

**Summary of
the Environmental Impact Assessment for
the Removal of the Eel River Dam**

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1.0 INTRODUCTION

This document is a summary of *The Environmental Impact Assessment (EIA) for the Removal of the Eel River Dam*, and was prepared by the New Brunswick Department of the Environment (NBENV) to assist the public in becoming familiar with the Project and understanding the information contained in the EIA Report.

The Eel River dam, located south of the Town of Dalhousie in Restigouche County, was built in 1963 to provide an industrial water source for the area. However, the construction of the dam resulted in marked changes to the character of the river and its associated ecological community, and limited the passage of fish upstream. Deterioration of natural resources within the Eel River watershed is largely attributable to the presence of the dam.

The purpose of the EIA was to evaluate the potential environmental effects of the removal of the Eel River dam, including cumulative environmental effects; to evaluate the need for mitigation; to determine the significance of the residual environmental effects; to consider the need for follow-up and monitoring; and to compare the residual environmental effects of the Project with the effects that would result from the continued operation of the dam (the "Status Quo").

The EIA Report is the result of two years of research, consultation, modelling and analyses conducted by the Jacques Whitford Study Team, on behalf of the New Brunswick Department of Supply and Services (NBDSS), pursuant to the *Clean Environment Act – Environmental Impact Assessment Regulation*, and is intended to support any future environmental assessments that may be required under the *Canadian Environmental Assessment Act*.

2.0 BACKGROUND

The Eel River dam is located in Restigouche County south of the Town of Dalhousie, approximately 600 m upstream of New Brunswick Route 134 at Eel River bar. The dam was built in 1963 by the Town of Dalhousie to provide an industrial water source (non-potable) for the area, and the Town of Dalhousie operates and maintains the dam under contract with NBENV.

Construction of the dam created a freshwater impoundment, effectively destroying the estuarine habitat upstream of the dam location, impeding fish passage, and harmfully altering the estuary below the dam. The Eel River Bar First Nation (ERBFN) receives financial compensation for losses of aquatic-based resources as a result of the dam, primarily related to fisheries and the harvesting of traditional plants.

In December 2002, an agreement was signed with the Province of New Brunswick, Her Majesty the Queen in Right of Canada, and the ERBFN requiring that an EIA be conducted for the proposed removal of the Eel River dam. That agreement expires in August 2006 and the expectation of the ERBFN is that the dam will be removed. The New Brunswick Department of Supply and Services (NBDSS) was designated as the proponent for the Project, and a harmonized provincial and federal EIA process was established, with the Final Guidelines issued on February 27, 2004. In April 2004, Jacques Whitford was contracted to conduct the EIA.

Environmental Assessment Methods

The EIA evaluated the Decommissioning or removal of the Eel River dam, including the earthen dyke, concrete water control structure, and ancillary infrastructure (*e.g.*, fish passage facilities) in consideration of the following Project Objectives:

- a long-term solution to fish passage;
- the establishment of conditions that lead to the natural re-establishment of salt marsh wetlands upstream of the current dam location; and
- improvement of habitat for softshelled clams and other shellfish upstream and downstream of the dam.

Three separate studies were carried out in support of the EIA: a biophysical investigation, a socio-economic investigation, and a hydrodynamic, water quality and geomorphological investigation.

Public, stakeholder, regulatory and Aboriginal consultations were conducted to ensure that the general public, regulators, stakeholders and the Aboriginal Community were kept informed and were able to identify issues and concerns related to the proposed Project to be considered. The results of this process are presented in the EIA Report.

Thirteen Valued Environmental Components were selected for the EIA, comprising a range of biophysical, socio-cultural and economic aspects of the environment that may be affected by the Status Quo and the Project. The EIA Report also considers the potential effects of the environment on the Project, and the cumulative environmental effects in combination with other projects and activities in the Assessment Area. It includes recommendations for mitigation measures and follow-up as required.

3.0 DESCRIPTION OF THE ENVIRONMENT

Coastal and Oceanographic Overview

The Eel River flows in an east-northeasterly direction and discharges through a tidal inlet opening in the Eel River bar into Eel Bay, a coastal embayment that is approximately 8.5 km long and 3.5 km wide, embedded to the west in the much larger Chaleur Bay. The water depths of Eel Bay range from 2 m to 5 m and the sea bottom of Eel Bay gently slopes seaward from the shoreline, gradually increasing in depth towards Chaleur Bay. Low tide exposes a relatively large area in Eel Bay that is primarily composed of gravelly sand with pockets of silty sand deposits in lower reaches.

Prior to the construction of the Eel River dam, the Eel River estuary extended from the head of tide, approximately where the Canadian National Railway Bridge is located in the Village of Eel River Crossing, to the mouth at the tidal inlet. Under present conditions, the estuary extends only from the dam to the tidal inlet, and the volume of tidal flow has been substantially reduced. The maximum width of the estuary, at the current location of the dam, has remained at about 600 m.

Eel River bar is a natural result of the hydrodynamic and sediment transport conditions in Eel Bay, and has been used as a highway since very early pioneer times. The bar of sand and gravel, approximately 1,500 m in length, extends across most of the lower portion of the Eel River estuary with a characteristic narrow tidal inlet at the north end. The tidal inlet and the lower reaches of the estuary were historically a

regional swimming area before the construction of the dam. At low tide, people could dive from the bridge on Route 134 into waters 2.5 m deep, and water holes 3 to 4.5 m deep could be found on the estuary side of the bridge on Route 134. By contrast, under present day conditions, one can cross the tidal inlet at low water and not have it go above the hips. The water holes are now exposed at low tide.

The water level in the Eel River estuary is predominantly affected by the tides in Eel Bay, and to a less extent by freshwater flow, which has significant seasonal fluctuations. The overall freshwater discharge contribution of Eel River into Chaleur Bay is very small and in the range of 0.5 to 0.7 percent.

Eel Bay typically experiences two tidal cycles on a daily basis, with mean tides that range from 1.1 m at high tide to -0.9 m at low tide. Large tides (*i.e.*, new or full moon tides) typically range from 1.7 m at high tide to -1.2 m at low tide. Waves have washed over Route 134 on the Eel River bar on a number of occasions, both before and since construction of the dam, generally during fall-winter storms (around October to December) where east winds mixed with very high tides would generate storm surges. Problems with Route 134 on the Eel River bar have not been observed or attributed to the construction or operation of the Eel River dam, freshwater runoff, tidal flow, or ice flows inside the estuary.

Physical Characteristics of the Eel River Estuary

Hydrodynamics

The pre-dam freshwater flow in Eel River and predominant land use in Eel River watershed was similar to the present conditions. Significant seasonal fluctuations are similar to those of other rivers in the Maritime Provinces, with high flow typically experienced in April and May as a result of spring melt. Low freshwater flow is typically experienced in the summer and winter. The predominant land use in the Eel River watershed is forest resource harvesting. There is a small amount of mixed agriculture in the lower portion of the watershed. Given the predominant land use in the watershed, the rate of sedimentation of the impoundment and estuary below the dam is considered to be small.

Prior to the construction of the Eel River dam, the tidal flow from Eel Bay could reach the Village of Eel River Crossing. The full length of the Eel River estuary experienced water level fluctuations influenced by the tidal cycles, similar to that of the estuary below the dam at the present time. There are little survey data available to establish the actual volume of the tidal prism for the pre-dam conditions.

The impoundment, created in 1963 through the construction of the Eel River dam, consists almost entirely of freshwater. The estuary below the dam remained estuarine with the construction of the dam, and the water level in this area is predominantly affected by the tides in Eel Bay, and to a less extent by freshwater flow. Tidal flow from Eel Bay is not able to migrate beyond the Eel River dam except by infiltration or by overtopping during extreme high tides.

Eel River dam has a total length of 600 m and is of earth fill construction with the crest of the dam constructed to an elevation of 3.4 m. The Eel River dam was completed in 1964 to have a maximum operating water level of 1.98 m; during 1968 and 1969, the dam was modified to increase the water storage capacity of the impoundment.

The water control structure, located adjacent to the south shore of the Eel River estuary, consists of six 3.66 m wide bays equipped with vertical steel gates and one 1.83 m wide fishway that has three pools divided by four baffles. The steel gates can be lifted to discharge flow from underneath the gates, and stop logs can be added on top of the steel gates to increase storage in the impoundment. One of the gates located adjacent to the fishway is equipped with a trapezoidal-shaped weir section, installed a few years ago under guidance of DFO, to enhance fish passage for the upstream migration of adult salmon.

Bathymetry

An examination of the pre-dam aerial photographs (1945 and 1955) and bridge drawings indicates that the net opening of the tidal inlet at Eel River bar was in the order of 90 m at mid-tide level and the bed of the channel was at elevation -1.8 m. The tidal inlet currently has a width of about 30 m at the mean tide elevation and a bottom elevation of about -1.0 m.

Prior to dam construction, the tidal effects of the estuary extended up to at least the railway bridge at the Village of Eel River Crossing, a distance of about 4,500 m upstream of the present dam. Substantial amounts of material, probably sand and gravel, were deposited in the Eel River estuary to at least 400 m upstream of the bridge on Eel River bar. The thalweg (the line drawn through the lowest points of a valley or water course in its downward slope and thus marks the natural bottom and direction of a watercourse) and the main channel upstream of the bridge followed the north bank of the estuary up to and around Blueberry Point.

The extent and location of the sand and gravel deposits in the estuary below the dam, just upstream of the bridge at the tidal inlet, have altered over time. In 1955, the larger channel was on the northwest side of the upstream deposits, whereas in 2005 the larger channel was along and parallel to the Eel River bar and Route 134. The entrance/exit to the estuary at the tidal inlet downstream of the Route 134 bridge has narrowed as a result of infilling.

Immediately downstream of the dam, the thalweg location is now indeterminate. A scour hole has developed immediately below the water control structure as a result of flow discharge, and much of the eroded material is mounded downstream of the scour hole, as might be expected. A channel has developed along the toe of the dam, and some erosion is occurring along the south bank just downstream of the control structure. Despite these changes, the extent and main features of the sediment deposit in the estuary below the dam has remained very similar for approximately 50 years and the bathymetric features in the impoundment area have also remained virtually the same, indicating that the sediment input into the impoundment and the estuary below the dam is typically low.

