

Appendix G: FERC Environmental Assessment of Woronoco Hydro Project No. 2631

Project No. 2631-007 - Massachusetts
Woronoco Hydroelectric Project
Woronoco Hydro LLC

Re: Issuance of Environmental Assessment (EA)

To the Party Addressed:

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Energy Projects has reviewed the application for license for the Woronoco Hydroelectric Project and prepared the attached Environmental Assessment (EA). The EA contains staff's analysis of the environmental effect of the proposal and concludes that approval, with additional staff recommended measures, would not constitute a major federal action significantly affecting the human environment.

Please file any comments (an original and 8 copies) within 30 days from the date of this letter. The comments should be addressed to Magalie R. Salas, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, D.C. 20426. Comments may be filed electronically via the internet in lieu of paper [see 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's web site at <http://www.ferc.gov> under the "e-filing" link]. Please affix the project number to all comments.

Please contact Allan E. Creamer at (202) 219-0365, or by e-mail at allan.creamer@ferc.gov if you have any questions.

Enclosure: Environmental Assessment

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**ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE**

Woronoco Hydroelectric Project

FERC Project No. 2631-007

Massachusetts

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Environmental and Engineering Review
888 First Street, NE
Washington, DC 20426

February 21, 2002

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Summary

On August 31, 1999, International Paper Company (IP) filed an application for a new license for its Woronoco Hydroelectric Project No. 2631. On May 22, 2001, the Federal Energy Regulatory Commission (Commission) authorized the transfer of the project from IP to Woronoco Hydro LLC (Woronoco Hydro). The Woronoco Project has an installed capacity of 2,700 kilowatts (kW) and historically generated an average of 7,700 megawatt-hours (MWh) of electricity annually. The project is located on the Westfield River, in the town of Russel, Hampden County, Massachusetts. The project does not occupy any federal lands. Woronoco does not propose any new capacity at the project, but does propose to rehabilitate two non-functioning turbine/generator units.

In the environmental assessment (EA), we evaluate the effects associated with the issuance of a new license for the existing Woronoco Project, and recommend conditions for inclusion in any license issued. For any license issued, the Commission must determine that the project adopted would be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to energy conservation, the protection and enhancement of fish and wildlife, aesthetics, cultural resources, and the protection of recreational opportunities. The EA for the Woronoco Project reflects staff's consideration of these factors.

Based on our consideration of all developmental and non-developmental resource interests related to the project, we recommend the following measures be included any license issued for the project:

- ! Operate the project in a run-of-river mode, with minimal fluctuations;
- ! Provide a year-round minimum flow of 57 cubic feet per second (cfs) to the project's bypassed reach, with 22 cfs in the north channel and 35 cfs in the south channel;
- ! Prepare and implement a plan for releasing the recommended bypass minimum flow, as well as to monitor run-of-river operations and the bypass flow;
- ! Prepare and implement a comprehensive fish passage plan that includes provisions for (a) operating the existing downstream fish passage facility; (b) installing an eel ladder at the south dam and providing upstream passage routes at two additional locations in the north and south channels, (c)

providing support, financial or otherwise, towards implementing the Massachusetts Division of Fish and Wildlife's upstream trap-and-truck program for Atlantic salmon on the Westfield River, and (d) evaluating the effectiveness of the existing downstream fish passage facility for passing salmon smolts, post-spawning adult salmon, and American eel, as well as developing appropriate protection measures for out-migrating eels;

- ! Reserve the U.S. Department of the Interior's authority to prescribe fish passage facilities in the future;
- ! Develop and implement a drawdown management plan;
- ! Consult with the State Historic Preservation Officer and implement appropriate measures before engaging in any activity that may result in an alteration to the National Register-eligible properties (*i.e.*, project powerhouse and the Strathmore Mill complex), and at any time during the project license if significant undiscovered properties are found in the project area during normal project operations; and
- ! Develop and implement a final recreation enhancement plan for enhancing access in the project area.

We recommend these environmental measures to protect and enhance water quality, fisheries, terrestrial, land use, aesthetics, recreational, and cultural resources. In addition, the electricity generated from the project (6,700 MWh) would be beneficial because it would continue to: (1) reduce the use of fossil-fuel, electric generating plants; (2) conserve non-renewable energy resources; and (3) continue to reduce atmospheric pollution.

Section 10(j) of the FPA requires the Commission to include license conditions based on recommendations provided by the federal and state fish and wildlife agencies, for the protection of, mitigation of adverse impacts to, and enhancement of fish and wildlife resources. We have addressed Interior's concerns and have included measures consistent with those recommendations (see section VII.).

On August 26, 1999, IP applied to the Massachusetts Department of Environmental Protection (MDEP) for Section 401 Water Quality Certification (WQC) for the Woronoco Project. The MDEP issued a Section 401 WQC on August 30, 2000, and amended the 401 WQC on September 29, 2000.

In a letter dated February 9, 2001, Interior reserved its authority to prescribe, through the U.S. Fish and Wildlife Service, the construction, operation, and maintenance of fishways at the Woronoco Project, including measures to evaluate the need for fishways, and to determine, ensure, or improve the effectiveness of such fishways. Interior states that the fishways would be for existing anadromous, catadromous and riverine fish species, and any fish species to be managed, enhanced, protected, or restored in the Westfield River Basin during the term of the license.

Based on our independent analysis of the projects, including our consideration of all relevant economic and environmental concerns, we conclude that the Woronoco Project, as proposed by Woronoco Hydro and with our additional staff-recommended enhancement measures, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Westfield River. In addition, we conclude that issuing a new license for the Woronoco Project, with our recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

**Federal Energy Regulatory Commission
Office of Energy Projects
Division of Environmental and Engineering Review**

WORONOCO HYDROELECTRIC PROJECT FERC NO. 2631-007, MASSACHUSETTS

I. APPLICATION

On August 31, 1999, International Paper Company (IP) filed an application for a new license, under Part I of the Federal Power Act (FPA), to continue operating its existing Woronoco Project (FERC Project No. 2631).¹ The Woronoco Project is located at river mile (RM) 18.5 on the Westfield River, in the town of Russell, Hampden County, Massachusetts (figure1). There are no federal lands within the Woronoco Project boundary.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

The Commission must decide whether to relicense the Woronoco Project and what, if any, conditions should be placed in any license issued. The purpose of the proposed action is to ensure the provision of electric power service to the public in compliance with FPA requirements. Part I of the FPA provides for the regulation of non-federal hydropower development. A project is licensable as long as it meets public interest standards and other regulatory requirements of the FPA, taking into account its development and non-developmental merits.

In deciding whether to issue any license, the Commission must determine that the project would 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 gives equal consideration to the purposes of energy conservation;

¹On December 12, 2000, IP and Woronoco Hydro LLC, jointly filed an application to transfer the Woronoco Project from IP to Woronoco Hydro LLC (Woronoco Hydro, or the applicant). The Commission approved the transfer application on May 22, 2001. [see 95 FERC ¶ 62,153]

protection of, mitigation of damage to, and enhancement of fish and wildlife; protection of recreational opportunities; and preservation of other aspects of environmental quality.

