The plan shall include but not be limited to: (1) an implementation schedule; (2) the location, design, and calibration of gaging equipment, if needed; (3) the method of data collection; and (4) a provision for providing flow data and water surface elevation data to the U.S. Geological Survey, the U.S. Fish and Wildlife Service, the Maine Department of Environmental Protection, and Maine Department of Inland Fisheries and Wildlife within 30 days from the date of the agency's request for the data. The Commission reserves the right to require changes to the plan. Upon Commission approval the Licensee shall implement the plan, including any changes required by the Commission.

(6) Article 410 is amended to read as follows:

Article 410. The licensees, to protect the visual character and quality of the Upper Kezar Falls timber-crib dam and its surrounding landscape, shall use the concrete grouting method described on page A-11 of the amended license application filed on January 2, 1990. The licensees, to improve the visual integrity and compatibility of the Kezar Falls Lower Development, shall within 6 months from the date of issuance of the license repaint various project facilities visible to the public to match the more compatible gray color of other adjacent project components.

(D) The docket for Project No. 11124 is terminated.

(E) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

[¶ 62,110]

Central Vermont Public Service Corporation, Project No. 2489-001 - Vermont

Order Issuing Subsequent License (Minor Project)

(Issued November 4, 1994)

Fred E. Springer, Director, Office of Hydropower Licensing.

Introduction

On December 31, 1991, Central Vermont Public Service Corporation (CVPSC or applicant) filed an application under section 4(e) of the Federal Power Act (FPA)[1] for a subsequent license to continue to operate and maintain the existing 1.4-megawatt (MW) Cavendish Hydroelectric Project on the Black River in Windsor County, Vermont.[2] CVPSC supplemented its application with additional information in August 1993. The current license for this project expired on December 31, 1993.

Background

Notice of the application has been published. On August 31, 1992, the Vermont Agency of Natural Resources (VANR) filed a motion to intervene in this proceeding. Comments on the application were filed by CVPSC, the U.S. Department of the Interior (Interior), and the VANR. Comments of intervenors and agencies have been fully considered in determining whether, or under what conditions, to issue this license.

On April 29, 1994, the Federal Energy Regulatory Commission's (Commission) staff issued a Draft Environmental Assessment (DEA). Comments on the DEA have been addressed in the final Environmental Assessment (EA), which is attached to this license. The Commission's staff also prepared a Safety and Design Assessment (S&DA) for the project, which is available in the Commission's public file.

Project Description

The Cavendish Project consists of: (1) a concrete gravity dam with two spillway sections: (a) the north section, 90 feet long by 25 feet high, with a crest elevation of 878.13 feet mean sea level (m.s.l.), topped with 6.0-foot-high flashboards; and (b) the south section, 21 feet long by 6 feet high, with a crest elevation of 881.63 feet m.s.l., topped with 2.5-foot-high flashboards; (2) an impoundment having a length of 3,000 feet, a surface area of 10 acres, a usable storage capacity of 18.4 acre-feet, and a normal headwater elevation of 884.13 feet m.s.l.; (3) a concrete intake structure, which serves as the north abutment of the dam, with a submerged entrance located parallel to the flow of the river, manually operated headgates, and an inclined trashrack; (4) a power tunnel that runs parallel to the river and carries the plant flow 180 feet from the intake to the penstock; (5) a 6-foot-diameter, 1,250-foot-long, steel penstock; (6) a penstock manifold, located

[1] 16 U.S.C. § 797(E).

[2] The Black River is a tributary of the Connecticut River, a navigable waterway of the United States. Power produced from the project is fed directly into an interstate grid. There has been no post-1935 construction of the project. *See* 41 FPC 765, 766 (1969).

adjacent to the powerhouse, which divides the flow and distributes it to the turbines; and (7) a 64-foot-long by 34-foot-wide powerhouse that contains three horizontal shaft Francis turbine generators with a combined installed capacity of 1,440 kilowatts (kW), and a hydraulic range of 19 to 226 cubic feet per second (cfs). A more detailed project description can be found in Ordering Paragraph (B)(2).

The project's original license permitted the Licensee to operate the project as a daily peaking facility. In July 1986, CVPSC voluntarily changed the operating mode to modified run-of-river (that is, at least one unit is in operation at all times; the remaining units are turned on and off in response to inflow).

CVPSC proposes to operate the project in an instantaneous run-of-river mode and to release a flow of 10 cfs at the dam from April 15 through October 31. During the remainder of the year, November 1 through April 14, there would be no dam release; consequently, bypass flows would be limited to dam leakage and local runoff (approximately 3 to 5 cfs).

Applicant's Plans and Capabilities

Need for Power and Action

There are three generating units at Cavendish Dam. The combined nameplate ratings of the three generators is 1,440 kW at a power factor of 0.8.

The Cavendish Project was constructed in 1907. Therefore, for approximately 87 years, CVPSC and its customers have benefitted from low-cost, non-polluting hydropower from the Cavendish Project. The 87-year operating history of the project fully demonstrates a past and continuing need for the amount of power generated by the project.

Conservation and Load Management Programs

In August 1993, CVPSC submitted to the Vermont Public Service Board a report, Conservation and Load Management, which includes quantitative information regarding CVPSC's specific conservation and load management goals and accomplishments for the first 6 months of 1993. Its programs affect residential, commercial, and industrial consumers.

My staff, after reviewing this document, concludes that CVPSC has made a satisfactory good faith effort to comply with section 10(a)(2)(C) of the FPA and to support the objectives of the Electric Consumers Protection Act of 1986. I concur.

Applicant's Record of Compliance with the Original License

Staff's review of the applicant's compliance with the terms and conditions of its original license shows that CVPSC's overall record of making timely filings and compliance with its license is satisfactory. I agree.

Water Quality Certification

Section 401(a)(1) of the Clean Water Act (CWA)[3] requires an applicant for a federal license or permit for any activity which may result in a discharge into navigable waters of the United States to provide to the licensing or permitting agency a certification from the state in which the discharge originates that such discharge will comply with certain sections of the CWA. If a state fails to act on a request for certification within 1 year, the certification requirement is waived.[4] Section 401(d) of the CWA[5] provides that state certifications shall set forth conditions necessary to ensure that applicants comply with specific portions of the CWA and with appropriate requirements of state law.

On October 9, 1992, the Vermont Agency of Natural Resources (VANR) received CVPSC's original application for Water Quality Certification. On September 9, 1993, VANR, Department of Environmental Conservation, conducted a hearing on the application for certification. VANR, on October 7, 1993, issued a Water Quality Certificate (WQC) to CVPSC for the Cavendish Project.

The October 7, 1993, certification included 18 conditions, labeled "A" through "R." As stated in *Tunbridge Mill Corporation*; 68 FERC ¶ 61,078 (1994), under section 401(d), states may lawfully impose only conditions related to water quality. In examining the conditions imposed here, I follow the principles laid out and discussed in *Tunbridge*.

Condition A requires CVPSC to operate and maintain the project pursuant to the conditions of the certification. Because some of these conditions are beyond the scope of section 401 and will not be included in the license, Condition A will become part of the license only to the extent that it requires compliance with conditions within the scope of section 401.

Condition B requires that CVPSC operate the project in instantaneous run-of-river mode, whereby flows below the project's tailrace are equal to the inflow to the impoundment at all times. When the project is not operating, all flows shall be spilled at the dam. This condition will become part of the license. I note that the

[3] 33 U.S.C. § 1341.

[4] 33 U.S.C. § 1341(a)(1).

[5] 33 U.S.C. § 1341(d).

project has been operating in a modified run-of-river mode since 1986, and that the Licensee proposes to change to instantaneous run-of-river operation. Article 401 of the license ensures operation in run-of-river mode.

Condition C requires CVPSC to release a year-round minimum instantaneous flow of 10 cfs at the dam when available from inflow. If the instantaneous inflow falls below the minimum hydraulic range of one turbine unit plus this spillage requirement, all flows shall be spilled at the dam. CVPSC must furnish a description, hydraulic design calculations, and plans for the measures to be used to pass this minimum flow. This condition will become part of the license. Moreover, Article 402 of this license contains requirements for minimum bypass flows at the project.

Condition D requires that the level of the project impoundment be maintained no lower than 6 inches below the crest of the flashboards, except during periods when the project's control system is not functioning or the flashboards have failed. When the control system is not functioning, the impoundment shall be maintained no lower than 12 inches below the crest of the flashboards. This condition will become part of the license. Article 404 contains requirements for maintaining impoundment elevations.

Condition E requires that CVPSC manage impoundment levels such that changes in excess of minus 2 feet from the normal operating level are eliminated. CVPSC must also develop and propose for VANR approval a management plan for such controls within 90 days of issuance of the Certification. Consideration may be given to a permanent reduction in the normal operating level of the impoundment; however, such an option would have to include an assessment of the impact on upstream wetlands and their values. This condition will be included as part of this license and Article 404 will ensure control of impoundment levels.

Condition F requires that following the reinstallation of flashboards or an approved special maintenance event requiring a draw-down, the impoundment shall be refilled by reducing downstream flows. Downstream flows, however, shall not be permitted to decline below the following levels:

June 1 to September 30—no less than 42 cfs
October 1 to March 31—no less than 83 cfs
April 1 to May 31—no less than 332 cfs

Under circumstances where the natural inflow to the project is insufficient to permit both passage of these minimum flows and refilling the impoundment, CVPSC can refill the impoundment while releasing 90 percent of instantaneous inflow downstream at all times. This condition will become part of the license and is provided for in Article 401.

Condition G requires the applicant to file a draft plan for monitoring instantaneous flow releases at the project, both in the bypass reach and below the tailrace, within 90 days of the issuance of the Certification. Following approval of this monitoring plan, CVPSC shall measure instantaneous flows and provide records of discharges at the project on a regular basis as requested by VANR. This condition will become part of the license. Article 403 requires submission of this plan to the Commission after appropriate consultation.

Condition H requires that the applicant submit a plan for downstream fish passage, which is to be operated April 1 to June 15 and September 15 to November 15. Articles 405, 406, and 407 of this license require the construction and operation of downstream fish passage facilities at the project. In light of the State's program designating fish habitat as a use of the Black River, this condition will become part of this license.

Condition I requires the applicant to file a plan for study, for VANR's review and approval, for assessing the impact of alternative bypass flows on the bryophyte *Scapania umbrosa*, a moss-like species of liverwort. This condition will become part of the license. Article 409 includes this provision.

Condition I also stipulates that, during the September 15 through November 15 period, the project's downstream fish passage facilities be operated using 10 cfs until sufficient information is available to determine whether or not operation at flows greater than 10 cfs would be detrimental to the colonies of *Scapania umbrosa* in the Cavendish Gorge.

We recognize that there could be a future conflict between the state's aforementioned requirement and Interior's section 18 prescription that flows needed for the operation of the downstream passage facility and attraction to the facility be released during operation of the fishway. We see no need to resolve these issues here, but may do so when the Licensee seeks our approval before constructing the fishway.

Condition J requires the applicant to provide the VANR with a copy of the project's turbine rating curves. This condition will become part of the license. Article 403 includes this provision.

Condition K requires the applicant to submit a plan for the proper disposal of debris associated with project operation, including trashrack debris. This condition will become part of this license. Article 410 provides for debris disposal at the project.

Condition L requires CVPSC to file for the state's prior review and approval, any proposals for project maintenance or repair work involving the river, including desilting of the dam impoundment, impoundment draw-downs to facilitate repair or maintenance work, and tailrace dredging. The state has no authority to halt or order maintenance and repair of the Cavendish Project. Section 401 provides that a state may issue its certification, at which point the federal licensing or permitting agency is responsible for making the certification a part of the license or permit. Section 401 gives the state no further role in the federal process. Condition L, which would give the state the ability to control the timing of activities under a federal license, is thus beyond the scope of section 401 and will not become part of the license.[6]

Condition M requires the applicant to provide a canoe portage at Cavendish Dam. While this condition is not related to water quality, staff's analysis indicates that the measure is warranted. Moreover, Article 413 provides for development of a canoe portage at the project.

Condition N requires the applicant to allow continued public access to the river for utilization of the public resources, subject to reasonable safety and liability limitations. Article 413 of the license ensures adequate public access to project recreational opportunities, and standard license Article 13 addresses public access to recreation in more general terms. Therefore, Condition N will become part of the license.

Condition O requires the applicant to allow VANR to inspect the project area at any time to monitor compliance with certification conditions. This condition will become part of the license.

Condition P requires the applicant to prominently post a copy of this certification at the facility. This condition will become part of the license.

Condition Q requires any changes to the project, including project operation, that would have a significant or material effect on the certificate to be submitted to VANR for prior review and approval. Section 401(a)(3) of the CWA sets out the exclusive manner in which state certifications may be modified and makes clear that process is to be initiated by the federal licensing or permitting agency, not the state.[7] Thus, the Commission determines whether proposed license amendments require new water quality certification.[8] Condition Q, which gives the state authority beyond that provided for in the CWA, is beyond the scope of section 401 and thus will not be included in the license.

Condition R states that the Department, at any time, may request FERC to reopen the license to consider modifications to the license necessary to assure compliance with Vermont Water Quality Standards. This condition will be included in the license.

Section 18 Fishway Prescriptions

Section 18 of the FPA provides the Secretary the authority to prescribe fishways at Commission-licensed projects.[9] Interior (December 17, 1993) prescribed the following measures pursuant to section 18:

1. The Licensee shall construct a permanent downstream fishway at the project. The Licensee shall develop and submit to the Fish and Wildlife Service (FWS), functional design drawings of the facilities and a construction schedule within 4 months from the issuance date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, FWS. The Licensee shall construct the facility as depicted in the approved final designs and according to the approved schedule. The Licensee shall provide as-built drawings to FWS following fishway construction.

The flows needed for operation of the passage facility and attraction to the facility must be released during the operation of the fishway. Once constructed, the downstream passage facilities shall be operated from April 1 through June 15, and from September 15 through November 15. This period may be modified in the future based on additional information on the appropriate seasons for downstream passage.

2. The Licensee shall, prior to the completion of the permanent downstream fishway at the project, design and operate by April 1, 1995, an interim fish bypass facility. The Licensee shall develop and submit to FWS, functional design drawings of the facilities

[6] *See Tunbridge, supra* at p. 12.

[7] *See Tunbridge, supra* at p. 11.

[8] Our regulations, 18 C.F.R. § 4.38(7)(iii) (1993), provide that, if an applicant seeks to amend its application or license, it must make a new request for water quality certification if the amendment would have a material adverse impact in the discharge from the project. We make the determination as to whether a material adverse impact will result from the amendment and, thus, whether a new certification is necessary. *See, e.g., Joseph M. Keating*, 57 FERC ¶ 61,261 (1991), *reh'g denied*, 61 FERC ¶ 61,215 (1992).

[9] Section 18 of the FPA provides: "The Commission shall require the construction, maintenance, and operation by a licensee at its own expense of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior, as appropriate."

and a construction schedule within 4 months from the issuance date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, FWS.

The Licensee shall construct the interim facility as depicted in the approved final designs and according to the approved schedule.

The flows needed for operation of the interim passage facility and attraction to the facility must be released during the operation of the fishway. Once constructed, the interim downstream passage facilities shall be operated from April 1 through June 15, and from September 15 through November 15 each year until the permanent facilities are completed. This period may be modified in the future based on additional information on the appropriate seasons for downstream passage.

3. The Secretary of the Interior's authority to prescribe the construction, operation and maintenance of fishways under section 18 of the FPA, 16 U.S.C., section 811, is reserved. We request that a notification of this reservation be placed in any new license.

4. The Department of the Interior reserves the right to modify its section 18 Fishway Prescription as needed to facilitate fish passage.

Interior also reserves the authority to prescribe the construction, operation, and maintenance of upstream fishways under section 18, and the right to modify its section 18 fishway prescription as needed to facilitate fish passage.

Interior's section 18 Fishway Prescription contains several requirements that qualify as section 18 measures. Under the Authority of section 18, Interior requires CVPSC to (i) develop functional design drawings for a permanent downstream fish passage facility, in consultation with FWS; (ii) construct the downstream passage facility as depicted in the Commission-approved final designs, and provide as-built drawings to FWS after construction; (iii) release flows for operation of, and attraction to, the passage facility, as required by the Commission's approved final design; (v) design, construct, and operate an interim downstream fishway, developed in consultation with FWS; and (vi) operate the project's downstream passage facilities during selected time periods each year.

In addition, Interior includes in its prescription deadlines and schedules for compliance with the prescribed measures (for example, submitting plans for interim and final fish passage facilities for FWS approval within 4 months of any license issued). Such deadlines and schedules do not qualify as section 18 measures. Moreover, some of the measures cited above appear to grant the FWS final approval authority for fish passage design. Although I am requiring CVPSC to consult with the FWS regarding the final design and specifications of the downstream passage facilities, the Commission must retain final approval authority over fishway design and construction. Therefore, I consider them as recommendations under sections 10(a) and 10(j) of the FPA. Disposition of 10(j) measures is discussed below.

Coastal Zone Management Program

The Cavendish Project is not located in the state-designated coastal zone management area.

Recommendations of Federal and State Fish and Wildlife Agencies

Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations of federal and state fish and wildlife agencies, for the protection, mitigation of adverse impacts to, and enhancement of fish and wildlife resources. Pursuant to section 10(j) of the FPA, staff made a determination that the recommendations of the Federal and state fish and wildlife agencies are consistent with the purposes and requirements of Part I of the FPA and other applicable law. Staff has addressed the concerns of the Federal and state fish and wildlife agencies in the EA, and the license includes conditions consistent with the recommendations of the agencies.

Comprehensive Plans

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with Federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under section 10(a)(2), federal and state agencies filed a total of 28 comprehensive plans of which staff identified 8 Vermont and 5 United States plans which are applicable. No conflicts were found. Comprehensive plans relevant to this project are listed in section XI of the EA.

Comprehensive Development

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When the Commission reviews a project, the recreational, fish and wildlife resources, and other nondevelopmental values of the involved waterway are considered equally with power and other developmental values. In determining whether, and under what condi-

tions, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

Staff considered the applicant's proposed enhancement measures, section 18 Fishway Prescriptions, agency-recommended terms and conditions, our recommended enhancement measures, and the no-action alternative under sections 4(e) and 10(a) of the FPA.

A. *Recommended Alternative*

Staff considered several environmental enhancement measures that would reduce the economic benefits of the project including: a seasonal schedule of minimum flows, landscape improvements, recreational enhancements, and downstream fish passage.

From staff's independent analysis of the environmental and economic effects of the alternatives, I have selected the applicant's proposal plus staff-recommended supplemental enhancement measures as the preferred alternative. I have selected this alternative because implementation of these measures will enhance fisheries, aesthetics, water quality, and recreational resources. Additionally, these measures will increase public access to the project area.

The required enhancement measures will include:

- operating the project in instantaneous run-of-river mode;
- providing a minimum flow in the bypass reach of 10 cfs from April 1 through November 15 and leakage flows from November 16 through March 31;[10]
- providing a seasonal 15 cfs flow (April 1 through June 15 and September 15 through November 15) for operation of the downstream fish passage facility;[11]
- providing plantings for visual screening of the substation;
- constructing, operating, and maintaining a parking area, picnic facilities, and canoe take-out, portage trail, and put-in;
- developing plans for flow monitoring during operation and repair events;
- implementing a Programmatic Agreement for the management of cultural resources; and
- constructing and operating downstream fish passage facilities.

B. *Developmental and Nondevelopmental Uses of the Waterway*

The project will generate an estimated 1.4 megawatts (MW) of relatively low-cost electricity from a renewable energy resource for use by CVPSC's customers. Positive, long-term benefits to water quality, aquatic habitat, area aesthetics, recreational resources, and cultural resources will result from operating the project with my recommended enhancement measures. Though the cost of these measures will reduce the existing power benefits of the project, the project will still have net benefits over the new license term compared to the least-cost alternative.

The primary costs associated with the Commission's recommended enhancements will be: (1) operating in instantaneous run-of-river mode at an annual levelized cost of $4,900; (2) providing minimum spillage flow of 10 cfs (4 cfs leakage flow and 6 cfs released at the dam) to the bypass reach at an annual levelized cost of $24,100; (3) providing plantings for visual screening of the substation at an annual levelized cost of $1,000; (4) constructing, operating, and maintaining a parking area and adjacent picnic facilities, and a canoe take-out, portage trail, and put-in at an annual levelized cost of $3,000; (5) developing plans for monitoring flows during operation and maintenance events at an annual levelized cost of $1,000; and (6) constructing and operating downstream fish passage facilities at an annual levelized cost of $25,600.

In total, the required enhancement measures will reduce the project's levelized annual net benefits from $385,400 to $325,800, or by $59,600.

C. *Economic Costs of Additional Water Quality Certificate Conditions*

Two conditions included in VANR's water quality certificate for the Cavendish Project that will affect project economics were considered unwarranted by the Commission's staff. These conditions, which will be included in this license as a matter of law, require: a 10 cfs flow in the bypass from November 16 through March 31; and the development and implementation of a plan to assess the impacts of various minimum bypass flows on the bryophyte *Scapania umbrosa*.

We have calculated that the additional 10 cfs flow required to meet the year-round 10 cfs bypass flow requirement will reduce the project's average annual generation by 175 MWH,

[10] This 10 cfs flow includes an existing leakage flow that averages 4 cfs plus a dam spillage of 6 cfs.

[11] Passage flow includes the 6 cfs year-round release as well as an incremental release of 9 cfs during the passage seasons. The total 15 cfs flow must be released through the fishway during the passage seasons. This 15 cfs flow is based on preliminary design drawings developed by CVPSC and filed with the Commission on November 30, 1993. The final design may require somewhat higher flows (20 to 25 cfs).

thereby decreasing yearly project benefits by an additional $17,200.

Condition I of the WQC requires that CVPSC develop a plan of study for assessing the impact of alternative bypass flows on the bryophyte *Scapania umbrosa*. The results of this study will be used to assess the feasibility of increasing the minimum flows to a level not to exceed 20 cfs. If the study results indicate that the bryophyte populations could sustain additional flows, the incremental 10 cfs needed to provide a total year-round flow of 20 cfs would result in an additional cost of $21,600 annually, levelized over the 30 year license term.

The cost of conducting the bryophyte study, levelized over a 30-year license period, would result in an additional annual cost of $5,100.

In total, the enhancement measures required by the Commission staff, section 18 prescriptions, and additional WQC conditions will reduce the project's levelized annual net benefits from $385,400 to $303,500, or by $81,900. Should the results of the bryophyte study indicate that flows of 20 cfs are warranted, the additional 10 cfs flow would reduce the project's annual net benefits by $21,600 to $281,900. We believe that this cost is feasible given the project's net economic benefits.

