

**ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE**

South Berwick Hydroelectric Project
FERC Project No. 11163-000
Maine/New Hampshire

**Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
888 First Street, N.E.
Washington, DC 20426**

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SUMMARY

On June 28, 1991, Consolidated Hydro Maine, Inc. (CHMI) filed an application with the Federal Energy Regulatory Commission (Commission) for an original license for the existing 1.2-megawatt (MW) South Berwick Hydroelectric Project. The project is on the Salmon Falls River in the towns of South Berwick, Maine, and Rollinsford, New Hampshire. No new capacity is proposed for this project.

In this Environmental Assessment (EA), we analyze and evaluate the effects associated with the issuance of an original license for the existing hydropower development and recommend terms and conditions to become a part of any license issued. For any license issued, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to the purpose of energy conservation; the protection and enhancement of fish and wildlife, aesthetics, and cultural resources; and the protection of recreation opportunities. This EA reflects the Commission's consideration of these factors.

Based on our consideration of all developmental and nondevelopmental resource interests related to the project, we recommend to the Commission that the following measures to protect, mitigate, or enhance environmental resource values be included in any license issued for the South Berwick Project. The applicant should be required to:

- enhance water quality and meet state standards for dissolved oxygen (DO) at the project by operating the project in run-of-river mode;
- ensure that the flow recommendation is enhancing tailrace water quality by developing and implementing a plan to monitor flows and DO;
- enhance impoundment, tailrace, commercial baitfish, and anadromous fish populations by designing, installing, and operating both upstream and downstream fish passage facilities;
- enhance wetland vegetation and fish populations by

operating the project with a seasonal stable pond elevation;

- develop and implement a recreation plan for facilities on the impoundment and below the powerhouse to help meet the recreational needs of the area;

- ensure trailered boat access to the impoundment by rebuilding the impoundment boat launch and developing an agreement with the town of Rollinsford for continued maintenance; and

- enhance recreation resources below the project by developing a park facility and directional signage in the area immediately below the powerhouse.

These environmental measures would protect, mitigate, or enhance fisheries resources, water quality, and recreation. In addition, the electricity generated from the project would be beneficial because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and continue to reduce atmospheric pollution.

If the license is denied, the project would cease to operate and about 3,000,000 kilowatt-hours of electric energy generation per year at the South Berwick Project would be lost. No measures would be implemented to protect, mitigate, or enhance existing environmental resources at this site. This loss of generation would affect the supply of energy in the region and a source of replacement energy may need to be identified.

The Maine Department of Environmental Protection (MDEP) received CHMI's original application for water quality certification (WQC) on July 9, 1991. CHMI subsequently withdrew and refiled its application for WQC on July 6, 1992, June 23, 1993, and again on June 8, 1994. On May 25, 1995, MDEP issued a final order granting WQC for the project.

Under Section 10(j) of the Federal Power Act (FPA), each hydroelectric license issued by the Commission must include conditions based on the recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. We have addressed the concerns of the federal and state fish and wildlife agencies and made recommendations. We recommend full or partial adoption of all agency recommendations

that were determined to be within the scope of Section 10(j).

Under Section 18 of the FPA, the Secretary of the U.S. Department of the Interior reserved authority to prescribe the construction, operation, and maintenance of fishways at the project.

Based on our independent analysis, including consideration of all relevant economic and environmental concerns, we conclude that: (1) the South Berwick Project, with our recommended environmental measures for flows, flow monitoring, fishways, impoundment fluctuation limitations, and recreation enhancements, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Salmon Falls River and other project-related resources; and (2) issuance of an original license for the South Berwick Project would not constitute a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

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

South Berwick Hydroelectric Project FERC Project No. 11163 -- Maine/New Hampshire

APPLICATION

On September 30, 1988, the Commission issued an Order Finding Hydroelectric Project Jurisdiction determining that the South Berwick Project is subject to the Commission's licensing

Jurisdiction. The Commission determined that the Salmon Falls River, including the South Berwick Project Segment, is a navigable waterway as defined by Section 3(8) of the Federal Power Act (12 U.S.C. § 61,028 (1980)).

On June 28, 1991,

Consolidated Hydro Maine, Inc. (CHMI or applicant) filed an application with the Commission for an original license for the South Berwick Hydroelectric Project. The 1.2-megawatt (MW) project is on the Salmon Falls River in the towns of South Berwick, Maine, and Rollinsford, New Hampshire (Figure 1). The project does not occupy any United States lands.

PURPOSE AND NEED FOR ACTION

Purpose of Action

In this Environmental Assessment (EA), we analyze the impacts associated with issuing an original license for the constructed project, alternatives to the proposed project, and make recommendations on whether to issue a license, and if so, the terms and conditions to become part of any license issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways and federal lands.

In deciding whether to issue any license, the Commission must determine that the project adopted will be best adapted to a

The Commission determined that the Salmon Falls River, including the South Berwick Project Segment, is a navigable waterway as defined by Section 3(8) of the Federal Power Act (12 U.S.C. § 61,028 (1980)).

comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation; the protection and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreation opportunities; and the preservation of other aspects of environmental quality.

Figure 1. Project Location Map, South Berwick Hydroelectric Project

Issuing an original license for the project would allow CHMI to continue to own and operate the South Berwick Project for the term of the license, making electric power from a renewable resource for its customers. The existing project generates an average of about 3,000,000 kilowatt-hours (kWh) of energy annually.

In this EA, we, the Commission staff, assess the environmental and economic effects of: (1) continuing to operate the project with the enhancements proposed by CHMI, (2) operating the project as proposed by CHMI with additional recommended environmental measures, and (3) the no-action alternative (continued operation of the project with no changes or enhancements).

Need for Power

The project is located in the New England Power Pool (NEPOOL) subregion of the Northeast Power Coordination Council (NPCC) region of the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. NERC's most recent report^{NERC's Electricity Supply and Demand Database, 1995-2004 dataset (June 1995).} on annual supply and demand projections indicates that, for the 1994 to 2005, loads in the NEPOOL area will grow faster than planned capacity additions, resulting in decreased reserve margins. These margins could fall below 15 percent in later years of the forecast period.