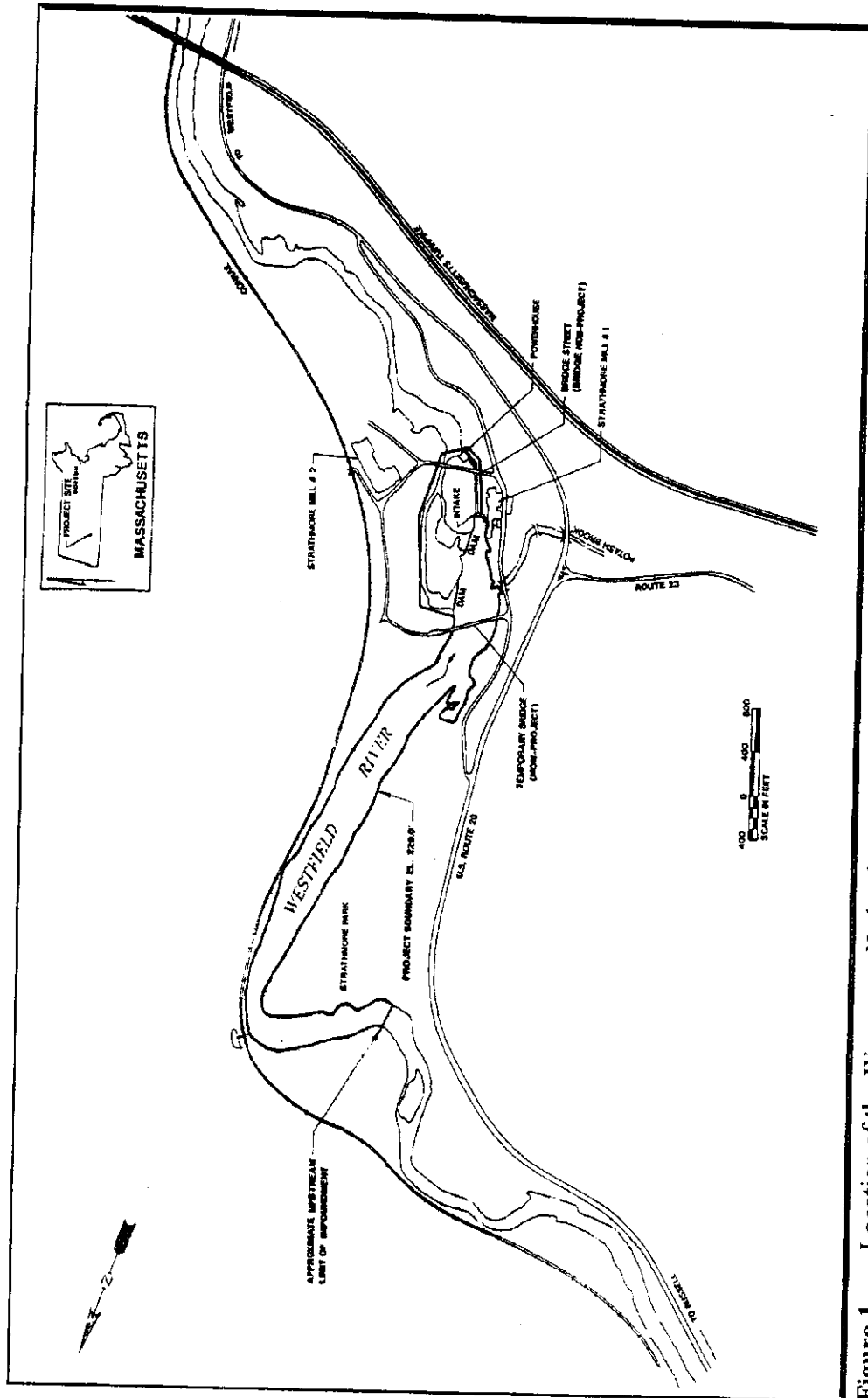


Figure 1. Location of the Woronoco Hydroelectric Project (FERC No. 2631) within the Westfield River Basin (Source: Commission staff, as modified from Kleinschmidt Associates, 1999).

This environmental assessment (EA) analyzes the effects associated with the continued operation of the Woronoco Project and 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 a part of any license issued.

B. Need for Power

Historically, the Woronoco Project generated an average of 7,700 megawatt-hours (MWh) annually. However, because two of the project's three units are currently off line (see sections III.B. and III.C), the project has generated an average of 6,130 MWh annually in recent years. As proposed by Woronoco Hydro and recommended for licensing by staff (including rehabilitating two of the project's generating units and releasing a bypass minimum flow), the Woronoco Project would generate an average of 6,700 MWh of energy annually.

Woronoco Hydro does not serve end use customers. Rather, Woronoco Hydro sells the power generated by the project to the Western Massachusetts Electric Company (WMECO), which is an operating subsidiary of Northeast Utilities. The applicant proposes to continue selling the power generated by the project to WMECO.

To assess the need for power that could be generated under any new license, we reviewed the future use of the project's power, together with the power needs of the operating region in which the project is located. The Woronoco Project is located in the New England area of the Northeast Power Coordinating Council (NPCC) region of the North American Electric Reliability Council (NERC). The NERC annually forecasts electrical supply and demand in the region for ten-year periods. In NERC's 2001 Reliability Assessment,² the NPCC shows an electric energy growth rate of 1.2 percent, annually, for the New England area.

Hydropower is a low cost form of electric power generation. It produces no atmospheric pollution and it derives its primary energy from a renewable resource. The Woronoco Project displaces existing and planned non-renewable fossil-fueled generation (*e.g.*, gas, oil, coal), which contributes to the production of nitrogen oxides, sulfur dioxides, and carbon dioxide. These gases create air pollution and may exacerbate global warming. In addition, hydroelectric generation contributes to the diversification of the generation mix in Massachusetts and the NPCC region.

²Reliability Assessment 2001-2010, The Reliability of Bulk Electric Systems in North America, NERC, October 16, 2001.

Hydroelectric facilities are operated to maximize: (1) net energy; (2) the value of energy produced; (3) recreational potential; and (4) voltage support. Hydro facilities are also operated to: (1) eliminate or minimize adverse environmental effects; (2) enhance environmental benefits; (3) increase system reliability; and (4) minimize required maintenance. Hydro units are critical to system restoration following large-scale outages because they can be brought on-line quickly. In the era of deregulation, hydropower is important because the cost of producing electricity at hydro facilities is typically low, and low-cost energy is purchased first on the market. While the Woronoco Project is not very large, every kW and MWh produced using low-cost, renewable resources is important to our national energy supply, as well as our efforts to control or reduce air pollution caused by burning fossil-fuels.

We conclude that the continued operation of the Woronoco Project and the future use of power generated from the project would displace non-renewable, fossil-fueled generation and contribute to a diversified generation mix. Also, project generation would help WMECO meet its need for generation in the short and long term.

III. PROPOSED ACTION AND ALTERNATIVES

A. Description of Existing Project Facilities

The Woronoco Project (figure 2) is an existing licensed hydropower project. The proposed project would have a total rated capacity of 2,700 kilowatts (kW), and an average annual generation of about 6,700 MWh.

The project's principal features are: (1) two concrete-gravity dams and an earthen dike; (2) an intake area leading to a powerhouse; (3) an interim downstream fish passage facility; (4) an impoundment; (5) a bypassed reach; and (6) appurtenant facilities. In detail, the existing project's principal features consist of:

1. two non-contiguous dam sections, with (a) a height of about 25 feet above the riverbed, (b) lengths of about 351 feet (south dam) and 307 feet (north dam), (c) a steel sluice gate adjacent to the trashracks (south dam); see

below), (d) a steel mud gate (north dam), (e) a 655-foot-long earthen dike with a sheet steel core, and (f) a crest elevation of 229.0 feet National Geodetic Vertical Datum (NGVD); ³

³The normal headpond elevation for the project is governed by the north dam. Flashboards (30-inch) are authorized by the project's current license, but have not been used for decades. All elevations are stated as NGVD, unless otherwise noted.

Figure 2. Woronoco Hydroelectric Project No. 2631 facilities (Source: Commission staff, as modified from Kleinschmidt Associates, 1999).

