UNITED STATES OF AMERICA 70 FERC 62,205
FEDERAL ENERGY REGULATORY COMMISSION

Green Mountain Power Corporation Project No. 2513-003 - VT

ORDER ISSUING NEW LICENSE
(Major Project)
Issued March 30, 1995

INTRODUCTION

On December 26, 1991, Green Mountain Power Corporation (GMP) filed a license application under Part I of the Federal Power Act (FPA) for the continued operation and maintenance of the Essex No. 19 Hydroelectric Project. The 7.2-megawatt (MW) project is located on the Winooski River in the townships of Essex Junction and Williston, Chittenden County, Vermont. 1/ The project would generate an average of approximately 36,319,000 kilowatt-hours (kWh) of energy annually. 2/ The project does not occupy any United States lands. No changes are proposed for the project.

BACKGROUND

Timely motions to intervene were filed by the United States Department of the Interior, Vermont Agency of Natural Resources (VANR), American Whitewater Affiliation, et al. Late interventions were filed by the Vermont Department of Public Service and the U.S. Environmental Protection Agency. Orders granting late intervention were issued June 30, 1993, and June 29, 1993.

A timely motion to intervene expressing serious concern about peaking and bypass flows was filed by Trout Unlimited (TU). In comments filed February 18, 1994, TU states that its concerns were satisfactorily addressed in the Water Quality Certificate issued by VANR.

1/ The Winooski River is a tributary of Lake Champlain, a navigable waterway of the United States. Power produced from the project is interconnected with the licensee's transmission system in Vermont which is, in turn, interconnected with New England Power Company's transmission system operation in New Hampshire. The project was constructed in 1917 and there has been no construction since 1935. The project is not required to be

licensed pursuant to Section 23(b)(1) of the FPA.

2/ The original license was issued on January 21, 1969, and expired on December 31, 1993. 41 FPC 64 (1969). The project is currently operating under an annual license that went into effect when the original license expired.

The Village of Morrisville Water and Light Department, the Village of Stowe Water and Light Department, the Village of Jacksonville Light Department, and the Village of Hardwick Electric Company (Villages) filed a timely motion to intervene which was opposed by GMP. By order issued July 1, 1993, the Commission granted the Villages' motion to intervene. In a July 6, 1993, filing entitled "Comments of the Villages," the Villages stated that they would no longer seek remedial action in this proceeding.

The Commission staff (herein referred to as the staff) prepared a Draft Environmental Assessment (DEA) which was issued on June 24, 1994. The staff received one comment letter dated September 5, 1994, from VANR and a second letter dated September 6, 1994, from GMP. The staff analyzed and considered all comments filed pursuant to the DEA and issued a final Environmental Assessment (EA), which is attached to and made part of this license order. The 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 Essex No. 19 Hydroelectric Project consists of: (1) a 495-foot-long concrete gravity dam consisting of, from left to right looking downstream: (a) a 66-foot-long, 50-foot-high south concrete abutment section; (b) a 345-foot-long, 45-foot-high uncontrolled spillway section topped with 5-foot-high flashboards; (c) an 84-foot-long, 45-foot-high tip section topped with 6.5-foot-high flashboards; and (d) an intake structure including a 36-foot-high headwall with two concrete wing walls, a steel trashrack, timber platform, and vertical sliding wood gates; (2) a reinforced concrete and brick powerhouse 156.5 feet long, 65 feet wide and 55 feet high, housing four horizontal Francis-type turbines with an installed capacity of 2,223 kilowatts (kW) each and four, horizontal shaft, General Electric generators rated at 1,800 kW each; (3) two 3-foot-diameter steel diversion/penstocks and four 9-foot-diameter steel diversion/penstocks extending from the dam to the powerhouse; (4) a 352 acre impoundment with a water surface elevation of 275.0

feet United States Geologic Survey (USGS) datum; and (5) appurtenant facilities.

The project is owned and operated by GMP. GMP operates the Essex No. 19 Project as a daily peaking plant and proposes to continue this operation with no changes to the project. During low-flow periods (<220 cubic feet per second (cfs)), GMP spills water over the dam. The station is essentially unmanned. Plant automation allows for unattended operation of the units.

APPLICANT'S PLANS & CAPABILITIES

In accordance with Sections 10 and 15 of the FPA, the staff evaluated GMP's compliance record as a Licensee for these areas:

(1) conservation efforts; (2) compliance history and ability to comply with the new license; (3) safe management, operation, and maintenance of the project; (4) ability to provide efficient and reliable electric service; (5) need for power; (6) existing and planned transmission services of the applicant; and (7) cost effectiveness. I accept the staff's findings in each of the areas.

Here are the findings:

1. Section 10(a)(2)(C): Conservation Efforts.

Section 10(a)(2)(C) of the FPA requires the Commission to consider the extent of electricity consumption efficiency improvement programs in the case of license applicants primarily engaged in the generation or sale of electric power, like GMP. GMP proposed three residential and Commercial & Industrial demand-side management programs which were approved by the Vermont Public Service Board. These programs are detailed in Exhibit H of the application.

These programs show that GMP has made an effort to conserve electricity and reduce peak hour demands. GMP 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 Consumer's Protection Act of 1986 (ECPA).

2. Section 15(a)(2)(A) and Section 15(a)(3)(A) and (B): Compliance History and Ability to Comply with the New License.

We have reviewed GMP's compliance with the terms and conditions of the existing license. GMP's overall record of

making timely filings and compliance with its license is less than satisfactory. The Licensee failed to timely file Part 12 Reports (6 times), Part 12 Consultants Reports (2 times), materials concerning Safety Conditions Monitoring and Reporting (3 times), Recreation Resource Reports (2 times), and a Construction Quality Control Plan. These instances of non-compliance occurred between January 1971 and November 1991.

The compliance record described above does not warrant the denial of GMP's application for a new license. However, because of the Licensee's compliance history, special consideration must be given to ensure that the Licensee will comply with the terms and conditions of this new license. Therefore, Article 203 has been added to the license requiring the Licensee to develop, and file for Commission approval, a Hydropower Compliance Management Program that will ensure compliance with the terms and conditions of the new license and allow the Commission to monitor progress toward compliance.

3. Section 15(a)(2)(B): Safe Management, Operation, and Maintenance of the Project.

GMP owns and operates a series of hydroelectric facilities along the Winooski River. These facilities are operated from GMP's control center in Colchester, Vermont, which is manned 24 hours a day, 7 days a week. The control center is able to coordinate the operation of these facilities in a manner that best provides for valuable electricity as well as for a healthy river.

GMP retains an independent consultant to make a complete inspection of the project facilities every five years in accordance with Part 12 of the Commission's regulations.

GMP has experienced one serious employee injury at the Essex No. 19 Project. The accident involved an employee who fell off the dam on July 11, 1990. As a result, GMP now conducts an extensive safety awareness and enhancement program for all its hydroelectric facilities including the Essex No. 19 Project. Specific examples of measures taken to enhance employee and public safety are the installation of: a safety cable atop the spillway crest, security fences and replacement of ladders, and an automatic trash rake to eliminate manual raking.

With respect to public safety, GMP is not aware of any injury or death occurring within the project boundary.

Therefore, GMP would be able to manage, operate, and

maintain the Essex No. 19 Project in a safe manner.

4. Section 15(a)(2)(C): Ability to Provide Efficient and Reliable Electric Service.

The staff reviewed GMP's plans and its ability to operate and maintain the project in a manner most likely to provide efficient and reliable electric service.

With four operating units at the facility, there have not been any significant unscheduled outages during the last 5 years. All outages have been due to scheduled outages, maintenance, or special projects (such as the automation of the facility).

GMP has been operating the project in an efficient manner within the constraints of the existing license and states that it would continue to provide efficient and reliable electric services in the future.

5. Section 15(a)(2)(D): Need for Power.

The Essex No. 19 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 the summer and 2.1 percent during the winter for the 1993-2002 planning period. During the same time period, NEPOOL is forecasting an annual decrease of 0.6 percent of planned capacity during the summer and 0.3 percent during the winter. The decrease in planned capacities is primarily due to the retirement of facilities offsetting planned facilities.

This report shows that the present generation schedule of the region is sufficient to accommodate the peak load compound growth rate and to provide reserves to meet the NPCC and NEPOOL reliability criteria.

GMP's short-term and long-term need for power exists to justify licensing the Essex No. 19 Project.

6. Section 15(a)(2)(E): Existing and Planned Transmission Services of the Applicant.

GMP does not anticipate that project power flows will significantly influence system losses, although system losses are

likely to increase if the project were not to receive a license. Project operation provides some degree of transmission support for local loads. This support offsets deliverables which are required on the area distribution systems. Loss of the project could require the acceleration of future transmission upgrades.

The Villages contend that the Commission, in considering GMP's application, must consider the existing and planned transmission services and system reliability of the applicant. Licensing the project will have no significant effect on the existing or planned transmission system because the license to be issued will authorize the project to operate with the same installed capacity as the previous license.

7. Section 15(a)(2)(F): Cost Effectiveness.

GMP proposes to: (a) improve Overlook Park to enhance public use; (b) enhance fisheries by increasing the minimum flow release at the project and by participating in a trap-and-truck program; and (c) provide access for a future public trail, consistent with municipal trail plans. The staff's analysis of these proposals in Section VI shows them to be cost effective.

VANR is in the process of completing a comprehensive River Planning Study of the Winooski River, which includes the Essex No. 19 Project. GMP has participated in these efforts. GMP expects that the project, with all the proposed modifications, will be in conformance with the general requirements of the comprehensive plan.

GMP's plans for constructing fish and recreation facilities, as well as its continued operation of the project, will be achieved in a cost-effective manner.

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 one 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 November 13, 1992, GMP applied to VANR for a Water Quality Certificate. The Certificate was issued by VANR on November 9, 1993, and contained 20 conditions labeled A through T. On November 24, 1993, an agreement to amend the Certificate was entered into by GMP, VANR, and the Vermont Natural Resources Council. Public notice of VANR's intent to grant an amendment to the Water Quality Certificate was issued November 18, 1994, and the formal amendment to the Certificate was granted on January 1, 1995. The amendment relates to Conditions A,B,E, and H leaving the remainder of the Conditions unchanged.

WQC Conditions which are certified by the appropriate state agency within a year after a request for Certification and do not exceed the scope of Section 401 of the CWA become license conditions. Here, the WQC was amended more than a year after it was certified. Therefore, the amendments do not become license conditions. However, I will construe the amended WQC, i.e., Conditions A,B,E, and H, as a petition to amend the license and will adopt those amendments which make the best use of the resources related to the Essex No. 19 Project. Conditions relating to the Gorge No. 18 Project will not be adopted as conditions of this license because Gorge No. 18 is not a part of this project. 6/ While the Commission does not have authority in the proceeding for Project No. 2513 to approve such conditions related to Gorge No. 18, GMP may independently agree to them.

3/ 33 U.S.C. 1341 (1988).

4/ 33 U.S.C. 1341(a)(1) (1988).

5/ 33 U.S.C. 1341(d).

6/ Nor is Gorge No. 18 separately licensed under the FPA. 8 FERC 62,078 (1979).

As stated in Tunbridge Mill Corporation, 68 FERC 61,078 (1994), states may, under Section 401(d) of the CWA, impose conditions related solely to water quality. In accordance with the principles set forth in Tunbridge, I find that certain of the conditions contained in the Certification are within the scope of Section 401 and are included in the license. Other conditions exceed the scope of Section 401 and will not become part of the license.

The Certification includes 20 Conditions, labeled A through T, as discussed below:

Condition A required GMP to operate and maintain the project pursuant to VANR's findings and the conditions specified in the certificate. The amended condition recommended changing the base document from VANR's findings to the applicant's WQC application. This recommendation is adopted. Because some of the certificate conditions are beyond the scope of Section 401 and will not be included in the license, Condition A will become a part of the license only to the extent that it requires compliance with conditions within the scope of Section 401.

Condition B specifies a continuous, minimum flow schedule as follows:

PERIOD	MINIMUM FLOW IN BYPASS	MINIMUM FLOW BELOW PROJECT
April 1-May 15	50 cfs	Run-of-river
May 16-June 15	50 cfs	1,000 cfs
June 16-March 31	50 cfs	500 cfs

Condition B was amended to recommend a below-project minimum flow of 450 cfs from June 16 through March 31 rather than the originally conditioned 500 cfs. I accept the recommendation because this minimum flow is appropriate to meet both the bass and trout management goals for the river (see Section V.C.3 of the EA).

Condition B also was amended to recommend that plans be submitted to VANR, within 90 days of the issuance of the license, for the means to release the flows, for the means to control lag time, and for operation under more extreme river conditions. Emergency exceedences may be changed by VANR. Articles 401 and 402 of the license require release of the flows according to the schedule indicated but VANR cannot reserve the right to change emergency exceedences and that portion of the recommendation will not become part of the license. Article 403 deals with the means to be used to release the minimum flow.

Condition C requires the applicant to uniformly spill all flows over the dam crest when the project is not in operation, except for those flows necessary to seasonally operate the fish passage facility. Based on our evaluation, the uniform spillway

flows are not reasonably achievable with a rubber dam, however, based on current interpretation of the scope of Section 401, this condition will be made part of the license in Article 401.

Condition D provides the Water Quality Division of the VANR authority to modify the minimum flow requirement from June 1 to June 15 upon determination by VANR (after consultation with the Vermont Department of Fish & Wildlife) that sturgeon runs in the Winooski River no longer occur. This condition is within the scope of Section 401 and is included in the license in Article 402 with the modification that the Commission has the authority to modify the minimum flow requirement based on VANR's recommendation.

Condition E limits daily peaking based on the following schedule:

PERIOD	LOW FLOW FOR CALENDAR DAY	MAXIMUM ALLOWED FLUCTUATION IN FLOW
April 1-May 15		None (R-O-R)
May 16-June 15	<1,000 cfs	None (R-O-R)
	>1,000 cfs	No limit
June 16-Sept 30	<500 cfs	None (R-O-R)
	>500 cfs	500 cfs
Oct 1-March 31	<500 cfs	None (R-O-R)
	>500 cfs	No limit

The Condition, relating to peaking flows, was amended to recommend reducing the low flow for calendar day from 500 cfs to 450 cfs during June 16 - March 31. I agree that this recommendation will provide reduced frequency of peaking and will enhance fisheries habitat upstream. Emergency exceedences are allowed in certain situations but a plan is required for complying with the minimum flow constraints. VANR reserves the right to modify the emergency exceptions. Among other issues, this plan shall describe the appropriate operation in the event natural river flows do not allow the project to maintain the river within the constraints described in the table above. Article 405 defines limits on impoundment fluctuation, and Article 402 specifies the flow limitations on daily peaking. VANR reservation of authority to modify the exceptions is beyond the scope of Section 401 and will not be included in the license.

Condition F requires the Licensee to develop and file a ramping plan with VANR to control the rate of transition between generation and ponding flows for the protection of fisheries resources. Although it is unlikely that stranding or displacement of aquatic biota will result due to project operation, this Condition appears to be within the current interpretation of the scope of Section 401 and is included as Article 406 in the license.

Condition G requires the Licensee to develop a contingency plan to prevent walleye mortality in the bypass reach during the spring spawning run. Such a contingency plan would not prevent walleye mortality because the impoundment has limited capacity to provide continued spillway flows of sufficient volume to reduce egg desiccation. However, this Condition appears to be within the scope of Section 401, and it is made a part of the license in Article 411.

Condition H requires that the Licensee not draw down the impoundment below elevation 272.0 feet without prior written approval by VANR. The amendment recommends allowing draw-down below 272 feet without prior written approval by VANR under certain exceptional conditions. VANR would reserve the right to modify these exceptions. Based on the staff's analysis, the draw-down limitation is warranted to protect fisheries resources and the recommendation, which allows for emergency situations, is in the public interest. Therefore, this Condition, as amended, will become part of the license in Article 405. VANR's reservation to unilaterally modify the exceptions goes beyond the scope of Section 401 and will not be included in the license.

Condition I requires the Licensee to file a plan for monitoring instantaneous flow releases at the project. The plan must include downstream flows as well as flows in the bypass. This condition will become part of the license and is detailed in Articles 404 and 406.

Condition J requires the Licensee to provide VANR with a copy of the project's turbine rating curves. This condition will become part of the license and is included in Article 404.

Condition K requires the Licensee to submit a plan for a downstream fishway to the Vermont Department of Fish and Wildlife for review and to implement the plan by the spring of 1996. The Secretary of the Interior, pursuant to Section 18 of the FPA, requires the Licensee to develop plans to build and operate a downstream fishway within 6 months of licensing. In light of the state's program designating fish habitat as a use of the Winooski River as well as the Section 18 prescription, the requirement for a downstream fishway is included in the license. Article 409 reserves to the Commission the authority to require the Licensee to construct, operate, and maintain such downstream fishways as required under Section 18. There is potential for conflict

between the facilities prescribed by the state and by the

Secretary of the Interior, but there is no need to resolve these issues until the Licensee seeks approval to construct the fishway. However, the requirement in Condition K that the Licensee construct the fishway by the spring of 1996 is beyond the scope of Section 401 and will not become a part of the license because this requirement would give the state the ability to control the timing of activities under a federal license. Article 407 defines the operating schedule of the fishway, and Article 410 deals with monitoring the fishway's effectiveness.

Condition L requires the Licensee to submit for the state's review and approval a plan for the proper disposal of debris associated with project operation, including trashrack debris. This condition will become part of the license and is adopted in Article 412.

Condition M requires the Licensee to file for the state's prior review and approval any proposals for project maintenance or repair work involving the river. 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. The state has no authority to halt or order maintenance and repair of the Essex No. 19 Project. Section 401 gives the state no further role in the federal process. Condition M, which would give the state the ability to control the timing of activities under a federal license, is beyond the scope of Section 401 and will not become part of the license. 7/

Condition N would require the Licensee to provide canoe portage on the north (right) side of the impoundment and river at Essex No. 19 dam by May 1, 1995. The condition further requires the applicant to provide a cartop boat put-in area to the impoundment. Recreation is a designated use of the river, therefore, the requirement for canoe portage and boat put-in area is within the scope of Section 401. Further, our analysis indicates the facilities are warranted and the Condition will be included in this license. Article 415 requires a recreation plan which includes both the canoe portage and the boat put-in area. However, Article 415 does not adopt the May 1, 1995, deadline because this requirement would give the state the ability to control the timing of activities under a federal license.

Condition O requires public access to the project area for utilization of public resources, subject to reasonable safety and liability limitations. Any limitations are subject to state

approval. Standard license Article 13 addresses public access to recreation in general terms. Article 415 of the license ensures adequate public access to project recreation opportunities. Therefore, Condition O will become part of this license.

7/ See Tunbridge, supra at p. 61,389.

Condition P requires the Licensee to install a telephone flow notification system which informs callers as to approximate volumes of water being released or spilled at the dam. Our independent analysis indicates that it is an appropriate measure at this project. Since recreation is a designated use of the river, the Condition will become a part of the license. Article 415 of the license will require that this system be installed and operated.

Condition Q requires the Licensee to allow the Department to inspect the project area at any time in order to monitor compliance with certification conditions. This Condition will become a part of the license. Article 417 requires such access for purposes of inspecting compliance.

Condition R requires the Licensee to prominently post a copy of the Water Quality Certification within the facility. This Condition will be included in the license. Article 416 requires posting of the WQC.

Condition S requires the Licensee to submit to VANR for prior review and approval any change which would have significant or material effect on the findings, conclusion, or conditions of the Water Quality Certification including project operation. This condition, in effect, would give the state the opportunity to revisit its certification. Section 401(a)(3) of the CWA sets out the exclusive manner in which state certifications may be modified and makes clear that that process is to be initiated by the federal licensing or permitting agency, not the state. 8/ The Commission, not VANR determines whether proposed license amendments require new Water Quality Certification. 9/ Condition S, 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 T states that VANR may, at any time, request the Commission to reopen the license to consider modifications to the license necessary to assure compliance with Vermont water quality standards. Although this condition will not be included in the

8/ See Tunbridge, supra at p. 61,389.

9/ Our regulations, 18 CFR 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).

license because it goes beyond the scope of Section 401, VANR may make such a request at any time.

COASTAL ZONE MANAGEMENT

The project is not located in a state-designated coastal zone management area.

SECTION 18 FISHWAY PRESCRIPTIONS

Section 18 of the FPA provides the Secretary of the Interior the authority to prescribe fishways at Commission licensed projects. Interior, by letter dated June 28, 1993, filed the following measures pursuant to Section 18 for the Essex No. 19 Project:

> "The Secretary of the Interior prescribes the construction, operation and maintenance of upstream and downstream fishways under Section 18 of the Federal Power Act, 16 U.S.C., Section 811 as follows:
>
> 1. The Licensee shall construct a downstream fishway at the project. The Licensee shall develop and submit to the Fish and Wildlife Service functional design drawings of the facilities and a construction schedule within 6 months from the effective date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, the Fish and Wildlife Service. The Licensee shall construct the facility as depicted in the approved final designs. The Licensee shall provide as-built drawings to the Fish and Wildlife Service following fishway construction.
>
> The flows needed for operation of the facility and

attraction to the facility must be released during the operation of the fishway. Once constructed, the downstream passage facilities shall be operated throughout the appropriate seasons for downstream passage.

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

3. The Department of the Interior reserves the right to modify its Section 18 Fishway Prescription as needed to facilitate fish passage."

Interior identifies a schedule for the submission of design drawings and reserves final approval of fishway design. Although the Commission retains the right over the procedures and schedules that a Licensee must follow as well as the right to approve all project works, including fishways, we will require the Licensee to submit drawings and schedules and to consult with FWS. Pursuant to Section 18 we will require the Licensee to construct and operate the downstream fishway prescribed by Interior and to release the flows necessary for operation of the fishway, and to operate the fishway at the times required by Interior. Article 407 requires the design and implementation of the downstream fishway. Article 410 requires monitoring studies.

Interior also seeks to reserve the authority to prescribe the construction, operation, and maintenance of upstream fishways under Section 18. Future fish passage needs and management objectives cannot always be predicted at the time of license issuance. Although fishways may not be recommended by Interior at the time of project licensing, upon receiving a specific request from Interior, it is appropriate for the Commission to include a license article that reserves authority to require future fishway construction. Article 409 reserves the Commission's authority to require fishways that Interior may prescribe.

Interior also wishes to reserve the right to modify its fishway prescription as needed to facilitate fish passage. Reasonable modification may be made to any fishways that have been prescribed to the extent that those modifications merely constitute fine-tuning of the fishways. However, Interior may be

anticipating the need for more substantial future modifications to the downstream fishway it is prescribing here. We will preserve its ability to ensure such modification by expanding the prescription authority reserved in Article 409 so that it is not limited to upstream fishways.

RECOMMENDATIONS OF FEDERAL AND STATE FISH AND WILDLIFE AGENCIES AND SECTION 10(j) PROCESS

Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations from federal and state fish and wildlife agencies, for the protection of, mitigation of adverse impacts to, and enhancement of fish and wildlife resources unless inconsistent with the purposes and requirements of the FPA or other applicable law. If found to be inconsistent, the Commission and the agencies shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agencies.

The staff made a preliminary determination that certain VANR and Interior recommendations were inconsistent with the public interest section of Section 4(e) and the comprehensive planning standard of Section 10(a) of the FPA. Specifically, staff recommended that two recommendations by Interior relating to (1) minimum flow from June 16 through March 31 and (2) maximum project flow releases and peaking limitations from June 16 through September 30 not be adopted. Staff also recommended that four recommendations by VANR not be adopted. These recommendations related to (1) specified spills over the dam; (2) establishing flows below the tailrace from June 16 through March 31; (3) a plan for maintaining minimum flows during flashboard repair; (4) inclusion of Gorge No. 18 in the fish passage plan.

By letter dated June 30, 1994, the staff informed Interior and VANR of the inconsistencies and requested they consider other options that would be agreeable to them and would adequately enhance fish and wildlife consistent with other project purposes. Interior responded by letter dated August 11, 1994, stating that although they disagreed with the VANR Water Quality Certification relating to minimum flows from June 16 through March 31, the Certification is, nevertheless, mandatory and it would be inappropriate and unproductive to undertake 10(j) negotiations on this issue. Interior also stated that the VANR Certification approach on peaking flows from June 16 through September is acceptable. The plan for maintaining minimum flow during flashboard repair was not necessary because the flashboards would

be replaced rather than repaired.

The Licensee may enter into an agreement with Interior concerning fish passage at Gorge No. 18, but it will not become a condition of this license.

VANR advised in its letter to the Commission dated September 5, 1994, that it would not respond directly to the Commissions's June 30 letter because the issues had been addressed in its Water Quality Certificate. Staff believes the license includes conditions consistent with the current recommendations of the agencies.