The South Berwick Project has historically generated an annual average of 3,000 megawatt-hours (MWh) of power for CHMI. In addition, the project displaces nonrenewable fossil-fired generation and contributes to diversification of the generation mix in the NEPOOL area.

We conclude that present and future use of the project's power, its displacement of nonrenewable fossil-fired generation and contribution to diversified generation mix support a finding that the power from the South Berwick Project will help meet a need for power in the NEPOOL area in the short- and long-terms.

NERC's Electricity Supply and Demand Database, 1995-2004 dataset (June 1995).

PROPOSED ACTION AND ALTERNATIVES

Proposed Action

Project Description

The existing unlicensed South Berwick Project (Figure 2) consists of: (a) a concrete gravity dam that is an average of 18 feet high and 290 feet long with a 220-foot-long concrete spillway section, which uses 2-foot-high wooden flashboards; (b) an impoundment that is about 1 mile long, has a surface area of 58 acres, and contains 116 acre-feet of usable storage; (c) a concrete intake structure in the east abutment of the dam consisting of three headgates that lead to three, 8-foot-diameter penstocks and two sluice gates that may be used as flood gates and for lowering the headpond; (d) an 85-foot-long by 30-foot-wide powerhouse housing three turbine units; and (e) appurtenant facilities.

The total rated capacity of the three turbine-generators is 1,200 kW. The project's hydraulic range varies from 50 to 885 cubic feet per second (cfs). The project presently operates in a manual run-of-river mode most of the time, matching inflows from upstream projects as closely as possible. During periods of low flow, the project operates as a modified peaking project (12 inch elevation drop in the summer and fall and up to 24 inches in the winter to manage ice and protect against flashboard failure). CHMI proposes to continue this mode of operation.

CHMI does not own, operate, or maintain any recreation facilities within the project boundaries, but does allow recreationists to cross its property to gain access to the river below the project. Access for water-based recreation on the project impoundment is available at a public boat launch and parking area on Foundry Street in Rollinsford. There are also a dirt road and paths that allow access to the tailrace area. CHMI proposes to transfer a parcel of land below the powerhouse to the town of South Berwick for recreational development.

Proposed Environmental Measures

CHMI proposes to implement the following measures:

- provide a minimum flow release below the project of 61 cfs, or inflow, to the Salmon Falls River for

enhancement of water quality and fisheries;

- manage the project impoundment with a maximum daily water level fluctuation of 12 inches from May 15 through October 15, and 24 inches from October 16 through May 14; and

Figure 2. Project Facilities, South Berwick Hydroelectric Project

·transfer ownership of a 1-acre parcel of land to the town of South Berwick for the development of a waterfront park below the project.

Other Action Alternatives

After evaluating CHMI's proposal and reviewing recommendations from resource agencies, we considered what, if any, additional protection, mitigation, or enhancement measures would be necessary and appropriate to include in a license. The staff alternative consists of the following enhancements or modifications to project operations:

·enhance water quality and meet state standards for dissolved oxygen (DO) in the project tailrace by providing alternate minimum flows below the project;

·ensure that the flow recommendation is enhancing tailrace water quality by developing and implementing a plan to monitor flows and DO;

·enhance impoundment, tailrace, commercial baitfish, and anadromous fish populations by designing, installing, and operating both upstream and downstream fish passage facilities;

·enhance wetland vegetation and fish populations by modifying the impoundment draw-down schedule;

·develop and implement a recreation plan for facilities on the impoundment and below the powerhouse to help meet the recreational needs of the area;

·ensure trailered boat access to the impoundment by rebuilding the impoundment boat launch and developing an agreement with the town of Rollinsford for continued maintenance; and

·enhance recreation resources below the project by developing a park facility and directional signage in the area immediately below the powerhouse.

C.No-action Alternative

Under the no-action alternative, the project would continue to operate as it has in the past, and no new environmental

protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

Denial of the original license application would be an action alternative that could result in project decommissioning, which would change the existing environment. We discuss project decommissioning in Section III.D.

D.Alternatives Considered but Eliminated from Detailed Study

We considered one other alternative to the applicant's licensing proposal but eliminated it from detailed study because it is not reasonable in the circumstances of this case.

The South Berwick Project could be decommissioned with or without dam removal. Either alternative would involve denying the license application and terminating operations at the project. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. The dam creates an impoundment that provides wetlands and wildlife habitat and generates electricity that is important for meeting the energy needs of the region.

The second decommissioning alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative; therefore, we have no basis for recommending it. Because the power supplied by the project is being used, a source of replacement power may have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

CONSULTATION AND COMPLIANCE

Consultation

The Commission's regulations require the applicant to consult with the appropriate resource agencies before filing a

license application. After an application is accepted, the Commission issues a public notice and seeks formal comments in accordance with federal statutes. All comments become a part of the record and are considered during analysis of the project.

The Commission issued a public notice of CHMI's application for original license on February 9, 1993. The following entities commented on the application by April 12, 1993, the deadline specified in the public notice.

Commenting Entities Date of Letter

State of New Hampshire, March 31, 1993
Fish and Game Department

State of Maine, April 2, 1993
Department of Environmental Protection

U.S. Department of the Interior April 5, 1993

State of Maine, State Planning April 8, 1993
Office

CHMI responded to these comments by letter dated June 3, 1993.

On August 30, 1994, the Commission issued a Scoping Document for the South Berwick Project, which identified the pertinent issues to be analyzed in the DEA.

Intervention

In addition to providing comments, organizations and individuals may petition to intervene and become a party to any subsequent proceedings. The following party filed and was granted intervenor status on the South Berwick Project:

Agency Date Filed

State of Maine, State Planning April 23, 1992
Office (not in opposition)

This motion was submitted to allow the state planning office to keep informed about the license issuance proceedings.

C. Comments on the Draft Environmental Assessment

The Federal Energy Regulatory Commission (Commission) issued the South Berwick Hydroelectric Project Draft Environmental Assessment (DEA) for comment on February 23, 1995. In response, we received five comment letters. All timely filed comment letters were reviewed by the staff. The sections of the DEA that have been modified as a result of comments received are identified in the staff responses to the right of the letters of comments, in Appendix A.

