17.0 SUMMARY AND CONCLUSION

In this report, Stantec Consulting Ltd. (Stantec) conducted a Comparative Environmental Review (CER) of Options being considered by the New Brunswick Power Corporation (NB Power) for the Mactaquac Generating Station (the Station), a 670 MW hydroelectric generating station located on the Saint John River approximately 19 km upstream of Fredericton, New Brunswick. The Station has been in-service since 1968.

Current modelling indicates that the Station is experiencing a premature end to its service life as a result of an alkali-aggregate reaction within the Station's existing concrete structures that is causing the concrete to expand. The Mactaquac Project (the Project) consists of an evaluation of potential Options being considered by NB Power to address the future of the Station at the end of its service life in 2030 (the end-of-life Options):

- Option 1, Repowering: Refurbish the Station by constructing a new powerhouse, spillway, and other components, followed by the removal of the existing concrete structures at the Station;
- Option 2, Retain the Headpond (No Power Generation): Build a new concrete spillway and maintain the dam as a water control structure without power generation, followed by the removal of the existing concrete structures at the Station; or
- Option 3, River Restoration: Remove the Station and enable the river to return to a free-flowing state.

Additionally, a fourth option, "Life Achievement", is described in Appendix A.

NB Power is continuing to review the projected 2030 end of service life for the Station. That work includes exploring ways to continue operations within the current footprint beyond 2030. NB Power did not initially include these potential approaches (collectively referred to as Life Achievement) in the CER process because they had not yet been determined to be technically or economically feasible, but they have been recently advanced to a stage that they can be evaluated at a high-level; this has been done in Appendix A.

The CER of the Options was devised as a means to better understand the environmental, social, and economic issues that could arise from each of the Options. The CER was a high-level evaluation of the likely ways that each of the Options may interact with, or affect, the surrounding environment. It also provided a means by which potential mitigation measures could be identified at an early planning stage to make each Option environmentally acceptable. The information collected as part of the CER will be considered by NB Power, along with other information, in its decision-making regarding the Station.

The CER was not part of a formal regulatory process, but rather part of the planning process to assist in the selection of a Preferred Option. Depending on the Preferred Option chosen, there is expected to be a requirement for a provincial environmental impact assessment (EIA), and possibly the need for a federal environmental assessment (EA). Various other permitting and approval processes would likely

be required prior to it proceeding. In this regard, the CER is also seen as an integral part of the scoping and planning of any future EIA/EA for the Preferred Option, once it has been selected.

In accordance with the Guidelines developed for the CER, this Final CER Report has included a discussion of the following elements.

- Following some introductory context, a high-level discussion of the planning processes for the Mactaquac Project was provided, including the rationale for the Project, a brief overview of the current CER Process, how it fits into NB Power's overall decision-making process regarding the Options, and the identification of next steps following the selection of the Preferred Option.

- A description of the end-of-life Options as, they are currently conceived, was provided, including a brief discussion of the existing Mactaquac Generating Station, a description of the activities that could be carried out, and a discussion of mitigation measures that may be employed.

- The scope of the CER, and CER methods were discussed. Engagement activities conducted in support of the CER, and the input gained from such engagement that influenced the scope of the CER, are described.

- An evaluation of potential interactions between each Option and the surrounding environment was conducted. This included a discussion of existing conditions, potential environmental interactions, and suggested mitigation to reduce undesirable interactions and enhance positive ones.

Thirteen valued components (VCs) were identified for the CER. They were:

- atmospheric environment;
- acoustic environment;
- surface water;
- groundwater;
- aquatic environment;
- vegetation and wetlands;
- wildlife and wildlife habitat;
- economy and employment;
- human occupancy and resource use;
- infrastructure and services;
- transportation;
- heritage resources; and

- current use of land and resources for traditional purposes by Aboriginal persons.

The Options were evaluated to determine if activities would interact with the VCs, in consideration of standard mitigation. If a particular Option was determined to interact highly with the VC, additional mitigation or other measures to further reduce changes to the VC were identified. Recommendations for further information, data collection, and analysis were also provided as well as assumptions and limitations of the evaluation.