OTHER AGENCY RECOMMENDATIONS

Recommendations made by state and federal agencies under 10(a) of the FPA are also addressed in the EA. The following recommendations were considered:

- ù All flows spilled over the dam when not operating.
- ù Develop plan to meet peaking restrictions.
- ù Peaking capacity unlimited in the event of power emergency or demonstration flow.
- ù Debris disposal plan.
- ù Provide canoe portage, cartop put-in, and plan for design and maintenance for agency approval.
- ù Provide angler access, parking and picnic facilities, handicap access, interpretive signs, spillage at dam, public viewing, and landscaping.
- ù Provide plans for whitewater releases.
- ù Provide plans for flow notification system by telephone.

The EA contains more detailed discussion of these recommendations and explains the staff's position pertaining to these issues. All items were adopted with the exception of the recommendation that GMP provide plans for whitewater releases. Staff has determined that opportunities for whitewater recreation will be provided by recommended minimum flows. Additional enhancement is unwarranted.

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 30 comprehensive plans of which we identified 8 Vermont and 5 United States comprehensive plans to be applicable. No conflicts were found. Section XI of the EA lists comprehensive plans relevant to this project.

COMPREHENSIVE DEVELOPMENT

Sections 4(e) and 10(a)(1) of the FPA require the Commission, in acting upon applications for license, to give equal consideration to the power and development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway for all beneficial public uses.

A. Recommended Alternative

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

The required enhancement measures will include:

(1) minimum flows in the bypass reach and below the project;
(2) limitations on peaking based on available flow;
(3) implementing a Programmatic Agreement;
(4) comprehensive landscape management;
(5) recreation enhancements;
(6) downstream fish passage;
(7) upstream fish passage; and
(8) installation of a rubber dam flashboard system.

The Programmatic Agreement will protect cultural resources from planned and future, unplanned activities related to the project. Signatories are the Commission, the Advisory Council on Historic Preservation, and the Vermont Department of Historic Preservation. GMP and VANR are concurring parties.

Though the cost of these measures will reduce the existing power benefits of the project, the project will still have positive net benefits over the new license term compared to the least-cost energy alternative.

B. Developmental and Nondevelopmental Uses of the Waterway

The project will generate an estimated 7.2 MW of relatively low-cost electricity from a renewable energy resource for use by GMP customers. Positive long-term benefits to water quality, aquatic habitat, aesthetics, recreation resources, and cultural resources will result from operating the project with the Commission's recommended enhancement measures.

The primary costs associated with the Commission's recommended enhancements will be: (1) operation of the project with a 50 cfs minimum flow in the bypass reach at an annual levelized cost of $173,500; (2) operation with peaking limitations and seasonal minimum flows below the project at a levelized annual cost of $174,800; (3) a comprehensive landscape management plan at an annual levelized cost of $7,100; (4) a recreation plan at an annual levelized cost of $21,300; (5) the construction, operation, and maintenance of downstream fishways at an annual levelized cost of $52,000; (6) upstream fish passage involving trapping upstream migrants at Winooski One and trucking fish to one or more release sites upstream of Essex No. 19 at an annual levelized cost of $55,400; (7) cultural resource studies at an annual levelized cost of $12,100; (8) various monitoring studies at an annual levelized cost of $24,500; and (9) construction of the rubber dam flashboard system would increase project benefits by $29,000 per year when levelized over a 30-year license period.

In total the Commission's required enhancement measures will reduce the project's levelized annual net benefits compared to the least cost energy alternative from $3,289,900 to $2,798,200, or by $491,700.

C. Economic Costs of Additional Water Quality Certificate Conditions:

Only one Condition (WQC Condition G) included in VANR's water quality certificate for the Essex No. 19 Project that will affect project economics was considered unwarranted by the Commission's staff. This Condition, which must be included in this license as a matter of law, requires preparation of a walleye contingency plan. The incremental reduction in levelized annual net benefits is estimated to be $800 each year.

Based on review of the agency comments filed on this project, and on the staff's independent analysis and assessment of the project pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, the Commission finds that the continued operation of Essex No. 19 Project is best adapted to a comprehensive plan for the proper use, conservation, and development of the Winooski River and other project-related resources.

LICENSE TERM

In 1986, the ECPA modified Section 15 of 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. Generally, we issue new 30-year licenses for projects that include no substantial new construction or power generating expansion. We issue new licenses for 40 years or more for projects that include substantial new construction or capacity increases. We issue these 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.

GMP does not propose new development at the existing project facilities. In light of the relatively modest environmental mitigation and enhancement costs involved here, the new license for the Essex No. 19 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 contains 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 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.

I conclude that the Essex No. 19 Project does not conflict with any planned or authorized development and is best adapted to the comprehensive development of the Winooski River for beneficial public use.

THE DIRECTOR ORDERS:

(A) This license is issued to the Green Mountain Power Company (Licensee) for a period of 30 years, effective the first day of the month in which it is issued to construct, operate, and maintain the Essex No. 19 Hydro Project. 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, enclosed by the project boundary shown by Exhibit G:

Exhibit G	FERC No.	Showing
1 (sheet 1 of 2)	2513-1005	Detail Project Map
1 (sheet 2 of 2)	2513-1006	Detail Project Map

(2) Project works consisting of: a 495-foot-long concrete gravity dam consisting of, from left to right looking downstream: (a) a 66-foot-long, 50-foot-high south concrete abutment section, (b) a 345-foot-long, 45-foot-high uncontrolled spillway section topped with 5-foot-high flashboards, (c) an 84-foot-long, 45-foot-high tip section topped with 6.5-foot-high flashboards, and (d) an intake structure including a 36-foot-high headwall with two concrete wing walls, a steel trashrack, timber platform, and vertical sliding wood gates; (2) a reinforced concrete and brick powerhouse 156.5 feet long, 65 feet wide, and 55 feet high, housing four horizontal Francis-type turbines with an installed capacity of 2,223 kilowatts (kW) each and four, horizontal shaft, General Electric generators rated at 1,800 kW each; (3) two 3-foot-diameter steel diversion/penstocks and four 9-foot-diameter steel diversion/penstocks extending from the dam to the powerhouse; (4) a 352 acre impoundment with a water

surface elevation of 275.0 feet United States Geologic Survey (USGS) datum and having about 1,950 acre-feet of gross volume; and (5) 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 26, 1991:

the description of the intake and penstocks on p. A-1; the discussion of the normally unused exciters, project transmission line and impoundment on p. A-2; the description of the turbines and generators on p. A-3; and the additional electrical, mechanical, and diesel generating equipment described on p. A-4.

Exhibit F: The following Exhibit F drawings, filed on December 26, 1991:

Exhibit F	FERC No.	Showing
1 (sheet 1 of 4)	2513-1001	Dam Plan and Sections
1 (sheet 2 of 4)	2513-1002	Headworks - Penstocks Plans and Sections
1 (sheet 3 of 4)	2513-1003	Powerhouse Plan and Section
1 (sheet 4 of 4)	2513-1004	Rock Anchor Plan Elevation, Sections and Details

(3) All of the structures, fixtures, equipment or facilities used to operate or maintain the project and located within the project boundary, all portable property that may be employed in connection with the project and located within or outside the project boundary, 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) This license is subject to the articles set forth in

Form L-10, (October, 1975), entitled "Terms and Conditions of License for Constructed Major 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 Federal Power Act, as determined by the Commission. The authorized installed capacity for that purpose is 9,600 horsepower.

Article 202. Pursuant to Section 10(d) of the Federal Power Act, a specified reasonable rate of return upon the net investment in the project shall be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves. The Licensee shall set aside in a project amortization reserve account at the end of each fiscal year one-half of the project surplus earnings, if any, in excess of the specified rate of return per annum on the net investment. To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year, the Licensee shall deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The Licensee shall set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The Licensee shall maintain the amounts established in the project amortization reserve account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves shall be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly includible in the Licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rate for such ratios shall be the weighted average cost of long-term debt and preferred stock for the year, and the cost of common equity shall be the interest rate on 10-year government bonds (reported as the Treasury Department's 10-year constant maturity series) computed on the monthly average for the year in question plus four percentage points (400 basis points).

Article 301. The Licensee shall commence construction of the rubber dam within 2 years from the issuance date of this license and shall complete construction within 4 years from the

issuance date of the license.

Article 302. The Licensee shall, at least 60 days prior to the start of construction, submit one copy to the Commission's Regional Director and two copies to the Commission (one of these shall be a courtesy copy to the Director, Division of Dam Safety and Inspections) of the final contract drawings and specifications for the installation of the rubber dam. The Commission may require changes in the plans and specifications to ensure a safe and adequate project. The plans and specifications must be accompanied by revised Exhibits F and G, as necessary.

Article 303. The Licensee shall, within 90 days of completion of construction, file for Commission approval revised Exhibits F and G, to describe and show the project "as-built," including all facilities determined by the Commission to be necessary and convenient for transmission of all the project power to the interconnected system.

Article 401. Within 15 days after completion of any required structural modifications required by Articles 403 and 404, the Licensee shall release from Essex No. 19 dam into the bypassed reach of the Winooski River on a continuous basis, a minimum flow of 50 cubic feet per second, including any leakage and flows through fishways, or inflow to the project reservoir, whichever is less, for the protection and enhancement of fish and wildlife resources, riparian vegetation, and water quality. When the project is not in operation, all flows shall be spilled over the dam crest, except for those flows necessary to seasonally operate the fish passage facility.

These flows may be temporarily modified if required by operating emergencies beyond the control of the Licensee, and for short periods upon agreement between the Licensee and the Vermont Agency of Natural Resources. If the flows are so modified, the Licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Article 402. Within 15 days after completion of any required structural modifications required by Articles 403 and 404, the Licensee shall provide on a continuous basis below the Essex No. 19 Project, a minimum flow for the protection and enhancement of fish resources in the Winooski River. During the period from June 16 through March 31, the Licensee shall provide a minimum flow of 450 cubic feet per second, or inflow to the project reservoir, whichever is less, for the protection of salmonid habitat. From May 16 through June 15, the Licensee shall provide a minimum flow of 1,000 cubic feet per second, or

inflow to the project reservoir, whichever is less, for the protection of sturgeon spawning and incubation habitat. From April 1 through May 15, the Licensee shall operate the project in run-of-river mode, such that outflow approximates inflow on an instantaneous basis, for protection of walleye spawning and incubation habitat.

These flows may be temporarily modified if required by operating emergencies beyond the control of the Licensee, and for short periods upon agreement between the Licensee and the Vermont Agency of Natural Resources (VANR). 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 incident.

Upon approval by the Commission, the 1,000 cfs minimum flow specified from June 1 through June 15 may be discontinued and a minimum flow of 500 cfs substituted. The change would be based on submission for approval of a determination by VANR, in consultation with the Vermont Department of Fish and Wildlife, that sturgeon runs no longer occur in the Winooski River, that the flow release is not needed to support the remnant population, and that the higher flow is not needed for the planned restoration program. If after flows have been altered, VANR determines that the 1,000 cfs flow is warranted for support of lake sturgeon, a request to reinstitute the flow will be submitted to the Commission for approval.

The Licensee shall operate the Essex No. 19 Project such that peaking on any calendar day shall not result in differences between the high and low artificially controlled flows, as measured directly below the project, greater than those shown below:

PERIOD	LOW FLOW FOR CALENDAR DAY	MAXIMUM ALLOWED FLUCTUATION IN FLOW
April 1-May 15		None (R-O-R)
May 16-June 15	<1,000 cfs	None (R-O-R)
	>1,000 cfs	No limit
June 16-Sept 30	<450 cfs	None (R-O-R)
	>450 cfs	500 cfs
Oct 1-March 31	<450 cfs	None (R-O-R)
	>450 cfs	No limit

The differences may be temporarily exceeded if required by operating emergencies beyond the control of the Licensee, and for short periods for project maintenance purposes upon mutual agreement between the Licensee and VANR. If an exceedence occurs, the Licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Article 403. Within 6 months from the issuance date of this license, the Licensee shall file with the Commission, for approval, a plan describing how the Licensee proposes to release the minimum flows required in articles 401 and 402 and to comply with the maximum flow fluctuation constraints. The plan shall include, but not be limited to: (1) the methods and equipment to be used; (2) the location of the equipment and the discharges; (3) hydraulic design calculations; and (4) the means to ensure that there are no lag times that would result in a minimum flow violation.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources (VANR). The Licensee shall include with the plan documentation of consultation, copies of comments on the 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 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 measures described in the plan, including any changes required by the Commission.

Article 404. Within 6 months from the issuance date of this license, the Licensee shall file with the Commission, for approval, a plan to monitor reservoir elevation and instantaneous flow releases at the project, both downstream and in the bypass. The plan shall show how the Licensee intends to monitor and record compliance with the minimum flows stipulated in Articles 401 and 402 and the elevations stipulated in Article 405.

The plan shall include, but not be limited to: (1) a description of the proposed design, location, and calibration of monitoring equipment; (2) the possible use of the U.S. Geological

Survey (USGS) streamflow gaging Station No. 04290500; (3) methods to collect and record flow and elevation data; (4) methods to provide flow data to agencies within 30 days of a request; (5) an implementation schedule; and (6) a copy of the project's turbine rating curves.

The Licensee shall prepare the plan after consultation with the USGS and the Vermont Agency for Natural Resources. The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and 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 prior to 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 installation or monitoring 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.

Article 405. After construction of the rubber dam identified in Article 301, the Licensee shall operate the Essex No. 19 Project such that the surface elevation of the impoundment is maintained between elevation 272 and 275 feet (U.S. Geological Survey datum). The elevation limit may be temporarily exceeded if required by operating emergencies beyond the control of the Licensee, and for short periods for project maintenance purposes upon mutual agreement between the Licensee and the Vermont Agency of Natural Resources. If an exceedence occurs, the Licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Article 406. Within 6 months from the issuance date of this license, the Licensee shall file with the Commission, for approval, a plan to establish limits on the maximum rate of change in river flow (ramping rate) for the protection of fish resources in the Winooski River.

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

A courtesy copy of the plan shall be filed with the Commission's Regional Office. 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 407. Within 6 months from the issuance date of the license the Licensee shall file, for Commission approval, detailed design drawings of the Licensee's proposed downstream fishway together with a schedule to construct/install the fishway. The Licensee shall operate the downstream fishway 24 hours per day from April 1 through June 15 and September 15 though December 15. The Licensee must also operate the fishway at such additional times as are required by Interior and must release flows necessary for the fishway's operation. Based on results of effectiveness monitoring described in Article 410, the Licensee, U.S. Fish and Wildlife Service (FWS), or the Vermont Agency of Natural Resources (VANR) may petition the Commission to revise periods of operation.

The Licensee shall prepare the aforementioned drawings and schedule after consultation with FWS and VANR. The Licensee shall include with the drawings documentation of consultation, copies of comments and recommendations on the 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 Licensee's facilities. 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 proposed facilities and schedule. No land-disturbing or land-clearing activities shall begin until the Licensee is notified by the Commission that the plan is approved. Upon Commission approval, the Licensee shall implement the proposal, including any changes required by the Commission.

Article 408. The Licensee shall maintain a contractual arrangement with the Winooski One Project (FERC No. 2756) to share operation and maintenance costs for the existing trap-and-truck fish facility at the Winooski One Project. A copy of the

contract and any subsequent revisions shall be provided to the Commission.

Article 409. Authority is reserved to 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, pursuant to Section 18 of the Federal Power Act.

Article 410. Within 6 months from the date of issuance of this license, the Licensee shall file with the Commission, for approval, a downstream fish passage monitoring plan. The plan shall include provisions for testing the effectiveness of the downstream passage facilities and for monitoring the numbers, species composition, and seasonality of fish using the facility. The downstream fish passage monitoring plan shall also include a schedule for implementation of the plan and reporting results of monitoring.

The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources and the U.S. Fish and Wildlife Service. The Licensee shall include with the plan documentation of consultation and copies of comments or 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 prior to 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. Within 6 months of a written request by the Vermont Agency of Natural Resources (VANR), the Licensee shall file, for Commission approval, a contingency plan for prevention of walleye mortality in the bypass during the spring spawning run, in circumstances where project operation results in diminished flows in areas used by walleye for spawning. The plan shall include criteria for its implementation.

The Licensee shall prepare the plan after consultation with VANR. The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the plan, and specific descriptions of how the agency's comments are accommodated by the Licensee's 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 proposed plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 412. Within 6 months from the issuance date of this license, the Licensee shall file with the Commission, for approval, a plan for disposal of river debris that collects on the project trashracks.

The plan shall include a schedule for implementation. The Licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources. The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been provided to the agency, and specific descriptions of how the agency's comments are accommodated by the plan. The license shall allow a minimum of 30 days for the agency to comment and to make recommendations prior to 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 this plan. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the Commission.

Article 413. The Licensee shall implement the provisions of the "Programmatic Agreement Among the Federal Energy Regulatory Commission, The Advisory Council on Historic Preservation, and the Vermont State Historic Preservation Officer, for Managing Historic Properties that may be Affected by a License Issuing to Green Mountain Power Corporation for the Continued Operation of the Essex No. 19 Hydroelectric Power Project in Vermont", executed on December 8, 1994. The Commission reserves the authority to require changes to any Cultural Resources Management Plan or plans at any time during the term of the license.

Article 414. Within 6 months from the date of issuance of this license, the Licensee shall file with the Commission, for approval, a plan for comprehensive landscape management to preserve and enhance the visual resources of the project area.

The plan, at a minimum, shall include the Licensee's specific proposals for:

(1) blending the project works into the existing landscape character;

(2) maintenance of vegetation around the project powerhouse and within the bypassed reach; and

(3) consideration of a street tree corridor along Route 2A within the project boundary as recommended by the Vermont Agency of Natural Resources.

The plan also shall include: (1) an implementation schedule; (2) plans for erosion and sediment control during implementation; and (3) provisions for the plan's periodic review and revision.

The Licensee shall prepare the plan after consultation with the Vermont Department of Forests, Parks, and Recreation, the Vermont Department of Transportation, and the Department of Environmental Conservation. The Licensee shall include with the plan documentation of 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 visual and landscape conditions at the site.

The Commission reserves the right to require changes to the plan. No land-clearing or land-disturbing activities 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.

Article 415. Within 6 months from the date of issuance of this license, the Licensee shall file with the Commission, for approval, a revised recreation plan. The revised plan shall include the proposals as described on pages E.5-46 to E.5-53 of the application filed December 26, 1991, and as amended in responses to Additional Information Requests No. 12, 13, 15, 16, and 17 filed with the Commission in October 1992, which include the following: (1) improvements to Overlook Park including a prominent road sign, parking improvements, landscaping, and improvements to the trail along the south bank of the bypassed

reach; (2) an improved tailrace trail, leading from the powerhouse to the north bank below the powerhouse; (3) a new portage route along the north bank including a take-out, a put-in, and a marked trail; (4) a trail easement to be provided to the village of Essex Junction for the construction of a bicycle/pedestrian trail; and (5) a telephone number for boaters to get information on anticipated river flows.

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 revised recreation plan shall also include the following additional enhancements: (1) an impoundment access site for car-top boats with parking for six vehicles along the western 2 miles of the impoundment; (2) an interpretative sign; (3) an access road near the powerhouse and a gate that could be closed across the powerhouse road at night; and (4) signs on both sides of the river for 100 yards warning people of the ramping dangers of fishing and boating close to the tailwaters of the powerhouse.

The revised plan shall include, at a minimum, the following: (1) final site plans for the recreation facilities; (2) design drawings of the interpretative sign, warning signs, and directional signs and a description of where they will be located; (3) a discussion of how the flow notification system will be operated; (4) a discussion of how all the facilities will conform to the guidelines established by the Architectural and Transportation Barriers Compliance Board (Federal Register, Vol. 56, No. 144); (5) erosion and sediment control measures, designed in consultation with the Soil Conservation Service, which shall be implemented during construction; (6) the entity responsible for operating and maintaining the facilities; and (7) an implementation schedule not to exceed 6 months from the date of the plan's approval.

The Licensee shall file the plan after consultation with the Vermont Department of Forests, Parks, and Recreation, the Vermont Department of Environmental Conservation, and the Villages of Essex Junction and Williston. The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies and Villages, and specific descriptions of how the agencies' and Villages' comments are accommodated by the plan. The Licensee shall allow a minimum of 30 days for the agencies and Villages to comment and to make

recommendations prior to 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 shall begin until the Licensee is notified that the plan is approved. Upon approval, the Licensee shall implement the plan, including any changes required by the Commission.

Pursuant to Article 303, after completion of construction, the Licensee shall file as-built drawings of the recreation facilities.

Article 416. The Licensee shall, within 1 week of the issuance date of the license, post a copy of the Water Quality Certificate within the Essex No. 19 facility. The integrity of the document shall be maintained so it can provide a ready reference.

Article 417. The Licensee shall allow VANR staff to inspect the project area at any time to monitor compliance with certification conditions. Access to the project area shall be subject only to reasonable safety and liability limitations.

Article 418. (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, cancelling the permission to use and

occupy the project lands and waters and requiring the removal of any noncomplying structures and facilities.

(b) The type 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) noncommercial 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, recreation, 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) nonproject 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.

(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) nonproject 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) recreation development consistent with an approved Exhibit R or approved report on recreation resources of an Exhibit E; and

(7) other uses, if: (i) the amount of land conveyed for a particular use is 5 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 recreation resources of an exhibit E; or, if the project does not have an approved exhibit R or approved report on recreation resources, that the lands to be conveyed do not have recreation 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 recreation 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, recreation, 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, recreation, 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.

Article 501. If the Licensee's project was directly benefitted by the construction work of another Licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extensions of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license.

Article 502. (1) The Licensee, within 4 months of issuance of this license, shall file a Hydropower Compliance Management Program (HCMP) for Commission approval. The HCMP shall include the following elements for each license requirement:

(a) The identification of, and schedule for, each action necessary to complete the license requirement;

(b) A schedule for the start and completion of the consultant process with each resource agency required to be consulted for each action necessary to complete the license requirement; and

(c) The identification of specific individuals in each agency that need to be consulted on each action necessary to complete the license requirement.

(2) The Licensee shall file an annual report with the Commission, on or before each anniversary of the issuance date of this license, that demonstrates the progress made toward completion of each license requirement under the schedules presented in the HCMP.

Seven copies of all submissions under this article must be filed with the Secretary of Commission. One copy of each submission must also be filed with any agency consulted under element 1(b) above.

The Commission reserves the right to require the Licensee to make modifications to the HCMP and to take other measures necessary to ensure compliance by the Licensee with the terms and conditions of the license.

(E) 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.

(F) This order is issued under authority delegated to the Director and constitutes final agency action. Requests for rehearing by the Commission may be filed with 30 days of the date of issuance of this order, pursuant to 18 CFR Section 385.713. The filing of a request to rehearing does not operate as a stay of the effective date of this order or of any other date 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.

Fred E. Springer
Director, Office of
Hydropower Licensing

ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Essex No. 19 Hydroelectric Project

FERC Project No. 2513
Vermont

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Project Review
825 North Capitol Street, N.E.
Washington, DC 20426

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

On December 26, 1991, Green Mountain Power Corporation (GMP or applicant) filed an application with the Federal Energy Regulatory Commission (Commission) for a new license for the existing 7.2-megawatt (MW) Essex No. 19 Hydroelectric Project.

The Essex No. 19 Project is located on the Winooski River in the townships of Essex Junction and Williston, Chittenden County, Vermont. GMP's license for the Essex No. 19 Project expired on

December 31, 1993, and GMP currently operates under an annual license. GMP proposes no new capacity at the project.

The environmental assessment (EA) presents analyses and evaluations of the effects associated with the issuance of a new license for the Essex No. 19 Project and recommendations for terms and conditions to include in 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 power and development needs, the Commission must balance the need for energy conservation, protection and enhancement of fish and wildlife resources, and protection of recreation opportunities. This EA reflects the Commission's consideration of these factors.

Based on our analysis of all project-related developmental and nondevelopmental resource interests, we recommend several measures to protect and enhance environmental resource values. These environmental recommendations, which are presented in Section VII, include: (1) stabilizing impoundment elevations; (2) providing minimum flows below the project on a seasonal schedule; (3) providing a continuous release to the bypassed reach; (4) monitoring flow and water surface elevation in the project area; (5) providing fish passage facilities and monitoring their effectiveness; (6) planning and implementing a plan for disposal of trashrack debris and consulting with the Vermont Agency of Natural Resources (VANR) on repair work; (7) filing a revised recreation plan; (8) providing landscaping along Route 2A and the project laydown area and a comprehensive landscape management plan; and (9) conducting investigations to protect cultural resources.

GMP applied to VANR for 401 water quality certification (WQC). VANR issued GMP's Section 401 WQC on November 9, 1993. On November 24, 1993, VANR, Vermont Natural Resources Council, and GMP signed a settlement agreement that included changes to be made at the Gorge No. 18 Project and several WQC conditions. The agreement resulted in a WQC amendment dated January 1, 1995, in which four WQC conditions were altered.

Adoption of our recommended environmental measures would avoid project-related adverse effects and would protect or

enhance fisheries resources, water quality, recreation and aesthetic resources, and undiscovered properties listed on or 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 reduce atmospheric pollution.

No reasonable action alternatives to the project were identified. The no-action alternative was considered and is addressed in the environmental analysis and the comprehensive development sections of this EA. Denial of the license would eliminate about 36.319 gigawatt-hours of electric energy generation per year at the Essex No. 19 Project, and no measures would be implemented to protect and enhance existing environmental resources.