2. a 40-foot-wide by 15-foot-high intake structure, having trashracks with 1.25-inch clear bar spacing, and a 550-foot-long by 11-foot-diameter steel (with concrete liner) penstock;
3. a 59-foot-long by 59-foot-wide concrete and brick powerhouse containing three Francis turbines and generating units, having (a) minimum and maximum hydraulic capacities of 130 cubic feet per second (cfs) and 710 cfs, respectively, ⁴ (b) a horsepower (hp) rating of 3,300 hp, (c) a gross head of 55 feet and a design head of 50 feet at 710 cfs, (d) a total installed capacity of 2,700 kW, and (e) a tailwater elevation of 174.0 feet.
4. an interim downstream fish passage facility, constructed in 1998 and located immediately in front of the trashracks (with its discharge at the base of the south dam); ⁵
5. a 1.2-mile-long impoundment, with (a) a normal pool elevation of 229.0 feet, (b) a surface area of 43 acres, and (c) negligible usable storage;
6. a bypassed reach, varying in length from about 200 to about 1,000 feet; and
7. appurtenant facilities.

B. Description of Current Project Operation

Currently, the applicant operates the Woronoco Project in an automated, run-or-river mode. When inflow to the generating station is equal to, or less than, the hydraulic capacity of the station (currently limited to Unit 3; see section III.C. below), Unit 3 is

⁴The minimum hydraulic capacities of the three units are 15 cfs each for Units 1 & 2 and 100 cfs for Unit 3. The maximum hydraulic capacities of the three units are 130 cfs each for Units 1 & 2 and 450 cfs for Unit 3.

⁵The interim downstream fish passage facility is designed to pass Atlantic salmon smolts, using a modified existing surface-draw gate. The draw gate opening is reduced to 36 inches wide using a steel plate bolted to the downstream side of the south dam face. Attraction and conveyance flow through the surface-draw gate is estimated at 25 cfs. From the gate, smolts enter a 3-foot-wide by 6-foot-long discharge chute, which directs smolts away from a retaining wall and exposed rocks into a plunge pool (about 14 feet downstream of the dam). Smolts then move downstream via the third, and shortest, channel of the bypassed reach.

throttled to maintain a stable headpond at the top of the project's two dams. Flows less than the station's minimum capacity, as well as those exceeding its maximum capacity, are spilled over the dams.

C. Proposed Action

1. Operational and Management Changes

As described in section III.A. above, the Woronoco Project is equipped with three generating units. However, Units 1 and 2 were taken out of service in 1996 and 1997, respectively. As part of its license application, Woronoco Hydro proposes to rehabilitate Units 1 and 2 (maximum hydraulic capacity of 130 cfs each). The combined hydraulic capacity of the three units would be 710 cfs. The project would continue to be operated in a run-of-river mode.

2. Environmental Measures

In addition to the aforementioned developmental proposal, Woronoco Hydro proposes the following measures to protect and enhance environmental resources that may be affected by the operation and maintenance of the Woronoco Project:

- ! operate the project in a run-of-river mode, by maintaining the impoundment elevation at 229.0 feet, with minimal fluctuations;⁶
- ! provide a year-round minimum flow of 57 cfs to the project's bypassed reach, with 22 cfs in the north channel and 35 cfs in the south channel;⁷
- ! evaluate the effectiveness of the existing downstream fish passage facility during the first downstream passage season for Atlantic salmon, following issuance of a new license for the project;

⁶The applicant expects to operate the project as a run-of-river facility, in the following manner: (1) spill flows less than 157 cfs [100 cfs minimum plant capacity and 57 cfs minimum flow release]; (2) Unit 3 (157 to 507 cfs); (3) Units 1, 2, and 3 (507 to 767 cfs); and (4) spill flows greater than 767cfs. Unit 3 would be throttled back as Units 1 and 2 are brought on-line between the range of 507 and 767 cfs.

⁷North channel flows would be released through a notch in the north dam. South channel flows would be released through the existing downstream fish passage facility (20 cfs) and through a notch cut in the center of the south dam.

- ! develop an agreement to participate in the Massachusetts Division of Fisheries and Wildlife's (MDFW) trap-and-truck program for Atlantic salmon in the Westfield River;
- ! install upstream fish passage facilities for American eel at the south dam and provide upstream passage routes at two additional locations in the north and south channels;
- ! develop an impoundment drawdown management plan that outlines measures to protect mussel species and recover stranded fish, and that includes an evaluation of alternatives to drawing down the impoundment for extended periods of time; and
- ! develop and maintain three new carry-in boat access sites at the project.

D. Proposed Action with Additional Staff-Recommended Measures

In considering appropriate environmental protection and enhancement measures for the Woronoco Project, we evaluated the measures proposed and/or recommended by the applicant, the resource agencies, and non-governmental organizations (NGOs). These measures are discussed in section V.C. and summarized in section VII.

Under staff's preferred alternative, the project would include all the measures proposed by the applicant. Staff's alternative would also include a project operation and flow monitoring plan, as well as requirements to consult with the State Historic Preservation Office (SHPO) under certain situations.

E. No-Action

The No-Action alternative would result in no change to the existing environment. The project would continue to operate as required by the existing project license. If the project were allowed to operate as it has in the past, there would be continued energy production, but no enhancement of natural resources values. Any ongoing effects of the project would continue. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

F. Alternatives Considered but Eliminated from Detailed Analysis

We considered three other alternatives to Woronoco Hydro's relicensing proposal, but eliminated them from detailed study, because they are not reasonable in the

circumstances of this case. The alternatives considered are: (1) federal government takeover and operation of the project; (2) issuance of a non-power license upon expiration of the original project license; and (3) project decommissioning.

Federal Government Takeover - Federal takeover and operation of the project would require congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is no evidence to indicate that Federal Takeover should be recommended to Congress. This alternative has not been raised, to date, as a reasonable alternative or appropriate alternative, nor has any federal agency expressed an interest in operating the project. Thus, we do not, in this case, consider federal takeover to be a reasonable alternative.

Non-power License - A non-power license is a temporary license which the Commission would terminate whenever it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider a non-power license to be a realistic alternative to relicensing in this circumstance.

Project Decommissioning - Project decommissioning could be accomplished with or without dam removal. Either alternative would involve: (1) denial of the relicense application; (2) ceasing power generation; and (3) surrender or termination of the existing license with appropriate conditions. At a minimum, project decommissioning would have the following effects.

- ! The energy generated by the project would be lost ($\approx 6,700$ MWh annually).
- ! There would be significant costs associated with dam removal, or decommissioning the project powerhouse, penstock, and appurtenant facilities.⁸

⁸International Paper estimated that the costs for decommissioning could range from about \$50,000 (for disconnecting from the grid and ensuring the safety of the facilities) to \$500,000 to \$1,000,000 (for removing the dam, sealing/failing the penstock, and removing the powerhouse and electrical equipment) [reported in 1999\$].

- ! Absent removal of the project's two dams, which would be costly and has not been recommended, the environmental enhancements currently proposed by the applicant would be foregone.

No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending dam removal. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate protection and enhancement measures.

Project decommissioning without dam removal 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 with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending such an alternative. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we don't consider removal of the electric generating equipment to be a reasonable alternative.

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation and Interventions

The Commission's regulations (18 CFR §§ 4.38 and 16.8) require that applicants consult with appropriate resource agencies and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

The Commission issued a public notice on December 7, 2000, indicating that the application for the Woronoco Project was ready for environmental analysis, and that all comments should be filed within 60 days of the notice. The following entities provided comments:

Commenting Entities

Filing Date

Trout Unlimited	February 8, 2001
U.S. Department of the Interior	February 9, 2001

On December 15, 1999, the Commission issued its public notice accepting the relicense application for the Woronoco Project and soliciting motions to intervene and protest. This notice set February 4, 2000, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene:

<u>Intervenors</u>	<u>Filing Date</u>
U.S. Department of the Interior	January 28, 2000
Trout Unlimited	February 3, 2000

B. NEPA Scoping Process

Before preparing this EA, we conducted scoping for the Woronoco Project to determine what issues and alternatives should be addressed. A scoping document (SD1) was distributed to interested agencies and others on September 20, 2000. It was noticed in the Federal Register on September 26, 2000. The following entities provided written comments pertaining to the scope of issues for the Woronoco Project:

<u>Commenting Entity</u>	<u>Filing Date</u>
Trout Unlimited	November 6, 2000
Massachusetts Division of Fisheries and Wildlife	November 20, 2000

As outlined by the Commission, in a letter dated August 24, 2001, the comments provided by the two entities listed above raised no new issues or support compelling changes to the scope of the NEPA document, but rather reiterated each entities' position relative to the issues. Therefore, no revised scoping document was issued. The comments provided by Trout Unlimited (TU) and the MDFW are addressed, as appropriate, in this EA.

