

7 Cumulative Effects

7. Cumulative Effects

The CEA Act states that all federal screenings must include an assessment of the potential cumulative effects of the project. Cumulative effects are defined as “changes to the environment that are caused by an action (i.e., the ‘project’) in combination with other past, present and future human actions” (Canadian Environmental Assessment Agency, 2004).

The first step in assessing the potential cumulative effects resulting from this project was to define any past, present or future human actions that have occurred, are occurring or may occur in the future within the project area. The potential for interaction of other human actions with this project varies depending on geographic location of the other action and the nature of the valued ecosystem or socioeconomic component being considered (e.g., habitat range or area over which an activity occurs). Therefore, it is necessary to examine the potential for cumulative effects on a broad regional scale (e.g., within a fairly broad geographic region surrounding the actual project’s footprint) in order to identify other projects which have the potential to result in cumulative effects.

The process used to assess cumulative effects involves

- identifying the potential projects and activities that may interact with the subject project
- assessing potential cumulative effects of the project in combination with the projects and activities identified
- identifying mitigation measures to prevent/minimize the potential for cumulative effects and then identifying residual cumulative effects remaining after implementation of mitigation
- determining the significance of the adverse residual cumulative effects
- determining necessary regional monitoring and follow-up measures, and effects management.

7.1 Identification of Other Projects and Activities

Past, existing and future projects or activities that have the potential to act cumulatively with the effects of the Bala Falls Small Hydro Project are identified in the following sections.

7.1.1 Past Projects and Activities

Past activities in the study area have included urban development in the Village of Bala, cottage development on Lake Muskoka and in the Bala Reach, construction of dams and hydropower facilities (including the former generating station at North Bala Dam), associated water management on the Muskoka River, and recreational activities in the area (fishing, scenic viewing, etc).

7.1.1.1 Village of Bala Development

The area of present day Bala was first colonized by European settlers around 1868, with the Village of Bala being incorporated in 1914 (Wikipedia, 2007). Past urban development around Bala has resulted in considerable environmental change from pre-development conditions including vegetation clearing, wildlife disruption and loss of habitat, changes in surface water hydrology and water quality (due to increases in imperviousness, road runoff, wastewater treatment and septic

leakage and withdrawals for drinking water) and the reduction in air quality (due to local and regional industrial discharges and vehicle emissions).

7.1.1.2 *Cottaging on Lake Muskoka/Bala Reach*

The construction of cottages on Lake Muskoka and in the Bala Reach commenced in the late 1800's. The Muskoka Lakes Association, which represents shoreline property owners on Lakes Muskoka, Joseph and Rosseau, was first formed in 1889 to represent the interests of these groups. Cottage development has resulted in changes to the environment surrounding the study area including vegetation clearing, wildlife disruption and loss of habitat, changes in surface water runoff and hydrology (due to increases in impervious surfaces, wastewater treatment and septic leakage, withdrawals for drinking water).

7.1.1.3 *Construction of Dams and Hydropower Facilities*

The North Bala Dam was originally constructed in 1873 to facilitate the driving of logs from Lake Muskoka into the Moon River. The construction of both the North and South Bala dams resulted in a change to the aesthetics of the falls area.

A small hydroelectric generating station (2.3 kV) was built at the North Bala Dam in 1924 by Bala Electric Company. It was purchased by the Hydro Electric Power Commission of Ontario in 1929. It supplied power to the town of Bala until 1957. It was demolished in 1972. The intake, powerhouse and tailrace areas were in-filled, and are evident due to the fact that the in-fill material differs from the surrounding natural rock in the area.

Development of the various dams and hydroelectric facilities upstream and downstream of the site, and resulting water management regimes within the Muskoka River watershed have altered natural flow rates and water levels in the watershed.

7.1.1.4 *Recreational Activities*

Past recreational activities in the study area have included fishing, power boating, canoeing, scuba diving, hunting, hiking/walking, scenic viewing at Bala Falls, swimming and cycling.

