3-30-1984

WATER QUALITY CERTIFICATION
(P.L. 92-500, Section 401)

In the matter of: Missisquoi Associates
c/o Boise Cascade Corporation
Specialty Paperboard Division
P.O. Box 498
Brattleboro, VT 05301
Application for the Sheldon Springs Hydroelectric Power Project

The Water Quality Division of the Vermont Department of Water Resources and Environmental Engineering (the Department) has examined the Federal Energy Regulatory Commission license application submitted by Missisquoi Associates (the applicant) and finds:

1. The applicant proposes to redevelop the existing hydroelectric facility at the former Saxon Industries Paper Mill located on the Missisquoi River at Sheldon Springs. The project would use the existing dam, which is located about 400 feet downstream of the Vermont Route 104B bridge. The existing hydromechanical and hydroelectric facilities in the mill are included as part of this application.

2. The existing plant contains five turbine units. A 12-foot diameter steel penstock conveys flows from a 750 foot headrace canal to two horizontal turbines which drive pulp grinders and are rated at 1340 HP at 70 feet of head and a flow of 200 cfs. These turbines are followed by two smaller horizontal turbines, one of which is presently not operational. Both are rated at 1000 HP at 70 feet of head and a flow of 150 cfs. The one operating unit can be connected to either a 750 kw generator or to the pulp grinders. A 6-foot diameter steel penstock

conveys flows from the canal to a horizontal, Leffel turbine which is rated at 1450 HP at 72 feet of head and a flow of 200 cfs and is directly connected to a 1000 kw generator.

These turbines will continue to be used. A study is currently underway to determine which, if any, of the existing hydro-mechanical water wheels will be coupled to new electrical generators.

3. A new intake structure (invert elevation 305.0' NGVD) is to be constructed about 50 feet upstream of the existing headrace canal. Some dredging in the area of the intake will be necessary in order to keep flow directed to the structure.

A 13.5 foot diameter steel penstock, about 1900 feet long, would carry water from the impoundment, which will not be modified, to a new powerhouse, which would contain two 12100 HP Kaplan, vertical propeller turbines. A bifurcation in the penstock would be constructed about 120 feet upstream of the powerhouse. Where the penstock crosses the Missisquoi River, it would be buried under the existing stream bed. The net head at full gate flow (1265 cfs, each unit) would be 92.8 feet. The minimum operating flow for each of the two new units would be about 140 cfs.

The new tailrace section is to establish a tailwater elevation of 217' NGVD at 3000 cfs. It would be 40 feet wide by 22 feet deep (bottom elevation 195 NGVD) and 125 feet in length.

4. The dam, 35 1/2 feet high and 283 feet long, is a concrete overflow Ambursen-type buttress dam with a crest elevation of 326.0' NGVD. It was constructed in 1908. Flashboards 20"-24" in height, are installed across the crest during periods of low flow. In the future, their height will be set at 24", and they will be designed to fail gradually when the pool rises above elevation 330' NGVD.

5. The impoundment extends about 3 1/2 miles upstream, almost to North Sheldon. Use of flashboards increases storage from 450 acre-feet at the crest to 750 acre-feet at the top of the boards (elevation 328.0' NGVD). The surface area increases from 120 acres to 175 acres. The useable storage with a 24" drawdown is 300 acre-feet.

6. Withdrawals are presently made via the existing headrace canal for process water and fire protection. The mill currently diverts approximately 15-20 cfs for process-related needs (see Finding #12).

7. The existing plant discharges from the west side of the mill building about 2800 feet downstream of the dam. The tailrace elevation is about 255.0' NGVD.

8. Presently, the facility operates out of storage with no minimum stream flow constraint. When flow exceeds about 770 cfs, all units are placed in operation and excess flows are spilled at the dam. Below a river flow of 770 cfs, normally no spillage occurs at the dam. Because adjustments to the wicket gates are performed manually, natural flows are augmented by impoundment storage using a drawdown of 6"-12". This is due to

the response time required when the impoundment inflow changes. Water may be drawn out of storage to increase production also. When flows drop below 770 cfs, a set of mechanical pulpers is first backed out of operation. Next, the remaining mechanical pulper or the hydroelectric unit is shut down, depending on the pulp demand. During low flow, the hydroelectric unit is maintained at minimum output to enable the mill to respond quickly to an increase in flow.

9. In the FERC license application, the applicant's proposal is to continue to withdraw up to about 20 cfs for process water and to pass 40 cfs at the dam for water quality and aquatic life. The 40 cfs would be supplemented by discharges of process water and generation flows at the mill. A minimum of 100 cfs is proposed to be passed through the existing turbines in order to set 140 cfs as the minimum flow standard for the Missisquoi River below the mill.

