ASSESSMENT OF THE MARINE ENVIRONMENT MONITORING PROGRAM FOR THE EASTMAIN-RUPERT 1A PROJECT

Context

When the federal permit was issued for the Hydro-Quebec's Eastmain 1-A hydroelectric power station and Rupert River diversion project, some guidelines were sent to the proponent so that monitoring programs be carried out to assess the environmental impacts of implementing this project. The Fish Habitat Management Branch (FHMB) is soliciting the Science Branch to validate two of these marine environment monitoring programs. These monitoring programs involve the assessment of total organic carbon (TOC) and changes in salinity in Rupert Bay. The FHMB would like to know if the proposed monitoring programs are acceptable (e.g. schedule, methodology) to verify predictions and whether any changes or additions are required. The request was sent to the Science Advice, Information and Support Branch (SAISB) on March 14, 2008, and a response was required by April 15, 2008.

Analysis and responses

Total organic carbon

The DFO's concern at the origin of these monitoring programs was associated with a possible drop in total organic carbon (TOC) and the repercussions this would have on biological productivity in Rupert Bay, on benthos among other things which is a food source for certain fish species and marine mammals. Because of the problems related to benthos sampling, it was first agreed to monitor the TOC. If this parameter dropped, the growth of Longnose suckers would then be monitored along with their stomach contents.

The proponent's suggested TOC analysis methods are recognized and respect the standardized methods from the American Water Works Association. However, sampling frequency appears to be insufficient to meet the targeted objective (i.e. determine whether the decrease of the river's flow rate will reduce the TOC output to the Estuary and Rupert Bay) at least without proof of the contrary. In fact, the proponent suggests sampling the TOC only four times per year at only one fixed station located at the head of the Rupert River's Estuary. The proposed sampling periods are the last weeks of March, May, August and October, which would cover the significant hydrological events: winter low-water flow, spring peak flow, summer low-water flow and fall peak flow, respectively. According to the sampling plan proposed, establishing the reference state would be based on only eight TOC values (4 sampling periods * 2 years), which seems relatively weak considering the natural variability that the proponent is likely to encounter (refer to for example Hudon *et al.* (1996); Fig. 2 - Carbon and nutrient output from the Great Whale River and a comparison with other rivers around Quebec. Can. J. Fish Aqua. Sci. 53: 1513-1525).

Because of the significance of the reference state, we recommend a sampling frequency of at least once per month from March to October for the first two years of the monitoring program in order to obtain a quantitative estimate of the Rupert TOC output prior to diversion (i.e. a sampling frequency similar to the study by Hudon *et al*. on the carbon and nutrient output from the Great Whale River). This recommendation is based on the fact that it will be impossible to backtrack once the diversion of the Rupert has begun. We also recommend a similar sampling frequency for 2011, 2012, 2014 and 2016 to compare the TOC output before and after the diversion of the Rupert. The increased sampling period, compared with what the proponent proposed, will not only allow us to compare the results from before and after diversion, but also to monitor the temporal evolution of the system's response after commissioning. Ideally, a second sampling station should be located at the mouth of Rupert Bay, in the freshwater area, because of the anticipated repercussions in Rupert Bay.

Salinity

According to predictions, the decrease in flow rate of the Rupert River will change the saline front (pushed back 5 km) in the bay and in one of its tributaries (Pontax River). The monitoring required by the proponent is to validate the predictions.

The proponent proposed the installation of 4 anchoring stations for current-meters equipped with sensors to measure salinity in order to determine the change in the saltwater intrusion limit in Rupert Bay. Because the precise location of the anchoring stations was not indicated, it is difficult to determine whether these positions are adequate for monitoring. Therefore, a map showing the precise location of the stations compared with the current intrusion limit is required prior to making any conclusion.

The proposed anchoring stations will certainly help measure the changes in salinity conditions at the monitored locations, but it is very likely this sampling strategy will fail to notice the saline front limit. In order to remedy this situation, it is recommended that the proponent also conduct a spatial sampling using a CTD during summer and winter low-water flow conditions, as was done in 2002 and 2003 during the project's impact assessment. This is the only way to accurately define the changes to the saline front and therefore offer the possibility of calibrating the numerical models of Rupert Bay.

Conclusion

The two marine environment monitoring protocols submitted by the proponent represent a good basis for assessing the impact of the diversion project on the environment. However, certain protocol improvements are required in order to obtain suitable scientific results. The improvements that are required are, for the protocol measuring total organic carbon, an increase in terms of sampling effort, and in terms of monitoring salinity, a specific description of the anchoring locations for current-meters and also conducting a spatial sampling using a CTD. These measures should help reach the monitoring program objectives.

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Sources of information

Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert 2007. Fish habitat monitoring program.

Hudon *et al.* 1996. Carbon and nutrient output from the Great Whale River and a comparison with other rivers around Quebec. Can. J. Fish Aqua. Sci. 53: 1513-1525.

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