Geomorphology

The Eel River estuary is characterized by a bar of sand and gravel extending across about 98 percent of its lower portion, and a narrow tidal inlet at the north end of the bar. An active tidal inlet is characterized by movement of sediment back and forth through the inlet due to tidal exchange and freshwater flow. Deposition occurs just upstream or downstream of the inlet and changes in size and volume continuously. If a large storm event should cause extensive littoral transport of sediment toward the inlet, the tidal flow will work to maintain the opening at a relatively constant size.

The construction of the Eel River dam resulted in a large reduction of the tidal volume which enters and exits the estuary at the tidal inlet. Major consequences have been the narrowing of the channel at and downstream of the bridge on Eel River bar, and a partial closure of the northern channel above the bridge. The main flow now occurs in a channel that is almost parallel to the bar and flows northward towards the bridge during ebb tide conditions. The reduction in the size of the tidal inlet appears to have been essentially complete between 1974 and 1985, some 10 to 20 years after construction of the dam. However, some reconfiguration of the upstream channel was still occurring between 1985 and 1997.

There is some evidence that a small amount of infilling has occurred in the pre-dam channel in the vicinity of the pipeline crossing about 1,100 m upstream of the dam. This infilling is assumed to be primarily associated with the deposition of suspended sediment supplied from the watershed upstream of the Village of Eel River Crossing.

Tidal Regime

Canadian Hydrographic Service operated a tidal water level monitoring station in the Town of Dalhousie in 1964, and from 1973 to 1992. The highest tide ever recorded at this station is 2.36 m, which occurred on October 26, 1980. The recorded tidal water level is the combined result of the tidal cycle, wind set-up, and local atmospheric pressure, but excludes the effect of wave action. The extreme tide elevation is lower than the crest elevation of the Eel River dam, but is higher than the gate crest elevations when stop logs are not installed. On occasions, salt water has risen above the crest of the gates and spilled into the impoundment.

Flooding

Prior to the construction of the Eel River dam, areas adjacent to the present impoundment could have been subject to flooding caused by extreme high tide, which could, on occasions, have been higher than the water level typically maintained in the impoundment. The ballfield adjacent to Eel River in the Village of Eel River Crossing was occasionally flooded. Any such flooding caused by extreme high tide would be short in duration, and would recede with the falling tide.

When the Province of New Brunswick purchased properties in the Village of Eel River Crossing due to flooding risk considerations related to construction of the Eel River dam, some homes were relocated. This appears to indicate that the typical pre-dam high water level in the impoundment area was lower than the water level currently maintained for the impoundment. Water level in the impoundment is currently regulated by the water control structure incorporated into the Eel River dam, which also protects the impoundment area from flooding from extreme high tide. The dam was initially designed to have a maximum operating water level of 1.98 m. The maximum operating water level was increased to 2.98 m during dam modifications in 1968–1969, but it is not known if the impoundment has been operated at this level.

Ice Regime

During the winter months, an ice cover forms over much of Eel Bay, over much of the estuary below the dam, and over all of the impoundment above the existing dam. If much of the area in the estuary below the dam is filled with ice from top to bottom, then the actual volume of tidal exchange during the late winter is relatively small compared to that during ice-free periods.

The major potential ice-related problem is that associated with storm surge during the period in which an ice cover forms on the sea side of the coast. During periods of high winds and high tides, the ice is shoved on shore. If ice were pushed up on Eel River bar during a storm surge, it could stop traffic flow on Route 134, and restrict the flow of water into and out of the tidal inlet, but it would not cause any physical problems upstream of the Route 134 bridge at the tidal inlet. The impact of storm surge effects during the winter will essentially remain unchanged whether the dam is left in place or removed.

Atmospheric Environment

Climate

Climate and weather patterns in the Assessment Area are affected by warm maritime air masses from Chaleur Bay in the summer and cold continental Arctic air masses from the west in winter. The close proximity of Chaleur Bay provides a moderating effect on temperatures in the summer. The dominant winds are from the west, south-southwest, northwest, and east. There are limited specific data available

with regard to greenhouse gas (GHG) emissions in the area. For the purposes of the EIA, therefore, GHG emissions were estimated based on the most recent published data from national GHG inventories, taking into account the rural environment and the relatively unchanged population and industrial base in the Eel River region over the years.

Air Quality

The Assessment Area is a predominantly rural environment with small population centres in the nearby communities of the Village of Eel River Crossing, Village of Charlo and the Town of Dalhousie. Although local industrial and commercial development has increased from the pre-dam period, given the relatively unchanged population and urban growth, this has not markedly affected the rural characteristics of the area. A summary of the results from the local ambient air quality monitoring sites in the Assessment Area, 1998-2003, is presented in the EIA Report. Ground-level concentrations of SO₂ and Total Suspended Particulate matter were notably low in the Assessment Area for the entirety of the selected monitoring period (1998-2003), and the monitored concentrations have also shown a decreasing trend over recent years. It can be concluded that the existing ambient air quality is very good.

Sound Quality

Based on recent aerial photographs, the local sources of potential noise emissions may include the residential development on the north shore of the estuary below the dam, and vehicle traffic on the Route 134 and Highway 11 crossings, and along the south shore of the river in the vicinity of the dam. However, given the relatively low traffic levels and the topographical features of the area (such as rolling terrain and abundant tree cover), the existing local noise levels are expected to be relatively low and characteristic of a rural environment. The impoundment represents a large reflective surface, which may result in the sound emissions in the area upstream of the dam to be transmitted further across the river than during the pre-dam period. However, since the existing water levels in the estuary below the dam are similar to those during the pre-dam period, the sound quality in this area is expected to have changed little from pre-dam conditions.

Odour

The existing conditions with respect to odour emissions in the Assessment Area are expected to be typical of an estuarine environment near marine waters. No odour emissions were reported by any members of the Water Quality Field Study Team during any of the fieldwork conducted in the impoundment area, including during the period of low water level in August 2005. Current levels of submerged vegetation and nutrient loadings, along with the type of sediment at the bottom of the impoundment, do not seem to be causing any appreciable odours. The potential for odour issues arising from increased nutrient loadings has been greatly reduced by the deactivation of the Village of Eel River Crossing sewage lagoon outfall.

Fish Habitat and Fish

Water Quality

The water quality considerations that are given greatest weight in this EIA include:

- nutrients (phosphorus and nitrogen) that can alter biological communities through the process of eutrophication;
- biochemical oxygen demand (BOD), which can alter biological communities if oxygen

concentrations in the receiving environment become limiting for aquatic life;

- temperature, which can be limiting for aquatic life if it is too high; and
- salinity, which is an important determinant of the kinds of aquatic life that can exist, and which can be limiting to migrating fish if salinity gradients are too abrupt.

The presence and numbers of coliform bacteria in water (total and/or fecal coliforms) are considered as a component of Public Health and Safety, since these bacteria are primarily of concern to human health.

Water quality information is limited for the Eel River, prior to construction of the Eel River dam in 1963. However, the New Brunswick Water Authority conducted water sampling at a freshwater site by the covered bridge in Eel River Crossing in May 1962. The Eel River water was deemed to be “soft water, low in suspended matter and dissolved organic matter” as would be expected for a relatively undeveloped catchment in northern New Brunswick. Given the land use and tidal prism, it is likely that concentrations of BOD and nutrients in freshwater entering the estuary would have been generally low. In addition, tidal flushing with marine waters from Chaleur Bay would likely have provided dilution and enhanced the removal of nutrients from the presently impounded area.

There is no reason to believe that the water of the Eel River impoundment was historically contaminated by industrial sources, or that historical trace metal concentrations in the water have been at levels that would pose a risk to human health, or to fish or wildlife. Since these substances have a strong tendency to bind to and remain stored in sediments, whereas concentrations in water would be more transient, greater consideration of industrial pollutants is provided in the review of sediment quality.

The upper portion of the impoundment has experienced gradual eutrophication since the construction of the Eel River dam, as evidenced by the algal growth, as a result of net accumulation of nutrients in the impoundment due to lack of flushing. However, the shallow water in much of the impoundment is a factor in the eutrophication process, since the entire water column lies within the photic zone, where light levels will support algal growth. Once an algal mat forms on the surface of the sediments, oxygen concentrations and redox potentials at the sediment-water interface fall, leading to the release of soluble iron, manganese, and phosphorus from sediment to the overlying water, further increasing the eutrophic condition. The shallow water is also prone to heating during the summer, and warm water temperatures also promote biological activity.

The sewage collected from the Village of Eel River Crossing was permanently diverted to the Town of Dalhousie wastewater treatment system in June 2005, the Eel River Crossing sewage lagoon has been decommissioned, and there is no longer sewage effluent discharge from that facility into Eel River. However, effluent from the Village of Balmoral wastewater treatment pond discharges into the South Branch Eel River, which feeds into the Eel River immediately upstream of the Village of Eel River Crossing. The Village of Balmoral is currently reviewing options to upgrade its wastewater treatment facility to accommodate population growth and economic expansion. The nutrient loading rates of private septic systems and small-scale agriculture operations in the watershed are affected by many factors and difficult to quantify.

In a water quality study conducted on behalf of the Village of Eel River Crossing, water samples were collected on November 5, 2003 from five locations in Eel River and one location at the sewage lagoon outfall, and these were analyzed for BOD. Further water samples were collected in 2004 and on three occasions (July 21, August 18, and September 21) in 2005, in the impoundment. The results of the general water chemistry analyses for 2005, provided in the EIA Report, indicate that the impoundment remained eutrophic, and that no immediate improvement in water quality was observed as a result of

sewage diversion from the Village of Eel River Crossing.

To summarize, the impoundment presently consists almost entirely of freshwater with low salinity. There are occasions when the tide rises above the top of the gates, and salt water spills into the impoundment. This will result in accumulation of denser and more saline water in the deeper portion of the impoundment, near the dam; however, the volume of this saltwater intrusion is likely limited. The impoundment is eutrophic, having relatively high concentrations of available nutrients, warm water temperatures, and depressed night time oxygen concentrations during the summer months. The combination of an abrupt transition from near-marine salinity to freshwater, together with high water temperatures and periodic low dissolved oxygen concentrations, could be stressful or limiting to migratory fish. There is presently no evidence of significant contamination of the water in the impoundment by heavy metals or persistent organic pollutants.