7.1.2 *Existing Projects and Activities*

Activities that currently occur in the vicinity of the project area include water management (of water levels and flows in the Muskoka River), recreational/tourism activities, commercial activities, and cottaging on Lake Muskoka/Bala Reach.

7.1.2.1 *Water Management Planning*

Water management is undertaken by the owners of water power facilities and control dams in accordance with the approved MRWMP.

7.1.2.2 *Recreational/Tourism Activities*

Existing recreational activities include boating, canoeing, kayaking, fishing, swimming, water skiing, hiking and walking, sightseeing/scenic viewing at the falls, picnicking, biking, scuba diving, yoga, sunbathing, snorkelling, photography and cross-country skiing. Lake Muskoka (upstream of North Bala Dam) and Moon River (downstream of North Bala Dam) are popular boating, swimming, scuba diving and recreational fishing areas. The land alongside the falls is used for recreation and a

number of benches are provided for public use. Many of these recreational uses take place at the base of Bala Falls. Within the District of Muskoka, 60 of the 122 tourist resort commercial accommodation properties are located within the Township of Muskoka Lakes where the largest lakes (Muskoka, Rosseau and Joseph) are located.

7.1.2.3 *Commercial Activities*

The Muskoka Lakes Chamber of Commerce Member Directory provides an on-line listing of approximately 100 businesses within the community of Bala. In close proximity to the Project (within 50 m) there are two local businesses. These are Purk's Place Boat House and Marina and an antique store, which is located within Burgess Memorial Bala Presbyterian Stone Church.

7.1.2.4 *Cottaging on Lake Muskoka/Bala Reach (Seasonal Residents)*

A large percentage of the local population in the vicinity of the project is seasonal, including numerous cottagers located on Lake Muskoka/Bala Reach. These seasonal residents have constructed docks, boathouses and other infrastructure on the water's edge, utilizing their property along the water's edge.

7.1.3 *Future Projects and Activities*

Activities anticipated to occur continue during the operation of the Bala Falls Small Hydro Project include water management (of water levels and flows in the Muskoka River), recreational/tourism activities, and further commercial and residential development.

7.1.3.1 *Water Management Planning*

Water management will continue to be in accordance with the approved MRWMP. Any additional development on the Muskoka River potentially affecting the approved MRWMP will be subject to an amendment to the plan.

7.1.3.2 *Recreational/Tourism Activities*

Future recreational activities in the study area will likely include the existing fishing, power boating, canoeing, scuba diving, hunting, hiking/walking, falls watching, swimming and cycling.

A snowmobile/pedestrian bridge to link the area close to Diver's Pond with the public docks on north side of the North Channel is under consideration. This would provide a better avenue for snowmobilers crossing the lake. This bridge would likely include the construction of support columns adjacent to the existing rail bridge columns

7.1.3.3 *Further Residential and Commercial Development*

Further residential and commercial development will continue to be guided by the Official Plan and Zoning By-laws of the Township of Muskoka Lakes. Development of the waterfront is encouraged to contribute to the attraction of visitors and residents (Township of Muskoka Lakes, 2006). Residential and commercial development will continue to be subject to permitting and approval processes by the municipality, ensuring that future development is consistent with the policies and strategies put forth by the Township.

7.2 Assessment of Potential Cumulative Effects, Identification of Mitigation Measures and Residual Adverse Cumulative Effects

Table 7.1 summarizes the potential cumulative effects of the North Bala Small Hydro Project and other projects and activities identifies potential mitigation measures and the residual adverse cumulative effects following mitigation.

7.3 Significance of Residual Adverse Cumulative Effects

The next phase in the cumulative effects assessment involved evaluating the significance of any residual adverse cumulative effects identified in Table 7.1. MOE (2001) provides criteria for assessing significance, including

- value or importance of the resource affected
- magnitude of the effect
- geographic extent or distribution of the effect
- duration or frequency of the effect.

The likelihood of the cumulative effect was also assessed.