C. Mandatory Requirements

1. Water Quality Certification

On August 26, 1999, IP applied to the Massachusetts Department of Environmental Protection (MDEP) for Section 401 Water Quality Certification (WQC) for the Woronoco Project. The MDEP received this request on September 8, 1999. The MDEP issued a Section 401 WQC on August 30, 2000, and amended the 401 WQC on

September 29, 2000. The conditions of the Section 401 WQC, as issued by the MDEP, include:

- ! The project shall be operated in accordance with the conditions contained in the 401 WQC and the provisions included in the license application and any modifications made thereto, to the extent such application provisions and modifications are consistent with the 401 WQC. The facility shall be operated to maintain the designated uses of the Westfield River, as outlined in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) and maintain an integrated and diverse biological community in the Westfield River.
- ! All activities shall be conducted in compliance with the Massachusetts Wetlands Protection Act. An application for a Section 401 WQC shall be submitted to, and approved by, the MDEP prior to any activity that will cause a discharge subject to Section 404.
- ! The applicant shall comply with Massachusetts General Laws Chapter 91.
- ! All maintenance and repair activities, including disposal of debris and removal of sediments in impounded areas, shall be conducted in a manner so as not to impair water quality.
- ! Changes to the project that would have a significant or material effect on the findings, conclusions, or conditions of this 401 WQC, including project operation, must be submitted to the MDEP for prior review and approval, where appropriate and authorized by law.
- ! The MDEP may request, at any time the 401 WQC is in effect, that the Commission reopen the license to make modifications necessary to maintain compliance with the Massachusetts Surface Water Quality Standards or other appropriate requirements of state law.
- ! The MDEP reserves the right to add and alter the terms and conditions of the 401 WQC, when authorized by law and as appropriate to carry out its responsibilities during the life of the project with respect to water quality.
- ! Operate the project in a run-of-river mode at an elevation of 229.0 feet. Submit an operations and monitoring plan, for MDFW review and MDEP approval, within 6 months of license issuance. The plan should address

provisions for maintaining pond height at 229.0 feet, a means of recording (hourly) and reporting (yearly) pond elevations, and notification of the MDEP when the impoundment falls below 229.0 feet.

- ! Develop and implement a drawdown management plan, in consultation with (and approval by) the MDEP, to protect mussels and prevent fish stranding within 1 year of license issuance. The plan should address: (a) performing maintenance activities with no drawdowns; (b) limiting the number of drawdowns; and (c) notification of MDEP when a drawdown is planned. No drawdown is permitted prior to approval the plan.
- ! Provide upstream passage for American eel within 1 year of license issuance. Dates of operation, as well as fishway design and locations shall be determined in consultation with the MDFW and approved by MDEP.
- ! Evaluate the effectiveness of the existing downstream fish passage facility during the first fish passage season following issuance of a license for the project. The study plan and results shall be reviewed by the MDFW and approved by the MDEP.
- ! Upon license issuance, release a continuous minimum flow of 57 cfs, or inflow, whichever is less, to the bypassed reach; 35 cfs to the south channel and 22 cfs to the north channel. The applicant shall consult with the MDFW and obtain approval from the MDEP regarding the time frame, location, and design of notches to be installed.

2. Section 18 Fishway Prescription

Section 18 of the FPA states that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as may be prescribed by the Secretary of the Interior. By letter dated February 9, 2001, the U.S. Department of the Interior (Interior) reserved its authority to prescribe, through the U.S. Fish and Wildlife Service (USFWS), the construction, operation, and maintenance of fishways at the Woronoco Project, as necessary, including measures to evaluate the need for fishways, and to determine, ensure, or improve the effectiveness of such fishways. Interior states that the fishways would be for existing anadromous, catadromous and riverine fish species, and any fish species (including American eel) to be managed, enhanced, protected, or restored in the basin during the term of the license.

The Commission recognizes that future fish passage needs and management objectives cannot always be determined at the time of project licensing. Under these circumstances, and upon receiving a specific prescription from Interior, we recommend the Commission follow its practice of reserving the Commission's authority to require such fishways as may be prescribed by the Secretary of the Interior.

3. Coastal Zone Management Act

Woronoco Hydro submitted a consistency certificate to the Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Office of Coastal Zone Management for compliance with the Coastal Zone Management Act (CZMA). In its reply letter dated October 3, 2001, the Massachusetts Office of Coastal Zone Management concluded that: (1) the activities associated with the proposed project fall outside the geographical boundaries of the Massachusetts Coastal Zone; and (2) the proposed relicensing of the Woronoco Project is not subject to Federal Consistency Review by the Coastal Zone Management Office. Therefore, we conclude that the Woronoco Project is not subject to CZMA review.

V. ENVIRONMENTAL ANALYSIS

In this section, we describe the Westfield River Basin, including the project drainage area and other man-made and natural features that could affect the resources analyzed. We also discuss the environmental resources subject to cumulative effects from the project when considered in combination with other actions affecting the resources. Then, for each resource, we describe the affected environment, the environmental effects and recommendations, cumulative effects (where applicable), and the unavoidable adverse effects of the proposed action with additional staff-recommended measures.

We address, in detail, only those resources affected by the operation of the Woronoco Project, and include analysis of comments by interested parties on the project's proposed operation. Unless otherwise indicated, the sources of our information include the license application (Kleinschmidt, 1999), IP's Additional Information Request response (Kleinschmidt, 2000a), and supplemental filings made by the applicant, Interior, MDFW and TU.

A. General Description of the Westfield River Basin ⁹

⁹Information in this section taken from the *Anadromous Fish Management Plan for the Westfield River, 2001-2010* (MDFW, 2000), unless otherwise indicated.

The Westfield River basin is located in west-central Massachusetts, the river originating in the eastern foothills of the Berkshire Mountains. The basin drains an area of 517 square miles (mi²) and includes portions of Franklin, Hampshire, Hamden, and Berkshire counties (Kleinschmidt, 1999). From its origination, the river travels south, southeast for about 60 miles before reaching its confluence with the Connecticut River.

The average annual precipitation in the drainage is about 48 inches, which, for the most part, is equally distributed over the course of the year. More than half of this total (25 inches) results in runoff, making the average runoff nearly equal to 2 cfs/mi² for the entire basin. The mean annual flow of the Westfield River at the U.S. Geological Survey (USGS) gaging station near the city of Westfield (Gage # 01183500; 1914 to present), which encompasses 497 mi² of drainage area, is 930 cfs. The high flow for this station was 70,300 cfs (August 1955) and the minimum flow was 9 cfs (October 2, 1921).

The basin is heavily vegetated with natural second and third growth forests. The damp, cool mountainous western section is characterized by northern hardwood forests. The central portion of the basin has a variety of vegetation, and is commonly considered transitional forest. The warmer eastern section of the basin consists mainly of an Oak-Chestnut climax community.

The extreme western portion of the basin is in the Berkshire Plateau region, with elevations of over 2,000 feet above mean sea level (msl). A good majority of the remainder of the basin exhibits the Southern New England Upland physiography, with only a small portion (downstream of the city of Westfield) in the Connecticut Valley Lowlands. The floodplain elevation drops to 50 feet msl at the confluence of the Westfield and Connecticut Rivers. With the drop in elevation, the mean annual temperature rises from 44 degrees Fahrenheit (°F) in the western mountain to 50°F on the eastern plain.