Based on review of the agency comments filed on this project, and on staff's independent analysis and assessment of the project pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the Act, I find that the Cavendish Project with the required environmental enhancement measures is best adapted to a comprehensive plan for the proper use, conservation, and development of the Black River and other project related resources.

Project Retirement

The Commission has issued a Notice of Inquiry (NOI), dated September 15, 1993, requesting comments that address numerous issues involving the potential decommissioning of licensed hydropower projects at some future time, based on project-specific circumstances.[12] The NOI states that the Commission is not proposing new regulations at this time, but is inviting comments on whether new regulations may be appropriate. Alternatively, the Commission may consider issuing a statement of policy addressing the decommissioning of licensed hydropower projects, or take other measures.

The Cavendish Project may be affected by future actions that the Commission takes with respect to issues raised in the NOI. Therefore, the license includes Article 202, which reserves authority to the Commission to require the Licensee to conduct studies, make financial provisions, or otherwise make reasonable provisions for decommissioning of the project in appropriate circumstances.

By including Article 202, I do not intend to prejudge the outcome of the NOI. I am simply including the article so that the Commission will be in a position to make any lawful and appropriate changes in the terms and conditions of this license, which is being issued during the pendency of the NOI, based on the final outcome of that proceeding.

License Term

In 1986, the Electric Consumers Protection Act (ECPA) modified section 15 if the FPA to specify that any license issued under section 15 shall be for a term which the Commission determines to be in the public interest, but not less than 30 years, nor more than 50 years. We are following the same guidelines in issuing subsequent licenses.[13]

Generally, we issue 30-year relicenses for projects that include no substantial new construction or power-generating expansion. We issue relicenses for 40 years or more for projects that include substantial new construction or capacity increases.

We issue licenses of longer duration to ease the economic impact of the new costs, and to encourage better comprehensive development of the renewable power-generating resource. For the same reason, we may issue longer duration licenses for projects that include substantial or costly environmental mitigation and enhancement measures. Licenses of longer duration, in these instances, encourage license applicants (1) to be better environmental stewards, and (2) to propose more balanced and comprehensive development of our river basins.

CVPSC does not propose new development at the existing project facilities. In light of the relatively modest environmental enhancement costs involved, this subsequent license for the Cavendish Project will be for a term of 30 years, effective the first day of the month in which this license is issued.

Summary of Findings

The EA issued for this project includes background information, analysis of impacts, support for related license articles, and the basis for the finding of no significant impact on the environment. Issuance of this license is not a

[12] Notice of Inquiry, Project Decommissioning at Relicensing, Docket No. RM93-23-000, September 15, 1993, 58 Fed. Reg. 48991 (1993).

[13] A subsequent license is issued for a minor project whenever sections 14 and 15 of the FPA were waived in the project's original license.

major federal action significantly affecting the quality of the human environment.

The design of this project is consistent with engineering safety standards. The project will be safe if operated and maintained in accordance with the requirements of this license. Analysis of related issues is provided in the S&DA prepared for the Cavendish Project and available in the Commission's public file for this project.

I conclude that the Cavendish Project does not conflict with any planned or authorized development, and it is best adapted to the comprehensive development of the Black River for beneficial public uses.

The Director orders:

(A) This license is issued to CVPSC for a period of 30 years, effective the first day of the month in which it is issued. This license is subject to the terms and conditions of the FPA, which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

(1) All lands, to the extent of the Licensee's interests in those lands, shown by exhibit G.

Exhibit G	*FERC No.*	*Showing*
G-1	2489-6	Project Map

(2) Project works consisting of: (1) a 111-foot-long concrete gravity dam consisting of (a) a 90-foot-long, 25-foot-high north section topped with 6-foot-high hinged flashboards and (b) a 21-foot-long, 6-foot-high south section topped with 2.5-foot-high flashboards, which also serves as an emergency spillway; (2) a submerged entrance, concrete intake structure on the north bank with a manually operated head gate, and inclined trashrack; (3) a powerhouse, 34 feet wide and 64 feet long, housing three horizontal Francis turbines with a total installed capacity of 1,440 kilowatts (kW); (4) a 10-acre impoundment, 0.6 miles long, having a usable storage capacity of 18.4 acre-feet at 884.13 feet mean sea level (m.s.l.); (5) a 180-foot-long power tunnel from the intake to the penstock; (6) a 6-foot-diameter, steel penstock extending 1,250 feet from the downstream end of the power tunnel to the powerhouse; (7) a 64-foot-long by 34-foot-wide powerhouse that contains three horizontal shaft Francis turbine generators with a combined installed capacity of 1,440 kilowatts (kW), and a hydraulic range of 19 to 226 cubic feet per second (cfs); and (8) appurtenant facilities.

The project works generally described above are more specifically shown and described by those portions of exhibits A and F shown below:

Exhibit A — The following sections of exhibit A filed on December 31, 1991, along with the supplemental filing on August 2, 1993:

The generator description on page A-1; the turbine description on page A-1; and the additional mechanical and electrical equipment described elsewhere on pages A-2 through A-4 of the exhibit A.

Exhibit F — The following exhibit F drawings filed on December 31, 1991, along with the revisions filed on August 2, 1993.

Exhibit	*FERC No.*	*Showing*
F-1	2489-4	Existing Conditions
F-2	2489-5	Existing Conditions

(3) All of the structures, fixtures, equipment or facilities used to operate or maintain the project, all portable property that may be employed in connection with the project, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) The exhibits A, F, and G described above are approved and made part of the license.

(D) The following sections of the FPA are waived and excluded from the license for this minor project:

4(b), except the second sentence; 4(e), insofar as it relates to approval of plans by the Chief of Engineers and the Secretary of the Army; 6, insofar as it relates to public notice and to the acceptance and expression in the license of terms and conditions of the FPA that are waived here; 10(c), insofar as it relates to depreciation reserves; 10(d); 10(f); 14, except insofar as the power of condemnation is reserved; 15; 16; 19; 20; and 22.

(E) This license is subject to the articles set forth in Form L-12 (October 1975) [54 FPC 1871], entitled, "Terms and Conditions of License for Constructed Minor Project Affecting the Interests of Interstate or Foreign Commerce," and the following additional articles.

Article 201. The Licensee shall pay the United States an annual charge, effective the first day of the month in which this license is issued, for the purpose of reimbursing the United States for the cost of administration of Part I of the FPA, as determined by the Commission. The authorized installed capacity for that purpose is 1,920 horsepower.

Article 202. The Commission reserves authority, in the context of a rulemaking proceeding or a proceeding specific to this license, to require the Licensee at any time to conduct studies, make financial provisions, or otherwise

make reasonable provisions for decommissioning of the project. The terms of this article shall be effective unless the Commission, in Docket No. RM93-23, finds that the Commission lacks statutory authority to require such actions or otherwise determines that the article should be rescinded.

Article 401. The Licensee shall operate the project in a run-of-river mode, except as allowed in the following two paragraphs. The Licensee shall at all times act to minimize fluctuations in the surface elevation of the Cavendish impoundment by maintaining a discharge from the project such that, at any point in time, flows, as measured immediately downstream from the project tailrace and bypass reach, approximate the sum of the flows to the project impoundment.

During the repair or replacement of flashboards, or maintenance that requires lowering of the impoundment water level, the water surface level of the impoundment shall be drawn to the dam crest, and the project operated continuously in a true run-of-river mode by passing all flows through the turbines. Scheduled drawdowns below the crest of the dam shall be made only after consultation with the Vermont Agency of Natural Resources (VANR) and the U.S. Fish and Wildlife Service (FWS) and approval by the Commission.

After the installation or maintenance is complete, the following instantaneous minimum flows shall be released downstream of the project as the impoundment is refilled: 42 cubic feet per second (cfs) from June 1 to September 30; 83 cfs from October 1 to March 31; and 332 cfs from April 1 to May 31. When natural inflow to the project is insufficient to meet these flow passage requirements and fill the impoundment, the impoundment shall be refilled while releasing 90 percent of the instantaneous inflow at all times through the turbines.

Run-of-river operation may be temporarily modified, if required by operating emergencies that are beyond the control of the Licensee, or for short periods upon mutual agreement among the Licensee, VANR, and FWS. If the flow is so modified, the Licensee shall notify the Commission as soon as possible, but no later than 10 days after each such occurrence.

Article 402. The Licensee shall provide to the bypassed reach of the Black River a continuous minimum flow of 10 cubic feet per second (cfs), or inflow, whichever is less, to enhance the aesthetics and aquatic habitats of the project area. This flow shall be comprised of dam leakage plus spill via a port(s) in the dam or flow through the required downstream fish passage facilities.

If the instantaneous inflow falls below the hydraulic capacity of the turbine unit plus the spillage requirement, all inflows shall be spilled at the dam.

The bypass flow may be temporarily modified, if required by operating emergencies beyond the control of the Licensee, or for short periods upon agreement among the Licensee, the U.S. Fish and Wildlife Service, and the Vermont Agency of Natural Resources. If the flow is so modified, the Licensee shall notify the Commission as soon as possible, but no later than 10 days after each such occurrence.

Article 403. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor inflow to the project and outflow from the project both below the tailrace and in the bypassed reach to document compliance with run-of-river operation and provision of downstream flows during impoundment refilling, required by Article 401, and the 10 cubic feet per second minimum instantaneous flow in the bypassed reach, required by Article 402.

The plan shall include, at a minimum, the following items:

(1) the specific methods to provide the specified minimum flows;

(2) a schedule for installing all flow measuring devices;

(3) the planned locations of the flow measuring devices;

(4) the design of the devices, including any pertinent hydraulic calculations;

(5) operating measures that will minimize the effects of lag time and deviations from true run-of-river conditions below the project;

(6) the method of flow data collection, and provisions for providing data to the regulatory agencies in a timely manner; and

(7) a provision to provide the project's turbine rating curve to the Vermont Agency of Natural Resources within 90 days of the Commission's approval of the plan.

The Licensee shall prepare the plan after consultation with the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the Vermont Agency of Natural Resources.

The Licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with

the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on site-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 404. The Licensee shall maintain the level of the Cavendish impoundment no lower than 6 inches below the crest of the flashboards, except during periods when the project's control system is not functioning or the flashboards have failed. When the control system is not functioning, the impoundment shall be maintained no lower than 12 inches below the crest of the flashboards. The Licensee shall manage the impoundment level such that changes in excess of minus 2 feet from the normal operating level are eliminated.

Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan that describes the measures that will be used to manage impoundment level.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources.

The Licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agency to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 405. Within 4 months of license issuance, the Licensee shall file with the Commission, for approval, detailed design drawings of the Licensee's interim downstream fish passage facilities, together with a schedule to construct/install the facilities. The filing shall include the design flows needed for the effective operation of and the attraction of anadromous fish to the facilities.

The Licensee shall develop the drawings and schedule in consultation with the U.S. Fish and Wildlife Service and the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed drawings and schedule after they have been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the filing.

The Licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the drawings and schedule with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the drawings and schedule. Upon Commission approval, the Licensee shall implement the plans for interim downstream passage facilities, including any changes required by the Commission.

The Licensee shall operate the interim downstream fish passage facilities yearly from April 1 through June 15, and from September 15 through November 15, until permanent fish passage facilities are completed.

If new information concerning the timing of migrating juveniles warrants it, the operational dates of the facilities may be modified, after approval by the Commission.

Article 406. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, detailed design drawings of the Licensee's permanent downstream fish passage facilities, together with a schedule to construct/install the facilities.

The Licensee shall develop the drawings and schedule in consultation with the U.S. Fish and Wildlife Service and the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of consultation, copies of comments and recommendations on the completed drawings and schedule after they have been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the filing.

The Licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the drawings and schedule with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the drawings and schedule. Upon Commission approval, the Licensee shall implement the plans for permanent downstream passage facilities, including any changes required by the Commission.

Article 407. Within one year of license issuance, the Licensee shall file with the Commission, for approval, a plan for operating, maintaining, and monitoring the effectiveness of the permanent downstream fish passage facilities.

The plan shall include provisions for operating the facilities yearly from April 1 through June 15, and from September 15 through November 15, unless new information concerning the timing of migrating Atlantic salmon juveniles warrants a modification of these operating periods. Operating periods may be modified only after approval from the Commission.

The plan shall establish the flows required for operating the passage facility and attracting anadromous fish to the facility during its operation.

The Licensee shall develop the plan in consultation with the U.S. Fish and Wildlife Service and the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 408. Authority is reserved by the Commission to require the Licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of, such fishways as may be prescribed by the Secretary of the Interior under section 18 of the Federal Power Act.

Article 409. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan for assessing the impact of alternative bypass flows on the bryophyte *Scapania umbrosa*, located within the Cavendish Gorge area, for the 5 years of project operation following license issuance.

The monitoring plan shall include a schedule for: (1) implementing the program; (2) consulting with the Vermont Agency of Natural Resources (VANR) concerning the results of the monitoring; and (3) filing the monitoring results and agency comments with the Commission.

The Licensee shall prepare the plan after consultation with the VANR.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agency to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

The Commission reserves the authority to increase the project's minimum bypass flow up to 20 cfs, if the results of studies on the effects of bypass flows on populations of the bryophyte *Scapania umbrosa* located in Cavendish Gorge indicate that flows up to 20 cfs would not produce a significant adverse effect on these populations.

Article 410. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan for the proper disposal of debris associated with project operation, including trashrack debris.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agency to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 411. At least 90 days before the start of any project maintenance or repair work involving the river, including desilting of the dam impoundment, the Licensee shall file with the Commission, for approval, a plan to implement its proposed actions, including impoundment draw-downs to facilitate repair/maintenance work, and tailrace dredging.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agency to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 412. The Licensee shall implement the provisions of the "Programmatic Agreement Among the Federal Energy Regulatory Commission, the Vermont Division of Historic Preservation, and the Advisory Council on Historic Preservation for Managing Historic Properties Affected by Continuing to Operate the Cavendish Hydroelectric Project, Project No. 2489." The Commission reserves the right to require changes to the Cultural Resources Management Plan incorporated as part of the Programmatic Agreement at any time during the term of the license.

Article 413. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a final recreation plan. The plan shall be based on the facilities described in: pages E.5-28 to E.5-31 of the application for relicense, filed in December 1991; responses to Additional Information Requests No. 10, 11, and 13, filed in August 1993; and a July 15, 1994 letter from Bruce M. Peacock to Lois D. Cashell.

The final plan shall provide for the following recreational enhancements at the project: (1) a public parking area for eight vehicles near the existing powerhouse and maintenance buildings; (2) a picnic area with three picnic tables and benches near the proposed parking area; (3) a trailhead, directional signs, and trail improvements for the existing 800-foot-long trail from the parking area to a fishing and canoe launching site located downstream of the powerhouse; (4) a scenic overlook and interpretative platform located downstream of the powerhouse; (5) a locked gate across the east side access road with a sign on the gate directing people to the recreation facilities on the west side of the river; (6) a canoe take-out, portage trail, and put-in on the west side of the river; (7) signs directing canoeists to the portage facilities; and (8) "Danger Dam" signs on the boat barrier.

The final plan shall include, at a minimum, the following: (1) final site plans for the recreation facilities cited above; (2) design drawings of the directional and warning signs and a description of where they will be located; (3) a discussion of how the facilities will conform to the guidelines established by the Architectural and Transportation Barriers Compliance Board (*Federal Register*, Vol. 56, No. 144); (4) erosion and sediment control measures, designed in consultation with the Soil Conservation Service, which shall be implemented during construction; (5) the entity responsible for operating and maintaining the facilities; and (6) an implementation schedule not to exceed 6 months from the date of the plan's approval.

The Licensee's design of recreational facilities shall conform to the national standards established by the Architectural and Transportation Barriers Compliance Board pursuant to the Americans with Disabilities Act of 1990.

The Licensee shall file the plan after consultation with the Vermont Agency of Natural Resources, the Village of Cavendish, and the Soil Conservation Service.

The Licensee shall include with the filing documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the entities, and specific descriptions of how the entities' comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. No land-disturbing or land-clearing activities for recreational facilities shall begin until the Licensee is notified by the Commission that the plan is approved. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Within 90 days of completion of construction, the Licensee shall file as-built drawings of the recreation facilities with the Commission.

Article 414. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a landscaping plan to reduce the visual intrusiveness of the substation adjacent to the project. The plan shall include diagrams indicating the locations of proposed landscaping and a schedule for implementation of the plan.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources.

The Licensee shall include with the filing documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan.

The Licensee shall allow a minimum of 30 days for the agency to comment and to make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 415. (a) In accordance with the provisions of this article, the Licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy without prior Commission approval. The Licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the Licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with, the covenants of the instrument of conveyance for any interests that it has conveyed under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the Licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the Licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The types of use and occupancy of project lands and water for which the Licensee may grant permission without prior Commission approval are:

(1) landscape plantings;

(2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings;

(3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and

(4) food plots and other wildlife enhancement.

To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the Licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The Licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the Licensee shall:

(1) inspect the site of the proposed construction;

(2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site; and

(3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline.

To implement this paragraph (b), the Licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the Licensee's costs of administering the permit program. The Commission reserves the right to require the Licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The Licensee may convey easements or rights-of-way across, or leases of, project lands for:

(1) replacement, expansion, realignment, or maintenance of bridges or roads where all

necessary state and federal approvals have been obtained;

(2) storm drains and water mains;

(3) sewers that do not discharge into project waters;

(4) minor access roads;

(5) telephone, gas, and electric utility distribution lines;

(6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary;

(7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and

(8) water intake or pumping facilities that do not extract more than one million gallons per day from a project reservoir.

No later than January 31 of each year, the Licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed. If no conveyance was made during the prior calendar year, the Licensee shall so inform the Commission and the Regional Director in writing no later than January 31 of each year.

(d) The Licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for:

(1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained;

(2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained;

(3) other pipelines that cross project lands or waters but do not discharge into project waters;

(4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained;

(5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina;

(6) recreational development consistent with an approved exhibit R or approved report on recreational resources of an exhibit E; and

(7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year.

At least 60 days before conveying any interest in project lands under this paragraph (d), the Licensee must submit a letter to the Director, Office of Hydropower Licensing, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked exhibit G or K map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the Licensee to file an application for prior approval, the Licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the Licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the Licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved exhibit R or approved report on recreational resources of an exhibit E; or, if the project does not have an approved exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to insure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the Licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised exhibit G or K drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised exhibit G or K drawings would be filed for approval for other purposes.

(g) The authority granted to the Licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

(F) The Licensee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to that filing. Proof of service on these entities must accompany the filing with the Commission.

(G) This order is issued under authority delegated to the Director and constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 10 C.F.R. section 385.713. The filing of a request for rehearing does not operate as a stay of the effective date of this order or of any other data specified in this order, except as specifically ordered by the Commission. The Licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Environmental Assessment for Hydropower License

Federal Energy Regulatory Commission

Office of Hydropower Licensing

Division of Project Review

Cavendish Hydroelectric Project

FERC Project No. 2489 - Vermont

Summary

On December 31, 1991, Central Vermont Public Service Corporation, Inc. (CVPSC) filed an application with the Federal Energy Regulatory Commission (Commission) for a subsequent license for the existing 1.4-megawatt (MW) Cavendish Hydroelectric Project. The project is located on the Black River in the Town of Cavendish, Windsor County, Vermont. CVPSC supplemented its application with additional information in August 1993. The current license for this project expired on December 31, 1993. No new capacity is proposed for this project.

This environmental assessment (EA) prepared for the Cavendish Project analyzes and evaluates the effects associated with the issuance of a subsequent license for the existing hydropower development and recommends terms and conditions to become a part of any license issued. For any license issued, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to the purpose of energy conservation; the protection and enhancement of fish and wildlife, aesthetics, and cultural resources; and the protection of recreational opportunities. This EA for the Cavendish Project reflects the Commission's consideration of these factors.

Based on the lawful conditions contained in Vermont's Water Quality Certificate issued for the Cavendish Project, which would be included in any license issued, plus our consideration of all developmental and nondevelopmental resource interests related to the project, the following eight measures to protect and enhance environmental resource values should be included in any license issued for the Cavendish Project.

The licensee should: (1) operate the project in such a manner that inflows to the project impoundment equal the flows below the confluence of the bypass reach and the project tailrace (instantaneous run-of-river mode); (2) refill the impoundment by reducing downstream flows following the reinstallation of flashboards or an approved special maintenance event requiring a drawdown, but to no less than the Aquatic Base Flow (ABF)—June 1 to September 30—no less than 42 cfs; October 1 to March 31—no less than 83 cfs; and April 1 to May 31—no less than 332 cfs; (3) provide a year-round minimum flow of 10 cfs in the bypass reach for aesthetic, recreation, and fisheries enhancements; (4) implement a study to determine flow effects on the rare bryophyte *Scapania umbrosa*; (5) develop and maintain recreational enhancements, including a parking area, picnic facilities, scenic outlook and interpretative platform, relevant signage, and a canoe portage; (6) provide plantings for visual screening of the project substation; (7) construct and operate downstream fish passage as prescribed by the U.S. Department of the Interior, pursuant to section 18 of the Federal Power Act (FPA); and (8) implement a

Programmatic Agreement for management of cultural resources.

These environmental measures would protect or enhance fisheries resources, water quality, recreational and aesthetic resources, and undiscovered properties eligible for listing on the *National Register of Historic Places*. In addition, the electricity generated from the project would be beneficial because it would: continue to reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and continue to reduce atmospheric pollution.

No reasonable action alternatives to the project have been identified for assessment. The no-action and decommissioning alternatives have been considered and are addressed in the environmental analysis and the comprehensive development sections of this EA. Denial of the license would mean that about 6,108,500 kilowatt-hours (kWh) of electric energy generation per year at the Cavendish Project would be lost, and no measures would be implemented to protect and enhance existing environmental resources.

The Vermont Agency of Natural Resources (VANR) received CVPSC's original application for Water Quality Certification pursuant to section 401 of the Clean Water Act on October 9, 1992. On September 9, 1993, the VANR, Department of Environmental Conservation, conducted a hearing on the application. VANR, on October 7, 1993, issued a Water Quality Certificate to CVPSC for the Cavendish Project.

