

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Finch, Pruyn & Company, Inc.

Project No. 2385-002
New York

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(September 13, 2001)

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 new license for the Glens Falls Hydroelectric Project, located on the Hudson River in Warren and Saratoga Counties, New York, and has prepared a Final Environmental Assessment (FEA) for the project.

The FEA contains the staff's analysis of the potential environmental impacts of the project and concludes that licensing the project, with appropriate environmental protective measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the FEA is on file with the Commission and is available for public inspection. The FEA may also be viewed on the web at <http://www.ferc.gov> using the "RIMS" link--select "Docket #" and follow the instructions (call 202-208-2222 for assistance).

David P. Boergers
Secretary

**ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE**

Glens Falls Hydroelectric Project

FERC Project No. 2385-002

New York

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

September 2001

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ACRONYMS AND ABBREVIATIONS

ADK	Adirondack Mountain Club
AHDC	Adirondack Hydro Development Corporation
APE	area of potential effect
Btu	British thermal units
cfs	cubic feet per second
Commerce	Secretary of Commerce
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
DO	dissolved oxygen
EA	environmental assessment
EPRI	Electric Power Research Institute
FCA	Feeder Canal Alliance
FPA	Federal Power Act
FPC	Finch, Pruyn & Company, Inc.
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Interior	U.S. Department of the Interior
kW	kilowatt
kWh	kilowatt-hour
MW	megawatt
MWh	megawatt-hours
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMPC	Niagara Mohawk Power Corporation
National Register	National Register of Historic Places
NYPOOL	New York Power Pool
NYRU	New York Rivers United
NYSDEC	New York State Department of Environmental Conservation
NYSTA	New York State Thruway Authority
O&M	Operation & maintenance
PA	Programmatic Agreement
ROR	run-of-river
SHPO	State Historic Preservation Officer
USGS	U.S. Geological Survey
WQC	Water Quality Certification

SUMMARY

On December 4, 1991, Finch, Pruyn & Company, Inc. (FPC) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) for a new license under Part I of the Federal Power Act (FPA) to operate the 12.7-megawatt (MW) Glens Falls Hydroelectric Project No. 2385, located on the Hudson River in Warren and Saratoga Counties, New York.¹ FPC proposes to increase the installed capacity by 0.6 MW.

This environmental assessment (EA) analyzes the effects of the proposed action, the proposed action with additional staff-recommended measures, and no-action. Our analysis shows that the best alternative for the Glens Falls Project to reduce or avoid adverse effects on environmental resources is to issue a new license with the following measures: (1) continue to operate the project in run-of-river mode; (2) limit reservoir fluctuation to within 6 inches of the normal maximum pond elevation; (3) continue to release a minimum flow of 5 cubic feet per second into the bypassed reach with weirs to disperse the flow; (4) monitor and report instantaneous flows and water surface elevations; (5) develop a plan to provide 1-inch trashracks and a fish bypass system at the powerhouse intake; (6) reserve the U.S. Department of the Interior's (Interior) authority to prescribe fishways; (7) implement a Programmatic Agreement providing for a Cultural Resources Management Plan; (8) provide an upstream access point for canoe portage; and (9) develop and implement a recreation plan providing for upstream and downstream canoe portage access points, a downstream fishing and parking area that is accessible to the physically disabled, signage, and appropriate erosion and sediment control measures. We discuss these measures in section V and summarize them in section VII of this EA.

Overall, these measures, along with the standard articles provided in any license issued for the project, would protect or enhance water quality, fisheries, terrestrial, cultural, and recreational resources.

Under the provision of Section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations of federal and state fish and wildlife agencies to adequately and equitably protect, mitigate damages to, and enhance fish and wildlife (including spawning grounds and habitat) affected by the

¹ FPC's license expired on December 31, 1993. On January 21, 1994, the Commission issued FPC an annual license effective to December 31, 1994, or until the issuance of a new license for the project or other disposition under the FPA, whichever came first.

project. The New York State Department of Environmental Conservation (NYSDEC) and Interior filed recommendations for the protection, mitigation, and enhancement of such resources in response to the Notice of Application Ready for Environmental Analysis issued on August 24, 1998. All of our recommendations are consistent with those of the resource agencies. We discuss these measures and our recommendations in sections V and VIII of this EA.

The NYSDEC granted FPC, pursuant to Section 401 of the Clean Water Act, a water quality certificate with conditions on May 5, 1995. In this EA, we make recommendations consistent with the terms of the water quality certificate to ensure protection of water quality at the site.

On the basis of our independent analysis, we conclude that issuing a new license for the Glens Falls Project, with our recommended measures, would not be 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
Washington, DC

GLENS FALLS HYDROELECTRIC PROJECT FERC NO. 2385--NEW YORK

I. APPLICATION

On December 4, 1991, Finch, Pruyn & Company, Inc. (FPC or applicant) filed an application with the Federal Energy Regulatory Commission (Commission) for a new license under Part I of the Federal Power Act (FPA) to operate the 12.7-megawatt (MW) Glens Falls Hydroelectric Project. The Glens Falls Project is located on the Hudson River in the city of Glens Falls in Warren and Saratoga Counties, New York (figure 1). FPC proposed to increase the installed capacity by 0.6 MW.¹ The project does not occupy any federally owned lands.

II. PURPOSE OF ACTION AND NEED FOR POWER

A. Purpose of Action

The Commission must decide whether to license FPC's proposed project, and what, if any, conditions should be placed on any license issued. In this environmental assessment (EA), we assess the environmental and economic effects of: (1) operating the project as FPC proposes; (2) operating the project as FPC proposes with additional staff-recommended measures; and (3) no-action.

B. Need for Power

To assess the need for power, we reviewed FPC's present and future use of the project's power. The Glens Falls Hydroelectric Project is located in the New York

¹ FPC proposes to increase the installed capacity by 0.6 MW to 12.7 MW following the rehabilitation of the turbines in Units 1, 2, and 5. FPC replaced the Unit 1 turbine in 1994 and the runners in the Unit 2 turbine in 1996. Only the upgrade to unit 5 remains to be completed to achieve the increase of 0.6 MW.

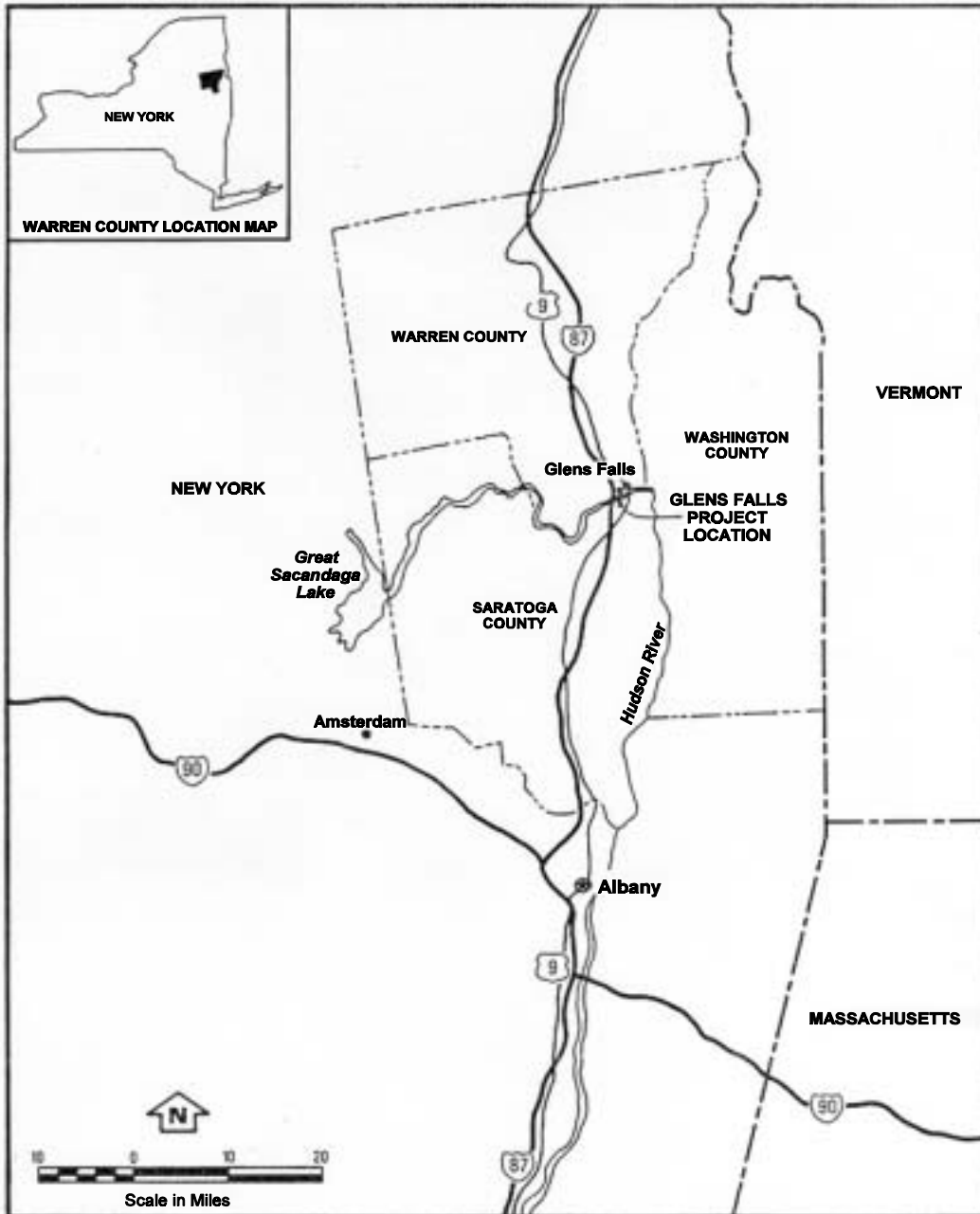


Figure 1. Glens Falls Hydroelectric Project - Location Map (Source: FPC, 1991)

Power Pool (NYPOOL) subregion of the Northeast Power Coordinating Council region of the North American Electric Reliability Council (NERC, 1998).

The Glens Falls Project generates an average of about 54,200 megawatt-hours (MWh) of power annually for FPC. All power is used for mill operations, unless the mill is shut down, which rarely occurs.² The relatively low-cost energy from the hydroelectric project enables FPC to keep its operating costs low, thus enabling it to remain competitive in a highly competitive market. Without the power from the project, about 7.2 MW of energy would need to be purchased from an outside source, lowering FPC's competitive margin and creating additional demand for power from NYPOOL.

The mill normally requires 39 MW of power for routine operation, according to information provided by FPC during our December 9, 1998, site visit. The dependable capacity from the hydroelectric project is 7.2 MW. FPC also operates 10 steam boilers that produce, on average, 27 MW of energy. The balance of needed energy is currently purchased from Niagara Mohawk Power Corporation (NMPC). During mill shutdown, the excess power is sold to NMPC.

III. PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action

1. Project Description

The Glens Falls Project (figure 2) consists of: (1) a portion of seven, 7.5-foot-high, 57-foot-long hydraulically operated steel crest gates anchored on a 5-foot-high concrete base including: (a) a Wingwall No. 1, constructed in 1991, which together with Pier No. 1, is the left abutment of the dam and future right abutment of the proposed headgate structure (to be redeveloped in the next few years); (b) an upper forebay wall; (c) a bridge pier of the Route 9 bridge integral with the forebay walls; and (d) a powerhouse headwall penetrated by six pressure cases, together with its left abutment; (2) a 167-acre impoundment with a normal minimum and maximum elevation of 268.6 and 269.1 feet National Geodetic Vertical Datum (NGVD), respectively, and a gross and usable storage capacity of 1,083 acre-feet; (3) a concrete headgate structure with eight, 7.5-foot-wide and 12-foot-high wooden slide gates that control flow to the power canal; (4) a 550-foot-long, 80-foot-wide, and 21- to 37-foot-deep power canal that supplies

² The FPC paper mill employs about 5,000 people and is FPC's sole paper making location.

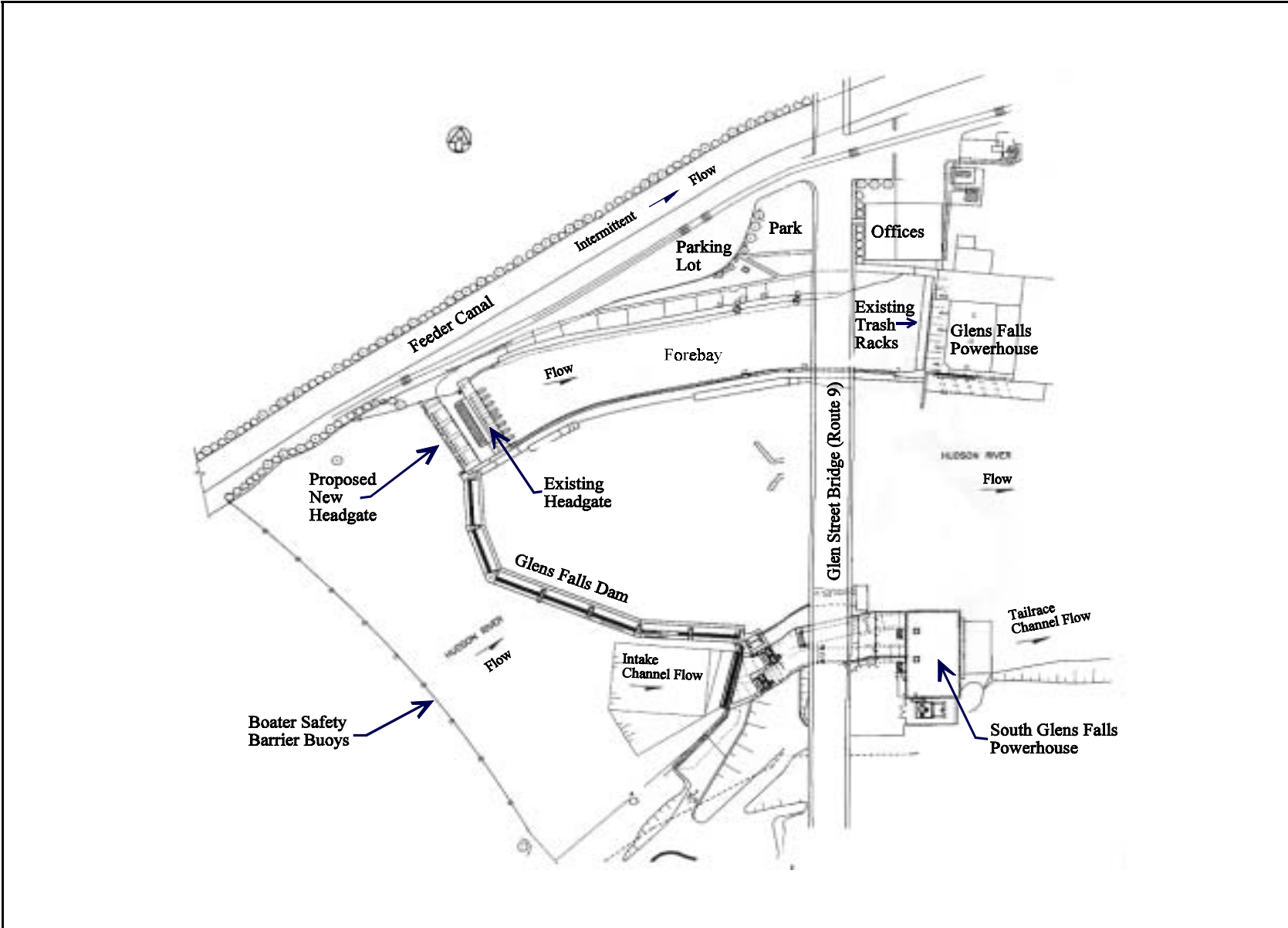


Figure 2. Glens Falls Hydroelectric Project Facilities (Source: FPC, 1991, as modified by staff)

water to the powerhouse and to a paper mill; (5) a 98-foot by 136-foot reinforced concrete powerhouse located in the FPC paper mill containing five horizontal Francis turbines and generators with an installed capacity of 12.09 MW (12.7 MW after upgrade), hydraulic capacity of 4,265 cubic feet per second (cfs) (4,465 cfs after upgrade), and design head of 46 feet; (6) five-arch tailrace tunnels of which two are interconnected that exit the powerhouse on the south side of the mill; (7) a 34.5-kilovolt transmission line connected to the NMPC power grid; and (8) appurtenant structures.