The respondents commenting on the DEA are as follows:

Commenting Entities Date of Letter

State of New Hampshire, March 29, 1995
Fish and Game Department

State of New Hampshire April 6, 1995
Department of Environmental Services

United States Environmental April 6, 1995
Protection Agency

U.S. Department of the Interior April 7, 1995
Fish and Wildlife Service

Consolidated Hydro Maine, Inc. April 21, 1995

D. Water Quality Certification

Section 401 (a)(1) of the Clean Water Act (CWA)^{33 U.S.C. § 1341 (1988).} requires an applicant for a federal license or permit for any activity that may result in a discharge into navigable waters of the United States to provide to the licensing or permitting agency a certification from the state in which the discharge originated that such discharge will comply with certain sections of the CWA. If a state fails to act on a request for certification within one year, the certification requirement is waived.^{33 U.S.C. § 1341 (a) (1) (1988).} Section 401 (d) of the CWA^{33 U.S.C. § 1341 (d).} provides that state certifications shall set forth conditions necessary to ensure that applicant's comply with specific portions of the CWA and with appropriate requirements of state law.^{Section 401 (d) provides that:}

33 U.S.C. § 1341 (1988).

33 U.S.C. § 1341 (a) (1) (1988).

33 U.S.C. § 1341 (d).

Section 401 (d) provides that: Any certification provided under this section shall set forth any effluent limitations and other limitations, and monitoring requirements necessary to assure that any applicant for a federal license or permit will comply with any application effluent limitations and other limitations, under section 1311 or 1312 of this title, standard of performance under section 1316 of this title, or prohibition, effluent standard, or pretreatment standard under section 1317 of this title, and with any other

The Salmon Falls River is the boundary between the states of New Hampshire and Maine, but the project tailrace and intake are located on the Maine bank of the river. The Maine Department of Environmental Protection (MDEP) received CHMI's original application for WQC on July 9, 1991. CHMI subsequently withdrew and refiled its application for WQC on July 6, 1992, June 23, 1993, and again on June 8, 1994.

On May 25, 1995, MDEP issued a WQC for the

project. The State of New Hampshire has argued that CHMI must also obtain Water Quality Certification from New Hampshire. This is

The

WQC requires CHMI to operate in run-of-river mode from June 1 through September 30 if the 3-day average of water temperature times river flow duration is 1,500 at the three CHMI projects on the lower Salmon Falls River: Great Falls, Rollinsford, and South Berwick (Figure 1).

Additional conditions of the MDEP WQC include:

- a year-round minimum flow of 44 cfs or inflow;
- passage of all nongeneration flows as leakage or spillway flow from June 1 through September 30;
- definitions for operating emergencies beyond CHMI's control;
- requirements for flow and temperature monitoring plans;
- an impoundment fluctuation restriction of 1 foot for the June 1 through September 30 period, and a 2-foot restriction at all other times except full pond level is required when the 3-day average of temperature times flow duration product is greater than 1,500;
- requirements for a water level monitoring plan;
- land transfer to the town of South Berwick for development of Counting House Park;

appropriate requirement of state law set forth in such certification, and shall become a condition on any federal license or permit subject to the provisions of this section.

The State of New Hampshire has argued that CHMI must also obtain Water Quality Certification from New Hampshire. This is a legal issue, which will be addressed in the license order.

- assistance with repair to the Foundry Street boat ramp;
- a plan for implementing development of Counting House Park and the Foundry Street boat ramp repairs;
- development of facilities for upstream and downstream fish passage within 3 years of a formal Maine Department of Marine Resources (MDMR) anadromous fish restoration plan for the Salmon Falls River; and
- design of fish passage facilities within 1 year and installation of upstream and downstream fish passage within 2 years of MDMR adopting a formal plan for anadromous fish restoration on the Salmon Falls River.

Our past experience with Section 401 water quality conditions indicates that some states routinely include measures that, in our opinion, do not relate to water quality and, therefore, are outside the scope of Section 401. Only those measures included in a WQC considered to be within the scope of Section 401 will become part of any license issued.

MDEP's WQC for the South Berwick Project lists items labeled "1" through "8." In the following section, we present the WQC conditions as listed in the MDEP order dated May 25, 1995.

1.MINIMUM FLOWS

A.Except as temporarily modified by equipment limitations and by emergencies beyond the applicant's control, as defined below, the Lower Great Falls and South Berwick Projects shall discharge the following minimum flows:

June 1 - September 30: Effective June 1, 1995, the projects shall discharge a minimum flow of 44 cfs or inflow, whichever is less. All non-generation flows (except those flows passed through minimum flows gates and/or flows for fish passage facilities) at Rollinsford and South Berwick shall be passed as leakage or spillage at the dams.

When the 3-day running average of water temperature times river flow duration is greater than 1,500, Lower Great Falls, Rollinsford and South Berwick shall be operated in a run-of-river mode with outflow equal to

inflow on an instantaneous basis.

October 1 - May 31: Effective October 1, 1995, the projects shall discharge a minimum flow of 44 cfs or inflow, whichever is less.

B. Limitations in existing equipment and facilities and the installation of new automation equipment at the Lower Great Falls and South Berwick Hydroelectric Projects may make continuous compliance with the minimum flow requirements impossible. Therefore, compliance with the minimum flow of 44 cfs or inflow, whichever is less, at these dams will be on an "as best as can be reasonably achieved" basis until June 1, 1997, by which time any modifications necessary to comply with the minimum flow requirement shall be completed.

C. Operating emergencies beyond the applicant's control include, but may not be limited to, equipment failure, flashboard failure or other temporary abnormal operating condition, generating unit operation or interruption under power supply emergencies, and orders from local, state, or federal law enforcement or public safety authorities.

D. The applicant shall, within three months of issuance of this certification, submit plans for providing and monitoring the minimum flow required by Part A of this condition. These plans shall be reviewed by and must receive approval of the DEP Bureau of Land and Water Quality.

E. The applicant shall, on an annual basis, submit daily flow, temperature, and operational records encompassing the period June 1 - September 30, to the Department for review. Operational records must include identification of run-of-river v. cycling operations.