The Westfield River drops a total of 2,000 feet over its entire 60 mile journey to Connecticut River. The major tributaries of the Westfield River include the Middle Branch, the West Branch, and the Little River, all contributing significantly to the basin's flow and drainage area.

The mainstem Westfield River originates in the town of Savoy and flows through steep sided valleys in a rugged terrain.¹⁰ The river is shallow and flow is rapid, with the

¹⁰The headwater reach, or up-river reach, of the mainstem Westfield River is commonly referred to as the East Branch.

elevation dropping about 1,000 feet in the river's first 14 miles. The U.S. Corps of Engineers (Corps) owns and operates a flood control reservoir at Knightville, which is located about 3 miles upstream of the river's confluence with the Middle Branch (table 1). The drainage area at this point is 162 mi², with an average flow of 318 cfs.

The Middle Branch of the Westfield River has its source in the town of Peru. The Middle Branch joins the mainstem Westfield River about 27 miles upstream of the river's confluence with the Connecticut River. The Middle Branch runs for about 18 miles through hilly, forested terrain and drops 1,250 feet over its length. Near its confluence with the mainstem, the Middle Branch is impounded by a Corps dam at Littleville (table 1). This reservoir is operated by the Corps for flood control and water supply. The Middle Branch contributes an average annual flow of 102 cfs from a drainage area of 52.6 mi².

The West Branch of the Westfield River is formed by the confluence of Depot and Yokum Brooks. The river flows about 17.5 miles and falls 840 feet before joining the mainstem at Huntington, 25 miles upstream of the river's confluence with the Connecticut River. The West Branch has an average annual discharge of 182 cfs and a drainage area of 93.7 mi².

The West Branch, Middle Branch, and mainstem Westfield (or East Branch), upstream of their confluence, comprise 60 percent of the basin's total drainage area and contribute about 2/3 of the basin's average annual flow. Downstream from the confluence of these three reaches, the Westfield River is characterized by three impoundments in a 7-mile stretch (table 1), including the impoundment formed by the Woronoco Project (drainage area of 346 mi²). The river bottom is generally rocky, with widths from 150 to over 200 feet. Through this stretch, the river has a high width to depth ratio and follows a shifting channel through islets and point bars.

Downstream from the Woronoco Project, the Westfield River flows unimpeded to the city of Westfield, where it is joined by the Little River. The source of the Little River is the outlet of Cobble Mountain Reservoir (table 1). From this outlet, the Little River flows for 13 miles before joining the Westfield River, 11 miles upstream of the Westfield River's confluence with the Connecticut River. The Little River drains 45.8 mi² of area, drops 280 feet along its course, and has an average annual flow of about 88 cfs.

As it flows through the city of Westfield, the Westfield River cuts through the alluvial deposits of the Connecticut River flood plain. In this stretch, the river's slope is more gradual, dropping only 60 feet in the last 11 miles, and the river forms several

meanders. The Westfield River joins the Connecticut River about 76 miles upstream of Long Island Sound and the Atlantic Ocean.

Table 1. Hydroelectric projects and other barriers in the Westfield River Basin
(Source: MDFW, 2000).

Dam Name	FERC No.	River Mile	Height (ft)
Mainstem Westfield			
1. Rexam-DSI	2608	4.1	18
2. Woronoco Falls (natural)	n/a	18.3	6
Woronoco dams (South & North)	2631	18.5	25
3. Russel Falls	n/a	21.2	10
4. Texon	2986	24.1	17
Little River			
1. Lower Steven	n/a	3.5	12
2. Upper Steven	n/a	4.8	15
3. Cobble Mountain	n/a	10.4	151
East Branch (or upper Mainstem)			
1. Knightville	n/a	4.6	160
Middle Branch			
1. Littleville	n/a	2.1	165
West Branch			
1. Hamilton	n/a	8.0	8

B. Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's regulations for implementing the National Environmental Protection Act (NEPA) (§ 1508.7), an action may cause cumulative effects on the environment if its effects overlap in time and/or space with the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

We reviewed all the environmental resources to determine whether they could be affected in a cumulative manner by hydroelectric development and other non-hydroelectric activities. We used this review of the resource areas to help define the geographic and temporal scopes of the environmental analysis.

Based on our review of Woronoco Hydro's license application, agency comments, and other filings in the proceeding, we identified the Atlantic salmon and American eel fisheries as having the greatest potential to be affected in a cumulative manner by the Woronoco Project, in combination with other past, present, and future activities in the Westfield River Basin and lower Connecticut River. Atlantic salmon and American eel were selected because hydroelectric developments along the waterway, as well as flood control reservoirs in the upper basin, have affected these fisheries and their habitat by altering the flow regime in the river, blocking or delaying fish movement, and entraining fish into intakes (*i.e.*, turbine-related mortality).

1. Geographic Scope

The geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources; and (2) contributing effects from other hydroelectric and non-hydroelectric activities within the Westfield River Basin and lower Connecticut River. Based on our review of the record, we identified the scope of analysis for Atlantic salmon and American eel to be the entire Westfield River Basin and lower Connecticut River, below the confluence of the two rivers. We chose this geographic scope because of direct and indirect effects of project operations and facilities, and the contributing effects from other dams,¹¹ as well as industrial and suburban development and wastewater discharges, on migratory fish habitat and passage in the basin.

2. Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on Atlantic salmon and American eel. Based on the term of the proposed license, we will look 30 to 50 years into the future, concentrating on the effects on Atlantic salmon and American eel from reasonably

¹¹The Woronoco dam complex is the second mainstem obstruction on the Westfield River. Upstream and downstream fish passage facilities are currently operating at the lower-most dam in West Springfield, providing migratory fish species access to the Woronoco Project (see table 1).

foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each fish species. We identified the present resource conditions based on the license application and supplemental filings, agency comments, and comprehensive plans.

C. Analysis of Site-Specific Resources

We have reviewed the proposed project in relation to the environmental resources in the project area and have concluded that there would be no direct or indirect environmental effects on federally threatened and endangered species, aesthetics, and socioeconomic resources. We have excluded these resources from our detailed analysis for the reasons identified below. Since the primary effects associated with geology and soils pertain to sedimentation and erosion control from installing eel ladders and constructing recreation access improvements, we address this issue in sections V.C.2. (Fisheries Resources) and V.C.5. (Recreation and Land Use).

Threatened and Endangered Species – There are no known federally listed threatened or endangered species in the project vicinity (Interior, 2001).

Aesthetic and Socioeconomic Resources – The proposed action would not involve any major new construction activity, nor change in project operations.

1. Water Quantity and Quality

a. Affected Environment:

Water Use and Quantity

Water uses of the Westfield River by the general public, in the vicinity of the project, consist mainly of occasional recreational fishing and boating. The primary uses of river water in the immediate project vicinity are hydroelectric generation and waste assimilation. Historically, river water also was used for paper processing at the Strathmore Paper Mill.¹² Currently, the village of Woronoco discharges domestic

¹²Strathmore Paper Company, a subsidiary of IP, historically withdrew about 10 cfs from the Woronoco impoundment for paper processing at the Strathmore Paper Plant. Following pre-treatment, wastewater was discharged downstream of the project tailrace pursuant to IP's National Pollution Discharge Elimination System (NPDES) Permit No. MA0004995. Further, non-contact condenser cooling water was discharged directly to

(continued...)

wastewater to municipal sewers, which, until 1991, discharged the raw sanitary wastes directly to the Westfield River downstream from the project tailrace pool. In 1991, the village of Woronoco completed the installation of a transfer station to pump wastewater to a wastewater treatment facility located in the town of Russell. This treatment facility applies a primary treatment process, including sand filtration and disinfection, to the wastewater before discharging into the river downstream from the project dam.