Pursuant to Section 10(j) of the Federal Power Act (FPA), we determine 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 applicable law. We address the concerns of the federal and state fish and wildlife agencies and adopt those that we determined are consistent with the best comprehensive development of the waterway.

Under Section 18 of the FPA, the Secretary of the Interior prescribed the construction, operation, and maintenance of downstream fishways, and reserved the authority to prescribe the construction, operation, and maintenance of upstream fishways (16 U.S.C., Section 811). The U.S. Department of the Interior also reserved the right to modify its Section 18 fishway prescriptions as needed to facilitate fish passage. We agree with Interior's request.

Based on our independent analysis, including consideration of all relevant economic and environmental concerns, we conclude in this EA that: (1) the Essex No. 19 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 Winooski River and other project-related resources; and (2) issuance of a new license for the project would not constitute a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF HYDROPOWER LICENSING,
DIVISION OF PROJECT REVIEW

Essex No. 19 Hydroelectric Project
FERC Project No. 2513 -- Vermont

INTRODUCTION

The Federal Energy Regulatory Commission (Commission or FERC) issued the Essex No. 19 Hydroelectric Project Draft Environmental Assessment (DEA) for comment on June 24, 1994. In response, we received two comment letters (see list in Section IV.C., Comments on the Draft Environmental Assessment). Both timely-filed comment letters were reviewed by the staff. We identify the sections of the EA that have been modified as a result of comments received in the staff's response to the right of the letters of comment, in Appendix A.

I. APPLICATION

On December 26, 1991, Green Mountain Power Corporation (GMP or applicant) filed an application with the Commission for a new license for the Essex No. 19 Hydroelectric Project. The 7.2-megawatt (MW) project is located on the Winooski River in the townships of Essex Junction and Williston, Chittenden County, Vermont (see Figures 1 and 2). The project does not occupy any United States lands.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

This environmental analysis assesses the impacts associated with issuing a new license for the constructed project or 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,

mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat); the protection of recreation opportunities; and the preservation of other aspects of environmental quality.

Figure 1

2

Figure 2

Issuing a new license for the project would allow GMP to continue to own and operate the Essex No. 19 Project for the term of the license, making electric power from a renewable resource available to its customers. The project generates an average of about 36,319,000 kilowatt-hours (kWh) of energy annually.

In this EA, we assess the environmental and economic effects of operating the project

(1) as proposed by GMP;

(2) as proposed by GMP with our additional recommended environmental measures and fish passage facilities as prescribed by other agencies; and

(3) as required by an additional condition included in the project's Water Quality Certificate (WQC) but not recommended by the staff.

We also consider the effects of the no-action alternative (continued operation of the project with no changes or enhancements).

B. Need for Power

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

The Essex No. 19 Project is located in the New England Power

Pool (NEPOOL) area (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut) of the Northeast Power Coordinating Council 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 forecasts an average annual increase in peak energy demand of 2.4 percent during the summer months and 2.1 percent during the winter months for the 1993 to 2002 planning period. During the same time period, NEPOOL forecasts an annual decrease of planned capacities of 0.6 percent during the summer and 0.3 percent during the winter. The decrease in planned capacities is primarily due to the retirement of facilities offsetting planned facilities.

III. PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action

1. Project Description

The Essex No. 19 hydroelectric facility, originally developed by the Winooski Valley Electric Company between 1913 and 1917, is located 17.6 miles upstream of the mouth of the

Winooski River. The total area of the Winooski River Basin is 1,065 square miles; the drainage area at the project dam is 1,011 square miles. The project is owned and operated by GMP, and it operates as a daily peaking plant. Since August 1, 1987, GMP has voluntarily agreed to pass a minimum flow of 167 cubic feet per second (cfs) or inflow, whichever is less, at the powerhouse. In practice, the units are shut down at flows below 220 cfs, and all water is spilled through the bypassed reach (the section of river bypassed by flows because of their diversion through the powerhouse).

Figures 3, 4, and 5 show the site plan and project boundaries for the existing Essex No. 19 Project. In the following section we describe the project's principal features.

The existing concrete gravity dam consists of a south concrete abutment section, an uncontrolled overflow concrete gravity spillway section, and a north abutment section that serves as the intake structure to the powerhouse. The dam has a total length of 495 feet, and the overflow spillway section is 345 feet long. The dam is founded on rock, and the crest (elevation 270.0 feet, U.S. Geological Survey (USGS) datum) is an

average of 45 feet above the foundation.

The crest of the dam is fitted with 5-foot-high flashboards with an 84-foot tip section fitted with 6.5-foot flashboards. The maximum reservoir water surface elevation at the top of the flashboards is 275.0 feet. At this elevation, there is approximately 1,950 acre-feet of gross reservoir volume covering 352 acres. Normal draw-down is 3 feet. The riverine impoundment extends upstream approximately 7 miles.

The intake structure, which is on the northern end of the dam, consists of a headwall 36 feet high, with two concrete wing walls, a steel trashrack, timber platform, and vertical sliding wood gates. An electric rack raker/crane services the intake area for removal of debris from the trashrack.

Four 9-foot-diameter penstocks supply water to the powerhouse to drive four turbines. The hydraulic exciters are supplied by two 3-foot-diameter steel penstocks. All six of the penstocks are located below the ground surface and are encased in concrete.

The powerhouse is approximately 156.5 feet long, 65 feet wide, and 55 feet high. The powerhouse contains four horizontal Francis-type turbines with an installed capacity of 2,223 kilowatts (kW) each. The powerhouse also contains four, horizontal shaft, General Electric generators rated at 1,800 kW each. The total installed capacity of the project is 7,200 kW; however, the maximum sustainable operating capacity is 7,800 kW. The powerhouse also contains two normally unused exciters. One

is in a state of disrepair, and the other is in a standby mode. The exciters are each powered by 150 horsepower (hp) water turbines located on the two, 3-foot-diameter steel penstocks. Four 1,000 kW diesel generating units, which are operated primarily for peaking purposes, are also located in the powerhouse. The diesel generating units are not part of this project.

6

Figure 3

Figure 4

Figure 5

Project transmission lines are limited to the lines from the powerhouse to the substation. A transformer adjacent to the powerhouse steps up the generator output from 2.4 kilovolts (kV) to 34.5 kV. From this transformer, one overhead 34.5 kV line, which is part of the project, extends north approximately 300 feet to the substation.

In its application GMP proposed to install a rubber dam on the straight section of the dam crest. Subsequently, GMP proposed in a letter dated August 20, 1993, to provide a rubber dam on the entire dam crest. All flashboards and their maintenance would be eliminated by this proposal.

2. Proposed Environmental Measures

GMP proposes in its application for relicensing to implement the following measures at the Essex No. 19 Project:

- ù enhance fish habitat by operating the project with a flow release below the project on the following minimum flow schedule:

run-of-river	April 1 through May 15
1,000 cfs*	May 16 through May 31
340 cfs*	June 1 through March 31

  *or inflow, whichever is less

- ù provide improved facilities at Overlook Park including a parking area, picnic table, and sanitary facilities. GMP also proposes to construct an access trail to the tailrace area;

- ù limit the range of fluctuation of headpond elevation;

- ù complete Phase 1B archeological studies on the impoundment;

- ù provide plantings to upgrade the visual character of the project laydown area;

- ù provide an easement to the village of Essex Junction to

allow for the development of a contiguous recreation trail;

- ù develop a canoe portage on the north bank of the impoundment;

- ù install a rubber dam to replace most existing flashboards;

- ù provide a downstream passage facility from the intake to the base of the dam; and

- ù provide a phone number for boaters to get information on river flows.

These items are considered the applicant's proposed alternative, but as noted throughout this EA, GMP has suggested other measures in various correspondence and has agreed to certain measures as part of a settlement agreement. This agreement has not formally amended the application for relicensing so the measures are considered recommendations and are incorporated into the staff's alternative where appropriate. These other measures, which may be repeated in the following staff's alternative section, include:

- ù modify the design of the downstream fish passage facility;

- ù provide a minimum flow below the project of 1,000 cfs from May 16 through June 16, 450 cfs from June 17 through March 31, and run-of-river from April 1 through May 15;

- ù provide a 50 cfs minimum flow in the bypassed reach;

- ù install a rubber dam to replace all flashboards;

- ù provide for upstream passage by participating in the Winooski One trap-and-truck operation;

- ù operate with peaking limitations based on seasonal flows; and

- operate the reservoir between elevations 272 and 275 feet USGS.

B. Alternatives to the Proposed Project

1. Staff's Alternative

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

- install a rubber dam to completely replace all flashboards;

- provide minimum flows as agreed upon in the settlement agreement below the project;
- operate with peaking limits as agreed upon in the settlement agreement;
- operate the reservoir in the elevation range of 272 to 275 feet USGS;
- provide flow monitoring in the bypass and below the project and water surface elevation monitoring in the impoundment;
- provide a continuous release of 50 cfs to the bypassed reach;
- operate downstream fish passage facilities from April 1 through June 15 and September 15 through December 15;
- conduct a study of the effectiveness of the downstream passage facilities. Consult with VANR and FWS on modifications to the operating period before filing results of the effectiveness study with the Commission;
- develop and implement a debris disposal plan, which includes trashrack debris;

- ù consult with VANR on all repair work that may affect water quality;

- ù file a revised recreation plan with the Commission detailing proposed recreation improvements and our recommended recreation improvements;

- ù plan, construct, and maintain an impoundment access site with parking for people with car-top boats;

- ù design and install an interpretive sign describing the project and related facilities;

- ù construct, operate, and maintain an access road near the project powerhouse;

- ù install signs below the project powerhouse warning anglers and boaters of ramping dangers;

- ù develop and implement a comprehensive landscape management plan; and

- ù implement a Programmatic Agreement for protection 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 existing license, and no new environmental protection or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives. The alternative of license denial and project retirement is discussed below.

3. Alternatives Considered but Eliminated From Detailed Study

We considered several other alternatives to the applicant's relicensing proposal but eliminated them from detailed study because they are not reasonable in the circumstances of this case. They are:

(1) Federal takeover and operation of the project;

(2) Issuing a nonpower license; and

(3) Retiring the project.

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

Issuing a nonpower license would not provide a long-term resolution of the issues presented. A nonpower license is a temporary license that the Commission will terminate whenever it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. In this case, no agency has suggested its willingness or ability to do so. No party has sought a nonpower license, and we have no basis for concluding that the project should no longer be used to produce power. Issuing a nonpower license, therefore, is not a realistic alternative in these circumstances.

The Essex No. 19 Project could be retired with or without dam removal. Either alternative would involve denying the relicense application and terminating the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. At present, the dam provides storage

capacity and regulates flow releases allowing generation at downstream facilities (Gorge No. 18 and Winooski One).

The second retirement 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, and no participant has advocated this alternative; therefore, we have no 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. Agency Consultation

The following entities commented on the application subsequent to the public notice (which was issued on May 7, 1993):

Commenting Entities	Date of letter
U.S. Department of the Interior	June 28, 1993
Trout Unlimited	July 2, 1993
Vermont Agency of Natural Resources	July 2, 1993
The Village of Morrisville Water and Light Department, the Village of Stowe Water and Light Department, the Village of Jacksonville Light Department, and the Village of Hardwick Electric Company (Villages)	July 6, 1993

GMP responded to these comments by letter dated August 20, 1993.

B. Interventions

In addition to providing comments, organizations and individuals may petition to intervene and become a party to any subsequent proceedings. The following entities filed for intervenor status on the Essex No. 19 Project:

Intervenor	Date of Motion
U.S. Environmental Protection Agency	August 10, 1992
U.S. Department of the Interior	August 13, 1993
Vermont Agency of Natural Resources	August 14, 1992
Villages	August 14, 1992

American Whitewater Affiliation, American Rivers, Inc., and New England Flow	August 14, 1992
Trout Unlimited	August 14, 1993

C. Comments on the Draft Environmental Assessment

The following entities provided comments on the DEA:

Vermont Agency of Natural Resources September 5, 1994
Green Mountain Power Corporation September 6, 1994

The staff analyzed and considered all comments filed pursuant to the DEA and provided responses to the comments in Appendix A of this EA.

D. Water Quality Certification Conditions

On November 13, 1992, VANR received GMP's original application for WQC. On October 7, 1993, VANR conducted a hearing on the certificate. On November 9, 1993, VANR issued a WQC for the Essex No. 19 Project to GMP.

The settlement agreement signed by VANR, GMP, and the Vermont Natural Resources Council included "Amendments to the 401 Water Quality Certificate dated November 8, 1993." VANR and GMP disagreed on the status of these "amendments" with VANR maintaining that GMP must file a formal request for a WQC amendment and allow for public comment. While disagreeing, GMP filed a formal request by letter dated November 9, 1994, for VANR to amend the WQC by adopting the terms of the November 24, 1993, agreement. The amendment was issued on January 1, 1995.

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, 10/ only those measures included in a WQC considered to be within the scope of Section 401 become part of any license issued. 11/

10/ Tunbridge Mill Corporation, 68 FERC 61,078 (1994).

11/ Commission staff is aware of PUD No. 1 of Jefferson County v. Washington Department of Ecology (U.S. Sup. Ct. No. 92-1911, May 31, 1994). As appropriate, the license order in this proceeding will address the relevance of the issues discussed in Jefferson County.

The State of Vermont's WQC for the Essex No. 19 Project lists 20 terms and conditions labeled "A" through "T". In the following section we first present the original WQC Conditions. Then we present the recommendations contained in the amendments to the WQC for Conditions A, B, E, and H and whether or not the recommendations are adopted.

A. The applicant shall operate and maintain this project as set forth in the findings of fact and conclusions above and these conditions.

B. The project shall be operated in accordance with the minimum-flow schedule tabulated below. Minimum flows shall be released on a continuous basis and not interrupted.

The run-of-river condition noted shall be outflow equal to inflow on an instantaneous basis. Within 90 days of the issuance of this certification, a description, hydraulic design calculations, and plans for the measure to be used to release the bypass flow shall be filed with the Department [VANR] for its review and approval. No construction shall commence until Department approval is received.

	Minimum Flow (cfs)	
	Bypass	Below
Period		
April 1 - May 15	50	run-of-river
May 16 - June 15	50	1,000
June 16 - March 31	50	500

Note: Minimum flows are values listed, or instantaneous inflow if less.

The project shall be managed such that no lag times occur that would result in a minimum flow violation. The method for controlling lag time shall be filed with the Department within 90 days of the issuance of this certification.

C. Whenever the project is not operating, all flows shall be uniformly spilled over the dam crest, except for those flows necessary to seasonally operate the fish passage facility.

D. The minimum flow requirement of 1,000 cfs from June 1 to June 15 may be discontinued and a minimum flow

requirement of 500 cfs instituted upon a determination by the Department, after consultation with the Department of Fish and Wildlife, that sturgeon runs in the Winooski River no longer occur and that the flow release is not needed to support the remnant population and that the higher flow is not needed for the planned restoration program. VANR may, after suspension of sturgeon spawning flows, re-institute the requirement at any time it determines such action is warranted for support of lake sturgeon.

E. Peaking on any calendar day shall not result in differences between the high and low artificial flows, as measured directly below the project, greater than those in the table below.

Period	Low Flow for Calendar Day	Maximum Allowed Fluctuation in Flow
April 1 - May 15		0 cfs (run-of-river)
May 16 - June 15	<1,000 cfs	0 cfs (run-of-river)
	>1,000 cfs	No limit
June 16 - September 30	<500 cfs	0 cfs (run-of-river)
	>500 cfs	500 cfs
October 1 - March 31	<500 cfs	0 cfs (run-of-river)
	>500 cfs	No limit

F. The applicant shall develop and file with the Department, on or before October 1, 1994, a ramping plan for controlling the rate of transition between generation and ponding flows.

G. Within 6 months of a written request by the Department, the applicant shall develop and file with the Department a contingency plan for prevention of walleye mortality in the bypass during the spring spawning runs, under events where project operation results in diminished flows in areas used by the walleye for spawning. Such a request will only be made if the Agency has determined that walleye attempt to use the bypass for spawning.

H. The impoundment shall not be drawn below elevation 272.0 feet without prior written approval by the Department.

I. The applicant shall file for review and approval, within 90 days of the issuance of this certification, a plan for monitoring instantaneous flow releases at the project, both downstream and in the bypass. Following approval of the monitoring plan, the applicant shall then measure instantaneous flows and provide records of discharges at the project on a regular basis as per specifications of the Department. Upon receiving a written request from the applicant, the Department may waive, all or in part, this requirement for flow monitoring at this project provided the applicant

satisfactorily demonstrates that the required flow will be discharged at all times.

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.

K. The applicant shall submit a plan for downstream fish passage to the Department of Fish and Wildlife for review. Downstream passage shall be provided 24 hours per day, April 1 to June 15 and September 15 to December 15 and shall be functional at all operating impoundment levels, with the period subject to adjustment based on knowledge gained about migration periods for migratory salmonids. Downstream fish passage facilities shall be installed so as to be operational in the spring of 1996. This plan shall include provisions to:

1. minimize passage of fish into the generating unit(s) if injury or mortality can result;

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

3. convey fish safely and effectively downstream of the facility.

L. Within 90 days of the issuance of this certification, the applicant shall submit a plan for proper disposal of debris associated with project operation, including

trashrack debris, for written approval by the Department.

M. Any proposal 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, shall be filed with the Department for prior review and approval.

N. The applicant shall provide a canoe portage on the right (north) side of the impoundment and river at Essex No. 19 Dam by May 1, 1995. The applicant shall also provide a car-top boat put-in area to the impoundment. The applicant shall consult with the Recreation Section of the Department of Forests, Parks, and Recreation; the Department of Environmental Conservation; and the townships of Essex and Williston in the planning, siting, and design of the portage and boat put-in. Design and maintenance plans shall be

filed with the Department of Environmental Conservation and the Department of Forests, Parks, and Recreation for review and approval before construction of either facility.

O. The applicant shall allow public access to the project area for utilization of public resources, subject to reasonable safety and liability limitations. Such access should be prominently and permanently posted so that its availability is made known to the public. Any proposed limitations of access to state waters to be imposed by the applicant shall first be subject to written approval by the Department. In cases where an immediate threat to public safety exists, access may be restricted without prior approval; notification of the Department and a request for approval, if the restriction is to be permanent or long term, shall be provided within 14 days of the restriction of access.

P. The applicant shall install and have operational by May 1, 1994, a telephone flow notification system that informs callers as to approximate volumes of water being released or spilled at the dam.

Q. The applicant shall allow the Department to inspect the

project area at any time to monitor compliance with certification conditions.

R. A copy of this certification shall be prominently posted within the facility.

S. 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, must be submitted to the Department for prior review and written approval.

T. The Department may request, at any time, that FERC reopen the license to consider modifications to the license necessary to assure compliance with Vermont Water Quality Standards.

We believe that Conditions B-L and N-R should become part of any license issued for the project. Condition A should be included in part since it appears that it is partially within the scope of Section 401. Conditions M, S, and T are considered beyond the scope of Section 401. We discuss the technical merits of these conditions in Section V.C.

WQC Conditions that are certified by the appropriate state agency within one year after a request for certification and do not exceed the scope of Section 401 of the Clean Water Act become

license conditions. For the Essex No. 19 Project the WQC was amended more than a year after it was certified; therefore, the amendments do not necessarily become license conditions. However, the amended WQC is construed as a petition to amend the license and the Commission will consider the measures as recommendations and adopt those that make the best use of the resources related to the Essex No. 19 Project.

The recommendations contained in the amendments to the WQC would alter four conditions. The amendment wording as shown in the settlement agreement is as follows:

Amendment to Condition A:

The recommendation reads: "The applicant shall operate and maintain this project consistent with its WQC application except where modified by these conditions."

Amendment to Condition B:

The recommendation provides for a below-project minimum flow of 450 cfs from June 16 to March 31.

Amendment to Condition E:

This recommendation provides for "Low Flow for Calendar Day" flows of 450 cfs from June 16 to March 31. The following language is also added:

The project may exceed the maximum allowed fluctuation in flow required by the above chart in emergency situations such as the need for full capacity output in the event of a NEPOOL or local power emergency. GMP shall annually provide the Agency [VANR] with a description of all such events and the magnitude and duration of such events. After considering the duration, degree, and benefits of actual emergency fluctuations resulting from this exception and any resulting impact to the river environment or the public use thereof, and having provided notice and an opportunity for hearing, the Secretary of the Agency may modify this exception as appropriate.

GMP shall, in consultation with the Agency, develop a plan for complying with the maximum flow constraints. Among other issues, this plan shall describe the appropriate operation in the event natural river flows do not allow the project to maintain the river within the constraints described in the table above.

Amendment to Condition H:

The recommendation reads:

The applicant may draw the pond below 272 feet without prior written approval provided:

(1) The drawdown is necessitated by a system or facility emergency (i.e., NEPOOL or local power emergency) or to prevent damage to the project (i.e., the rubber bladder may be damaged if not deflated), or when the drawdown is beyond the control of the applicant (i.e., the rubber bladder loses air

pressure);

(2) The applicant notifies the Agency in writing as soon as practical after it becomes aware of such an occurrence but in no event more than one business day after such event begins;

(3) The applicant takes all reasonable action to limit the extent and duration of any such event including making every attempt to maintain the elevation above 271 feet prior to Agency notification;

(4) The applicant shall provide the Agency with a written report within 30 days after such event describing the cause and nature of the event including a discussion as to whether this type of situation can be prevented in the future. If it can be prevented, the applicant shall discuss how it will accomplish this.

If the frequency, duration, or degree of these events reach proportions that the Agency believes are detrimental to the river environment, this exception may be modified by the Secretary of the Agency at that time as appropriate after consultation with GMP and an opportunity for hearing.

We believe that Condition A, as amended, should be included in part, and Condition B, as amended, should become part of any license issued for the project. Conditions E and H as amended should be included but without parts allowing unilateral changes by the state.

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.12/ Interior (June 28, 1993) filed the following measures pursuant to Section 18:

"The Secretary of the Interior prescribes the construction, operation and maintenance of upstream and downstream fishways under Section 18 of the Federal Power Act, 16 U.S.C., Section 811 as follows:

1. The licensee shall construct a downstream fishway at the project. The licensee shall develop and submit to the Fish and Wildlife Service, functional design drawings of the facilities and a construction schedule within 6 months from the effective date of the license. The designs shall be developed in consultation with, and final design drawings shall meet with the approval of, the Fish and Wildlife Service. The licensee shall construct the facility as depicted in the approved final designs. The licensee shall provide as-built drawing to the Fish and Wildlife Service following fishway construction.

The flows needed for operation of the facility and attraction to the facility must be released during the operation of the fishway. Once constructed, the downstream passage facilities shall be operated throughout the appropriate seasons for downstream passage.

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

3. The Department of the Interior reserves the right to modify its Section 18 Fishway Prescription as needed to facilitate fish passage."

Our review of Interior's prescription shows that items 2 and 3 are consistent with the language of Section 1701(b) of the Energy Policy Act of 1992 and are qualified prescriptions. Item 1 is not qualified because Interior identifies a schedule for design drawings and reserves final approval of fishway design.

12/ 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."

Those elements of item 1 are not considered valid prescriptions because they encroach on the Commission's authority over project works and operation. The part of item 1 prescribing construction of a downstream fishway is consistent with Commission-qualified prescriptions.

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 Essex No. 19 Project could involve activities that would affect wetlands (e.g., construction of recreation and fish passage facilities), a Section 404 Permit may be required.

G. Coastal Zone Management Program

The Essex No. 19 Project is not located in the state-designated coastal zone management area (personal communication between Ginny Garrison, State of Vermont Lakes and Ponds Management and Protection Section, VANR Water Quality Division, Waterbury, Vermont, and J.H. Rumpp, Jr., Stone & Webster Environmental Technology & Services, on December 17, 1993).

H. Scoping

We conducted a site visit to the project area on November 30, 1993, to provide an opportunity for the staff to become familiar with the project environment and proposed actions. Resource agencies and the public were invited to attend this visit. In addition to GMP, VANR, Vermont Public Service Department, Northern Vermont Canoe Cruisers, and Trout Unlimited attended.

We issued a Scoping Document on January 19, 1994, describing the environmental issues we felt should be analyzed in detail, as well as issues that should not be analyzed based on input received through the project application, agency comments, and the intervention process. The following entities commented on the Scoping Document:

Commenting Entity	Date of Letter
State of Vermont	February 17, 1994 and March 7, 1994
Green Mountain Power	February 17, 1994
Trout Unlimited	February 18, 1994

V. ENVIRONMENTAL ANALYSIS13/

This chapter presents a general description of the Winooski River Basin, describes existing and proposed hydropower projects in the basin, summarizes the potential for cumulative impacts on environmental resources, and provides a detailed assessment of the environmental resources affected by the project. For each resource 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. For the Essex No. 19 Project, these resources are land use and socioeconomics.