FPC and Adirondack Hydro Development Corporation (AHDC) own the existing dam. FPC owns gates 6 and 7 and AHDC owns gates 1 through 5. All other elements of the facility are exclusively owned by FPC. A Commission consent order dated November 13, 1991, required NMPC and FPC to rehabilitate the dam at Glens Falls. Subsequent to the order, NMPC leased its holdings to AHDC, the licensee of the South Glens Falls Hydroelectric Project No. 5461. Reconstruction of the dam included 125 feet of the north section (including gate bays 6 and 7) owned by FPC (letter from David P. Manny, Vice President, FPC, May 24, 1995). The only portion of the dam remaining to be rehabilitated is the FPC power canal headgate structure.

2. Proposed Operation

The Glens Falls Project shares the Hudson River water and the impoundment with the South Glens Falls Hydroelectric Project (FERC No. 5461), located across the river from the project. Both the South Glens Falls Hydroelectric Project (which was redeveloped in 1994) and the Glens Falls Hydroelectric Project operate 24 hours a day, 7 days a week (letter from David P. Manny, Vice President, FPC, dated May 24, 1995). The hydraulic capacity of the redeveloped South Glens Falls Project is 4,900 cfs, and the hydraulic capacity of the Glens Falls Project is 4,265 cfs. The two facilities share the available flow equally up to twice the hydraulic capacity of the Glens Falls Project. The remaining flow can be used by the South Glens Falls Project. Flows are computer-monitored at both facilities to allow for near-instantaneous flow sharing and are balanced on a daily basis.

Both projects operate in a run-of-river mode (ROR). The inflow to the impoundment fluctuates due to re-regulation of the flow at the upstream Feeder Dam Hydroelectric Project (FERC No. 2554). The elevation of the impoundment is kept within 6 inches of the normal maximum elevation of 269.1 feet NGVD. Impoundment water levels are fluctuated only for maintenance work if needed.

FPC proposes to increase the hydraulic capacity of the project to 4,465 cfs after upgrade of Units 1, 2, and 5. Upon completion of the proposed upgrade, the flow would

be shared equally with the South Glens Falls Project up to 8,930 cfs (2 x 4,465 cfs). The remaining flow could be used by the South Glens Falls Project. Flow in excess of 9,365 cfs, which would be the maximum combined capacity of the two facilities, would spill over the dam's crest gates. A new turbine was installed to replace Unit 1 in 1995, and new runners were installed in Unit 2 in 1996. Only Unit 5 remains to be upgraded.

Both projects would continue to operate in a ROR mode. The impoundment level would remain unchanged with a maximum drawdown of 6 inches below the normal maximum elevation of 269.1 feet NGVD. The installation of the crest gates by the South Glens Falls Project in 1994 resulted in more stable impoundment levels than in the past when flashboards were used. The operations of the Glens Falls Project would continue to be coordinated with the Feeder Dam Hydroelectric Project to minimize water level fluctuations.

3. Proposed Environmental Measures

FPC proposes the following measures:

- (1) continue to operate in ROR mode;
- (2) limit impoundment fluctuations to within 6 inches of normal maximum pond elevation of 269.1 feet NGVD;
- (3) release a minimum flow of 5 cfs through a pipe (installed in 1994), and install low-head diversion weirs to disperse the flow;
- (4) develop a plan to monitor and report instantaneous flow releases;
- (5) investigate the option of replacing the existing trashracks at the powerhouse with 1-inch clear spaced trashracks when the existing racks have reached the end of their service life;³
- (6) install and maintain a small picnic and overlook area adjacent to the power canal (completed in 1996); and

³ FPC subsequently reached an agreement with the U.S. Fish and Wildlife Service (FWS) to install 1-inch clear spaced trashracks and a fish bypass system; this is discussed in section VIII, Recommendations of Fish and Wildlife Agencies.

- (7) provide car-top boat access downstream of the dam.

B. Proposed Action with Additional Staff-recommended Measures

In addition to or in lieu of FPC's proposed measures, we recommend the following measures:

- (1) reserve the U.S. Department of the Interior's (Interior's) authority to prescribe the construction, operation, maintenance of fishways under Section 18 of the FPA;
- (2) implement a Programmatic Agreement (PA) providing for the development of a Cultural Resources Management Plan (CRMP); and
- (3) provide an appropriate canoe take-out point along the impoundment shoreline and develop and implement a recreation plan providing for recreational access downstream of the dam for fishing and boating and additional signs at FPC's picnic and overlook area, an operations and maintenance plan for recreational facilities, and erosion and sedimentation control measures.

C. No-action

Under the no-action alternative, the project would continue to operate 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.

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation and Interventions

The Commission's regulations require applicants to consult with appropriate state and federal environmental resource agencies and the public before filing a license application. This consultation is required to comply with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be complete and documented in accordance with the Commission's regulations.

The Commission issued a Public Notice on August 24, 1998, saying that the application for the Glens Falls Project was ready for environmental analysis and that all comments should be filed within 60 days of the notice. The following entities commented:

<u>Commenting Entities</u>	<u>Date of Letter</u>
New York State Department of Environmental Conservation	October 19, 1998
U.S. Department of the Interior	October 21, 1998
Adirondack Mountain Club	October 26, 1998
New York Rivers United	December 1, 1998

FPC responded to the terms and conditions filed by the resource agencies in letters dated October 23, December 7, December 18, 1998, and February 3, 1999.

Organizations and individuals also may petition to intervene and become a party to subsequent proceedings. On August 28, 1992, the Commission issued a notice that FPC had filed an application to license the Glens Falls Project. This notice set October 27, 1992, as the deadline for filing protests and motions to intervene. In response to the public notice, the following entities filed motions to intervene in, but not in opposition to, the proceedings:

<u>Intervenors</u>	<u>Date of Motion</u>
New York State Department of Environmental Conservation	October 20, 1992
Adirondack Hydro Development Corporation	October 29, 1992
U.S. Department of the Interior	November 27, 1992
American Rivers and New York Rivers United	November 30, 1992
New York State Electric & Gas	June 5, 1995
Fort Miller Associates	June 27, 1995

We address intervenor concerns in the environmental analysis section (section V) of this EA.

B. Scoping Process

Before preparing this EA, we conducted scoping for the Glens Falls Project as part of a proposed multiple project environmental impact statement for Hudson River

Projects to determine what issues and alternatives should be addressed. A Scoping Document was distributed to agencies and other interested parties on March 31, 1995. One day-time public scoping meeting was noticed and held on April 25, 1995, at the Sanford Town Library at Loudonville, New York. Three evening public scoping meetings were noticed and held on April 25, April 26, and April 27, 1995, in Loudonville, Cohoes, and Glens Falls, New York, respectively, to request oral comment on the project. A court reporter recorded all comments and statements made at the scoping meetings, and the transcripts of these meetings are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments pertaining to the Glens Falls Project:

<u>Commenting Entity</u>	<u>Date of Letter</u>
Finch, Pruyn & Company, Inc.	May 24, 1995
Adirondack Hydro Development Corporation	May 26, 1995
New York Rivers United	May 26, 1995
U.S. Fish and Wildlife Service	May 31, 1995

We conducted a publicly noticed site visit on December 9, 1998. The Feeder Canal Alliance (FCA) filed a letter dated December 16, 1998, in response to the site visit notice.

C. Comments on the Draft Environmental Assessment

We issued the draft EA for comment on May 7, 1999. We received four comment letters from the following agencies and non-governmental organizations:

<u>Commenting Entity</u>	<u>Date of Letter</u>
Finch, Pruyn & Company, Inc.	June 18, 1999
Adirondack Mountain Club	June 21, 1999
U.S. Fish and Wildlife Service	July 8, 1999
Finch, Pruyn & Company, Inc.	July 23, 1999

Comments are addressed (where pertinent) within the text of this final EA and in detail in Appendix A.

D. Mandatory Requirements

1. Clean Water Act, Section 401

Under Section 401(a)(1) of the Clean Water Act (CWA), license applicants must obtain either state certification that any discharge from a project would comply with applicable provisions of the CWA or a waiver of certification by the appropriate state agency.

On November 13, 1991, FPC applied to the New York State Department of Environmental Conservation (NYSDEC) for Water Quality Certification (WQC) for the Glens Falls Project, as required by Section 401 of the CWA. The NYSDEC denied the WQC for the Glens Falls Project on November 9, 1992. FPC appealed the denial.⁴ The NYSDEC issued a WQC with conditions on May 5, 1995.

The WQC includes the following conditions for project operations in section A: (1) operate ROR where operation is based on an active storage volume of 0 cubic feet at all times and instantaneous sum of all discharges and releases equals instantaneous inflow to the extent practicable, and can be modified for operating emergencies; (2) ensure that impoundment elevation does not drop lower than 0.50 foot below 269.1 feet U.S. Geological Survey (USGS) datum, as modified for emergencies; (3) provide a minimum flow release of 5 cfs to the bypassed reach to be accomplished by installation of minor flow diversion structures designed by Acres International Corporation and dated November 1, 1994 (demonstrated on November 17 and December 6, 1994), and which must be installed within 6 months of licensing; and (4) file a flow monitoring plan within 3 months of licensing consistent with flow monitoring plan at South Glen Falls Project, and including a USGS gaging station, unless an alternative is justified. The plan must include all gages to determine stage and flow of streams, determine all other project flows, including flows through the turbine and any other diversions, and determine project headpond and tailwater elevation.

The WQC also contains project maintenance and construction conditions in section B that deal with maintenance dredging, sediment analysis and disposal, erosion and sediment control, placement of cofferdams, maintenance of river flows, turbidity monitoring, and notifications, and in section C that provide for car-top boat and fishing access to the river below the impoundment, a parking area for five cars, and a plan including handicapped fishing access. We discuss our recommendations to ensure protection of water quality at the Glens Falls Project in section V.C.1, Water Resources.

⁴ The FPC appeal coincided with various court cases (Niagara Mohawk Power Corporation v. New York State Department of Environmental Conservation and PUD No.1 Jefferson County v. Washington Department of Ecology) involving the scope of Section 401 WQC.

2. Federal Power Act, Section 18

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, or the Secretary of Commerce (Commerce), as appropriate.⁵

Pursuant to Section 18, Commerce determined that the Glens Falls Project would not affect resources or species for which the National Marine Fisheries Service (NMFS) is responsible (Stanley W. Gorski, Assistant Branch Chief, NMFS, Highlands, NJ, dated May 12, 1989). Subsequently, Commerce reviewed the draft application for the Glens Falls Project and deferred to Interior (Kathy Middleton, NMFS, Gloucester, MA, dated January 7, 1991).

Pursuant to Section 18, Interior filed with the Commission, by letter dated October 21, 1998, a request for the reservation of authority to prescribe the construction, operation, and maintenance of upstream and downstream fishways.

3. Coastal Zone Management Act

The Glens Falls Project is not located within the New York State coastal zone management program. For the purpose of federal consistency, the coastal zone area along the Hudson River ends at the federal dam at Troy downstream of the Glens Falls Project. For the purposes of consistency with the state inland program, the community must complete a waterfront revitalization plan. The city of Glens Falls has not completed a waterfront revitalization plan and is, therefore, not participating in the inland program (personal communication between Patricia L. Weslowski, Louis Berger & Associates, Needham, MA, and Kevin Millington, Coastal Resources Specialist, New York, Department of State, Division of Coastal Resources, Albany, NY, December 7, 1998). Our assessment is that no coastal zone consistency is needed for this project.

V. ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the project area, including a discussion of environmental resources in the project area that may be

⁵ Section 18 of the FPA provides that “the Commission shall require construction, maintenance, and operation by a licensee at its own expense such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior, as appropriate.”

subject to cumulative effects from the Glens Falls Project when considered in combination with other actions affecting the resources. Then, we discuss each affected environmental resource. For each resource, we first describe the affected environment--which is the existing condition and the baseline against which to measure the effects of the proposed and any alternative actions--and then the environmental effects of the project, including proposed environmental measures.

We include only resources that would be affected, or about which comments have been made by interested parties, in detail in this EA.

Unless mentioned otherwise, the source of our information is the license application (FPC, 1991) and supplemental filings by the applicant.

A. General Description of the Hudson River Basin North of Albany

The Glens Falls Project is located on the Hudson River in the northern portion of its drainage basin. The Hudson River drains about 8,100 square miles at Albany, New York. The river's mainstem originates in the Adirondack Mountains and flows southward to New York Bay and the Atlantic Ocean. Table 1 lists the existing hydroelectric projects north of Albany from the Great Sacandaga Lake downstream to Troy dam.

Table 1. Hydropower development on the Hudson River north of Albany (Source: FERC, 1995a)

Project name	FERC number	Installed capacity kilowatt (kW)	Drainage area (sq mi)	Storage capacity (ac-ft)
E.J. West ^a	2318	20,000	1,044	866,000
Stewarts Bridge ^a	2047	30,000	1,054	21,400
Palmer Falls	2609	58,300	2,756	1,340
Curtis	2609	10,800	2,755	9,800
Hudson River	2482			
Sherman Island Development		28,800	2,779	32,276
Spier Falls Development		44,400	2,785	11,285

Project name	FERC number	Installed capacity kilowatt (kW)	Drainage area (sq mi)	Storage capacity (ac-ft)
Feeder Dam	2554	6,000	2,790	7,016
Glens Falls	2385	12,700	2,817	1,253
South Glens Falls	5461	15,700	2,817	1,253
Hudson Falls	5276	36,100	2,812	578
Fort Miller	4226	4,800	2,980	1,500
Stillwater	4684	3,500	3,745	9,000
Upper Mechanicville	2934	18,500	4,500	10,735
Mechanicville	6032	4,500	4,572	1,150
Green Island	13	6,000	8,090	6,000

^a On the Sacandaga River.

The Glens Falls Project lies approximately 5 miles southeast of the Adirondack State Park and 46 miles north of Albany. The project is located at river mile 200.7 on the north bank of the Hudson River. Directly across the river and using the same dam is the South Glens Falls Hydroelectric Project (Project No. 5461), owned and operated by AHDC.

The climate consists of cold winters and warm, wet summers and is heavily influenced by the North Atlantic Ocean. Temperatures in the project area range from an average of 22.1°F in January to an average of 71.8°F in July. Annual precipitation averages 40 inches, and snowfall averages 60 inches.

The natural feature known as Glens Falls is located immediately downstream of the project dam. Approximately 35 feet high, the falls have etched steep and picturesque banks in the limestone formations along the north side of the river.

Vegetation in the immediate project vicinity is sparse, having been replaced by urban and industrial development. The steep banks of the shoreline of the impoundment, however, remain relatively densely forested.

The project occupies land within an industrial zone of the city of Glens Falls with a population of approximately 15,000 (1990). The project site has been used continuously as a paper mill since 1865 when FPC was established.

B. Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's Regulations for implementing the National Environmental Policy Act (§ 1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to 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.

We identify fisheries and recreation as having the potential to be cumulatively affected by this project in combination with the other hydropower developments in the basin.