In summary, the CER concluded the following with respect to the potential interactions of the Options with each of the selected VCs.

- Atmospheric environment: Each of the Options has the potential to release emissions of dust or other air contaminants from planned activities. Option 1 has the potential to create the greatest emissions of all three end-of-life Options since it involves the longest construction period and the greatest number of activities. With careful planning and implementation of good practices however, none of the Options should result in a large-scale change in air quality or change in greenhouse gas (GHG) emissions compared to existing conditions. Emissions from Option 2 are expected to be similar to, but less than, those associated with Option 1. Option 3 may cause some localized dust and odours for a short period of time (perhaps one or two growing seasons, until exposed areas begin to naturally re-vegetate) from newly exposed sediments currently submerged in the headpond, but these are not expected to cause exceedances of ambient air quality objectives or cause widespread and prolonged exposure to elevated levels of contaminants. Option 3 may also result in small, localized changes in microclimate near the former headpond location due to physical changes in the landscape caused by the removal of the headpond. Option 3 may also generate GHG emissions from residual off-gassing from newly exposed sediments; however, the newly exposed banks of the Saint John River are expected to begin to re-vegetate quickly and absorb the released GHG emissions as vegetation matures.

- Acoustic environment: All of the construction and demolition activities associated with each of the Options (*e.g.,* blasting, equipment operation and vehicle movement) will emit sound, and have potential to increase noise levels and vibration at nearby residences and other sensitive receptors. Changes in sound quality are expected to be similar for Options 1, 2 and 3, although to varying levels and duration. The daytime sound level expected at the nearest residence to the construction activities is expected to increase compared to current conditions, with sound levels decreasing with increased distance from the construction areas. At approximately 1,000 m from the noise-producing activities, sound levels would be at or near background levels. Since NB Power plans to limit heavy vehicular use and noise-producing construction activity to daytime or evening hours to the extent feasible, nighttime noise levels are not expected to change noticeably from current levels. Noise and vibration from blasting will be noticeable several kilometres from the blast site and may influence sound quality, but will be infrequent (up to twice daily during peak construction), and residents will be notified in advance of the blasting schedule.

- Surface water: All three Options have potential to result in some localized changes to surface water. Options 1 or 2 would not result in a substantive change to the existing flow regime or to surface water and sediment quality. Option 3 would result in the greatest long-term change in the surface water flow regime and river characteristics as the dewatered headpond moves from lake-like to river-like conditions. With Option 3, following dewatering of the headpond, the river would be

expected to return to a near-natural surface water flow regime, similar to that which might have existed prior to the construction of the Station. This change in flow regime could result in reduced floodplain elevation in most of the headpond area, modified navigation opportunities, and reduced ability to achieve mixing from effluent discharges in the headpond. Most submerged sediments would be flushed downstream during dewatering, but a dewatering sequence would be developed based on sediment transport modelling to mitigate adverse downstream effects. After dewatering, the exposed and undrained soils and new river banks could become unstable and lead to slope failure; engineered solutions would be put in place in areas of high potential for slumping and erosion. The downstream reaches of the Saint John River may become more susceptible to ice jam flood events following dewatering under Option 3; but the risk of ice jam flooding can be reduced or controlled by various ice mitigation techniques. Flood damages within the former headpond reach, particularly the lower headpond reach, are anticipated to be minimal because of the currently undeveloped floodplain.

- Groundwater: Option 1 or Option 2 have limited potential to cause a change in groundwater quantity and quality, as the current operating water level of the headpond is not expected to change in either of these Options. Option 3, however, will result in the lowering of the water level of the headpond, resulting in a lowering of the static groundwater level adjacent to the headpond. This will likely result in lower well yields and negative changes to water quality in some wells by potentially altering the mixing of groundwater and surface water in the aquifer, particularly in those wells nearest to the headpond. Some groundwater aquifers, especially those in sand and gravel immediately adjacent to the headpond, could be adversely affected by Option 3 due to lowered water levels in the river. This could cause a reduction or complete loss of well yield in wells located in these aquifers. Low yield bedrock wells and shallow wells within 300 m of the current headpond, as well as major groundwater users, could see pronounced changes in well yield that could render the existing wells unsuitable for their intended uses. In the event of decreased well yield, mitigation could include deepening of an existing well, replacement of a well, provision of water storage facilities, or a combination of these or other measures.