Sediment Quality

The contamination of sediments is typically from material in suspension in the water that may have settled out. The sources of existing contaminated sediments are likely the same as those identified above for water quality, including sewage, industrial wastes and agricultural runoff.

Sediments within the impoundment are primarily silty or sandy, and contain relatively high concentrations of ammonia. Sediments in the estuary below the dam and nearby marine areas are predominantly sandy or sand-gravel, and contain much lower concentrations of ammonia. The coarser sediment grain size reflects the higher energy regime of the tidally influenced estuary below the dam, while the lower ammonia concentrations in those sediments reflect the higher flushing rates. Based on grain size, TOC and ammonia, those samples in which potential contaminants would most likely be concentrated were submitted for further analysis. The results of the analyses and the relevant guidelines are presented in the EIA Report.

Although traces of some PAH compounds were detected, the concentrations were all below CCME guidelines, and are not sufficiently elevated to be of concern. Significant environmental effects are not likely to occur in either the freshwater or the marine environment at the slightly elevated chromium concentrations measured in the Eel River impoundment area, which could be attributable to natural sources. It is noteworthy that mercury concentrations were well below the CCME guidelines, since a previous issues scoping for the Eel River dam raised concern about the possible presence of mercury in water of the impoundment. The absence of detectable PCB residues in the sediments indicates that there has been no significant release of PCBs to the Eel River watershed.

To summarize, sediments within the impoundment contain more silt and ammonia than sediments in the estuary below the dam, consistent with the quiescent nature of the water body, and its eutrophic condition. However, concentrations of heavy metals and persistent organic pollutants are low, indicating that there has been no significant introduction of chemical pollutants, other than nutrients, to the system.

4.0 EVALUATION OF EXISTING FISHWAY AND POTENTIAL IMPROVEMENTS TO THE FISHWAY AGAINST THE FISH PASSAGE PROJECT OBJECTIVE

Fish migration is governed by several factors including time of day, length of day, season of the year, freshwater signal, water quality, water temperature, water velocity (speed at which water flows downstream), flow direction, tide levels and the location of fish in the water column. Synchronization

between these factors, in the Eel River system, is complicated by the wide variety of migratory requirements associated with the fish species needing passage at the dam for life cycle purposes: American eel, rainbow smelt, American shad, gaspereau (blueback herring + alewife), sea lamprey, Atlantic salmon, brook trout, and Atlantic tomcod.

The Eel River dam fishway is a combination pool-and-weir and pool-and-orifice type, built at the time of dam construction and designed primarily for Atlantic salmon. The Town of Dalhousie operates the fishway; however, DFO monitors fishway operation and the Town usually follows DFO instructions. In the spring, generally one steel gate is opened fully with a second steel gate opened halfway, primarily to control flooding upstream at Eel River Crossing but also to permit upstream fish passage. No gates remain open in winter, and in the summer the gates are usually closed except during periods of heavy rainfall. In the summer, there is no flow through the dam except through the fishway.

The major drawback with the current Eel River dam fishway configuration is at the exit weir when the pools are drowned out by the tide. The flow velocity through the submerged orifice cannot be overcome by small-bodied fish such as rainbow smelt and Atlantic tomcod. In addition, shad will not swim through submerged orifices. Large, strong fish like salmon and large brook trout would easily overcome the velocities through the exit opening, but the presence of algae in the fishway late in the summer and in the early autumn has been known to discourage these fish from using the facility. Another problem with the fishway is that drops of 30 cm between the inlet and the intermediate pools, and the intermediate and the exit pool, are greater than recommended for shad. This drop is undoubtedly too great for rainbow smelt and tomcod as well.

In addition to the effectiveness of the fishway, other components of the fish passage Project Objective include:

- differences in water temperature between the impoundment and the estuary below the dam;
- break-down of salt stratification due to total mixing of the water column downstream of the impoundment by plunging flow from the fishway and gate openings that is used by downstream migrating fish to acclimate to the marine environment;
- episodes of high water temperatures in the impoundment during the summer months;
- eutrophic conditions (excessive plant production) of the impoundment resulting in the clogging of the fishway pools with algae and a reluctance of upstream migrating fish to use the facility;
- increased predation and poaching (NBDNR, 1992) of fish, particularly adult Atlantic salmon below the dam as they wait for suitable conditions to pass through the fishway or over the spillway;
- increased predation of downstream migrating fish due to decreased water velocity in the impoundment and consequential effects on passage; and
- inability of the fishway to operate under icy conditions.

Making modifications to the fishway structure would improve fish passage for some species at some times, but would not effectively achieve the fish passage Project Objective. Some species would continue to have physical difficulty getting over the dam, and all species would still be exposed to marked changes in temperature and salinity upstream of the dam and increased predation below the dam. As well, the presence of ice during the winter months could affect operation of the fishway, thus limiting the upstream and downstream movement of fish species.

5.0 PROJECT DESCRIPTION AND IMPLEMENTATION STRATEGY

The Project is defined as the Decommissioning of the Eel River dam, including the earthen dyke, concrete water control structure, and associated infrastructure (*e.g.*, fish passage facilities). In support of these Project Objectives, intended to address fish passage and other environmental and ecosystem issues associated with the Eel River dam, the following Project Design Criteria have been established:

- the minimum width of an opening in the Eel River dam will be sufficient to allow tidal exchange to occur in a manner that is not substantially different (similar tidal prism, range and exchange) from the pre-dam condition. This opening should be located at the north end of the dam to reflect the pre-dam channel location;
- the Project should not result in a non-permitted prohibition of the *Species at Risk Act (SARA)* or a violation of the New Brunswick *Endangered Species Act*;
- the Project should allow for the free passage of ice so that there is no potential for ice-jamming;
- sedimentation of the Eel River estuary as has occurred because of the dam construction should be arrested;
- there should be no further constriction of the tidal inlet channel at the mouth of the estuary and in the vicinity of the bridge on Route 134;
- the Aboriginal Heritage Gardens should be protected; and
- during the implementation of the Project, sediment generated during the Decommissioning activities must be controlled.

The Project will employ strategies to mitigate potential negative environmental effects to ecological and socio-economic features that have adapted or developed since the dam was constructed. An adaptive management approach to dam removal will be implemented to ensure that significant negative environmental effects are avoided, should the Project proceed, subject to the outcome of the EIA.

The Project

The Project will be implemented in three stages. Stage 1 would take approximately one year, with Stage 2 taking one to two years to complete, depending on the timing for Decommissioning. Stage 3 would take one year to complete, although the follow-up would continue for three years.

Stage 1 – Design, permitting, planning, and communication

Stage 1 includes activities relating to design, acquisition of permits and communication, and implementation of shoreline protection, that must be carried out prior to creating the opening in the dam. It includes the preparation of an Environmental Management Plan (EMP), including supporting plans and procedures. Monitoring and compensation required as conditions of the permits, approvals, and authorizations may extend beyond Stage 1 as appropriate.

Stage 2 – Create a 150 m-Wide Opening in the Dam

During Stage 2, a 150 m-wide opening will be created in the north end of the dam, with the existing gates being used to control flows. The excavation work would proceed from the north to the south.

Erosion protection will be placed on either side of where the dam currently abuts the north shoreline. The mobilization and movement of sediment will be minimized by the placement of turbidity/sediment control barriers to isolate the Decommissioning area; construction of a barrier made of clean rockfill, to moderate flow velocities in the area as the dam is removed; followed by removal of the rockfill barrier and the turbidity curtains after water quality (suspended sediment) in the area has reached acceptable levels.

Stage 3 – Remove Remainder of Dam

Stage 3 involves removal of the remainder of the dam, which would be accomplished by excavating in a southerly direction from the initial 150 m opening. Stage 3 also includes removing the existing control structure.

Alternative Means of Carrying Out the Project

This EIA was originally conceived to include consideration of a partial dam removal and a full dam removal. As a result of consultation with the ERBFN, it was identified that only full removal would be considered acceptable. In addition, partial dam removal would have no substantive environmental benefits.

As an alternative to the use of the turbidity/sediment control barriers and rockfill barrier, the isolation of the Decommissioning area with watertight cofferdams was considered. However, this approach would require the construction of a sedimentation pond and a pumping system to de-water the area, and removal of the cofferdam would require the use of turbidity/sediment control barriers in any event; therefore the rockfill method is recommended.

Instead of removing the entire control structure, just the deck and girders could be removed and the remaining structure filled in with excavated material from the dam. However, this approach would not comply with the Coastal Areas Protection Policy of New Brunswick. Full removal of the dam structure is therefore required.

Accidents, Malfunctions and Unplanned Events

Given the implementation of the Environmental Management Plan, and the accidents assessed specifically as part of other VECs, the residual accidents and malfunctions with the greatest potential for significant environmental effects include hazardous material spills and unplanned erosion (*i.e.*, beyond the pre-dam river channel). Although such events are considered unlikely to occur, necessary precautions will be taken to prevent any accidents, malfunctions and unplanned events that may occur throughout all stages of the Project and to minimize any environmental effects should they occur.

Environmental Management Plan

An Environmental Management Plan (EMP) will be developed during Stage 1 of the Project and may be updated as required as a result of on-going monitoring. The EMP and its supporting documents and procedures will be submitted to the Director of Project Assessment Branch at NBENV and other regulatory authorities for review and approval prior to the initiation of Stage 2 of the Project.

The purpose of the EMP is to provide protection of the environment for the life of the Project by ensuring compliance with the commitments as set forth in the EIA Report; ensuring compliance with environmental legislation, regulations, and conditions of approval; ensuring that the environmental effects of accidents, malfunctions and unplanned events, should they occur, are minimized; and verifying the accuracy of environmental effects predictions in the EIA and the effectiveness of recommended mitigation. The EMP will also define and identify roles and responsibilities, accountability, and reporting procedures.

The Environmental Protection Plan (EPP) is a vital common reference document designed to ensure that the commitments of the EIA and other regulatory permits are followed. The EPP will contain Standard Operating Procedures (SOPs) that describe the best practice mitigation measures to be used during construction, and an Emergency Response and Contingency Plan to ensure safe, quick, and effective response to unexpected and emergency situations.