1. Geographic Scope

The geographic scope of our cumulative effects analysis defines the physical boundaries of the proposed actions' effects on fisheries and recreation resources. Because the proposed actions affect the resources differently, the geographic scope for each resource area may vary. In this case, our geographic scope for fisheries is from Feeder dam to Troy dam. Included within this scope are the Glens Falls Project, the South Glens Falls Project, the Hudson Falls Project, and the Feeder Dam Project. We choose this geographic scope because there is no upstream passage at Feeder dam but actions at the project could affect resident fish populations at downstream locations. Our geographic scope for recreational resources is from Great Sacandaga Lake to Troy dam because the Hudson River serves to link recreational opportunities in the Adirondack region (i.e., Great Sacandaga Lake) to the more urban Albany and Troy area.

For all other resources, we confine our analysis to the immediate project area.

2. Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and future actions and their effects on fisheries and recreational resources. Based on the term of the proposed license, we projected 30 to 50 years into the future, concentrating on the effects on fisheries and recreational resources from reasonably foreseeable future actions.

The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the license application, comprehensive plans, and scoping comments received from agencies.

As we discuss in detail in sections V.C.2, Fisheries Resources, and V.C.5, Recreation and Land Use Resources, with our proposed environmental measures, the project would have beneficial cumulative effects on fisheries resources and recreational opportunities in the Hudson River Basin.

C. Proposed Action and Action Alternatives

We have reviewed the proposed project in relation to the environmental resources in the project impact area and have concluded that there would be no direct or indirect adverse environmental impacts on soils and geology, aesthetics, and socioeconomic resources, because the proposed action would not involve any major new construction activity.

1. Water Resources

a. Affected environment:

Water Quantity

The drainage area of the Hudson River at the Glens Falls Project is 2,817 square miles. Hudson River flows at the project are primarily controlled by releases from the Great Sacandaga Lake located about 20 miles upstream; the minimum daily release is 3,000 cfs with lower releases during droughts. During the drought of 1985, the average release was about 2,500 cfs. Additional flows are contributed by releases from dams at Indian Lake, Stewarts Bridge, Spier Falls, and Sherman Island, although the storage capacity of the latter three impoundments is limited.

The flow is re-regulated by the Feeder Dam hydroelectric facility (FERC Project No. 2554), located about 2 miles upstream of the project. The Feeder dam diverts between 120 and 250 cfs to the Feeder Canal which provides water to the Champlain canal to ensure navigability during the navigation season (typically from May to November).

The average annual flow at Glens Falls dam between 1941 and 1989 was 4,955 cfs ranging from 3,902 to 6,684 cfs. The highest daily flow since flow regulation started at the Great Sacandaga Lake in 1930 was 40,577 cfs on April 2, 1976. The minimum

flow occurred on July 20, 1982 with 321 cfs. On average, the highest flows occur in April, the lowest flows occur in August and September (table 2).

In conjunction with the South Glens Falls Project on the opposite side of the river, the Glens Falls Project maintains a continuous flow downstream because it is operated ROR (the combined outflow from the projects equals the inflow to the projects).

Water Quality

The state classifies the water upstream of a point 0.25 miles upstream of Glens Falls dam as Class B. The river is classified as Class C for about 8 miles downstream of that point. Class B water is considered suitable for all uses including primary recreation but excluding drinking water supply. Class C is considered suitable for fishing and all other uses, except as a source for drinking and food processing water and primary contact recreation. The dissolved oxygen (DO) standard for Class B and C waters is 5.0 mg/l (minimum daily average), and at no time shall the DO concentration be less than 4.0 mg/l. Water temperatures in class B and C waters shall not exceed 90°F. Discharges into these waters are not permitted to increase the temperature of the receiving waters by more than 5°F. The state considers the water quality in the project area to be good, and there are no health advisories related to the human consumption of chemically contaminated fish in effect for project waters. However, there is a health advisory in effect for fish caught upstream of the Feeder Dam Project and downstream of the Fort Edwards Project. This advisory pertains to potential polychlorinated biphenyl (PCB) contamination of fish caught in these waters (1998-1999 Health Advisories: Chemicals in Sportfish and Game, listed at www.health.state.ny.us accessed on January 12, 1999).

Available water quality data are in compliance with state standards. DO concentrations measured by FPC in the impoundment on July 31, 1991, ranged between 8.1 and 9.2 mg/l; the water temperature was 75°F. Both DO and temperature measurements reflected an unstratified water column. DO measured in the Glens Falls forebay by FPC on July 12, 18, 25, and August 1, 1991, all exceeded 7.7 mg/l. A diurnal DO survey of the Glens Falls forebay conducted on July 14, 1980, by the NYSDEC found all DO values to be above 7.9 mg/l. Another diurnal DO survey conducted by NYSDEC at Haviland Cove Beach on June 22, 1977, found all values to be above 8.3 mg/l.

FPC measured DO downstream of the project on July 25 and August 1, 1991, and both values exceeded 7.7 mg/l. NYSDEC conducted a diurnal DO survey about a mile downstream of the project on June 22, 1977. All values exceeded 8.0 mg/l.

There are several industries, both upstream and downstream of the project, that use the river for process water or cooling water. The most relevant of these intakes is the FPC paper mill which can withdraw up to 63 cfs from behind the intake trashracks for mill process water. In addition, the river receives effluent from municipal and private wastewater treatment facilities. The Corinth Village sewage treatment plant is located 18 miles upstream of Glens Falls dam with an average discharge of 0.48 mgd (FERC,

Table 2. Monthly flow duration based on data from 1940 to 1989 (Source: FPC, 1991^a).

Month	Flow exceeded 20 percent of the time (cfs)	Flow exceeded 50 percent of the time (cfs)	Flow exceeded 80 percent of the time (cfs)
January	5,930	4,490	3,250
February	5,650	4,320	2,970
March	7,630	4,910	2,970
April	14,000	9,040	5,040
May	10,270	6,830	4,260
June	5,870	3,960	2,670
July	4,240	3,090	2,280
August	3,760	3,100	2,140
September	3,850	3,150	2,110
October	4,900	3,420	2,460
November	6,660	4,440	2,990
December	6,740	4,730	3,150
Annual average	6,680	4,070	2,770

^a FPC used two different methods of flow assessment: Water years 1940 to 1975: addition of the flows at the USGS gaging stations at Hadley on the Hudson River (#01318500) and at Stewarts Bridge on the Sacandaga River (#01325000); both stations are located upstream of the project. Water years 1976 to 1989: USGS gaging stations at Fort Edwards (#01327750), located downstream of the project.

1995a). Wastewater treatment facilities downstream of the dam include the FPC facility with an average discharge of 1.41 mgd, the Encore Paper Company facility in South Glens Falls, and the Glens Falls municipal sewage treatment plant located about 0.5 mile downstream of the FPC treatment facility. The average discharge from the Glens Falls treatment plant is 3.5 mgd (FERC, 1995a).

b. Environmental effects:

Water Quantity

The WQC specifies and Interior recommends that FPC should submit a flow monitoring plan to the NYSDEC and FWS 3 months after issuance of any Commission license. The WQC further specifies that the monitoring plan should be consistent with the flow monitoring plan for the South Glens Falls Project and could include providing a USGS gaging station unless an alternative is justified. In addition, the WQC indicates that permanent staff gages should be installed in the headpond and tailwaters to enable independent verification of the respective water levels.

Our Analysis

The proposed continued operation of the project in ROR mode should maintain existing hydraulic conditions and simulate natural conditions to the extent reflected by the flow regulation at the upstream Feeder Dam Project. Accurate flow monitoring is essential for documenting compliance with our recommended flow regime. The provision to evenly split incoming flows with the South Glens Falls Project dictates close coordination of flow measurement at both projects to document maintenance of ROR flows downstream of both projects. Discussions and observations during our December 9, 1998, site visit indicate that instrumentation to monitor flow entering both powerhouses is already in place. Establishing a means to document the recommended minimum flow to the bypassed reach should be straightforward because FPC releases the flow through a pipe. Providing staff gages at publicly accessible locations would enable independent verification of water levels in the headpond, and the tailwater, which would provide a general measure of ROR operations at both projects. Aquatic habitat within the bypassed reach and the headpond is discussed in section V.C.2.

We therefore recommend that FPC develop a flow monitoring plan in consultation with the NYSDEC, the FWS, the USGS, and AHDC. This monitoring plan should enable monitoring and documentation of instantaneous ROR flow conditions and the recommended instantaneous minimum flow to the bypassed reach. The plan also should

include provisions for measuring and documenting headpond and tailrace water surface elevations and providing documentation of the flows and water surface elevations to the resource agencies and the Commission, as appropriate. The plan should be filed with the Commission for approval.

Water Quality

FPC received its WQC for this project on May 3, 1995 (letter from David P. Manny, Vice President, FPC, to the Commission, dated May 11, 1995). The WQC states that the project would comply with applicable New York State water quality standards if operated in accordance with the conditions of the certification. Specific WQC conditions that pertain to maintaining water quality are as follows:

- C Maintenance dredging: Generation should be curtailed or flow through the turbine(s) should be shut off prior to dredging in the intake and forebay area.
- C Sediment analysis and disposal: Any sediment to be disturbed by dredging or other excavation should be sampled, tested for contaminants, and properly disposed. The protocol for such activities and potential disposal sites should be submitted and approved by the NYSDEC in advance of any sediment removal.
- C Erosion and sediment control: At least 60 days before commencing work, FPC should submit an erosion and sediment control plan to the NYSDEC for approval. As a minimum, FPC would be required to do the following:
 - Isolate instream work from the flow of water and prevent turbid discharges and sediments from entering the waters of the river due to excavation, dewatering, and construction activities.
 - Avoid the use of heavy construction equipment from below the mean high water line of the river until the work area is protected by an approved structure and dewatered.
 - Stabilize any disturbed banks by grading to an appropriate slope, followed by armoring or vegetating as appropriate, to prevent erosion and sedimentation into the waterbody.
 - Minimize soil disturbance and provide appropriate grading and temporary and permanent revegetation of stockpiles and other disturbed areas to minimize erosion and sedimentation potential.

- Protect all waters from contamination by deleterious materials such as wet concrete, gasoline, solvents, epoxy resins, or other materials used in construction, maintenance, and operation of the project.

- Install effective erosion control measures on the downslope of all disturbed areas and maintain them in a fully functional condition. These erosion control measures are to be installed before commencing any other activities involving soil disturbance.

- Ensure complete removal of all dredged and excavated material, debris, or excess materials from construction from the bed and banks of all water areas to an approved upland disposal site.

- Ensure that all temporary fill and other materials placed in the waters of the river are completely removed promptly upon completion of construction unless otherwise directed by the NYSDEC.

C Placement of cofferdams, construction of temporary roads or ramps, or other temporary structures that encroach upon the bed or banks of the river: These activities should be conducted in accordance with the erosion and sediment control measures specified above.

C Maintenance of river flow: The water flow downstream of the work sites should be maintained in a manner to assure compliance with water quality standards.

C Turbidity monitoring: During all periods of construction, FPC should monitor the water in the river immediately upstream and downstream of the work site. If turbidity measurements upstream of the work site exceed the downstream concentrations, the source for the increased turbidity should be identified and mitigated.

C Notifications: The NYSDEC should be notified at least 2 weeks before FPC commences construction or maintenance activities governed by the above conditions.

No other specific entity made any recommendations pertaining to water quality.

Our Analysis

Provision of a minimum flow to the bypassed reach (no minimum flow is currently required) would enhance water quality by preventing water stagnation in several pools. The water temperature in these pools would thus not be expected to superheat in the summer and would be suitable for aquatic biota. The DO levels in these pools would be expected to meet the state standard because inflow would gain DO as it cascades from the pipe and over the rocks upstream of the pools, unless the water was already supersaturated. Continuing to operate the project in ROR mode would maintain the existing water quality in the river downstream of the project, which currently meets state standards.

Replacement or refurbishment of the existing headgate structure is unlikely to result in water quality degradation because the substrate in the area where construction would occur is bedrock, based on observations of divers (letter from David Manny, Vice President, FPC, to the Commission, dated May 24, 1995). Therefore, increased turbidity and resuspension of potentially toxic sediments would not occur when the new or refurbished headgate is constructed and maintenance dredging in the forebay would not be needed.

The recommendations in the WQC are consistent with generally accepted practices to prevent adverse impacts on water quality. Implementation of these measures would also ensure that ground-disturbing activities from other measures that we recommend (i.e., recreational facilities discussed in section V.C.5) would have minimal impacts on water quality. We therefore recommend including these conditions in any license issued for this project. The erosion and sedimentation control plans developed in accordance with the provisions of the WQC would be submitted to the Commission for final approval before ground-disturbing activities began.

c. Unavoidable adverse effects: Even with the implementation of state-of-the-art erosion control measures, there still could be localized, short-term increases in turbidity and sedimentation associated with the construction of recreational facilities along the shoreline of the impoundment and downstream areas (see section V.C.5).

2. Fisheries Resources

a. Affected environment: The fishery in the project vicinity of the Hudson River is a diverse mix of warm-, cool-, and coldwater species. A total of 30 species of fish were collected in the project area during fishery surveys in 1985 and 1993 (Culp and Homa, 1985; Acres, 1993) (table 3). The three most abundant fish species in both surveys were rock bass, spottail shiner, and fallfish. Crappie (black and white) and northern pike were collected during the 1993-1994 entrainment study at the Feeder Dam Project (immediately upstream of Glens Falls), as were an additional seven fish species,

including rainbow and brook trout, rainbow smelt, channel catfish, blacknose dace, and northern hogsucker (Acres, 1995a).

FWS indicates, based on data reported in 1932, that historically American eels were “moderately common” upstream of the Glens Falls Project and that the Hudson River was considered the best eel waters of the area (letter from David Stilwell, Acting Field Supervisor, FWS, Cortland, NY, to the Commission, dated July 8, 1999). FWS further indicates that, in 1886, eels were reported in the Adirondack’s Piseco and Pleasant lakes. Major game fish in the project area include large- and smallmouth bass, northern

Table 3. Summary of fish species collected near Glens Falls (Source: Acres, 1993; Culp and Homa, 1985)^a

Species	1993 Survey		1985 Survey
	# Collected	% Composition	% Composition
Rock bass	383	19.89	13.9
Spottail shiner	307	15.94	37.9
Fallfish	288	14.95	23.3
Redbreast sunfish	198	10.28	N.C. ^b
Smallmouth bass	163	8.46	5.7
Yellow perch	108	5.61	0.8
Bluntnose minnow	104	5.40	N.C.
Pumpkinseed	70	3.63	0.9
White sucker	64	3.32	11.2
Largemouth bass	62	3.22	0.1
Chain pickerel	62	3.22	0.4
Tessellated darter	28	1.45	0.4
Bluegill	26	1.35	N.C.
Golden shiner	22	1.14	N.C.
Yellow bullhead	9	0.47	0.4
Bridle shiner	8	0.42	N.C.

Species	1993 Survey		1985 Survey
	# Collected	% Composition	% Composition
Banded killifish	6	0.31	N.C.
Common carp	4	0.21	0.2
Logperch	4	0.21	N.C.
Emerald shiner	2	0.10	N.C.
Brown bullhead	2	0.10	0.8
Brown trout	1	0.05	N.C.
Greenside darter	1	0.05	N.C.
Shield darter	1	0.05	N.C.
Blacknose darter	1	0.05	N.C.
Mimic shiner	1	0.05	N.C.
Walleye	1	0.05	N.C.
Longear sunfish	N.C.	N.C.	3.8
Black bullhead	N.C.	N.C.	0.1
American eel	N.C.	N.C.	<0.1
TOTAL	1926	100	100

^a Collection gear in both 1985 and 1993 included boom electroshocker, gillnets, and seines; sampling in 1985 also included trap nets and angling.

^b N.C. = not collected.

pike and chain pickerel. Other sport and pan fish collected in the project area include trout (brown, brook, and rainbow), crappie (black and white), walleye, yellow perch, catfish and bullheads, rock bass, and various other sunfish (bluegill, redbreast, pumpkinseed, and longear). Some of these species are relatively abundant (e.g., smallmouth bass and redbreast sunfish), and others are relatively uncommon (e.g., brown and yellow bullhead).