2. WATER QUALITY CONDITIONS MONITORING PLAN

The applicant shall, within 15 days of the issuance of this certification, submit a plan to monitor temperature and flows in the Salmon Falls River during the period June 1 - September 30 annually. This plan shall be reviewed by and must receive approval of the Department prior to

implementation of run-of-river operations.

3.WATER LEVELS

A.Except as temporarily modified by (1) approved maintenance activities (2) inflows into the project area, or (3) by operating emergencies beyond the applicant's control, as defined below, water levels in South Berwick impoundment shall be maintained according to the following schedule:

June 1 - September 30: Within 1 foot of full pond elevation of 24.95 feet (msl), except when the 3-day average of temperature times flow duration product is greater than 1,500, the project will be operated in a strict run-of-river mode.

October 1 - May 31: Within 2 feet of full pond elevation of 24.95 feet (msl).

B.Operating emergencies beyond the applicant's control include, but may not be limited to, equipment failure or other temporary abnormal operating condition, and orders from local, state, or federal law enforcement or public safety authorities.

C.The applicant shall, in accordance with the schedule established in a new license for the project, submit plans for providing and monitoring the water levels in South Berwick as required in Part A of this condition. These plans shall be reviewed by and must receive approval of the DEP Bureau of Land and Water Quality.

4.RECREATIONAL FACILITIES

A.The applicant shall transfer land to the Town of South Berwick to assist in the development of a park downstream of the powerhouse; and assist the Town of Rollinsford, New Hampshire, with the repair of the existing boat launch site on Foundry Street.

B.In accordance with the schedule established in a new license for the project, the applicant shall prepare a plan for implementing the items required in Part A of this condition. The plan must be reviewed by and receive approval from the DEP Bureau of Land and Water

Quality.

5.UPSTREAM AND DOWNSTREAM FISH PASSAGE FACILITIES

A.Upstream and downstream fish passage facilities shall be installed and operated at the South Berwick Project within three years following the adoption of a formal anadromous fish restoration plan for the Salmon Falls River by the Maine Department of Marine Resources.

B.The applicant, shall within one year following the adoption of a DMR anadromous fish restoration plan for the Salmon Falls River, submit functional design drawings, a construction schedule, and operating and maintenance plans for the fish passage facilities required by Part A of this condition, prepared in consultation with state and federal fisheries agencies. These submittals shall be reviewed by and must receive approval of state and federal fisheries agencies and the DEP Bureau of Land and Water Quality prior to facilities construction.

6.LIMITS OF APPROVAL

This approval is limited to and includes the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. All variances from the plans and proposals contained in said documents are subject to the review and approval of the Bureau or Department prior to implementation.

7.COMPLIANCE WITH APPLICABLE LAWS

The applicant shall secure and appropriately comply with all applicable federal, state and local licenses, permits, authorizations, conditions, agreements and orders required for the operation of the project.

8.EFFECTIVE DATE

Except as otherwise noted in these conditions, this certification shall be effective on the date of issuance of a new project license by the Federal Energy Regulatory Commission (FERC) and shall expire with the expiration of this FERC license.

We conclude that conditions 2, 3, and 5 should become part of any license issued for the project. We recommend adopting conditions that contain measures to meet the goals of those requirements contained in Condition 1 that relate to the South Berwick Project in the license. We will also recommend adopting part A of Condition 4 that relates to recreation development on the Salmon Falls River. Nevertheless, part of Condition 4 and Conditions 6, 7, and 8 are considered beyond the scope of Section 401 because they attempt to control the timing of activities under a federal license and transfer final approval authority from the Commission to MDEP.

E. Section 18 Fishway Prescription

Section 18 of the FPA provides the U.S. Department of the Interior (Interior) the authority to prescribe fishways at

Commission-licensed

projects.
Section 18 of the FPA provides: "The Commission shall require the construction, maintenance, and operation by a licensee at

Interior (April 5, 1993)

prescribed the following measures pursuant to Section 18:

1. The Licensee shall ensure that the design, location, installation (including scheduling), maintenance, and operation of fishways at the South Berwick Dam Project conform to the specifications of the Fish and Wildlife Service.

2. The Secretary of the Interior's authority to prescribe the construction, operation, and maintenance of fishways is reserved under Section 18 of the Federal Power Act.

Interior also states that CHMI's fish passage plans should be modified based on additional consultation. Interior states that it will supplement its Section 18 Prescription with more information following further consultation.

Interior's comments and prescription indicate that it believes that CHMI has proposed to include fish passage as a part of its application. CHMI's fish passage plans were submitted to the Commission in response to an additional information request. CHMI does not propose to provide fish passage and CHMI repeatedly questioned the cost benefit of fish passage on the Salmon Falls

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

River. For purposes of our analysis (Section V.D.2.b), we assume that item 1 of Interior's prescription is not a requirement to build a fishway at South Berwick at this time.

F.Dredge and Fill Permit Conditions

Pursuant to Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) issues dredge and fill permits for specified types of construction in wetlands. These permits generally include conditions applicable to project construction activities. If there is no discharge of dredged or filled materials in waterways or wetlands, no Section 404 permit would be required. Should secondary work such as for recreational enhancements or fish passage facilities be required, however, the activities should be reviewed to ensure that Corps permits are not required.

The applicant is not proposing any modifications that would require issuance of a Section 404 permit. However, some agency-recommended modifications, including fish passage and boat launch improvements would likely require a 404 permit. In an October 31, 1994, letter, the New England Division of the Corps commented on 404 requirements based on the scoping document and agreed that CHMI may need a permit for fishway or boat launch improvements.

G.Coastal Zone Management Program

The South Berwick Project is within the state-designated Coastal Zone Management (CZM) areas in Maine and New Hampshire. The State of Maine (letter dated October 10, 1995) determined that the project is consistent with applicable elements of the Maine Coastal Program.

CHMI (letter dated October 12, 1995) submitted a federal consistency certification to the Office of State Planning, New Hampshire Coastal Program, for a determination regarding the South Berwick Project's consistency with Federal and New Hampshire Coastal Programs. The New Hampshire Coastal Program (letter dated April 29, 1996) denied concurrence with CHMI's consistency certification due to the lack of sufficient information to indicate that the project is consistent with the enforceable policies of New Hampshire's federally approved coastal management program. Final resolution of this issue will be addressed in any license issued for this project.