A. General Description of the Locale

1. General Setting

The Essex No. 19 Project is located within the Lake Champlain drainage basin, which encompasses about 5,230 square miles in Vermont. Major rivers in the Vermont portion of the basin, all emptying into Lake Champlain and generally flowing from east to west, include the Missisquoi, Lamoille, and Winooski. Annual precipitation across Vermont averages 38 inches, varying from about 30 inches around Lake Champlain to more than 50 inches at Somerset.

2. Winooski River Sub Basin

The Essex No. 19 Project is located at river mile (RM) 17.6 on the main stem of the Winooski River in the northwestern portion of Vermont, east of Lake Champlain. Figure 1 shows the river drainage basin and the location of the Essex No. 19 Project. Figure 2 provides a more detailed location map,

indicating the locations of the Essex No. 19, Gorge No. 18, and Winooski One projects.

13/ Unless otherwise indicated, the source of our information is GMP's application (1991).

Table 1 describes the 15 existing hydroelectric facilities in the Winooski River Basin. Table 2 lists the mainstem dams by RM and location, indicating dam height and usable storage, if known.

Table 1. Existing Hydroelectric Projects in the Winooski River Basin (Source: FERC's Hydropower Resources Assessment - 5/3/93)

Name of Project	FERC No.	Stream	Capacity (kW)	Head (ft)	Status
Winooski One (Chace Mill)	2756	Winooski	6,500	56	Major License
Gorge No. 18	2653	Winooski	3,000	34	Non-Jurisdictional
Kingsbury	7434	Kingsbury Branch Winooski River	200	27	Exemption
Essex No. 19	2513	Winooski	7,200	66	Major License
Bolton Falls	2879	Winooski	8,800	51	Major License
Waterbury No. 22	2090	Waterbury River	5,520	148	Major License
Moretown No. 8	5944	Mad River	1,250	45	Minor License
Warren	6219	Mad River	80	20	Exemption
Tourin Musica	6162	Mad River	50	45	Exemption
Middlesex No. 2	2480	Winooski	3,200	52	Non-Jurisdictional

Dog River	6757	Dog River	200	22	Exemption
North Branch 3	5124	North Branch Winooski	933	62	Minor License
Ladds Mill	8242	North Branch Winooski	148	17	Exemption
Winooski No. 8	6470	Winooski	810	32	Minor License
Marshfield No. 6	2439	Mollys Brook	5,000	378	Non-Jurisdictional

Table 2. Dams on the Winooski River Main Stem

Name (FERC No.)	River Location	Height Mile	Impoundment of Dam (ft)	Usable Storage (ft3)	Owner
Clarks Sawmill	Cabot	--	14	500,000	Robert Davis, Jr.
Farrington1	Marshfield	--	12	--	Harold Hayward
Old Batchelder Mill 2	Plainfield	71.1	15	500,000	Town of Plainfield
Montpelier No. 53	East Montpelier	60.6	15	--	GMP
Winooski No. 8 (6470)	East Montpelier	59.9	21	700,000	Winooski One Partnership
Montpelier No. 32	Montpelier	57.4	8	--	Daughly Gould
Bailey Clothespin	Montpelier	56.1	5	--	City of Montpelier

Middlesex (2480)	Middlesex	49.4	50	4,000,000	GMP
Bolton (2879)	Duxbury	39.7	55	9,000,000	GMP
Essex No. 19 (2513)	Essex	17.6	45	73,000,000	GMP
Gorge No. 18 (2653)	Colchester	11.4	48	17,500,000	GMP
Winooski One (Chace Mill) (2756)	Burlington	10.4	18	500,000	City of Burlington/ Winooski One Partnership

1 - Not in Use, Breached
2 - Not in Use

3 - Abandoned, Breached

Source: Vermont Agency of Environmental Conservation, Water Quality Division. Winooski River Water Quality Management Plan. June 1976 (with revisions per GMP, 1989).

Within the Winooski River Basin, there are two dams on the main stem downstream of the Essex No. 19 Project. An additional 12 hydroelectric projects are located above the Essex No. 19 Project on the Winooski main stem and its tributaries. The proposed operation at the Essex No. 19 Project would affect peaking operations at the downstream projects (Gorge No. 18 and Chace Mill) due to changes in minimum flow releases and frequency and duration of peaking events. Information on existing dams upstream of the Essex No. 19 Project indicates that power generation and other activities affect inflow to the Essex No. 19 Project. In Section V.C.2 (Water Resources) we present a further discussion of the interrelation of projects within the Winooski River Basin.

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 in space and time, 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.

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 Essex No. 19 Project affects anadromous fish restoration and downstream hydropower peaking capacity. We present a discussion of the project's cumulative impacts on these areas in sections V.C.2.c and V.C.3.c.

C. Proposed Action and Action Alternatives

In this section we discuss the applicant's proposal and recommendations by agencies for all area resources. We then present our analysis and conclusions. For convenience, we list our specific recommendations together in Section VII.

1. Geologic Resources

a. Affected environment: The Winooski River is an actively eroding and meandering river. The lower 3 miles of the impoundment behind the Essex No. 19 Dam are located in a narrow, forested valley that is essentially urbanized. Further upstream, the valley widens, the river has forested banks, and the major land use is agricultural. The bordering soils are primarily loamy soils formed from water deposited-material that are well drained and susceptible to erosion if not vegetated. Erosion is minimal and is primarily confined to the outside banks of meander loops (Stetson-Harza 1991).

b. Environmental impacts:

Shoreline Erosion

The major issue is whether shoreline erosion in the Essex No. 19 impoundment can be attributed to project operation. Under the existing license, the impoundment elevation routinely varies between 268 and 275 feet USGS. GMP proposes to install a rubber dam to limit routine elevation fluctuations to the range of 272 to 275 feet USGS.

VANR requested that "The erosion evaluation should include an evaluation of the effect the project's historical operational mode may have had on stream bank erosion, both in the impoundment area and downstream" (VANR 1994). GMP has not yet responded to VANR's comments on erosion and sedimentation. As part of the Essex No. 19 Phase 1A Archeological Study, however, extensive

research and field reconnaissance was performed to characterize erosion and sedimentation potential as related to archeological resources.

After reviewing the erosion investigation report and photographic evidence, we agree with both Robinson (1991) and Stetson-Harza (1991) that the existing minor erosion and channel shifting in the Essex No. 19 impoundment is a natural phenomenon consistent with normal river migration and historical flood events and is independent of project operations. There is a general lack of identified erosion that could be attributed to impoundment-related erosional factors such as scouring and wind-induced waves. Water level fluctuations, therefore, are deemed insignificant (Stetson-Harza 1991).

The proposed operation of the Essex No. 19 Project includes reduced water level fluctuations. Because historical operation appears to have had an insignificant effect on shoreline stability in the Essex No. 19 impoundment, effects of the proposed reduced peaking operations also should be insignificant.

A plunge pool will have to be constructed near the base of the dam to receive the discharge of the downstream fish passage facility. This is needed so that downstream migrant fish are not damaged when discharged onto rocks below the intake that would otherwise be there. The staff observed the site of the proposed plunge pool on November 30, 1993, and it appears that a suitable structure can be sited in the channel and built with minor stream modifications. Although this construction would take place in the existing river bed, the short construction duration can reasonably be accommodated by bypassing minimum flows to the south channel during the construction period.

GMP proposes to construct new recreation facilities at the Essex No. 19 Project (see Section V.C.7). The portage put-in and take-out and other work in shoreline areas could cause erosion of unprotected bank areas and release sediments to the impoundment. During development of these facilities, GMP should use sediment control measures to minimize erosion and sedimentation of the river. These facilities also should be designed to prevent future shoreline erosion.

Removal of vegetation, earth disturbances, and construction activities associated with installation of recreation facilities and the downstream fish passage facility may cause some minor short-term erosion and sedimentation. We conclude that GMP should develop a site-specific erosion and sedimentation control plan to minimize these potential adverse impacts.

c. Unavoidable adverse impacts: There will be some minor, short-term increases in erosion and sedimentation associated with the construction

of recreation facilities and the downstream fish passage facility that would be minimized or eliminated by a specific erosion and sedimentation control plan.

2. Water Resources

a. Affected environment: Water flow and quality in the Lower Winooski River have been affected by human activity since the late 1700s. Development of four earlier dams at this site created the first impoundments that changed the water resources of the lower watershed. These four dams were built in slightly different locations, which created different impoundment sizes and elevations.

Waterbury dam is a flood control structure built in the 1930s on the Little River. The Little River meets the Winooski River at RM 42, about 25 miles upstream of Essex dam. Other upstream dam developments with flood control capacity were built in the 1930s. The seasonal operation of these dams has reduced the magnitude of flood events. The Essex No. 19 Project and other upstream hydroelectric resources also have altered the daily and weekly flow regimes to service the electric power peaking requirements of the region.

Early dams powered sawmills, lathes, and other woodworking facilities. It was common to discharge bark and other wood wastes to nearby rivers for disposal. Other businesses and residential areas that supported mill operations probably were founded near the river at the same time. Wastes from these settlements probably were discharged to the river for disposal since this was also common practice at the time.

In the early 1980s, many municipal and industrial facilities discharging to the Winooski River were required to improve the quality of their effluents to meet current standards and discharge permit requirements. At the same time, urbanization of the Lower Winooski-Burlington area also increased the quantity of pollutants in the river through nonpoint source stormwater runoff.

Flows

The Winooski River contains 1,011 square miles of watershed upstream of the Essex No. 19 Project. Tables 3 and 4 show annual and monthly flow data before and after August 1, 1987, when GMP voluntarily imposed a minimum flow of 167 cfs or inflow at the project.

Table 3. Annual and Monthly Median, Mean, Maximum, and Minimum Daily Flows at Essex No. 19 Project (October 1, 1962 through July 31, 1987)

	Median Daily Flows (cfs)	Mean Daily Flow (cfs)	Maximum Daily Flow (cfs)	Minimum Daily Flow (cfs)
Annual	1,017	1,746	28,568	23
October	759	1,153	17,431	53
November	1,162	1,562	8,919	77
December	1,191	1,593	19,852	86
January	920	1,174	16,366	329
February	949	1,310	12,589	116
March	1,695	2,737	28,568	329
April	4,193	4,903	24,888	583
May	2,329	2,881	24,501	257
June	1,065	1,343	12,299	158
July	513	782	25,856	42
August	470	760	18,884	44
September	451	685	11,137	23

Source: GMP 1991. Based on USGS Gage No. 04290500 which is located 1.7 miles downstream of the Essex Project. Flows are adjusted for the watershed area at Essex dam.

The USGS gaging station located 1.7 miles downstream of the project measures an annual median flow of 1,051 cfs and a mean flow of 1,804 cfs, based on records from October 1, 1962 through July 31, 1987. The 7 consecutive day low-flow with a 10-year recurrence (7Q10) at the Essex No. 19 Project is 167 cfs. In the application for relicensing, GMP proposes to provide run-of-river operation from April 1 through May 15, 1,000 cfs or inflow from May 16 through May 31, and 340 cfs or inflow from June 1 through March 31.

Flows downstream of the Essex No. 19 Project are greatly influenced by the project's generating regime (GMP 1994). The downstream Gorge No. 18 Project has limited ponding capacity to store flows released from Essex. The Gorge No. 18 Project is typically operated in conjunction with Essex to meet NEPOOL peaking demands but is not licensed by FERC. The Winooski One (Chace Mill) Project downstream of Gorge No. 18 is operated in run-of-river mode, following the daily peaking flows of the Essex and Gorge facilities.

Table 4. Mean, Maximum, and Minimum Daily Flows at Essex No. 19 Project (August 1, 1987 through January 31, 1991)

	Mean Daily Flow (cfs)	Maximum Daily Flow (cfs)	Minimum Daily Flow (cfs)

October	2,140	14,600	243
November	2,626	10,200	658
December	1,932	16,800	500
January	1,497	6,760	490
February	1,548	7,350	379
March	2,580	12,000	360
April	4,020	14,600	1,110
May	2,802	14,300	765
June	1,244	6,500	260
July	917	7,080	261
August	1,250	10,600	193
September	924	7,740	246

Source: GMP 1991. Based on USGS Gage No. 04290500 which is located 1.7 miles downstream of the Essex Project. Flows are adjusted for the watershed area at Essex dam.

The Essex No. 19 Project inflows are regulated in part by GMP's Waterbury Station, which is located on the Little River, a tributary to the Winooski River. Waterbury Station has a discharge capacity of 500 cfs. The reservoir at Waterbury has more than 20 times the storage volume of the Essex Reservoir, however, and can influence Winooski River flows during reservoir draw-down periods. Waterbury operates in a peaking mode on a weekly draw-down cycle. Discharges travel through the Bolton Falls run-of-river facility before reaching the Essex No. 19 impoundment.

In a February 17, 1994, letter, GMP identified an average 12-hour travel time for Waterbury flows to reach Essex No. 19. GMP states (GMP 1994 and Appendix A) that the effect of upstream project releases on Essex flows is limited because GMP must maintain maximum pool for flood control and minimum pool for recreation purposes. In addition, the travel time from Waterbury to Essex puts the daily peaking flows released at Waterbury out of phase (12-hour lag time) with desired peaking periods for Essex.

Water Quality

The Winooski River has a water quality designation of Class B. Class B waters are managed to achieve and maintain a level of quality compatible with the following uses: public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation. The river segment near the project is designated a waste management zone. The river

reach above Essex dam is classified as coldwater fisheries habitat, and the reach below the project is suitable for warmwater habitat. The river below Essex dam, however, also is designated as coldwater habitat from October 1

through May 30. The dissolved oxygen (DO) minimum standards are 6.0 parts per million (ppm) or 70 percent saturation for coldwater streams and 5.0 ppm or 60 percent saturation for warmwater streams.

There are six wastewater treatment plants (one industrial and five municipal) on the lower Winooski River. There is also one cooling water discharge associated with GMP's diesel units at the Essex powerhouse. These diesel units are not a part of the license application. The Essex Junction Municipal Treatment Facility discharges about 1,500 feet downstream of the Essex powerhouse. Since 1979, wastewater treatment plants at Montpelier, Essex Junction, and South Burlington have been updated. In 1988, the applicant agreed to provide a continuous minimum flow of 167 cfs below the powerhouse. GMP provides this flow voluntarily based on Vermont Department of Water Resources modeling and recommendations to ensure that water quality standards downstream of the project are met.

In 1985, the Vermont Department of Water Resources (now the Department of Environmental Conservation) modeled DO concentrations. The wasteload allocation model showed that the 5 ppm warmwater standard would not be violated. Violations of the coldwater standard, however, could be expected with a minimum flow of 149 cfs during warmwater temperatures and with the treatment plants discharging pollutants at design levels. The models show that DO concentrations in the river decrease in the lower watershed as pollutants are added from downstream treatment facilities. Hydrology and river water temperature data indicate that coldwater standard violations are rare during coldwater habitat season. Spillage of the 7Q10 flows at Essex was not a factor in meeting the minimum DO standard near the mouth of the Winooski River; the 7Q10 flow could be passed through the powerhouse and the same DO sag would occur.

GMP also sampled temperature and DO in summer and fall 1990 and 1991 at three sites: upstream of the Essex impoundment, 800 feet downstream of the powerhouse, and about 1 mile downstream of the powerhouse. DO concentrations were all above 6.2 mg/l even though most samples were taken in the early morning when DO concentrations would be expected to be lowest. July and August water temperatures were 18 to 27oC, and September temperatures generally declined from about 20oC to 12 to 14oC. Temperatures downstream of the impoundment were generally 1oC higher than temperatures upstream of the impoundment.

b. Environmental impacts:

Minimum Flows Below the Project

Minimum flows below the project affect recreation, fisheries, aesthetics, water quality, and other related uses of the Lower Winooski River. Water quality in the Lower Winooski could be affected by the volume of water released below the project. Increased flow releases could help the river downstream of the project assimilate wastewater discharges without violating water quality standards.

In its application, GMP proposed the following minimum flows below the project:

run-of-river	April 1 through May 15
1,000 cfs (or inflow)	May 16 through May 31
340 cfs (or inflow)	June 1 through March 31

In a June 28, 1993, comment letter, the U.S. Fish and Wildlife Service (FWS) recommended minimum flows based on aquatic habitat. In a July 2, 1993, letter, VANR also recommended minimum flows below the project based on fisheries habitat. In August 1993, GMP responded to comments and modified the end date of the second period to June 15 and the start date of the third period to June 16. In the November 1993 settlement agreement, the 340 cfs flow was revised to 450 cfs. See Section V.C.3 for our discussion of these recommendations.

Both agencies and GMP agree that the water quality parameters of concern in the licensing of this project are DO and temperature. We reviewed water quality sampling (GMP 1991, Volume 4, Appendix E2) and modeling studies and determined that the mouth of the Winooski River is where water quality standards for DO may not be met under some conditions. Under existing project operations, minimum flows below the project were less than 50 cfs during summer and early fall. (Since 1987, GMP has released 167 cfs, or inflow.) Modeling studies of flows in this range indicate below standard DO concentrations near the river's mouth. The modeling data show, however, that the water quality standards would be met with a 340 cfs minimum flow release below the powerhouse. At flows between 50 and 340 cfs, water quality standards may not be met under some combinations of water temperature and downstream wastewater discharge loading. Therefore, we believe that minimum flows below the project of 340 cfs or more are sufficient to meet water quality standards downstream of the project.

Flashboard Operations

Under current operation, the wooden flashboards on Essex dam are knocked out or damaged by high river flows about five times per year. Some boards cannot be retrieved and contribute to downstream debris load. In addition, the impoundment must be drawn down below the dam crest to safely repair flashboards.

In its application, GMP proposed to replace all flashboards except the "tip" section with a rubber dam. After considering agency comments and recommendations, GMP proposed to replace all flashboards by installing a rubber dam along the entire crest of the dam.

Before GMP proposed to install the rubber dam along the entire spillway crest, VANR recommended special flow management provisions for flashboard repairs and installation. Installation of a rubber dam along the entire length of the dam crest would render flow management provisions unnecessary. The draw-down for the one-time construction of the rubber dam is the same as that required for conventional wooden board replacement. Subsequent repairs are expected to be infrequent and any draw-downs would be similar to the

standard low pond elevation. Since repair requirements cannot be anticipated, repairs do not need to be restricted to a specific season. Use of a rubber dam would benefit fisheries resources, reduce downstream debris, and provide better control of impoundment elevations. Therefore, we recommend installing a rubber dam instead of continuing to use flashboards.

GMP states that it will require a draw-down below the dam crest on an annual basis for inspection of the rubber dam (see Appendix A). We assume that GMP can conduct the inspection in less than 1 day. This inspection should take place in late summer or fall to avoid draw-down that would have adverse impacts on fish spawning or growth of riparian vegetation.

Flow and Headpond Control

The applicant proposes minimum flows below the project and a more limited fluctuation of headpond elevation. GMP proposes to monitor bypass flows using the fishway pipe opening and existing SCADA headwater monitoring (see Appendix A); below the powerhouse, flow monitoring can be accomplished using turbine kW versus cfs curves.

VANR recommends methods for designing spillage and pond level controls and that GMP monitor and demonstrate compliance with pond level and minimum flow requirements. VANR recommends that GMP commit to funding the operation of the downstream USGS gage station.

We conclude that GMP should implement gaging and monitoring headpond elevations and flow conditions, but we disagree that funding of the existing

USGS station is the most appropriate method. GMP should describe in detail plans to monitor headpond elevation, bypass flows, and flow conditions downstream of the tailrace. GMP should identify the most appropriate equipment to provide this information. The specific methods and equipment chosen should be approved by FERC.

Bypass Flows

Bypass flows contribute to aesthetic, fisheries, and water quality resources. Flow releases can reaerate waters with low DO concentrations and provide flows and conditions in the bypassed reach of river channel that meet water quality standards.

As Essex No. 19, the applicant did not propose a continuous bypass flow in its application. However, after conducting fisheries habitat demonstration releases, GMP proposed to provide a 50 cfs flow release to the bypassed reach of river channel for fishery habitat.

In addition, GMP proposed in its relicensing application to release all inflow when flows drop below 220 cfs, since the units cannot generate. Thus, under the current proposal, GMP would spill all inflow in the bypass when flows drop below 270 cfs. VANR, in a March 7, 1994, letter, stated that the project as proposed, along with the requirements outlined in the WQC and the November 24, 1993, settlement agreement would meet Vermont Water Quality Standards and that the minimum bypass flow need not be supplied by spillage.

The minimum bypass flow that is identified in WQC Condition B is 50 cfs and it is not identified as a spillway discharge. VANR's WQC Condition C requires the applicant to spill all flows uniformly over the dam crest when the project is not operating, but uniform spillway flows are not reasonably achieved with the use of a rubber dam. VANR findings (Number 70) in the WQC discount the value of any incremental oxygenation from passage over the spillway on downstream DO concentration. We conclude that the minimum bypass flow does not contribute to downstream water quality and a spillway release of any bypass minimum flows is not necessary for water quality purposes.

GMP notes that all parties to the settlement agreement have agreed that the 50 cfs discharge can be through the downstream fish passage facility, when it is in operation (see Appendix A).

Debris Removal

Debris regularly collects on the trashracks of hydroelectric intakes. Debris typically consists of floating trash, brush, logs, and vegetation. The debris is raked from the racks automatically and disposed of so that it meets state, county, or municipal regulations. GMP proposes to install a new

trashrack overlay with more narrow openings for downstream fish passage. The new rack may collect more debris than the current wider spaced rack.

WQC Condition L requires GMP to submit a plan to VANR for proper disposal of debris from the trashrack or other project-related features. We agree that GMP should develop and submit a debris disposal plan to VANR, and we recommend implementation of the debris disposal plan.

c. Cumulative impacts:

Peaking Capacity at Downstream Projects

GMP's proposed releases will influence the downstream hydrology and the peaking capacity of the two downstream projects. The Gorge No. 18 Project, which is located about 6.3 miles downstream of Essex No. 19, has a much smaller reservoir (402 acre-feet) than Essex No. 19 (1,676 acre-feet) and operates in a peaking mode. The peaking operation at Gorge follows the peaking operation at Essex because the storage capacity at Gorge is much smaller than at Essex. The proposed minimum flow release at Essex would reduce the average quantity of stored water there in some seasons. The smaller volumes of stored water reduce the quantity of on-peak generation compared with existing licensed conditions. The unlicensed Gorge Project is owned and operated by GMP.

Below Gorge, the Winooski One Project operates run-of-river. Because the Winooski Project is located downstream of a peaking plant, the run-of-river operation follows the load demand of GMP. The value of the energy produced at Winooski is greater under the existing operations of Essex No. 19 than under GMP's proposed minimum flow conditions. If the on-peak to off-peak shift in flows is as great as that at Essex No. 19 and the on- and off-peak energy values are similar, the loss in energy value should be less than 5 percent.

The hydrology of the Lower Winooski would be modified under GMP's proposed minimum flow conditions. This increase in minimum flows would reduce on-peak generation and influence the total generation (on-peak plus off-peak). While these changes may influence the peaking cycle of generation each day and the possible generation of the Gorge No. 18 Project, the total energy resource of the Lower Winooski should not be greatly altered by the proposed minimum flows.

d. Unavoidable adverse impacts: None.

3. Fishery Resources

a. Affected environment: Historically, the Winooski River

supported both coldwater and warmwater fish, and a number of native species used the river before industrial development of the watershed in the 1700s. Lake sturgeon from Lake Champlain probably used parts of the Winooski for spawning; however, it is unclear if lake sturgeon reached the tailwater of Essex dam or could have migrated past Hubble Falls (the natural falls at the site of the existing Essex dam) under typical spring flows. Atlantic salmon also were native to Lake Champlain, but habitat changes and fishing pressure extirpated native stocks by 1852 (Smith 1985). Although brook trout probably were common in the Winooski, they probably could not compete for food and habitat when rainbow trout from the western United States and brown trout from Europe were introduced to the Champlain River Valley. Other native fish species probably included walleye, yellow perch, sauger, smallmouth bass and other members of the sunfish family.

Current occupants (based on angler reports and sampling) include: smallmouth bass, walleye, landlocked Atlantic salmon, brown and rainbow trout, rock bass, yellow perch, pumpkinseed, fallfish, white sucker, and common carp. Until 1993, there were no anadromous fish runs reaching the Essex No. 19 Project area because of two downstream dams. During spring 1993, a new trap-and-truck program at the Winooski One Project began as part of the Atlantic salmon and steelhead (rainbow trout) restoration effort on the Winooski River.

There may still be limited runs of lake sturgeon, a state-listed endangered species, in the Winooski River up to the Winooski One Project dam, about 3 miles from the river mouth. During the last 10 years, VDFW recorded anecdotal sightings. Anglers reported catching and releasing sturgeon below the Winooski One Project and at the river mouth during 1992 and 1993. VANR (1993a) said the reach downstream of Essex No. 19 has a remnant sturgeon population, but it does not specifically claim there are sturgeon in the reach between Essex and Gorge.

Smallmouth bass and fallfish are abundant (as recorded during VANR's sampling in 1988) between the Essex No. 19 and Gorge No. 18 projects. Adult brown and rainbow trout sometimes are caught below Essex No. 19, and walleye are caught between Essex No. 19 and Gorge No. 18 (VANR 1993b).

