existing infrastructure. For example, water infrastructure such as intakes and outfalls could be affected as a result of receding water levels. Infrastructure could be left stranded with considerable distance between the structure and the river channel. Water yield requirements for wells located close to the headpond may not experience the same recharge necessary to operate at full capacity.

Downstream water elevations under Option 3 could be somewhat higher than currently, particularly as a result of ice jams, resulting in increased potential for damage to in-stream infrastructure (e.g., bridges and piers). Increased water flows downstream of the Station, particularly during a shorter drawdown scenario could result in river bed and bank scour, leading to shoreline erosion, and subsequent slope failure. As mentioned above, a geotechnical stability assessment of river banks has been conducted and potential mitigation has been recommended for high risk areas.

13.5.3 Assumptions and Limitations

Assumptions and limitations associated with infrastructure and services relate to the availability and accuracy of data. Timely and relevant information on Infrastructure and Services may not be available from primary or secondary sources. For instance, in most cases, most recent Statistics Canada data are only available for 2011 and most data are not available for smaller communities. It is assumed that information regarding the labour force required for each Option and the duration of activities that has been provided is accurate.