- Aquatic environment: Options 1 and 2 are expected to have similar interactions with the aquatic environment as the current operating water level of the headpond is not expected to change appreciably in either of these two Options. In general, it is expected that positive changes to fish passage will result under Option 1 or Option 2 with the incorporation of improved design of fish passage; however, the continued presence of the dam would continue to present challenges to fish migrating upstream. The headpond would also remain in place and may continue to present challenges to some fish when navigating downstream. Option 3 will fundamentally alter the aquatic environment as the current headpond changes from a lake-like to a river-like environment. This will affect the existing community of fishes in the headpond, and result in river-like habitat between the Station and the upstream Beechwood Dam. Fish passage will improve and thereby benefit migratory species such as Atlantic salmon; but the improved passage will require monitoring and management. Other resident species in the headpond could see declines in their populations due to the changed ecosystem. Mitigation will likely be required to restore fish passage to streams that no longer have unimpeded access from the restored river channel. Downstream of the current Station, fish habitat could be affected by increased sediment transport during dewatering of the headpond. However, preliminary MAES results indicate that by conducting the accelerated drawdown in two stages that avoid key migration periods and coincide with seasonal periods of

heavier precipitation and high downstream water flows, adverse interactions to fish populations can likely be avoided. If Option 3 is selected as the Preferred Option, additional study may be required and management measures will need to be carefully planned and conducted so that fish species are not adversely affected by dewatering. Considerable dialogue among the design engineers, fish passage experts, stakeholders, and regulators will be required to develop designs that are conducive to improved fish passage. These discussions would inform the final design and the drawdown scenario to be carried out as well as the mitigation and management practices that could be implemented to reduce adverse outcomes to aquatic populations downstream during and following drawdown. Regardless of the Option selected, the continued presence of other dams upstream of the Station would continue to influence flows through the area of the Station and also present challenges for fish passage upstream of the headpond.

- Vegetation and wetlands: Options 1 or 2 will require the disturbance of undeveloped lands on the south bank of the Saint John River to make way for the Project facilities to be constructed, which will affect vegetation in that footprint. Following construction, Options 1 and 2 are not expected to interact to a great extent with vegetation and wetlands. Under Option 3, vegetation and wetlands upstream of the Station will change as a result of a drop in water level and a return to river-like riparian conditions. This will likely result in an increase in various types of wetland and riparian mineral habitats upstream of the Station. These habitats are important for many plant species at risk and species of conservation concern, and would provide an opportunity for these species to re-colonize the upstream section of the Saint John River where habitat and some species were lost when the Station was built and the headpond was created. Downstream vegetation and wetlands could receive a large release of water and some sediments when the headpond is dewatered under Option 3. If Option 3 is selected as the Preferred Option, additional study may be required to further understand the best drawdown schedule to manage vegetation and habitat changes (including changes to wetlands) as a result of direct interactions with the force of water, sedimentation, and scouring.

- Wildlife and wildlife habitat: Options 1 or 2 will require the disturbance of undeveloped lands on the south bank of the Saint John River, thereby affecting wildlife and habitats that might be present in that footprint. Following construction, Options 1 and 2 will not have a large effect on wildlife and wildlife habitat. The return to a river system in the headpond area as a result of Option 3 could cause a short-term stress for local wildlife habitat and communities; however, long-term improvements in, and enrichment of, the current headpond area would also result. Some wildlife species at risk and several species of conservation concern have been recorded but are not likely to be affected greatly by any of the Options. An increase in various types of wetland and riparian mineral habitat is expected as a result of dewatering; this could benefit species at risk or species of conservation concern. While wildlife and wildlife habitat may be sensitive to change, secure and non-secure wildlife populations will not change substantially on a local or regional basis under any of the Options. No Option is expected to affect the survival of any population of a wildlife species in New Brunswick. Changes to wildlife and wildlife habitat will be mitigated through timing restrictions on clearing, establishing buffers, and other measures.