The Woronoco Project is located at RM 18.5 on the Westfield River, and has a total contributing drainage area of 346 mi². The mean annual flow for the Westfield River, in the vicinity of the project, is 718 cfs. The 7Q10 flow for the river at the Woronoco dam complex is 53 cfs.¹³

The annual flow duration curve for the Westfield River at the Woronoco Project is shown in figure 3. The curve was derived using the mean daily flow data from three upstream USGS gaging stations, including: (1) Westfield River at Knightville (No. 01179500); (2) Middle Branch of the Westfield River at Goss Heights (No. 0110500); and (3) the West Branch of the Westfield River at Huntington (No. 01181000). These three gages monitor and account for a total of 308.3 of the 346 mi² of drainage area upstream of the Woronoco Project. The daily flows from each gage were added together and prorated by the ratio of remaining drainage area. The period of record is from 1965 to 1990.

The current license for the Woronoco Project does not include a minimum flow requirement for the bypassed reach. However, the previous 401 WQC was issued by the MDEP contingent upon a minimum flow release of 28 cfs during impoundment re-filing operations (see 15 FERC ¶ 62,243). Per requirements of Article 24 of the project's original license, the license was subsequently modified to include a minimum flow release of 48.1 cfs to the Westfield River downstream from the project during impoundment re-fill periods (see 30 FERC ¶ 62,186). This represents the only flow requirement for the project.

¹²(...continued)

the river downstream from the tailrace pool. The paper plant was closed in 1997 and the discharge is no longer occurring.

¹³Represents the 7-day, 10-year low flow for the river.

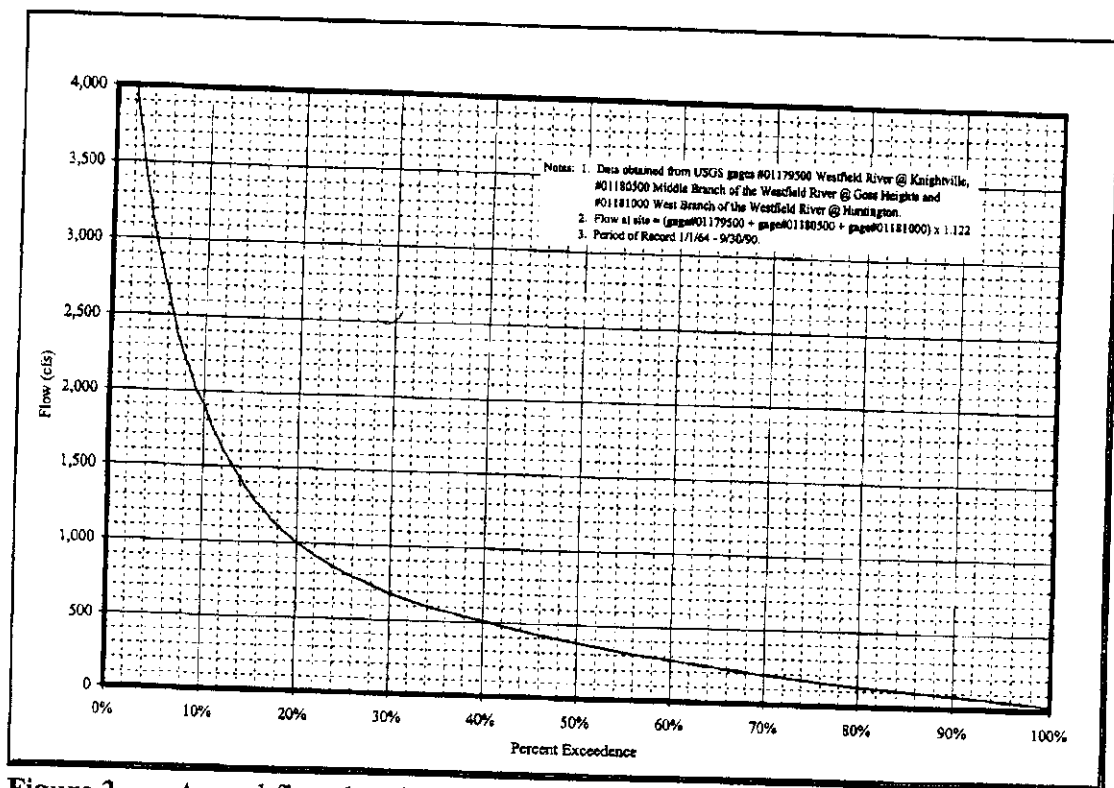


Figure 3. Annual flow duration curve for the Woronoco Project (FERC No. 2631)
(Source: Kleinschmidt Associates, 1999).

Water Quality

The MDEP, Division of Water Pollution Control (MDEP-DWPC) has designated the Westfield River as Class B waters. Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated, Class B waters shall also be suitable for public water supply with appropriate treatment, as well as be suitable for irrigation and other agricultural uses and for compatible industrial cooling and processing uses. Class B waters shall have good aesthetic value. From its confluence of the East and West Branches at RM 25.1 to its confluence with the Connecticut River, the Westfield River is designated as Class B Warmwater Fishery and Recreation.

In relevant part, water quality standards for Class B waters include: (1) minimum dissolved oxygen (DO) levels of no less than 5.0 milligrams per liter (mg/l) for

warmwater fisheries, unless background conditions are lower;¹⁴ (2) a maximum temperature of 83°F (28.3°C) for warmwater fisheries, and the rise in temperature due to a discharge shall not exceed 5°F (2.8°C) in rivers and streams designated as warmwater fisheries; and (3) an acceptable pH range of 6.5 to 8.3 and not more than 0.5 units outside of the background range. In addition, the standard for fecal coliform is a geometric mean of 200 organisms per 100 milliliter (ml) in any representative set of samples, and no more than 10 percent of the samples shall exceed 400 organisms per 100 ml.

According to the U.S. Environmental Protection Agency (USEPA) Fact Sheet for the 1983 renewal of the NPDES discharge permit for Strathmore Paper Company, in 1975 the segment of the river where the project is located was designated by the MDEP-DWPC as a Water Quality Limited segment. This designation means that the quantity of wastewater discharged exceeds the river's waste assimilative capacity, which may result in violations of water quality standards. Since 1975 a number of new wastewater treatment facilities have been constructed, and water quality in the Westfield River has significantly improved.

In May and July 1985 the MDEP-DWPC conducted a water quality survey, with samples collected from the mainstem, the three upriver branches, and the Little River in Westfield. Results of this survey indicated that water quality was "good" throughout much of the basin, though most water quality problems existed in the lower portions of the drainage (MDFW, 2000). However, water quality in the lower portion of the river had improved considerably from conditions in the 1950's through the 1970s.

Based on the survey results, water quality in the upper three branches was very good; DO ranged from 8.0 to 9.7 mg/l and percent saturation values ranged from 90 to 100 percent. The water quality from the confluence of the East and West Branches to the Westfield city line was considered good. DO levels were high (9.4 to 9.6 mg/l) and biological oxygen demand (BOD) and solids were low. Bacteria levels in this river segment decreased from a previous survey in 1978. Despite an increased pollution load in the river segment between Westfield to the confluence with the Connecticut River, relative to the upstream segments, DO concentrations in the lower segment were above the standard of 5.0 mg/l, ranging from 8.4 to 8.7 mg/l. BOD, suspended solids, and total solids were found to be higher in the upriver segments.

¹⁴Natural seasonal and daily variations above these levels shall be maintained; levels shall not be lowered below 60 percent saturation in warmwater fisheries due to a discharge.

The MDEP-DWPC collected water quality data on the lower Westfield River during the summer of 1990 (June, August, September, and October). Data were collected from 11 stations along the Westfield River and four tributaries in the lower drainage. Visual observations found no algal blooms, and DO levels were consistently above the Class B standard of 5.0 mg/l (MDEP, 1991). Analysis of the data indicated little change from the 1985 study. More specifically, the Westfield River meets Class B water quality standards as far downstream as RM 12.3, except for continuing fecal coliform problems on the lower portion of the river (last 5 miles). Between 1985 and 1991, BOD loading, nutrient levels, suspended solids, and fecal coliform declined by 1, 1-39, 12, and 44 percent, respectively.