H.Scoping

We issued a Scoping Document on August 30, 1994, that describes the environmental resources we feel should be analyzed in detail, and identifies the resources that do not need analysis based on our preliminary review and comments received from agencies and the public. We visited the site and conducted scoping meetings on September 29, 1994. The site visit was attended by resource agencies, CHMI personnel, and Commission staff. About 13 people attended the scoping meeting held Thursday morning, September 29, 1994, in South Berwick. The meeting was also held that evening in South Berwick, and no one attended.

Five letters were received from resource agencies in response to the Scoping Document. Comments from these entities have been considered and are discussed in this EA as appropriate.

ANALYSIS Unless otherwise indicated, the source of our information is CHMI's application (1991). **ENVIRONMENTAL**

In this chapter, we present a general description of the river basin, describe existing and proposed hydropower projects in the basin, and summarize potential cumulative impacts of the project on environmental resources.

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

As part of our analysis, we examined resource areas including water quality, fisheries, terrestrial, and recreation resources in the context of how the South Berwick Project would affect them for the term of any license issued. We include only affected resources in detail. Continued operation of the South Berwick Project would not affect geology, land use, aesthetics, cultural, or socioeconomics resources, so we exclude them from our detailed analysis for the following reasons:

- a. Under current operations, the project does not adversely

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

affect existing geologic conditions. Project operations under a license would not change geologic conditions. Further, no resource agency has commented on the status of the geology and soils of the project area.

b. Existing land use and aesthetic resources at the South Berwick Project consist of undeveloped forested river banks and scattered development along the river corridor. This project has existed in its present form since 1923 and is an accepted part of the natural landscape. Land use and aesthetic quality of the project area would not change as a result of any proposed enhancements, nor has any resource agency proposed measures to improve land use or aesthetics at the project.

c. Phase I archeological surveys of the project area discovered no resources within the potential project impact zone. The Maine State Historic Preservation Commission stated that there were no sites of historical, architectural, or archeological significance that would be affected by the continued operation of the South Berwick Project.

d. The project would not affect the socioeconomics of the region because no major construction activities are proposed that would affect employment, business, infrastructure, or local tax revenues.

General Setting

The Great Bay Estuary (Figure 3) is a complex bay formation on the New Hampshire-Maine border composed of the Piscataqua River, Little Bay, and Great Bay. The estuary is tidally dominated and the drainage confluence of seven major rivers, several small creeks and their tributaries, and ocean water from the gulf of Maine.

The Salmon Falls River lies within the Piscataqua River Basin. The Piscataqua River is an ocean-dominated system extending from the gulf of Maine at Portsmouth Harbor and forms the border of New Hampshire and Maine to the fork of its tributaries, the Salmon Falls and Cocheco Rivers. The ecology of the Piscataqua River is influenced by the heavy industrial development at its mouth, where the city of Portsmouth and the Portsmouth Naval Shipyard are located, as well as by the industrial development along the New Hampshire side of the river and residential development on the Maine side (Short, 1992).

Figure 3. Great Bay Estuary - New Hampshire and Maine

B.Salmon Falls River

The Salmon Falls River flows for about 40 miles, forming a boundary between New Hampshire and Maine. Beginning in the Great East Lake, in Acton, the river passes through farmland, countryside, woodland, urban areas, and tidal areas toward the town of South Berwick. At the confluence of the Salmon Falls and Cocheco Rivers just south of the Eliot/South Berwick line, the water course widens and becomes the Piscataqua River. A few miles south of this confluence the river enters the harbor at Portsmouth and eventually empties into the Atlantic Ocean.

The Salmon Falls River is impounded by 24 dams in the 35-mile freshwater reach of river between Wakefield and South Berwick (Figure 4 and Table 1). Several of these dams may have breached and may no longer impound water (DiStefano, 1995). In addition to CHMI's pending license application for the South Berwick Project, there are three licensed projects on the Salmon Falls River and three projects for which exemptions from licensing have been granted (FERC, 1996).

C.Cumulative Impact Summary

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

We reviewed the project's potential to cause adverse cumulative impacts. Given the project's location and the nature of the area's resources, we conclude that the South Berwick Project may have adverse impacts on water quality and fisheries in the river basin. The South Berwick Project, in conjunction with upstream hydropower projects and point source discharges, contributes to violations of state DO standards on the Salmon Falls River. Because the South Berwick Project is the first dam located on this river, it also presents the first obstacle to upstream migrating fish species in the basin. We present the project's potential cumulative impacts on these resources in sections V.D.1 and V.D.2.

Figure 4. Dams on the Salmon Falls River

Table 1. Dams on the Salmon Falls River
 Source: New Hampshire Water Resources Board

Dam Name	River Mile (RM)	Dam Height (ft)
South Berwick Dam	0.00	18
Rollinsford	0.90	19
Somersworth (Lower Great Falls Dam)	3.10	35
Salmon Falls River Dam II	4.10	N/A
Great Falls Upper Dam	4.40	16.5
Mast Point	7.15	13
Baxter Mill Dam	13.65	10
Salmon Falls Dam II	13.80	13
Spaulding Pond Dam	18.80	30
Salmon Falls River I	20.05	18
Salmon Falls River II	20.80	16
Milton Leatherboard Lower Dam	20.95	20
Milton Leatherboard Dam	21.10	32
Salmon Falls River V	21.25	11
Milton Three Pond Dam	21.35	19
Salmon Falls River VII	28.60	10
Salmon Falls River VI	28.75	17
Salmon Falls River VIII	28.90	10
Salmon Falls River IX	29.15	12
Salmon Falls River X	29.45	14
Salmon Falls River XII	31.15	10
Salmon Falls River XI	31.55	N/A
Horn Pond Dam	33.35	14
Great East Lake Dam	34.95	15

D. Proposed Action and Action Alternatives

In the following sections we describe the applicant's proposal and agency recommendations for area resources that would be affected by this project. We then present our analysis and conclusions. After consideration of all developmental and nondevelopmental resource values and project economics, we present the recommended alternative in Section VII.

Water Resources

a. Affected environment: In this section, we discuss the quantity and quality of the water resources of the Salmon Falls River in the project area.