The existing fish community in the project impoundment appears balanced and stable. In addition to the game and predatory fish (e.g., northern pike and basses), a variety of forage fish are present in the project area and relatively common. About 40 percent of the fish (representing 12 species) collected during the 1993 fishery survey were minnows and darters. A range of fish sizes also were collected during the fishery survey. FPC's assessment of length-frequency distributions revealed a good mixture of age classes for most species (Acres, 1993). Downstream fish passage is currently provided at the South Glens Falls Project and the NYSDEC characterizes the existing smallmouth bass fishery downstream of the project as "exceptional" (letter from Kenneth Kogut, Regional Manager, Bureau of Habitat, NYSDEC, to David Manny, Vice President, FPC, dated December 2, 1998).

FPC did not collect any anadromous fish species during its fishery surveys at the Glens Falls Project. The American eel, a catadromous fish that spawns at sea but spends most of its life in freshwater, was infrequently collected in the project area. Interior notes that, although American eels are relatively rare in this portion of the Hudson River because upstream access is limited by numerous downstream dams and natural barriers such as Hudson Falls and Glens Falls, some eels are able to migrate this far via the Hudson and Champlain canals, also referred to as the Feeder Canal in the vicinity of the project (letter from Willie Taylor, Director, Office of Environmental Policy and Compliance, Interior, Washington, DC, to the Commission, dated October 21, 1998). Although the Feeder Canal could provide an avenue of upstream and downstream passage for anadromous fish, this currently does not seem to be occurring.

The bypassed reach is about 600 feet long by 300 feet wide and consists primarily of steeply sloped limestone bedrock. When no spillage is occurring (about 91 percent of the time in an average year), the bypassed reach is dewatered except for a series of three pools, two of which are relatively small and shallow (maximum depths of 1 and 5 feet). One pool is 16 feet deep and has more potential for fish colonization. FPC's study of the bypassed reach found that, in general, the area offers marginal quality habitat for fish and macroinvertebrates. A limited number of benthic invertebrates were observed in all three pools, and several suckers and a minnow were observed in one of the two shallow pools (Acres, 1991). Currently there is no minimum flow requirement at the bypassed reach. Before the crest gates were installed at the dam, leakage was estimated to be about 5 cfs.

No state- or federally listed aquatic species that would be affected by project operation are known to occur in the project vicinity (letter from David A. Stilwell, Acting Field Supervisor, FWS, Cortland, to the Commission, dated February 22, 1999).

b. Environmental effects:

Impoundment Fluctuations

Impoundment water level fluctuations can reduce shoreline spawning habitat, cause nest abandonment and exposure, desiccate eggs and strand young fish, and lead to the gradual loss of shoreline shelter due to erosion and reservoir aging (Miracle and Gardener, 1980; Ploskey, 1983; von Geldern, 1983). Centrarchids (e.g., sunfish and bass) are particularly susceptible to water level fluctuations because they spawn primarily in the shallow, nearshore zone.

Historically, the project dam was equipped with breakaway flashboards that would wash out during high flow events. This would result in a relatively sudden decrease in the water elevation by about 5 feet, dewatering up to 25 acres of shoreline habitat. This habitat could be dewatered for up to several weeks until the flashboards were replaced. When these drawdowns occurred from May through August (when most centrarchid spawning occurs and fry are likely to be in the nests), the potential for adverse impacts was increased.

AHDC and FPC replaced the flashboard system in 1994 with a hydraulically operated crest gate system. This new dam configuration eliminated the sudden decrease in the impoundment level associated with flashboard failures (Acres, 1995b).

FPC proposes to continue to operate the project in a ROR mode and to maintain the impoundment within 6 inches of the normal maximum water level of 269.1 feet NGVD. Interior makes a 10(j) recommendation and New York Rivers United (NYRU) agreed with implementation of FPC's proposed ROR operation and impoundment water level management regime by letters dated October 21, 1998, and December 1, 1998, respectively. The WQC, issued on May 3, 1995, affirms FPC's proposed operating mode, as do comments in the NYSDEC's October 19, 1998, letter to the Commission.

Our Analysis

Installation of the new crest gates on the dam in 1994 eliminates the previous deep drawdowns that had the potential to adversely influence the nearshore aquatic habitat. We consider the 6-inch drawdown limitation to be reasonable given the complexity of the inflows and outflows in this reach of the river (i.e., reregulation at the upstream Feeder Dam Project and concurrent operation at South Glens Falls and Glens Falls). At the maximum drawdown of 6 inches, about 2 acres of nearshore habitat would be exposed, but most centrarchid nest building would occur in water deeper than 6 inches (Scott and Crossman, 1973). Therefore, nests would generally be protected from exposure with this operating regime. The new crest gates should better enable the

maximum pond elevation of 269.1 feet to be maintained on a regular basis. Both hydroelectric projects at the dam attempt to maximize the head and associated generation capacity by keeping the impoundment at full pond. Therefore, we expect that drawdowns to the maximum of 6 inches would be infrequent. Continuing to operate the project in a ROR mode would simulate natural flows in the river downstream of the project and would maintain the existing aquatic habitat.

We therefore agree that the Glens Falls Project should be operated in a ROR mode and should maintain impoundment levels within 6 inches of the normal maximum pool elevation of 269.1 feet NGVD. These conditions would provide stable aquatic habitat and minimize disruptions to the fishery in the project reservoir.

Bypassed Reach Flow

FPC conducted a series of flow releases from 5 to 60 cfs to provide a basis for assessing an appropriate minimum flow to the bypassed reach. FPC concluded that usable habitat increased little with more flow because of the predominant bedrock substrate. During a subsequent flow assessment, FPC and representatives of the FWS and NYSDEC established temporary flow diversion structures to better distribute flows to the bypassed reach and reviewed their effectiveness. Diverting the flows fostered the development of additional pools in the bypassed reach to enhance aquatic habitat and create a modest aesthetic enhancement to the falls by wetting a greater portion of the rock outcrop (letter from David Manny, Vice President, FPC, to the Commission, dated May 24, 1995).

These evaluations resulted in an agreement between FPC, the FWS, and the NYSDEC to release a minimum flow of 5 cfs to the bypassed reach and install permanent minor flow diversion structures. Interior specifies these conditions in its 10(j) recommendations (dated October 21, 1998), as does the NYSDEC in its WQC. NYRU also made a similar recommendation in its letter dated December 1, 1998. FPC reports that a similar agreement was reached with AHDC whereby an additional 5 cfs would be released from the South Glens Falls Project, giving a total bypassed reach flow of 10 cfs (letter from David Manny, Vice President, FPC, to the Commission, dated May 24, 1995).

Our Analysis

The habitat quality of the bypassed reach is marginal based on our review of FPC's bypassed reach survey (Acres, 1991) and our observations during the December 9, 1998, site visit. The predominant bedrock substrate would not provide optimal habitat

for most fish and invertebrates even if watered. Substantive fish and aquatic invertebrate colonization would only be likely in one pool. The only apparent means for fish to enter this pool would be by passage over the dam or through a minimum flow diversion mechanism. Upstream movement of most fish into most of the bypassed reach is precluded by bedrock barriers (young American eels could be expected to move into the bypassed reach but would not be expected to remain there for extended periods).

We reviewed the bypassed reach habitat map and characterization in FPC's application and the map of proposed berm placement in FPC's May 24, 1995, letter to the Commission. Construction of permanent berms as proposed would increase the water depth of the shallowest of the three major pools in the bypassed reach which could make it more suitable for fish and aquatic invertebrates. If properly configured, it could also increase the prevailing depth of the water at the base of much of the dam. During periods of spillage over the crest of the dam, increased water depth in the plunge pool could enhance the chances of survival of fish and other aquatic organisms that may also pass over the dam.

We conclude that the proposed minimum flow release of 5 cfs should provide sufficient flow to adequately protect the limited aquatic habitat in the bypassed reach. We also conclude that, if properly designed, the construction of strategically placed weirs would enhance the suitability of one of the three bypassed reach pools for fish and benthic invertebrate habitat. It would also serve as a protective measure for fish that may pass over the crest of the dam. Therefore, we recommend that FPC release a minimum flow of 5 cfs from the pipe that was modified for this purpose and develop and implement a plan to construct low diversion weirs that would enhance the aquatic habitat near the base of the dam, in consultation with the FWS and the NYSDEC. Prior to implementation, the final plan should be submitted to the Commission for approval.

Fish Protection

FPC currently does not provide downstream fish passage at the Glens Falls Project. The only downstream passage routes for fish at the site currently are through the Glens Falls or South Glens Falls turbines, spillage over the dam (when river flows exceed the hydraulic capacity of the turbines, which occurs only about 9 percent of the time), or via a downstream passage facility at the South Glens Falls Project. Protection from entrainment at the Glens Falls Project currently consists of a set of trashracks with 1 5/8-inch clear bar spacing.

FPC conducted a fish entrainment and mortality study at the Feeder Dam Project (2 miles upstream of the Glens Fall Project) to estimate the number of fish entrained and

killed by the project turbines. The study took place between November 1993 and November 1994. Data collected were used to extrapolate entrainment and turbine-related mortality at the Glens Falls Project. An estimated total of 38,746 fish representing 29 species were entrained at the Glens Falls Project during the 1 year study period (Acres, 1995a). Entrainment rates ranged from 1.01 to 1.29 fish/unit/hour. Centrarchids comprised about 62 percent of all the entrained fish, with rock bass (17 percent), redbreast sunfish (17 percent), and pumpkinseed (10 percent) being the most frequently entrained species. The four major sport fish species in the project area were entrained at relatively low rates: large- and smallmouth bass, northern pike and chain pickerel comprised 2.83 percent, 2.26 percent, 0.25 percent, and 0.49 percent, respectively, of the entrained fish. Other entrained sport fish included rainbow trout (0.42 percent), brown trout (0.38 percent), brook trout (0.04 percent), walleye (0.37 percent), white and black crappie (0.57 percent), yellow perch (6.69 percent), and ictalurids (bullheads and catfish, 13.08 percent).

FPC categorized the length distribution of the eleven most commonly entrained species at the Feeder Dam Project (85 percent of the total entrainment catch). Most entrained fish were small; 41 percent were less than 4 inches long (and most likely predominantly young-of-the-year) and 86 percent were less than 8 inches long. The percentage of small fish entrained at Glens Falls would be higher because the 1 5/8-inch spacing of the Glens Falls trashracks would most likely screen certain species of fish (e.g., bullheads) that were not screened by the 2 3/4-inch spacing of the trashracks at the Feeder Dam Project.

Entrainment mortality rates were estimated using several different assumptions about factors contributing to the interpretation of turbine mortality study results (e.g., accounting for lost fish, adjustments for control and latent mortality). Estimated mortality rates under the different scenarios ranged from 2 to 65 percent, with the consultant's "best estimate" of turbine-related mortality ranging from 4 to 37 percent. The total estimated annual turbine-induced mortality at the Glens Falls Project ranged from 3,085 to 19,343 fish and the consultant's "best estimate" of 6,807 fish (Acres, 1995a).⁵

Interior makes a 10(j) recommendation to install trashracks with 1-inch bar spacing (or equivalent) at the headgate structure (letter dated October 21, 1998). NYRU echoes Interior's recommendation for trashracks with 1-inch bar spacing at the Glens

⁵ FPC estimates the annual replacement value of these fish to be \$7,724 (1998\$).

Falls Project in its December 1, 1998, comment letter. The NYSDEC, however, did not require or recommend installation of trashracks with 1-inch bar spacing at the project in its WQC or in its October 19, 1998, letter to the Commission.

FPC is opposed to placing 1-inch trashracks at the headgate structure (letter from David Manny, Vice President, FPC, to the Commission, dated December 7, 1998). FPC asserts that the existing 1 5/8-inch trashracks and the relatively low velocities in the power canal would prevent most fish from being entrained. FPC commits to investigating the option of installing 1-inch trashracks when the existing racks have reached the end of their service life and must be replaced (the length of the service life of the existing trashracks is dependent on several variables, including the frequency of high flow events and conductivity of the water, and is not readily predictable). FPC notes that with trashracks at both the headgates and the turbine intakes, increased raking of debris and ice (which during the winter requires both mechanical and manual labor) would greatly increase operation and maintenance costs.⁶

Our Analysis

FPC's entrainment estimates appear to be reasonable and generally comparable to entrainment estimates at hydroelectric projects in the east and midwest with similar species assemblages (FERC, 1995b). However, we consider the FPC turbine mortality estimates (average 35 percent; RMC, 1991) to be very conservative because they are based on a limited entrainment mortality study on smallmouth bass at the Glens Falls Project under "worst case" conditions (high water temperatures, relatively large fish [4 to 12 inches long], and lowest wicket gate settings [60 percent]) that yielded relatively high mortality rates. Mortality rates measured at Feeder dam, which has vertical fixed blade turbines similar to Kaplan turbines, were very similar to those found by the Electric Power Research Institute (EPRI) (1992) in an extensive review of entrainment and mortality studies (primarily in the eastern and midwestern United States). Feeder dam mortality rates for centrarchids at Feeder dam, which comprised about 62 percent of entrained fish, ranged from 5 to 9 percent ("best estimate"; size dependent), compared with an average centrarchid mortality rate of 9 percent at other sites with Kaplan turbines (EPRI, 1992).

⁶ Following issuance of the draft EA and the Section 10(j) meeting on November 30, 1999, to discuss the issue of fish protection, FPC and FWS reached an agreement regarding a solution to this issue. We summarize the resolution of this issue in section VIII, Recommendations of Fish and Wildlife Agencies.

EPRI (1992) reported that the average mortality rate of entrained resident fish (not introduced) was 5.8 percent at sites with Francis turbines and 6.3 percent at sites with Kaplan turbines. The estimated mortality rate was much higher for introduced resident fish (over 30 percent). One reason for this difference is that most naturally entrained fish were less than 4 inches long (EPRI, 1992). Small fish generally experience low turbine mortality. The higher mortality rates found for introduced fish are probably also related to the cumulative stress of transport, marking, introduction, turbine passage, recapture, and holding (EPRI, 1992).

The existing trashracks with 1 5/8-inch bar spacing should preclude entrainment of most larger fish. The average water velocity measured at the trashracks was 1.2 feet per second (fps) and the maximum velocity measured at any location on the trashracks was 2.35 fps. Velocity greater than 2.0 fps was measured at 6.8 percent of the trashrack area. Most fish would therefore have sufficient burst speed to swim upstream against the prevailing flow and avoid entrainment (actual burst speeds of individual fish are dependent on the species and the size of the fish).

The water velocity at the existing headgate structure is substantially greater than at the trashracks, averaging 6.2 fps. Smaller fish that enter the forebay may be able to avoid entrainment but would have a more difficult time swimming upstream of the headgate structure. Many adult fish (e.g., trout, American eels, suckers, carp) have burst speeds that exceed 6.2 fps (Bell, 1991) and could therefore escape from the forebay if necessary. Young and adult fish could most likely reside in the forebay indefinitely, but because public access to the forebay is not available, would not be available to the sport fishery.

FPC submitted information on the average water velocity at the proposed new headgate structure (the point of highest water velocity) in response to concerns about possible fish entrapment in the intake canal (letter from David Manny, Vice President, FPC, to the Commission, dated December 7, 1999). FPC categorizes fish species by swimming speeds (strong, moderate, or weak) and concludes that moderate to strong swimmers would be able to swim out of the canal even during high river flows that result in average water velocities of up to 6 fps at the new headgate. Weak swimming fish would be able to swim out of the canal when intake flows were equal to or less than 1,500 cfs, which typically occurs during a portion of every month.