Upstream of the project between Bolton Falls and Richmond, VANR annually stocks approximately 5,000 brown trout yearlings. Rainbow trout also were stocked until 1973. Brown, rainbow, and brook trout are all stocked in

upstream tributaries (VANR 1993a). A reservoir survey showed an abundance of forage fish, a moderate population of smallmouth bass, and some rainbow and brown trout in the upper sections of the reservoir (Jirka and Costanza 1991).

The WQC for the Essex No. 19 Project identifies the Lower Winooski River as a spawning tributary for a cooperative effort between Vermont, New York,

and FWS to develop Lake Champlain's salmonid fishery. Interior (1993) states that the Lake Champlain Special Designation Act (1990) was passed to implement fisheries restoration in the Lake Champlain Basin.

b. Environmental impacts:

Impoundment Level Fluctuations

Under current peaking operations the project impoundment supports smallmouth bass and other species. Impoundment levels generally fluctuate about 2.2 feet/day, but about 5 percent of the time the fluctuation exceeds 5 feet. These fluctuations may have an impact on reservoir fish, especially species such as smallmouth bass that construct spawning nests in shallow waters. Nest desiccation and fish stranding are possible with large reservoir elevation fluctuations.

Figure 6 shows average monthly surface elevations for the Essex impoundment from 1987 through 1990. The 1988 and 1989 graphs show a declining average elevation in the May through June smallmouth bass spawning and nesting period. All four graphs show average elevations 1 to 7 feet below top flashboard elevation.

The graphs show declining reservoir levels of a magnitude that could negatively influence bass reproduction. During fish population sampling, 33 smallmouth bass were collected. Jirka and Costanza (1991), who conducted the sampling, state that the limited collection of smallmouth bass less than 180 mm indicates poor spawning success in recent years.

The data also show a broad and relatively even size distribution of slightly larger smallmouth (144 to 460 mm), however, which indicates a wide age range in the population. If this population is a product of the Essex reservoir, water levels must have been suitable for spawning in a number of recent years. GMP's August 20, 1993, informal proposal to extend the rubber dam and limit impoundment draw-downs to elevation 272 feet should enhance smallmouth bass spawning success (see Section V.C.2 for more discussion of the proposed rubber dam).

There may be some fish stranding in two wetland sites (6 to 7 acres) on the north side of the river near the dam when impoundment elevations vary. No stranding has been reported in this area, but the emergent vegetation, elevation, and topography make it a possible location for stranding juvenile fish. GMP's August 20, 1993, proposal to

Figure 6

limit impoundment operating levels to between 272 and 275 feet should reduce dewatering in these wetlands, however, and thus also limit potential for fish stranding.

Based on our review of the effects of current operation and the benefits to reservoir fisheries, we recommend that the project operate with a full-crest rubber dam as a flashboard system. With the rubber dam, reservoir elevations should be more stable than in the recent years when the reservoir was often drawn down to reface the dam surface. Limiting draw-downs to 272 feet should enhance fisheries habitat - especially for smallmouth bass - in the reservoir.

Minimum Flows in Bypassed Reach

Flow releases in a bypassed reach can provide habitat for fish and invertebrates. With minimum flow release at Essex dam, the 550-foot-long bypassed reach contains islands, cascades, and some falls that are not typical of the main stem of the river below the powerhouse.

Under the current license, the applicant is not required to provide minimum flows in the bypassed reach. This is the baseline condition for our analysis. On August 1, 1987, however, GMP voluntarily agreed to provide a 167 cfs minimum flow downstream of the powerhouse. Since the minimum capacity of the turbines is 220 cfs, GMP releases flows up to 220 cfs over the dam when the reservoir is full and the plant cannot operate. Bypass flows are also provided through the spillway when flows exceed turbine capacity and the reservoir is full. Most of the time when the project is operating, no minimum flows are provided in the bypassed reach.

GMP's original application proposed no minimum flow in the bypass reach. At the request of the fisheries resource agencies, GMP conducted bypass flow demonstrations at flows between 55 and 350 cfs. The demonstration flows showed habitat conditions were similar over this range. Later, in an August 20, 1993, letter, GMP proposed to provide a minimum bypass flow of 50 cfs at all times. GMP also proposed to pass all reservoir inflow through the bypass when flows are below 270 cfs.

VANR, in its comment letter dated July 2, 1993, did not specify a minimum flow in the bypassed reach. It had, during initial consultation, recommended the 167 cfs release to which GMP agreed. After the demonstration flow study, VANR agreed that 50 cfs was sufficient for the bypassed reach and that value is in Condition B in the water quality certifications.

We agree that a continuous bypass release is necessary to provide smallmouth bass and macroinvertebrate habitat and to ensure that water quality standards are met in the bypassed reach. Based on the demonstration flow

study (GMP 1992), we agree that 50 cfs is sufficient. Study results indicate that this reach can be used by bass as they move from the upper reservoir to the tailrace. The 50 cfs may be released to the base of the dam through the downstream fishway, through a gate, over the dam crest, or through a fish ladder if one is constructed.

Minimum Flows Below the Project

GMP's voluntary 167 cfs flow releases below the project provide fish habitat from the Essex tailrace to the Winooski River mouth. The existing license for Essex No. 19 has no minimum flow requirements, however, and low flows associated with peaking may limit potential fish resources of the Winooski River.

GMP proposed in its application to operate run-of-river from April 1 through May 15, to provide a minimum flow of 1,000 cfs from May 16 through May 31, and to provide 340 cfs for the remainder of the year. If inflows are less than 1,000 or 340 cfs during the stated periods, GMP proposed to provide the inflow amount below the project.

In its WQC, VANR included Condition B which specified the following minimum flow requirements:

run-of-river	April 1 through May 15
1,000 cfs (or inflow)	May 16 through June 15
500 cfs (or inflow)	June 16 through March 31

The VANR WQC also specifies maximum allowable daily flow fluctuations based on time of year and low flow (LF) for the calendar day. The fluctuations, which are further defined by comparing the LF to VANR's specified minimum flow requirements, are as follows:

Date and Condition	Maximum Flow Fluctuation
April 1 through May 15	No Fluctuation
May 16 through June 15	
If LF is <1,000 cfs	No Fluctuation
If LF is >1,000 cfs	No Limit
June 16 through September 30	
If LF is <500 cfs	No Fluctuation
If LF is >500 cfs	500 cfs
October 1 through March 31	

If LF is <500 cfs	No Fluctuation
If LF is >500 cfs	No Limit

In its amended WQC and in the November 24, 1993, settlement agreement, VANR modified the minimum flow requirements by reducing the minimum recommended flow from June 16 through March 31 from 500 to 450 cfs. At the same time, VANR specified low flows of 450 cfs instead of 500 cfs for the periods from June 16 through September 30 and from October 1 through March 31 to be used in determining allowable flow fluctuations.

These fluctuations would limit peaking capabilities on some days. The amended WQC allows deviations from this requirement for power emergencies and flow demonstrations. VANR will review the frequency of deviations from these

limitations, however, and may provide alternate requirements if it determines that the deviations are detrimental to the environment.

GMP studied instream flow for a reach of river below the project. The study included an evaluation of five life stages of smallmouth bass and adult rainbow trout, walleye spawning and incubation, and four life stages of fallfish. GMP also studied instream flow for walleye spawning in the bypassed reach. Since the two projects below Essex No. 19 operate in tandem with Essex No. 19, GMP evaluated an additional study reach below the last project (Winooski One) for rainbow trout, walleye, sturgeon, and landlocked Atlantic salmon. The results support the 340 cfs recommended minimum flow as a good year-round condition for smallmouth bass, fallfish, and invertebrates. Although spawning fallfish, adult rainbow trout, and adult and spawning walleye are best served by flows in the range of 1,000 cfs, all species, except smallmouth bass, would have much more habitat with 340 cfs than with the currently licensed 0 cfs or GMP's voluntary release of 167 cfs.

In May 1988, the Vermont Department of Fish and Wildlife reported results of a "Fishery Flow Needs Assessment" for two reaches of the river below the project. The study included four life stages of smallmouth bass, adult rainbow trout, and macroinvertebrates. Although the needs assessment recommended 500 cfs as a minimum flow, it concluded that 340 cfs was the absolute minimum adequate flow for these species. For trout and food production, 550 cfs was considered optimum.

In its July 2, 1993, letter conveying terms and conditions, VANR commented on GMP's proposed flows, the flow studies conducted by GMP, and results of additional flow analyses using GMP's study data. VANR agreed that GMP's proposed minimum flows are suitable for walleye. For lake sturgeon, VANR stated that the 1,000 cfs minimum flow should be continued until June 15 for spawning and incubation. VANR stated there is adequate information to demonstrate that sturgeon use the Winooski River for spawning. VANR also

stated, however, that if lake sturgeon populations cannot be sustained or restored, the 1,000 cfs minimum flow for June 1 through June 15 could be suspended.

VANR reexamined GMP's minimum flow analyses for macroinvertebrates and proposed changes in the water depth suitability curves. The agency reanalyzed the data using both conventional IFIM analysis and a dual flow analysis. The dual flow analysis calculates the minimum flow as in the IFIM methodology and also looks at limiting effects of high flows on available habitat. Although VANR claims the dual flow analysis demonstrated the need to limit peaking for macroinvertebrates, it does not specify minimum flow requirements for macroinvertebrates.

VANR conducted a dual flow analysis for smallmouth bass fry and young-of-year life stages, which indicated that minimum flows of 300 to 550 cfs are most suitable. Based on the analysis, VANR recommended a 500 cfs minimum flow and a 1,000 cfs maximum flow.

VANR also conducted dual flow analyses for rainbow trout and fallfish. Results for fallfish were similar to those for smallmouth bass, and results

for rainbow trout showed maximum weighted usable area (WUA) at a flow of 1,840 cfs in the below-project reach. VANR conceded that 1,840 cfs could not be sustained, but stated that its recommended 500 cfs flow could be sustained 80 percent of the time.

VANR performed a "balancing" analysis of minimum flow between life stages and species. Comparing minimum flows for bass, fallfish, rainbow trout, and invertebrates led VANR to conclude that 400 to 500 cfs flows would substantially increase habitat yet would not be "excessive" for life stages preferring lower flows.

FWS, by letter dated June 28, 1993, noted that the 340 cfs proposed flow is an improvement over existing conditions, but recommended a 500 cfs flow because it would provide 80 percent of the maximum available habitat, and would reduce duration and frequency of high flow releases. FWS requested a 1,000 cfs flow from June 1 to June 15. FWS also commented on peaking generation flows by describing reductions and relocation of suitable habitat for smallmouth bass for flows of 2,000 cfs. FWS recommended a 1,000 cfs peak generation flow during June through September. FWS recognized that this restriction is costly and agreed that the license should allow capacity demonstrations, which are audits of the ability of the project to supply capacity generation on request, and full capacity output during power emergencies. Allowing the capacity demonstrations helps GMP receive an economic benefit associated with having the proven capacity available.

Because the minimum flow and species habitat requirements differ by season, we divided our analysis accordingly. The first season focuses on walleye spawning and incubation, the second on sturgeon, and the third on smallmouth bass spawning and rainbow trout adult habitat. Table 5 summarizes flows proposed by GMP, FERC, and the agencies.

Table 5. Minimum Flows (cfs) Below the Project as Proposed by GMP and Recommended by Agencies and FERC Staff.

		Seasonal Period					
		4/1-5/15	5/16-5/31	6/1-6/15	6/16-6/30	7/1-9/30	10/1-3/31
Species and life stage of concern		Walleye spawning and incubation		Sturgeon	Smallmouth bass spawning and rainbow trout adult habitat		
GMP Proposal	R-O-R	1,000	340	340	340	340	
FWS 6/28/93	R-O-R	1,000	1,000	500*	500*	500	
VANR 7/2/93	R-O-R	1,000	1,000	500 and limited peaking except for emergencies	500 and limited peaking except for emergencies	500	

VANR WQC 11/9/93	R-O-R and no peaking	1,000 and limited peaking	1,000 and limited peaking	500 and limited peaking	500 and limited peaking	500 and limited peaking	
VANR WQC Amendment 1/1/95	R-O-R and no peaking except for emergencies	1,000 and limited peaking except for emergencies	1,000 and limited peaking except for emergencies	450 and limited peaking except for emergencies	450 and limited peaking except for emergencies	450 and limited peaking except for emergencies	
FERC Staff	R-O-R	1,000	1,000	450	340	450	

*Maximum generation flow at 1,000 cfs or inflow (if inflow exceeds 1,000 cfs).

April 1 through May 31. GMP's proposed run-of-river operation from April 1 through May 15, and the 1,000 cfs minimum flow from May 16 through May 31 is acceptable to FWS and VANR, and it represents an enhancement of existing conditions. Our analysis indicates these flows are appropriate for walleye spawning

and incubation. Figures 7 and 8 show the WUA curves for walleye for the two study reaches. The curves show a reduction in the rate of increase in habitat at about 1,000 cfs. The curves do not show maximum WUA for walleye, because flows exceeding the velocity and depth habitat preferences were not modeled. The 1,000 cfs flow is reasonably achievable based on the May flow duration curve. The 1,000 cfs flow should provide significant enhancement for walleye incubation since this species spawns on vegetation, brush, and other obstacles that could be dewatered with a low minimum flow.

In the WQC, VANR included Condition G requiring a contingency plan to prevent walleye mortality in the bypassed reach during the spring spawning run. This condition is not supported in the WQC and is contrary to VANR's previous analysis and recommendations. Condition G of the WQC implies that if walleye use the channel south of the island in the bypassed reach for spawning under high spillway flow conditions, GMP would be required to spill flows until spawning and incubation are complete.

Our analysis indicates that such use of the channel would occur only rarely as there are adequate spawning flows in the south channel only during unusually high spring flows. If the flows dropped rapidly and subjected eggs in that channel to desiccation,

Figure 7

Figure 8

GMP could do little to prolong spill conditions. The impoundment has limited capacity to provide continued spillway flows of sufficient volume to reduce egg desiccation. Thus, developing a contingency plan appears to be unwarranted. However, because the plan is part of a condition determined to be within the scope of Section 401, GMP would be required to develop such a plan.

June 1 through June 15. GMP opposed the 1,000 cfs minimum flow first recommended and then conditioned (WQC Condition B) by VANR for sturgeon spawning in the June 1 through June 15 period. Although GMP believes further sturgeon restoration progress should be made, it agreed to the minimum flow on August 20, 1993, with a condition: This flow release should be reviewed every 5 years and discontinued if there are no confirmed sightings of sturgeon in the Winooski River.

June 15 is within the sturgeon spawning period, based on water temperature preference (Becker 1983), but there are no habitat-based data supporting the 1,000 cfs minimum flow. Although there are no data to support the 1,000 cfs requirement for sturgeon spawning and incubation, VANR and FWS recommend this based on professional judgment. We have no basis to refute their judgment. The quantity of flow is reasonable, and it is typical of natural flows in early June.

Although the 1,000 cfs minimum flow through June 15 is not strongly supported, we believe that it is reasonable and we agree that it should be implemented. These flows should be sufficient to document spawning and restoration progress. If, after a reasonable period of time, little progress has been made on sturgeon restoration, or evidence indicates runs no longer occur, VANR should submit its determination and request relief of this license condition.

June 16 through March 31. The applicant proposed a 340 cfs minimum flow from June 16 to March 31, and VANR (in its WQC) stipulated a 500 cfs minimum flow for the same period. On November 24, 1993, however, GMP, VANR, and the Vermont Natural Resources Council (VNRC) agreed to amendments to the WQC limiting the minimum flow to 450 cfs.

We agree that a minimum flow is needed during this period. Without minimum flow, smallmouth bass spawning and adult trout habitat below the project are limited. The 340 cfs originally proposed by GMP clearly improves habitat for a number of species compared to existing license conditions, which do not require minimum flows.

Smallmouth bass is the primary management species, and Figure 9 shows that flows of 300 to 500 cfs are best for all life stages of this species. This is the appropriate range of minimum flows, and the specific flow within this range has little influence on this species. The 500 cfs proposed by VANR is more suitable for trout than the 340 cfs proposed by GMP, but our analysis for trout shows that the 500 cfs minimum flow is not necessary for the entire period from June 16 through March 31.

Figure 9

The adult rainbow trout put-grow-and-take program is of secondary importance in the fishery management plans for the Winooski River. Although trout habitat increases with flows up to 1,840 cfs, these flows are not common in the low-flow season. Natural flows less than 500 cfs are common in July, August, and September. Summer water temperatures can approach the upper range tolerated by rainbow trout, and this reach of river is classified as suitable for warmwater fish species from June 1 through September 30. The preferred habitat for coldwater species in these areas may be unidentified thermal refuges in the river reach. These refuges are often smaller tributary stream mouths which sustain coldwater flow from groundwater or forested wetland sources. Summer minimum flows above 340 cfs may generate more suitable depth and velocity habitat for trout, but such habitat would probably not be used because mainstem water temperatures may be too high.

Our analysis shows the 340 cfs minimum flow is most appropriate from July 1 through September 30 when smallmouth bass is the important management species. At other times, trout can be expected to use all portions of the Lower Winooski River. A 450 cfs minimum flow would help meet both the bass and trout management goals for the river and is an acceptable compromise within the 340 to 500 cfs range. Since this value is included in the settlement agreement, it would appear to be in the public interest and does represent a savings in lost generation over higher flow requirements.

Peaking Flows

FWS and VANR evaluated effects of peaking flows on fisheries habitat in their minimum flow analysis.

VANR used a dual flow analysis to estimate habitat loss from peaking flows, in particular the effects of peaking on macroinvertebrate production and smallmouth bass fry and young-of-year habitat. VANR recommended use of the dual flow analysis because peaking operations cause flow related changes in habitat. These changes expose immobile species to less suitable habitat and expose mobile species to predation and additional energy expenditures as they seek suitable habitat.

The dual flow analysis identified theoretical quantitative habitat improvements provided by minimum and maximum flow releases. VANR conducted the dual flow analysis for smallmouth bass, rainbow trout, fallfish, and macroinvertebrates. It also provided dual-flow analysis recommendations based on "balancing" of the species-specific optimum flows using an averaging method.

Existing peaking operations provide suitable habitat for immobile macroinvertebrate species. In a November 3, 1993, Vermont Fish and Wildlife Department memo to Larry Becker, Mr. Wentworth notes that DEC invertebrate sampling in 1986, 1987, and 1991 of continuously wetted areas below the powerhouse showed a "reasonable assemblage of invertebrates" and that ". . . sampling did not indicate a major problem existed."

In our review of the minimum and maximum flow conditions in the ranges studied in the dual flow analysis, we noted that the flow ranges are beyond the control of GMP. Expected natural flows in most seasons are outside this arbitrary range. The dual flow analysis does not evaluate the effect of natural flow excursions outside the recommended range. None of the species-specific analyses demonstrate the relationship between sustained habitat and frequency of flow excursions beyond the range of preferred minimum and maximum combinations for these species/life stages. Based on our analysis, we do not believe that peaking restrictions combined with minimum flows recommended by the agencies and identified in the WQC, are needed to provide suitable habitat for fisheries resources in the lower Winooski River, however, since the conditions are within the scope of Section 401, we include them as part of the license. That the restrictions are part of the settlement agreement suggests they are in the public interest.

The reduced range of headpond fluctuation (275 to 272 feet) combined with the minimum flows agreed upon will provide some reduced peaking frequency, more continuously wetted area for macroinvertebrates, and more bass habitat than existing conditions. These conditions should provide the best habitat combination at the most important seasons of the year.

Ramping Rates

Ramping is sometimes used to reduce the rate of change in flow below a peaking hydroelectric facility. Ramping helps prevent stranding of fish or boats from a rapid decrease in flows. Ramping also helps prevent fish, wading anglers, or boats from being flushed downstream in a rapidly rising river flow.

GMP did not propose a ramping rate schedule, and has not operated with ramping rate restrictions in the past. In the WQC, Condition F, VANR requires a ramping rate plan for the project, but does not explain the need for this rate. Information item 140 in the WQC states only that rapid transition between minimum

flow and peak generation flows is "disruptive to aquatic life and dangerous to anglers." Without specific supporting documentation for ramping rates, however, the VANR WQC requirement is not technically justified.

Our analysis indicated no evidence of downstream fish strandings or kills resulting from project operations or disruption of aquatic biota. Our analysis also considered the cross sectional profiles and water surface elevations at various flow levels. From this information we find it unlikely that stranding or displacement of aquatic biota will be an issue. Therefore, we do not believe ramping rates are a fisheries resource related issue, and we do not believe it is necessary to require the applicant to implement related measures. See Section V.C.7.b for our discussion of public safety issues related to ramping rates and recreation. Having stated the staff's position, it should be noted that the condition to develop ramping rates is considered within the scope of Section 401 and the applicant will be required to develop ramping rates.

Downstream Fish Passage

When enough spawners are collected at the Winooski trap-and-truck facility, landlocked salmon and steelhead trout are transported above the dam. In addition, the state has stocked excess hatchery-reared steelhead above Essex No. 19 and may stock additional fish if future excess hatchery production is provided. Without passage facilities, fish moving downstream must pass over the dam or through the turbines. Adult outmigrants, which probably would not survive this route, however, are typically an important part of a restoration effort.

VANR's WQC Condition K requires that the downstream passage facilities for Essex No. 19 be operational in the spring of 1996. The facility is to operate 24 hours per day from April 1 through June 15 and September 15 through December 15.

FWS prescribed (June 28, 1993), under Section 18 of the FPA, that the applicant develop plans to build and operate downstream fish passage facilities within 6 months of licensing. FWS did not specify downstream passage at Gorge No. 18. FWS recommended operating continuously from April 1 through June 15 and from September 15 through November 15 and implementing a fish passage monitoring plan.

Volume 6 of GMP's application contains conceptual plans for a fish passage facility using one of two exciter penstocks to bypass downstream migrants to the tailrace. On February 17, 1994, however, GMP submitted a revised plan and cost estimate providing a release in the north channel of the bypassed reach.

We recognize that fish passage facilities would reduce downstream passage delay and mortality of steelhead and salmon adults and smolts. Salmon smolt mortality through the horizontal Francis turbines at Essex is expected to be about 20 percent (EPRI 1992). Adult salmonids migrating downstream would probably not pass through the existing trashracks, but mortality for adults that did pass through would be approximately 100 percent because of their large size. Without passage facilities, downstream migrating adults probably would be delayed at the dam until flows are provided over the spillway.

VANR recommended and subsequently conditioned (WQC Condition K) a 1 month longer fall operation period than did FWS. VANR's dates are appropriate given that adults may outmigrate at any time and presmolts often redistribute downstream during fall.

Flows for downstream passage will be 30 to 50 cfs and can provide the minimum flow for the bypassed reach, if released at the base of the dam. We agree that the plan for releasing downstream fish in the bypassed reach is necessary, and sufficient to meet migratory species goals. We agree with FWS that the applicant should provide downstream passage at this site to support agency plans for developing a landlocked salmon and steelhead trout fishery. We also agree that a downstream passage monitoring study should be conducted at Essex.

Because the Commission has no authority over Gorge No. 18, the staff will neither accept nor comment on the VANR recommendations relating to Gorge No. 18 but note that GMP and VANR may independently agree to them.

Upstream Fish Passage

Upstream fish trap-and-truck facilities have been operating at Winooski One since spring 1993 to transport Atlantic salmon, steelhead trout, and walleye from the lower Winooski River to suitable upstream spawning sites. Walleye are presently transported to the base of the second dam (Gorge No. 18). Steelhead and Atlantic salmon are scheduled for stocking at a number of sites, including sites upstream of the Essex No. 19 Project.

VANR recommended that the applicant share in the cost of the Winooski One trap-and-truck facility. As stated in a February 17, 1994, letter, GMP agreed to support the cost of fish passage at Winooski One.

Our analysis shows that upstream passage from Winooski One to spawning sites in the Winooski River will be necessary to reestablish an Atlantic salmon fishery and to establish a new steelhead run in the Winooski River. These fisheries could greatly enhance recreation opportunities and diversity of the Winooski River fishery resources. Upstream passage of walleye also could enhance the fishery walleye stocks by facilitating mixing and migration of spawning stocks from the lower river. We agree that GMP should provide a reasonable portion of the Winooski trap-and-truck costs. We agree that additional upstream fish passage at the Essex No. 19 site is not necessary at this time. The existing trap-and-truck facility is adequate to pass the upstream migrants for the foreseeable future.

c. Cumulative impacts:

Impacts of downstream passage are cumulative for all the dams a species must pass. Downstream passage facilities are installed at the Winooski One Project, but facilities have not been installed at Gorge No. 18, between Essex No. 19 and Winooski One. Outmigration patterns will not be known until the steelhead and Atlantic salmon restoration programs are more established. Fish would benefit from passage at all three lower dams. For facilities built at any of the dams, a monitoring study would establish the passage rates and effectiveness of facilities.