Water Quantity

The Salmon Falls River is a coastal tributary to the Piscataqua River. The entire river drains a watershed of 330 square miles, and South Berwick dam separates the riverine and tidal portions of the river. The watershed area drained by the Salmon Falls at South Berwick is 235 square miles.

The Salmon Falls River is impounded by 24 dams in the 35-mile freshwater reach of river between Wakefield and South Berwick. The operation of the impoundments influences the daily and seasonal flow rates above the dam, but the 4-mile tidal reach below South Berwick is unimpounded. NHDES operates two of the larger impoundments, Great East Lake dam (RM 35) and Milton Three-Pond dam (RM 21). These 1,800- and 1,100-acre impoundments are filled for flood control in spring, maintained near full pond for recreation, and drawn down in fall to accommodate expected spring flows (MDEP, 1994). NHDES (1991) states that it augments flows during natural low-flow periods of the year, and provides some spring flood abatement through reservoir operations on the Salmon Falls River.

CHMI also operates the Rollinsford (RM 0.90) and Lower Great Falls (RM 3.10) projects immediately upstream of the South Berwick facility (Figures 1 and 4). CHMI has little flexibility in operation at these two projects during low flow seasons which can influence inflow to the South Berwick impoundment. The license for the Lower Great Falls Project (FERC No. 4451), requires run-of-river operation. At the Rollinsford Project (FERC No. 3777), the minimum flow is 115 cfs or inflow. Therefore, when inflow to the Rollinsford impoundment exceeds 115 cfs, CHMI can cycle operation of the Rollinsford and South Berwick Projects.

Because of flow regulation through the many impoundments, the flow duration rates for the river at South Berwick may not accurately reflect actual flows. The only existing USGS gauges are at Milton, New Hampshire (watershed drainage 108 square miles) and South Lebanon, Maine (watershed drainage 147 square miles). Both gauges are below the Milton Ponds Development regulated by NHDES. The closest gauge (at South Lebanon), operated from 1928 to 1969, is about 8 miles upstream of the South Berwick Project. Although the impoundments below this gauge are small and not likely to alter "average" daily flow for most of the year, they can influence hourly flow in the critical low-flow season.

CHMI provided flow duration curves prorated for the 21 years of data available from the Milton gauge (about 20 miles upstream of the project) (CHMI, 1991, Appendix E). CHMI also provided data on flow duration from the nearby Lamprey River to show comparison with a nearby unregulated river. Figures 5 and 6 show the annual and August flow duration for both the Lamprey and Salmon Falls Rivers prorated for the watershed area at South Berwick.

Figure 5 shows a consistent bias for higher flows for the Salmon Falls River. Part of the reason for this may be the different periods of record used for the Lamprey (1935-1985) and Salmon Falls-Milton (1969-1987) gauges. USGS (letter dated January 17, 1991) endorsed as logical CHMI's computation method used to derive unregulated flow duration conditions on the Salmon Falls from the Lamprey River data. USGS agreed with CHMI's assertion that the August median unregulated flow could be 61 cfs, because the data used for the computation were specific to the local region and not derived from data throughout New England. Even though USGS endorsed the method used by CHMI for deriving the 61 cfs estimate of the median August flow, they provide little justification for its appropriateness.

Table 2 shows high flows in March and April and low flows July through September. October median flows in the Lamprey River also were low. Although these median monthly flows are based on daily average flow data, they do not show the within-day variability that currently occurs near South Berwick during the low-flow season. During this season, the South Berwick and upstream projects operate in a store-and-release mode. At South Berwick, this leads to leakage-only releases of about 3 cfs during nongenerating periods. This within-day variability in inflow influences water quality.

Figure 5. Annual Flow Duration Curve, South Berwick Hydroelectric Project

Figure 6. August Flow Duration Curve, South Berwick Hydroelectric Project

Table 2. Prorated median monthly flows (cfs) at South Berwick dam based on Salmon Falls and Lamprey River gauges

Month	Salmon Falls River	Gauge ^a	Lamprey River
January			
February	330		270
March	360		290
April	550		600
May	910		730
June	350		350
July	180		160
August	105		95
September	95		60
October	110		45
November	290		80
December	320		190
	360		290

^a Values approximate and estimated from figures EAE-1 through EAE-12 in Appendix E of CHMI (1991, application).

Water Quality

The Salmon Falls River near South Berwick is classified as Class B and SB by Maine and as Class B by New Hampshire. The B classification is for fresh waters above South Berwick dam, and SB is for the tidal flows downstream of South Berwick. The specific definitions used by the two states for these classifications are similar.

Class B waters in Maine are defined as follows:

A. Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, Section 403; navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired.

B. The DO content of Class B water shall be no less than 7 parts per million or 75 percent of saturation, whichever is higher, except for the period from October 1 to May 14. To ensure spawning and egg incubation of indigenous fish species, the 7-day mean DO concentration shall not be less than 9.5 parts per million and the 1-day minimum DO concentration shall

not be less than 8.0 parts per million in identified fish spawning areas. Between May 15 and September 30, the number of *Escherichia coli* (E. coli) bacteria of human origin in these waters may not exceed a geometric mean of 64 per 100 milliliters or an instantaneous level of 427 per 100 milliliters.

C. Discharges to Class B waters shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

Class SB waters in Maine are defined as follows:

A. Class SB waters shall be of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation, and as habitat for fish and other estuarine and marine life. The habitat shall be characterized as unimpaired.

B. The DO content of Class SB waters shall be no less than 85 percent of saturation. Between May 15 and September 30, the numbers of enterococcus bacteria of human origin in these waters may not exceed a geometric mean of 8 per 100 milliliters or an instantaneous level of 54 per 100 milliliters. The number of total coliform bacteria or other specified indicator organisms in samples representative of the waters in shellfish harvesting areas may not exceed the criteria recommended under the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, United States Department of Food and Drug Administration.

C. Discharges to Class SB waters shall not cause adverse impact to estuarine and marine life in that the receiving waters shall be of sufficient quality to support all estuarine and marine species indigenous to the receiving water without detrimental changes in the resident biological community. There shall be no new discharge to Class SB waters which would cause closure of open shellfish areas by the Department of Marine Resources.