An operating rule curve is provided in Figure B-1 of the FERC license application. The maximum capacity of the existing units will be 900 cfs and of the new units will be 2530 cfs. The first priority would be given to the process water (15-20 cfs) and the 40 cfs minimum release at the dam. When the stream flow is less than 160 cfs, all inflows would be discharged over the dam. When the flow is between 160 cfs and 2690 cfs, 140 cfs would be maintained in the bypassed section with 100 cfs below the mill and 40 cfs above. The remaining turbines in the mill

would not be put on line until the new powerhouse is at full capacity. Excess flows will be discharged over the dam.

In the range of 160-300 cfs, the proposal is to operate out of storage for peaking and flexibility of the mill operation. Rather than the present maximum drawdown of 12", the new facility would use a 24" drawdown when flashboards are in place. It may be concluded from the narrative on page B-5 of the FERC license application, that the facility operation would not cause the pool to be dropped below the crest even when the flashboards are not in place. The ponding mode of operation would occur about 10% of the time on the average.

10. The Department concludes, as discussed later, that the applicant's proposal for minimum flows referred to in Finding #9 is inadequate to meet Water Quality Standards. Following a series of meetings and discussions with the Department, the applicant's present proposal is to pass minimum flows as outlined in conditions A, B, C and D of this certificate. This proposal is described in a letter dated January 31, 1984 from the applicant's attorney (Reid and Priest, Washington, D.C.) to FERC.

11. The U.S. Geological Survey operates a surface water gaging station (#4293500) on the Missisquoi River near East Berkshire. The station was established in 1911. Flow values for the site (drainage area about 800 square miles) may be estimated based on the gage (drainage area 479 square miles) using a direct proration by drainage area:

Parameter	Value
Mean runoff	1540 cfs (26.17 inches)
7Q10	95 cfs
Minimum flow	13 cfs
95% exceedance flow	170 cfs
50% exceedance flow (median)	770 cfs

12. The process water estimated flow of 15-20 cfs includes cooling water, boiler make-up water and water used by the sanitary facilities, as well as the actual process water. The permitted cooling water discharge is 2.3 MGD (3.6 cfs). The mill treatment lagoon discharges at an average rate of 8.5 cfs. The Sheldon Springs municipal wastewater treatment facility discharges (permitted monthly average discharge of 0.1 cfs) about 400 feet downstream of the mill discharge point, which is about 0.5 mile below the dam.

13. The Water Resources Board has classified the Missisquoi River as Class B from the mill treatment plant upstream to Tyler Branch and as Class C from the plant to a point 1.5 miles downstream. Class B waters are suitable for bathing and recreation; irrigation and agricultural uses; good fish habitat; good aesthetic value; and acceptable for public water supply with filtration and disinfection. Class C waters are suitable for recreational boating; irrigation of crops not used for consumption without cooking; habitat for wildlife and for common food and game fishes indigenous to the region; and such industrial uses as are consistent with other class uses.

From Enosburg Falls to the confluence with Lake Champlain, the river is Water Management Type III. As such, it is to be managed for a warmwater fishery containing such species as

smallmouth bass, perch and bluegills. The dissolved oxygen minimum standard is 5 mg/l. The turbidity standard is 25 Jackson turbidity units.

14. A fairly comprehensive water quality sampling effort was undertaken in 1980. From 8:00 A.M. on September 10, 1980 to 12:00 P.M. on September 11, 1980, samples were collected at 4 hour intervals from 14 stations and analyzed for dissolved oxygen (D.O.) and temperature. All samples collected at station 4 located at the bridge 300 feet upstream of the dam contained D.O. concentrations well above the minimum standard. This was also the case for earlier sampling done by the Department in 1960, 1965 and 1973 at the same station. The lowest recorded D.O. level was 7.1 mg/l from a sample collected on September 10, 1980 at 9:15 P.M. at a depth of 8 feet. The flow on that date at the Berkshire gage was 174 cfs, or about three times 7Q10.

Because of the required spillage at the dam and the minimum flow through the mill units, this project should result in an improvement to dissolved oxygen concentrations downstream during critical summer low flow periods.

15. Fisheries surveys (trap and gill netting) conducted by the applicant in 1980 revealed an exclusively warmwater fishery at East Highgate and at the Sheldon Springs impoundment, with the primary game species being smallmouth bass and rock bass. The bypassed section of stream from the dam to the new powerhouse tailrace contains varied substrates which have the potential to provide a diversified habitat compatible with the

spawning requirements of several fish species including walleyed pike, which successfully spawn in other sections of the Missisquoi River.

Past operation of this dam has severely limited spawning potential in this reach. This conclusion can be substantiated by looking at the month of May which is utilized both by walleye and smallmouth bass for spawning. During an average May under existing operating conditions about 85% of the month the project spills into the bypassed reach. For the remaining 15% of the month, or for 5 days it is essentially dry. This is not, of course, favorable for spawning. During drier May months and for spawning into June, the impact would be even more severe.

The bypassed reach consists of boulder-strewn rapids connecting large pools. It provides excellent habitat for a smallmouth bass fishery, and there are reports of successful brown trout fishing, which is probably a result of downstream drift from upstream stocking efforts by the Department of Fish and Game.