- Economy and employment: Each Option has potential to contribute both positively and negatively to economy and employment in central New Brunswick. Option 1 would be carried out over 11 years and would require an on-site peak daily labour force of approximately 1,750 workers. Option 2 would be carried out over 10 years and would require approximately 1,000 workers at the peak of construction. Option 3 would be carried out over 7 years and require a peak labour force of up to 300 workers. All Options would contribute to job creation, the purchase and sale of goods, and the creation of economic activity in the region. Local companies (including Aboriginal companies) are expected to benefit from construction-related business contracts. Business-related benefits would extend to the provincial economy, as specialized goods and services are likely to be sourced from companies outside the immediate area if they are not available locally. Government revenues would also increase, primarily through increased income taxes and sales taxes paid to the provincial and federal governments. Positive economic outcomes can be enhanced through initiatives to increase the potential for local businesses to participate in the Project. Negative interactions (*e.g.,* transportation delays affecting the movement of goods and services; displacement of businesses such as tourism and recreation that depend on the headpond; population increase in the area from an influx of construction workers potentially affecting availability of local goods, services and infrastructure) will be carefully identified and managed.

- Human occupancy and resource use: All three Options are expected to result in some nuisance-type issues (*e.g.*, noise, vibration, and dust) during construction and demolition activities; but they will be carefully managed (*e.g.,* compliance with applicable regulations and standards and permit conditions) to reduce negative effects Option 1 or Option 2 will change the land use at the location of the new structures from agricultural, commercial, and recreational uses to an industrial landscape, and will require redevelopment of the area on the south side (*i.e.,* right bank) of the Saint John River. In general, if any changes in property values occur from any of the Options, they would be expected to be largely temporary; however, some existing facilities will no longer exist (*e.g.,* commercial developments) or will need to be moved (*e.g.,* snowmobile trails), and the public will no longer be able to access the area where new facilities are to be built. Navigation may be affected by increased exclusion zones near the new facilities, but the headpond will continue to provide recreational opportunities, including several public access points and navigable waters. With Option 3, dewatering will eliminate the headpond, and changes in the flow regime would occur as a result of the new river-like environment created by dewatering. Some recreational and navigational opportunities currently in existence would be lost, but others might be created. Lower water levels may make some areas of the River or its tributaries impassable for some of the larger vessels that are currently used on the headpond, particularly during dry conditions. Downstream flow regimes may also change and potentially affect navigation during dry seasons; but with the dam no longer presenting a physical barrier to navigation on the river, navigational opportunities for downstream users would be expected to generally improve due to increased connectivity to upstream areas Removal of the headpond, and the associated change in the aesthetics of the area, will likely negatively affect local residents' sense of community; however, it is expected that residents and users will adapt to the new conditions over time, and will find new ways to identify with the character and aesthetics of the area.

- Infrastructure and services: Approximately half of the workforce for Option 1 or Option 2 will require specialized skills that will likely come from outside the local area, potentially placing pressure on the housing and accommodation market as well as other public services (*e.g.*, healthcare, emergency services, education). Overall, it is expected that locally available facilities and services will be sufficient to accommodate Project needs and the community would respond to fill any further needs for facilities and services beyond existing levels; but careful implementation, communication, and planning by NB Power and the community would be expected to meet those needs. Option 3 could affect existing infrastructure as a result of receding water levels (particularly upstream of the Station) or from downstream sediment deposition. Intakes and outfalls, erodible slopes, existing drainage infrastructure, and transportation infrastructure could be affected. Infrastructure could be left stranded with considerable distance between the structure and the river channel. Downstream, Option 3 could result in increased risk of ice jams and resulting flooding, which could potentially damage in-stream infrastructure (*e.g.*, structures, bridges, and piers). Careful planning and management including the identification of high risk areas and implementation of corrective measures would be required to minimize the potential for damage to infrastructure.