Pursuant to section 10(j) of the FPA, we make a determination that the recommendations of the Federal and state fish and wildlife agencies regarding the enhancement of fish, wildlife, and their habitat are consistent with the purposes and requirements of Part I of the FPA and applicable law. Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations of Federal and state fish and wildlife agencies, for the protection and enhancement of fish and wildlife resources. We have addressed the concerns of the Federal and state fish and wildlife agencies and made recommendations consistent with those of the agencies.

Under section 18 of the FPA, Interior has prescribed the construction, operation and maintenance of a downstream fishway at the project.

Based on our independent analysis of the project, including our consideration of all relevant economic and environmental concerns, we conclude in this EA that: (1) the Cavendish Hydroelectric Project, with our recommended environmental measures and other special license conditions, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Black River and other project-related resources; and (2) issuance of a subsequent license for the Cavendish Project would not constitute a major Federal action significantly affecting the quality of the human environment.

Introduction

The Federal Energy Regulatory Commission issued the Cavendish Hydroelectric Project Draft Environmental Assessment (DEA) for comment on April 29, 1994. In response, we received three comment letters listed in section IV.C, Comments on the DEA. All timely-filed comment letters were reviewed by the staff. The sections of the DEA that have been modified as a result of comments received are identified in the staff responses to the right of the letters of comment, in appendix A.

I. Application

On December 31, 1991, Central Vermont Public Service Corporation, Inc. (CVPSC or applicant) filed an application with the Federal Energy Regulatory Commission (Commission) for a subsequent license for the Cavendish Hydroelectric Project. The 1.4-megawatt (MW) project is located on the Black River in the Town of Cavendish, Windsor County, Vermont (see Figure 1). The project does not occupy any United States lands.

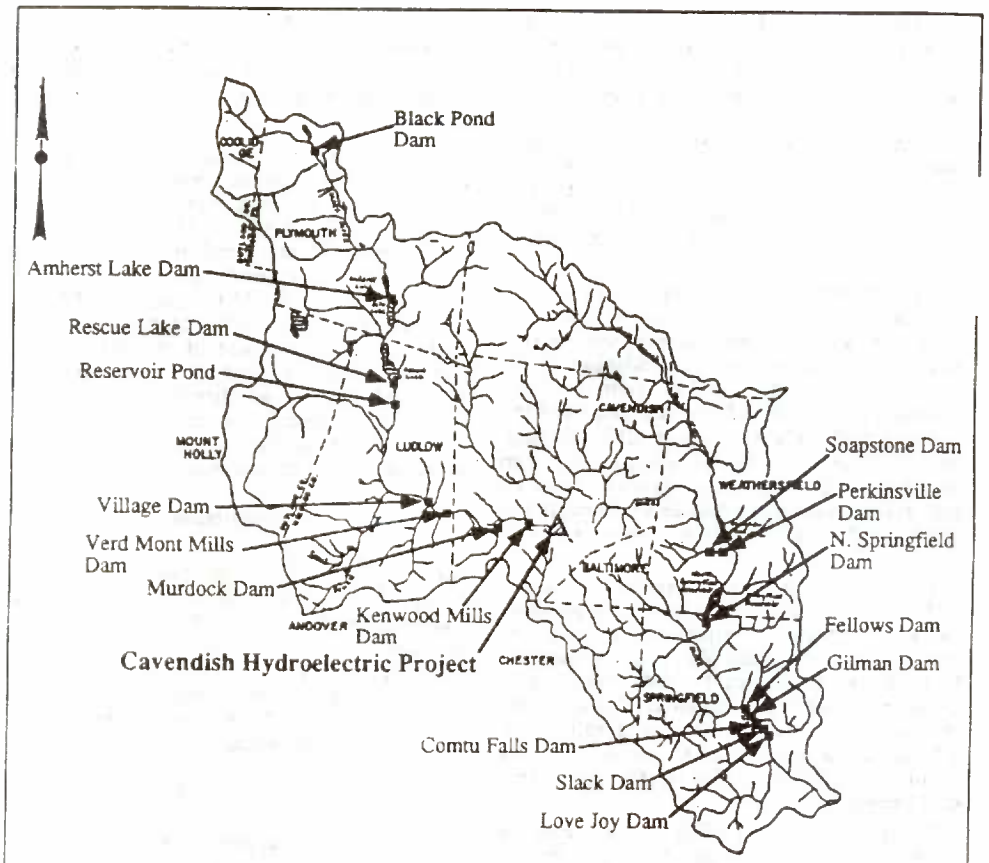


FIGURE 1
Dams on the Black River Mainstem

Cavendish Hydroelectric Project
Environmental Assessment

(Locations are approximate. From CVPSC 1991.)

II. Purpose and Need for Action

A. *Purpose of Action*

This environmental analysis assesses the impacts associated with issuing a subsequent license for the constructed project, alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license, and, if so, recommends terms and conditions to become part of any license issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways and Federal lands.

In deciding whether to issue any license, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation; the protection and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

Issuing a subsequent license for the project would allow CVPSC to continue to own and operate the Cavendish Project for the term of the license, making electric power from a renewable resource for its customers. The project generates an average of about 6,108,500 kilowatt-hours (kWh) of energy annually.

In this environmental assessment (EA), we, the Commission staff, assess the environmental and economic effects of (1) continuing to operate the project with the enhancements proposed by CVPSC, (2) adding future fish passage facilities as prescribed by other agencies, and (3) operating the project as proposed by CVPSC with our additional recommended environmental measures. We also consider the effects of the no-action alternative (continued operation of the project with no changes or enhancements) and the project decommissioning alternative.

B. *Need for Power*

CVPSC is a domestic corporation. To consider the need for power we evaluated the regional need for power.

The Cavendish Hydroelectric Project is located in the New England Power Pool (NEPOOL) area of the Northeast Power Coordinating Council (NPCC) Regional Electric Reliability Council region. As reported in the June 1993 Electricity Supply and Demand report issued by the North American Electric Reliability Council (NERC), NEPOOL is forecasting an average annual increase in peak energy demand of 2.4 percent during summer months and 2.1 percent during winter months for the 1993 to 2002 planning period. During the same time period, NEPOOL is forecasting an annual decrease in planned capacities of 0.6 percent during the summer and 0.3 percent during the winter. The decrease in planned capacities is due primarily to the retirement of facilities offsetting planned facilities.

The continued operation of the Cavendish Project would be useful in meeting a small part of the need for power projected by the NPCC.

III. Proposed Action and Alternatives

A. *Proposed Action*

1. Project Description

The Cavendish hydroelectric facility, originally developed by the Claremont Power Company in 1907, is located in the Town of Cavendish, Vermont, 20.8 miles upstream of the Black River's confluence with the Connecticut River. The drainage area upstream of the project is approximately 83 square miles. The project, owned and operated by CVPSC, is currently licensed to operate as a daily peaking facility.

The constructed Cavendish Project (Figure 2) consists of a concrete gravity dam with two spillway sections: (a) the North section, 90 feet long by 25 feet high, with a crest elevation of 878.13 feet mean sea level (m.s.l.), topped with 6.0-foot-high flashboards; and (b) the South section, 21 feet long by 6 feet high, with a crest elevation of 881.63 feet m.s.l., topped with 2.5-foot-high flashboards.

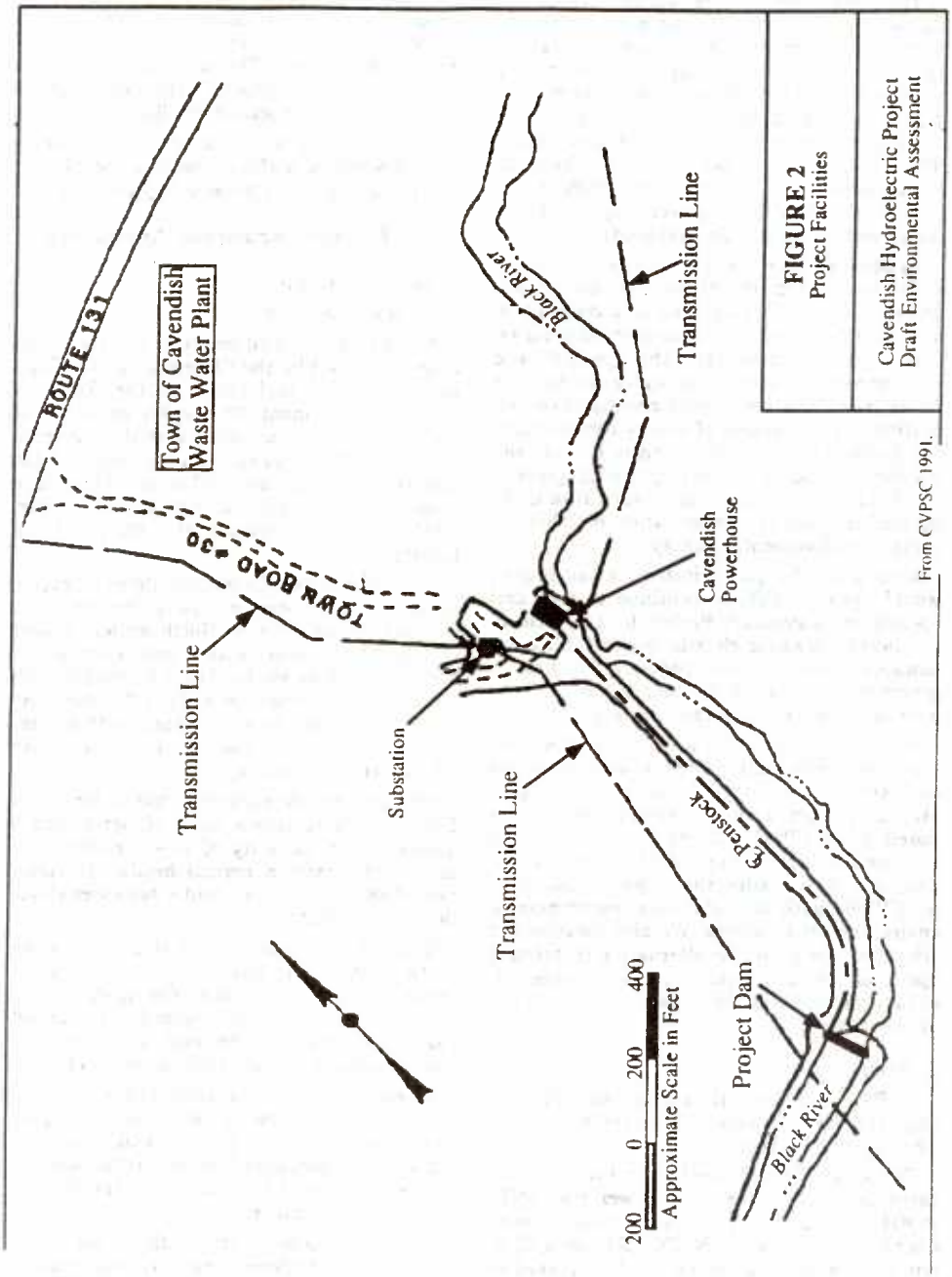
The project impoundment has a length of 3,000 feet, a surface area of 10 acres, and a usable storage capacity of 18.4 acre-feet. The project maintains a normal headwater elevation of 884.13 feet m.s.l. and a tailwater elevation of 764.6 feet m.s.l.

There is a concrete intake structure on the north bank of the river which serves as the north abutment of the dam. The intake configuration consists of a submerged entrance set parallel to the flow of the river, manually operated headgates, and an inclined trashrack.

A power tunnel runs parallel to the river and carries the plant flow 180 feet from the intake to a 6-foot-diameter, 1,250-foot-long, steel penstock. A penstock manifold, located adjacent to the powerhouse, divides the flow and distributes it to the turbines.

The powerhouse contains three horizontal shaft Francis turbine generator units with a combined installed capacity of 1,440 kilowatts (kW), a hydraulic range of 19 to 226 cubic feet per second (cfs), and an average annual genera-

tion of about 6,108 megawatt-hours (MWh), based on the last 20 years of record. The powerhouse substation is located adjacent to the access road almost directly across from the entrance to the powerhouse. The existing substation includes a 3-way transformer used to step up the voltage for distribution.



2. Proposed Environmental Measures

CVPSC proposes to implement the following measures:

- enhance water quality and fisheries by operating the Cavendish Project in an instantaneous run-of-river mode (that is, inflow to the project impoundment equals flow in the Black River below the project tailrace);
- enhance recreational opportunities by investigating the feasibility of, and if feasible, developing a canoe portage trail around the Cavendish Dam and bypass reach; constructing a picnic and parking area; providing directional signage for recreational users; improving an access trail for fishing and canoeing below the powerhouse; and developing a scenic overlook and interpretive platform downstream of the powerhouse;—maintain a minimum flow of 10 cfs (dam leakage of about 4 cfs plus 6 cfs spillage via a port(s) in the dam) from April 15 through October 31 to enhance area aesthetics and to protect aquatic resources in the bypass reach; and
- provide plantings to upgrade the visual character of the project site, especially in proximity to the substation.

B. *Alternatives to the Proposed Project*

1. Staff's Alternative

After evaluating CVPSC's proposal and reviewing recommendations from resource agencies, we considered what, if any, additional protection or enhancement measures would be necessary and appropriate to include in a new license. Our alternative consists of CVPSC's proposal with the following additions or modifications.

- in addition to CVPSC's proposed minimum flow of 10 cfs in the bypass reach from April 15 through October 31, provide a 10 cfs minimum flow from April 1 through April 15 and from October 31 through November 15, and leakage the remainder of the year;
- provide a canoe portage around the Cavendish Dam and bypass reach on the west side of the river;
- construct, operate, and monitor the effectiveness of downstream fish passage facilities; and
- implement a Programmatic Agreement for management of cultural resources.

2. No-Action Alternative

Under the no-action alternative, the project would continue to operate under the terms and conditions of the original license, with no change in existing environmental conditions. We use this alternative to establish baseline environmental conditions for comparison with other alternatives. The project decommissioning alternative is discussed below.

3. Alternatives Considered but Eliminated From Detailed Study

We considered two decommissioning alternatives to the applicant's relicensing proposal but eliminated them from detailed study because they are not reasonable in the circumstances of this case. Project decommissioning could be accomplished with or without dam removal. Either alternative would involve denial of the subsequent license application and surrender or termination of the existing license with appropriate conditions.

No participant has suggested that dam removal would be appropriate in this case, and we have found no adequate basis for recommending it. The current project and impoundment provide recreational opportunities, wildlife habitat, and important wetland areas. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate protection and enhancement measures.

The second decommissioning alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, no participant has advocated this alternative, nor have we found any adequate basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

IV. Consultation and Compliance

A. *Consultation*

On October 25, 1993, we issued a Scoping Document, which identified the pertinent issues to be analyzed in the DEA. No comments were received regarding the Scoping Document.

The following entities commented on the application subsequent to the October 25, 1993, public notice indicating that the application was ready for environmental analysis. All comments become part of the record and are considered in our analyses. All references in the EA to agency comments, recommendations or statements refer to the following agency communications (unless otherwise noted).

Commenting Agencies and Other Entities	*Date of Letter*
U.S. Department of the Interior	December 17, 1993
Vermont Agency of Natural Resources	December 20, 1993

CVPSC, by letter dated February 8, 1994, responded to the agencies' comments.

B. *Intervention*

No interventions were filed regarding the Cavendish Project.

C. *Comments on the Draft Environmental Assessment*

The respondents commenting on the DEA are as follows:

U.S. Fish and Wildlife Service	May 19, 1994
Central Vermont Public Service Corporation	May 26, 1994
Vermont Agency of Natural Resources	July 6, 1994

Other letters from FWS (June 8, 1994) and CVPSC (July 15, 1994) were received with comments/responses to earlier comment letters.

D. *Water Quality Certification*

The Vermont Agency of Natural Resources (VANR) received CVPSC's original application for Water Quality Certification on October 9, 1992. On September 9, 1993, VANR, Department of Environmental Conservation, conducted a hearing on the application for certification. VANR, on October 7, 1993, issued a Water Quality Certificate (WQC) to CVPSC for the Cavendish Project.

Our past experience with section 401 water quality conditions indicates that some states routinely include measures that, in our opinion, do not relate to water quality and, therefore, are outside the scope of section 401. Based on the Commission's Order Issuing License issued July 15, 1994, for the Tunbridge Mill Project, only those measures included in a water quality certificate considered to be within the scope of section 401 become part of any license issued.[1]

The State of Vermont's WQC for the Cavendish Project lists 18 terms and conditions, labeled "A" through "R." These conditions are presented below.

Condition A. CVPSC shall operate and maintain the project as described in the text of the WQC and in accordance with the conditions outlined below.

Condition B. CVPSC shall operate the project in instantaneous run-of-river mode, whereby flows below the project's tailrace are equal to the inflow to the impoundment at all times. When the project is not operating, all flows shall be spilled at the dam.

CVPSC shall, within 90 days of issuance of the WQC, furnish VANR a description, hydraulic design calculations, and plans for the measures to be used to maintain true run-of-river flows below the project tailrace. This plan shall include operating measures that will eliminate or substantially reduce the effects of lag time and deviations from true run-of-the-river conditions below the project.

Condition C. When available from inflow, CVPSC shall release a year-round minimum instantaneous flow of 10 cfs at the dam. If the instantaneous inflow falls below the minimum hydraulic range of one turbine unit plus this spillage requirement, all flows shall be spilled at the dam. Within 90 days of the issuance of this Certification, the applicant shall furnish a description, hydraulic design calculations, and plans for the measures to be used to pass this minimum flow.

Condition D. The level of the project impoundment shall be maintained no lower than 6 inches below the crest of the flashboards, except during periods when the project's control system is not functioning or the flashboards have failed. When the control system is not functioning, the impoundment shall be maintained no lower than 12 inches below the crest of the flashboards.

Condition E. CVPSC shall manage impoundment levels such that changes in excess of minus 2 feet from the normal operating level are eliminated. CVPSC shall develop and propose for VANR approval a management plan for such controls within 90 days of issuance of this Certification. Consideration may be given to a permanent reduction in the normal operating level of the impoundment; however, such an option would have to include an assessment of the impact on upstream wetlands and their values.

Condition F. Following the reinstallation of flashboards or an approved special maintenance event requiring a drawdown, the impoundment shall be refilled by reducing downstream flows. Downstream flows,

[1] *Tunbridge Mill Corporation*, 68 FERC ¶ 61,078 (1994).

however, shall not be permitted to decline below the following levels:

June 1 to September 30 — no less than 42 cfs
October 1 to March 31 — no less than 83 cfs
April 1 to May 31 — no less than 332 cfs

Under circumstances where the natural inflow to the project is insufficient to permit both passage of these minimum flows and refilling the impoundment, CVPSC can refill the impoundment while releasing 90 percent of instantaneous inflow downstream at all times.

Condition G. CVPSC shall file a draft plan for monitoring instantaneous flow releases at the project, both in the bypass reach and below the tailrace, within 90 days of the issuance of this Certification. Following approval of this monitoring plan, CVPSC shall measure instantaneous flows and provide records of discharges at the project on a regular basis as requested by VANR. Upon receiving a written request from CVPSC, VANR may waive, all or in part, this requirement for flow monitoring at this project provided CVPSC satisfactorily demonstrates that the required flow will be discharged at all times.

Condition H. On or before April 1, 1994, CVPSC shall submit a plan for downstream fish passage to VANR, Department of Fish and Wildlife, for review and written approval. Downstream passage shall be provided April 1 to June 15 and September 15 to November 15 and shall be functional with and without flashboards in place. This period of operation shall be subject to adjustment based on knowledge gained about migration periods for migratory salmonids. Unless deferred, the approved plan shall be implemented by April 1, 1995. The plan shall include provisions to:

1. minimize passage of fish into the generating unit(s);

2. minimize impingement of fish on trashracks or on devices or structures used to prevent entrainment; and

3. convey fish safely and effectively downstream of the project, including flows as necessary to operate conveyance facilities.

Condition I. CVPSC shall file a plan of study, for VANR's review and approval, for assessing the impact of alternative bypass flows on the bryophyte *Scapania umbrosa*, a moss-like species of liverwort, within 90 days of issuance of this Certification. The results of the study will be used to assess the environmental feasibility of increasing the minimum flow to a level not to exceed 20 cfs, as well as the effects of the 10 cfs flow set in Condition C above. CVPSC shall work closely with the Agency during the development and implementation of this study, which shall include, but not be limited to, the following steps:

1. A feasibility analysis and plan to protect Site 1 (located at the head of pool 5) at a flow release of 10 cfs, including a determination of the threshold flow (between leakage and 12 cfs) at which the site becomes inundated.

2. A feasibility analysis and plans to modify the outlet controls of pools 4 and 5 to protect existing populations of *Scapania umbrosa* within the backwater influence of the pools.

3. A maintenance plan to include annual inspections of any measures undertaken to protect *Scapania umbrosa* in accordance with the plans referenced in Nos. 1 and 2 above.

4. A plan for a long-term study of the gorge to assess (a) the size and distribution of the *Scapania umbrosa* population under staged alternative minimum flows, and including other factors that may affect bryophyte distribution; and (b) any impairment of swimming use that may occur due to increases in the minimum flow through the gorge.

5. Annual reporting to VANR of study progress and findings.

6. A 5-year report summarizing the findings of the study and recommending action to be taken or study continuation.

Plans for protective measures are subject to prior review and approval by VANR and shall be implemented before passage of minimum flows in accordance with Condition C above.

During the fall period, the fish passage conveyance structure shall be operated at 10 cfs until sufficient information is available to determine whether or not operation at higher flows would be detrimental to *Scapania umbrosa*. When the dam release exceeds 10 cfs, such as during high flow periods, the conveyance structure shall be operated at its design capacity, inflow permitting.

The analyses and plans referenced in Nos. 1 to 3 above shall be filed with VANR on or before June 1, 1994, with completion of any approved modifications by October 1, 1994. The bryophyte study shall be initiated on or before July 1, 1994.

Condition J. The applicant shall provide VANR with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within 1 year of the issuance of this Certification.

Condition K. Within 90 days of the issuance of this Certification, CVPSC shall submit a plan for proper disposal of debris associated with project operation, including trashrack debris, for written approval by VANR.

Condition L. CVPSC shall file with VANR for prior review and approval any proposals for project maintenance or repair work involving the river, including desilting of the dam impoundment, impoundment drawdowns to facilitate repair/maintenance work, and tailrace dredging.

Condition M. CVPSC shall provide a canoe portage at Cavendish Dam by May 1, 1994, in consultation with the Recreation section of the State of Vermont Department of Forests, Parks and Recreation. CVPSC will file design plans for the portage with the Department of Environmental Conservation and the Department of Forests, Parks and Recreation for review and approval before construction.