The results are provided in Table 7.2. The residual cumulative effects are not anticipated to be significant as a result of the adverse effects of past, present or future activities acting in conjunction with the adverse effects of the Bala Falls Small Hydro Project. Most potential cumulative effects are of a low magnitude and have a low probability of occurrence.

Table 7.1 Cumulative Effects Assessment

Environmental Component	Project Phase	Net Project Effects following Effective Mitigation	Effects of Unrelated Activities on Environmental Components			Potential Interaction	Mitigation Measures	Residual Cumulative Effect
			Construction of Dams and Hydropower Facilities and Water Management Planning on Muskoka River	Development of the Village of Bala, Cottages/Residences on Lake Muskoka/Bala Reach, and Commercial Activities/Development	Local and Regional Recreation/Tourism Activities			
Air Quality	Construction	Minor dust and air emissions during construction	Construction and maintenance of dams and other hydropower facilities likely have a minor, temporary impact on local air quality due to periodic emissions associated with equipment.	Past and present construction, residential development, home heating and personal vehicle use have likely caused changes to local air quality in Bala	Recreation and tourism activities likely result in minor air emissions due to vehicle use	Air emissions during construction may cumulatively interact with local vehicle emissions	No additional mitigation proposed to prevent cumulative effect	Minor cumulative impact on local air quality during construction due to cumulative combustion emissions
	Operation	Periodic emissions from back up diesel generator				Air emissions during operation may cumulatively interact with local vehicle emissions	No additional mitigation proposed to prevent cumulative effect	Minor cumulative impact on local air quality during operation due to cumulative combustion emissions. This would be less than that likely to occur during construction.
Geology	Construction	Decrease in bedrock on site due to excavation	Past construction of other hydropower facilities has also likely resulted in losses of bedrock in the past – no ongoing effects	Past development activities in Bala have likely affected bedrock, though not in immediate project site – future development may continue to do so.	No effect	Cumulative loss of local area bedrock resources due to various projects where bedrock excavation is required	No additional mitigation proposed to prevent cumulative effect	Minor cumulative loss of local area bedrock resources due to various projects and activities
Soil Quality	Construction	Possible limited loss of soil due to erosion, minor impacts on soil health due to stockpiling, short term disturbance due to compaction	Construction of dams and hydropower facilities likely had an impact on soil resources in the vicinity of those structures.	Past site development has likely resulted in erosion of soil resources	No effect	Erosion during construction may cumulatively increase loss of local soils resources when considering losses due to previous construction projects – no ongoing erosion known to be occurring so no cumulative erosion in the same time period	No additional mitigation proposed to prevent cumulative effect	Minor cumulative loss of soil resources due to various projects and activities
Surface Water Hydrology	Construction	Short term changes to local hydraulics in vicinity of working platform and cofferdams	Existing water management practices for hydro power generation affect surface water hydrology – MRWMP has attempted to balance water management to enhance numerous competing activities	Local development has likely had a minor effect on surface water hydrology due to increases in impervious surfaces resulting in increased runoff rates	No effect	Local hydraulics in area impacted by project are affected by current water management practices and developments affecting surface water resources, therefore resulting in cumulative effect on local hydraulics	No additional mitigation proposed to prevent cumulative effect	Minor cumulative effects on local hydraulics due to various past and present activities acting cumulatively with proposed project
	Operation	Decreased flows over dams due to flow diversion Non consumptive water takings in the powerhouse				No cumulative effects anticipated due to run-of-river model of operation	None required	No cumulative effects anticipated
Surface Water Quality	Construction	Minor turbidity during construction, risk of spills during construction	Construction of dams and hydropower facilities likely had a short term effect on surface water	Local development likely affects surface water quality due to urban	Local recreational activities may result in minor turbidity due to	Unlikely to be any cumulative surface water quality impacts on the	No additional mitigation proposed to prevent cumulative effect	No cumulative effect anticipated