- Transportation: The removal of the existing concrete structures at the Station under any of the Options will disrupt traffic on Mactaquac Road that links Routes 102 and 105, as the existing concrete structures at the Station that make up this transportation link are demolished. With any Option, construction activities and increased passenger vehicles and heavy trucks transporting workers, materials, and equipment to and from the site will affect local traffic patterns in the transportation network leading to and from the Station. For all Options, a crossing linking Routes 102 and 105 (either existing, modified, or new) will be maintained, keeping traffic flow and connectivity intact between Routes 102 and 105 in the area. Several routes and locations for a new transportation link are being considered. A permanent crossing would need to be put in place prior to the existing or temporary roads coming out of service. The timing of this would depend on the Preferred Option and transportation link alternative selected for the Project and crossing. Changes in transportation patterns will depend on the new cross-river transportation link selected and the origin and destination of the vehicles. NB Power will work with NBDTI in selecting and implementing the alternative transportation link, and developing a plan to manage transportation issues associated with Project-related traffic including consideration of such measures as carpooling, bussing, park-and-ride lots, and staggering shifts, among others.

- Heritage resources: Heritage resources are non-renewable resources, and archaeological or palaeontological resources cannot be returned to their original state once they have been disturbed or destroyed. No Option is expected to affect built heritage resources. There are several known heritage resource sites in or near the headpond. Given the use of the Saint John River by Aboriginal persons for several centuries, and historical settlement by Europeans in the area since the 18th Century, it is very likely that unknown heritage resources are present in or near the headpond. Option 1 or Option 2 may uncover heritage resources in the areas where new structures would be built, if they are present; continued presence of the Station may expose or damage any archaeological sites located along

the shore of the headpond or that may be submerged and may be eroding below the surface of the headpond. However, some of the submerged archaeological sites may be afforded additional protection if they remain covered by sediment. Although Option 3 would make currently submerged heritage resources available for additional study, this Option may result in the greatest change to these heritage resources because any that may be present, particularly Pre-Contact artifacts and sites, would be exposed after water levels are lowered, possibly subjecting some sites to continued or accelerated erosion over current conditions. Mitigation for Option 3 may be extensive if it is determined that large areas with heritage resources under or near the current headpond have eroded or are at risk of eroding.

- Current use of land and resources for traditional purposes by aboriginal persons: Aboriginal people have lived in the territory now known as New Brunswick for at least 8,000 years, with the Maliseet (Wolastoqiyik) concentrated along the Saint John River. General information was provided in the CER Report on potential existing conditions for traditional use, though specific information and use patterns by Aboriginal persons of the six Maliseet communities of New Brunswick will be documented through a Traditional Knowledge/Traditional Land Use study. However, it is widely known that the lands and resources of New Brunswick and particularly along or near the Saint John River have been used, and are being used, by Aboriginal persons for traditional hunting, fishing, trapping, gathering, subsistence, and related purposes. The extent to which the practice of traditional activities might be affected by the Options is not fully understood at this time; the Traditional Knowledge/Traditional Land Use study being conducted will further evaluate if and how traditional activities (and potentially Aboriginal and treaty rights) might be affected by the Options.

Overall, the CER Report has demonstrated that all three end-of-life Options have both positive and negative attributes from an environmental and social standpoint. It is clear, however, that any Option selected by NB Power will require careful planning, management, and execution to achieve acceptable environmental results and enhance positive attributes.

The CER Report is an integral part of the early planning process to assist NB Power in its decision making regarding the Station and to consider environmental, social and economic opportunities and constraints. It will be important for NB Power to continue this ongoing planning, consultation, issues management, and mitigation so that whatever Option is ultimately selected is carried out in a progressive, systematic, and environmentally responsible manner.