Condition N. CVPSC shall allow continued public access to the river for utilization of the public resources, subject to reasonable safety and liability limitations.

Condition O. CVPSC shall allow VANR to inspect the project area at any time to monitor compliance with Certification conditions.

Condition P. CVPSC will prominently post a copy of this Certification at the facility.

Condition Q. CVPSC must submit to VANR for prior review and written approval any change to the project that would have a significant or material effect on the findings, conclusions, or conditions of this Certification, including project operation.

Condition R. VANR may request, at any time, that the Commission reopen the license to consider modifications to the license necessary to assure compliance with Vermont Water Quality Standards.

We are of the opinion that Conditions B-I, J, K, O, P, and R are related to the protection and enhancement of water quality. Condition A is partially within the scope of section 401 and Conditions L-N and Q are considered beyond the scope of section 401. The technical merits of these conditions are discussed below.

E. *Section 18 Fishway Prescription*

Section 18 of the FPA provides the Secretary of the U.S. Department of Interior (Interior) the authority to prescribe fishways at Commission-licensed projects.[2] Interior (December 17, 1993) prescribed the following measures pursuant to section 18:

1. The licensee shall construct a permanent downstream fishway at the project. The licensee shall develop and submit to the Fish and Wildlife Service (FWS) functional design drawings of the facilities and a construction schedule within 4 months from the issuance date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, FWS. The licensee shall construct the facility as depicted in the approved final designs and according to the approved schedule. The licensee shall provide as-built drawings to FWS following fishway construction.

The flows needed for operation of the passage facility and attraction to the facility must be released during the operation of the fishway. Once constructed, the downstream passage facilities shall be operated from April 1 through June 15, and from September 15 through November 15. This period may be modified in the future based on additional information on the appropriate seasons for downstream passage.

2. The licensee shall, prior to the completion of the permanent downstream fishway at the project, design and operate by April 1, 1995, an interim fish bypass facility. The licensee shall develop and submit to FWS functional design drawings of the facilities and a construction schedule within 4 months from the issuance date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, FWS.

The licensee shall construct the interim facility as depicted in the approved final designs and according to the approved schedule.

The flows needed for operation of the interim passage facility and attraction to the facility must be released during the operation of the fishway. Once constructed, the interim downstream passage facilities shall be operated from April 1 through June 15, and from September 15 through November 15 each year until the permanent facilities are completed. This period may be modified in the future based on additional information on the appropriate seasons for downstream passage.

3. The Secretary of the Interior's authority to prescribe the construction, operation and maintenance of fishways under section 18 of

[2] Section 18 of the FPA provides: "The Commission shall require the construction, maintenance, and operation by a licensee at its own expense of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior, as appropriate."

the FPA, 16 U.S.C., section 811, is reserved. We request that a notification of this reservation be placed in any new license.

4. The Department of the Interior reserves the right to modify its section 18 Fishway Prescription as needed to facilitate fish passage.

Interior also reserves the authority to prescribe the construction, operation, and maintenance of upstream fishways under section 18, and the right to modify its section 18 fishway prescription as needed to facilitate fish passage.

Interior's section 18 Fishway Prescription contains several requirements that qualify as section 18 measures. Under the Authority of section 18, Interior requires CVPSC to (i) develop functional design drawings for a permanent downstream fish passage facility, in consultation with FWS; (ii) construct the downstream passage facility as depicted in the approved final designs, and provide as-built drawings to FWS after construction; (iii) release flows for operation of, and attraction to, the passage facility, as required by the final approved facility design; (iv) design, construct, and operate an interim downstream fishway, developed in consultation with FWS; and (v) operate interim and permanent facilities during specific time periods.

In addition, Interior includes conditions that establish deadlines and schedules for compliance with the prescribed measures. These items, which include submitting plans for interim and final fish passage facilities for FWS approval within 4 months of any license issued, and specifying operation of an interim fish bypass facility by April 1, 1995, do not qualify as section 18 measures. Therefore, we consider them as recommendations under sections 10(a) and 10(j) of the FPA. Disposition of 10(a) and 10(j) measures are discussed in sections VIII and IX of this EA.

F. *Dredge and Fill Permit Conditions*

Pursuant to section 404 of the Clean Water Act, the U.S. Army Corps of Engineers issues dredge and fill permits for specified types of construction in wetlands. These permits generally include conditions applicable to project construction activities. Since relicensing of the Cavendish Project would not involve any construction activities that would affect wetlands, a section 404 Permit is not required.

G. *Coastal Zone Management Program*

The Cavendish Project is not located in the state designated coastal zone management area (personal communication between Ginny Garrison, Lakes and Ponds Management and Protection, VANR Water Quality Division, Waterbury, Vermont (802-241-3777) and J.H. Rumpp, Jr., Stone & Webster Environmental Services on December 17, 1993).

V. Environmental Analysis[3]

This chapter presents a general description of the river basin, describes existing and proposed hydropower projects in the basin, and summarizes the potential for cumulative impacts on environmental resources.

In our detailed assessment, we discuss the environmental resources affected by the project. For each, we first describe the affected environment, which serves as the baseline for measuring and comparing the effects of the proposed project and any alternative actions. We then describe the environmental effects of the project, including any proposed enhancement measures.

We do not discuss those resources that are largely unaffected by the project. Specifically, these resources are geology, land use, and socioeconomics.

A. *General Description of the Locale*

1. General Setting

The Cavendish Project is located within the Connecticut River Basin, which contains the Connecticut River, the largest river in the New England states. It extends about 400 miles from its origin in Fourth Connecticut Lake, New Hampshire, at an elevation of 2,625 feet, to Saybrook, Connecticut, where it empties into Long Island Sound (FWS 1989). The tidal portion of the river extends from Long Island Sound to a point 60 miles upstream (Enfield Rapids).

The English first settled in the Connecticut River watershed in 1635. They used small boats, as Native Americans did before them, for transportation on the extensive river system. They were limited, however, by numerous falls and cascades. Settlers started to develop dams and canals as aids to navigation in the late 1700s. The wing dam and canal to bypass South Hadley Falls were constructed in 1795. The first dam across the Connecticut was built in 1800 at Turners Falls. The dam at Enfield Rapids was completed in 1829. Development based on use of the river for cheap transporta-

[3] Unless otherwise indicated, the source of our information is CVPSC's application (1991) and revised text of the license application (1993).

tion continued until about 1850 when the impact of railroads became evident.

About the same time, the Connecticut River began to be developed for industry. The first large industrial dam was built at Holyoke in 1849. The first hydroelectric dam was constructed on the Farmington River near Hartford. As the industries were attracted to the water power, towns grew up around the industries. Their prosperity grew as the New England textile industry grew and waned as economic conditions drove the industry from New England. With prosperity also came industrial pollution. The years of abuse were only recently addressed by Federal and state clean water laws.

The Connecticut River supported large runs of Atlantic salmon and American shad until the end of the eighteenth century. With the development of high dams, the fish were no longer able to reach spawning and nursery areas, and the runs ceased to exist. As long as pollutants made conditions unsuitable for the fish, no restoration was warranted.

Increased pollution controls and steadily increasing water quality beginning in the 1970s brought about efforts to restore fish runs, which are now beginning to show results. This is significant since fish restored to the Connecticut River have few barriers to movement between Long Island Sound and the confluence with the Black River (Figure 3). Table 1 lists those projects in the Connecticut River Basin that have license applications pending before the Commission as of October 5, 1993. The first dam on the Connecticut (Enfield) has been breached and presents no obstacle. Other dams upstream, such as Holyoke and Turners Falls, currently provide fish passage; more dams will be modified to allow fish passage as restoration proceeds.

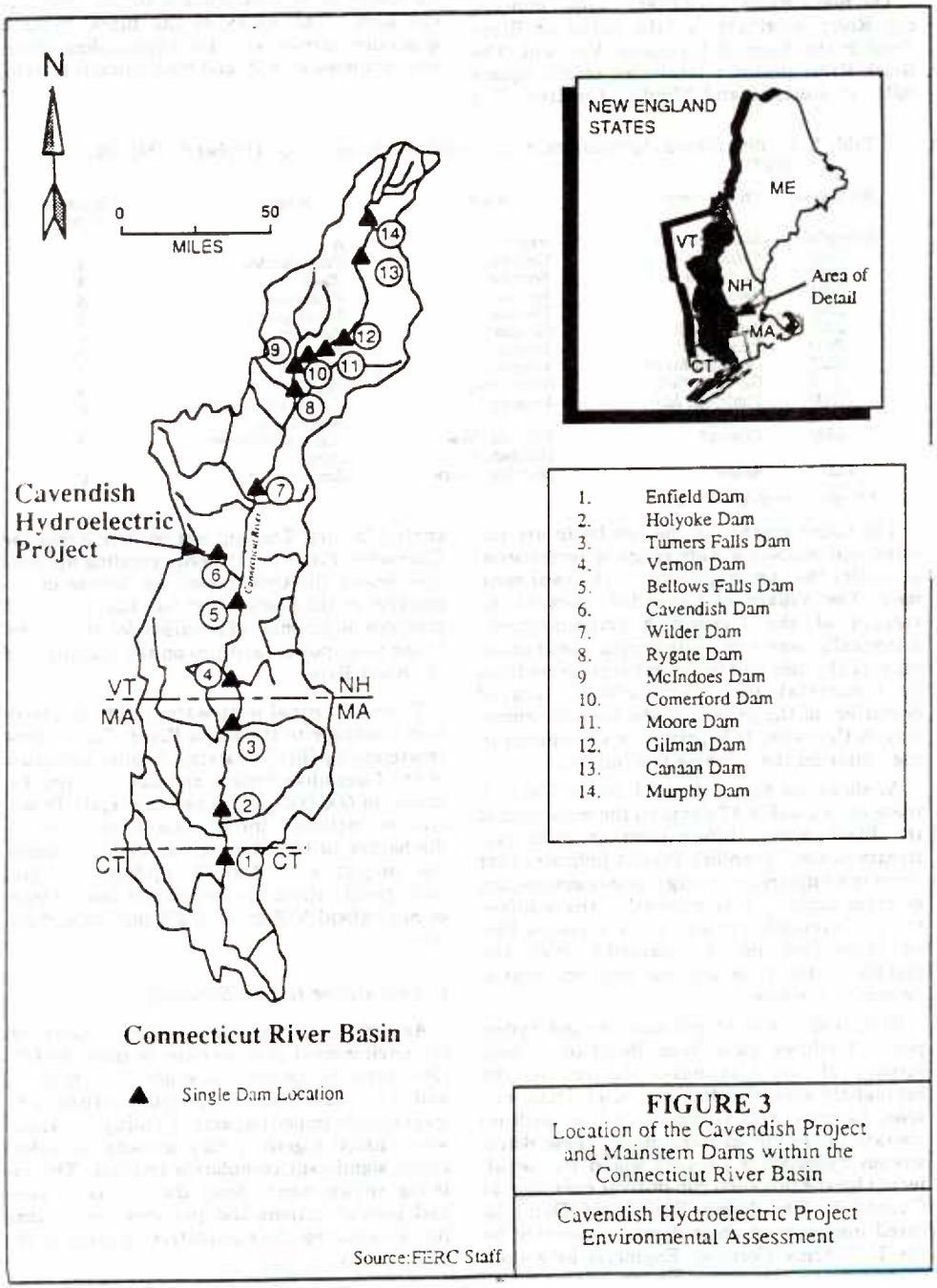


FIGURE 3
Location of the Cavendish Project and Mainstem Dams within the Connecticut River Basin

Cavendish Hydroelectric Project
Environmental Assessment

2. Black River Sub Basin

The Black River, a tributary to the Connecticut River, originates at the outlet of Black Pond in the Town of Plymouth, Vermont. The Black River drains a total area of 202 square miles in Rutland and Windsor Counties. The main stem is approximately 38 miles long, from its source to its confluence with the Connecticut River. The valley of the Black River is generally narrow with the surrounding drainage composed of hilly and mountainous terrain.

Table 1. Pending License Applications in the Connecticut River Basin—October 5, 1993 (Source: Staff).

FERC No.	*Project Name*	*State*	*River*	*Application Type* [4]
Springfield	*Massachusetts*	*Westfield*	*A*	
2490	*Taftsville*	*Vermont*	*Ottauquechee*	*A*
2489	*Cavendish*	*Vermont*	*Black*	*A*
2396	*Pierce Mills*	*Vermont*	*Passumpsic*	*A*
2397	*Gage*	*Vermont*	*Passumpsic*	*A*
2399	*Arnold Falls*	*Vermont*	*Passumpsic*	*A*
2400	*Passumpsic*	*Vermont*	*Passumpsic*	*A*
2323	*Deerfield River*	*Vermont, Massachusetts*	*Deerfield*	*A*
2334	*Gardners Falls*	*Massachusetts*	*Deerfield*	*A*
11090	*Tunbridge Mill*	*Vermont*	*First Branch of the White River*	*B*
2392	*Gilman**	*Vermont, New Hampshire*	*Mainstem Connecticut River*	*A*
11313	*Apthorp*	*New Hampshire*	*Ammonoosuc*	*C*

* *License issued April 13, 1994.*

The upper reaches of the sub basin are forested and support a wide range of recreational activities that are important to the local economy. The Village of Cavendish, located upstream of the Cavendish impoundment, historically was a manufacturing community; some of the mill buildings that remain continue in industrial uses. Springfield, located downriver of the project, is the largest community in the basin. It is primarily a manufacturing center for the machine tool industry.

As shown on Figure 1 and listed in Table 2, there are a total of 17 dams on the mainstem of the Black River. Information on dams upstream of the Cavendish Project indicates that there is no upstream storage, power generation, or other activity that currently affects inflow to the Cavendish Project. The Cavendish Project is the most upstream licensed hydroelectric facility on the river and the only one that is owned by a utility.

Since 1984, several privately owned hydropower facilities have been developed downstream of the Cavendish Project in the Springfield area: Comtu Falls, Slack Dam, Fellows, Lovejoy, and Gilman. All five facilities operate in the run-of-river mode. These downstream hydropower projects would not be affected by the proposed run-of-river operation at Cavendish. The North Springfield Dam, located upstream of these dams, is operated by the U.S. Army Corps of Engineers as a flood control facility. The application to relicense the Cavendish Project is the only pending application before the Commission for license or exemption in the Black River Sub Basin. Table 3 provides additional information for the six existing hydropower facilities on the mainstem of the Black River.

Three municipal wastewater treatment facilities discharge to the Black River. The Ludlow treatment facility is located 5 miles upstream of the Cavendish Project and has a design discharge of 600,000 gallons per day (gpd). Downstream facilities include Cavendish, which discharges to the Black River 800 feet below the project at a 100,000 gpd design, and Springfield, which discharges just downstream of Springfield Village at a 2.2 million gpd design.

B. *Cumulative Impact Summary*

An action may cause cumulative impacts on the environment if it overlaps in space and/or time with the impacts of other past, present, and reasonably foreseeable future actions. The individually minor impacts of multiple actions, when added together, may amount to collectively significant cumulative impacts. The existing environment shows the effects of past and present actions and provides the context for determining the cumulative impacts of future actions.

[4] A = Constructed operating project with a pending application for a new or subsequent license.

B = License application for a proposed new hydropower facility at an existing dam.

C = License application for an unlicensed constructed project.

We reviewed the project's potential to cause adverse cumulative impacts. Given the project's location and the nature of the area's resources, we conclude that the Cavendish Project affects anadromous fish restoration. The project's cumulative impact on this resource is discussed in section V.C.2.

C. *Proposed Action and Action Alternatives*

In the following sections, we discuss the applicant's proposal and agency recommendations for all area resources. We then present our analysis and conclusions. For convenience, all our specific recommendations are listed together in section VII.

1. Water Resources

a. Affected environment:

The estimated average annual flow of the Black River at the Cavendish Project is 154 cfs. Table 4 shows the mean, minimum, and maximum monthly flows. The 7Q10 flow (the lowest flow that can be expected to occur for a duration of 7 days in any given 10-year period) at the Cavendish Dam is 12.9 cfs.

During the peaking operation permitted under the original license, the only flows downstream from the project while the Cavendish reservoir is refilling are due to leakage (about 3 to 5 cfs), local drainage, flow from tributaries below the project, and the discharge of the Cavendish Wastewater Treatment Plant located 800 feet downstream of the Cavendish powerhouse. The next downstream impoundment at Soapstone Dam is approximately 8 miles below the Cavendish powerhouse. There are three major tributaries in this 8-mile segment: Twentymile Stream, Elm Brook, and an unnamed brook.

The Cavendish Project requires a minimum inflow of 19 cfs before one of its turbines can operate. The project's maximum hydraulic capacity is 226 cfs. Therefore, when reservoir inflow is less than 19 cfs, the turbines do not operate and all flows are spilled at the dam. When reservoir inflow exceeds 226 cfs, all flows above 226 cfs are spilled. According to mean flow data presented by CVPSC, flows are most likely to be spilled into the bypassed reach during March, April, and May, when mean inflow exceeds turbine capacity (Table 4).

When turbines are shut down because flows drop below 19 cfs, there may be a lag time between the time of turbine shutdown and the restoration of natural flows below the tailrace because flows are shunted into the bypass reach and travel downstream to the tailrace. The length of this lag time depends on the travel time for the spillage to reach the tailrace and the time it may take for the impoundment to reach a level at which spillage can be implemented. In a September 16, 1993, letter to VANR, CVPSC indicated that a small stoplog section at the dam is removed before an intentional shutdown to release flows into the bypass. This release (of about 15 cfs) is maintained until the bypass flows stabilize at the project tailrace, at which time the gates to the turbines are closed and flows through the powerhouse cease. CVPSC estimates that it takes approximately 50 minutes for tailrace flows to stabilize, if the impoundment level is at full pond. The actions described by CVPSC ensure that continuous flows are maintained below the tailrace even under turbine shutdown conditions.

The Black River is designated as a Class B coldwater habitat stream for its entire length (VANR 1993a). VANR categorizes the 16.5 mile reach of the Black River from Ludlow Village to the North Branch in Weathersfield as a Class B waste management zone. Three sewage treatment plant outfalls currently discharge into this reach: the Ludlow facility, located 5 miles upstream of the Cavendish Project; the Cavendish facility, noted above; and the Springfield facility, which discharges immediately downstream of Springfield Village. According to VANR, waste management zones, although Class B waters, present the possibility of an increased level of health risk to contact recreation users because of sanitary wastewater discharge.

Vermont dissolved oxygen (DO) standards for Class B coldwater habitat streams are 6 milligrams per liter (mg/l), or 70 percent saturation. Measurements taken by the applicant in August and September 1986 and July and August 1988 show that the DO levels in project area waters typically exceed these standards (DO range: 6.4 to 10.1 mg/l, temperature range: 13 to 27.5° C). CVPSC corroborated these data in a 2-day DO and temperature study on July 15 and 16, 1993, pursuant to a Commission additional information request (AIR) (CVPSC 1993b). Study results confirmed that DO levels in the bypass reach exceed Class B standards (DO range: 7.6 to 10.0 mg/l DO; temperature range: 20.3 to 24.8° C).

The applicant conducted macroinvertebrate sampling below the project using the protocol described in the Vermont Department of Environmental Conservation (VDEC) Field Procedures Manual (1989) and the Biological Compliance Monitoring Methods Manual (1990). Calculation results indicated a biotic index (a measure of the abundance and diversity of aquatic invertebrates) of 2.3, which, according to the manual, indicates "good" water quality (VDEC 1990).

Table 2. Black River Mainstem Dams (Source: CVPSC 1991, Modified by Staff).

Name	Location	River Mile	Height of Dam (ft)	Installed Capacity (kW)

Table 2. Black River Mainstem Dams (Source: CVPSC 1991, Modified by Staff).

Name	Location	River Mile	Height of Dam (ft)	Installed Capacity (kW)
Lovejoy Dam	Springfield	4.0	12	150
Slack Dam	Springfield	4.2	26	400
Comtu Falls Dam	Springfield	4.3	7	400
Gilman Dam	St. Johnsbury	4.4	9	Under Const.
Fellows Dam	Springfield	4.6	12	150
North Springfield Dam	North Springfield	8.8	120	None
Perkinsville Dam	Weathersfield	11.8	23	None
Soapstone Dam	Weathersfield	12.6	10	None
Cavendish Dam	Cavendish	20.8	33	1,400
Kenwood Mills Dam	Cavendish	22.8	7	None
Murdock Dam	Cavendish	23.5	8	None
Verd Mont Mills Dam	Ludlow	25.2	10	None
Village Dam	Ludlow	26.5	12	None
Reservoir Pond	Ludlow	29.6	5	None
Rescue Lake Dam	Ludlow	30.8	10	None
Amherst Lake Dam	Plymouth	33.6	7	None
Black Pond Dam	Plymouth	NA	6	None

Table 3. Existing Hydroelectric Projects in the Black River Basin (Source: FERC's Hydropower Resources Assessment).

Name of Project	FERC Project No.	Capacity (kW)	Head (ft)	Status
Comtu Falls	7888	400	30	Minor License
Slack Dam	8014	400	19	Exemption
Fellows	9648	150	10	Minor License
Lovejoy	9649	150	16	Minor License
Gilman	9650	125	23	Minor License
Cavendish	2489	1400	120	Minor License

Table 4. Annual and Monthly Mean, Maximum, and Minimum Flows at the Cavendish Hydroelectric Project (for the Period October 1929 to September 1960). (Modified from CVPSC 1991).

Period	Mean Flow (cfs)	Maximum Flow (cfs)	Minimum Flow (cfs)
Annual	150	5,302	5
October	65	1,502	5
November	126	2,006	15
December	123	3,402	20
January	113	1,328	18
February	102	1,628	18
March	240	5,302	17
April	530	2,924	59
May	238	2,599	26
June	120	2,630	11
July	60	2,646	7
August	38	1,454	6
September	53	3,859	7

b. Environmental impacts:

Run-of-River Operation

The Cavendish Project is currently licensed as a daily peaking facility, with headpond drawdowns from storage of 3.0 feet. Under the subsequent license, the applicant proposes to operate the project as an instantaneous run-of-river facility. The FWS supports the applicant's proposed run-of-river operation. This agency indicates that run-of-river operation would minimize impacts associated with reservoir fluctuations and fluctuating flows downstream from the project. As Condition B of its WQC, VANR requires CVPSC to operate the project run-of-river.

The VANR WQC also requires implementation of a plan to continuously monitor project inflow and outflow to ensure that the run-of-river condition is met. VANR indicates that switching from daily peaking to run-of-river operation would significantly improve the bio-

logical integrity of the river both upstream and downstream of the project.