Table 7.1 Cumulative Effects Assessment - 2

Environmental Component	Project Phase	Net Project Effects following Effective Mitigation	Effects of Unrelated Activities on Environmental Components			Potential Interaction	Mitigation Measures	Residual Cumulative Effect
			Construction of Dams and Hydropower Facilities and Water Management Planning on Muskoka River	Development of the Village of Bala, Cottages/Residences on Lake Muskoka/Bala Reach, and Commercial Activities/Development	Local and Regional Recreation/Tourism Activities			
			quality due to erosion – no ongoing effects Existing water management practices may be resulting in some shoreline erosion due to water level fluctuations	runoff, leakage from septic systems	shoreline erosion from boat wake	same time and space during construction and operation		
Aquatic Biota	Construction	Short term localized effects due to in-water works, blasting	Construction and operation of dams and hydropower facilities and associated water management practices have had a significant effect on aquatic biota	Local development has likely affected fish due to disturbance associated with in-water construction and adverse effects on shoreline habitat	Recreational fishing results in an effect on local fish communities in Lake Muskoka and Bala Reach	Disturbance due to project and other activities may have a minor cumulative effect on the local fish community	No additional mitigation proposed to prevent cumulative effect	Minor potential cumulative effects due to disturbance of local fish communities
	Operation	Mortality due to turbine passage	Mortality due to turbine passage at other hydropower facilities on the river			Turbine mortality not likely acting on same populations – cumulative loss of fish on a watershed basis	No additional mitigation proposed to prevent cumulative effect	Cumulative loss of fish on a watershed basis
Aquatic Habitat	Construction	Short term loss/alteration of habitat due to cofferdam and working platform Long term alteration of habitat due to intake/ tailrace and habitat enhancement and creation	Aquatic habitat loss and increased habitat availability (in flooded areas) and habitat alterations due to water management – current MRWMP has attempted to enhance water management practices to protect aquatic habitat while balancing other water needs	Local development has likely resulted in impacts on aquatic habitat due to shoreline alteration	Minor effects on aquatic habitat may occur due to shoreline erosion from boat wakes	Cumulative short-term disturbance to aquatic habitat – no change in productivity anticipated following habitat creation and enhancement	No additional mitigation proposed to prevent cumulative effect	No cumulative long-term effects on aquatic habitat anticipated
	Operation	Loss of spawning function at north channel, creation of new spawning habitat at south channel				No long-term change in aquatic habitat productivity – no cumulative effect anticipated	No additional mitigation proposed to prevent cumulative effect	No cumulative long-term effects on aquatic habitat anticipated
Terrestrial vegetation, wildlife and Habitat	Construction	Permanent loss of existing vegetation community and wildlife habitat in powerhouse and intake area Minor wildlife disturbance during construction	Construction and operation of dams and hydropower facilities and associated water management practices have had an effect on terrestrial wildlife and habitat, including wetlands Current hydropower and dam operations likely result in minor wildlife disturbance due to noise and human presence	Development in Bala and the surrounding area has affected wildlife and habitat due to vegetation clearing and human presence	Recreational activities likely result in some wildlife disturbance	Cumulative loss of terrestrial wildlife habitat and wildlife disturbance due to project during construction.	No additional mitigation proposed to prevent cumulative effect	Minor cumulative loss of local wildlife habitat and disturbance of local wildlife during construction
	Operation	Noise disturbance to local wildlife due to operation and human presence				Cumulative wildlife disturbance during project operation	No additional mitigation proposed to prevent cumulative effect	Minor cumulative disturbance of local wildlife during operation
Public Use and Access	Construction and Operation	Restricted public water access; enhanced land aesthetics for public use	Construction of dams and hydro power facilities has increased (flooding increases areas available for boating) and decreased (limited continuous routes for canoeing/kayaking) areas available for public use and access	As areas have been developed for various uses and lands were sold to private owners, the amount of land available for public use and access has decreased.	Public use areas and access points (i.e. boat ramps)	Loss of some areas from public use and access as illustrated in Figure 6.7. Aesthetic enhancement of land area for public viewing	No additional mitigation proposed.	Some loss of public water use and access for recreation; aesthetic enhancement of land area for public viewing of falls and Bala Reach.