Because the Gorge No. 18 facility is not licensed by FERC, no recommendations will be made regarding construction of a downstream fishway at that project. It is noted, however, that because there is no passage

provided there, some outmigrants may be delayed at Gorge No. 18 and injured or killed while waiting for flows over the dam. Adult salmonids are not expected to survive passage through the turbine. We recommend that the applicant install downstream passage facilities at Essex No. 19 and monitor their effectiveness.

d. Unavoidable adverse impacts: None.

4. Terrestrial Resources

a. Affected environment: Before settlement of the area in the early eighteenth century, much of the land in the vicinity of the Essex No. 19 Project was covered by hardwood forest. Land was cleared for agriculture (in some cases, right up to the Winooski River) from the early eighteenth century to the present. Most of the project area is surrounded by urban and rural suburban development because of increased population in the greater Burlington area.

Because the gorge is steep and rocky and the river channel is well defined, only small, scattered wetland systems existed prior to project construction. Presently, within the project area there are 27 acres of emergent wetland, 9.5 acres of scrub/shrub wetland, 49 acres of forested wetland, and 12 acres of mixed-type wetland. Additionally, the continual 6 foot peaking fluctuation in the impoundment elevation creates approximately 77 acres of continually inundated mud and sand flats. Because of the daily alternating inundation and exposure cycle, the mud and sand flats support very little aquatic or wetland vegetation and subsequently provide little usable habitat for aquatic or terrestrial animals.

Vegetation in the area of the Essex No. 19 Project is characterized by small scattered patches of floodplain forest, scrub/shrub, emergent wetlands bordering the impoundment, and ledge communities in Williston Gorge. The floodplain forests contain willows, maples, cottonwoods, elm, and box elder in the overstory; several species of vines in the midstory; and ferns as ground cover. Two species of state significance include buffalo berry and hyssop-leaved fleabane found on the rocky ledges in the gorge. Riverweed is located near the mouth of Muddy Brook 1.3 miles downstream of the dam.

Wildlife in the area of the Essex No. 19 Project is characterized by species typical of the region. No state or federally listed rare, threatened, or endangered species are known to occur in the project area (USDI 1993). Four state-listed birds whose ranges include the project area are the common loon, loggerhead shrike, bald eagle, and osprey.

b. Environmental impacts:

Construction of Recreation Facilities

GMP proposes to construct new recreational facilities at the Essex No. 19 Project (see Section V.C.7). The portage take-out and put-in and other work near or in water (the boat launch) should use sediment control measures to minimize erosion and sedimentation of the river and should be designed to prevent future shoreline erosion. Clearing for the south trail upgrade and the new trails on the north side should be the minimum necessary to create the facilities. The proposed construction would result in the removal of some natural vegetation and the temporary disturbance of associated wildlife. We agree with VANR that impacts would not be significant from construction of recreation facilities; consequently, we do not recommend that GMP implement mitigative measures.

Installation of Rubber Dam to Benefit Wetlands and Wildlife

GMP proposes to install a rubber dam to replace the flashboards along the dam crest, which would eliminate changes in impoundment water level associated with flashboard failure and maintenance. At the same time, GMP proposes to operate the project with reduced impoundment fluctuations.

VANR's WQC and comment letter state that a more constant pool level would inundate existing wetlands and allow for the establishment of additional wetland areas. The more stable water level would create hydrologic conditions that support a plant mix that is a more desirable wildlife habitat (VANR 1993a, 1993b) than existing mud and sand flats.

Based on proposed changes in peaking operation and use of the rubber dam, it is clear that the impoundment water level would be more stable than under the current license. This stability will reduce stress on existing habitat and permit aquatic and wetland habitat to develop more fully. Both the habitat and the dependent wildlife should benefit. We agree with the applicant's proposal, and we recommend

installation of the rubber dam across the entire dam crest.

Effect of Minimum Bypass Flows on Rare Plant Species

GMP's plant survey identified three significant species in the gorge. The outcrop community has a natural permanence, and there appear to be few threats to its continued existence. VANR (1993a) states that GMP does not propose any construction or operational activities that would be incompatible with the protection of the habitat for the three significant plant species. Based on our analysis, we agree with GMP and VANR and, therefore, we do not recommend any measures for protecting the rare plant species from bypass flows.

Effect of Operational Changes on Wetlands and Wildlife

The WQC states that an operating mode that provides consistent flow below the project would protect wetlands and better support wildlife using the riparian zone (VANR 1993b). VANR (1993a) states that GMP does not propose any construction or operational activities that would be incompatible with the protection of the habitat for the three significant plant species. Both the proposed and recommended changes in operation will not have an adverse impact on wetlands and wildlife, and, therefore, we do not recommend any protective measures for the operational changes.

c. Unavoidable adverse impacts: None.

5. Aesthetic Resources

a. Affected environment: The Winooski River drainage is one of the largest in Vermont, ultimately emptying into Lake Champlain in the towns of Burlington and Colchester. In the upper reaches of the river, stream gradients are very steep and water velocities are high, which creates areas of riffles and pools and stretches of whitewater.

Closer to the project area, the Winooski River drops in elevation as it passes over a series of rapids and falls, between which are floodplains or level areas along the banks. Prior to construction of the dam and impoundment, the project area encompassed one of these sequences of river falls, rapids, and floodplains in an area known as Hubble Falls. Hubble Falls was a vertical or near vertical waterfall of approximately 12 feet. This area included a minor gorge with relatively steep bedrock banks and outcrops in the channel. Pre-project photographs show that the area surrounding the dam was forested up to the river banks. Upstream flood-prone areas were cleared, and the west bank was developed with a grist mill and a creamery. Other

photographs show a covered bridge downstream of the present dam site.

Essex No. 19 Project dam is located at RM 17.6. Because of its location in the gorge, the dam is screened by vegetation and topography from areas to the north and south. The dam is most visible from downstream areas in the gorge and from the Route 2A bridge. In 1989 the dam was resurfaced with shotcrete to strengthen the structure and improve its appearance. This resurfacing changed the texture of the face of the dam, resulting in a largely uniform surface interrupted by areas of older material.

A laydown area used for equipment storage, trashrack cleaning equipment, and staging for dam maintenance activities (Figure 10) is located next to the dam on the northwest bank of the river. This area is enclosed by a 6-foot-high chain link fence which parallels Route 2A for approximately 150 feet. Attempts to reduce the prominence of the storage area and fencing have been made by planting evergreen trees

Figure 10

along the section of fence that faces Route 2A and installing green nylon mesh screening on the fence to block views of the interior space of the laydown area. A Vermont Electric Company (VELCO) substation is located on the south side of the dam outside of the project boundary.

The project powerhouse is a concrete, masonry, and red-brick structure on the north bank of the river downstream of the Route 2A bridge. It is most visible from Route 2A, Overlook Park, and areas downstream of the project. It is a "T" shaped structure approximately 157 feet long by 65 feet wide on its longest sides, designed in the Federal style with simple cornice millwork and a gabled roof. There have been no apparent visual modifications to the powerhouse.

A substation (not part of this project) is on the crest of a hill on the north bank of the river, approximately 150 feet north of the powerhouse. This 50-foot by 70-foot facility is enclosed by a 6-foot chain link fence and contains a 30-foot-high cluster of grey power poles and transformers. Adjacent to the fenced area is a 10-foot by 25-foot relay house of corrugated metal. This facility is on a hill and is visible from both up- and downstream locations, Route 2A, and the adjacent residential community. GMP hired a landscape architect to work with the village of Essex Junction Planning Commission to identify methods to effectively screen the substation. GMP has installed shrubs around the substation and spruce trees along Route 2A.

Three primary groups view the project area and facilities: motorists, pedestrians, and boaters. Motorists include both passengers and operators of vehicles traveling on Route 2A (north and south bound); pedestrians include travelers on foot or on bicycle; and boaters include individuals traveling on the water either below the dam or on the impoundment.

Traffic flows in the project area on the Route 2A bridge are classified as high density but stable, where drivers or pedestrians experience a generally poor level of comfort and convenience (Transportation Research Board 1985). The 1992 Average Daily Traffic (ADT) count was 18,320 vehicles at the Essex Junction/Williston town line in the middle of the bridge (Vermont Agency of Transportation 1994).

The project and river are visible to northbound motorists for approximately 1,000 feet and to southbound motorists for approximately 800 feet. Considering posted speed limits, motorists may view portions of the project for 15 to 30 seconds, depending on direction. Because their viewing speeds are generally lower, views last longer for pedestrians. All project facilities may be viewed by pedestrians from the west side of the bridge, Overlook Park, or areas below the bridge in the bypassed reached. Boaters below the project may view the powerhouse and

the dam, with secondary views of the substation. On the impoundment, boaters have more view of the VELCO and Essex substations and of shoreline conditions in the project area.

b. Environmental impacts:

Landscaping of Project Facilities

The laydown area on Route 2A is highly visible to motorists and pedestrians using the Route 2A bridge. GMP has provided green slats in the fence to screen the laydown area and has planted buffer trees in front of the fence along the road. The existing trees have not grown well, perhaps because of the stress of wind and road salt spray. GMP proposes to plant and maintain additional trees and shrubs along the fence to reduce the visual intrusiveness of the laydown area.

VANR commented that the chain link fence surrounding the laydown area is unattractive and that the vegetation planted to screen the area has not been well maintained and is insufficient to screen the facility. VANR suggests redesigning the laydown area to be both a service access and a place for a new dam overlook park (VANR 1993). (We address the future use of this area in Section V.C.7). VANR also recommends improving the aesthetic quality of the area by adding deciduous street trees along Route 2A and evergreen buffers at both the GMP and VELCO substation sites. VANR suggests planting oak, Norway maple, linden, or similar trees and developing a long-term maintenance program for management of these trees.

The wooded banks of the bypassed reach and area below the project create a scenic river corridor when viewed from the Route 2A bridge, Overlook Park, and from within the gorge. Existing vegetation tends to be overgrown with a mixture of medium size trees and invasive species in the area near the powerhouse and along the south bank of the bypassed reach. GMP proposes to maintain the existing landscaping and to selectively cut back vegetation in the area around the powerhouse.

VANR requested that GMP conduct selective clearing along both banks of the river to favor species like oak and ash and allow more light for birches and cedars. In addition, VANR recommends mowing open areas to control invasive species such as poison ivy and to improve project aesthetics.

Based on our site visit and review of available information, we believe that there is a need for overall forest improvement and coordinated landscape management at the Essex No. 19 Project. Development and implementation of a long-term landscape management program would improve the aesthetic quality and increase visual enjoyment for viewers of the project due to the

healthy growth and appearance of new and existing vegetation and limiting encroachment of invasive species such as sumac, poison ivy, and alder. Landscaping of project facilities would soften the appearance of the chain link fences surrounding the laydown area and project substation and create a less industrial look. GMP has already provided some plantings at the substation in consultation with the village of Essex Junction and a landscape architect. We recommend that GMP consult with a qualified landscape architect, the Vermont Department of Forest, Parks, and Recreation, and the Department of Environmental Conservation to develop a comprehensive landscape management plan for the project. This plan should be filed with the Commission for approval prior to its implementation.

We do not agree, however, that GMP should be required to provide evergreen screening at the VELCO substation located on the south side of the river by the project dam. This facility is not owned by GMP, nor is it within the project boundary. We also do not recommend plantings along Route 2A, outside the project boundary. Plantings within the boundary should be considered as part of the overall landscape management program.

Flows for Aesthetics

The most obvious element of the project, because it is located at the head of Williston Gorge at a curve on a heavily traveled road, is the dam structure. The face of the dam is 495 feet long with an average height of 45 feet. During periods of high flow in excess of the project's hydraulic capacity, GMP spills water over the crest of the dam. This occasional spillage creates visual interest for viewers. The dam is most visible, though fleetingly, to motorists using the Route 2A bridge, but also can be viewed by pedestrians on the bridge sidewalk (located only on the downstream side of the roadway), within the bypassed reach, and by boaters using the area below the project. Only a small portion of the dam is visible from Overlook Park.

The bypassed reach below the dam contains a series of small falls and pools, varying in size and appearance depending on the flow released to the bypass. This area is visible to pedestrians on the Route 2A bridge and to boaters using the area below the project. Views of the bypassed reach are limited for users of the Overlook Park area because of the configuration of the shoreline below the parking area. Direct access to the bypassed reach can be gained over the rocks below the park and by a trail

system leaving the park and continuing parallel to the river.

GMP does not propose to release any flows over the face of the dam, but will release 50 cfs in the bypassed reach for aesthetic, water quality, and fishery purposes.

VANR (1993) recommended that a minimum instantaneous flow of 167 cfs, or inflow if less, should be spilled uniformly over the dam crest at all times. VANR further suggested that if the instantaneous inflow falls below the hydraulic capacity of the turbine unit plus this spillage requirement, all flows should be spilled at the dam. In the WQC, however, VANR requires only that all flows be spilled over the dam crest when the project is not in operation (Condition C). The exception is seasonal flows needed to operate the fish passage facility.

We examined the results of GMP's aesthetic flow study conducted on August 27, 1992, which included videotape, photos, and study notes on a reasonable range of flows including 350 cfs (estimate), 275 cfs (estimate), 225 cfs (200 cfs attempted), 162 cfs (150 cfs attempted), 82 cfs (100 cfs attempted), and 55 cfs (50 cfs attempted) released over the dam into the bypassed reach. Flows were evaluated from four viewer locations: the west side of Route 2A (pedestrian), the west side of Route 2A (motorist), the east side of Route 2A (motorist), and Overlook Park.

The results of the study and our analysis indicate that the four higher flows (350, 275, 225, and 162 cfs) were all similar in aesthetic value. These flows all provided a veil of water that covered the entire dam. Flows of 82 and 55 cfs resulted in a more streaked appearance, with some whitewater but more "soft" flatwater wetting the face of the dam.

Flows in the bypassed reach below the project dam were most visible from the Route 2A pedestrian vantage point. Bypass flows are not visible to motorists on Route 2A in either direction and barely visible from Overlook Park, even at the highest flows, due to the configuration of rocks and ledges between the water and the park.

Based on our site visit and analysis of available information including the flow study, location of probable viewing points, and overall site condition, we conclude that no aesthetic flow released over the crest of the dam is required to

enhance the visual quality of the project area. While spillage over the face of the dam may be visually interesting from some vantage points, we find that the lack of dam viewing locations does not justify the significant cost of providing this type of spillage flow.

All flows in the bypassed reach provided visual interest for pedestrian viewers on the bridge and persons accessing the bypassed reach; however, the higher flows provided more dramatic whitewater between the fall and pool areas. Based on our site visit and additional data gathered during the flow study, the aesthetic quality of the bypassed reach is highest when viewed from within the gorge down close to the flowing water. From locations within the gorge, traffic noise was reduced by the

sound of the water at all flows of 82 cfs and higher. Traffic was more audible at the 55 cfs flow.

Based on these observations, we believe that a flow of 82 cfs or more released to the bypassed reach would provide visual interest and reduce the noise associated with traffic on Route 2A. These flows could be released only during the recreation season, April 15 through October 31, and only during daylight hours (approximately 12 hours/day) to provide an adequate aesthetic resource at the project. We have also noted, however, that flows in the bypass can be viewed from few locations, and it is unlikely that enough people would access the bypass to justify requiring any flow above the minimum flow (50 cfs) for fish and water quality enhancement. Furthermore, we note that VANR modified its recommendation based on settlement agreements and that local governments have specifically objected to any incremental cost specifically for aesthetic flows. Thus, we conclude that the 50 cfs flow will be acceptable and in the public interest.

c. Unavoidable adverse impacts: None.

6. Cultural Resources

a. Affected environment: The water power at this location on the Winooski River, known as Hubble Falls, was first developed in the late eighteenth century when a dam was constructed at the approximate location of the existing Essex No. 19 Project dam. After this structure was washed out in 1798, another dam was erected further upstream to power sawmills and a carding machine plant. Sometime after 1830 a timber dam was built downstream from the site of the present powerhouse. By the 1890s, this dam provided power to a sawmill and several woodworking shops, manufacturing items such as butter tubs, bobbins, piano bushings, and inkwell caps. Around the turn of the century, a small electric plant was constructed by Samuel Brownell on the north bank of the river to provide current for the various manufacturing enterprises in the area.

Between 1913 and 1917 the Winooski Valley Electric Company oversaw the construction of the Essex Junction plant. The facility, with some 10,000 hp, was described at the time as the "largest hydraulic development lying wholly within the state" of Vermont.

The constructed project meets the National Register of Historic Places (NRHP) eligibility Criterion C because it possesses distinctive characteristics of hydroelectric powerplant design and construction during the pre-World War I formative years of the industry's historic development in Vermont. The structures that contribute to the significance of the property are the dam, intake structure, penstocks, and powerhouse. These features, which date to the original construction, clearly represent the aspects of hydroelectric plant design and technology at the turn of the century in Vermont. The outdoor substation was not part of the original design or construction, and does not contribute to the property's significance.

There are no sites currently listed on the State or National Register of Historic Places in the Essex No. 19 Project area.

b. Environmental impacts: The continued operation of the Essex No. 19 Project could affect properties of archeological and/or historical significance. GMP has completed the first phase of a study to determine if there are archeological sites that are presently adversely affected by project operation. A Phase 1A study was conducted to determine potential archeological sites/areas and to lay out a program for sampling. In addition, GMP performed a water surface model and bank stability study to determine areas that may be subject to erosion from the existence and operation of the project.

During the Phase 1A study, 15 areas were identified as potentially significant for the initial scope of the Phase IB studies. Five of the fifteen sites were identified as sites possibly affected by the operation of the project. Four sites were recommended for Phase 1B investigations, and the fifth site is recommended for an intensive surface walkover. Annual monitoring for potential erosion impacts has been recommended for the remaining 10 sites.

GMP submitted copies of the "Proposed Study Plan for Archeological Phase 1B Investigations" and a draft "Cultural Resources Management Plan for Archeological and Historic Resources Impacted by the Essex No. 19 Hydroelectric Project" to Eric Gilbertson, the Vermont State Historic Preservation Officer (SHPO) on September 29, 1992. Vermont's guidelines for archeological studies require that "all scopes of work must be reviewed and approved by the Division for Historic Preservation

before the study begins." No comments or approvals on the study plan for Phase IB investigations at the Essex No. 19 Project have been received from the Vermont Division of Historic Preservation (VDHP).

To determine if significant historical or archeological properties would be affected by activities associated with the continued operation of the Essex No. 19 Project, additional archeological investigations and a final cultural resources management plan (CRMP) are needed. To ensure that the studies are completed and the provisions of the CRMP are reviewed, refined, and enacted, a Programmatic Agreement (PA) has been executed among the Commission, Advisory Council on Historic Preservation, and the VDHP (with GMP as a concurring party). The PA stipulates that a CRMP will be filed with the Commission for approval within one year of any license issued for this project. The CRMP will specify how historic properties will be managed in the project's area of potential effect during the term of the license.

c. Unavoidable adverse impacts: None.

7. Recreation Resources

a. Affected environment: The area surrounding the Essex No. 19 Project is hilly and wooded, and the project dam and powerhouse are located in the Williston Gorge. Route 2A crosses the gorge bisecting the project area just below the dam. There is residential and commercial development along Route 2A on the north and south sides of the Winooski River (Figure 10).

The larger area encompassing the impoundment is mostly undeveloped woodlands or agricultural land. Property belonging to International Business Machines (IBM) stretches for several miles along the north shore of the project impoundment. Six

miles downstream of the project the Winooski River is impounded in the Winooski Gorge by the Gorge No. 18 Project.

The river in the project area provides opportunities for fishing, flatwater and whitewater boating, swimming, picnicking, photography, and viewing. The Winooski River is one of the few rivers in Vermont that provides summer-long boating opportunities (VANR 1993a). The Winooski River flows through Vermont's most heavily populated corridor from Montpelier to Burlington.

Fishing is a popular activity in the project area. There are both warmwater and coldwater fisheries in the project area, with anglers taking smallmouth bass, yellow perch, walleye, and rainbow trout. People fish along the banks and from canoes upstream and downstream of the dam. Palmer (1991) estimates there are over 48,000 user days of shore fishing and 10,000 user days of boat fishing per year in the project area.

The Winooski River flows westward through the Green Mountains to Lake Champlain near Burlington. The river flows through pastoral settings offering over 78 miles of whitewater and flatwater boating (AMC 1989). There are 62 miles of paddling above the Essex No. 19 Project, and portage is possible around the eight upstream dams. The 15 mile stretch directly above the Essex No. 19 Project is described as a smooth course with occasional quick-water through farmland (AMC 1989).

Two sections of river below the Essex No. 19 powerhouse - both approximately 100 yards long - are classified as Class II on the International Scale of River Difficulty. The first section is directly below the powerhouse, and the second section is just beyond the Winooski River Muddy Brook confluence, approximately 1.25 miles downstream of the project (GMP 1992). The remaining four miles of river downstream to the Gorge No. 18 Project is classified as Class I and quick-water.

There is a difficult portage around Gorge No. 18 dam, then one mile of quick-water before the Winooski One Project dam. Below Winooski One Project dam there are nine miles of easy paddling to Lake Champlain (AMC 1989).

During the normally high spring river flows, the river sections downstream of the Essex No. 19 powerhouse are not a significant whitewater resource. There are 10 other Class II river areas within approximately a one-hour drive from the Essex No. 19 Project (AMC 1989). The Mad River, the Lamoille River, and the area of the Winooski River below Middlesex dam are nearby runs that are highly rated for spring-time boating by whitewater enthusiasts (GMP 1992).

Local canoeists and kayakers use the project tailwaters and the reach beyond the Muddy Brook confluence (1.25 miles

downstream) for whitewater boating (VANR 1993b). An unknown number of boaters currently pass through the Essex No. 19 Project area. However, Palmer (1991) estimated that there are 14,906

user days of flatwater canoeing and 3,975 user days of whitewater boating per year in the vicinity of the project.

Prior to the construction of Essex No. 19 dam and powerhouse, the Winooski River in the Williston Gorge was probably used for fishing, swimming, and viewing. The 12-foot cascades could be viewed from in the gorge and from the bluffs above the falls.

The two existing recreation facilities within the project boundaries are Overlook Park and the south-side canoe portage (see Figure 10). Overlook Park is on the south bluff overlooking the powerhouse, Route 2A bridge, and the project dam. There is a gravel parking area off of Route 2A and picnic tables and restroom facilities. An undeveloped trail is used for hiking and fishing along the southern bank of the river, downstream of the dam. Improvements to Overlook Park are needed because of current heavy use. Any improvements should be made while maintaining safety and sanitary conditions and preventing environmental degradation (VANR 1993a).

The south-side canoe portage has a take-out approximately 200 feet upstream of the dam. It is designated with signs and the route travels through an open field adjacent to a powerline, past a VELCO substation, and down the substation driveway. The portage trail crosses Route 2A at Overlook Park. From Overlook Park, the trail extends along a rocky footpath to a point downstream of the project. This portage is well marked, but it is over 3,000 feet long, steep, and often muddy (VANR 1993b).

Unrestricted, but undeveloped, access on the north side of the river is also available from the powerhouse driveway around the powerhouse and down to the tailrace of the powerhouse (Figure 10). Whitewater boaters and canoeists launch their boats, and anglers fish along the north shore of the river below the powerhouse.

The project's 352-acre impoundment extends upstream approximately seven miles and is used for flatwater boating and fishing from late May through October. The State of Vermont Agency of Transportation maintains a parking area and car-top boat launch eight miles upstream of the dam on the south shore of the impoundment. A second facility is a small pull-off and canoe put-in on farm land on the north bank in the town of Jericho, between five and six miles upstream of the Essex No. 19 Project (VANR 1993b). All formal boat launches are located near the east end of the impoundment. Eight or nine additional informal access sites are situated around the impoundment, indicating use of the impoundment by boaters.

Two parks in the vicinity of the Essex No. 19 Project provide recreation facilities. The village of Essex Junction maintains Cascade Park on the north bluff above the project, one-quarter mile downstream of the project powerhouse. Cascade Park has ball fields, courts, picnic areas, and parking, but does not offer access to the river. However, a foot path to the river is under construction. GMP has offered to construct a foot path to link the Cascade Park path with the proposed canoe portage at the project powerhouse (Appendix A). The Winooski Valley Park District maintains Muddy Brook Park on the south bank approximately one mile downstream of the dam. Muddy Brook Park has picnic and parking areas and provides access to the Winooski River.

The village of Essex Junction maintains hiking and bicycling trails in the vicinity of the project. Work has begun on extending the trails through the Essex No. 19 Project area as part of the Chittenden County Greenway Plan (VANR 1993b). The Winooski Gorge, six miles downstream of the Essex No. 19 Project, attracts numerous sightseers to the area. Located approximately four miles overland to the west or 17 river miles north-west, Lake Champlain provides numerous opportunities for recreational water sports.

b. Environmental impacts: GMP proposes to construct, operate, and maintain the following recreation enhancements at the Essex No. 19 Project:

- ù improvements to Overlook Park including a prominent road sign, parking improvements, landscaping, and trail improvements to the south bank along the bypassed reach;

- ù an improved tailrace trail, leading from the powerhouse to the north bank below the powerhouse;

- ù a new north portage route including a take-out, a put-in, and a marked trail;

- ù a trail easement to be provided to the village of Essex Junction for the construction of a bicycle/pedestrian trail, north of the project area; and

- ù a telephone number for boaters to get information on anticipated river flows.