Our analysis:

The collected water quality data show that Class B water quality criteria are being met in the project area under peaking operations. However, the limited water quality data available may not be representative of worst-case, low flow, high temperature conditions when potential water quality degradation is most likely to occur. Run-of-river operation that results in continuous water flow through the impoundment would reduce the potential for lower oxygen conditions during such worst-case circumstances. Run-of-river operation would also reduce the number and magnitude of fluctuations in reservoir elevations, thereby providing adjacent wetlands with a relatively constant, stable water source and decreasing the potential for shoreline erosion around the impoundment. Thus, while run-of-river would not be necessary to improve water quality, we conclude that it would provide for more protection against water quality degradation than a peaking mode of operation and would protect wetlands adjacent to the project impoundment.

Run-of-river operation would also reduce the potential for degraded water quality downstream of the project. Under existing peaking operations, discharges from the two downstream wastewater treatment facilities located below Cavendish (see section V.A.2) experience limited dilution during plant shutdown periods. Under run-of-river operations these discharges would be continuously diluted and, thus, would be less likely to contribute to declines in DO (which may occur under some circumstances due to increases in biological oxygen demand associated with concentrated wastewater facility discharges).

We also concur with VANR and FWS that CVPSC should develop and implement a plan to ensure that the run-of-river operation is maintained. CVPSC should design this plan in consultation with VANR and provide the data periodically to the VANR for verification.

Bypass Flow

The applicant currently operates the Cavendish Project such that flows to the project's 1,570-foot-long bypass reach are eliminated (except for leakage flows) when (1) all available inflow is used for generation, or (2) project operations have lowered the impoundment elevation below the crest of the dam. The applicant proposes to provide a continuous release of 10 cfs to the bypass reach from April 15 through October 31. During the period from November 1 through April 14, CVPSC would not provide any minimum flow; consequently, flows in the bypass would be only 3 to 5 cfs from dam leakage and local drainage.

VANR WQC Condition C requires release of a minimum instantaneous flow of 10 cfs in the bypass at all times. Part of this WQC condition also requires that, when the instantaneous inflow falls below 29 cfs, all flows must be spilled over the dam.[5] WQC Condition I stipulates that bypass flows could be increased from 10 cfs to 20 cfs, depending on the findings of a 5-year study to be implemented to assess the impact of the 10 cfs flow on the bryophyte *Scapania umbrosa* found in Cavendish gorge (see section V.C.3, Terrestrial Resources). Operation of downstream fish passage facilities at the project (discussed in section V.C.2, Fishery Resources) may require flows greater than 10 cfs. However, WQC Condition I stipulates that flows through the passage facilities must not exceed 10 cfs until the 5-year bryophyte study is completed. FWS concurs with the 10 cfs bypass flow until the bryophyte study is completed.

Our analysis:

We agree that, in comparison to historic operation, a continuous minimum flow to the bypass reach would enhance water quality by reducing water temperatures and by increasing DO during summer and fall. Data from the AIR studies suggest that temperature and DO water quality criteria are being met at existing leakage flows. Flow greater than leakage would provide added protection against deterioration of water quality during extreme low-flow periods. Therefore, we conclude that minimum flows that are greater than existing leakage would be appropriate for the enhancement of water quality in the bypass reach. To ensure compliance with minimum flow requirements, we will require monitoring of flows in the bypass reach.

Reservoir Elevation and Downstream Flows During Flashboard Installation

CVPSC employs a project automation System Control and Data Acquisition (SCADA) system, with a precision of 1 inch, to maintain the impoundment elevation. While the SCADA system is used to restrict drawdowns to 3.0 feet under the existing peaking mode of operation, the applicant proposes to set the system so that the impoundment elevation remains at a fixed level 1 foot below the top of the flashboards

[5] This requirement is consistent with the minimum turbine hydraulic capacity of 19 cfs and a 10 cfs minimum flow to the bypass.

under the proposed run-of-river operation. WQC Condition D requires that CVPSC maintain the impoundment level no lower than 6 cept when flashboards have failed or the control system is not operating. When the SCADA is not operating (two to three 1-hour events each year), impoundment elevations must be manually controlled. Under manual control, a 6-inch fluctuation in impoundment level can be expected. However, when flashboards are manipulated, there are much greater variations in impoundment level.

The 6-foot-high hinged flashboards along the crest of the dam are dropped 15 to 23 times per year to reduce the potential for flooding upstream of the dam during storm events and snowmelt runoff, most commonly during March and April. More water released over the dam reduces the amount of water backed up behind the dam. Of the 18 flashboard panels, six to eight are usually lowered at a time. Flashboards are normally reset when the water recedes 2 to 4 feet below the crest of the flashboards. Thus, the fluctuations in impoundment level associated with flashboard operation may be on the same order as the fluctuations associated with existing peaking operation.

WQC Conditions D, E, and F specify constraints on impoundment water levels as well as on flow releases during the periods when the impoundment is being refilled following flashboard failure. Condition D requires maintaining the impoundment level no lower than 12 inches below the crest of the flashboards. Condition E requires that CVPSC eliminate any change in impoundment level in excess of minus 2 feet from the normal operating level (i.e., 2-1/2 feet below the crest of the flashboards). Condition E also allows CVPSC to study a permanent reduction in the normal operating level of the impoundment as a means of stabilizing impoundment levels.

In WQC Condition F, VANR mandates that, after any impoundment drawdown associated with project maintenance, the Cavendish impoundment shall be refilled by reducing flows below the powerhouse. Downstream flows, however, must not be reduced to less than the following levels: 42 cfs from June 1 to September 30; 83 cfs from October 1 to March 31; and 332 cfs from April 1 to May 31. The condition further stipulates that, when natural inflow is insufficient to permit both release of these minimum flows and refilling of the impoundment, the impoundment may be refilled while releasing 90 percent of the instantaneous inflow downstream at all times. FWS concurs with these downstream flows or when the project inflow is less than these flows, the continuous instantaneous release of 90 percent of the inflow.

Impacts of flow reductions associated with refilling the impoundment include dewatering of the river below the project, with resultant increases in water temperature and low DO. Because three sewage treatment plants discharge into the Black River in the project area, any significant reduction in river flows during refilling increases the likelihood of low DO downstream of the project in response to elevated biological oxygen demand from sewage discharges. Because drawdown happens frequently, there are probably periods of low DO, although no data in the project record suggest such events have occurred.

Impoundment fluctuations can adversely impact fish and wetlands in and around the impoundment (see discussions in Fisheries and Terrestrial Resources sections). Wetlands adjacent to the impoundment and organisms occupying shallow water habitats along the shorelines of the impoundment would benefit from stabilized impoundment levels, since, under stabilized impoundment levels, non-motile organisms would not experience dewatering and desiccation, which could result from frequent drops in water level and exposure to the air. Thus, we concur with VANR and FWS that stabilizing the impoundment levels would enhance aquatic resources. Stabilizing the impoundment level at 6 inches below the flashboard crest would establish a water elevation near the project's full-impoundment level and, thus, be protective of existing wetlands and fisheries resources.

We also concur with the WQC requirement to restrict future impoundment drawdowns to 2 feet, in order to minimize potential impacts on wetlands and impoundment biota. While the complete elimination of impoundment level fluctuations would be more protective, such a restriction does not appear to be feasible, since CVPSC has indicated that flashboards can only be restored when water levels have dropped from 2 to 4 feet below normal operating levels. Continuous monitoring of impoundment levels should be required in any license issued for this project.

We do not agree with VANR's position that a permanent reduction in pool elevation would be a means of stabilizing impoundment levels. Given that the existing wetlands and aquatic ecosystems in the impoundment have evolved in response to existing operations, there would probably be adverse impacts to living resources in and around the impoundment if its operating level was permanently reduced.

We conclude that flow should be maintained below the project during refilling of the impoundment; however, no site-specific data are currently available to establish the lowest flow that would prevent water quality deterioration. The Aquatic Base Flow (ABF)[6] has been adopted by FWS as the basis for its flow recommendations for the protection of water quality and aquatic resources in cases where site-specific data are unavailable. Maintaining the ABF (or 90 percent of inflow) below the project during refilling of the impoundment would protect against fisheries impacts and water quality degradation during refilling, and, thus, we concur with VANR's WQC Condition F. To ensure that adequate flows are maintained below the tailrace during refilling of the impoundment, the system established to monitor minimum flows and run-of-river operation should be extended as necessary.

Flooding Resulting from the Project's Impoundment Elevation

VANR expresses concern regarding the effects of project flashboards on upstream flood stages in the Cavendish Village area. VANR suggests that additional studies are needed to assess the effects of project flashboards (VANR 1994). We have obtained a copy of the Federal Emergency Management Agency's (FEMA) flood study for the Town of Cavendish to aid in our assessment of flooding at this project. The applicant's data and FEMA flood study provide adequate information to estimate the effects of flooding from the project flashboards.

CVPSC's operational procedures call for dropping the flashboards when the water surface elevation is 1 foot over the flashboard crest (elevation 885.12 feet). Elevated water levels resulting in manual flashboard removal occur 15 to 23 times per year. Historic records show that, if the flashboards are not manually dropped, they will fail at an inflow of 1,270 cfs. This flow represents less than 20 percent of the 10-year storm event discharge and corresponds to a water surface elevation of 886.12 feet, 2 feet over the crest of the flashboards. Normal surface water level is maintained at 884.13 feet.

Our analysis:

Because reservoir inflows equal to or greater than 1,270 cfs cause the flashboards to fail, project flashboards do not increase upstream flood stages for flood events that produce inflows of 1,270 cfs or higher.

For storm events that produce inflows under 1,270 cfs, some incremental increase in upstream water levels may result from the flashboards if they are not manually lowered. However, the magnitude of this increased flooding is no greater than 1 foot. The impoundment elevation normally fluctuates between 884.16 feet and 885.16 feet, as dictated by operational constraints. If the flashboards are not manually dropped, the maximum increase in flooding during and after storm events is 1 foot, or a water surface elevation equal to 886.16 feet.

Based on our review of the information provided by the applicant and the FEMA flood study for the Town of Cavendish, Vermont, we conclude that the dam and flashboards do not have significant flooding impact on areas upstream of the project. Additional studies are not warranted, because the estimated increase in flooding is minor.

c. *Unavoidable adverse impacts:* None.

2. Fishery Resources

a. *Affected environment*

Historically, the Black River supported anadromous Atlantic salmon populations in addition to a mixture of warm- and coldwater resident species. Currently, there are no anadromous fish runs reaching the Cavendish Project area because there are seven downstream dams that do not have upstream fish passage facilities.

The Cavendish Project area supports stocked and wild populations of brown and brook trout, as well as stocked populations of rainbow trout (CVPSC 1991). Spawning has not been documented in the project's bypass reach but may occur in tributaries near and within the project area (CVPSC 1993a). VANR indicates that (1) pool habitat in the bypass reach is suitable as holding habitat, and (2) little or no spawning occurs there (VANR 1994).

The WQC for the Cavendish Project indicates that the Vermont Water Resources Board has designated the Black River as coldwater fisheries habitat (VANR 1993a). The applicant states that this designation is inappropriate due to elevated stream temperatures during the summer. VANR states that the elevated temperatures are caused by the project's peaking mode of operation, which would be discontinued under CVPSC's proposed run-of-river operation.

FWS identifies the Black River as a potential production area for Atlantic salmon smolts

[6] For rivers where inadequate flow records exist, FWS recommends an ABF, generally calculated as 4.0 cubic feet per second per square mile of drainage area (cfsm) for spring spawning and incubation, 1.0 cfsm for fall/winter spawning and incubation, and 0.5 cfsm for the remaining period when spawning and incubation do not occur.

originating from non-natal sources, as stated in the "Strategic Plan for Restoration of Atlantic Salmon in the Connecticut River Basin" (Stolte 1982). Originally, both FWS and VANR deferred fish passage requirements for the Cavendish Project. However, in 1993 VANR stocked 23,124 fry upstream of the project. VANR plans additional stocking downstream of the project near Springfield (VANR 1993b). These stockings have caused VANR to change its recommendations regarding downstream fish passage, and Interior to prescribe downstream passage under its section 18 authority. This prescription requires implementation of downstream passage (VANR 1993b and DOI 1993).

b. *Environmental impacts:*

Impoundment Level Fluctuations

Impoundment level fluctuations under current peaking operations or during failure or manipulation of flashboards may have limited impact on fish within the Cavendish impoundment. Fish are mobile and thus not susceptible to stranding along the habitat exposed during drawdown. The short duration of drawdowns and the limited period during which they occur (discussed under the Water Resources section) may have some effect on the abundance of food resources for fish that reside in the shallow, shoreline areas subject to exposure.

Existing data do not suggest that present project operations and the impoundment drawdowns associated with flashboard manipulation have any significant impact on existing fish stocks. Of greatest concern would be the potential exposure of fish spawning areas. While the Cavendish Project area is managed for trout, which would not spawn in the impoundment, largemouth and smallmouth bass as well as sunfish (all of which are documented to occur in the project area) may use near-shore impoundment habitat for spawning. While no substantial impacts would be expected from the impoundment fluctuations associated with flashboard manipulation, as discussed earlier, we conclude that stabilization of impoundment levels would ensure that there would be no impacts to existing impoundment fish populations. Therefore, we conclude that impoundment level stabilization is appropriate for this project.

Bypass Flow

CVPSC is not required to provide flows to the bypass reach under the current license for the Cavendish Project. CVPSC proposes a minimum flow of 10 cfs from April 15 through October 31 for the enhancement of fisheries resources. The WQC requires CVPSC to release an instantaneous year-round minimum flow of 10 cfs into the bypass reach. CVPSC also is required to install downstream passage facilities. Such passage facilities require certain levels of flow in order to effectively divert downstream migrating salmon from passage through generating turbines (additional discussion of downstream passage facilities is presented below).

FWS concurs with the 10 cfs bypass flow until the bryophyte study is completed. At the same time, Interior's section 18 prescription requires release of flow needed for operation of the fishway for downstream passage from April 1 through June 15 and from September 15 through November 15.

While flows required for effective operation of the downstream passage facilities may exceed 10 cfs (CVPSC preliminary designs indicate operating flows of 15 cfs), WQC Condition I prohibits releases greater than 10 cfs during the fall migration period (September 15 to November 15), except during high flow periods (i.e., when river flow exceeds turbine hydraulic capacity by more than 10 cfs). During such times, the structure can be operated at its design capacity. This restriction is linked to the study of flow effects on the rare bryophyte, and could be lifted after 5 years, based on findings of the bryophyte study. The WQC has no stated restriction on downstream passage releases during the spring migration period (April 1 to June 15), most likely because flows during that period generally exceed hydraulic capacity by more than 10 cfs.

Our analysis:

Data from several studies provide a means of evaluating the potential enhancement value of various bypass flow rates for fisheries. In 1993 CVPSC conducted a habitat-based flow study of the bypass reach in response to the Commission's AIR dated July 30, 1992 (CVPSC 1993a). The quantity of wetted area and depth (general indicators of habitat abundance and quality) and qualitative judgments were both used to determine the suitability of the bypass reach for adult trout at 3 to 5, 10, 15, 20, 25, and 35 cfs flows (no wetted area calculations were performed in the study for the flows of 15, 20, and 25 cfs).

Study results indicate that increases in total wetted area are greatest between leakage (3 to 5 cfs) and 10 cfs. Between 10 and 35 cfs, wetted area continues to increase but at a lower rate (Figure 4). Several pools in the bypass reach have depths ranging from 5 to 22 feet at leakage, which provides adequate overwintering habitat based on habitat requirements for adult brown trout (FWS 1986). Depth increases with flow in all pools except the tailrace pool (due to backwatering at higher flows). However, the percent change in

depth for most pools is modest (10 to 20 percent) and does not differ substantially among flows (Table 5).

At 10 cfs, the habitat-based flow study categorizes the pool habitat for adult trout as "poor" to "good," but primarily "fair," a substantial improvement over the generally "poor" conditions under leakage flow. A further significant improvement in habitat quality does not occur again until flows reach 20 cfs (Table 6). The incremental increase in wetted area between flow levels is greatest when flow increases from leakage to 10 cfs (Figure 4). Pool depths necessary to provide overwintering habitat for trout are adequate at leakage flows and not substantially improved at higher flows.

Table 5. Depths of Pools in the Bypass Reach at Various Flows (Modified from Ritzi 1993).

		Depth Increase (ft) Above Leakage at Flow of:				
Pool Number	*Depth at Leakage*	*10 cfs*	*15 cfs*	*20 cfs*	*25 cfs*	*35 cfs*
			(-)	(-)	(-)	(-)
1* (at tailrace)	4' - 19'	0.10	0.10	0.15	0.20	0.10
2	5' - 6'	0.70	0.95	1.15	1.40	1.85
3	4' - 5'	2.05	2.40	2.70	2.95	3.20
4	3' (max)	0.75	1.00	1.10	1.30	1.45
5	3' (max)	0.55	0.70	0.80	0.90	1.00
6	up to 10' mostly 2'-4'	0.50	0.60	0.65	0.75	0.90
7						
		No Measurements - Inaccessible				
8	*5' - 22'*	*0.95*	*1.15*	*1.30*	*1.55*	*1.90*
9	*5' - 7'*	*0.80*	*1.30*	*1.60*	*1.95*	*3.30*
(at dam)						

* Depth of this pool under influence of backwatering from powerhouse tailrace discharge. As powerhouse discharge was reduced to provide study flows in the gorge, the backwatering decreased and pool depth decreased (at flows over 10 cfs) rather than increasing because of more flow in gorge.

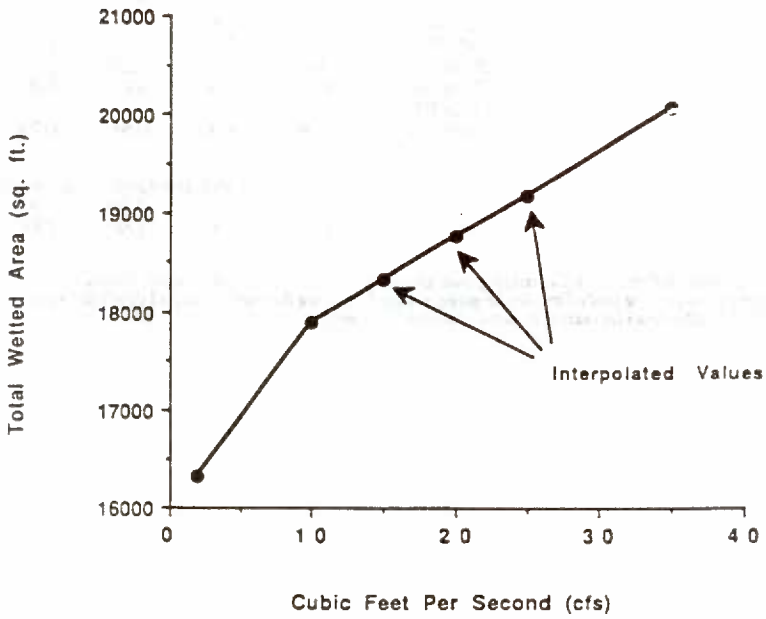


FIGURE 4
Relationship Between Bypass Flow and Total Wetted Area

Cavendish Hydroelectric Project
Environmental Assessment

Source:FERC Staff

Table 6. Habitat Suitability Ratings for Pools in the Bypass Reach at Various Flows (Modified from Ritzi 1993).

		*Adult Trout Habitat Suitability Rating**				
Pool Number	*Leakage*	*10 cfs*	*15 cfs*	*20 cfs*	*25 cfs*	*35 cfs*
1 (at tailrace)	F	F	F	F-G	F-G	F-G
2	P-F	F	F	F-G	F-G	G-E
3	P-F	F	F	F-G	G	G
4	P	P-F	P-F	F-G	G	G
5	P	F	F	F-G	G	G
6	P	P-G	P-G	F-G	F-G	G-E
7	P	P	P	P	P	P-F
8	F	G	G	G	E	E
9 (at dam)	P	G	G	G-E	E	E

* Suitability Code: P = Poor; F = Fair; G = Good; E = Excellent

Taken together, these data suggest that an increase in bypass flows from leakage to 10 cfs would substantially improve habitat for trout from spring through fall, but would not substantially improve trout overwintering habitat. Winter flows might offer some protection to benthic invertebrates, a major food source for fish, by preventing freezing of organisms which would otherwise be exposed when flows decreased from 10 cfs to leakage. However, the wetted area, a measure of the submerged habitat, changes by only 12 percent between these flows, and most of the habitat in the bypass is deep and protective of these biota even under leakage. Thus, winter flows do not appear essential for protection of this part of the stream ecosystem.

We recommend a flow regime for fisheries resources that provides for a minimum of 10 cfs flow (including leakage) in the bypass reach from April 1 to November 15. The initiation of the flow earlier and cessation later than is proposed by the applicant would be more protective of trout. These dates also would ensure that minimum flows are in place during the primary salmon smolt migration periods (discussed in detail below), thereby potentially contributing to successful passage through the bypass reach. Flows above this recommended level that would be required for operation of downstream passage facilities are discussed below.

Downstream Passage

VANR first stocked Atlantic salmon fry above the project in spring 1993. Most of the juvenile salmon that survive to smolt stage will migrate downstream in spring 1995. In the absence of downstream passage facilities, migrating smolts must pass through existing generating turbines, experiencing mortalities ranging from 1 to nearly 20 percent per project, depending on the type of turbine, the physical characteristics of the hydroelectric facility, and the mode of turbine operation (FWS 1989).

The need for downstream passage facilities at Cavendish must be considered within the context of other actions that are being taken within the Black River Basin and the Connecticut River to restore runs of Atlantic salmon. FWS, by letter dated November 5, 1993, requested assistance from the Commission in the implementation of downstream fish passage measures at four licensed hydroelectric projects on the Black River in Springfield, Vermont: Comtu Falls, Fellows Dam, Lovejoy Dam, and Gilman Dam (Figure 1). Subsequently, by letters dated December 10, 1993, the Commission notified the operators of these projects to provide, within 45 days, plans for the construction of such passage facilities in addition to evidence of consultation with FWS and the VDFW. The Commission received responses from all operators either requesting an extension of time allowed for providing such plans or disagreeing with the need for the requested facilities. Commission staff is actively pursuing fish passage. However, to date no schedule for construction of downstream passage facilities has been established.