Table 7.1 Cumulative Effects Assessment - 3

Environmental Component	Project Phase	Net Project Effects following Effective Mitigation	Effects of Unrelated Activities on Environmental Components			Potential Interaction	Mitigation Measures	Residual Cumulative Effect
			Construction of Dams and Hydropower Facilities and Water Management Planning on Muskoka River	Development of the Village of Bala, Cottages/Residences on Lake Muskoka/Bala Reach, and Commercial Activities/Development	Local and Regional Recreation/Tourism Activities			
Local Traffic – Highway 169 and Bala Falls Road	Construction	Potential traffic disruption/delay during the 12 to 18-month construction period.	No effect	Increased traffic in the area as residential/commercial development increases in the area	Increased traffic in the area during tourist attractions such as the Bala Cranberry Festival.	Increased traffic resulting from development in the Bala area in combination with some traffic delay during the construction of the project may result in traffic delays.	No additional mitigation proposed.	The residual cumulative effect is a potential for slowing of the traffic flow during construction.
Sound Levels	Construction and Operation	Temporary noise emissions observed in the vicinity of the construction area during the 12 to 18-month construction period. Potential for increased ambient sound levels in the vicinity of the project during operation. These will remain below MOE's maximum requirements for stationary sources of sound within Class 2 Areas.	Temporary noise emissions would have occurred in the vicinity of existing hydropower facilities and dams during their construction. Increased noise levels likely occurred during the operation of plants which occupied the Bala Falls area in former years.	Development in the community of Bala, whether residential or commercial including cottages along Lake Muskoka/Bala Reach shorelines has resulted in increased ambient sound levels.	Increases in recreational/tourism visitors to the Bala area has resulted in seasonal increased ambient sound levels on the water and within the community.	Increased ambient sound levels from the project will represent an additional source of sound in the vicinity of the project.	No additional mitigation proposed.	Increased ambient sound levels within the vicinity of the project; however, these sound levels will meet MOE limitations for stationary sources of sound at nearby receptors.
Aesthetics	Construction and Operation	A change in aesthetics from baseline conditions during the 2010 tourist season, and into operation.	Construction in the vicinity of the Bala Falls, especially of the North and South dams resulted in a dramatic change in aesthetics from natural conditions.	Development of the Village of Bala, along with cottage and commercial development would result in an aesthetic change, especially along the waterfront areas.	Infrastructure created to accommodate recreation/tourism such as docks, boathouses etc. as well as recreational activities taking place in the area (i.e., rowing) has resulted in an aesthetic change to the area.	The construction and operation of the project represents an additional change to aesthetics in the project area.	No additional mitigation proposed.	Change in local aesthetics.
Tourism/ Recreation	Construction	A temporary disruption and traffic delay in the vicinity of Bala Falls and the potential for a decrease in visitation to the Bala Falls area during Bala's 2010 tourist season.	Water Management Planning on the Muskoka River/Bala Reach has resulted in the regulation of water levels in consideration of, among other area uses, tourism and recreation.	Development in the community of Bala has provided infrastructure for recreational visitors, as well as the development of tourist attractions	N/A	The development of tourist and recreational attractions has traditionally attracted visitors to the area. This may be adversely affected by the construction of the project, during the 2010 tourist season.	No additional mitigation proposed.	Potential for the following: <ul style="list-style-type: none"> • temporary disruption and traffic delay in the vicinity of Bala Falls • decrease in visitation to the Bala Falls area during Bala's 2010 tourist season.
Local Businesses	Construction	A potential for disruption to local businesses during this 12 to 18-month construction period.	No effect	Creation of various local businesses and services.	Recreational outfitters and suppliers as well as tourist attractions would become more viable and profitable as local and regional recreation and tourism activities were developed. In	A potential for disruption to local businesses during construction in areas where commercial, recreation and tourism development has occurred.	No additional mitigation proposed.	Temporary disruption to local businesses during construction in areas where commercial, recreation and tourism development has occurred.