A Follow-up Program will be designed and executed to fulfill the need for and the requirements of a Follow-up Program as outlined in the Guidelines and *CEAA*. The objectives of the Follow-up Program will be to verify the accuracy of the EIA and determine the effectiveness of any measures taken to mitigate the negative environmental effects of the Project.

6.0 PREDICTED FUTURE ENVIRONMENT

Hydrodynamic modelling, trend analysis, and the professional judgment of the Jacques Whitford Study Team were used to predict the future physical and chemical environments as a result of the Project.

With the removal of the Eel River dam, the water level in the entire estuary, including the present Eel River estuary and impoundment area, will fluctuate with the tidal cycle. It is expected that the opening at the tidal inlet will widen in response to the substantially increased tidal prism and related velocity increase, and an opening of approximately 100 m will adequately restore this tidal prism. Erosive processes resulting from increased tidal flow will re-establish the pre-dam channel width to approximately 90 m at mid-tide elevation and the former channel on the north side of the estuary will likely be re-established as the dominant channel.

With respect to water quality, eutrophication in the impoundment area will be alleviated over time, and the daily fluctuations of DO levels will be substantially reduced. BOD loading from the Village of Balmoral is expected to be considerably oxidized prior to reaching Eel River estuary downstream and the accumulation of BOD in the substrate of the area of the impoundment is not expected to be great. Increased dilution will result in decreased nutrient levels and the increased flushing of nutrients will result in conditions in the estuary being similar to pre-dam conditions.

7.0 ENVIRONMENTAL EFFECTS ANALYSIS

Atmospheric Environment

Atmospheric Environment refers to the layer of air near the earth's surface to a height of approximately 10 km, characterised by three key aspects: climate; air quality; and sound quality (noise). For this assessment, a fourth key aspect is odour.

A *significant negative residual environmental effect* on climate is one that results in a substantive increase to provincial releases of greenhouse gases (*i.e.*, > 1% of total provincial CO₂ emissions) or a substantial loss in carbon sinks (*i.e.*, > 1% of carbon sinks) in Southern New Brunswick.

A *significant negative residual environmental effect* on air quality is one that degrades the quality of the air such that the emissions of air contaminants of concern lead to an exceedance of the ambient air quality standards, as defined in the *New Brunswick Air Quality Regulation – Clean Air Act*. For the purposes of this assessment, the air contaminants of concern are defined as total particulate matter (TPM), sulphur dioxide (SO₂), nitrogen oxides (NO_x as NO₂), carbon monoxide (CO), and hydrogen sulphide (H₂S).

A *significant negative residual environmental effect* on sound quality is one that creates a “nuisance” at the nearest residential property by causing sound pressure levels that frequently (*i.e.*, more than 10% of the time on an annual basis) exceed 65 dB_A on a sustained and permanent basis at the nearest noise sensitive area (NSA); or, where ambient levels already exceed 65 dB_A, by frequently causing ambient sound pressure levels of more than 10 dB_A above background.

A *significant negative residual environmental effect* on odour is one that results in a noticeable change in the character, intensity, or frequency of odours in the Assessment Area, such that the resulting odours would frequently (*i.e.*, >10% of the time on an annual basis) and substantially interfere with the normal conduct of business, or the normal enjoyment of the use of properties, as defined in the *Clean Air Act*.

Evaluation of Potential Environmental Effects

Status Quo

There are no features of the Status Quo that would result in substantive changes to greenhouse gas (GHG) emissions, regional climate, or microclimate in the Assessment Area, or in measurable changes to sound quality. Any changes to air quality in the Assessment Area under the Status Quo would likely be the result of other factors (*e.g.*, long-range transport of air contaminant emissions) rather than being directly attributable to the Status Quo. Previous reports of negative odour emissions in the impoundment seem to have been largely related to the former sewage lagoon outfall, which has since been deactivated. In summary, the environmental effects of the Status Quo on the Atmospheric Environment (climate, air quality, sound quality, and odour) are rated not significant

The Project

Climate

The Project is expected to result in the release of some GHG emissions from the operation of vehicles/heavy equipment during the placement of turbidity/sediment control and rockfill barriers (Stage 2), and the actual removal of the dam (Stage 3). These emissions would be temporary, intermittent, of short duration, and confined to a local area, and should not be discernible from current levels. The replacement of the current impoundment with a narrow river channel may result in some small-scale changes to microclimate upstream of the current dam location, but these changes would not likely be measurable. Any fog that forms as a result of tidal waters coming into contact with the warmer ground surface around the estuary would likely be localized, intermittent, of short duration, and similar to natural pre-dam conditions. In some parts of the Assessment Area, the Project may result in the loss of wetlands or salt marshes, which serve as a carbon sink to absorb carbon dioxide in the atmosphere, but this is expected to be largely offset by the enhancement or creation of carbon sinks in other areas. In summary, the potential adverse environmental effects of the Project on climate are rated not significant.

Air Quality

The Project is expected to result in the release of some combustion gases and particulate matter from the operation of vehicles/heavy equipment, and very small amounts of fugitive particulate matter (dust) generated during Stage 2 and Stage 3. Standard mitigation measures (*e.g.*, following federal and provincial guidelines and regulations, using dust suppressants, and ensuring proper maintenance of equipment) would minimize the potential environmental effects. Any emissions or dust generated would be temporary, intermittent, of short duration, and confined to a local area, and should not be discernible from current levels. Overall, the environmental effects of the Project on air quality are rated not significant.

Sound Quality

Standard mitigation measures (*e.g.*, using mufflers, ensuring proper maintenance of equipment, and restricting activities to daytime hours, where warranted) would be used to minimize the sounds generated by the operation of vehicles/heavy equipment during Stage 2 and Stage 3. Any sounds generated would be temporary, intermittent, of short duration, and confined to a local area in close proximity to the dam, where there are few residences or other NSAs. Overall, the environmental effects of the Project on sound quality are rated not significant.

Odour

The Project is expected to result in certain parts of the bottom of the current impoundment being exposed during low tide, but the type of sediment observed on the bottom of the impoundment is not the type to produce odours and there is a limited amount of submerged vegetation. Further, the restoration of flow in Eel River and twice-daily tidal flushing is expected to remediate any lingering odour emissions related to the former sewage lagoon outfall at the upper end of the impoundment. Overall, the environmental effects of the Project on odour are rated not significant to positive.

Accidents, Malfunctions, and Unplanned Events

There are no foreseeable features of the Status Quo or the Project that would result in accidents, malfunctions, or unplanned events that would lead to a significant negative environmental effect on the Atmospheric Environment. Therefore, the potential environmental effects of accidents, malfunctions, or unplanned events, for both the Status Quo and Project, are rated not significant.

Fish Habitat and Fish

Two of the Project Objectives are to achieve a long-term solution to fish passage and improvement of habitat for softshelled clams and other shellfish. Key issues related to fish habitat include the fishway structure and associated fish passage concerns, water quality, and sediment quality.

A significant negative residual environmental effect on fish habitat would be one that results in:

- a non-compensated harmful alteration, disruption or destruction of the spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes; and/or
- the concentration of specific water quality parameters exceeding Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Aquatic Life; and /or

- the concentration of specific sediment quality parameters exceeding background concentrations and the CCME sediment Probable Effect Levels (PEL) on Aquatic Life, for a sufficient duration and over a sufficient area that an exceedance of the significance criteria for fish may occur.

"Fish" is defined under the *Fisheries Act* as fish, shellfish, crustaceans, marine animals, and any parts of them, as well as the eggs, sperm, spawn, larvae, spat, and juvenile stages of fish, shellfish, crustaceans, and marine animals. No fish Species of Conservation Concern or Species at Risk are known to inhabit the Assessment Area.

A significant negative residual environmental effect on fish is one that affects fish in such a way as to cause a decline in abundance, or an undesirable increase in the population or change in distribution of common and secure species, of indicator/representative fish species over one or more generations within the regional population, and natural recruitment may not re-establish the population(s) to its original level.

Evaluation of Potential Environmental Effects

Status Quo

Under the Status Quo, the fishway structure will continue to be an impediment to fish passage, water quality issues will persist in the impoundment, and sediment quality issues involving grain size and lack of suitable clam habitat below the dam will also persist. Native anadromous fish species will continue to be prevented from accessing the Eel River for life cycle purposes. Softshelled clams and other shellfish will remain absent from the freshwater impoundment and limited by unsuitable habitat in the estuary below the dam. The Status Quo does not meet the Project Objectives and will continue to result in significant environmental effects on Fish Habitat and Fish.

The Project

Fish Habitat

Given that the Project itself is aimed at the effective removal of the Eel River dam to rectify the fish passage concern, the fish passage Project Objective will be achieved. There are no expected conditions that would lead to the impairment of water or sediment quality with respect to the CCME guidelines. The release of accumulated sediments to the current Eel River estuary and Eel Bay as a result of the Project is not expected to be substantial, and any environmental effects will be short in duration and are predicted to be not significant. Water quality concerns and sediment quality issues will be rectified with the return of mudflats similar to pre-dam conditions, and clam stocks will have the opportunity to replenish. As such, the Project Objective of improving habitat for softshelled clams and other shellfish will be met. Overall, the Project will result in positive environment effects on fish habitat.

Fish

The Project will restore free passage for anadromous and diadromous fish species that use Eel River for spawning or rearing purposes, and the restoration of estuarine conditions and mudflat habitat will provide the opportunity for the replenishment of softshelled clam stocks. As the primarily freshwater conditions of the current impoundment will become estuarine, there will be a loss of freshwater fish in the impoundment. However, these species will be replaced by those that prefer estuarine environments, there will be no net loss of fish habitat, and regional biodiversity may be improved. Overall the Project will result in positive environment effects on fish.

Accidents, Malfunctions, and Unplanned Events

There are no foreseeable features of the Status Quo that would result in accidents, malfunctions or unplanned events that would lead to a significant environmental impact on Fish Habitat and Fish.

There is a possibility that hazardous materials used during Project activities could be accidentally spilled and introduced into the Eel River, which could temporarily degrade water quality, sediment quality, and fish habitat, and directly kill fish. Mitigation measures outlined in the EMP will protect against such spills and provide for their safe and effective clean-up.

Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, the environmental effects of accidents, malfunctions or unplanned events on Fish Habitat and Fish in the Assessment Area, for both the Status Quo and the Project, are rated not significant.

Terrestrial Environment

The key elements of the Terrestrial Environment VEC are wetland and vegetation, wildlife, and Species of Special Conservation Concern.

A significant negative residual environmental effect on wetland is one that would not result in a net increase of wetland area towards that which existed before the dam was built, and a net increase in salt marsh.

A significant negative residual environmental effect on vegetation in wetland and riparian areas is one that:

- causes a decline in common and secure populations in the region of indicator/representative species over one or more generations, and natural population growth may not re-establish the population(s) to original levels; and/or
- causes riparian habitat within the Assessment Area to be altered physically, chemically, or biologically, in such a way as to substantially reduce the likelihood of the long-term survival of Species of Conservation Concern population(s) within the regional population; and/or
- causes direct mortality of many individuals or communities substantially reducing the likelihood of the long-term survival of Species of Conservation Concern population(s) within the regional population; and/or
- in the case of “Species of Special Concern” listed in Schedule 1 of SARA, includes Project activities that are not in compliance with the objectives of management plans (developed as a result of Section 65 of SARA) that are currently in place.

A significant negative residual environmental effect on wildlife would be the same as for vegetation.

- causes a decline in common and secure populations in the region of indicator/representative species over one or more generations, and natural population growth may not re-establish the population(s) to original levels; and/or
- causes wildlife habitat within the Assessment Area to be altered physically, chemically, or biologically, in such a way as to substantially reduce the likelihood of the long-term survival of Species of Conservation Concern population(s) within the regional population; and/or

- causes direct mortality of many individuals or communities substantially reducing the likelihood of the long-term survival of Species of Conservation Concern population(s) within the regional population; and/or
- in the case of “Species of Special Concern” listed in Schedule 1 of *SARA*, includes Project activities that are not in compliance with the objectives of management plans (developed as a result of Section 65 of *SARA*) that are currently in place.

Evaluation of Potential Environmental Effects

Status Quo

Under the Status Quo, it is expected that current regional population levels of common native vegetation and wildlife will remain stable for the foreseeable future. Purple Loosestrife and Flowering Rush, which are alien invasive species, will continue to spread and eventually dominate the wetland and shoreline. Six plant Species of Conservation Concern were identified in the Assessment Area, and no substantive change in these plant populations is expected under the Status Quo for the foreseeable future. No wildlife Species of Conservation Concern are known to exist in the Assessment Area. The environmental effects of the Status Quo on the Terrestrial Environment (wetlands, vegetation, wildlife) are rated not significant.

The Project

Wetland

The restoration of unrestricted tidal flow to the entire estuary will cause a permanent change in wetland vegetation within the impoundment area by reducing the amount of freshwater marsh and re-establishing of salt marsh habitat towards levels similar to those that existed before construction of the dam. It is possible that a small amount of salt marsh in the estuary below the dam, which may have developed recently due to sediment accumulation caused by dam construction, could be reduced in size or removed entirely by tidal scouring as a result of the Project. It is also possible that it will not change in size, since it is located in a protected part of the estuary. As the Project will result in a net increase in wetland and salt marsh areas, the environmental effects of the Project on wetlands are rated positive.

Vegetation

The Project is expected to cause major permanent change in wetland vegetation within the area of the impoundment in response to restored tidal flow. However, no common vegetation species will suffer a decline that could measurably alter the regional population levels, with the possible exception of Purple Loosestrife and Flowering Rush, which are likely to be severely reduced or eliminated from the lower impoundment area. Since these are alien invasive species that are associated with negative affects on native vegetation, this is considered to be a benefit of the Project.

Tufted Loosestrife, Water-flaxseed and Marsh Horsetail, which will not tolerate tidal conditions in the lower estuary, will probably be reduced or eliminated from the impoundment area following dam removal. These species are relatively uncommon but are considered “Secure” in New Brunswick by NBDNR, and it is likely that they occur in freshwater habitats upstream along Eel River and in the surrounding region.

Lesser Panicled Sedge may tolerate the tidal conditions in the lower estuary, given its ability to exist along coastlines. It is possible for these populations to change location within the estuary or to increase or decrease in area following dam removal. The species is relatively uncommon but considered “Secure” in

New Brunswick by NBDNR, and may be more common than currently documented.

Estuary Sedge and Cursed Crowfoot are both capable of tolerating tidal conditions in the estuary. It is possible for these populations to change location within the estuary or to increase or decrease in area following dam removal. These species are considered by NBDNR to be “Sensitive”, and “May Be At Risk”, respectively.

Overall, the Project is not expected to result in direct mortality of individuals or communities of Species of Special Conservation Concern to such an extent that such communities would reduce the likelihood of the long-term survival of regional populations. Moreover, the creation of locally uncommon salt marsh will improve opportunities to establish communities of Species of Special Conservation Concern and to improve local and regional biodiversity. The environmental effects of the Project on vegetation Species of Special Conservation Concern are therefore rated not significant, and may be positive.

Wildlife

The Project will result in wildlife species dependant on freshwater habitat moving out of the area of the current impoundment, while species dependant on saltwater habitat may move in. Freshwater habitat will continue to be available upstream and elsewhere in the region for any wildlife species (*e.g.*, muskrat) displaced by the change in habitat type. Common wildlife habitat that may be affected by Project activities is restricted to the wetland and shoreline habitats. Current population levels of common native wildlife are expected to remain stable for the foreseeable future, under the Project. No wildlife Species of Conservation Concern are known to occur in the Assessment Area. Overall, the environmental effects of the Project on wildlife are rated not significant.

Accidents, Malfunctions, and Unplanned Events

There is a possibility that hazardous materials used during Decommissioning could be accidentally spilled and introduced into Eel River. These materials could temporarily degrade water quality and wetland habitat, resulting in displaced habitat, reduced wetland function, and direct mortality of vegetation Species of Conservation Concern, as well as the possible ingestion/uptake of contaminants by wildlife. Mitigation measures outlined in the EMP will reduce the likelihood and potential volumes of such spills (probably less than 200 litres), and provide for their safe and effective clean-up, should they occur. Environmental effects of accidents, malfunctions or unplanned events would be of limited magnitude and very short duration.

Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, potential accidents, malfunctions or unplanned events on Terrestrial Environment are not likely and, should they occur, are predicted to be not significant.

Migratory Birds

Migratory birds are known to be in the Assessment Area during certain periods of the year, and are protected under the *Migratory Birds Convention Act*.

A *significant negative residual environmental effect* on Migratory Birds would be the same as for vegetation and wildlife.

Evaluation of Potential Environmental Effects

Status Quo

No Species of Conservation Concern in the Assessment Area are known to rely on the impoundment area for critical habitat. The birds that currently frequent the impoundment are species adapted to freshwater and related wetlands and riparian habitat, and will continue to use the impoundment under the Status Quo. The environmental effects of the Status Quo on Migratory Birds are rated not significant.

The Project

The saltwater habitat below the dam, used by several birds species including wading birds and ducks, will remain substantially unchanged as a result of the Project. The current freshwater impoundment will be converted to a saltwater environment, similar to pre-dam conditions. Many of the birds present in the current impoundment area have the ability to exist in saltwater environments as well. Moreover, the creation of locally uncommon salt marsh will improve opportunities to establish communities of migratory birds and improve local and regional biodiversity.

Although no Species of Conservation Concern are known to currently rely on the Assessment Area for critical habitat, the potential exists that the Project will provide suitable habitat for the Piping Plover. Therefore, the environmental effect on this listed species is rated significant and positive. Barrow's Goldeneye may be drawn into the expanded estuary, following dam removal, and the presence of the Great Blue Heron, which inhabits both saltwater and freshwater marshes, is not expected to change.

Overall, the environmental effects of the Project on Migratory Birds and Migratory Bird Species of Conservation Concern are rated not significant and may be positive.

Accidents, Malfunctions, and Unplanned Events

There is a possibility that hazardous materials used during Decommissioning could be accidentally spilled and introduced into Eel River. These materials could temporarily degrade water quality and wetland habitat, resulting in the ingestion/uptake of contaminants by wildlife including migratory birds. However, mitigation measures outlined in the EMP will reduce the likelihood of and protect against such spills, and provide for their safe and effective clean-up, should they occur.

Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, potential accidents, malfunctions or unplanned events on Migratory Birds are not likely and rated not significant.

Species at Risk

A *significant negative residual environmental effect* on Species at Risk would be one that affects species listed in Schedule 1 of SARA as "Extirpated," "Endangered," or "Threatened." It would result in a non-permitted violation of any of the prohibitions stated in Sections 32–36 of SARA, or in Section 3 of the New Brunswick *Endangered Species Act* (NB ESA).

Evaluation of Potential Environmental Effects

Status Quo

The Provincial Department of Natural Resources (NBDNR) has declared four bird Species at Risk: Bald Eagle, Peregrine Falcon, Harlequin Duck and Piping Plover. The impoundment has habitat suitable for foraging for the first three, which are occasional visitors, but it is not considered critical habitat for any of these. The habitat at the impoundment is not conducive to Piping Plovers, which select open sand beaches on which to nest and forage. No other Species at Risk (wildlife, fish, or vegetation) have been identified in the impoundment area and therefore no direct environmental effect is expected. However, it is possible that some Species at Risk could, in the future, use habitat available in the impoundment. Overall, as the Status Quo will not change habitat characteristics, the environmental effects of the Status Quo on Species at Risk are rated not significant.

The Project

Due to the fact that the impoundment has not been identified to be critical habitat for Species at Risk in the Assessment Area, potential environmental effects of its removal are expected to be nominal. It is possible that some Species at Risk, including those that currently visit occasionally, could use habitat available in the restored estuary in the future.

Removal of the dam will cause restoration of full tidal flow to the estuary, which will restore the impoundment into a saltwater estuary and saltwater wetland. Since estuary and saltwater wetlands are limited in the region they are considered more valuable for Species at Risk than the more common freshwater habitats. It is also likely that the area of wetland will increase, which will further enhance the potential for Species at Risk to use the area. Other potential benefits associated with the Project include improved water quality and reduced (or eliminated) populations of invasive plant species that could dominate and displace potential habitat for Species at Risk in the current impoundment.