Downstream of the proposed powerhouse, 10% of the time, on the average, a store-and-release mode of operation would alter natural stream flows. Under the initial proposal (See Finding #9), minimum flows of 40 cfs in the bypassed section upstream and 140 cfs downstream were proposed to be maintained in the river about 80% of the time.

16. The U.S. Fish and Wildlife Service Flow Recommendation Policy for the New England Areas is used by the

Department as the basis for recommending flows necessary for preservation of indigenous fish species and the benthic community where site-specific fishery/flow studies have not been done. In order to protect aquatic life downstream of the proposed powerhouse, a minimum flow of 300 cfs, the estimated August median flow, is desirable. In this case, the Department is requiring minimum flow releases of 70 cfs at the dam and 200 cfs through the mill. Those flows combined with the average process water discharge of about 15 cfs would result in the maintenance of a flow of 285 cfs below the project.

17. On October 12, 1983, a visual assessment of controlled flows in the bypassed section of stream was conducted in order to set minimum flows for this certificate. Participants included the Department of Water Resources and Environmental Engineering, the Department of Fish and Game, the applicant and the applicant's consultants. The natural project inflow of 424 cfs was measured at the Vermont Route 104B bridge. Spillage at the dam was regulated for the purposes of the study by controlling the releases through the plant. Flows in the range of about 40 cfs to 200 cfs were observed in the reach from the dam to the mill. In this range, it was noted that flows stayed for the most part to the right of the island at the mill. The mill releases into the left channel.

The bass pool fishery in the upper bypassed section would be maintained by a minimum flow of 70 cfs. The remaining bypassed section would be adequately protected by the release of 200 cfs at the mill.

18. The warmwater species of primary importance here are spring spawners. The applicant proposes to release flows favorable for spring walleye spawning in the bypassed section when walleyes are introduced to the section. The Department of Fish and Game has determined that a flow of 700 cfs below the mill tailrace would be sufficient to meet the spawning needs of walleyes during the spring months of April and May. That flow is based on the U.S. Fish and Wildlife Service Flow Recommendation Policy, which recommends passage of a minimum flow equivalent to the April-May median flow for the spring spawning and incubation period.

Passage of adequate minimum flows below the dam should greatly improve the benthic community and, thereby, provide a better food source for the fishery both downstream due to drift and in the bypassed section. Macroinvertebrate food production to a large degree controls the quality of the fishery in any stream.

19. Flow requirements for water quality may not be sufficient for recreational needs and aesthetics.

Conditions

The Department certifies that this project will meet Vermont Water Quality Standards under the following conditions:

A. The applicant shall release a minimum instantaneous flow of 70 cfs or net instantaneous inflow (actual instantaneous inflow less the actual process water withdrawal rate of up to 20 cfs) to the impoundment, if less, at all times at the dam. The applicant shall provide the Department with a description, hydraulic calculations, and plans for the method to be used to pass minimum flows, for the Department's review and approval.

B. The applicant shall maintain a minimum instantaneous flow of 200 cfs at the paper mill tailrace unless the net instantaneous inflow to the impoundment is less than 270 cfs, in which case inflows not released at the dam as required under Condition A shall be released through the mill. The process water release shall not be used to meet this flow requirement in part.

C. The applicant shall maintain a minimum instantaneous flow of 285 cfs, or the actual instantaneous inflow to the impoundment, if less, downstream of the new plant tailrace.

D. When required by the Department of Fish and Game's management plan for the establishment of a walleye fishery, the applicant shall release a minimum instantaneous flow of 700 cfs, or net instantaneous inflow to the impoundment, if less, through the paper mill from April 1 through May 31. The minimum spillage at the dam under Condition A, however, shall take precedence.

E. The applicant shall not install flashboards which are greater than 24 inches in height. The pool shall not be drawn down below the dam crest (elevation 326.0' NGVD) without prior written approval by the Department.

F. During the final engineering phase or earlier, the applicant shall file a comprehensive erosion and sediment control plan with the Department for review and approval. The plan shall cover temporary and permanent measures to limit the impacts on water quality from turbidity and sedimentation with regard to construction activities and shall indicate what measures will be taken to preserve stream flow during work. It may be beneficial to consult with the Department during the development of the plan.

G. The applicant shall insure that every reasonable precaution is taken during construction to prevent the discharge of petro chemicals, wet concrete and debris to state waters.

H. Any debris removed from the project area during construction and later operation shall be disposed of properly.

I. Any significant changes to the project including the operational scheme must be submitted to the Department for review and approval.

J. Upon completion of the project, an as-built set of plans shall be provided to the Department.

K. No construction may commence until the Department has issued written approval under conditions A, F and I. Operational changes made after project completion are subject to condition I and must be approved prior to effecting the change.

John R. Ponsetto, Commissioner
Department of Water Resources
and Environmental Engineering

Dated At Montpelier, Vermont this 30th day of March, 1984.

JRC/rh