We question some aspects of FPC's analysis, although we also conclude that FPC raises some valid points. Although not stated by FPC, it appears that its fish categories pertain to adults. Swimming speed of fish, however, is not only a function of the species but also fish size (Bell, 1991). The young of many of the species that FPC categorizes as strong or moderate swimmers most likely would be weak swimmers. However, most

young and adult fish should be able to swim out of the canal if the average velocity at the headgates is 2 fps or less (which occurs at canal flows of 1,500 cfs or less). Such flows typically occur during a portion of each month and 25 percent of the time on an annual basis (table 4). Therefore, although some young and adult fish may not be able to escape from the canal during high flows, they would not be trapped in the canal indefinitely. Average headgate water velocities of 6 fps, which occur when the project operates at maximum hydraulic capacity (the worst case scenario for potential fish entrapment in the canal), would occur only 10 percent of the time during an average year (see table 4).

The effectiveness of 1-inch clear spaced angled trashracks as described in Interior's Section 10(j) recommendation has not been conclusively demonstrated for warm- and coolwater species. Studies conducted at the Upper Greenwich Project, on the Batten Kill River in New York, using released fish, found that 21 percent of largemouth bass (3.3 to 10.8 inches in length) and 36 percent of brown trout (4.8 to 7.7 inches in length) moved downstream through the turbines despite installation of angled trashracks designed to meet Interior's specifications (ERC, 1996). For resident fish (primarily bullhead, rock bass, and sunfish species), data from this study indicate that 69 percent of the fish moved through the turbines and only 32 percent used the bypass. Although angled trashracks have been shown to be efficient in passing salmon smolts at several sites, their effectiveness for passing coolwater and warmwater species has yet to be demonstrated.

In general, entrainment rates were relatively low, particularly for the four major game fish species (each less than 3 percent of the total entrainment). The "best estimate" of 6,807 fish annually killed at the Glens Falls Project, the majority of which were highly prolific centrarchids, does not appear to be adversely affecting the fish populations or recreational fisheries in the project area. While no fish population estimates are available for the Glens Falls impoundment, it appears to be a fairly diverse, healthy fishery. The NYSDEC characterized the existing smallmouth bass fishery downstream of the project as exceptional. A total of 36 species of fish have been collected in the project area, and about 20 of these species are sport fish. The fish community appears balanced with a good mixture of forage and predatory species. Most species also had a range of age classes present in the project impoundment. Additionally, there are no anadromous fish species nor do any management plans exist for the introduction of anadromous stocks to the project area.

We have no evidence to support a claim that fish entrainment is having an appreciable adverse impact on the fishery.⁷ Therefore, we conclude that Interior's recommendation to install 1-inch trashracks at the forebay headgate, in addition to the existing trashracks at the powerhouse, is not warranted at this time. Nevertheless, FPC's proposal to investigate the replacement of the existing 1 5/8-inch trashracks with 1-inch trashracks has merit. Most larger fish would be excluded by a 1-inch trashrack, and smaller fish may avoid the turbulence created by the narrower spacing of the trashrack. Smaller fish have low rates of turbine mortality at most sites where this was studied (EPRI, 1992; FERC, 1995b) and their entrainment would be less likely to result in mortality. Some entrained fish would enter the process water for the mill (which withdraws up to 63 cfs from behind the existing trashracks) and would not be expected to survive. Therefore, we recommend that FPC consult with FWS and NYSDEC regarding installation of 1-inch clear spaced trashrack and fish bypass system at the powerhouse intake, consistent with the agreement between FPC and FWS, referenced in FWS's letter to the Commission, dated May 11, 2000, and file a plan with the Commission for approval.

Fish Passage

No upstream passage facilities are currently provided at the Glens Falls Project or other dam facilities in this area of the upper Hudson River. Additionally, natural barriers exist to upstream passage, such as Hudson Falls and Glens Falls. There are no anadromous fish species present in the project area.

No resource agencies or other parties request that downstream or upstream fish passage be provided at this project. Interior requests a reservation of authority to prescribe downstream and upstream fish passage for American eels, existing riverine species, and any other species that may be restored to the basin in the future under Section 18 of the FPA. The NYSDEC also recommends that the issue of upstream passage for American eels be revisited when more is known about the status of eel populations and migrations in the project area (letter from Timothy Post, Fish and Wildlife Ecologist, NYSDEC, to the Commission dated October 19, 1998). The Atlantic

⁷ The court ruled in the New Martinsville case that: "Entrainment mortality that has no appreciable impact on fish populations can hardly be characterized as 'losses' to the fishery." The ruling further requires the Commission to demonstrate that adverse impacts on fish populations are more than purely speculative. See *City of New Martinsville, W.Va. v. FERC*, 102 F. 3d 567 at p. 571 (D.C. Cir. 1996).

Table 4. Percentage of time that expected flows in the Glens Falls intake canal would be less than 1,500 cfs (average velocity at headgate less than 2 fps) and equal to 4,465 cfs (average velocity at headgate 6.0 fps) (Source: Staff, based on flow duration curves in FPC, 1991)

	Percent of time # 1,500 cfs	Percent of time at 4,465 cfs
January	15	<5
February	20	<5
March	20	15
April	5	50
May	10	27
June	30	6
July	50	<5
August	45	<5
September	45	<5
October	35	<5
November	20	6
December	17	7
Annual	25	10

Note: Assumes that South Glens Falls Project passes half of the total flow of the river.

States Marine Fisheries Commission is currently developing management goals for this catadromous species due to its apparent decline in recent years.

Our Analysis

Given the passage barriers (natural and man-made) and fish community (no anadromous species and few catadromous eels) currently in the project area, there is no need to recommend upstream fish passage at the Glens Falls facility. A downstream fish passage facility is currently provided at the South Glens Falls Project. We conclude that, given current conditions, there is no need to provide additional avenues for downstream passage although a fish bypass system near the existing trashracks would reduce the

potential of fish entrapment in the intake canal due to high velocities at the headgates. However, we recommend including in any license issued for this project an article reserving Interior's authority to prescribe fish passage facilities in the future. This would enable measures to be taken, as appropriate, when future management plans for American eels are finalized.

c. Cumulative effects: Continued operation of the project in a ROR mode should protect the existing fisheries both upstream and downstream of the project. Provision of a minimum flow to the bypassed reach with diversion weirs could enable some fish to use the pools as a limited nursery habitat and foster increased macroinvertebrate production, which would provide a slight enhancement to the downstream fish community. We see no evidence that there are any directed downstream migrations associated with any of the fish populations that occur in the project area (with the exception of American eels, which would be addressed by reserved authority to prescribe downstream fish passage when plans are finalized and effective techniques developed). We therefore conclude that the Glens Falls Project, in association with downstream hydroelectric projects, is not contributing to adverse cumulative impacts on fish populations. Operation of the project with our recommended environmental measures for fisheries resources is unlikely to influence any fisheries resources upstream of the Glens Falls impoundment and downstream of the Hudson Falls Project (the next project downstream of Glens Falls).

d. Unavoidable adverse effects: Some entrainment and turbine-related mortality would still occur even with implementation of our recommended protective measures.

3. Terrestrial Resources

a. Affected environment:

Botanical Resources

Natural vegetation in the Glens Falls area consists of the Hemlock-White Pine-Northern Hardwood association. This association, transitional between the boreal forest and the deciduous forest zones, characteristically exhibits a mosaic of stands, some dominated by deciduous species and others dominated by coniferous species. Dominant coniferous species include white, red, and jack pine and eastern hemlock. Sugar maple, American beech, American basswood, and yellow birches are dominant deciduous species.

The disturbed nature of much of the project area promotes the presence of pioneer and successional species, especially downstream of Haviland Cove beach along Murray Street and near the FPC mill and hydroelectric project. The patchy distribution of vegetation at the dam site is a result of extensive commercial, industrial, and residential development over the years. A narrow riparian zone borders the impoundment and river downstream of the dam and transitions to the bank cover types. Bank cover types include upland forest, herbaceous upland, and wooded wetlands.

Relatively dense stands of mature hardwood forest, frequently intermixed with exotic tree and shrub species, occur along the river's southern shoreline, upstream of the dam. The primary canopy species within the project area include red oak and sugar maple. Trembling aspen and red maple, early successional species, are also common. Dominant midstory and groundcover species include hazel, willow, alder, brambles, elderberry, twinflower, bracken fern, aster, goldenrod, Pennsylvania sedge, and yarrow.

Urban development and herbaceous uplands dominate the northern shoreline. Species comprising the herbaceous land cover type include hazel, willow, alder, brambles, elderberry, twinflower, bracken fern, aster, goldenrod, Pennsylvania sedge, and yarrow.

Wetland acreage includes approximately 0.5 acre of emergent marsh, 0.1 acre of scrub/shrub, and 11.0 acres of forested wetlands. The majority of wetland cover types occur along the southern shoreline of the reservoir with occasional small wetlands along the northern shoreline. Wetland canopy species include box elder, red maple, and silver maple. A combination of the reservoir level and groundwater seeps maintain the hydrology of the area wetlands. Groundwater seeps maintain approximately 3 acres of forested wetlands along the southern shoreline of the reservoir.

No known state or federal threatened or endangered plant species or species of concern exist within the project area (letter from David A. Stilwell, Acting Field Supervisor, FWS, Cortland, to the Commission, dated February 22, 1999).

Wildlife Resources

The small, interspersed habitats within the project area limit wildlife species diversity. Wildlife typical of the area include species with small home ranges or a tolerance to habitat disturbance or discontinuity. Habitat types include urban, residential, wooded upland, herbaceous upland, wooded wetland, riverine, and shore types. Mammals that are characteristic of the area include deer, raccoon, and beaver. Migratory, shore, and wading birds also use the project area for feeding and possibly

nesting. Waterfowl observed and reported at the reservoir include mallard duck and mergansers. The project area provides suitable habitat for a variety of reptiles and amphibians common to the area.

The FWS indicates that no known state or federal threatened or endangered species or species of concern occur within the project area (letter from David A. Stilwell, Acting Field Supervisor, FWS, Cortland, to the Commission, dated February 22, 1999).

b. Environmental effects: FPC proposes no specific measures pertaining to terrestrial resources. FPC and AHDC replaced the 5-foot high breakaway flashboards with hydraulic crest gates in 1994, which eliminated the sudden decrease in the impoundment water level that occurred when the flashboards washed out during high flows. Frequent or prolonged exposure of nearshore habitat could have an adverse impact on wetlands and shoreline-oriented wildlife. FPC now controls impoundment water levels with crest gates, and there are no deep drawdowns related to seasonal flashboard failure and replacement. However, due to limited reservoir storage and a highly dynamic river, precise water level control may not be possible at all times, and FPC proposes a maximum drawdown of 6 inches below the full pond water elevation of 269.1 feet NGVD.

The WQC and NYSDEC comments pertaining to the proposed FPC project dated October 19, 1998, make no specific recommendations for terrestrial resources other than that the project should be operated in a ROR mode and that impoundment drawdowns should be limited to 6 inches or less. Interior, by letter dated October 21, 1998, and NYRU, by letter dated December 1, 1998, also recommend that these operating measures be implemented, but also make no specific measures pertaining to terrestrial resources.

The WQC specifies that FPC should provide car-top boat access to the river downstream of the project, including a parking area for five vehicles (see section V.C.5 for our analysis of this measure). This could have an effect on vegetation and habitat (clearing to accommodate the access) and wildlife (displacement due to increased human activity) in proximity to the new access site.

Our Analysis

The continued operation of the project in a ROR mode and maintaining the reservoir elevation not less than 6 inches below the normal maximum pool elevation (269.1 feet NGVD) should simulate natural river flows and create stable habitat conditions within the impoundment and bordering wetland areas. The hydraulic crest gates that were installed in 1994 should enhance terrestrial resources by avoiding the

historical deep drawdowns associated with flashboard failure. This stability would be particularly important during the plant growing season and wildlife breeding season, which typically extends from May through September for at least some species. We therefore conclude that relicensing the Glens Falls Project with the proposed operating regime would not adversely affect botanical and wildlife resource (see section V.C.2 for our analysis of impacts on fisheries resources).

Our recommended recreational measures pertaining to access for car-top boats, discussed in section V.C.5, would require some improvements at the take-out site and some, more substantial improvements at the downriver put-in site. Creation of access would probably require the removal of some vegetation at both sites, with some short-term wildlife displacement during construction. Based on our December 9, 1998, site visit, we estimate that vegetative clearing would be less than 1 acre regardless of where the take-out and put-in are placed. Long-term, but minor, wildlife displacement also would result from people using the access sites. Vegetation that would be removed does not offer any unique ecological characteristics that are not found elsewhere in the area, based on our observations. Wildlife common to the area are typical of those found in developed areas and probably would become accustomed to frequent human disturbances at potential upstream and downstream access sites and would experience little incremental impacts. We consider the benefits offered by our recommended access to project waters to outweigh the minor adverse effects on terrestrial resources.

Continued operation of the Glens Falls Project, along with proposed operational changes, would have no effect on federally listed threatened or endangered species.

c. Unavoidable adverse effects: Vegetative clearing at the recommended car-top boat access would represent a minor, long-term unavoidable adverse impact. Wildlife disturbance during construction would represent a short-term minor adverse impact. Wildlife disturbance and displacement during use of the car-top boat access would represent a long-term, minor adverse impact.

4. Cultural Resources

a. Affected environment:

Archeological Resources

There are no historic or prehistoric archeological sites recorded within the Glen Falls Project's area of potential effect (APE). In the course of three cultural resources investigations conducted for NMPC (operator of the South Glen Falls Hydroelectric

Project), no prehistoric archeological sites were located on either side of the Hudson River downstream of Glens Falls dam. The closest recorded prehistoric site is 2.5 miles upstream of the dam, outside the project's APE.

Historical Resources

A 1984 National Register of Historic Places (National Register) Multiple Resource Listing for the central Glens Falls area includes listings for four properties in the immediate vicinity of the Glens Falls Project. The Glens Falls Feeder Canal, built between 1824 and 1832, extends 7 miles along the north side of the Hudson River from Queensbury, through Glens Falls and Kingsbury, to its terminus at the Champlain canal in Fort Edward. Contributing elements include the canal right-of-way, intact portions of the canal towpath, and 13 stone navigation locks with adjacent concrete bypass sluices. The 23 acres of the Three Square Historic District encompass the historic and commercial center of Glens Falls. Buildings in the district generally consist of brick commercial, office, and institutional structures between two and five stories high, most erected between 1902 and 1930. Focal points include Fountain, Union, and Monument Squares, as well as the centrally located City Park. The Fredella Avenue Historic District contains eight dwellings built between 1914 and 1918 as speculative housing for Italian immigrant families by a local mason (and himself an Italian immigrant) named Joseph J. Fredella. The houses are constructed of concrete block cast to resemble ashlar stone, with decorative and structural elements from the Neoclassical style. The Joseph Fredella House, at 15-17 Mohican Street, is the residence of this locally prominent builder. Of these Historic Properties,⁸ only the Glens Falls Feeder Canal is within the project's APE.

On the basis of cultural resource studies conducted previously on behalf of NMPC, several other resources are considered potentially National Register eligible. Cooper's Cave, situated a short distance downstream of the Glen Street bridge, and inside the project's APE, was reputedly the setting for James Fenimore Cooper's *The Last of the Mohicans*. Building foundations at each end of Glens Falls dam constitute remains of industrial facilities dating to the 19th century within the project's APE. The Glens Falls powerhouse, constructed in 1904, initially supplied hydromechanical power to pulp grinders that were gradually replaced with generators. The powerhouse is included among these latter potentially eligible resources, and is within the project's APE.

⁸ Historic Properties are properties that are eligible for listing or listed in the National Register.

b. Environmental effects: FPC proposes to either replace the existing headgate structure with a new headgate structure or rehabilitate the existing headgate structure, and to upgrade Units 1, 2, and 5 with new runners. FPC proposes no specific measures for treatment of Historic Properties beyond avoidance of impacts on known cultural resources. However, characteristics that may qualify portions of the Glen Falls powerhouse for listing in the National Register could be diminished by future repairs and alterations that could diminish the integrity of the property's design, workmanship, materials, and association.