Overall, the environmental effects of the Project on Species at Risk are rated not significant and may be positive due to the creation of saltwater wetlands and estuarine conditions.

Accidents, Malfunctions, and Unplanned Events

Accidents, malfunctions and unplanned events do not pose a potential environmental effect on Species at Risk due to their absence or limited presence in the Assessment Area. Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, potential accidents, malfunctions or unplanned events on habitat for Species at Risk in the Assessment Area are not likely and, should they occur, are predicted to be not significant.

Water Resources

The Water Resources VEC is comprised of two components: surface water; and water resources infrastructure. Groundwater was originally considered as a third component; however, there are no groundwater users within the potential zone of influence of the Status Quo or Project, and no environmental effects to groundwater resources are anticipated as a result of the Project. A key issue with regard to surface water is the potential environmental effects of the Project on current users of water from the impoundment and distributed through the Dalhousie Industrial Water System (DIWS), and the potential for replacement of this surface water supply with another source. Efforts to find a replacement

water supply for fire protection for the Dalhousie Community Health Centre are progressing rapidly, effectively leaving NB Power as the last remaining user of the DIWS.

A significant negative residual environmental effect on the surface water is considered to be one that results in a loss of adequate freshwater supply to current users of the DIWS.

A significant negative residual environmental effect on the water resources infrastructure is considered to be one that results in damage to existing water resources infrastructure and subsequently interruption of service to current users.

Evaluation of Potential Environmental Effects

Status Quo

Given that the DIWS is already and will continue to be an inadequate freshwater supply for industrial or municipal use, the potential environmental effects of the Status Quo on surface water are rated not significant. The Charlo River water supply watermain does not appear to be affected by the existing conditions; therefore the Status Quo is not expected to result in environmental effects on water resources infrastructure component of the Water Resources VEC.

The Project

Surface Water

The Project will result in the loss of immediate freshwater supply for the NB Power generating station. Following the restoration of free tidal flow, the water level and type of water will not be suitable for use as a freshwater supply, nor will the necessary infrastructure (*e.g.*, dam, pumping station) be in place and/or operational. However, the DIWS is already an inadequate freshwater supply for industrial or municipal use, continued use may infringe upon Aboriginal interests, potential alternate water supply sources are available to NB Power, and future liabilities and costs for the provision of a water supply already rest with NB Power. Therefore, because the water supply is effectively already lost to NB Power, the potential negative environmental effects of the Project on surface water are rated not significant.

Water Resources Infrastructure

The Project has the potential to cause damage to the portion of the Charlo River water supply watermain that is buried beneath the current Eel River impoundment area, should the watermain be unable to withstand the restored flow of tidal waters over the ground surface. However, it is highly unlikely that this would be the case since the watermain has been in place since 1929. The Charlo River water supply watermain was capable of withstanding the flow of tidal water in the Eel River prior to the construction of the Eel River dam, and the Project is expected to restore the flow of water in the Eel River to pre-dam conditions. In addition, Bowater Maritimes Inc. has recently installed a new high density PVC watermain inside the existing cast iron pipe. During construction, the proposed rock infill dam will protect against excessive erosion to ensure that the buried watermain is not affected. Therefore, the Project is not expected to result in environmental effects on the water resources infrastructure.

Accidents, Malfunctions, and Unplanned Events

There are no foreseeable features of the Status Quo or the Project that would result in accidents, malfunctions or unplanned events that would lead to a significant negative environmental impact on

Water Resources, other than unplanned erosion of the Charlo River water supply watermain that would interrupt the supply to water users. The likelihood of such an unplanned event is very low and any damage could be repaired in a matter of days (at least with temporary repairs). Any other accidents, malfunctions or unplanned events that may occur as a result of the Status Quo or Project would likely be corrected by initiating immediate actions, or implementing mitigation, to cease, control, or prevent a reoccurrence of these events (*e.g.*, hazardous materials spill due to equipment fuelling or faulty vehicle components). The potential environmental effects of both the Status Quo and the Project on accidents, malfunctions and unplanned events with respect to Water Resources are rated not significant.

Vessel Navigation

A *significant negative residual environmental effect* is one where the Project restricts or degrades the existing opportunity for vessel navigation in the Assessment Area such that there is a non-compensated net loss of the opportunity for vessel navigation in the Assessment Area.

Evaluation of Potential Environmental Effects

Status Quo

The Status Quo is expected to maintain the present limited opportunities for vessel navigation above the dam, but the dam will continue to be an obstruction to continuous navigation for all vessels. The continuing process of sediment accumulation in the Eel River estuary may further reduce the width of the inlet over time, impeding vessel navigation. The environmental effects of the Status Quo on vessel navigation are anticipated to be neutral to negative, but not significant.

The Project

The Project will result in the restoration of the pre-dam tidal exchange and channel dimensions, including the pre-dam width of the inlet of 100 m. Therefore, it is anticipated that pre-dam navigation conditions will be restored quickly upon removal of the dam.

The Project will result in the loss of some navigation opportunity above the dam as portions of the estuary will be high and dry during low tide that would have been consistently under water in the impoundment. However, navigation conditions in the impoundment have deteriorated in recent years, largely due to eutrophic conditions causing excessive aquatic vegetation that fouled propellers.

Increased depth of the tidal inlet will provide the opportunity for recreational powerboat access to the estuary from Eel Bay. With the removal of the dam, canoes, kayaks and small vessels will have the potential to navigate from the Village of Eel River Crossing to Eel Bay without obstruction. The Project will result in the loss of the unofficial boat access near the existing control structure. However, boat access will remain in the Village of Eel River Crossing.

Vessel traffic may be temporarily restricted near the dam during Decommissioning. In the long term, however, after removal of the dam, access to the estuary from Eel Bay will be greatly improved and navigation opportunity within the estuary will be well suited for those that want to enjoy navigating small craft in a natural setting. Therefore the environmental effects of the Project on vessel navigation during Decommissioning are considered to be negative but not significant, and positive after Decommissioning.

Accidents, Malfunctions, and Unplanned Events

Accidents, malfunctions and unplanned events are not anticipated to affect vessel navigation.

Transportation Network

A *significant negative residual environmental effect* is one that results in a substantial reduction in the Level of Service (LOS), continuous or semi-continuous impediment of traffic flow, or the permanent physical loss of any portion of the road transportation network as a result of the Project Options or the Status Quo.

Evaluation of Potential Environmental Effects

Status Quo

The Status Quo is not anticipated to negatively affect the LOS of the road network or the road infrastructure within the Assessment Area during normal operating conditions, and will not affect the operation or infrastructure of the CN Rail line. Therefore, the Status Quo is not anticipated to result in significant environmental effects on the Transportation Network.

The Project

The Project will result in increased construction-related traffic during Decommissioning. Some of this traffic will be workers going to and from the work site, but the majority of the traffic will be trucks hauling the removed dam material from its present location to a disposal/re-use site. An ultimate disposal site has not been selected, but the likely trucking route will be from the south end of the dam to Route 280 south to Highway 11 interchange with one grade crossing at the CN Rail line. The excavation and hauling portion of Stage 2 will take approximately 8 weeks, for an average of approximately 90 truck passes per day over a given section of the hauling route. The excavation and hauling portion of Stage 3 will take approximately 10 weeks, for an average of 120 truck passes per day over a given section of the Route 134 hauling route. No decrease of the LOS value is anticipated. Therefore, although the Decommissioning period of the Project will result in negative environmental effects on the Transportation Network traffic levels that are measurable, these environmental effects are considered as not significant.

The Project may indirectly result in increased traffic during the summer months if the restoration of the natural estuary leads to increased tourism in the Assessment Area. It is not anticipated that tourism-related traffic increases would be of sufficient magnitude or duration to result in a significant environmental effect on the Transportation Network. The volume or flow of traffic on the CN Rail line will not be affected by the Project. Although the Project will increase tidal energy back to pre-dam conditions, this is not expected to result in significant negative environmental effects from increased tidal energy or increased erosive forces of ice acting on the Transportation Network infrastructure.

Accidents and Malfunctions

The increased level of traffic as a result of the Project will result in a very small increase to the potential for vehicular collisions. However, this traffic increase will be very small in magnitude (*i.e.*, a few extra trucks per day), limited to the route between the dam and the disposal/reuse site, temporary (*i.e.*, less than 5 months), and reversible. The environmental effects of these on the transportation network in the Assessment Area are predicted to be not significant. There are no other accidents, malfunctions or

unplanned events associated with the Project that are anticipated to occur that would affect the Transportation Network VEC.

Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons

Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons refers to the use of lands and waterways, and resources within those lands and waterways, that are within the zone of influence of Eel River bar or on adjacent lands potentially affected by the Status Quo and/or the Project. It includes contemporary hunting, fishing and gathering activities for subsistence purposes as well as the use of lands and resources for social and ceremonial activities.

A significant negative residual environmental effect is one where the Project or Status Quo would result in an unmitigated long-term negative change in the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons.

Evaluation of Potential Environmental Effects

Status Quo

The Status Quo will not reverse the reported significant adverse environmental effects to the Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons as a result of dam construction, such as reduced availability of activities such as gathering of various plant species, hunting, fishing, swimming and boating. It is unlikely that these activities will resume if the Status Quo is maintained. In addition, some sections of reservation land owned by ERBFN at the time of the dam's construction were permanently flooded, reducing the ability of First Nations members to use the resources in these locations. The continued presence of the dam would perpetuate this problem.

The creation of the impoundment has contributed to the development of substantial populations of beaver and muskrats. Most of the trapping is carried out by non-First Nations people and groups, however, and the continued presence or removal of the dam is not expected to affect trapping by ERBFN members.

It is not known if the Aboriginal Heritage Gardens (AHG), will be negatively affected by the continuation of the Status Quo. It is likely, however, that related tourism initiatives that may be planned by ERBFN in future (such as boating or fishing excursions associated with the AHG, or with their ecotourism program on Heron Island) may be less viable or less profitable if the Status Quo is maintained.

Overall, due to the continued loss of aquatic resources and plant harvesting areas, the potential negative environmental effects of the Status Quo on Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons are predicted to be significant.