Two unlicensed dams are situated between the Cavendish Dam and the Connecticut River: Slack Dam (an exempted project) and North Springfield Storage Dam (a Corps of Engineers flood control dam) (Figure 1). FWS indicates that Slack Dam has downstream fish passage facilities in place and is prepared to operate them as soon as the FWS requests (FWS letter to Commission dated November 5, 1993). Similarly, the Corps of Engineers intends to provide the requested downstream passage by spilling water from the stoplog section of the dam spillway. The Corps also plans to excavate a plunge pool below the dam to eliminate potential mortality associated with emigrating smolts falling onto rocks or into shallow water (J. Warner, FWS, pers. comm.).

There are five dams between the confluence of the Black and Connecticut Rivers and the mouth of the Connecticut River. Enfield Dam, the mainstem dam closest to the mouth, is

breached and passable to anadromous fish. The Holyoke Project has an effective louver array/bypass in the canal system; other facilities are being tested at the powerhouse intake. At Turners Falls, a bypass and narrowly spaced trashrack overlays are being tested. At Vernon and Bellows Falls, angled guidance walls and bypasses are being installed and will be tested in subsequent years. Thus, within the foreseeable future, salmon smolts originating upstream of the Cavendish Project will be afforded the protection of downstream passage facilities at all projects which they must pass during their migration to the ocean.

CVPSC submitted conceptual design drawings for downstream passage facilities at the Cavendish Project in response to a letter from the Commission dated October 12, 1993. These drawings present proposed location and orientation of possible facilities, but no specifics as to the nature of bars or screens that would be used. Drawing notations suggest use of 15 cfs for facility operation. It is possible that different flows, *e.g.*, 20 to 25 cfs, may be required when final design plans have been developed. FWS has not completed its review of the plans and, thus, has not yet made a determination of the adequacy of the design specifications (J. Warner, FWS, pers. comm.).

Interior, by letter dated December 17, 1993, filed its section 18 prescriptions for downstream passage. Both FWS and VANR specify that downstream facilities must be constructed and operated; functional design drawings for interim facilities must be submitted; and interim passage facilities must be operated until permanent facilities are constructed and operating. Both agencies state that interim and permanent downstream passage facilities should be operated during two periods: April 1 through June 15 and September 15 through November 15, corresponding to salmon smolt migration periods.

Our analysis:

As discussed above, the WQC requires that the downstream passage facility not be operated at flows greater than 10 cfs during the fall migration period, pending results of the 5-year bryophyte study (see Terrestrial Resources). FWS indicates that its general recommendation for downstream passage facilities is for installation of an angled trashrack or fish screen with a maximum clear spacing between bars of 1 inch. Minimum flows of approximately 20 to 25 cfs are generally required for effective operation. These are general recommendations, however, and not specified for the Cavendish Project at this time. FWS indicates that interim passage facility measures may include spillage through a weir or lowering of a flashboard section.

Downstream passage facilities divert migrants away from turbines and reduce mortality, thus reducing the adverse cumulative impacts of hydroelectric facilities on anadromous fish within the Connecticut River Basin. Installation and operation of such facilities at Cavendish would contribute to the ongoing effort to restore Atlantic salmon in the Black River and the Connecticut River.

Because of the stocking conducted in 1993, migrating juvenile salmon may begin migrating downstream past Cavendish in 1995. At that time there would be a need for operating passage facilities to pass fish below the Cavendish Project. Design and construction of permanent facilities, however, is likely to take several years. Thus, interim passage facilities are needed beginning in the spring of 1995 and must be operated until permanent facilities are in place and operating.

The delineation of migration periods during which passage facilities must be operated (April 1 through June 15; September 15 through November 15) is based on existing knowledge of seasonal migration within the Connecticut River Basin. VANR and FWS specify these periods and we concur. In the future, these periods may have to be modified, based on monitoring of facility operation, to accommodate site-specific migration patterns in the Black River.

CVPSC submitted conceptual designs for passage facilities that are based on operational flows of 15 cfs. However, exact fish passage flows have not been finalized and may be as high as 25 cfs, as discussed above. VANR's restriction of passage flow to 10 cfs during the bryophyte study, however, could reduce the efficiency of the facility by reducing operational flows. By requiring the passage facility to operate at less than design flows, there could be higher levels of downstream mortality during the fall migration period (September 15 through November 15). The increased flow from 10 to 15-25 cfs would benefit out-migrating fish by providing optimum passage flows. Additionally, the 5-15 cfs increment would be less increase than the bryophyte population currently experiences during naturally occurring spring flows. Because existing bryophyte populations survive these substantially increased spring flows and because the passage facilities are designed to operate most effectively at 15-25 cfs, we do not agree that the flow should be restricted during the migration period. For these reasons, we believe that the facility should be operated at design flows (15-25 cfs) during both migration periods. Flows needed for operation of the passage facil-

ity and for attraction to the facility will be determined when passage design is finalized.

To insure that the passage facility operates effectively, CVPSC should develop and implement a plan to maintain and monitor the effectiveness of the downstream passage facility. This plan should be developed in consultation with the FWS and VANR.

c. *Unavoidable adverse impacts*: None.

3. Terrestrial Resources

a. *Affected environment*:

Before settlement of the area in the early eighteenth century, much of the land in the vicinity of Cavendish was covered by hardwood forest (Braun 1950). From the early eighteenth century to the early twentieth century, land was cleared for agriculture (in some cases, right up to the Black River). However, due to the inaccessibility of the Cavendish gorge, most of the project area probably has changed little over time, except for minor forest clearing. Because the gorge is steep and rocky, only small, scattered wetlands systems existed before project construction.

In the area of the Cavendish Project, vegetation is presently characterized by a narrow margin of mixed deciduous hardwood forest along both banks of the Black River. In low-lying areas and floodplains of the river, willows and red maples are predominant. In higher areas, such as the rim of the Cavendish gorge, hemlock, mountain maple, and aspen are the principal trees in the rocky soils. Immediately upstream of the Cavendish Dam, and beyond the Cavendish gorge, the narrow fringe of forest opens to agricultural fields. In several places, the forest is cleared very close to the edge of the river.

Because the topography is steep at the Cavendish Project, wetlands comprise only a small portion of the project area. About 1,400 feet upstream of the Cavendish Dam, adjacent to the river, is an approximately 10-acre emergent wetland (categorized as Class II by VANR) dominated by cattails, bulrushes, sedges, and grasses. This wetland is inundated year round. In some of the terraces above the river, there are several wetlands meadows dominated by grasses and sedges; these wetlands are apparently only occasionally inundated. There are alder thicket wetlands with small openings of herbaceous wetlands in the old river channels and backwaters behind the terraces; these wetlands are currently inundated during periods of high water in the river (Countryman 1991).

Except for occasional, transient bald eagles and peregrine falcons, no federally listed threatened or endangered plants or animals are known to exist within the project area (FWS 1991).

A bryophyte, *Scapania umbrosa*, considered by VANR to be very rare in Vermont, is found at six sites in the Cavendish gorge in the area of pools 4 and 5, just above the current water line. Currently it is not protected under Vermont's endangered species law.

Cavendish gorge is the only known location of this species in Vermont. A strictly subarctic-subalpine plant, *Scapania umbrosa* may be near the southern limit of its range at Cavendish. VANR asked the Vermont Endangered Species Committee to consider the plant's eligibility for state listing (VANR 1993). Dr. Cyrus McQueen, a bryologist who has studied this species in Cavendish gorge, indicates that more information on its ecology and reproductive biology is needed before it can be considered for state listing as rare or endangered (CVPSC 1993c).

CVPSC conducted a literature search for plants, amphibians, reptiles, birds, and mammals that may occur in the project area. None of the species identified as threatened or endangered in Vermont has been observed or is suspected to occur at the Cavendish Project.

b. *Environmental impacts*:

Effect of Minimum Bypass and Downstream Fish Passage Flows on Scapania umbrosa

Dr. McQueen's study indicates that the bryophyte *Scapania umbrosa* currently exists in Cavendish gorge at leakage flows and occasional spills, and that higher continuous flows would result in population losses due to continuous, rather than intermittent, submergence and scouring. A continuous minimum flow of 10 cfs in the project's bypass reach, which is required by VANR's WQC, would cause an estimated 50 percent loss of the present population; losses could be as high as 77 percent at 35 cfs (Table 7). However, due to the lack of long-term data, we cannot predict if or to what extent the bryophyte would redistribute in the gorge in response to a change in minimum flow from the present leakage conditions.

In the WQC, VANR requires CVPSC to conduct a 5-year study of the bryophyte population. FWS also recommends such a study. This study must assess mortality under a continuous minimum flow of 10 cfs and document whether any expansion of the population occurs. According to VANR and FWS, if results from the study indicate that the bryophyte is able to recover its lost habitat under a 10 cfs minimum flow condition, CVPSC should continue bryophyte studies at higher minimum flows. Under the study plan, loss of bryophyte areal coverage beyond Dr. McQueen's projected loss esti-

mate would require VANR to consider lower base flows.

Our analysis:

The population of *Scapania umbrosa* in Cavendish gorge would be best protected under the existing leakage flows (3 to 5 cfs) at the project. However, because the bryophyte is not currently protected under Federal or state endangerment laws and Dr. McQueen's study indicates that a 50 percent reduction of the bryophyte population is an acceptable loss, we believe that 10 cfs is an appropriate minimum flow for the protection of the bryophyte.

Required flows for downstream fish passage are likely to exceed 10 cfs. We have assumed a 15 cfs flow rate for downstream fish passage based on CVPSC's conceptual designs, although actual flow will depend on final designs (see Fishery Resources discussion). Higher flows naturally occur in the bypass reach during the spring, due to natural river flow (see Water Resources discussion).

Our analysis of VANR's and FWS's required study of the bryophyte leads us to conclude that this study is not required to ensure the adequate protection, mitigation, and enhancement of fish and wildlife resources and /or other beneficial public uses in the project area. We believe that this study is not required because (1) a similar study assessing the impacts of flows on the bryophyte has previously been conducted; (2) the cost of the study is not warranted as the bryophyte currently survives periods of high flow which are in excess of the proposed minimum flows; and (3) there may be additional, unforeseen environmental impacts associated with pool modifications proposed as part of this study. However, because this condition may be related to water quality issues, we will recommend that this condition be included in any order issuing a license.

Construction of Recreational Facilities

CVPSC proposes to construct new recreational facilities at the Cavendish Project, as discussed in section V.C.6 (Recreation Resources). The planned facilities would be located within areas that have been cleared of vegetation or subjected to previous disturbance. The proposed construction, however, would result in the removal of some natural vegetation and the temporary disturbance of associated wildlife. This impact would not be significant; consequently, we do not require CVPSC to implement protective measures.

Elimination of Flashboards to Benefit Wetlands

VANR (1993a) indicates that the periodic loss or dropping of flashboards at the project has detrimental effects on wetlands and wildlife, especially in winter. This agency further contends that eliminating or reducing the frequency of flashboard collapse would increase functional values of impoundment wetlands and wildlife habitat. Therefore, as discussed in detail in the Water Resources section, VANR recommends that CVPSC stabilize the impoundment level at 6 inches below flashboard crest, restrict impoundment fluctuations associated with flashboard manipulation to no more than 2 feet in magnitude, and investigate the feasibility of a permanent reduction in impoundment depth (i.e., flashboard removal) to stabilize impoundment levels.

Our analysis:

We recognize that flashboard collapse is a relatively frequent occurrence at this project. However, flashboard collapse or manipulation generally occurs in the high-flow months of March and April, and drawdowns are relatively short in duration. (Flashboards are restored after water levels in the impoundment drop 2 feet; refill time during low-flow periods under the existing peaking regime's impoundment level fluctuations of 3 feet is less than 7 hours.) We conclude that the resultant short-term impacts to wetlands and wildlife would continue to be minor.

Wetland areas tend to retain substantial amounts of water, and ecosystems of this type are unlikely to be stressed during the spring when most flashboard failures occur. In addition, wildlife are not prevented from using these areas for nesting during the relatively short duration of drawdowns. A permanent decrease in impoundment level, however, would completely dewater and alter some wetlands and riparian habitats. We conclude that a permanent reduction in the impoundment level is not a desirable option for stabilizing impoundment levels at the Cavendish Project. Therefore, as was stated in the Water Resources section, we concur with VANR recommendations to stabilize the impoundment level and restrict fluctuations to a maximum of 2 feet.

c. *Unavoidable adverse impacts:*

The population of the bryophyte *Scapania umbrosa* in Cavendish gorge would be adversely affected by the WQC's required continuous minimum flow of 10 cfs. However, because the bryophyte is not currently protected under Federal or state endangerment laws, and Dr. McQueen's study indicates that a 50 percent reduction of the bryophyte population is an acceptable loss, we view these impacts as minor.

Flashboard loss and resultant impoundment level fluctuations at the project would continue

to cause short-term, minor adverse impacts to wetlands and wildlife.

Construction of applicant's proposed recreational facilities would result in minor, short-term disturbances to wildlife and the permanent loss of small areas of habitat.

Table 7. Summary of Inundation of Six *Scapania umbrosa* Populations Subjected to Six Experimental Flow Releases in Cavendish Gorge. Size of Sites and Areas Inundated are Given in Square Feet (adapted from original data presented in CVPSC 1993c).

Leakage

Site	Size	Area Inundated	% Loss
1	2.37	0.00	0%
2	3.30	0.00	0%
3	0.32	0.00	0%
4	0.68	0.00	0%
5	1.77	0.00	0%
6	0.48	0.00	0%
Total	8.92	0.00	0%

10 cfs

Site	Size	Area Inundated	% Loss
1	2.37	2.37	100%
2	3.30	0.63	19%
3	0.32	0.00	0%
4	0.68	0.68	100%
5	1.77	0.30	17%
6	0.48	0.48	100%
Total	8.92	4.46	50%

15 cfs

Site	Size	Area Inundated	% Loss
1	2.37	2.37	100%
2	3.30	0.96	29%
3	0.32	0.00	0%
4	0.68	0.68	100%
5	1.77	0.45	25%
6	0.48	0.48	100%
Total	8.92	4.94	55%

20 cfs

Site	Size	Area Inundated	% Loss
1	2.37	2.37	100%
2	3.30	1.48	45%
3	0.32	0.00	0%
4	0.68	0.68	100%
5	1.77	0.51	29%
6	0.48	0.48	100%
Total	8.92	5.52	62%

25 cfs

Site	Size	Area Inundated	% Loss
1	2.37	2.37	100%
2	3.30	1.79	45%
3	0.32	0.00	0%
4	0.68	0.68	100%
5	1.77	0.54	31%
6	0.48	0.48	100%
Total	8.92	5.86	66%

35 cfs

Site	Size	Area Inundated	% Loss
1	2.37	2.37	100%
2	3.30	2.21	67%
3	0.32	0.32	100%
4	0.68	0.68	100%
5	1.77	0.78	44%
6	0.48	0.48	100%
Total	8.92	6.84	77%

4. Aesthetic Resources

a. *Affected environment*:

The Black River valley in the vicinity of the Cavendish Project is rural with steep, forested hillsides and small villages, such as Cavendish, which is less than 1 mile west of the project. The project area includes an impoundment, dam, gorge, powerhouse, substation, maintenance garage, parking, and lawn area (Figure 2).

Prior to the construction of the Cavendish Dam and powerhouse, the Black River flowed freely through the Cavendish gorge, creating an 80-foot falls and filling the gorge with all available flows. The area along the west side of the gorge was heavily forested, and views of the surrounding hillsides were not obstructed by project buildings, substation, or power lines.

The Cavendish Dam creates a 10-acre impoundment that backs up 0.5 mile into the Town of Cavendish. Fields, wetlands, and several houses surround the impoundment. The dam is a 75-foot high, concrete structure set into ledge outcroppings on both sides of the river with 6-foot high, wooden flashboards on the crest. A steel truss bridge spans the river above the dam.

The Cavendish gorge is a 1,570-foot bypass reach below the dam. Steep cliffs line the boulder-strewn gorge, and a dense tree canopy filters sunlight onto the river and gorge walls. The gorge is between 50 and 100 feet wide at the base with slanting or sheer rock walls from 50 to 80 feet high. There are boulders 10 to 20 feet high in the stream channel. The river channel through the gorge has a series of cascades or chutes linking nine pools of various sizes. The largest pool is about 70 feet by 40 feet and is 9 feet deep at dam leakage.

There are no sand and gravel deposits at the base of the gorge walls, and no areas that support woody plants. Because of the lack of soil, all of the vascular plants in the gorge are

confined to the ledge tops and cracks in the walls (VANR 1994).

The gorge is undisturbed and secluded, with few areas from which the dam and powerhouse are visible. The historical operating mode of the project (which does not provide minimum releases below the dam) virtually dewaters the gorge; only leakage flows exist for much of the year.

The gorge can be viewed by hiking in the gorge (which is dangerous because of slippery rocks and steep slopes) or from three viewpoints along the western rim of the gorge. The gorge can be accessed, with some difficulty, by hiking down the steep, rocky banks to the water's edge. The three viewpoints above the gorge are partially obstructed by overhanging branches of large conifer trees. One viewing location, just below the dam, provides views of the dam, gorge, and river. The two other viewpoints are further downstream. One overlooks a pool and water cascade, and another overlooks a rock slide area, water cascade, and pool.

The powerhouse, maintenance buildings, gravel employee parking area, and substation are located around a grassy clearing. They are accessed via a gravel road that leaves VT Route 131 just east of the Town of Cavendish and passes Cavendish's wastewater treatment plant and settling ponds, which are not visible from the project area.

The powerhouse area, bordered by tall deciduous and coniferous trees, is dominated by a 600-square-foot substation surrounded by a chain link fence and 46-kV powerline on single wood poles. The two-story, brick powerhouse itself is set below the clearing at the downstream end of the gorge, partially hidden by bushes and grassy bluffs. A gravel service road begins behind the substation and loops through the woods up to the dam. A path follows the penstock route from the clearing to the dam. The river and the gorge area are not visible from the clearing due to dense vegetation and topography.

b. *Environmental impacts:*

Landscaping to Enhance the Project Substation

CVPSC developed a site-specific landscape plan for its proposed public parking and picnic area (see Recreation resources section) near the existing powerhouse and substation. This plan provides for planting serviceberry shrubs and paper birch trees between existing trees and around the substation to reduce the visual prominence of that structure.

VANR requests that CVPSC:

- landscape the area in the vicinity of the proposed parking and picnic area (CVPSC 1991);
- clear underbrush between the picnic area and the river to improve views of the river; and
- block views of the powerline right-of-way by planting an understory screen (VANR 1994).

VANR (1994) also recommends that, at the next scheduled maintenance, CVPSC (1) paint the metallic gray dam machinery and hardware dark green or black to make these structures less prominent; and (2) stain the project's wooden sheds and other structures the same color.

Our analysis:

We agree with the need for visual screening of the substation. The proposed landscaping also would improve the appearance of the proposed picnic area. Before the landscape plan is implemented, CVPSC should consult with VANR to finalize the details of species selection and planting locations. We also agree that CVPSC should paint its machinery, hardware, and buildings using colors that blend the facilities with project area viewscapes. We recommend that CVPSC consult with VANR regarding its preferred colors.

We disagree with VANR's suggestion to clear underbrush between the picnic area and the river to improve views of the river. This measure would reduce the rustic appeal of the project area. We also do not agree with VANR's suggestion to block off views of the powerline right-of-way by planting an understory screen, because the powerline right-of-way must be kept clear of vegetation for maintenance and safety, and the area of the right-of-way is not a primary viewing site.

Bypass Flows for Aesthetics

The magnitude of flows through the gorge is an important aesthetic component, since the sight and sound of flowing water can affect the visual quality of the area. The project's bypass reach, therefore, can be enhanced by establishing a minimum flow during daylight hours.

CVPSC estimates that existing flows in the bypass reach are limited to the 3 to 5 cfs of dam leakage for most of the year. CVPSC proposes to provide 10 cfs into the bypass continuously from April 15 to October 31. These flows would be released from the east side of the dam, where a flashboard would be removed. During the remainder of the year, except when inflows either are too low for operation of the turbines or exceed project capacity, the bypass

would receive only leakage flows (CVPSC 1993d).

CVPSC videotaped selected reaches of the gorge under a range of bypass flows, including leakage, 10 cfs, 15 cfs, 20 cfs, 25 cfs, and 35 cfs. The video shows pools in the gorge at different flows as seen from several locations in the gorge. The video then focuses on three specific overlook points from the gorge rim.

After viewing the applicant's videotape, VANR (1991 and 1993a) conducted a site visit to evaluate the aesthetic quality of flows between 14 and 20 cfs. Based on these viewings, VANR concludes that a minimum flow release of at least 15 cfs should be provided, and CVPSC should investigate measures to pass this flow uniformly over the dam. VANR (1993b), however, recommends an interim minimum instantaneous flow of 10 cfs rather than 15 cfs, because of its concern about protecting the bryophyte, *Scapania umbrosa*.

Our analysis:

We examined the videotape and photos of a reasonable range of flows (leakage, 10 cfs, 15 cfs, 20 cfs, 25 cfs, and 35 cfs) released in the gorge. We also viewed flows of leakage, 10 cfs, and 20 cfs in the gorge during our site visit. Based on this information, we conclude:

- an aesthetic flow of 35 cfs, viewed from in the gorge and from the three primary viewing points along the rim of the gorge is superior to the other flows examined based on visual and aural quality; and
- flows released uniformly over the face of the dam would be more attractive than the method of release proposed by CVPSC.

The sound of the water in the gorge consistently rose as the water volume rose. However, from in the gorge and viewpoints above the gorge, there was not a uniform increase in visual character as flows increased from leakage to 35 cfs. There was a particularly noticeable increase in visual character when flows increased from leakage to 10 cfs, because cascades between pools became more visually dominant, and pools appeared more distinctive. Between 10 cfs and 25 cfs, visual changes were due primarily to increases in the water depth of the pools. There was no noticeable improvement in the visual quality of cascades until flows of 35 cfs were viewed. Therefore, of the flows analyzed, 35 cfs provides the greatest visual and aural aesthetic enhancement.

Because of limited use of the project area from November to mid-April, and restrictions on the use of the gorge area at night, a minimum daytime flow of 35 cfs from April 15 through October 31 would enhance the aesthetic character for people viewing the gorge. We do not recommend that CVPSC provide a 35 cfs minimum flow during these periods, however. Instead, we suggest a 10 cfs flow for the following reasons:

- the incremental increase in aesthetic enhancement is greatest when flows increase from leakage to 10 cfs;
- there is limited public access to the gorge; and
- there is a high cost in terms of lost generation by increasing bypass flows from leakage to 35 cfs.