Section V.C.5.b of this EA outlines several canoe portage alternatives that should be considered in our recommended recreation plan that FPC would prepare. Because these portage alternatives may involve ground disturbance and changes to an Historic Property, specifically the Glen Falls Feeder Canal, such alternatives could potentially diminish the integrity of this Historic Property.

The New York State Historic Preservation Officer (SHPO) reviewed the Initial Consultation Document in 1989 and the Application for New License in 1990. In each instance, the SHPO stated its opinion that the project would have no effect on districts, sites, buildings, structures, objects, or archeological resources listed in or eligible for inclusion in the National Register.

Our Analysis

Glens Falls has been used for hydropowered industry since the late 18th century, and electric power has been generated from the falls since then throughout nearly all the 20th century. Thus, continued operation of the Glens Falls hydroelectric project would maintain historic facilities in productive use for the purpose for which they were originally designed and built, and would therefore be beneficial to the National Register-eligible Glens Falls powerhouse.

FPC's proposal to replace or rehabilitate the headgate structure and any future plans to rehabilitate other portions of the powerhouse could alter elements contributing to the National Register-eligible Glens Falls powerhouse. The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings are intended to ensure that rehabilitation measures avoid or minimize actions that may diminish characteristics that qualify Historic Properties for the National Register. The Secretary of the Interior's Standards for Historic Preservation Projects define the "general and specific treatments" that are appropriate for cultural resources listed in or eligible for the National Register. Adherence to these guidelines in consultation with the SHPO

would ensure that adverse effects on Historic Properties arising from replacement of the headgate structure would be avoided or minimized.

The facilities of the Glens Falls Project would require maintenance, repair, and possibly alteration to meet changing circumstances over the license period. Appropriate provisions within a CRMP prepared in consultation with the SHPO would ensure that potential adverse effects on Historic Properties resulting from such future actions would be avoided or satisfactorily mitigated.

Recreational enhancements yet to be finalized may also affect Historic Properties. Development of the recreation plan in consultation with the SHPO would ensure that potential adverse effects on Historic Properties resulting from improvement of recreational facilities would be avoided or satisfactorily mitigated.

A PA between the Commission and the SHPO, with FPC as a concurring party, would document the Commission's consideration of the effect of relicensing the Glens Falls Project on Historic Properties. The PA would contain a stipulation requiring FPC to prepare a CRMP addressing both short- and long-term management of Historic Properties within project boundaries.

c. Unavoidable adverse effects: None.

5. Recreational and Land Use Resources

a. Affected environment:

Land Use

The Glens Falls Project and the South Glens Falls Project stand on opposite sides of the river, in industrial zones that extend approximately 1 mile upstream and downstream of the dam. Commercial and civic buildings, including the new Civic Center on Glen Street, extend along Glen Street (Route 9) on either side of the river.

Downstream of the dam, the FPC paper mill, wood lot, and steam plant form a high density industrial area along the north shore. A Portland cement concrete factory and the municipal wastewater treatment plant occupy adjacent parcels just beyond FPC's complex. Across the river, an industrial zone, including a rail yard, extends east about 0.8 mile from the South Glens Falls Project. Further downstream the land is zoned residential. Brush cover and forest provide a buffer between these industrial and residential zones and the riverbank. Upstream of the dam, Pruyn's Island, which also is

zoned for heavy manufacturing, extends about 1 mile along the north shore. This zone, which includes FPC's warehouses, gives way to a secluded beach at Haviland Cove just beyond a bend in the river. Across the river, brush cover and forest provide a shoreline buffer between commercial and residential zones and the riverbank.

Regional Recreational Opportunities

The city of Glens Falls is located in the foothills of the Adirondacks, 46 miles north of the capital city of Albany, and just 4 miles south of the Adirondack State Park boundary (figure 3). Established in 1882, the Adirondack State Park consists of 2.5 million acres of public land and 3.5 million acres of private land holdings. Administered by the Adirondack Park Agency formed in 1971, the park offers year-round recreational opportunities that include flatwater boating, canoeing, whitewater rafting, hiking, skiing, fishing, camping, golfing, and other outdoor activities. From Glens Falls, it is a short trip north along the New York State Thruway (I-87), or Route 9, to Lake George situated at the southern end of the park. The public lands within the park contain more than 40 state-operated campgrounds, 2,000 miles of hiking trails, hundreds of miles of canoe routes and 42 peaks more than 4,000 feet in height (www.adirondacks.org/overview, accessed on December 22, 1998). Table 5 lists major recreational resources, including those within the Adirondack State Park, located within 25 miles of the Glens Falls Project.

The Feeder Canal trail extends about 7 miles along the towpath of the historic Feeder Canal from the Feeder dam in Glens Falls, located about 2 miles upstream of the Glens Falls Project to Fort Edward located about 6 miles downstream of the Glens Falls Project. The Feeder Canal was constructed in the 1820's to help maintain the water level in the Champlain canal between Fort Ann and Fort Edward, along a segment of canal that was higher in elevation than the rest. Today, the canal trail is part of the New York State

Canalway Trail System that includes a network of more than 220 miles of existing multi-use recreational trails across upstate New York. The New York State Thruway Authority manages this system. The FCA provides volunteer assistance for the development and maintenance of the Feeder Canal trail.

Project Area Recreational Opportunities

A wide array of public recreational facilities are available in the vicinity of the project (see figure 3). From upstream to downstream, these include: (1) an interpretive

display at Feeder dam; (2) the city-owned, 12-acre Haviland Cove beach; (3) the South Glens Falls Historic Park created in 1990 and managed by the town of Moreau; (4) Sand Bar Beach located both across the river and downstream from Haviland Cove beach; (5) a trail along Water Street; (6) four playgrounds located on Murray Street; and (7) a small picnic and overlook occupying about 0.75 acre of FPC-owned land adjacent to the power

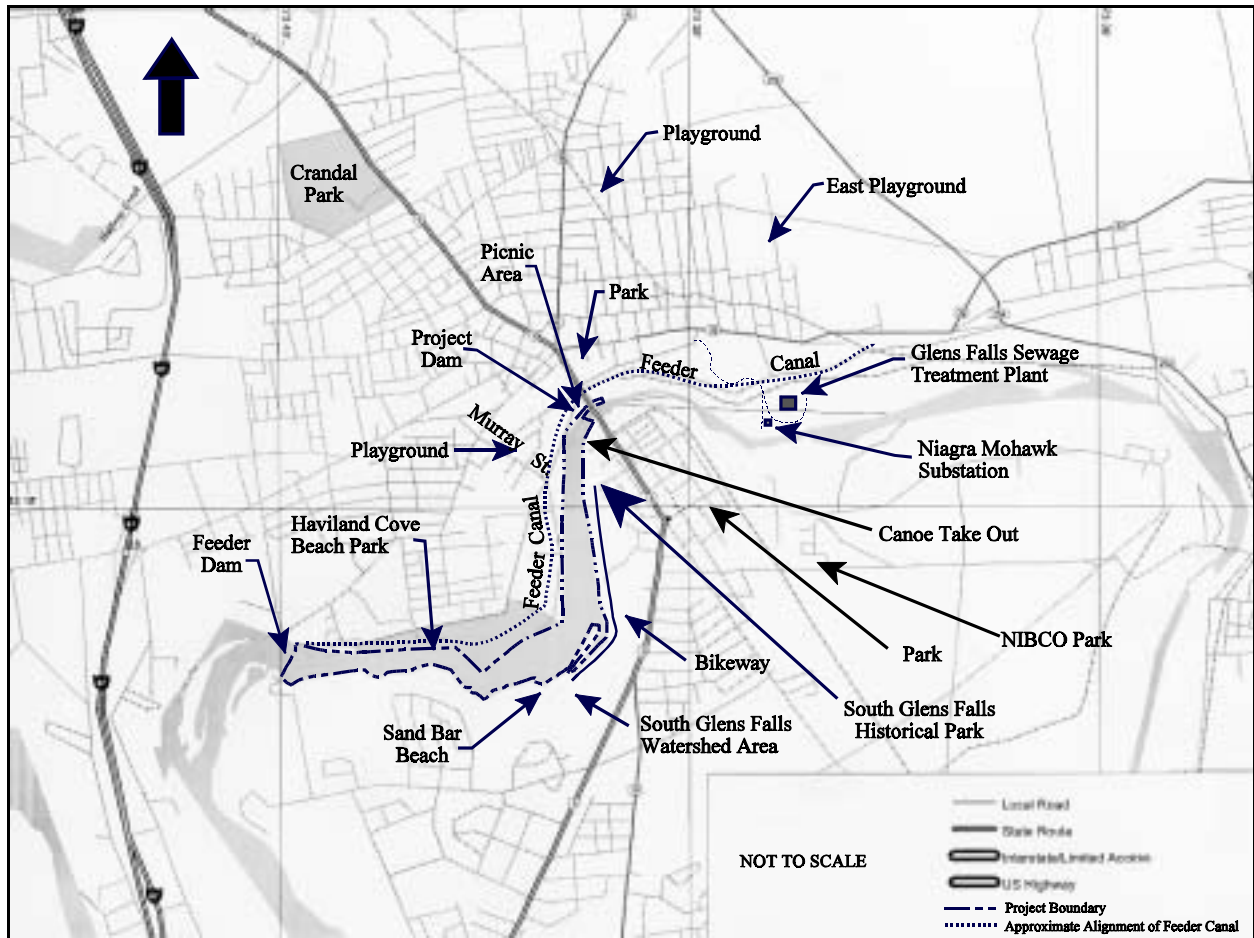


Figure 3. Project area recreational facilities (Source: DeLorme, 1995, as modified by staff).

canal (FPC, Form 80, 1997). All of these facilities are accessible to the physically disabled. Approximately 15,000 people use the Haviland Cove beach and the South Glens Falls Historic Park annually during the summer season (June 15 to August 30).

The city of Glens Falls operates the International Cross-Country Ski Trails in Crandal Park, the nation's first municipal lighted cross-country trail system, located a little more than 1 mile northeast of the project boundary. Warren County maintains 250

Table 5. Major recreational resources located within 25 miles of Glens Falls
(Source: FPC, 1991)

Site	Facilities/Activities
Moreau Lake State Park	Picnicking, hiking, beach, boating, fishing, camping, ice skating, cross-country skiing, snowmobiling
Saratoga Spa State Park	Spa, picnicking, swimming pool, trails, biking, fishing, golf, tennis, skiing, skating, snowmobiling, sledding
Lake Lauderdale State Park	(Undeveloped)
Luzerne Forest Preserve Campground	Camping, picnicking, fishing, boating, swimming
Hearthstone Point Forest Preserve Campground	Camping, fishing, boating, swimming
Prospect Mountain Forest Preserve	Picnicking, hiking
Lock 4 Stillwater State Park	Picnicking, fishing, hiking
Lake George Beach State Park	Swimming
Lake George Island	Camping, picnicking, boating, fishing
Lake George Battleground Campground	Camping
Lake George Battlefield Picnic Area	Picnicking, hiking
Crandall Park International Ski Trails	Cross-country skiing, hiking, bicycling

miles of snowmobile trails and about 10 miles of hard-surfaced bike trails near Glens Falls. Private resorts, campgrounds, parks, and other tourist attractions are available in addition to these public recreational facilities.

The reservoir created by Glens Falls dam is an excellent source of water-based recreation, especially boating and fishing. Although bank fishing is possible, boat fishing is more suitable given the limited public access, industrial development, and steep banks. Anglers typically fish for large and smallmouth bass, northern pike, chain

pickerel, and varieties of trout. Historically the quality of sport fishing in the area was diminished by poor water quality (PCB contamination upstream and to a larger degree, downstream at Fort Edwards; see section V.C.1.a) but recovered by 1985 in the immediate project area. Improvements in water quality over the past decade have improved the sport fishery. To ensure boaters' safety, FPC cooperates with AHDC to install a boat safety barrier before June 1 of each year.

The project is located on a natural falls. The river at this point drops about 30 feet in elevation over a length of 100 to 400 feet. The falls offer scenic views during both high flow periods, when several thousand cfs of water pass over the dam, and during low flow periods when the etched and layered rock ledges that comprise the falls are exposed. Upstream, the river meanders through gentle rolling terrain with pockets of sand and gravel suitable for swimming areas intermingled with brush and forest. Downstream, the banks are steep and rocky and provide modest rapids.

There are no areas within or in the immediate vicinity of the project boundary that are included in, or have been designated for inclusion in, the National Wild and Scenic Rivers System.

Whitewater Boating

There are regional whitewater boating opportunities serviced by numerous commercial rafting companies within the Adirondack State Park. Commercial rafting also is available on the Sacandaga River, downstream of NMPC's Stewart's Bridge Project located about 25 miles upstream of the Glens Falls Project.

Three areas of whitewater boating potential exist within a 3-mile stretch of the Hudson River downstream of Glens Falls dam. These include: (1) the upper riffles, referred to as Cooper's Run, located immediately downstream of the project discharge; (2) the lower riffles located immediately upstream of the Portland Cement conveyor bridge, about 2,700 feet downstream of the upper riffles; and (3) the ruins of Fenimore dam in Hudson Falls located about 8,000 feet downstream of the lower riffles. Both shallow and deep flat water runs occur between the riffle segments.

FPC conducted a study of the potential for whitewater boating along these segments of the Hudson River and concluded that the opportunities are marginal at best. Based on the study, with flows of 6,500 cfs these segments were judged to be Class I rapids, except for the upper portion of Cooper's Run (closest to Glens Falls dam) which

was considered to be Class II.⁹ FPC also determined that a flow of at least 5,000 cfs would be needed to provide at least marginal to fair whitewater opportunities. Flows greater than 5,000 cfs are typically available in the spring months. Flows in excess of 13,000 cfs would render the river too dangerous to run.

None of these whitewater segments are listed in the American Whitewater Affiliation (AWA) Nationwide Whitewater Inventory, nor are they included in a NMPC survey of the most popular whitewater destinations on New York rivers conducted in 1991 (FPC, 1992). The low classification, relatively short riffle runs separated by relatively long stretches of flat water, very limited public access, and the availability of other nearby and more scenic whitewater boating opportunities, result in limited use of the whitewater segments downstream of the Glens Falls Project.

b. Environmental effects: FPC proposes to replace or refurbish the headgate structure and to expand the installed capacity of the project to 12.7 MW. Construction activities could affect passive recreational opportunities in the project area.

FPC proposed to install and maintain a small picnic and overlook area adjacent to the power canal (installed in 1996). Originally, FPC proposed to negotiate with NMPC to provide formal canoe portage downstream of the project on land owned by NMPC adjacent to FPC's property. FPC indicated that canoe portage from its property within the existing project boundaries would pose safety hazards to potential users because of the proximity to industrial activities and traffic. Subsequently, NMPC withdrew from these negotiations.

FPC explored the possibility of providing formal canoe portage at the municipal wastewater treatment facility located about 150 yards downstream from the original site for portage. The city of Glens Falls requested that FPC provide funds for the development of Haviland Cove Park instead, indicating that the public park would benefit more residents of Glens Falls than would canoe portage facilities. Based on the city's request, FPC filed a revised recreational enhancement option that eliminated the downstream recreational access and proposed instead to provide \$75,000 toward a program of measures recommended by the city totaling \$300,000 (letter from David P. Manny, Executive Vice President and Secretary, FPC, Glens Falls, New York, dated October 23, 1998).

⁹ The international scale of difficulty includes six classifications from the easiest (Class I) to the extreme (Class VI). Class II is considered novice.