All trails GMP proposes, other than the north portage trail, would accommodate disabled persons, meeting Challenge Level 1 criteria as defined by the National Center for Accessibility. GMP also proposes to provide sanitary facilities at Overlook Park that would be accessible to the physically disabled.

GMP proposes to make parcels of land available for recreation trail linkages through GMP property from the IBM property to River Street and along the south bank of the Winooski River downstream of the Route 2A bridge (see Figure 10). Easements would be issued to the village of Essex Junction and the town of Williston at their request. GMP is proposing easements so existing bicycle and hiking trails can be extended. GMP is not proposing to fund the construction of the trail (GMP 1992).

GMP does not propose any overnight canoe camping facilities in the project area. VANR (1993b) suggests a downstream river island for an overnight camping area for canoeists. GMP would allow primitive camping on this island (VANR 1993b). Because these facilities would be beyond the project boundaries, the staff does not recommend and has not adopted the suggestion. GMP and VANR could certainly reach an independent agreement concerning such facilities.

VANR (1993b) generally concurs with GMP's plans for new recreation facilities at the project. In addition, VANR (1993a, 1993b, 1994) requests the construction of a car-top boat access with parking at the west end of the project impoundment, a public access site at the laydown area overlooking the dam, a plan for flow releases for boating, an interpretative sign, and the expansion of project boundaries to accommodate recreation facilities.

We reviewed GMP's proposal and believe that the proposed recreation improvements, including trail linkages/easements for trails, would enhance public use of the area. We recommend that GMP develop a revised recreation plan, in consultation with the Vermont Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the villages of Essex Junction and Williston, to include GMP's proposed recreation improvements and our recommendations that are detailed below. GMP should file its revised recreation plan with the Commission.

Impoundment Access

GMP states that the canoe portage proposed for the northern shore of the impoundment would meet the needs for boating access,

and that there is no support or request by interest groups or others for a car-top boat put-in area in the impoundment (VANR 1993b). Interior (1993) and Trout Unlimited (1993) request GMP to provide access to the impoundment, and VANR (1993b) recommends that GMP construct and maintain a car-top boat launch in the western two miles of the impoundment.

Based on our site visit and the recreation use study commissioned by GMP (Palmer 1991), we believe there is sufficient

demand to warrant the construction of an additional impoundment car-top boat access site with parking for four to six vehicles. It appears that space is available within project boundaries at several locations. Therefore, we recommend that GMP find a site for, plan, construct, and maintain an impoundment access site with parking for people with car-top boats. GMP should consult with the Recreation Section of the Vermont Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the villages of Essex Junction and Williston on the location and planning of the facility and should file its plan with the Commission as part of its revised recreation plan.

Laydown Area Recreation Site

GMP (1993) does not propose public access to the laydown area to serve as an overlook for upstream and bypass views because the area is a work yard essential to project operation and use of the area would subject the public to unsafe conditions. VANR (1994) suggested GMP consider development of the laydown area for recreation.

Based on our site visit, we believe that access to the laydown area could endanger public safety. The area is close to the project intakes and would be difficult to access because of the heavy traffic on Route 2A. Therefore, we do not recommend that GMP develop a public access site in the project laydown area.

Flow Releases for Boating

A representative of the Northern Vermont Canoe Cruisers tested various flow releases below the Essex No. 19 Project. The representative canoed the Class II sections in the tailrace and beyond the Muddy Brook confluence downstream of the project (VANR 1993b). He assessed the usable range of beginner/instructional flows to be between 750 and 1,700 cfs with optimal flows ranging from 1,000 to 1,500 cfs.

GMP has not proposed flows for boating below the project. VANR (1993a) suggests that GMP should draft a plan for whitewater flow releases.

We evaluated VANR's request for a plan for whitewater flow releases and concluded that special flow releases should not be provided. The peaking of the Essex No. 19 Project and the minimum flow requirements we recommend for aquatic resources (see Section V.C.3, Fishery Resources) would offer opportunities for boaters, while limiting conflicts with fish and other resource values.

The 750-foot bypassed section of the Winooski River possesses little potential for boating and contains numerous

natural hazards. The best location for whitewater boating is downstream of the tailwater of the Essex No. 19 powerhouse.

Using USGS data, we estimated flows downstream of the project under GMP's proposed mode of operation and our recommended minimum flow requirements for aquatic resources. Under this scenario, flows downstream of the powerhouse would exceed 750 cfs from 30 to 100 percent of the time on a monthly basis from April through October (Table 6).

Table 6. Percent of Time Flows Exceed 750 cfs (Source: USGS, Staff)

Month	Number of Days*	Percent Exceedance
April	30	100
May	29	95
June	22	75
July	15	50
August	10	30
September	9	30
October	11	35

*Note: This is the number of days in the month on which the average daily flow exceeded 750 cfs at USGS Gage No. 04290500.

Therefore, we conclude that special flow releases are not appropriate and we do not recommend providing them.

Interpretive Signs

GMP does not propose to install an interpretive sign at the Essex No. 19 Project. VANR (1993a) requests that GMP provide an interpretive sign. We agree with VANR and believe that because of the historical significance of the project area an interpretive sign would enhance people's recreation experience. The sign should convey information about the natural history of the Winooski River, the history of the project, and the historic architecture and pre-history of the project area. We recommend that GMP design and install an interpretive sign after consulting with the Vermont Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the villages of Essex Junction and Williston on its design and location. GMP should include its plan for an interpretative sign in its revised recreation plan to be filed with the Commission.

Project Boundaries

Recreation facilities and access in the project area is limited by steep banks and existing land uses. GMP has not proposed to expand the boundaries at the project. VANR (1993b) requests that GMP extend the project boundaries in order to provide a reasonable level of recreation opportunities.

We agree that the size of the project area is limited, which restricts the development of recreation facilities. However, the recreation enhancements GMP has proposed, plus the enhancements we recommend, would provide for recreation facilities that are appropriate for this section of the Winooski River. Therefore, we do not recommend expanding the project boundaries.

Powerhouse Parking Area

GMP does not propose parking for the proposed boat put-in near the powerhouse. GMP (1991) cites concerns about safety and vandalism as reasons for not proposing a parking area. We believe there is a need for access near the project powerhouse for whitewater boaters, canoeists and anglers who use the Winooski River downstream of the Essex No. 19 Project. We recommend that GMP continue to maintain an access road near the

project powerhouse.

GMP (1992) stated that a parking area near the powerhouse would attract parties and vandalism and accidents would likely occur. We recommend that GMP install a gate that would be closed across the powerhouse road at night. We also recommend that GMP post a sign near the access road informing people of the time the gate would be locked. GMP should consult with the Recreation Section of the Vermont Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the villages of Essex Junction and Williston and include the plans for the gate and signs in the revised recreation plan it files with the Commission.

Access for the Disabled

GMP did not receive any comments from the public or from agencies about disabled access at the Essex No. 19 Project. However, GMP is ultimately responsible for complying with the Americans with Disabilities Act of 1990.

Currently, there are no developed recreation facilities at the Essex Project that allow access for the disabled. All trails GMP proposes, other than the north portage trail, would accommodate disabled persons, meeting Challenge Level 1 criteria as defined by the National Center for Accessibility. GMP also proposes to provide sanitary facilities at Overlook Park that would be accessible to the disabled. GMP did not receive any comments from the public or from agencies about disabled access at the Essex Project.

Public Safety

Anglers and boaters near the discharge of the turbines could be subjected to turbulent and changing water levels during changes in plant operation. GMP offered to review options to control the rate at which the transition between flows is made (VANR 1993b). In the WQC, Condition F, VANR (1993b) requires that GMP develop a ramping plan for controlling the rate of transition between generation and ponding flows. We believe improved access to the tailwater area warrants additional safety precautions. In addition to the continued operation of the existing audible message and warning light system, we recommend GMP install and maintain signs on both sides of the river, posted along the shore for 100 yards downstream of the powerhouse. These signs would help alert people to the dangers of fishing and

boating close to the powerhouse. As part of its revised recreation plan, GMP should plan for the installation of safety signs below the project powerhouse.

We do not agree with VANR that a ramping plan is needed to protect anglers and boaters. Given required and recommended changes in flows and plant operation, conditions in the river below the tailrace should be less extreme than at present. Review of tailrace rating and IFIM transect information indicates that the greatest change in water depth would be about 3 feet, with water levels rising less than 1 foot in most locations. Based on these data and implementation of the measures discussed above, we do not recommend that GMP develop a ramping plan. It should be noted that, while the staff does not recommend a ramping plan, such a plan is a lawful condition of the WQC and must be developed by GMP. A pertinent article is included in the license order.

c. Unavoidable adverse impacts: None.

D. No-Action Alternative

Under the no-action alternative the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

VI. DEVELOPMENTAL ANALYSIS

In this section we analyze the project's use of the Winooski River's water resources to generate hydropower, estimate the economic benefits of the proposed project, and address the economic effects on the project of various measures considered in the EA for the protection or enhancement of environmental and recreational resources.

A. Power and Economic Benefits

The main purpose of the project is to provide power for GMP's customers. With an installed capacity of 7.2 MW, the project generates about 36.319 GWh annually. This amount represents the project's average annual generation for a 30-year period, from 1958 to 1988, prior to GMP's filing for relicense. This type of operation agrees with GMP's original license, and it

represents the appropriate base case for this project.

GMP does not propose to increase the project's installed capacity. Proposed enhancements for aesthetic, recreation, and other environmental resources, however, would affect project economics as a result of construction costs, operation and maintenance costs, and lost generation.

To analyze the economics of the project, we computed its net benefits using GMP's estimated average annual generation, and its estimated annual operation and maintenance costs for the project.

The economic analysis covers a specific period of time. That period is based on the expected license term, which can extend up to 50 years. We use 30 years for the Essex No. 19 analysis, because this is the license term the Commission usually provides in relicenses for projects that would not include new construction or be required to implement major environmental enhancements.

Peak and off-peak generation values for the Essex No. 19 Project were developed using 10 years (1965 through 1974) of average daily flow data obtained from the USGS gaging station on the Winooski River, approximately 1.7 miles downstream of the project. In the application for relicense, GMP defines peak generation for the project as that generation between 6:00 AM and 10:00 PM (two-thirds of a day) for all days in January through March and December and weekdays from April through November. All other generation is defined by GMP as off-peak generation.14/ Our analysis assumes that two-thirds of the generation developed from the average daily flow data is peak generation and one-third of the generation is off-peak generation. We believe that this assumption sufficiently approximates the project peak and off-peak generation allowing for a comparison of alternative flow proposals.

We based our analysis of the project's net benefits on the following:

14/ Source: GMP Application.

ONE TIME COSTS

Construction costs of new capacity None
Other costs
$5,628,55015/

ANNUAL COSTS
Operation and maintenance costs
$443,71916/
Operation and maintenance escalation rate 3.0
percent17/
Discount rate 10.96 percent18/
Period of analysis 30 years
Term of financing 30 years
Levelized power value, peak 140.03
mills/kWh19/
Levelized power value, off-peak 90.13
mills/kWh9

Based on this information, the existing project (without enhancements proposed by either applicant, agencies, or the staff) has positive net benefits of $3,289,900 (based on 30,388 MWh of peak generation and 5,930 MWh of off-peak generation) annually levelized over 30 years when compared to the alternative power source. This net benefit is equivalent to 90.58 mills per kilowatt-hour (mills/kWh).

B. Cost of Environmental Enhancement Measures

In this section we look at the net economic effect on rate payers of the recommended enhancements made by the applicant, agencies, and others for protecting or enhancing nondevelopmental resources in the project area. Measures would affect the project economics in three ways:

15/ This is the net investment escalated at 3 percent to 1994 dollars ($4,068,526) and application and AIR preparation costs ($1,560,024).

16/ Source: GMP Application.

17/ Source: Staff estimate.

18/ Source: GMP Application.

19/ We based the levelized power value on GMP's statement of avoided energy and capacity costs provided through the year 2033 included in Exhibit H of the application. GMP derived these avoided costs from actual 1991 experiences for existing energy sources and published those values in their 1991 Integrated Resource Plan. We levelized the resulting values over a 30-year license period.

- changing the minimum flow schedule of operation, and thereby, altering generation;

- increasing the project's cost by the construction and operation of new facilities; and

- reducing project generation by diverting flows for other purposes.

We consider nine measures that could reduce the economic benefits of the project: bypass flows, minimum flow schedule of operation, aesthetic enhancements, recreational enhancements, downstream fish passage, upstream fish passage, rubber dam flashboard system, archeology studies, and miscellaneous measures not included elsewhere.

1. Bypass Flows

GMP proposed no minimum bypass flow at the Essex No. 19 Project. GMP proposed to continue to spill all inflows when river flows are less than 220 cfs. Interior recommends that GMP provide a continuous minimum flow of 50 cfs or inflow, whichever is less, to the project bypass. VANR's amended WQC requires GMP to provide a minimum year-round bypass flow of 50 cfs.

Our analysis shows that a year-round 50 cfs bypass flow would decrease project benefits by about $173,500 annually (based on lost peak generation of 1,114 MWh and lost off-peak generation of 194 MWh) or about 4.8 mills/kWh, when levelized over a 30-year license period.

We also looked at providing a 100 cfs aesthetic bypass flow from April 15 through October 31 for 12 hours a day. This evaluation assumes no other flow is being released and all 100 cfs must be provided for aesthetic enhancement. Our analysis shows that this 100 cfs aesthetic flow in the bypass would decrease project benefits by about $34,600 annually (based on lost peak generation of 247 MWh) or 1.0 mill/kWh, when levelized over a 30-year license period.

2. Minimum Flow Schedule of Operation Downstream of the Project

Minimum flow schedules of operation at the Essex No. 19 Project are proposed to enhance aesthetics, fish habitat, water quality, and recreation uses.

GMP proposed to operate Essex No. 19 using the following

minimum flow schedule downstream of the project:

run-of-river	April 1 through May 15
1,000 cfs*	May 16 through May 31

340 cfs*
June 1 through March 31
* - or inflow, whichever is less.

Our analysis shows that changing to this proposed minimum flow schedule of operation downstream of the project would decrease project benefits by about $126,400 annually (based on lost peak generation of 2,351 MWh and an increase in off-peak generation of 2,250 MWh) or about 3.5 mills/kWh, when levelized over a 30-year license period.

Interior proposed that GMP operate the Essex No. 19 Project in accordance with the following minimum flow schedule downstream of the project:

run-of-river	April 1 through May 15
1,000 cfs*	May 16 through June 15
500 cfs*	
	June 16 through March 31

* - or inflow, whichever is less.

Interior further recommended that GMP maintain a maximum flow of 1,000 cfs from June 16 through September 30 at the Essex No. 19 Project.

Our analysis shows that changing to this minimum flow schedule of operation downstream of the project would decrease project benefits by about $194,800 annually (based on lost peak generation of 3,778 MWh and an increase in off-peak generation of 3,708 MWh) or about 5.4 mills/kWh, when levelized over a 30-year license period.

VANR's amended WQC conditions recommend that the project be operated in accordance with the following minimum flow schedule downstream of the project:

run-of-river	April 1 through May 15
1,000 cfs*	May 16 through June 15
450 cfs*	
	June 16 through March 31

* - or inflow, whichever is less.

The amended WQC recommends specific maximum allowable flow in each calendar day as shown in Table 7.

Table 7. Maximum Daily Flow Fluctuations for Peaking (Source: Amended WQC)

Period	Low Flow for Calendar Day (cfs)	Maximum Allowed Fluctuation in Flow (cfs)
April 1 - May 15		None (run-of-river)
May 16 - June 15	< 1,000	None (run-of-river)
	> 1,000	No Limit
June 16 - September 30	< 450	None (run-of-river)
	> 450	500
October 1 - March 31	< 450	None (run-of-river)
	> 450	No Limit

Our analysis shows that changing project operation to the VANR minimum flow schedule of operation below the project would decrease project benefits by about $174,800 annually (based on lost peak generation of 3,368 MWh and an increase in off-peak generation of 3,293 MWh) or about 4.8 mills/kWh, when levelized over a 30-year license period.

We considered operation of the Essex No. 19 Project in accordance with the following minimum flow schedule:

run-of-river	April 1 through May 15
1,000 cfs*	May 16 through June 15
500 cfs*	June 16 through June 30
340 cfs*	July 1 through September 30
500 cfs*	
	October 1 through March 31

* - or inflow, whichever is less.

Our analysis shows that changing to this minimum flow schedule of operation would decrease project benefits by about $165,600 annually (based on lost peak generation of 3,175 MWh and an increase in off-peak generation of 3,095 MWh) or about 4.6 mills/kWh, when levelized over a 30-year license period.

We evaluated the economics of lost generation due to various flow schedules. Table 8 presents a summary of the results. The staff's proposal presented does not include the 100 cfs aesthetic flow discussed earlier. Change in generation is the change in peak and off-peak generation from the base condition of 30,388 MWh average annual peak generation and 5,930 MWh average annual off-peak generation. A positive sign indicates an increase in

generation and a negative sign indicates a decrease in generation.

Table 8. Decrease in Project Levelized Annual Benefits Due to Flow Schedules (Source: Staff)

	Change in Generation		Decrease in Annual Benefits	
	Peak (MWh)	Off-Peak (MWh)	(Dollars)	For Average Annual Generation (mills/kWh)
Applicant's proposal	-2,351	+2,250	126,400	3.48
Interior's proposal	-3,778	+3,708	194,800	5.36
VANR amended WQC requirement	-3,368	+3,293	174,800	4.81
Staff's proposal	-3,175	+3,095	165,600	4.56

3. Aesthetic Enhancements

GMP proposes landscaping at the laydown area and selective clearing at the powerhouse as aesthetic enhancements for the Essex No. 19 Project.

The total one-time cost provided by GMP of implementing these aesthetic enhancements would be $14,400 in 1994 dollars. Our analysis shows that the proposed aesthetic enhancements would decrease project benefits by $2,300 annually or about 0.06 mills/kWh, when levelized over a 30-year license period.

We recommend that GMP, in consultation with a registered landscape architect, VANR, and DEC, develop a comprehensive landscape management plan for the Essex No. 19 Project. This plan should be submitted to the Commission for approval prior to implementation.

We estimated the cost of implementing these additional aesthetic enhancements and have included an allowance of $29,500 in 1994 dollars for them. Our analysis shows that these proposed aesthetic enhancements would decrease project benefits by $4,800 annually or about 0.14 mills/kWh, when levelized over a 30-year license period.

We do not recommend the release of an aesthetic flow over the face of the dam because we find that the small increase in

aesthetic value is not justified by the lack of dam viewing locations and the significant cost of providing this type of spillage flow (approximately $596,000 decrease in levelized annual net benefits for a 167 cfs flow released over the dam).

4. Recreation Enhancements

GMP proposes the following recreation enhancements for the Essex No. 19 Project:

- ù improvements to Overlook Park including a prominent road sign, parking improvements, landscaping, and trail improvements to the south bank along the bypassed reach;

- ù an improved tailrace trail, leading from the powerhouse

to the north bank of the river below the powerhouse;

- ù a new north portage route including a take-out, a put-in, and a marked trail;

- ù an easement on GMP land for a recreation trail linkage to the planned Essex Junction trail system; and

- ù a telephone flow notification system that informs callers as to approximate volumes of water being released at the project.

The total one-time cost provided by GMP of implementing these recreation enhancements would be about $107,500 in 1994 dollars. Our analysis shows that these proposed recreation enhancements would decrease project benefits by about $17,400 annually or about 0.5 mills/kWh, when levelized over a 30-year license period.

VANR's WQC requires, in addition to those recreation enhancements proposed by GMP, the construction of an impoundment access site and interpretive signage at the Essex No. 19 Project.

We estimate that the cost of this additional recreation enhancement would be about $10,500 in 1994 dollars. Our analysis shows that these proposed recreation enhancements would decrease project benefits by about $1,700 annually or about 0.05 mills/kWh, when levelized over a 30-year license period.

We recommend the following additional recreation enhancements:

- ù an access road at the powerhouse, including a security gate; and

- ù safety signage.

We estimate that the cost of these additional recreation enhancements would be $13,500 in 1994 dollars. Our analysis shows that these proposed recreation enhancements would decrease project benefits by about $2,200 annually or about 0.06 mill/kWh, when levelized over a 30-year license period.

Table 9 summarizes the decrease in levelized net annual

benefits for the recreation enhancements proposed by GMP, VANR, and the staff.

Table 9. Decrease in Project Levelized Annual Benefits Due to Recreation Enhancements (Source: Staff)

Recreation Enhancement	Applicant's Proposal (Dollars)	VANR WQC Requirements (Dollars)	Staff's Proposal (Dollars)
Improvements at Overlook Park	11,100	11,100	11,100
Improved Tailrace Trail	800	800	800
North Canoe Portage	2,000	2,000	2,000
Easement to Essex Junction Trail System	2,600	2,600	2,600
Telephone Flow Notification System	900	900	900
Impoundment Access Site		1,600	1,600
Interpretive Signage		100	100
Access Road at the Powerhouse			2,000
Safety Signage			200
Total	17,400	19,100	21,300

5. Downstream Fish Passage

VANR's WQC and Interior require the construction of a downstream fish passage facility by spring 1996. The economic impact of constructing a downstream fish passage facility would include construction costs, operation and maintenance costs, and lost generation due to passage flows.

GMP provided the cost of a downstream fish passage device in Attachment D-2 of the application for relicense dated December

23, 1991. GMP's proposed downstream fish passage facility releases the fish into the tailrace area via an existing exciter

penstock. We estimate a lost peak generation of 165 MWh and a lost off-peak generation of 82 MWh per year based on a flow of 50 cfs through the downstream passage facility from April 1 through June 15 and from September 15 through December 15, as required in the WQC.

We base our analysis of GMP downstream fish passage economics on the following data:

Construction costs: $273,20020/
Construction period: 0.25 years
Construction escalation rate: 2.5 percent
Annual operation and maintenance costs: $94021/
Operation and maintenance escalation rate: 3.0 percent
Estimated operation start: March 1996
Levelized peak power value: 147.31 mills/kWh22/
Levelized off-peak power value: 94.24 mills/kWh13
Lost annual peak generation: 165 MWh
Lost annual off-peak generation: 82 MWh

Our analysis shows that the construction of the GMP downstream fish facility passage would decrease project benefits by about $72,000 per year or about 2.0 mills/kWh, when levelized over a 30-year license period.

We recommend a downstream fish passage facility that releases the fish at the base of the dam. GMP has provided a cost of $300,000 in 1991 dollars for this alternative in written comments on the EA scoping document that was issued on January 19, 1994. We estimate a lost peak generation of 165 MWh and a lost off-peak generation of 82 MWh per year based on a flow of 50 cfs through the downstream passage facility from April 1 through June 15 and from September 15 through December 15, as required in the WQC.

20/ Source: GMP Application cost of $250,000 in 1991 dollars escalated to 1994 dollars.

21/ Source: Staff estimate. Cost is in 1994 dollars.

22/ We based the levelized power value on GMP's statement of avoided energy and capacity costs provided through the year 2033 included in Exhibit H of the application. GMP derived these avoided costs from actual 1991 experiences for existing energy sources and published those values in its 1991 Integrated Resource Plan. We levelized the resulting values over the 30-year license period.

We base our analysis of staff-recommended downstream fish passage economics on the following data:

Construction costs: $327,80023/
Construction period: 0.25 years
Construction escalation rate: 2.5 percent
Annual operation and maintenance costs: $94024/
Operation and maintenance escalation rate: 3.0 percent
Estimated operation start: March 1996
Levelized peak power value: 147.31 mills/kWh13
Levelized off-peak power value: 94.24 mills/kWh13
Lost annual peak generation: 165 MWh
Lost annual off-peak generation: 82 MWh

Our analysis shows that the construction of the staff-recommended downstream fish passage facility would decrease project benefits by about $52,000 per year or about 1.4 mills/kWh, when levelized over a 30-year license period. Operation of the downstream fish passage facility would result in a loss in generation as shown above. We estimate that the value of this lost generation would be about $29,000 annually or about 0.8 mill/kWh, when levelized over the 30-year license period. Since the 50 cfs minimum flow previously discussed could be used as the fish passage flow, only the construction cost would be incurred for downstream fish passage.

6. Upstream Fish Passage

GMP proposes to enter into an agreement with the Winooski Trap and Truck Program to provide for upstream fish passage. GMP has provided an annual cost of $41,800 in 1994 to implement its portion of this agreement in the written comments on the EA scoping document. Our analysis shows that the implementation of the trap and truck agreement would decrease project benefits by $55,400 annually (or about 1.5 mills/kWh) when levelized over a 30-year license period.

7. Rubber Dam Flashboard System

GMP proposed in its application construction of a rubberized flashboard system on the two straight portions of the dam. Therefore, we consider the economic impact of constructing a rubber dam flashboard system, which involves construction costs and operation and maintenance costs.