The Project

The Project is anticipated to reverse the majority of the negative trends that have taken place since the construction of the dam, regarding available resources that were used in traditional ways by the ERBFN members. Fish passage will be restored including the opportunity for fish stocks to return, water quality will be improved in the impoundment area, and clam habitat will be improved. With the restoration of floodplain areas, there may be a corresponding increase in the presence of plants that are gathered for traditional purposes, such as blueberries and sweetgrass. The increase in traditional plant and animal

resources will only serve to reinforce the ecotourism potential of this area, and may promote both economic and cultural growth opportunities for ERBFN. In addition, the use of the areas near the dam for boating and swimming could potentially be restored. The loss of muskrat populations in the impoundment is negative, but is greatly offset by other positive environmental effects. Overall, the potential environmental effects of the Project on Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons are predicted to be positive.

Accidents and Malfunctions

Although the potential exists for a hazardous material spill to temporarily impact Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons, with proper mitigation long-lasting effects are not anticipated. Based on consideration of the potential environmental effects and the residual environmental effects significance rating criteria, and the environmental effects of accidents, malfunctions and unplanned events, the effects of the Project on Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons in the Assessment Area are anticipated to be positive.

Tourism and Recreation

Tourism is identified as commercial activity realized by the attraction of visitors to the tourism area. The Tourism attraction is identified as the natural, artificial or cultural attributes and supporting infrastructure (e.g., accommodations, restaurants, and cultural/heritage facilities) that appeals to and serves tourists.

Recreation is defined as any physical activity and supporting infrastructure located on or adjacent to the Eel River system (Eel River, impoundment, estuary and Eel Bay) that are reliant on the river and its conditions for the enjoyment of those activities. These activities include hiking, hunting/trapping, bird watching, swimming, boating, canoeing, kayaking, recreational fishing and bird watching and any supporting infrastructure such as riverside trails and boat facilities.

A significant negative residual environmental effect on Tourism and Recreation is one that results in net long-term losses in tourism or recreational opportunity, compared to conditions observed in 2004 and 2005, that cannot be compensated.

Evaluation of Potential Environmental Effects

Status Quo

As the current limited opportunities for recreational fishing and impoundment-based activities are not expected to change under the Status Quo, the environmental effects of the Status Quo on Tourism and Recreation will be small to non-existent, and are considered to be neutral. However, the Status Quo does not appear to provide opportunity for the improvement or enhancement of Tourism and Recreation activities in the Assessment Area.

The Project

The Project will result in the loss of the freshwater impoundment, and the restoration of the full former extent of the Eel River estuary. The freshwater fish habitat of the impoundment will be replaced with a more natural saltwater marsh habitat. The improved tidal energy will also improve overall water quality and will provide the opportunity for the re-establishment of clam populations and saltwater marsh.

The Project will result in negative environmental effects, but not significant, on trapping and hunting, and negative environmental effects on current recreational fishing activities will be mitigated by new fishing opportunities. Loss of opportunity for the viewing of migratory birds that prefer freshwater habitat is considered to be negative but not significant because these species can be commonly seen elsewhere in nearby freshwater habitat. The environmental effects of the Project on trail infrastructure are considered to be neutral.

The restoration of natural estuarine conditions is anticipated to result in improved opportunity for nature-based tourism and recreation activities, including swimming, boating, recreational fishing for sea-run brook trout, Atlantic salmon, American eel and rainbow smelt, and to have positive environmental effects on recreational viewing of estuarine migratory birds by locals and tourists. The Project will also result in the opportunity for the re-establishment of clam populations and this will provide increased opportunity for the harvesting of clams as a recreational activity should DFO remove the closed status of this fishery.

The hydrodynamic investigation did not predict that the Project will lead to erosion affecting the Aboriginal Heritage Gardens and/or Blue Heron Campground. However, shoreline protection will be implemented as contingency if erosion is observed along the southern shore of the estuary after the dam is removed. Restoration of the natural estuarine environment of Eel River is considered desirable for the intended purposes of the Aboriginal Heritage Gardens. Therefore, the Project will have positive environmental effects on the potential for the Aboriginal Heritage Gardens to attract visitors, and this may lead to increased business for Tourism services such as accommodations, restaurants and gas bars.

Overall, although the Project will result in some negative environmental effects on hunting and trapping activities and the viewing of migratory birds that prefer freshwater habitat, the overwhelming majority of the environmental effects of the Project on Tourism and Recreation are expected to be positive.

Accidents and Malfunctions

There are not expected to be any accidents, malfunctions or unplanned events that would have a significant negative environmental effect on Tourism and Recreation. In the event that erosion (an unplanned event) is observed along the south shore of the estuary, then appropriate shoreline protection will be implemented.

Labour and Economy

A significant negative residual environmental effect on labour is one that directly affects the current supply and demand of skilled and unskilled labour, ultimately causing degradation to the production base such that there is an uncompensated net loss of employment opportunity that extends beyond the period of Decommissioning.

A significant negative residual environmental effect on the economy is one that induces negative measurable changes in the regional economy and the ERBFN that extend beyond the period of Decommissioning.

Evaluation of Potential Environmental Effects

Status Quo

All current employment opportunities associated with the Eel River impoundment, estuary, and Eel Bay are expected to continue under the Status Quo. Ultimately, the control structure and DIWS infrastructure will require repair or replacement, generating some employment opportunity with short-term economic benefits. Overall, the Status Quo would have a positive environmental effect on Labour and Economy during the period that the DIWS and dam control structure were under repair or replacement, and a neutral environmental effect outside of that period.

The Project

Due to the infrequent maintenance requirements and limited labour associated with the operation, maintenance or repair of the dam control structure and the DIWS, the elimination of this work as a result of the Project is not expected to have a significant negative environmental effect on labour.

During the Decommissioning period, labour demand will be created and materials and services will be required for a period of up to 2 years. This will create a net short-term gain in employment opportunity and an increase in the local economy, contributing to an overall positive environmental effect on Labour and Economy during that period.

After Decommissioning, the replacement of “coarse” freshwater fish species with restored populations of valued diadromous commercial fish species and clams represents a potential positive environmental effect on Labour and Economy in the Assessment Area as this may lead to increased commercial or Aboriginal fishing opportunity. In addition, the Project is anticipated to increase the potential number of visitors to the Aboriginal Heritage Gardens. This may require the need for more staff at the Aboriginal Gardens, and may also indirectly lead to economic benefits to local businesses that provide goods or services for tourists. Therefore the Project is anticipated to result in long-term positive environmental effects to Labour and Economy within the Assessment Area.

Accidents and Malfunctions

In the unplanned event that the Project resulted in damage to the Bowater water line infrastructure, then there would be significant negative environmental effects on Labour and Economy in the Town of Dalhousie and for the owners and employees of the Bowater paper mill. However, the Project is not anticipated to affect the Bowater water line and therefore this unplanned event is considered to be highly unlikely. There are no other accidents, malfunctions or unplanned events associated with the Project that are anticipated to occur that would affect Labour and Economy within the Assessment Area.

Archaeological and Heritage Resources

Archaeological and Heritage Resources are defined as any physical remnants found on top of and/or below the surface of the ground that inform us of past human use of and interaction with the physical environment, including historic structures and palaeontological resources. Significant archaeological resources are defined as those sites, such as living areas, that can inform us on the customs and living practices of the Mi'kmaq and early European settlers on and around Eel River. Individual artefacts are not typically considered significant as they provide only minimal information on the past.

A *significant negative residual environmental effect* is a Project-related disturbance to, or destruction of, an archaeological or heritage resource (including palaeontological resources) considered by the provincial heritage and archaeological regulators to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, that cannot be mitigated.

Evaluation of Potential Environmental Effects

Status Quo

The Status Quo can be expected to cause minimal damage to the historic (*i.e.*, pre-dam) shorelines of Eel River through continued erosion along the southern shoreline of the impoundment. The potential negative environmental effects of the Status Quo on Archaeological and Heritage Resources are likely to be not significant, but may be significant due to a disruption of currently unknown resources.

The Project

It is probable that a number of previously unrecorded and/or unidentified archaeological and heritage resources may exist along the Eel River. Therefore, the initial placement of rip-rap on the shoreline at Blueberry Point should be preceded by an archaeological assessment of the shoreline. It is also likely that a staging area will be created for the second stage of construction, and therefore once the location for this area is confirmed, an archaeological survey and testing of this location will be required.

The removal of the northern 150 m of the dam is anticipated to result in the rapid return of water levels in the impoundment to pre-dam levels, with the possibility that sections of newly exposed shoreline, floodplains and islands may be subjected to erosion. Therefore it is recommended that all shoreline areas in the current impoundment and upriver portions that have been flooded as a result of the dam undergo a comprehensive archaeological survey, once water levels in the impoundment area have decreased and ground conditions allow. If any archaeological sites are encountered during this survey, their condition will need to be evaluated in relation to the threat that may result from erosion, and the threat from unauthorized digging and theft of artifacts once exposed.

The potential negative environmental effects of the Project on Heritage and Archaeological Resources, in consideration of the residual environmental effects significance rating criteria and the suggested mitigation, are predicted to be not significant.

Accidents and Malfunctions

In the event of a hazardous material spill along a shoreline, contaminated soil will have to be excavated and disposed of. The provincial regulator may, depending upon the potential of the location, require that a licensed archaeologist be present as the soil is excavated in the event that the contaminated site contains archaeological material. If a hazardous materials spill is located in an area where it may rapidly become a threat to human health or wildlife safety, however, then containment should proceed immediately, regardless of the presence of an archaeologist.

The Project has the potential to result in an accidental disturbance to archaeological resources. Depending on the nature, extent and magnitude of the disturbed resource, the environmental effect could be significant, but this is considered very unlikely to occur, as the Project is not anticipated to result in erosion or scouring of land beyond what existed prior to 1963. If an unknown archaeological or heritage resource is encountered during construction, then all work should be stopped in the immediate area, and the Archaeological Services Unit should be contact for guidance.

Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, the environmental effects of Accidents, Malfunctions and Unplanned Events on Archaeological and Heritage Resources in the Assessment Area are predicted to be not significant.

Public Health and Safety

The Status Quo and Project have the potential to result in environmental effects on Public Health and Safety arising primarily from unplanned natural events (storms, extreme high tides) that are made worse by the Project, or through changes in the environment that may have implications for public health and safety (*i.e.*, flooding, contaminated water with coliform bacteria, or contaminated food resources). Traffic accidents are considered as part of the Transportation Network VEC.