The NYSDEC specifies in its WQC that FPC shall provide car-top boat and fishing access to the river below the project. The NYSDEC also specifies that the downstream access include parking for five cars and be accessible to the physically disabled. In response to FPC's filing to amend its recreational enhancements, the NYSDEC states that it would not support elimination of downstream recreational access in favor of improvements to Haviland Cove beach (letter from Kenneth Kogut, Regional Manager, Bureau of Habitat, NYSDEC, Ray Brook, New York, dated December 2, 1998). During our site visit on December 9, 1998, NYSDEC representatives indicated that they would view the elimination of downstream recreational access as a major change in the license application requiring reconsideration of the WQC.

The Adirondack Mountain Club (ADK) indicates that canoe portage around Glens Falls dam is necessary at either the Glens Falls Project or the South Glens Falls Project to complete a regional canoe trail on the Hudson River. ADK requests that the re-entry point downstream of the dam be located as far upstream as possible to allow access to Cooper's Run, the free-flowing portion of the river from U.S. Bridge 9 to the backwater of the Hudson/Baker Falls run (letter from Betty Lou Bailey, Chairperson, Canoe Route Subcommittee, ADK, Schenectady, New York, dated October 26, 1998).

The FCA supports the use of the Feeder Canal for canoe portage, and if the canal becomes the preferred canoe portage solution, requests an annual donation from FPC to help maintain a safe, clean trail and waterway for recreational use (letter from Howard Raymond, President, FCA, Glens Falls, NY, dated December 16, 1998). The Alliance also suggests that FPC install signs at the picnic area and overlook to let the public know that it is available for use.

Based on the comments provided by the NYSDEC in its letter of December 2, 1998, and on comments made during the site visit on December 9, 1998, FPC renewed discussions with the city of Glens Falls and received assurances that the city would make available land in the vicinity of wastewater treatment plant for the construction of a canoe/car-top boat access point. FPC now proposes to construct a canoe/car-top boat launch facility on city-owned lands as an alternative to the previously proposed boat launch facility on NMPC lands, and superceding the recent proposal (of October 23, 1998) to eliminate the boat launch facility and contribute to the city's Haviland Cove beach improvement project. FPC's current proposal for downstream recreational access consists of the following: (1) a parking area for a minimum of five vehicles adjacent to an existing lighted roadway; (2) a traffic barrier between the parking area and the adjacent roadway; (3) a gravel or wood chip trail from the parking area to the river bank access point; (4) a wooden platform with benches, on the river bank, for launching canoes/car-top boats; and (5) signs identifying the boat launch facility, including signage

from the nearby Feeder Canal (letter from David P. Manny, Vice President, FPC, Glens Falls, NY, to the Commission, dated February 3, 1999, and to the NYSDEC, dated February 8, 1999). Interior, by letter dated March 18, 1999, indicates that FPC's plan to provide canoe portage on city-owned lands on the north bank is consistent with its Section 10(j) recommendation.

Our Analysis

The replacement or rehabilitation of the headgate structure and expansion of the installed capacity would be consistent with existing land uses and would not result in any long-term effect on recreational resources in the region or in the project area. The powerhouse is located within the FPC paper mill and expansion of the installed capacity would not require any modification to the exterior of the building. Repair or replacement of the headgate structure, however, would interfere with views of the river from the FPC park during the construction period. The effect of this construction on recreational resources would be minor and short term.

The small picnic area and scenic overlook installed by FPC on its land adjacent to the power canal provides passive recreational opportunities to both local and regional users who can enjoy views of the dam, the scenic ledges, and the architecturally distinguished FPC headquarters building. However, we agree with the FCA that the area would benefit from additional signs inviting public use of the area. We recommend that FPC install additional signs at this location as part of a recreation plan for the project. However, we do not agree with FCA's request for an annual donation by FPC for maintenance of the canal, but recommend that FPC be responsible for annual operation and maintenance for existing and proposed recreational facilities associated with this project.

Haviland Cove beach on the north side of the river and Sandy Bar beach on the south side of the river provide ample recreational access to the impoundment for swimming and bank fishing. Canoe access, however, is currently lacking upstream of the dam and both canoe and bank fishing access are lacking downstream of the dam. The Hudson River offers regional recreational opportunities that are currently impeded by lack of canoe portage around the Glens Falls dam.

We agree with the NYSDEC, the ADK, and the FCA that formal canoe portage around Glens Falls dam would be necessary to allow completion of a regional canoe route on the Hudson River. We also agree with the NYSDEC that a parking area for five cars should be sufficient to accommodate the anticipated level of usage for both boat and fishing access. One or more canoe put-in and take-out locations are needed to enable

regional users to get around the Glens Falls dam. FPC's current proposal to construct a canoe/car-top boat launch facility on city-owned land would address the need for canoe portage facilities downstream of Glens Falls dam.

During our site visit of December 9, 1998, we viewed the FPC property and agree that canoe portage through FPC property would not be preferred because of potential safety hazards and traffic, including logging trucks and fork lifts. We also considered the appropriateness of canoe portage facilities on the south side of the river at the South Glens Falls Project. Access through the South Glens Falls Project would expose users to similar safety hazards associated with industrial operations. Representatives from the NYSDEC, the FCA, and the ADK agreed with our assessment.

We viewed the alternative downstream locations for canoe portage facilities on NMPC-owned land and at city-owned land at the municipal wastewater treatment facility. At the city-owned location, the slope is gentler than at the NMPC-owned location. There is a flat area between the riverbank and the river, making it more suitable for portage and for fishing access that is accessible to the physically disabled. NYSDEC representatives indicated during the December 9, 1998, site visit that, while certainly inundated during periods of high flows, this area would not be considered a wetland. The location is within 100 yards of the treatment facility outflow pipe, but the NYSDEC representative knew of no violations of the discharge permit. The existing access road and the gentler slope of the municipal site would make installation of parking, canoe portage facilities, and fishing access slightly less expensive here than at the NMPC location. We reviewed FPC's preliminary site plan and proposed signage as presented in FPC's filing of February 3, 1999, and conclude that the preliminary plans take good advantage of the site's topography and are consistent with Americans With Disabilities Act standards for access for the physically disabled. FPC estimates that provision of the downstream recreational option on NMPC land would cost \$59,600 (letter from David P. Manny, Vice President, FPC, Glens Falls, NY, dated October 23, 1998). We estimate that the cost of this option on city-owned land would be comparable.

FPC's proposed downstream canoe put-in location would not be ideal for access to Cooper's Run for whitewater boating purposes, but it would afford the best, safest opportunity to access the river below the dam. We agree with FPC that the whitewater boating potential within the 3-mile stretch downstream of the Glens Falls dam is limited.

While FPC's current proposal would address the need for recreational access downstream of the dam, it does not address the need for a safe canoe put-in/take-out access point upstream of the dam. Based on the December 9, 1998, site visit, we conclude that three upstream locations could be suitable for formal canoe put-in or take-

out: (1) just downstream of the Feeder dam; (2) at the Haviland Cove beach; or (3) off of Murray Street adjacent to the FPC warehouse property at the upper end of Pruyn's Island (see figure 3). All three locations are on the north side of the river and would use the Feeder Canal to facilitate portage. Two of these locations would require the construction of a small platform along the abutment of the Feeder Canal to facilitate safe access to the canal. Use and any modification to the Feeder Canal would require the permission of the NYSTA. A platform already exists at the Feeder dam location. We conclude that upstream canoe access is necessary and could be provided at one of several locations. We estimate that an upstream canoe put-in or take-out access point at Feeder dam, Haviland Cove, or Murray Street, using the Feeder Canal to portage past the dam, would cost about \$11,300.

FPC should develop a recreation plan, in consultation with the NYSDEC, the National Park Service (NPS), the city of Glens Falls, the ADK, the FCA, NYRU, and the SHPO, that includes upstream canoe portage access, downstream canoe portage access consistent with the preliminary plan filed by FPC on February 3, 1999, additional signage at the FPC-owned picnic and overlook area, an operations and maintenance plan for recreational facilities, and appropriate soil and erosion control measures.

c. Cumulative effects: Our recommended canoe-portage downstream of the project would provide beneficial cumulative effects on recreational opportunities in the project area by facilitating canoe portage around one of several dams on the Hudson River.

d. Unavoidable adverse effects: There would be short-term, minor impacts on passive recreational use of the overlook park during construction of the headgates.

D. No-action

Under the no-action alternative, FPC would continue to operate the project and there would be no changes to the existing environment. No measures to enhance existing environmental resources would be implemented.

VI. DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the Hudson River's available water resources to generate hydropower; estimate the economic benefits of the proposed project; and estimate the cost of various environmental protection, mitigation, and enhancement measures and the effects of these measures on project operations.

A. Power and Economic Benefits of the Project

We base our independent economic analysis on existing electric power conditions. We do not consider future inflation, escalation, or deflation beyond the potential license issuance date.¹⁰

We would typically base our estimate of the value of project-related capacity on a cost of alternative capacity of \$109/kW-year (at a fixed charge rate of 14 percent), based on a combined-cycle combustion turbine plant fueled by natural gas. We would typically base our estimate of the value of project-related energy on the 1998 cost of natural gas to electric generators in the Middle Atlantic Division of the United States. The 1998 cost of fuel would be based on information in Energy Information Administration, Supplement to the Annual Energy Outlook, March 1998, and our estimate of the amount of fuel that would be displaced would be based on fuel consumption at a heat rate of 6,200 British thermal units per kilowatt-hour (Btu/kWh).¹¹

In this case, however, even though the project has a dependable capacity of 7.2 MW, the Glens Falls Project is treated as having no dependable capacity beyond the context of the mill because FPC generally uses all its energy for the mill operations. Furthermore, the regional energy value (22.03 mills/kWh) plus capacity (total power value of 34.47 mills/kWh) is too low to represent the replacement cost for a small mill such as FPC. These regional energy values were derived from the projected average costs of fossil fuels utilized by electric utilities and are therefore not applicable to paper mills. FPC purchases any power need in excess of its hydropower and cogeneration power from NMPC. Therefore, in our analysis, we use the estimated current energy replacement cost of 58 mills/kWh.

For our economic analysis of the alternatives, we use the assumptions, values, and sources shown in table 6. The proposed action consists of the operation of the Glens Falls Project with FPC's proposed environmental and safety measures as shown in table 7.

Based on the assumptions in table 6 and the costs of enhancements shown in table 7, we estimate that the annual cost of FPC's proposed Glens Falls Project would be about \$2,987,680 (55.23 mills/kWh). The annual power benefit would be \$3,137,340 (58.00

¹⁰ See Mead Corporation, Publishing Paper Division, 72 FERC ¶61,027 (July 13, 1995).

¹¹ This fuel consumption rate is for a new plant designed for maximum efficiency.

mills/kWh) for the estimated annual generation of 54,092 MWh. The resulting annual net benefit would be \$149,660 (2.77 mills/kWh).

B. Proposed Action with Additional Staff-recommended Measures

In this section, we present the annual costs of the proposed action with additional staff-recommended measures. Table 8 shows the annual costs of additional staff-recommended measures.

Based on the assumptions in table 6 and the costs of the enhancements shown in tables 7 and 8, we estimate that the annual cost of the proposed action with additional staff-recommended measures would be \$2,991,010 (55.29 mills/kWh). The annual power benefit would be \$3,137,340 (58.00 mills/kWh) for the estimated annual generation of 54,092 MWh. The resulting annual net benefit would be \$146,330 (2.71 mills/kWh).

C. No-action

Under the no-action alternative, the project would continue to operate as it does now, with no change in existing environmental conditions.

The annual cost of the no-action alternative would be about \$2,980,960 (55.00 mills/kWh). The estimated average annual output of the project would be 54,200 MWh. This would provide an annual power benefit of \$3,143,600 at the energy replacement cost of 58.00 mills/kWh. The resulting annual net benefit for the no-action alternative would be about \$162,640 (3.00 mills/kWh).

D. Economic Comparison of the Alternatives

Table 9 presents a summary of the current net annual power benefits for the proposed action, the proposed action with additional staff-recommended measures, and no action.

The enhancements proposed by FPC would increase annual costs by \$12,980 (including lost energy) and decrease the annual net benefit by the same amount. The annual generation would decrease to 54,092 MWh.

The additional staff-recommended measures would increase annual costs by an additional amount of \$3,330 above FPC's proposed action and decrease the annual net benefits by the same. As with FPC's proposed action, the annual generation for the

proposed project with additional staff-recommended measures would remain at 54,092 MWh.

E. Pollution Abatement

The Glens Falls Project annually generates about 54,200 MWh of electricity. This amount of hydropower generation, when contrasted with the generation of an equal amount of energy by fossil-fueled facilities, avoids the unnecessary emission of atmospheric pollutants. Assuming that the 54,200 MWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to that produced by the Glens Falls Project would require combustion

of about 559 million cubic feet of natural gas annually. Removal of pollutants from the emissions to levels presently achievable by state-of-the-art technology would cost about \$27,000 (1998\$) annually.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which the project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreational, cultural, and other nondevelopmental values of the involved waterway equally with its electric energy and other developmental values. In determining whether, and under what conditions, to license a project, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

This section contains the basis for, and a summary of, our recommendations to the Commission for the licensing of the Glens Falls Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

A. Recommended Alternative

Based on our independent review and evaluation of the proposed action, the proposed action with the additional staff-recommended measures, and no-action, we select the proposed action with additional staff-recommended measures as the preferred alternative.

Table 6. Staff's assumptions for economic analyses of the Glens Falls Project
(Source: Staff)

Assumption	Value	Source
Energy value (1998) ^a	58 mills/kWh	NMPC
Operation & maintenance (O&M) costs (1998) ^b	\$762,000	FPC
Period of analysis	30 years	Staff (Mead)
Discount rate	10 percent	Staff
Net investment ^c (1998)		
Escalation rate	\$16,070,000	FPC
Federal tax rate	0 percent	
Local tax rate	34 percent	
Insurance rate	3 percent	
	0.25 percent of cost to construct	
Term of financing	20 years	

^a Energy-only, based on 1998 estimated replacement cost from NMPC (www.nimo.com, January 14, 1999).

^b Based on the average 1994 cost of \$593,000 presented by FPC. Adjusted by the staff to 1998\$ by inflating 5 percent annually for 4 years. We removed the flashboard replacement and added in the interim replacements from FPC's license application (table D-3 of the application).

^c Based on book value of \$4,237,385 and new development costs of \$8,598,000 presented by FPC. Adjusted by the staff by depreciating the book value to 1998\$ and by depreciating then adding in the capital expenditures for a new unit #1 turbine, forebay wall, tailrace repair, unit #2 runner, park along Route 9 and the bypassed flow pipe (as reported by FPC in its 1995 and 1996 annual inspection report submitted to the Commission on July 2, 1997), and by subtracting out the previously estimated amounts for the turbine repairs from table D-1 of the application.

Table 7. Summary of annual costs of FPC's proposed action (Source: Staff)

Protection or enhancement measure	Capital cost (1998\$)	O&M cost (1998\$)	Annual cost (1998\$)
Continue to operate in ROR mode	0	0	0
Limit reservoir drawdowns to within 6 inches of the top of the crest gates	0	0	0
Continue to release minimum flow of 5 cfs and install weirs to disperse flows ^{a,b}	\$7,000	0	\$6,870
Develop and implement plan to monitor and report instantaneous flows	\$10,000 ^c	0	\$880
Consider replacing existing trashracks at the powerhouse with 1-inch clear trashracks when the existing racks need to be replaced ^{a, d}	0	0	0
Install and maintain picnic and overlook area adjacent to power canal ^e	0	0	0
Construct canoe/car-top boat launch facility downstream of the dam	\$59,600 ^f	0 ^g	\$5,230

^a O&M cost accounted for as part of normal O&M costs (includes replacing equipment).

^b Capital costs of constructing weirs to redistribute minimum flow from the existing pipe (estimated by the staff). Annual cost includes \$6,260 in lost energy (108 MWh at 58 mills/kWh).

^c Cost of plan development, including consultation, estimated by the staff.