We conclude, therefore, that CVPSC should release a minimum flow of 10 cfs during daylight hours from April 15 through October 31 to enhance aesthetic resources of the project area.

The visual effects of flows released uniformly across the face of the dam (viewed from in the gorge and from the one viewpoint on the rim of the gorge below the dam) are aesthetically superior to the visual effects of a flow release from the side of the dam (VANR 1993c). The primary benefit of flows over the entire dam is that they screen views of the 75-foot concrete face of the dam. Nevertheless, limited public viewing of the dam and the substantial cost to provide this type of flow deter us from recommending the release of a uniform flow over the face of the dam. We, therefore, accept CVPSC's proposed method of releasing the minimum flow.

Dam Warning Device and Boat Barrier

The applicant maintains a dam warning device and boat barrier upstream of the dam. This safety device can be viewed from the east and west side impoundment access sites at the dam. CVPSC now uses orange-colored buoys for the barrier. VANR (1994) suggests that this color detracts from the quality of public viewing. VANR (1994), therefore, requests that CVPSC investigate alternative colors that would blend this facility with the viewscape.

We do not agree that CVPSC should evaluate alternative colors for the dam warning barrier. Since the warning device must be highly visible to function effectively, we recommend that it remain orange.

c. *Unavoidable adverse impacts*: None.

5. Cultural Resources

a. *Affected environment*:

The Cavendish Hydroelectric Station was constructed on the Black River by the Claremont Power Company in 1907 to 1908. Several local distribution systems, including the Chester Water and Light Company and the Cavendish Electric Light Company, purchased power generated from the station to supply local customers. In 1919, the Claremont Power

Company was absorbed by Colonial Light and Power, which was reorganized that same year as the Vermont Hydro-Electric Company. In 1929, Vermont Hydro-Electric was among eight utilities which were joined to form CVPSC. Since then, CVPSC has operated the Cavendish Station.

The present Cavendish Station is eligible for inclusion on the *National Register of Historic Places* because of its historic integrity of design. That is, the arrangement of key elements remains as originally designed and, for the most part, as originally constructed. The powerhouse possesses integrity of design, workmanship, and materials; it has experienced only limited and superficial alteration over time.

The penstock, installed in 1979, maintains the integrity of the original design, since it follows the same route as the original conduit. As a new feature, it does not possess integrity of historical materials and workmanship.

Repairs at the dam in the 1970s and 1980s involved replacement of deteriorated material (concrete, wood) with like materials. These actions did not reduce the dam's integrity of design, workmanship, or materials. The intake structure and the gatehouse over the sluice likewise possess integrity of design, workmanship, and materials. Thus, the powerhouse (and the generating units within it), dam, and intake/gatehouse are the elements that most contribute to the historical significance of the facility.

The facilities that do not contribute to the project's historical significance include: the penstock (because it is a very recent feature and, lacking a surge tank, does not conform to the design of the original conduit); existing substation (because it represents a modern installation on a site different from that of the original substation); and the steel bridge, storage shed, and garage, all of which were constructed/installed after the period of significance (1907 to 1908) and are features that are not part of the original facility design.

Based in part on recommendations from the Vermont Division of Historic Preservation (VDHP), the applicant conducted a Phase IA archaeological survey (background research) of three locations at the Cavendish Project. These included a canoe and boat landing on the north bank of the impoundment, the ruins of a historic mill complex on the south bank of the impoundment, and a canoe portage trail leading from a location above the dam on the east bank downstream to a put-in point on the east bank across from the powerhouse. These three locations were designated Survey Units A-1, A-2, and A-3, respectively.

The only known archaeological resource for the Cavendish Project is the historic mill complex site (Survey Unit A-2). Background research of historic maps reveals that this historic site represents the remains of the "J. Fitton Woolen Factory" and associated buildings that are depicted on the Beers 1869 maps of Baltimore Township and Cavendish Village. The Fitton Woolen Factory operated in Cavendish primarily during the third quarter of the nineteenth century. The Beers 1869 map of Cavendish Village indicates that the dam across the Black River then was located further upstream at the mill factory building.

In addition to the factory, this rural industrial complex consisted of an office building, storehouse, boarding house, and at least eight tenement houses for factory workers, all located between the east bank of the Black River and the Rutland and Burlington Railroad tracks. A series of fires in the 1870s and 1880s apparently destroyed virtually all of this mill complex. Reconnaissance at this site reveals that much, if not all, of this nineteenth century mill complex survives as a historic archaeological site. Despite a heavy understory and scrub forest in this area, reconnaissance recorded the presence of foundation remains of six separate structures belonging to this complex, possible remnants of the original dam on the impoundment's south bank, four separate retaining walls of stone, and the beds of several gravel roads which serviced this complex, some of which are in use today.

b. *Environmental impacts*:

Historic Architectural/Engineering Resources

Within the historic context "Hydroelectric Power in Vermont, 1882 to 1941," the Cavendish facility is significant under Criterion C of the *National Register of Historic Places* as possessing distinctive features of hydroelectric engineering and architecture during the formative, turn-of-the-century decades of the industry's development in Vermont. The component most clearly representative of this period is the powerhouse, with solid masonry walls buttressed with pilasters and segmental-arched window openings with typical wooden sash (both derived from earlier industrial precedent), and the sweeping, slate-clad hipped roof, which gives the building a decidedly Craftsman-style character.

The plant's relative technological sophistication for the time is illustrated by its use of turbines in spiral steel casings, during a decade in which most moderate-head installations in Vermont were equipped with boiler-plate cylindrical casings. The dam (with flashboard crest control, intake, and gatehouse) is much less indicative of a specific time, since structures of these types were erected at hydroelectric facili-

ties during nearly the entire historic period of the industry in Vermont.

The continued operation of the Cavendish Project in the present or proposed mode of operation would have no effect on the characteristics that qualify the project for listing in the *National Register of Historic Places* because no changes to *Register*-critical components would occur.

Archaeological Resources

No prehistoric or historic archaeological sites listed on or determined eligible for listing on the *National Register* have been recorded within the project area. One archaeological site, the Fitton Woolen Mill Complex Site (VT-Wn-182), has been identified, but this site has not yet been evaluated for *National Register* eligibility.

The 1990 Phase 1A survey determined that:

- the canoe and boat landing on the north bank of the impoundment (Survey Unit A-1) possesses moderate potential for archaeological resources; and
- both the ruins of the Fitton Woolen Mill complex on the south bank of the impoundment (Survey Unit A-2) and the canoe portage trail leading from a location above the dam on the south bank downstream to a put-in point on the east bank across the river from the powerhouse (Survey Unit A-3) possess high potential for archaeological resources.

Currently none of these areas exhibits impacts from either shoreline erosion or from recreational activity. Only the upper end of Survey Unit A-3 is now being considered for use as an impoundment access area by CVPSC.

The applicant proposes to implement a program of monitoring at 4-year intervals, beginning in 1996, to identify any increase in shoreline or recreation-induced erosion that may occur within Survey Unit A-2 (Fitton Woolen Factory) and Survey Unit A-3, which could be used in development of an impoundment access site. CVPSC should provide the results of these monitoring activities to the Vermont State Historic Preservation Officer (SHPO) within 8 weeks following completion of the monitoring effort, accompanied by appropriate recommendations from the archaeologist performing the work. CVPSC should consult with the SHPO to determine if additional archaeological investigations are warranted to identify archaeological resources that may be eligible for the *National Register of Historic Places*.

In addition, before beginning any project-related land-clearing or ground-disturbing activities in areas that have not been subjected to an archaeological survey, CVPSC should consult with the SHPO concerning potential effects on *National Register* listed and eligible properties regarding options for avoiding adverse effects.

Moreover, if previously unidentified historic properties are discovered during any project-related land-clearing or ground-disturbing activities, CVPSC should immediately alert the SHPO to the discovery, and ensure that all work that may affect the property is halted until measures to address potential impacts to these historic properties have been carried out. CVPSC should also ensure that work crews are informed that they are required to report and protect any historic properties that are found.

Cultural Resources Management Plan

CVPSC developed a draft Cultural Resources Management Plan (CRMP) to avoid or minimize disturbances to: properties at the Cavendish Project that are listed on or eligible for listing on the *National Register of Historic Places*; archaeological sites near the project; and any other historic properties that may be identified in the course of operating the project or engaging in presently unscheduled ground-disturbing activities. The prime objective of the management plan is efficient, cost-effective maintenance of historic features in relation to the facility as a whole. Implementation of this plan by CVPSC would allow operation of the register-eligible project features as well as development of the proposed recreation enhancements without adversely affecting any register-eligible properties.

The objective of the CRMP is to conserve the existing historic fabric and features of the National Register-eligible Cavendish Hydroelectric Station to the greatest extent practicable within the framework of continuity of use. This concept derives from the fact that without continued "use" (i.e., operation), both during the facility's period of significance and since that time, the facility would not exist. Thus, continued operation is critical to the preservation of the facility as a National Register-eligible property and to the conservation and care of historic features. CVPSC's draft CRMP identifies the following steps for future activities at the Cavendish Project:

- routine maintenance and repairs that do not permanently alter the existing visual or functional character of the fabric or feature shall be considered to have no effect, and, therefore, shall be undertaken as necessary without notification of the SHPO;
- repairs or other activities limited to in-kind replacement of historic fabric or features (i.e., replacement with new fabric or features that duplicate the old in terms of

materials, design, size, color, texture and functional characteristics) shall be considered to have no adverse effect. As a matter of information, CVPSC shall send a letter to the SHPO that summarizes the work to be performed and states why the activity would have no adverse effect; and

● activities requiring replacement other than in-kind replacement, new construction, and partial or total demolition within the boundaries of the National Register-eligible property shall be considered to have a potential adverse effect. When the need for such activities is identified, CVPSC shall initiate consultation with the SHPO to consider ways to avoid or minimize potential adverse effects. As a documentary basis for this consultation, CVPSC shall prepare an alternatives analysis, in detail commensurate with the nature and scale of the proposed activity. The alternatives analysis shall include: purpose and need, description of the affected fabric or feature, description of the proposed activity and its anticipated effect upon the historic feature and upon the historic character of the Cavendish Hydroelectric Station as a whole, and an evaluation of alternatives. Measures agreed upon by both CVPSC and the SHPO to avoid or minimize adverse effects shall be documented through an activity-specific plan. If CVPSC determines that no agreement can be reached, CVPSC shall so inform the Commission, and shall undertake recordation of the affected feature prior to initiation of the proposed action. This recordation shall consist of 35-mm black-and-white photographs plus a summary report that describes the feature, its history and use, current condition, and the circumstances requiring the proposed action. The photographs and summary report shall be submitted to the SHPO.

VANR suggests that CVPSC continue to consult with the VDHP in developing a final version of the CRMP and that VANR be consulted in the development of the plan with respect to any potential impacts on visual resources. We recommend development of a final CRMP and that CVPSC consult with the VDHP and VANR to produce the final plan.

In order to ensure that the provisions of the CRMP are reviewed, refined, and enacted, a Programmatic Agreement should be executed among the Commission, Advisory Council on Historic Preservation, and the VDHP (with CVPSC and VANR as concurring parties). The Programmatic Agreement should stipulate that the CRMP must be refined and filed for Commission approval within 1 year of any license issued for the Cavendish Project.

c. *Unavoidable adverse impacts*: None.

6. Recreation Resources

a. *Affected environment*:

The area surrounding the Cavendish Project is hilly, wooded, and undeveloped. The 1,513-acre Proctor-Piper State Forest is located 0.5 mile southwest of the project. The Hawks Mountain Wildlife Management Area, which borders the project, is situated to the northeast. Hiking and hunting are popular in the state forest and wildlife area. The Okemo Mountain Ski Area is located approximately 5 miles upstream from Cavendish (CVPSC 1991).

Currently there are no developed recreational facilities at the Cavendish Project. However, the project vicinity is popular for picnicking, swimming, fishing, boating, photography, and viewing. Before construction of the Cavendish Dam and powerhouse, the Black River near the Cavendish gorge probably was used for trout fishing, hunting, swimming, and picnicking.

Primary access to the project area is via a gravel road that leaves VT Route 131, passes the Town of Cavendish wastewater treatment facility, and leads to the powerhouse area. Informal parking for picnickers, anglers, swimmers, and sight-seers is available near the powerhouse. A gravel maintenance road starts near the powerhouse and loops through the woods up to the dam and impoundment. Established paths, which start at the powerhouse parking area, pass through the woods, and end at the pool and riffle area downstream of the powerhouse, are used by picnickers, swimmers, and anglers. Another pathway on the west side of the gorge follows the penstock route, leading from the powerhouse to scenic overlooks, which provide views of the gorge, dam, and the east bank of the impoundment (see Aesthetics section and Figure 5).

Nine pools in the gorge are used by swimmers who scramble down the steep slopes and ledges to the gorge bottom. Weather conditions and the isolation and ruggedness of the gorge limit swimming to summer months during daylight hours.

An undeveloped maintenance road, which leads to the dam and impoundment area from the east, offers car-top boating access. There is frequent use of an undeveloped picnic site accessed by this road. Evidence of the area's popularity includes multiple trails criss-crossing the area, fire rings, and considerable litter. The existing, uncontrolled use of this area has caused some degradation of the site. The quarter-mile road from the town-maintained Gulf Road to the picnic site has several large ruts;

during the spring, it is muddy and impassable except for four-wheel drive vehicles. Although there is parking space for three vehicles at the end of the road, turning around is difficult.

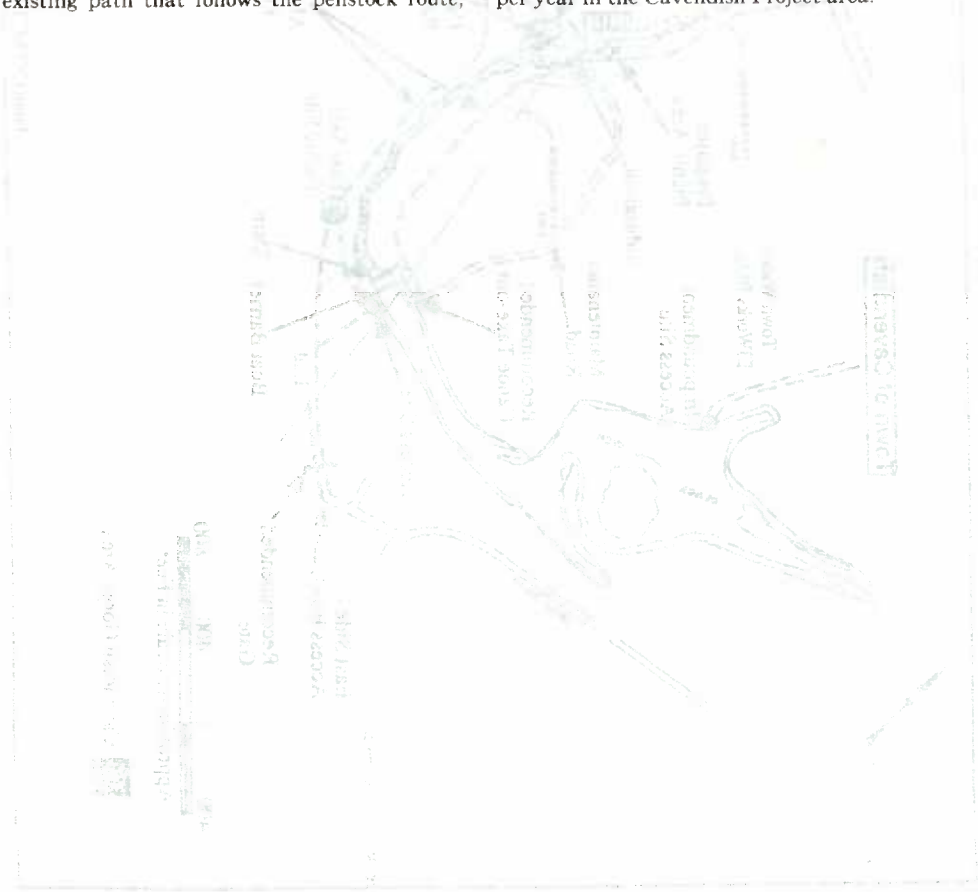
Car-top boaters can also access the impoundment via a 300-foot-long track that leads from the Town of Cavendish past the Water Works pump house to the northern bank (see Figure 5).

The project's 10-acre impoundment is used for flatwater boating and fishing from June through October. Canoeists travel the Black River from April through June with trips originating at upstream Amherst and Echo Lakes (River Mile (RM) 35). The river current increases near Ludlow (RM 25), slowing for the Cavendish impoundment at RM 21 (Ellmore 1993).

A portage around Cavendish Dam and gorge is possible by taking out on the west bank of the impoundment above the dam, using an existing path that follows the penstock route, and putting in at the river access site below the powerhouse. Currently the take-out area at the Cavendish Dam is undeveloped and should be upgraded to make it safer and easier to use.

The Black River's current quickens again to Class II to III whitewater below the Cavendish gorge, continuing on to the North Springfield flood-control dam at RM 9, which greatly limits portage for further canoe travel on the Black River (AMC 1989). No estimates are available on the number of canoeists who currently pass through the Cavendish Project area.

Local people account for most of the recreational use in the Cavendish Project area. The majority of recreationists at the project either swim in the gorge, fish for brown and brook trout, or picnic. Based on recreational use at other nearby hydroelectric projects, we estimate that there are 200 recreation user-days per year in the Cavendish Project area.



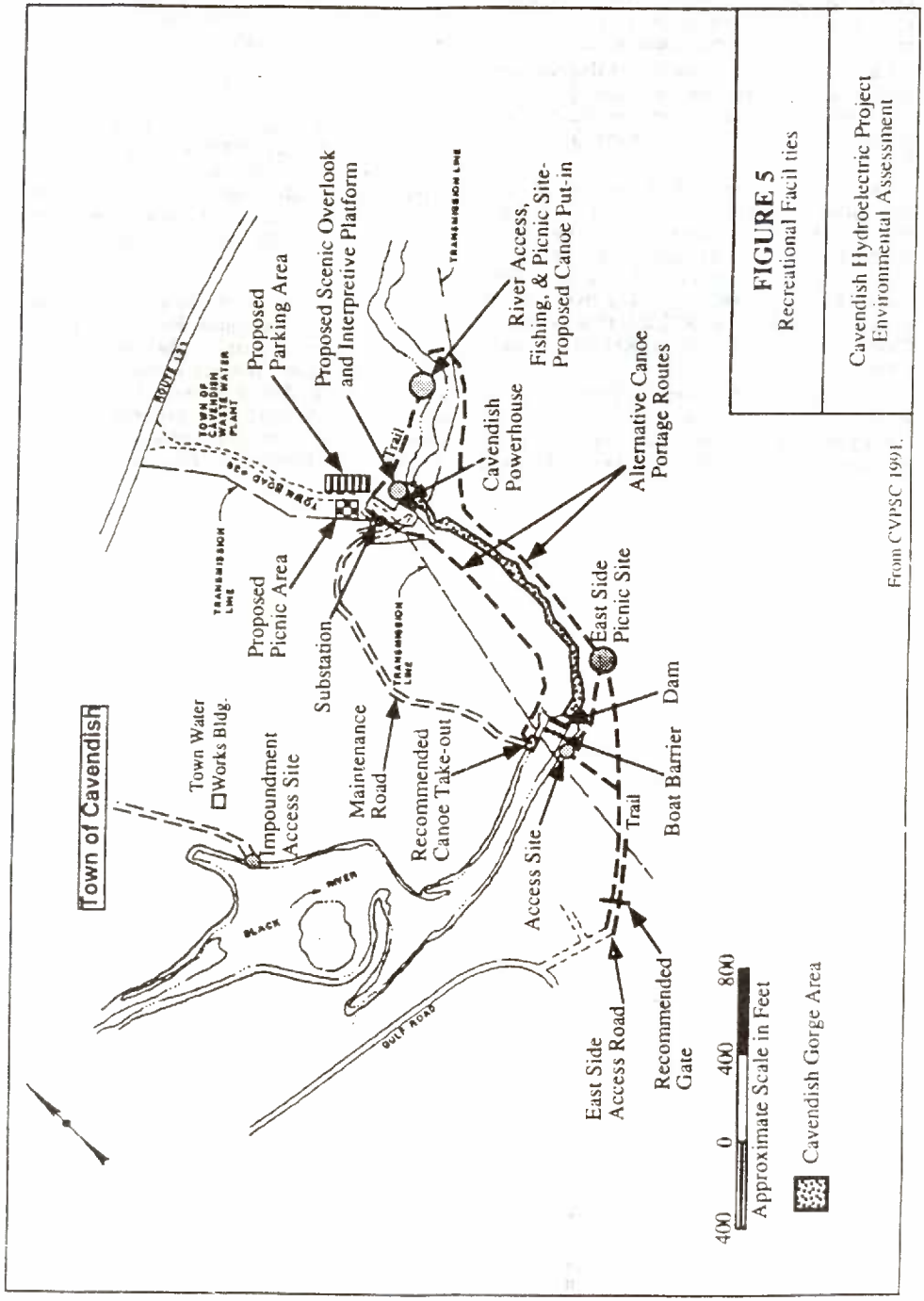


FIGURE 5
Recreational Facilities

Cavendish Hydroelectric Project
Environmental Assessment

b. *Environmental impacts:*

Public Safety

Representatives from the Town of Cavendish (1990), VANR (1989), and CVPSC (1993b) express concern about safety for people using the Cavendish gorge. Concerns cover people hiking in the gorge, swimming in the pools in the gorge, and using the picnic area on the east rim of the gorge above the dam. Representatives from the Town of Cavendish base part of their reluctance to the expansion of recreational facilities in the project area on concerns about safety and rescue services. CVPSC has not proposed improvements to the east side access road or interpretative overlooks and paths along the edge of the Cavendish gorge because of concerns about increased use and public safety in the gorge area.

We recognize the safety concerns that have been raised. The recent (October 1993) accidental death of a person who was using the picnic site on the east side of the gorge and the precarious nature of hiking and swimming in the gorge convince us that recreational enhancements at the Cavendish Project should be on a small scale and concentrated away from the gorge.

Recreational Facilities

The applicant proposes to construct and operate the following recreational facilities at the Cavendish Project:

- a public parking area for eight vehicles near the existing powerhouse and maintenance buildings;
- a picnic area with three picnic tables and benches near the proposed parking area;
- a trailhead, directional signs, and trail improvements for the existing 800-foot-long trail from the parking area to a fishing and canoe launching site located downstream of the powerhouse; and
- a scenic overlook and interpretative platform immediately downstream of the powerhouse that would be accessible to the disabled.