Class B waters in New Hampshire are defined as follows:

Class B waters shall be of the second highest quality and shall have no objectionable physical characteristics, shall contain a DO content of at least 75 percent of saturation, and shall contain no more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 126 E. coli per 100 milliliters, or greater than 406 E. coli per 100 milliliters in any one sample; and for designated beach areas shall contain no more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 E. coli per 100 milliliters, or 88 E. coli per 100 milliliters in any one sample; unless naturally occurring.

There shall be no disposal of sewage or waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical, or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters. The pH range for said waters shall be 6.5 to 8.0 except when due to natural causes.

Any stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with the uses assigned to this class. The waters of this classification shall be considered as acceptable for fishing, swimming, and other recreation purposes and, after adequate treatment, for use as water supplies. Where it is demonstrated to the satisfaction of the division that the Class B criteria cannot reasonably be met in certain surface waters at all times as a result of combined sewer overflow events, temporary partial use areas shall be established by rules adopted under RSA 485-A:6, XI-c, which meet, as a minimum, the standards specified in paragraph III.

Notwithstanding the foregoing, a temporary partial use area subject to the minimum standards specified in paragraph III shall be established for those surface waters which receive effluent from an existing municipal wastewater treatment facility and which are subject to extremely low flows and low dilution as specified in paragraph III.

New Hampshire classifies all waters as A or B. The SB equivalent is defined by the definition for Class B plus the following paragraph:

Tidal waters utilized for swimming purposes shall contain no

more than either a geometric mean based on at least 3 samples obtained over 60-day period of 35 enterococci per 100 milliliters, or 104 enterococci per milliliters in any one sample, unless naturally occurring. Those tidal waters used for growing or taking of shellfish for human consumption shall, in addition to the foregoing requirements, be in accordance with the criteria recommended under the National Shellfish Program Manual of Operations, United States Department of Food and Drug Administration.

In the following discussion, we use Maine definitions because the data reports are primarily referenced to Maine classifications.

It is generally acknowledged by state water resource agencies that the lower Salmon Falls River does not meet the Class B and SB standards during the summer and fall low-flow season. The widespread summer exceedance of Class B and SB standards results from the numerous point source discharges in this reach of river. Table 3 shows some of the major point source discharges that affect water quality near the South Berwick Project.

Maine sampled water quality near the South Berwick Project in 1983, 1986, 1991, and 1992. New Hampshire conducted sampling in 1988. CHMI conducted sampling in 1989 in preparation of the license application and in 1992 as additional information for its WQC from Maine. These water quality studies were conducted during the critical low-flow season of the year. Each study showed some violations of the water quality standards, and most violations were related to the DO standard.

In general, there were three distinct regions relative to this project where water quality violations occurred: the impoundment, the project tailrace, and the 4-mile estuary below the project.

Impoundment. In the impoundment, low DO was observed both near the surface and near the bottom. The low DO levels in the impoundment surface waters were associated with algal blooms and samples collected in the early morning. During algal bloom events, mid-day samples often showed supersaturation of DO. The wide swings in DO in the impoundment surface waters are associated with algal respiration and photosynthesis. Low DO near the bottom of the impoundment was associated with high oxygen demand in the sediments. Mitnik (1994) collected sediment cores in the Rollinsford and South Berwick impoundments and in the tidal reach of river below the project. The sediment oxygen demand was the primary contributor to DO violations in the deeper

water layers in the impoundment and estuary. Algal respiration was the primary contributor to DO violations in the surface waters.

Table 3. Permitted point source discharges near South Berwick
(Source: CHMI, 1991, application)

Name	Approx. River Mile Location	Flow Rate MGD ^a	Type of Effluent
Milton STP ^b	17	0.08	Municipal Secondary Treatment
Spaulding Composites	15	0.03	Cooling Water
Berwick STP	6	1.10	Municipal Secondary Treatment
General Electric	6	0.30	Cooling and Stormwater
Somersworth STP	6	2.41	Municipal Secondary Treatment
Rollinsford STP	5	0.14	Municipal Secondary Treatment
South Berwick STP	^c 4	0.28	Municipal Primary Treatment
Dover STP	0	4.70	Municipal Secondary Treatment

^a Million gallons per day.

^b Sewage treatment plant.

^c Located about 0.1 mile downstream of South Berwick dam.

Tailrace. The pool immediately adjacent to the project tailrace was a second location where violations of DO standards were observed during sampling. At low tide, this pool spills into a riffle zone about 200 yards downstream of the powerhouse. Violations were observed in this pool during early morning sampling when project flows were only leakage. On behalf of CHMI, Normandeau (1993) conducted field sampling and tidal hydraulic modeling of the impacts of project flows. Normandeau concluded that project minimum flows and the upgrade of the South Berwick sewage treatment plant (STP), completed in February 1995 (South Berwick 1995), should reduce or eliminate DO violations in the immediate project tailrace. The flow modeling conducted by Mitnik (1994) supports this conclusion but was vague about the region influenced by continuous run-of-river operation on the lower Salmon Falls River.

Tidal Reach Below the Project. The tidal portion of the Salmon Falls River would continue to sustain low DO conditions

even under a variety of alternative advanced treatment scenarios for the point source discharge (Mitnik, 1994). One conclusion of the wasteload allocation report is that even with zero loading at all point source discharges there would continue to be violations of standards in the Rollinsford and South Berwick impoundments and 2 miles of the tidal reach of river. These violations occur because nonpoint source loading and sediment oxygen demand use all the available assimilative capacity of the river. Sediment oxygen demand has a major effect on the tidal water quality below the project. Mitnik (1994) also concluded that hydroelectric ponding operations contributed to low DO in the tidal river below South Berwick, but the extent of the contribution was not clear or well documented in the report. Normandeau concluded that operations at South Berwick could influence the flushing rate of the river near the South Berwick STP.

The Normandeau report also modeled flushing in the entire tidal portion of the lower Salmon Falls River. Normandeau (1993) concludes that, with typical summer flows of about 100 cfs, the South Berwick discharge accounts for only 4 percent of the daily exchange of tidal waters. It states that, in summer, tidal exchange dominates the water movement irrespective of the minimum flow at South Berwick. Although Mitnik (1994) presents results of modeling impacts at 7Q10 flows (the lowest 7-day flow that occurs in a 10-year interval), it does not provide comparable tidal hydraulic models to analyze the effect of freshwater flow rates on tidal exchange.