^d Subsequent to issuance of the draft EA and the November 30, 1999, Section 10(j) meeting, FPC and FWS reached agreement on installation of 1-inch trashracks and a fish bypass system. There would be costs for implementing this agreement, but we have not included them in our analysis.

^e Capital costs associated with this enhancement were incurred in 1996 and are reflected in the current value of the project.

^f FPC estimated the cost of a comparable facility on NMPC land at \$59,600 in its October 23, 1998, filing. We assume the cost would be equivalent on city-owned land.

^g FPC indicated that the City of Glens Falls would be responsible for maintaining this facility once it is constructed (letter from David P. Manny, Vice President, FPC, to the Commission, dated February 3, 1999).

Table 8. Summary of annual costs of additional staff recommended measures for FPC's proposed Glens Falls Project (Source: Staff)

Protection, mitigation, or enhancement measure	Capital cost (1998\$)	O&M cost (1998\$)	Annual cost (1998\$)
Install 1-inch clear spaced trashracks on new headgate structure ^a	\$1,300,000 ^a	0	\$114,000
Reserve Interior's authority to prescribe fishways	0	0	0
Implement a PA providing for development of a CRMP	\$5,000	0	\$440
Provide upstream canoe/car-top boat access ^b	\$11,300	\$550	\$1,350
Develop and implement a recreation plan including downstream access, signs, and erosion control measures	\$10,000	\$1,000	\$1,540

^a Estimate provided by FPC in a letter dated December 7, 1998; we do not adopt this environmental measure recommended by Interior and do not include the costs in the staff-recommended alternative.

^b Cost of enhancement estimated by staff.

Table 9. Summary of the net annual benefits of alternatives for FPC’s proposed Glens Falls Project (Source: Staff)

	Proposed action	Proposed action with additional staff-recommended measures	No action
Annual generation (MWh)	54,092	54,092	54,200
Annual power benefit			
(\$)	\$3,137,340	\$3,137,340	\$3,143,600
(mills/kWh)	58.00	58.00	58.00
Annual cost ^a			
(\$)	\$2,987,680	\$2,991,010	\$2,980,960
(mills/kWh)	55.23	55.29	55.00
Annual net benefit			
(\$)	\$149,660	\$146,330	\$162,640
(mills/kWh)	2.77	2.71	3.00

^a The \$1,300,000 for the proposed 1-inch spaced trashrack is not included in the annual cost.

We recommend this alternative because: (1) issuance of a license would allow FPC to continue to operate the project as a dependable source of electric energy; (2) the 12.7-MW project would avoid the need for an equivalent amount of fossil-fuel fired electric generation and capacity, continuing to help conserve these nonrenewable energy resources and reduce atmospheric pollution; and (3) the recommended environmental measures would improve water quality, protect fish and terrestrial resources, improve public use of recreational facilities and resources, improve multiple use and management of project lands, and maintain and protect historic and archeological resources within the area affected by project operations.

We recommend including the following measures in any license issued by the Commission for the Glens Falls Project:

- (1) operate the project in a ROR mode;

- (2) maintain the reservoir elevation to within 6 inches of the normal maximum pond elevation of 269.1 feet NGVD;
- (3) release minimum flows of 5 cfs through a pipe and install low-head diversion weirs to disperse the flow to the bypassed reach;
- (4) develop and implement a plan to monitor and report instantaneous flow and headpond and tailwater elevations;
- (5) develop, in consultation with FWS and the NYSDEC, and implement a plan to install 1-inch trashracks and a fish bypass system consistent with the agreement reached between FPC and FWS;
- (6) reserve Interior's authority to prescribe the construction, operation, and maintenance of fishways;
- (7) implement a PA among the Commission, the SHPO, and the Advisory Council on Historic Preservation that provides for the development and implementation of a CRMP; and
- (8) develop and implement a recreation plan providing for recreational access for fishing and boating downstream of the dam, provisions for an appropriate canoe take-out point along the impoundment shoreline, signs at FPC's picnic and overlook area, an operations and maintenance plan for recreational facilities, and appropriate soil and erosion control measures that are consistent with the conditions of the WQC.

Implementation of these measures would protect and enhance fisheries, cultural, and recreational resources in the project areas and provide for the best use of the waterway.

The costs of some of these measures would reduce the net benefit of the project. As discussed in section VI, we estimate that the proposed action would cost less than currently available alternative power. The proposed action with additional staff-recommended measures would decrease the positive benefit of the project. Specifically, two of the additional staff-recommended measures would reduce the economic benefits of the project. These include: (1) implementation of a PA and CRMP and (2) development of a recreation plan. We summarize these recommendations briefly in the following section.

1. Implement a Programmatic Agreement and CRMP

FPC does not propose to develop or implement a CRMP. Implementation of a CRMP is necessary to ensure that the historic character of the Glens Falls Project would be protected during the term of the license. A PA executed by the Commission would contain a stipulation requiring FPC to prepare, and upon Commission approval, implement a CRMP in consultation with the SHPO, addressing the management of Historic Properties within the project's APE and consideration of the effects of recommended recreational enhancements. We estimate that the current annual cost of preparing the CRMP would be about \$440, a relatively minor amount in relation to total costs.

2. Develop and Implement a Recreation Plan that Includes Upstream Canoe Access

FPC currently does not propose to provide an upstream access point for canoe portage. We agree with the NYSDEC and other interested parties that portage around Glens falls dam is necessary. We consider it necessary to provide for an appropriate canoe take-out site along the impoundment shoreline to complement the downstream canoe take-out/put-in site proposed by FPC. Several viable canoe take-out sites are available, and we consider it most appropriate for FPC to select and develop a site after consultation with the appropriate entities. We also consider it appropriate for FPC to provide signs at its recently completed picnic area and overlook park that make it clear that this park is open to the public. Therefore, FPC should develop and implement a recreation plan in consultation with the NYSDEC, NPS, NYRU, FCA, ADK, the city of Glens Falls, and the SHPO, that includes an upstream access point for canoe portage; the proposed downstream access for canoe portage, fishing that is accessible to the physically disabled, and parking for five cars; and additional signage at FPC's recently completed park.

We estimate that the current annual cost of providing the upstream access point and developing the recreation plan, including the specified consultation, and annual operation and maintenance costs, would be about \$2,890.

B. Conclusion

Based on our review of the agency and public comments filed on the project and our independent analysis pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, we conclude that licensing the project as proposed by FPC with the additional staff-

recommended measures would provide for the best comprehensive use of the Hudson River.

VIII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies submitted to adequately and equitably protect, mitigate damages to, and enhance 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 the agency.

Pursuant to Section 10(j) of the FPA, we made a preliminary determination in the draft EA that one of the recommendations of the fish and wildlife agencies may be inconsistent with the purposes and requirements of Part I of the FPA or other applicable laws. Recommendations, or parts of recommendations, that are inconsistent with Section 10(j) conflict with the comprehensive planning and public interest standards of Section 4(e) and 10(a) of the FPA. This is because the recommendation would cost more to implement than the value of its potential benefit.

For the Glens Falls Project, both the NYSDEC and Interior have had the opportunity to make comments and recommendations. Both agencies have provided recommendations, and we evaluate and discuss all recommendations in the water, fisheries, and recreation sections of this EA.

Table 10 presents a summary of the NYSDEC's and Interior's recommendations, shows if they are within the scope of Section 10(j), and indicates whether or not we recommend adopting the measures under the proposed action with additional staff-recommended measures.

As table 10 shows, we determine that one recommendation is not within the scope of Section 10(j) because it is not a specific measure for the protection of fish and wildlife. We did not recommend adopting Interior's recommendation to install 1-inch clear spaced trashracks on the new (or rehabilitated) headgate structure. Based on our analysis, we concluded that the existing 1 5/8-inch trashracks at the turbine intake would

protect most fish and the prevailing approach velocity at the trashrack would enable most fish to escape entrainment. We recommended in the draft EA that when the existing trashrack is replaced, FPC consult with FWS and NYSDEC regarding appropriate fish protection measures at the powerhouse intake based on then-current technologies and file a plan, including an evaluation of installation of a smaller-spaced trashrack, with the Commission. This could afford a similar level of protection to that sought by Interior if the plan is approved by the Commission, although some small fish would not be able to exit the forebay because of the high water velocity at the headgates. The estimated \$114,000 annual cost associated with installing Interior’s recommended trashrack at the headgate would have a significant effect on the economics of the project and would not be justified based on the lack of a demonstrated adverse effect on the fishery. Therefore, we found that the recommendation may be inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA.

Table 10. Analysis of fish and wildlife agency recommendations for the Glens Falls Project (Source: Staff)

Recommendation	Agency	Within scope of section 10(j)?	Annual cost	Recommend adopting?
1. Operate the project in ROR mode and maintain impoundment water level to within 6 inches of the top of the crest gates (elevation 269.1 feet NGVD)	NYSDEC Interior	Yes	\$0	Yes
2. Provide minimum flow of 5 cfs to the bypassed reach with diversion weirs to direct the flow to the most desirable habitat	NYSDEC Interior	Yes	\$6,870	Yes

Recommendation	Agency	Within scope of section 10(j)?	Annual cost	Recommend adopting?
3. Develop and implement a plan for monitoring impoundment levels and minimum flow releases	NYSDEC Interior	Yes	\$880	Yes
4. Develop and implement plan for installation of 1-inch clear spaced trashracks in the new headgate structure	Interior	Yes	\$114,000	No, however we recommend measures agreed to by Interior. See detailed discussion following this table.
5. Provide public access, to a reasonable extent, to project waters and adjacent parcels	Interior	No. Not a specific measure to protect fish and wildlife	\$8,120	Yes, considered under Section 10(a).

Pursuant to Section 10(j) of the FPA, we consulted with Interior, as represented by FWS, to attempt to resolve this inconsistency between the requirements of the FPA and the recommendation of Interior.

We held a meeting on November 30, 1999, with representatives of FWS to discuss the one remaining unresolved Section 10(j) issue, the installation of a 1-inch clear spaced trashrack at the new Glens Falls forebay headgate structure. At this meeting, FWS indicated that it could exercise its reserved authority to prescribe downstream fish passage facilities, pursuant to Section 18 of the FPA, if needed. Although Commission staff remained unconvinced about the need for fish protection at the headgate structure, FPC indicated a willingness to discuss alternative fish protection options with FWS. We issued a summary of the results of the Section 10(j) meeting on January 19, 2000.

FPC informed the Commission that it had reached agreement in principle with FWS over fish protection and downstream fish passage (letter from D. Manny, Executive

Vice President, FPC, to the Commission, dated January 21, 2000). The agreement would require FPC to replace the existing 1 5/8-inch trashracks with 1-inch trashracks and provide a potential downstream migration route for fish via a bypass pipe. Conceptual plans for the fish bypass facility were attached to the January 21, 2000, submittal. Components of the conceptual plan included a 1-foot square entry near the upstream face of the trashracks with a 5 cfs bypass flow. FPC proposed to operate the fish bypass seasonally during fish migration periods. NYRU expressed support for the agreement reached between FPC and FWS (letter from B. R. Carpenter, Executive Director, NYRU, to the Commission, dated January 27, 2000).

FPC and FWS continued to negotiate regarding the specific points of the agreement. FPC agreed to modify its original conceptual fish passage proposal to accept FWS' recommendation to increase the entry dimensions to 2-foot square, increase the bypass flow to 20 cfs, and operate the fish bypass year-round (letter from D. Manny, Executive Vice President, FPC, to Chris Metcalf, FWS, Cortland Field Office, dated April 27, 2000). In response to FPC's revised proposal, FWS stated that it considered the one remaining Section 10(j) issue that pertains to fish protection to be resolved and that the terms of the agreement should replace its Section 10(j) recommendation pertaining to fish protection (letter from D.A. Stilwell, Field Supervisor, FWS, Cortland Field Office, to the Commission, dated May 11, 2000).

Our analysis in the draft EA concluded that FPC should develop and implement a plan for appropriate fish protection measures at the powerhouse intake (including consideration of 1-inch clear spaced trashracks) when the useful life of the existing trashracks expired. The agreement reached by FPC and FWS would move the implementation of fish protection measures from an indefinite time in the future (when the trashracks need replacement) to a more definite time in the near future (once the final plans have been developed in consultation with FWS and approved by the Commission).¹² Our analysis in the draft EA also raised the concern that once small fish

¹² FPC indicated in a letter to the Commission dated April 4, 2001, that replacement of the existing trashracks would require a crane to be located on the Route 9 bridge, which the New York State Department of Transportation plans to replace during the period beginning May 1, 2001, and ending on June 4, 2004. FPC requested that it be granted an amendment to its existing license, if applicable, or measures that would be included in its new license (including the timing of the replacement of the trashracks and construction of the fish bypass) until after the bridge replacement is complete. The Commission issued a Notice of Application to Amend the Glens Falls Project license in accordance with FPC's request on April 5, 2001.

or fish with relatively slow burst speeds entered the intake canal, the high velocity at the forebay headgate (over 6 fps) could preclude many of them from exiting the canal, especially under high flow conditions. The proposed fish bypass would provide an avenue of passage for such fish, thus allowing them to contribute to the fishery of the tailwaters. Considering that FPC and FWS have worked cooperatively to reach a resolution of this remaining Section 10(j) issue and that implementation of the plans described in the agreement would protect and enhance fishery resources, at a cost substantially less than that of Interior's 10(j) recommendation, we recommend that the Commission include the provisions of the final agreement between FPC and FWS in any license that it issues for this project.

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 and state comprehensive plans for improving, developing, and conserving waterways affected by the project. Under section 10(a)(2), federal and state agencies filed 29 plans that address various resources in New York. Nine plans address resources relevant to the Glens Falls Project.¹³ No conflicts were found with the plans.

¹³ (1) New York State Department of Environmental Conservation. 1979. Hudson River Basin water and related land resources: level B study report and environmental impact statement. Albany, New York. September 1979. 148 pp. and map. (2) New York State Department of Environmental Conservation. 1985. New York State wild, scenic, and recreational river system act. Albany, New York. March 1985. 22 pp. (3) New York State Department of Conservation. 1986. Regulation for administration and management of the wild, scenic, and recreational rivers system in New York State excepting the Adirondack Park. Albany, New York. March 26, 1986. 27 pp. (4) New York State Executive Law. 1981. Article 27 - Adirondack Park Agency Act. Albany, New York. July 15, 1981. 65 pp. (5) New York State Office of Parks, Recreation, and Historic Preservation. 1983. People, resources, recreation. Albany, New York. March 1983. 353 pp. and appendices. (6) State of New York Hudson River Regulating District. 1923. General plan for the regulation of the flow of the Hudson River and certain of its tributaries. Albany, New York. June 7, 1923. 63 pp. (7) Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. May 1986. 19 pp. (8) Fish and Wildlife Service. Undated. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp. (9) National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, D.C. January 1982. 432 pp.

X. FINDING OF NO SIGNIFICANT IMPACT

With the staff's additional recommended measures, the Glens Falls hydroelectric facilities would continue to operate, ROR operations and minimum flows would protect fish and wildlife resources, and recreational access would be enhanced and maintained. With our recommended consultation with the SHPO, execution of the PA, and development of a revised CRMP, no significant impacts on cultural resources are expected.

Based on our independent analysis, issuance of a license for the project with additional staff-recommended measures would not constitute a major federal action significantly affecting the quality of the human environment.

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APPENDIX A
COMMENTS ON THE GLENS FALLS PROJECT DRAFT ENVIRONMENTAL
ASSESSMENT AND STAFF RESPONSES

<u>Commenting Entity</u>	<u>Date of Letter</u>	<u>Page</u>
Finch, Pruyn & Company, Inc.	June 18, 1999	A-2
Adirondack Mountain Club	June 21, 1999	A-4
U.S. Fish and Wildlife Service	July 8, 1999	A-6
Finch, Pruyn & Company, Inc.	July 23, 1999	A-19