To support relicensing the project, the applicant conducted site-specific water quality sampling in August 1997. The goal of this sampling was to characterize the existing water quality (temperature, DO, pH, and secchi disc transparency) at the project under warm weather conditions in order to determine compliance with applicable water quality standards. Sampling for temperature and DO occurred at six stations in the morning and in the evening on three consecutive days. Stations were located upstream of the project, in the impoundment, at the project intake, and in the project tailrace.

The monitoring data show that water quality conditions exceed the state standards for Class B warmwater fisheries. River flow during the sampling period varied from about 131 to 139 cfs. Water temperature ranged from 67.6°F (19.8°C) to 73.4°F (23.0°C) throughout the study period, and varied little among stations during any given sampling series. Similarly, there was little spatial or temporal change in DO from day to day at (or among) sampling stations. DO values ranged from 7.7 mg/l (85.5 percent saturation) to 9.1 mg/l (101.7 percent saturation) and typically never varied more than a few tenths of a mg/l among stations during a given sampling series. pH ranged from 6.4 to 7.6 over the course of the sampling event. Finally, secchi disk transparency in the impoundment ranged from 8.2 to 16.4 feet; in the impoundment at the intake the value was 1.48 feet.

b. Environmental Effects and Recommendations:

Water Use and Quantity

The applicant proposes to continue operating the Woronoco Project in a run-of-river mode, whereby outflow from the project would approximate inflow to the project. The impoundment elevation would be maintained at 229.0 feet, with minimal fluctuations. The applicant also proposes to release a continuous, year-round minimum flow of 57 cfs to the bypassed reach and develop a drawdown management plan, but does

not propose any specific measures to monitor compliance with run-of-river operation and the bypass minimum flow.

The applicant's proposals for run-of-river operation, bypass minimum flow, and a drawdown management plan are consistent with measures recommended by Interior and TU. Additionally, Interior recommends that the applicant develop a plan to maintain run-of-river operations and the bypass minimum flow.¹⁵

Because bypass minimum flows and impoundment drawdowns primarily affect fisheries resources, we provide our detailed analyses of these measures in section V.C.2., Fishery Resources.

Our Analysis

The Woronoco Project would continue to be operated in a run-of-river mode. Run-of-river operation would maintain existing hydraulic conditions and simulate natural conditions in the Westfield River, to the extent flow is controlled by the Corps' upstream flood control operations. Run-of-river operation would: (1) minimize daily water level fluctuations in the Woronoco impoundment, thus maintaining aquatic resources in the impoundment; and (2) maintain downstream habitat availability for fish and other aquatic organisms by mimicking natural flows. The project has no storage capacity and, when coupled with the proposed run-of-river operation, would have no influence on the seasonal quantity of water discharged into the Westfield River downstream from the project. Run-of-river operation would minimize shoreline erosion, and would limit adverse effects on adjacent wetland communities and wildlife species that use shoreline habitats (see section V.C.3.). The bypassed reach would receive a minimum flow of 57 cfs, which would restore some natural flow and ecosystem stability to the reach.

Based on the aforementioned findings, we conclude there is little potential for the Woronoco Project to adversely affect aquatic resources in the Westfield River stemming from the project's use and allocation of Westfield River flows. The applicant's proposed

¹⁵Interior's recommended plan would include a description and design of the mechanisms and structures that are used. The plan would also include provisions for recording data on project operations to verify proper operations and minimum flow releases, and for maintaining these data for inspection by the Commission and resource agencies. The plan would be developed in consultation with the USFWS and the MDFW, and 30 days would be provided for agency comment on the draft plan before it is filed with the Commission for approval.

run-of-river operation, coupled with the provision to provide minimum flows in the bypassed reach, would ensure habitat conditions remain suitable for aquatic resources in the Westfield River.

The applicant does not propose specific measures for monitoring run-of-river operation or any bypass minimum flow that may be required as part of a new license. Thus, we agree with Interior's recommendation for a project operation and flow monitoring plan. Such a measure is necessary to ensure compliance with run-of-river operation and any bypass minimum flow requirement. Moreover, implementing such a measure would afford interested parties a greater understanding of project operations and allow them to independently verify compliance. Therefore, we conclude that a plan for monitoring project operations, including any bypass minimum flow, is warranted.

The project operation and flow monitoring plan should include a description of: (1) the mechanisms and/or structures that would be used to release any required bypass minimum flow; and (2) all gages (including staff gages) and other equipment necessary to monitor run-of-river operation (*e.g.*, headpond and tailrace water surface elevations, generation flow) and any bypass minimum flow. The plan should also include: (1) procedures for recording and maintaining data on project operations and bypass minimum flows; (2) provisions for reporting appropriate project operations and bypass minimum flow data to the resource agencies and the Commission; (3) if necessary, a remote alarm system that can be used to notify an off-site operator in case of emergencies; and (4) a schedule for implementing the plan. The monitoring plan should be developed in consultation with the MDFW, the USFWS, and the USGS.

Water Quality

The applicant proposes to continue run-of-river operations at the Woronoco Project, and to provide a 57 cfs minimum flow to the project's bypassed reach. The applicant proposes no further measures to protect or enhance water quality in the Westfield River. Nor do the resource agencies recommend any specific measures to protect or enhance water quality.

Our Analysis

The Westfield River, in the vicinity of the project, has been designated as Class B waters for warmwater fisheries and recreation. The state standard for DO is no less than 5.0 mg/l and 60 percent saturation. The state standard for water temperature is 83°F, with a 5°F difference associated with water discharges. Historical water quality data for the Westfield River indicates that the river, in the vicinity of the project, fully meets these

standards as far downstream as RM 12.3, well below the Woronoco Project.¹⁶ Further, the results of the applicant's 1997 survey showed that water quality conditions in the project area attained or exceeded Class B warmwater standards for water temperature, DO, and pH during the critical, low-flow/high-temperature summer period.

Under the applicant's run-of-river proposal, we expect water temperature and DO to remain within the acceptable range for supporting a warmwater fishery in the river. Uninterrupted river flows provided by operating in a run-of-river mode minimizes water retention time in the project impoundment, thereby lessening the potential for reduced DO levels and stratification. In addition, continued project operation in a run-of-river mode would protect existing water quality in the river by maintaining natural flow volumes downstream from the project, which would promote circulation through the project impoundment, minimize solar warming, and assist with flushing of accumulated sediments potentially trapped behind the project's two dams and earthen dike.

The applicant's proposed bypass flow of 57 cfs, released from several locations along the north and south dams, would provide certain long-term benefits to water quality in the bypassed reach. We would expect the proposed minimum flow for the bypassed reach to help provide continuity of flows, enhance mixing and aeration of river water, and effectively increase the water quality and waste assimilation capacity of the river.

As discussed further in section V.C.2., the resource management goals for the bypassed reach include, among other things, providing nursery habitat for juvenile Atlantic salmon and incidental habitat for transient brown and rainbow trout. Water temperature and DO levels would be important to achieving these goals. During the 1997 water quality study,¹⁷ water temperature ranged from about 69°F (20.0°C) in the morning to about 72°F (22°C) in the afternoon. DO levels varied little, averaging about 8.4 mg/l, with percent saturation in the 96 percent range. In addition, as part of the instream flow study, water temperature and DO were collected in the south channel pool. On July 31,

¹⁶According to the 1990 MDEP water quality survey for the Westfield River, the lower 5 miles of the river experiences violations of state standards for fecal coliform. Fecal coliform is associated with domestic wastewater discharges, as opposed to the Woronoco Project. However, the project's proposed run-of-river operation and minimum bypass flow would help ensure some level of flushing in the system.

¹⁷Flow conditions in the river represented a 50 percent exceedence flow for the month of August. Weather conditions were mild, with day-time temperatures ranging from the mid-70s to high 80's and night-time temperatures in the mid-60s. Rain occurred on the third day.