23/ Source: GMP estimated cost of $300,000 in 1991 dollars escalated to 1994

dollars.

24/ Source: Staff estimate.

GMP provided the cost of a rubber dam flashboard system in Attachment D-2 of the application for relicense on December 23, 1991. The WQC identifies leakage at the project to be approximately 45.6 cfs. Of this, the majority of the leakage, 36.8 cfs, was through the flashboards; 1.8 cfs was estimated as structural dam leakage; and 7.0 cfs was gate leakage at the powerhouse. The two straight portions of the dam constitute approximately 80 percent of the total dam length. The economic analysis for the rubber dam flashboard system assumes an increase in annual generation by eliminating 80 percent of the flashboard leakage.

We base our analysis of the GMP rubber dam flashboard system economics on the following data:

Construction costs: $633,80025/
Construction period: 0.25 years
Construction escalation rate: 2.5 percent
Annual operation and maintenance costs: $1,84026/
Operation and maintenance escalation rate: 3.0 percent
Estimated operation start: March 1996
Levelized peak power value: 147.31 mills/kWh13
Levelized off-peak power value: 94.24 mills/kWh13
Gain in annual peak generation: 891 MWh
Gain in annual off-peak generation: 155 MWh

Our analysis shows that the construction of the rubber dam flashboard system would increase project benefits by $31,000 per year (based on a gain in peak generation of 891 MWh and a gain in off-peak generation of 155 MWh) or about 0.9 mill/kWh, when levelized over a 30-year license period.

We recommend a rubber dam flashboard system across the full length of the dam. GMP has provided a cost of $860,000 in 1994 dollars for this alternative in its reply and comments on the terms, conditions, and prescriptions of the license. The economic analysis for the staff-recommended rubber dam flashboard system assumes an increase in annual generation by eliminating all of the flashboard leakage.

We base our analysis of the staff-recommended rubber dam flashboard system economics on the following data:

25/ Source: GMP Application cost of $580,000 in 1991 dollars was escalated to 1994 dollars.

26/ Source: GMP Application. Cost is in 1994 dollars.

Construction costs: $860,00027/
Construction period: 0.25 years
Construction escalation rate: 2.5 percent
Annual operation and maintenance costs: $1,84018
Operation and maintenance escalation rate: 3.0 percent
Estimated operation start: March 1996
Levelized peak power value: 147.31 mills/kWh13
Levelized off-peak power value: 94.24 mills/kWh13
Gain in annual peak generation: 1,114 MWh
Gain in annual off-peak generation: 194 MWh

Our analysis shows that the construction of the rubber dam flashboard system would increase project benefits by $29,000 per year (based on a gain in peak generation of 1,114 MWh and a gain in off-peak generation of 194 MWh) or about 0.8 mill/kWh, when levelized over a 30-year license period.

27/ Source: Staff estimate. Cost is in 1994 dollars.

8. Archeology Studies

The State of Vermont's "Guidelines for Archeological Studies" requires that "all scopes of work (for archeological studies) must be reviewed and approved by the Division of Historic Preservation before the study begins." GMP has yet to receive approval for either the Essex No. 19 "Proposed Study Plan for Archeological Phase 1B Investigations" or comments on the draft "Cultural Resources Management Plan for Archeological and Historic Resources Impacted by the Essex No. 19 Hydroelectric Project."

We estimate that the cost of developing the Phase 1A archeology study downstream of the project would be $20,000 in 1994 dollars. Our analysis shows that this study would decrease project benefits by $3,200 annually or about 0.1 mills/kWh, when levelized over a 30-year license period.

We estimate that the cost of developing the Phase 1B study upstream of the project would be $55,000 in 1994 dollars. Our analysis shows that this study would decrease project benefits by $8,900 annually or about 0.25 mill/kWh, when levelized over a 30-year license period.

9. Miscellaneous Measures

Several other measures required by VANR or recommended by the staff would have an impact on project benefits. These

measures include:

- ù develop a contingency plan for the prevention of walleye mortality in the bypass (VANR);

- ù plan and implement monitoring of minimum flow releases and reservoir elevation;

- ù provide a plan for downstream fish passage and monitor effectiveness of the facility; and

- ù the following miscellaneous plans and items: (1) a debris removal plan; (2) a ramping rate plan; (3) a plan for the release of bypass flows; (4) a plan to comply with the required minimum flows downstream; and (5) the turbine rating curves.

We estimate that the cost of developing the walleye contingency plan would be $5,000 in 1994 dollars. Our analysis shows that the development of this plan would decrease project benefits by $800 annually or about 0.02 mills/kWh, when levelized over a 30-year license period.

We estimate that the cost of developing the plan for monitoring instantaneous flow releases would be $10,000 to develop the plan and $10,000 a year to implement the plan in 1994 dollars. Our analysis shows that the development of this plan would decrease project benefits by $14,900 annually or about 0.4 mill/kWh, when levelized over a 30-year license period.

We estimate that the cost of developing the downstream fish passage plan and of monitoring the facility's effectiveness would be $50,000 in 1994 dollars. Our analysis shows that this would decrease project benefits by $8,000 annually or about 0.20 mill/kWh, when levelized over a 30-year license period.

In addition, GMP will have to develop five miscellaneous plans. We estimate that the cost of providing the miscellaneous plans and items would be $10,000 in 1994 dollars. Our analysis shows that the development of these plans would decrease project benefits by $1,600 annually or about 0.04 mill/kWh, when levelized over a 30-year license period.

C. No-Action Alternative

We have also evaluated the no-action alternative in the EA. Under the no-action alternative the project would continue to operate under the terms and conditions of the original license, and there would be no change to the existing environmental setting or project operation. Therefore, there are no incremental costs for this alternative.

Costs associated with the project's operation and maintenance would continue to be varied, but the project's net benefits would remain essentially unchanged compared to the project's current operation.

D. Impacts on Downstream Projects

There are two hydroelectric projects downstream of the Essex No. 19 Project; the Gorge No. 18 Project at RM 11.4 and the Winooski One Project at RM 10.4. In this section we discuss the impacts of Essex No. 19 operation changes and minimum flows on the economics of these projects.

1. Impacts on the Gorge No. 18 Project

The Gorge No. 18 Project is a daily cycle project. The facility is used in a peaking mode in normal flow conditions and in a base-load mode during high-flow conditions.

In its letter dated October 1992, GMP states that "The existence of Essex No. 19 merely impacts the time during any given day in which Gorge No. 18 physically draws down its impoundment or stores incoming water." This means that any

changes to the existing outflow patterns at the Essex No. 19 Project could result in some shifting of generation from on-peak to off-peak production at the Gorge No. 18 Project. This generation shifting would result in a decrease in project economic benefits because the on-peak generation is more valuable than the off-peak generation.

In its comments on the DEA, submitted September 6, 1994 (see Appendix A), GMP quantified the lost levelized annual revenues at the Essex No. 19 and Gorge No. 18 projects. The analysis is based on the same flow conditions adopted in the EA for Essex No. 19 and the assumption that the same flow conditions are applied at Gorge No. 18. GMP's analysis indicates that there is a greater loss of levelized annual energy revenues at the Gorge No.

18 Project ($290,800) than there is at the Essex No. 19 Project ($114,400). Conversely, its shows a greater loss in levelized annual capacity revenues at the Essex No. 19 Project ($217,500) compared to Gorge No. 18 ($47,100). Combining the lost energy and capacity revenues results in approximately the same total levelized annual revenue loss at both projects ($337,900 at Essex No. 19 compared to $331,900 at Gorge No. 18). The levelized annual revenue loss as a percentage of total levelized annual revenues at Gorge No. 18 is estimated to be 15.8 percent.

2. Impacts on the Winooski One Project

The Winooski One Project operates in run-of-river mode. It has a hydraulic capacity range of 75 to 3,000 cfs.

The minimum flow releases stipulated in the settlement agreement for the Gorge No. 18 Project would tend to levelize the incoming flows to the Winooski One Project. Since the hydraulic capacity range of the Winooski One Project brackets the minimum flow releases, we would not expect a decrease in generation at Winooski One.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

We have considered the applicant's proposed enhancement measures, WQC-required measures, Section 18 fishway prescriptions, agency-recommended terms and conditions, measures recommended under the settlement agreement, our recommended enhancement measures, and the no-action alternative under sections 4(e) and 10(a) of the FPA. From our independent analysis of the environmental and economic effects of the alternatives, we have selected the applicant's proposed project with our recommended enhancement measures as the preferred alternative.

This alternative consists of the following measures:

- ù install a rubber dam to completely replace all flashboards;
- ù operate the reservoir in an elevation range of 272 to 275 feet USGS;
- ù provide a continuous release of 50 cfs to the bypassed reach;

ù provide minimum flows below the project on the following seasonal schedule:

run-of-river from April 1 through May 15
1,000 cfs
* from May 16 through June 15
450 cfs* from June 16 through March 31
(* or inflow if less);

ù limit peaking on any given day as described in WQC Condition E;

ù provide flow monitoring in the bypass and below the project and water surface elevation monitoring in the impoundment;

ù provide upstream fish passage by co-funding the operation of Winooski One trap-and-truck program;

ù provide downstream fish passage by constructing and operating a fish collecting system at the intake and bypassing downstream migrants to the base of the dam;

ù operate downstream passage facilities from April 1 through June 15 and September 15 through December 15;

ù conduct a study of the effectiveness of the downstream passage facilities;

ù develop and implement a plan for disposal of debris, including trashrack debris;

ù file a revised recreation plan with the Commission detailing proposed recreation improvements and our recommended recreation improvements;

ù construct, operate, maintain, and provide improvements to Overlook Park including a prominent road sign, picnic table, sanitary facilities, parking improvements, landscaping, and trail improvements to the south bank along the bypassed reach; an improved tailrace trail, leading from the powerhouse to the north bank below the powerhouse; a new north portage route including a take-out, a put-in, and a marked trail; a trail easement to be provided to the village of Essex Junction; and a

phone number for boaters to call to get information on anticipated river flows;

- ù ensure that the proposed and our recommended recreation facilities conform to the national standards for disabled people established by the Architectural and Transportation Barriers Compliance Board;

- ù plan, construct, and maintain an impoundment access site with parking for people with car-top boats;

- ù design and install an interpretive sign;

- ù construct and maintain a gated access road near the project powerhouse;

- ù install signs below the project powerhouse warning anglers and boaters of ramping dangers;

- ù develop and implement a comprehensive landscape management plan; and

- ù implement a Programmatic Agreement for protection of cultural resources.

Implementation of the staff's recommended alternative would: improve aesthetics, water quality, fisheries, and recreation resources; increase access to the river in the project area; and provide for upstream and downstream fish passage. Though the cost of the recommended measures would reduce the existing power benefits of the project, the project would still have net benefits over the new license term compared to the least-cost alternative. Specifically, we consider eight measures that would reduce the economic benefits of the project: (1) minimum flows, (2) aesthetic enhancements, (3) recreation enhancements, (4) downstream fish passage, (5) upstream fish passage, (6) installation of a rubber dam flashboard system, (7) archeological studies, and (8) miscellaneous measures.

A. Minimum Flows

Bypass

Water flow in the bypassed reach of river provides habitat for smallmouth bass and other aquatic species. It also provides a passage route for fish migrating downstream. A flow of 50 cfs released to the bypassed reach at the Essex No. 19 Project would provide appropriate habitat and passage conditions. These flows should be continuous and could be supplied as a spillway-dedicated flow release or as discharge from fish passage facilities. Water flowing over the small falls and through the

pools within the bypassed reach improves the aesthetic quality at the project.

Our analysis shows that the recommended 50 cfs minimum bypass flow requirement would cost GMP about $173,500 annually when levelized over a 30-year license period. The combined cost of implementing both of these measures would be in excess of the $173,500 annual figure, but would not equal the sum of the two.

Downstream Releases

Downstream minimum flow releases are needed on a seasonally adjusted basis to provide suitable fisheries habitat. During April 1 through May 15, walleye spawning and incubation require run-of-river operation. From May 16 through March 31, sturgeon spawning and incubation, adult trout use of the downstream river reach, and smallmouth bass spawning and incubation will benefit from a 450 cfs minimum flow. Related peaking restrictions will help to maintain the enhanced habitat within an acceptable range.

Our analysis shows that the proposed downstream minimum flow requirements would cost GMP about $174,800 annually, when levelized over a 30-year license period.

B. Aesthetic Enhancements

GMP proposes additional plants to reduce the visual intrusiveness of project features. This calls for the planting and maintenance of trees and shrubs around the project laydown area located just off Route 2A. In addition, GMP has provided plantings at the project substation located above the project on Cascade Street. The development and implementation of a street tree planting program along both sides of Route 2A within the project boundary would substantially improve the appearance of the project area. Implementation of this plan would improve the overall visual quality of the site by creating a visual corridor linking both sides of the river and providing additional screening of the project substation and laydown area, as well as the nonproject VELCO substation. These improvements along the roadway would enhance the quality of the project setting for all viewers, but especially for motorists who represent the largest viewer group at this location.

Because these various landscape improvements are segmented (not one overall management plan) we recommend that GMP develop a comprehensive landscape management plan to provide for species

selection, planting locations, and long-term maintenance. This plan should be developed by a qualified landscape architect in consultation with the Vermont Department of Forest, Parks, and Recreation, the Department of Environmental Conservation, the Vermont Agency of Transportation, and the townships of Essex Junction and Williston. We calculated that the annual levelized

cost to GMP for these aesthetic improvements for a 30-year license would be about $7,100.

C. Recreation Enhancements

We recommend that GMP revise its recreation plan for the Essex No. 19 Project to include our recommendations and incorporate the comments of the Recreation Section of the Vermont Department of Forests, Parks, and Recreation, the Vermont Department of Environmental Conservation, and the townships of Essex Junction and Williston. GMP should file the revised recreation plan with the Commission 6 months from the issuance of any license.

The recreation plan should include diagrams showing the dimensions of the proposed and recommended facilities, a description of the construction materials that would be used for all of these facilities, a description of the content and location of the proposed and recommended signs, and a description of the status of the easement proposed.

It is likely that the demand for recreation in the project area will continue to rise as a consequence of increases in population and the proportion of the public that recreates. The recreation improvements GMP proposes, and our additional recommended measures, would substantially enhance the local opportunities for recreation. We calculated that the annual levelized cost to GMP for the proposed and recommended recreation enhancements for a 30-year license would be about $21,300.

D. Downstream Fish Passage

VANR intends to establish populations of Atlantic salmon and steelhead trout above the Essex No. 19 Project. Downstream fish passage facilities are needed at the project to pass downstream migrating salmon and trout. VANR recommended downstream passage facilities at both Essex No. 19 and Gorge No. 18 projects. The detailed design of the Essex No. 19 passage facilities should be developed in consultation with VANR and FWS. The facilities

should be operational from April 1 through June 15 and from September 15 through December 15. We require that GMP monitor the effectiveness of the passage facility.

We calculated that the annual levelized cost to GMP for design, construction, operation, and maintenance of downstream passage would be $52,000, when levelized over a 30-year license period and assuming that the 50 cfs minimum flow noted above is used to operate the passage facility.

E. Upstream Fish Passage

Upstream passage facilities on the Winooski River will allow migratory fish species such as Atlantic salmon, steelhead trout, and walleye to migrate upstream. Availability of such habitat is necessary to develop a self-reproducing population. With passage facilities these migratory species can use suitable spawning and nursery habitats upstream of the Essex No. 19 Project.

GMP has entered into an agreement with the Winooski One Partnership to co-fund upstream passage costs at the Winooski One Project for the benefit of the riverwide fisheries. Our analysis shows that, for the foreseeable future, this agreement should provide sufficient upstream passage. Interior has reserved its right under Section 18 of the FPA to require an upstream passage facility at the Essex No. 19 Project.

We calculated that the levelized cost to GMP of maintaining the trap-and-truck co-funding agreement for a 30-year license period would be about $55,400 annually.

F. Rubber Dam Flashboard System

We reviewed the effects of current operation and the benefits to power and reservoir fisheries and recommend that the project operate with a full-crest rubber flashboard system. With the rubber dam, reservoir elevations should be more stable than in recent years of operation. Peaking operation with limitation of draw-downs below 272 feet elevation should enhance fisheries habitat, especially for smallmouth bass, in the project reservoir.

We calculated that operating the project with a full-crest rubber flashboard system for a 30-year license period would

increase the project's net benefit by about $29,000 annually.

G. Archeological Studies

In order to comply with state and federal regulations, GMP must complete archeological studies at the Essex No. 19 Project. We estimate that the cost of developing the Phase 1A archeology study for areas downstream of the project would be about $20,000 in 1994 dollars. We estimate that the cost of developing the Phase 1B study for the impoundment would be about $55,000 in 1994 dollars.

Our analysis shows that these studies would decrease project benefits by about $12,100 annually, when levelized over a 30-year license period.

H. Miscellaneous Measures

In addition, the staff's alternative requires a series of miscellaneous measures including: (1) a contingency plan for the

prevention of walleye mortality in the bypass; (2) a plan for monitoring reservoir elevations and flow releases and its implementation; (3) a plan for downstream fish passage and effectiveness testing; and (4) miscellaneous plans including a debris removal plan; a ramping rate plan; a bypass flow release plan; a plan to comply with required minimum flows downstream; and turbine rating curves.

We calculated that the levelized cost to GMP of these measures for a 30-year license period would be about $25,300 annually. Of this cost, $1,200 each year is attributable to the walleye contingency plan and the ramping plan, which are required by VANR but not recommended by the staff.

I. Conclusion

In conclusion, we recommend GMP's proposal with our recommended measures as described in Section III.B.1. We estimate that it will cost GMP a levelized total of $491,300 per year to implement the preferred alternative, which is feasible given the project economics. This figure is the sum of the value of lost generation and the cost of project enhancements. Table 10 lists the levelized annual net benefits associated with implementation of recommended enhancements for the Essex No. 19 Project.

Table 10. Annual Net Benefits Levelized for 30 Years of the Essex No. 19 Project

Condition	Applicant's Proposal with Enhancements	Additional Costs with Staff Enhancements	Additional Costs with WQC Requirements
Existing Project	$3,289,900	-	-
Minimum Flow Schedule of Operation	($126,400)	($48,400)	-
Bypass Flow	-	($173,500)	-
Aesthetic Enhancements	($2,300)	($4,800)	-

Recreation Enhancements	($17,400)	($3,900)	-
Downstream Fish Passage	($72,000)	$20,000	-
Upstream Fish Passage	($55,400)	-	-
Rubber Dam	$31,000	($2,000)	-
Archeology Studies	($12,100)	-	-
Plans	-	($24,100)	($1,200)

Total Net Benefits: Applicant's Proposal	$3,035,300
Applicant and Staff Proposal	$2,798,600
Applicant, Staff, and WQC	$2,797,400

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 based on

recommendations provided by federal and state fish and wildlife agencies for the protection and enhancement of fish and wildlife resources affected by the project. Section 10(j) of the FPA states that whenever the Commission believes 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.

VANR and FWS commented on the Essex No. 19 Project. In

response to the Notice of Application Ready for Environmental Analysis, VANR submitted a July 2, 1993, letter, with comments, recommendations, terms, and conditions. Since the WQC was produced 4 months after VANR's letter, however, there are some inconsistent comments and recommendations. The inconsistencies are the result of negotiation, additional bypass demonstration studies, and communication between VANR and GMP in the 4-month period between the letter and issuance of the WQC. Some of the recommendations in the July 2, 1993, letter no longer applied when GMP (in its August 20, 1993, letter) agreed to extend the rubber dam across the entire crest of the dam. Similarly, after executing the settlement agreement, VANR issued amended versions of four WQC conditions. This also resulted in changes from earlier recommendations and in certain items not being adopted because they were no longer applicable. In these cases, there are no 10(j) conflicts.

All VANR and FWS fish and wildlife recommendations have been evaluated and are discussed in the appropriate water, fisheries, and/or terrestrial resources sections of the EA. Table 11 summarizes these conclusions and our actions on those recommendations that relate to fish and wildlife. We identify with an asterisk (*) VANR's July 2, 1993, recommendations that parallel the WQC conditions. In Section V we describe our reasons for adopting or not adopting each recommendation. The table includes recom-mendations that we disagree with but ultimately adopted based on statutory requirements.

Table 11. Recommendations of Fish and Wildlife Agencies

Recommendations	Within Agenc	the	Action

	y	Scope of 10(j)	
Minimum bypass flow of 50 cfs.	Inter ior	Yes	Adopted
Minimum bypass flow of 167 cfs spilled at dam. (later deleted)	VANR (changed recommendation)	Yes	Not Adopted
Rubber dam should be approved.	Inter ior	Yes	Adopted
All flows uniformly spilled over the dam when not operating.*	VANR	No	Adopted
Submit plan for ramping.*	VANR	Yes	Adopted
Run-of-river operation April 1 through May 15.*	Inter ior VANR	Yes	Adopted
1,000 cfs minimum flow May 16 through June 15.*	Inter ior VANR	Yes	Adopted
500 cfs minimum flow June 16 through March 31. (later amended to 450 cfs)	Inter ior VANR	Yes	Not Adopted (as 500 cfs)
Develop plan to meet peaking restrictions.	VANR	No	Adopted
Peaking capacity limited to a maximum of 1,000 cfs June 16 through September 30 when inflow drops below 1,000 cfs.	Inter ior	Yes	Not Adopted (used VANR flow)
Peak capacity limited to inflow June 16 through September 30 when inflow exceeds 1,000 cfs.	Inter ior	Yes	Not Adopted (used VANR flow)
Peaking capacity unlimited in the event of power emergency or demonstration flow.	Inter ior	No	Adopted

Recommendations	Agency	Within the Scope of 10(j)	Action
Submit plan to record and provide flow data to document conformance to flow releases.	Interior	Yes	Adopted
A plan for maintaining minimum flow during flashboard replacement.	VANR (dropped recommendation)	Yes	Not Adopted
Develop a report with plans to meet spillage requirements and pond level control for VANR approval.	VANR	Yes	Adopted in part
Develop plan for monitoring minimum flows.*	VANR	Yes	Adopted
Develop contingency plan, to be implemented at request of agencies, to prevent mortality to walleye spawning in the bypass.*	VANR	Yes	Adopted
Draw-downs of impoundment below elevation 272 should be better defined.	VANR	Yes	Adopted
Monitor project discharges and provide records to VANR.*	VANR	Yes	Adopted
Submit plan for downstream fish passage at Essex.*	VANR	Yes	Adopted
Operate downstream fishway April 1 through June 15.*	VANR Interior	Yes	Adopted
Operate downstream fishway September 15 through November 15.	Interior	Yes	Adopted
Operate downstream fishway September 15 through December 15.*	VANR	Yes	Adopted
Final operational dates can be modified by FWS and VANR.	Interior VANR	Yes	Adopted

Recommendations	Agency	Within the Scope of 10(j)	Action
Submit plan for downstream fishway for Gorge facility.	VANR (nonjurisdictional)	Yes	Not Adopted
GMP develops plans to operate, maintain, and monitor downstream fish passage.	Interior	Yes	Adopted
GMP to cost share in Winooski One trap-and-transport program.	VANR	Yes	Adopted
A plan for debris disposal.*	VANR	No	Adopted
Provide canoe portage, cartop put-in and plan for design and maintenance for agency approval.	VANR	No	Adopted
Provide angler access, parking and picnic facilities handicap access, interpretive signs, spillage at dam, public viewing and landscaping.	VANR	No	Adopted
Provide plans for whitewater releases.	VANR (releases already there)	No	Not Adopted
Provide plans for flow notification system by telephone.*	VANR	No	Adopted

The following discussion briefly summarizes reasons that items considered within the scope of Section 10(j) have not been adopted. Additional information can be found in Section IV.D on WQC conditions and Section IV.E on FWS's Section 18 prescriptions.

ù VANR's recommendation for a minimum flow of 167 cfs is no longer current.

ù The condition for 500 cfs minimum flow was changed to 450 cfs, based on VANR's recommendation.

ù Interior's recommendations on peaking capacity were replaced by VANR's amended WQC Condition B, which has been adopted. Peaking under emergency situations is not limited but must be reported.

ù VANR's recommendation for maintaining flow during flashboard replacement was superseded by agreement to replace the flashboards with a rubber dam.

ù VANR's recommendation to plan to meet spillage requirements was changed by the settlement agreement, which no longer required spillage. The recommendation for pond level control still stands and has been adopted.

ù VANR's recommendation pertaining to a fishway at Gorge No. 18 is not adopted because Gorge No. 18 is nonjurisdictional to FERC.

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 30 comprehensive plans of which we identified 8 Vermont and 5 United States comprehensive plans to be applicable. No conflicts were found. Section XI lists comprehensive plans relevant to this project.

X. FINDING OF NO SIGNIFICANT IMPACT

We conclude that none of the resources we studied - geologic, water quantity and quality, 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. For this reason and pursuant to Commission regulations, we conclude that no environmental impact statement (EIS) is required.

On the basis of the record and this EA, issuing a new license for the project as proposed by GMP, plus the enhancement measures we recommend, would not constitute a major federal action significantly affecting the quality of the human environment.

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