Table 7.1 Cumulative Effects Assessment - 4

Environmental Component	Project Phase	Net Project Effects following Effective Mitigation	Effects of Unrelated Activities on Environmental Components			Potential Interaction	Mitigation Measures	Residual Cumulative Effect
			Construction of Dams and Hydropower Facilities and Water Management Planning on Muskoka River	Development of the Village of Bala, Cottages/Residences on Lake Muskoka/Bala Reach, and Commercial Activities/Development	Local and Regional Recreation/Tourism Activities			
					addition, local businesses providing support to these industries, such as hotels and restaurants would also experience growth.			
Archaeological and Heritage Assessment	Construction	Careful adherence to the above mitigation measures will avoid negative residual effects on cultural and heritage resources.	Construction prior to the requirement for an Archaeological and Heritage Assessment may have resulted in the loss of cultural resources.	Construction prior to the requirement for an Archaeological and Heritage Assessment may have resulted in the loss of cultural resources.	Construction prior to the requirement for an Archaeological and Heritage Assessment may have resulted in the loss of cultural resources.	No interaction is anticipated with the completion of Archaeological and Heritage Assessments for the area prior to construction, and the protection of heritage buildings during construction activities such as blasting.	No additional mitigation proposed.	Protection of local archaeological and heritage resources during construction.

Table 7.2 Significance of Residual Adverse Cumulative Effects

Parameter	Net Adverse Cumulative Effects	Value of Resource	Magnitude	Geographic Extent	Duration/Frequency	Ecological Context	Likelihood of Effect	Reversible/Irreversible
Air Quality	Cumulative effects due to vehicle emissions during construction	High	Low	Low	Low	Low	Moderate	Reversible
	Cumulative emissions during operations when back-up diesel generation used	High	Low	Low	Low	Low	Low	Reversible
Geology	Cumulative loss of bedrock resources	Low	Low	Moderate	Moderate	High	High	Irreversible
Soils	Cumulative erosion of soil resources in local area	Moderate	Low	Moderate	Low	Moderate	Moderate	Irreversible
Surface Water Hydrology	Cumulative effects on local hydraulics during construction	Low	Low	Low	Low	High	High	Reversible
Aquatic Biota	Cumulative disturbance of fish community during construction	High	Low	Low	Low	Low	High	Reversible
	Cumulative loss of fish due to turbine mortality throughout watershed	High	Low	Moderate	Moderate	Low	High	Irreversible
Terrestrial wildlife and habitat	Cumulative loss of wildlife habitat and vegetation	Moderate	Low	High	High	Low	High	Reversible
	Cumulative wildlife disturbance	Low	Low	High	High	Low	High	Reversible
Public Use and Access	Minor loss in public water use for recreation.	High	Moderate	Low	High	Low	High	Irreversible
Local Traffic – Muskoka Road 169 and Bala Falls Road	Temporary disruption of traffic flow during construction.	High	Moderate	Moderate	Low	Moderate	Moderate	Reversible
Sound Levels	Increased ambient sound levels within the vicinity of the project; however, these sound levels will meet MOE limitations for stationary sources of sound at nearby receptors.	High	Low	Low	Low	Low	Low	Irreversible

Parameter	Net Adverse Cumulative Effects	Value of Resource	Magnitude	Geographic Extent	Duration/Frequency	Ecological Context	Likelihood of Effect	Reversible/Irreversible
Aesthetics	Change in local aesthetics displeasing.	High	Moderate	Low	Moderate	Low	Moderate/High	Irreversible
Tourism/Recreation	<ul style="list-style-type: none"> • A temporary disruption and traffic delay in the vicinity of Bala Falls • Potential for a decrease in visitation to the Bala Falls area during Bala's 2010 tourist season. 	High	Moderate	Moderate	Low	Low	Moderate	Reversible
Local Businesses	Temporary disruption to local businesses immediately adjacent to site during construction.	High	Moderate/High	Low	Low	Moderate	Moderate/High	Reversible