1998, water temperature in the pool was 76°F, and DO was 5.7 mg/l. The maximum temperature recorded during the study period (July 31 to August 28, 1998) was about 78°F.

The temperature and DO data cited above meet Class B warmwater fishery standards. However, these data represent marginal conditions for coldwater fisheries, particularly where it concerns water temperature. The temperature tolerance range for rainbow trout is 0 - 77°F (Raleigh *et al.*, 1984) and for brown trout is 0 - 81.6°F (Raleigh *et al.*, 1986). Minimum flows provided to the bypassed reach would improve habitat, aeration, and temperature conditions for coldwater fisheries and other aquatic organisms during the summer months.

In conclusion, no water quality issues have been raised by federal or state resource agencies or other entities in this relicensing process. The continued operation of the project, as proposed, would not adversely affect, but rather would enhance, the ability of the existing project to comply with Class B water quality standards. Further, the proposed project would not contribute to, but could enhance the impaired water quality identified by the MDFW for the lower-most 5 miles of the Westfield River. Therefore, we conclude that relicensing the Woronoco Project would not have significant adverse effects on water quality in the Westfield River.

c. Unavoidable Adverse Effects: None.

2. Fishery Resources

a. Affected Environment:

The Westfield River upstream of the project drains the east slope of the Berkshire Mountains in western Massachusetts. Generally, the headwater tributaries in the drainage support coldwater fisheries, while the mainstem and lower river reaches support marginal coldwater and warmwater fisheries. The river basin upstream of the project, including numerous small tributaries, contributes rearing habitat for Atlantic salmon restoration.

Aquatic Habitat

The Woronoco Project includes: (1) a shallow impoundment of about 43 acres, which provides suitable habitat for warmwater fishes; (2) a deep tailwater pool, which is capable of supporting adult fish; and (3) a bypassed reach consisting of three channels that provide some fish habitat (figure 4). These habitat areas are described more fully below.

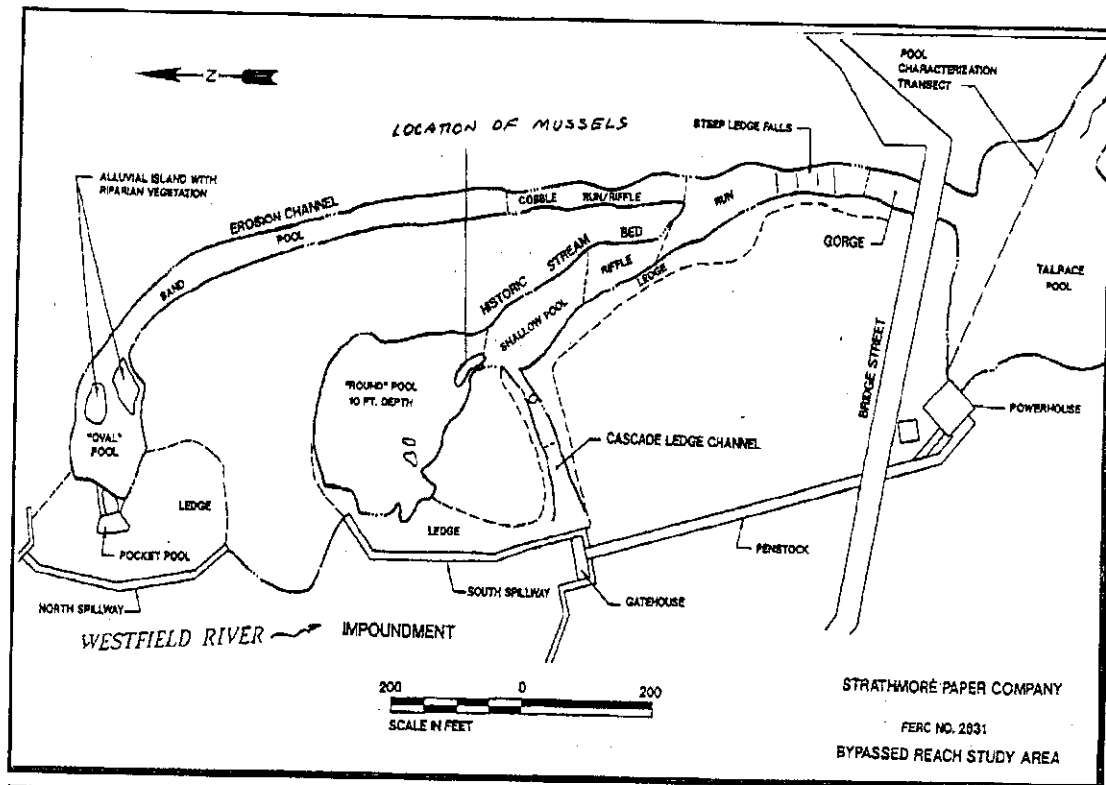


Figure 4. Bypassed reach and instream flow study area for the Woronoco Project (FERC No. 2631) (Source: Kleinschmidt Associates, 1999).

The Woronoco impoundment is relatively narrow and riverine in character, extending upstream of the dam complex for about 6,800 feet (or just over 1.25 miles). Channel depth is about 8 feet, with shoal areas ranging from 2 to 4 feet deep. The shoreline generally consists of steep banks, and is fringed with natural wetland, riparian, and upland vegetation. Substrate throughout the impoundment is predominately a mix of sand and silt. Cover types present in and around the impoundment include areas with overhanging terrestrial vegetation, brush, downed trees, and rooted aquatic vegetation.

The project's bypassed reach extends from the toe of the north and south dams downstream to the confluence with the project tailrace.¹⁸ The habitat consists of three

¹⁸The bypassed reach was the subject of habitat mapping and a flow demonstration study in 1990 and 1991. Recreational access to the reach is limited by steep, hazardous approaches, which surround the entire reach.

channels, separated by ledge outcrops and/or vegetated alluvium. The three channels converge immediately upstream of a 14.6-foot-high natural ledge drop, which is located in a steep-walled gorge. This ledge drop forms a barrier to upstream fish movement at most flows. The bypassed reach currently supports fish, mussels, and macro-invertebrates, though habitat in the reach is limited by a lack of any minimum flow release.

The original river channel, which extends about 700 feet from the ledge base of the south dam's spillway to the project tailrace, is composed of pool, shallow run and shallow riffle habitat areas. Substrate in this reach is composed of either sand/silt or highly impeded gravel/cobble. There are few hydraulic controls and essentially no cover or velocity shelters. The original river channel is joined, about 600 feet from its origin, by a secondary "erosion" channel, which was formed by a 1938 flood event. This secondary channel begins at the base of the north dam's spillway and extends about 1,000 feet downstream to its confluence with the original channel. Habitat types in this channel consist of shallow pool and shallow run/riffle areas, with substrates of either sand or cobble embedded in sand. Microhabitat features in this channel (*e.g.*, cover, channel form) are poorly developed and ephemeral in nature, due to substrate instability. Velocity shelters are scarce, though the riffle areas provide some macroinvertebrate habitat. A third channel, located adjacent to the project intake, cascades some 200 feet over bedrock terrace ledges to its confluence with the original river channel. Habitat in this channel is limited to small, shallow scour pools in bedrock pockets, with little or no available cover.

The bypassed reach converges with the project tailrace in a circular pool of about 250 feet in diameter. The tailrace pool is generally 11 to 15 feet deep, with a maximum depth of about 19 feet. Substrate is a combination of boulder, ledge, and sand. The water elevation of the pool is controlled by a cobble island and ledge outcrop located at the pool's outlet.

Resident Fish Community

The MDFW has periodically surveyed the fish fauna of the Westfield River since the 1940s, including surveys conducted in 1942, 1952, and 1977 (MDFW, 2000). Some 65 locations throughout the drainage were sampled in 1977 using electrofishing equipment. A total of 25 species were collected (table 2). The five most frequently encountered species during the surveys were white sucker, blacknose dace, brook trout, brown trout, and longnose dace.