A significant negative residual environmental effect on Public Health and Safety from flooding is one that would result in an increase in risk to Public Health and Safety over the existing conditions. Upstream flooding in excess of elevation 3.4 m is considered an exceedance of existing conditions.

*A significant negative residual environmental effect on Public Health and Safety from recreational contact of bacteriological contaminated waters would result when the CCME recreational guideline of 200 fecal coliforms (*E. coli*) per 100 mL is exceeded.*

*A significant negative residual environmental effect on Public Health and Safety would occur when food resources (*e.g.*, fish and clams) are contaminated beyond the maximum limits established in the *Canadian Food and Drugs Act* (1991). A significant negative residual environmental effect on Public Health and Safety would also occur when the most probable number (MPN) of fecal coliforms in water exceed a median or geometric mean of 14 per 100 mL and 10 percent of the samples exceed 43 fecal coliforms per 100 mL in areas approved for shellfish harvesting. These are Environment Canada's bacteriological standards for the consumption of shellfish in shellfish harvesting waters in Canada.*

Evaluation of Potential Environmental Effects

Status Quo

Flooding and Flood Risk

Currently, the dam limits storm surge and extreme high tide in the estuary from entering the impoundment, and this protection will continue under the Status Quo. Occasional flooding occurs below the 3.4 m level, likely a result of a backwater effect at the control structure during peak runoff events, but this is a temporary inconvenience and no property damage occurs. Under the Status Quo, the dam would continue to result in some flooding upstream, but not to a level that would be different from existing conditions. Overall, the environmental effect of the Status Quo on the flooding and flood risk component of Public Health and Safety is rated not significant.

Bacteriological Environment

The bacteriological water quality in the impoundment has shown signs of general improvement in 2005, likely as a result of the Eel River Crossing sewage lagoon and outfall decommissioning, but relatively higher levels of fecal coliform bacteria persist upstream of the impoundment and in the estuary. Under the Status Quo, the bacteriological environment is expected to remain similar to current conditions for the

foreseeable future, and is likely an indirect result of the presence of the dam. The environmental effects are considered to be negative and significant because of the potential for public health and safety issues through recreational contact and exposure to coliform-containing waters.

Food Resource Contamination

The food resources in the Assessment Area, including resident fish species upstream of the dam and clams in the estuary, are not contaminated with bioaccumulating chemicals (such as metals, including mercury, and PCBs) to a level of concern as defined by the maximum limits for contaminants under the *Canadian Food and Drugs Act*. The fecal coliform concentrations measured in 2005 by Environment Canada in the estuary and along Eel River bar in the bay, however, are sufficiently high to maintain the ban on harvesting clams in these shellfish areas.

Sediment infilling, reduced capacity of the tides to flush the estuary and a smaller tidal prism, related to the presence of the dam, are likely contributing to the retention of fecal matter produced by waterfowl in the estuary. This is contributing to a public health risk from coliform-contaminated food resources, specifically the clams in the estuary and bar. The bacteriological contamination of this food resource may be expected to remain unchanged for the foreseeable future under the Status Quo, and therefore the environmental effects are rated negative and significant.

The Project

Flooding and Flood Risk

It is conceivable that the impoundment area may be subject to additional flooding risk in the distant future as a result of extreme high tide and sea level rise due to global warming, but the maximum rise in water level is not expected to exceed 3.4 m within the next 10 years, nor even by the year 2100. The potential negative environmental effects of the Project on flooding are therefore predicted to be not significant.

Bacteriological Environment

The restoration of unrestricted tidal flow to the entire Eel River estuary will greatly reduce the build-up of fecal coliform bacteria in the estuary to levels that are well below the CCME guidelines for recreational contact. Upstream of the dam, the Project will not dilute the concentration of coliforms to any appreciable level in the vicinity of the Village of Eel River Crossing as the intrusion of salt water will not likely reach this point with the tide, even though the water level at this location will fluctuate with the tide cycle. However, restoration of unrestricted tidal flow throughout the estuary will promote the flow of coliform-containing waters out of this area with the outgoing tide, and reduce the optimal conditions for coliform survival (*e.g.*, higher flow and less warm temperatures). Overall, the Project will result in positive environmental effects on the bacteriological environment and Public Health and Safety.

Food Resource Contamination

The Project over the long term may potentially reduce the level of heavy metals and mercury in food resources within the area of influence of the tidal prism, specifically on filter-feeding aquatic animals like mussels and clams. Fecal coliform concentrations in the estuary and along Eel River bar may be reduced below bacteriological water standards of Environment Canada for shellfish growing areas. The environmental effects are considered to be positive because of the potential reduction in public health risk from coliform bacteria in shellfish growing areas, the possibility of lifting the ban on the harvesting of shellfish in the Assessment Area, and the opportunity for the restoration of these fisheries.

Accidents and Malfunctions

As excavation of the dam will occur during the ice-free period, and the rock wall barrier will control the rate at which water enters the impoundment area, the potential environmental effects on Public Health and Safety from Accidents, Malfunctions and Unplanned Events on flooding and flood risk in the Assessment Area are not likely and are predicted to be not significant.

There is a possibility that sewage wastes from temporary holding facilities or during pumping for transport may be accidentally spilled and introduced into Eel River during Decommissioning. There is also a possibility that hazardous materials used during Decommissioning could be accidentally spilled and introduced into Eel River. These materials could temporarily degrade water quality and contaminate food resources in the water and on dry land if released there. Environmental effects will be of limited magnitude and very short duration, as mitigation measures outlined in the EMP will reduce the likelihood and potential volumes of such spills, and provide for their safe and effective clean-up, should they occur. Environmental effects on Public Health and Safety from sewage wastes or hazardous materials spills in the Assessment Area, therefore, are not likely and are predicted to be not significant.

Based on consideration of the potential environmental effects, the proposed mitigation, and the residual environmental effects significance rating criteria, potential effects from Accidents, Malfunctions and Unplanned Events on Public Health and Safety from contamination of food resources in the Assessment Area are not likely, and should they occur, are predicted to be not significant.

8.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The aspects of the environment that may cause a change in the Status Quo or Project include the following: sediment transport process; tidal prism; weather; flooding; ice; climate change; and earthquake activity. However, the Project is an environmental restoration effort, and does not involve permanent infrastructure. In this regard, the Project is not particularly sensitive to effects from the environment. The sediment transport process, tidal prism, flooding, and the weather have the potential to affect Stage 2 of the Project. However, the rock wall barrier will minimize and control flow velocities to prevent excessive scour and provide a safe working environment during Decommissioning. All effects of the environment on the Project will be limited to the Decommissioning period and are therefore temporary. In contrast, the Status Quo includes the dam and control structure infrastructure, and is therefore more sensitive to effects from the environment, which will likely persist in the form of sediment plugs, ice jams, and potential need for retrofitting as a result of climate change and sea level rise.

9.0 CUMULATIVE ENVIRONMENTAL EFFECTS ANALYSIS

The cumulative environmental effects of future actions that overlap with in time and space with those of the Status Quo and Project are consistent with those identified in the environmental effects assessment and assessment of the effects of the environment of project. The future actions determined to have the most likely, most direct, and greatest potential cumulative environmental effects with the Project and/or Status Quo were the Aboriginal Heritage Gardens, the Village of Balmoral Sewage Aeration System, and Commercial Fishing.

The Status Quo, in combination with the other identified actions, will continue to result in significant cumulative environmental effects on Fish Habitat and Fish, Terrestrial Environment, Migratory Birds, Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons, and Public Health

and Safety. The Status Quo would continue to have some positive cumulative environmental effects on fish and wildlife species (including birds) that prefer the freshwater environment of the impoundment, but not to the extent that the overall cumulative environmental effects could be considered positive.

The Project, in combination with the other identified actions, will result in positive cumulative environmental effects on Fish Habitat and Fish, Terrestrial Environment, Migratory Birds, Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons, Tourism and Recreation, Labour and Economy, and Public Health and Safety. The Project will result in some negative but not significant cumulative environmental effects (in combination with tourism-related actions) on the Transportation Network. No additional mitigation is required to address cumulative environmental effects beyond those measures proposed for the Project.

10.0 FOLLOW-UP PROGRAM

A Follow-up Program will be developed for each phase of the Project (*i.e.*, Decommissioning and post-Decommissioning) and designed to meet the requirements of the EIA Guidelines and CEAA. It will be filed with NBENV and provided to the public, stakeholders, and the ERBFN for review, prior to the commencement of Decommissioning activities. There may be opportunities for capacity building and employment within the ERBFN community through involving members of the community in the recommended follow-up and monitoring activities.

11.0 SUMMARY AND CONCLUSIONS

The Status Quo does not meet the Project Objectives, whereas the Project does. The Status Quo will result in significant environmental effects on the following components: Fish Habitat and Fish; Wetlands; Vessel Navigation; Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons; Heritage and Archeological Resources (not likely); and Public Health and Safety (Bacteriological Environment and Food Resource Contamination).

The Project will result in significant environmental effects that may be positive on the following components: Wetlands; Vegetation; Migratory Birds; Vessel Navigation; Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons; Tourism and Recreation; Labour and Economy; and Bacteriological Environment.

Finally, the Project will result in positive environmental effects on Fish Habitat and Fish. The Project will rectify the fish passage issue, and thus the fish passage Project Objective will be achieved. All of the current water quality concerns and sediment quality issues will be rectified. Softshelled clam stocks will have the opportunity to replenish and the Project Objective of improving habitat for clams and other shellfish will be met.

12.0 OPPORTUNITIES FOR PUBLIC REVIEW AND COMMENT

Following the release of EIA documentation for review, the public is invited to comment on the report and attend the public meeting which is scheduled as follows:

**October 23, 2006 beginning at 7:00 PM
At the Eel River Bar First Nation Community Building
11 Main Street, Unit 201**

To register to make a presentation at the public meeting, please contact the Department of Environment at (506) 453-3700 (collect). The public meeting will also provide opportunity for general comments.

To submit written comments, which should be received **on or before November 7, 2006**, or 15 days following the date of the public meeting, please forward them in the official language of your choice to

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