VANR (1989) generally concurs with the applicant's plans for new recreational facilities at the project. In contrast, representatives of the Town of Cavendish, citing safety, emergency response, and site degradation concerns, prefer to see Cavendish gorge remain as it is today with its current level of recreational use and development (CVPSC 1993b).

Based on our site visit and the increasing demand for river access documented in the 1988 Vermont Recreation Plan, we conclude that there is a need for the proposed recreational facilities. Therefore, we recommend that CVPSC submit a revised recreation plan specifying the details of all proposed facilities. After Commission approval, CVPSC should construct and operate the facilities.

East Side Access Road

Driving on the east side access road with a two-wheel drive vehicle is difficult due to ruts and frequent muddy conditions. Conditions are hazardous and there is degradation at the picnic site that is accessed by the east side road.

VANR recommends that CVPSC repair and maintain the east side road to allow two-wheel drive vehicle access, improve parking, and construct a vehicle turn-around at the end of the road. Representatives from the Town of Cavendish, however, object to improvements to the east side access road, because they have concerns that public safety, emergency response, and site conditions would be adversely affected by increased recreation there.

CVPSC states that it will accommodate VANR's request for road improvements to the extent acceptable to the Town of Cavendish (CVPSC 1993b).

We recognize the Town of Cavendish's concerns about public safety, emergency response, and site degradation and agree that increased access to this site would lead to greater degradation and safety risks. Furthermore, we conclude that the existing impoundment access road near the Town of Cavendish water works building plus the recreational facilities CVPSC proposes to construct on the west side of the gorge near the powerhouse and the facilities we recommend would provide adequate recreational access and facilities in the project area. Therefore, we recommend that CVPSC restrict further public access to the east side road and picnic area by constructing and maintaining a locked gate across the road. CVPSC should install a sign on the gate directing people to the recreation facilities on the west side of the river.

Canoe Portage

One of the most limiting factors to canoeing the Black River is the difficult portage around the Cavendish Dam and gorge. VANR (1993b) and the Northern Vermont Canoe Cruisers (NVCC) (1991) request that CVPSC provide a canoe portage around the Cavendish Dam. NVCC recommends a route on the east side of the gorge with signs and limited trail brushing. VANR (1993b and 1994) recommends a portage on either the east or west side of the gorge. CVPSC (1993b) states that a portage is not desirable for the Cavendish site because of public safety considerations.

We conclude that a canoe portage around the Cavendish Dam and gorge would enhance the

25-mile-long trip from Amherst Lake to the North Springfield Dam. A signed portage at the Cavendish Project also would improve public safety by directing canoeists to the portage from the take-out and offering a route that safely skirts the gorge.

Based on information gathered during our is preferable to the east side route, because the east side route would be longer, would cross about 200 feet of wetlands, and would necessitate a put-in requiring a descent down a brushy and steep slope.

The west side portage should use a take-out site developed approximately 50 feet above the existing boat barrier on the west side of the impoundment. There should be clearing and grading to enable canoeists to maneuver the slope safely. The boat barrier should be fitted with "Danger Dam" signs. The existing trail over the penstock route and the trail from the proposed parking area to the downstream put-in should be converted into the canoe portage trail. This portage trail would be approximately 1,600 feet in length, 20 percent shorter than an east side portage trail, which would be close to 2,000 feet long. Signs also should be provided, directing canoeists to the take-out from the impoundment and along the canoe portage route.

We recommend that CVPSC be required to develop a "west side" portage as described above. CVPSC should include design details for the west side canoe portage facilities in its revised recreation plan.

Flows for Swimming

The Cavendish gorge is a popular local swimming area. VANR (1994) suggests that changes in the minimum flow through the gorge could affect the character of the gorge pools for swimmers. VANR, therefore, requests that CVPSC study the effects of higher flows on swimming in the gorge in connection with the bryophyte study.

Based on our site visit, our review of videotapes and photos, and our review of the fishery study, which analyzed how flows affect pool depth and water velocity in the gorge, we observe that swimming conditions in the gorge change the most when flows increase from leakage flows (3 to 5 cfs) to 10 cfs. The additional 5 to 7 cfs causes pool depth to increase and the velocity of the water between the pools to increase noticeably.

Further increases in flows from 10 cfs to 35 cfs result in smaller incremental changes in flow velocity and water depth in the pools. Flows of 35 cfs, however, would not cause flow velocities in pools to increase sufficiently to endanger swimmers.

To determine optimal flows for swimming, we considered the following factors:

- the incremental improvement in swimming conditions is greatest when flows increase from leakage to 10 cfs;
- there is limited public access to swimming in the gorge; and
- there is a significant cost in terms of lost generation as a consequence of increasing flows from leakage to 35 cfs.

We conclude that 10 cfs represents a reasonable flow for swimming. We recommend, therefore, that CVPSC provide a 10 cfs minimum flow during daylight hours from June 15 through September 15 for optimal swimming conditions in the gorge. We do not recommend that CVPSC study the effects of higher flows on swimming in the gorge, because sufficient information has been provided.

Recreation Master Plan

VANR requests that CVPSC provide a comprehensive recreation master plan that includes monitoring recreational use in the project area (VANR 1994), a region-wide recreational resource analysis (CVPSC 1991), and consultation with the Recreation section of the Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the Town of Cavendish (VANR 1994).

Standard license article 17 allows the Commission to require a licensee to make reasonable modifications or add recreational facilities throughout the term of the license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested federal and state agencies, after notice and opportunity for hearing.

In addition, section 8.11 of the Commission's regulations requires licensees to collect and file periodic data on recreational use at projects where recreational activity is occurring. This information helps to identify the need for additional recreation facilities and enhancements. We, therefore, conclude that there is inadequate justification to require CVPSC to conduct additional monitoring of recreational use in the project area.

CVPSC collects and files data on recreational use at all its FERC-licensed projects, but has no involvement with other recreational facilities over a broad geographic area. We conclude that CVPSC should not be required to conduct a region-wide recreational resource analysis, because this analysis is more appropriate for a state agency or regional planning group. CVPSC, if requested, should provide its recreational use data to any organization performing the regional analysis.

- implementing CVPSC's cultural resources management plan and programmatic agreement;
- constructing and operating interim and permanent downstream fish passage facilities; and
- monitoring required flows.

We believe that implementation of these measures would: improve aesthetics, water quality, fisheries, and recreational resources; increase access to the river in the project area; and provide for future fish passage.

Based on the Commission's past practice, the terms and conditions in the VANR WQC issued for the Cavendish Project must be considered in any license issued. The major cost items required by the WQC not already included in our recommended alternative are:

- providing a minimum spillage flow of 10 cfs year-round; and
- conducting a five-year study on the bryophyte *Scapania umbrosa*.

Though the cost of these measures would reduce the existing power benefits of the project, the project would still have net economic benefits over the new license term compared to the least-cost alternative. Specifically, we consider six measures that would reduce the economic benefits of the project: (1) run-of-river operation, (2) spillage flows, (3) aesthetic measures, (4) recreational enhancements, (5) downstream fish passage, and (6) WQC conditions not included in our recommended alternative.

A. *Run-of-River Operation*

CVPSC proposes instantaneous run-of-river operation at the Cavendish Project in its application for subsequent license. Both VANR and FWS concur with CVPSC's proposal. We also agree and, therefore, recommend run-of-river operation.

Instantaneous run-of-river operation would eliminate regular variation in reservoir elevation and downstream flows that would occur under the daily peaking mode allowed by the original license. Moreover, by switching to a run-of-river mode, shoreline erosion would be reduced, wetland vegetation adjacent to the impoundment would be enhanced, water quality would be protected, and fisheries habitat both upstream of the dam and below the powerhouse would be enhanced by the reduced number of dewatering events.

We calculate the cost of the change from a daily peaking operation to an instantaneous run-of-river operation to be approximately $4,900 each year.

B. *Minimum Flows*

We conclude that, while water quality criteria are presently met with only leakage in the bypass reach, additional flows would reduce the likelihood of water quality degradation occurring in that reach under extreme weather and low-flow conditions. For fishery resources, we conclude that trout holding habitat would improve with additional flows greater than leakage. The largest incremental habitat gain would occur from increasing flows in the gorge from leakage to 10 cfs. For these reasons, as well as consideration of the increased costs associated with increasing minimum flows from 10 cfs to 20 cfs, we conclude that flows higher than 10 cfs are not the best comprehensive use of the water resources at this project. We also conclude that a study to determine whether minimum flows greater than 10 cfs would affect the bryophyte is not necessary. However, since this study may be within the scope of section 401 of the Clean Water Act, it will be included in any license issued.

Studies of the bryophyte indicate that 50 percent of the present population could be lost at flows of 10 cfs, with additional losses at higher flows. A flow of 10 cfs also would provide for adequate flows for aesthetics and swimming in the bypass reach. We note that aesthetics and swimming would not be substantially improved at higher flows, and that further increases in flow to enhance water quality, fisheries, aesthetics, and swimming would be detrimental to the rare bryophyte.

Regarding seasonality, dam releases are not needed during late fall, winter, and early spring to enhance water quality, recreation, or aesthetics. Fisheries requirements during this period are for deep, overwintering pools, which exist in the bypass reach under existing leakage flows. Also, leakage flows would provide adequate protection for benthic invertebrates, which are a major food source for fish. (A 10 cfs dam release would increase wetted area (the area of inundation in which benthic invertebrates are found) by only about 10 percent; this represents a minimal benefit to this resource base.) In addition, flows for aesthetics and recreation would not be needed during this period, because of limited recreational use of the project area at that time. Thus, dam releases from November 16 through March 31 are not necessary for the protection or enhancement of any of the resources considered.

We conclude that a minimum flow of 10 cfs from April 1 through November 15 with leakage flows from November 16 through March 31, would provide adequate enhancement of fish habitat in the bypassed reach, and would enhance water quality, recreational activities, and aesthetic qualities. However, higher flows

of up to 15 cfs (which would be released through the passage facility and thus would be in addition to estimated leakage of 4 cfs) would be required during the juvenile salmon downstream migration periods (April 1 through June 15 and September 15 through November 15). The 10 cfs minimum flow and limited period of the higher flow during the salmon migration periods would provide a reasonable assurance that populations of the bryophyte, *Scapania umbrosa*, would remain in the gorge.

Because the WQC requires a year-round 10 cfs flow and limits downstream passage facilities to 10 cfs during the fall migration period for the 5-year duration of the bryophyte study, CVPSC must provide a year-round minimum flow of 10 cfs to the bypass reach, and must limit flow provided for downstream fish passage from September 15 through November 15 to a maximum of 10 cfs (unless natural spillage flow is higher) during the 5-year duration of the VANR-mandated bryophyte study.

From in the gorge and from the one viewpoint on the rim of the gorge below the dam, flows released uniformly across the face of the dam are aesthetically superior to flow released from the side of the dam (VANR 1993c). Flows over the entire dam screen views of the 75-foot concrete dam face of the dam. However, limited public viewing of the dam and the additional cost of $61,500 per year deter us from recommending the release of a uniform flow over the face of the dam.

We estimate that the annual cost of providing a seasonal (April 1 through November 15) minimum bypass flow of 10 cfs for enhancement of fishery habitat, water quality, swimming, and aesthetics, would be $24,100.

C. *Aesthetic Resources*

CVPSC developed a plan to minimize the visual dominance of the substation located near the project powerhouse and the proposed picnic area. This plan calls for planting serviceberry bushes and paper birch trees around the substation. We agree with the need and design of the landscape plan for visual enhancement of the proposed parking and picnic area and recommend its implementation. Landscaping would enhance the proposed picnic area and would help focus recreational use in this area. Before the plan is implemented, we recommend that CVPSC consult with VANR to finalize the details of species selection and planting locations.

We also agree with the suggestion that, at the next scheduled maintenance, CVPSC should paint its machinery, hardware, and buildings with colors that VANR recommends to blend the facilities with the project area viewscape. Our analysis shows that the proposed landscaping would cost CVPSC approximately $1,000 annually when levelized over a 30-year license period.

D. *Recreational Resources*

We recommend that CVPSC submit a revised recreation plan within 6 months from the date of issuance of any license. After the Commission approves the revised plan, CVPSC should construct and operate the approved recreational enhancements.

The demand for the recreational facilities in the project area will probably continue to rise as a consequence of increases in population and the proportion of the public that recreates. We also believe the introduction of Atlantic salmon in the Black River will increase demand for recreational angling opportunities in the project area. We have calculated that the annual levelized cost to CVPSC for the parking area, trail, picnic area, scenic outlook and interpretive platform, signs, canoe portage, and gate for a 30-year license would be about $3,000.

E. *Downstream Fish Passage*

VANR stocked approximately 23,124 fry above the Cavendish Project in 1993. This stocking is part of a plan to restore Atlantic salmon runs to several New England river basins. Depending on the success of the restoration program, the Secretary of the Interior may also require upstream passage in the future. However, construction of upstream passage facilities has been deferred to a time when migrating adults have access to the Cavendish Dam. Since VANR stocked salmon above the project in 1993, downstream passage facilities must be completed by the time these juvenile salmon are ready to migrate downstream to the Atlantic ocean (beginning in the spring of 1995).

Interior has prescribed downstream fish passage at the Cavendish Project. We recommend that CVPSC install downstream fish passage facilities at the Cavendish Project. We have calculated that the cost to CVPSC for this enhancement, levelized over a 30-year license period, would be about $25,600 annually ($9,400 for construction of the facility and an additional $16,200 for operation, including a flow of 15 cfs which is made up of the 6 cfs minimum flow requirement and an additional 9 cfs dam spill). If the results of the bryophyte study indicate that increased flows are appropriate, fish passage flows would be included in the cost to provide the 20 cfs minimum flow.

F. *Water Quality Certification*

In addition to our recommendations, the Commission includes lawful WQC conditions in any license issued. As noted in section IV.D,

the Cavendish WQC includes a requirement for a minimum year-round spillage flow of 10 cfs and provides for the development of a study to assess the impacts of minimum flows on the bryophyte *Scapania umbrosa*.

We have calculated the annual incremental cost (above the 10 cfs flow that we recommend from April 1 through November 15) to provide this additional spillage during the period November 16 through March 31 would be $17,200.

Condition I of the WQC requires that CVPSC develop a plan of study for assessing the impact of alternative bypass flows on the bryophyte *Scapania umbrosa*. The results of this study will be used to assess the feasibility of increasing the minimum flows to a level not to exceed 20 cfs. If the study results indicate that the bryophyte populations could sustain additional flows, the incremental 10 cfs needed to provide a total year-round flow of 20 cfs would result in an additional cost of $37,800 annually, levelized over the 30-year license term.

The cost of conducting the bryophyte study, levelized over a 30-year license period, would result in an additional annual cost of $5,100.

G. *Conclusion*

We estimate that implementing the preferred alternative would cost about $59,600 annually. While staff's analysis indicates the additional flow is unwarranted, adding VANR's requirement for a year-round 10 cfs minimum flow increases the annual cost to $76,800. In addition, the 5 year bryophyte study increases the annual cost by $5,100 to a total of $81,900. Should the study conclude that the bryophyte populations can withstand increased flows, the total cost to the project for implementing all enhancement measures would be $103,500. We believe that this cost is feasible given the project's net economic benefits (see Table 10, below). This figure is the sum of: (1) the value of lost generation and (2) the cost of project enhancements.

Table 9. Summary of the Levelized Annual Costs of the Proposed Enhancements to the Cavendish Hydroelectric Project (Source: Staff).

Condition	*Applicant's Proposed Enhancements*	*Add'l Costs of Staff Enhancements*	*Add'l Costs of WQC Requirements*
Run-of-River	($ 4,900)	—	—
Spillage	($ 21,300)	($2,800 [24]	($7,200 [25] ($1,600 [26]
Aesthetics	($ 1,000)	—	—
Recreation	($ 1,900)	($1,100 [27]	—
D/S Fish Passage	—	($5,600 [28]	—
Bryophyte study	—	—	($ 5,100)
Plans	—	($ 1,000)	—

[24] Annual cost of providing a 10 cfs minimum flow from April 1 through April 14 and from November 1 through November 15.

[25] Annual cost for a 10 cfs minimum flow from November 15 through March 31 ($17,200).

[26] Annual *incremental* cost for a 10 cfs flow increase to provide a year-round 20 cfs minimum flow. Total cost of $37,800 is reduced by $16,200 as incremental increase will cover fish passage flows.

[27] Annual cost of left bank canoe portage ($700) and gate for the right bank access road ($400).

[28] Annual cost of constructing and operating fish passage facilities ($9,400) and providing a 15 cfs minimum flow in the fish passage from April 1 through June 15 and from September 15 through November 15 ($16,200).

Table 10. Levelized Annual Net Benefits of the Cavendish Hydroelectric Project (Source: Staff).

	Applicant's Proposal	*Applicant's Proposal with Staff Enhancements and Section 18 Prescription*	*Applicant's Proposal with Staff Enhancements, Section 18 Prescription and WQC Condition*
Existing Project	$385,400	—	—
Enhancements	($29,100) [29]	($30,500) [30]	($21,600) [31]
			($21,600) [32]
Total Net Benefits	$356,300	$325,800	$303,500 [33]
			$281,900 [34]

VIII. Recommendations of Fish and Wildlife Agencies

Under the provisions of the FPA, as amended by the Electric Consumers Protection Act of 1986, each hydroelectric license issued by the Commission must include conditions to protect, mitigate damages to, and enhance fish and wildlife (including related spawning grounds and habitat) affected by the project. These conditions must be based on recommendations provided by Federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA, or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of each agency.

For the Cavendish Project, VANR and Interior have had an opportunity to make comments and recommendations and have done so. All VANR and FWS recommendations have been evaluated and discussed in the Water, Fishery, and Terrestrial Resources sections of this EA, and our conclusions concerning the merits of these recommendations are presented there. Table 11 summarizes these conclusions and our recommended actions.

In some instances, our conclusions concerning the appropriate enhancement measures differ from those of VANR. However, VANR recommendations that are also lawful WQC conditions will be included in any license issued for the project.

The recommendation for the bryophyte study does not qualify under FPA section 10(j), because this measure deals with a rare plant rather than fish, wildlife, or their habitat. Thus, we considered the recommendation under FPA section 10(a). In addition, this measure's related maximum spillage flow of 10 cfs is in direct conflict with the section 18 prescription for release of higher flows (15 to 25 cfs) to adequately operate downstream fish passage facilities. We recommend that the Commission reserve its authority to increase the minimum flow up to 20 cfs if requested by the VANR pursuant to its lawful WQC condition.

Table 11. Analysis of Fish and Wildlife Agency Recommendations.

Recommendations	*Agency*	*Within the scope of 10(j)*	*Conclusion*	*Action*
Use run-of-river operation	Interior VANR	yes	Agree	Adopted *
Provide a minimum bypass flow of 10 cfs year round.	Interior VANR	yes	Disagree	Adopted *
Develop a monitoring plan for run-of-river and minimum flow.	Interior VANR	yes	Agree	Adopted *

[29] Annual costs of CVPSC's proposed enhancements: Run-of-river ($4,900), 10 cfs minimum flow from April 15 through October 31 ($21,300), Aesthetics ($1,000), and Recreation ($1,900).

[30] Additional annual cost of staff enhancements and section 18 prescriptions: Recreation ($1,100), Plans ($1,000), Fish Passage Facilities ($9,400), and Combined Spillage and Fish Passage Flows ($19,000).

[31] Additional annual cost of WQC requirement: 6 cfs spillage from November 16 through March 31 ($17,200), and annual cost of bryophyte study ($5,100).

[32] Additional annual cost of WQC requirement: 10 cfs increase to provide year-round 20 cfs minimum bypass flow ($37,800). The 20 cfs flow includes flows required for downstream fish passage—therefore the additional cost of passage flows ($16,200) is not required under this option. The total cost for this flow would be $21,600 annually.

[33] Includes the 10 cfs year-round flow and the bryophyte study.

[34] Includes incremental 10 cfs for a total 20 cfs year-round flow pending outcome of bryophyte study.

Table 11. Analysis of Fish and Wildlife Agency Recommendations.

Recommendations	*Agency*	*Within the scope of 10(j)*	*Conclusion*	*Action*
Construct a permanent downstream passage facilities.	Interior VANR	yes	Agree	Adopted *
Operate the downstream passage facilities from April 1 through June 15 and from September 15 through November 15; the time period may be modified in the future in accordance with new information on downstream migration.	Interior VANR	yes	Agree	Adopted *
Submit, within 6 months from issuance of license, plans and schedules of operation, maintenance and monitoring of fishway to ensure its operation as intended.	Interior	yes	Agree	Adopted
Submit a plan to evaluate the impact of increased bypass flows on bryophyte, *Scapania umbrosa*.	Interior VANR	no	Disagree	Adopted *
Maintain elevation of impoundment no lower than 6 inches below the design crest of flashboards; when control system is down, no lower than 12 inches below crest.	VANR	yes	Agree	Adopted *
Manage impoundment levels such that deviations in excess of minus 2 feet from normal are eliminated.	VANR	yes	Agree	Adopted *
Minimum ABF flows below project during flashboard replacement.	Interior	yes	Agree	Adopted *
Construct a canoe portage at Cavendish Dam.	VANR	no	Agree	Adopted
Allow continued public access to the river subject to reasonable safety limitations.	VANR	no	Agree	Adopted
Develop a recreation master plan.	VANR	no	Disagree	Not Adopted
Develop a plan to handle trashrack debris.	VANR	no	Agree	Adopted *
Conduct a study to determine the influence of the project dam on upstream flooding, and the benefits of reducing the height of or eliminating flashboards.	VANR	no	Disagree	Not Adopted

* Must be included in the license, because this recommendation also is a lawful condition of VANR's WQC.

IX. Consistency With Comprehensive Plans

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with Federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under section 10(a)(2), federal and state agencies filed a total of 28 comprehensive plans of which we identified 8 Vermont and 5 United States comprehensive plans to be applicable. No conflicts were found. Comprehensive plans relevant to this project are listed in section XI.

X. Finding of No Significant Impact

We conclude that none of the resources we studied—which include geologic resources, water quantity and quality, and fishery, terrestrial, aesthetic, cultural, and recreational resources—would experience significant adverse effects under the proposed action or any of the action alternatives considered in this EA.

On the basis of the record and this EA, issuing a subsequent license for the project as proposed by CVPSC, plus the enhancement measures we recommend, would not constitute a major Federal action significantly affecting the quality of the human environment. For this reason and pursuant to Commission regulations, no Environmental Impact Statement is required.

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