Mitnik (1994) also provides information on ammonia concentrations in the lower Salmon Falls River, including how present waste loadings lead to existing violations of water quality standards for ammonia. Mitnik's (1994) modeling demonstrated that summer and nonsummer reductions in the ammonia component of nitrogen levels are required at the upstream Berwick and Somersworth STPs to meet the EPA water quality criterion for ammonia toxicity.

b. Environmental impacts: Water resources impacts are related to effects of minimum flow releases and impoundment fluctuations on water quality.

Minimum Flows

CHMI and the state water resource agencies have discussed minimum flow issues since the initial consultation stage. CHMI proposes to release a flow of 61 cfs, or inflow, based on its construction of unregulated August median flow from the gauge on the nearby Lamprey River. CHMI (letter dated June 3, 1993) also proposed a compromise minimum flow of 73 cfs.

The New Hampshire Fish and Game Department (NHF&G) (letter dated March 3, 1993) and FWS (letter dated April 5, 1993) recommend a minimum flow of 117 cfs. They make this recommendation based on an FWS regional policy on minimum flows, which is to use a factor of 0.5 cfs/mi² of watershed to estimate median August flow rates. The minimum flow is then set to equal the median August flow rate. Because the watershed at South Berwick dam is 235 mi², the agencies' flow recommendation, based on this policy, is 117 cfs.

We reviewed the effects of continuous flow releases on water quality. We then considered the methods proposed by CHMI to provide the minimum flow release and the availability of upstream flows to provide alternative flow releases.

State water quality standards are not being met at the project (see Section V.1.a). There are high concentrations of ammonia and low DO because of the existing point source discharge loadings that exceed the assimilative capacity of the river. Implementation of either the 61 or 117 cfs minimum flow release would change seasonal violations of the DO standards in the impoundment and tidal reach of river below the dam. A continuous release of either flow probably would reduce or eliminate the low DO conditions that consistently appear on a seasonal basis in the immediate vicinity of the project tailrace. The continuous releases limit the intrusion of the South Berwick STP discharge into the tailrace pool. Eliminating the low DO conditions immediately below the dam would reduce water quality standard violations.

CHMI proposes (May 6, 1992, response to the Commission's additional information request) to provide minimum flows through the generating units or through a waste gate. It proposes to install an automated gate with headpond level and unit trip-out sensors. Minimum flows would be provided through the operating turbines, unless the units have tripped-out. At unit trip-out, the gate would automatically open to a position where, based on pond level, the appropriate minimum flow would be released.

CHMI proposes that the turbine units would provide the minimum flows the majority of the time, and adding a gate with operation tied to project operation would ensure minimum flows would be provided at all other times. The automatic operation of the gates would reduce time lags in continuity of flow at the project to, at most, a few minutes. Lags as small as this should not lead to intrusion of flows from the South Berwick STP. We conclude, therefore, that CHMI's proposed method for providing

minimum flows is reasonable and appropriate.

We also reviewed the flows that are available at the site (Section V.D.1.a). CHMI contends that the flow duration curve from the Lamprey River closely approximates unregulated flows in the Salmon Falls River. FWS and NHF&G state that 117 cfs or 0.5 cfs/mi² is a more appropriate equivalent to August median flows. We considered the prorated flows from gauges in both rivers. Even though the period of record may alter actual median flow rates, the August median unregulated flow is not likely to reach 117 cfs using data from either gauge station and any other 20 to 25 year period of record.

Table 2 shows that August median monthly flow from the Salmon Falls gauge is about 95 cfs. If NHDES operations are supplementing flows in this period, then 95 cfs is probably greater than the unregulated median August flow rate. USGS endorsed the 61 cfs median monthly flow (letter dated January 17, 1991) as an estimator of August median flows in a review of methods conducted by USGS. From the flow data available, we conclude that 117 cfs is not available during most of the low flow season of the year.

Minimum flows greater than local leakage (about 3 cfs) would provide positive benefits in meeting water quality goals below the project by reducing violations of state DO standards in the tailrace. CHMI's proposed minimum flow of 61 cfs can be provided with existing project equipment and is more likely to be available during critical summer low flow periods than the 117 cfs flow recommended by FWS and NHF&G. Additionally, there is no quantifiable resource benefit from providing the 117 cfs flow over the 61 cfs flow. However, because the agency has made this flow recommendation under Section 10(j) and it appears to be consistent with the FPA, we recommend that the agency's minimum flow of 117 cfs, or inflow, be incorporated in our recommended minimum flow condition (Section V.D.2.b.).

Flow Monitoring

CHMI proposes to provide minimum flow monitoring using an operator's log to record unit operation, impoundment level, and waste gate positioning (AIR No. 4, May 6, 1992). Flows through the waste gate would be calibrated with a stage discharge survey. USGS (letter dated April 8, 1992) reviewed and commented on CHMI's plan for flow monitoring. USGS commented that the proposed plan should provide the minimum flows, but did not comment on the functionality of the proposed plan.

NHF&G (letter dated March 31, 1993) agreed with CHMI's proposed method of monitoring minimum flows. NHF&G believes that CHMI must develop a plan to provide the minimum flows during any maintenance refill period. FWS requests that CHMI develop a flow monitoring plan.

For our analysis, we looked at the need for flow monitoring and available methods for providing flow monitoring. The project currently provides only leakage flows (about 3 cfs) during part of the year, and the present water quality of the river does not meet state water quality standards. Although minimum flows alone would not eliminate low DO conditions in the project area, we recommend a minimum flow that should eliminate or reduce DO violations in the tailrace. We recommend flow monitoring be required for compliance.

CHMI's proposed method of recording project operation, gate positions, and headpond elevations will not supply flow information in an easily usable manner. The tailwater is tidally influenced, and common monitoring methods do not apply. CHMI could do more to collect flow data through the project, such as taking surrogate measurements of actual flows. CHMI may need to use a data logger to tally estimated flows at four locations: over the dam, through the powerhouse, through the minimum flow waste gate, and through the fishway(s). Automated recording would allow measurements at the commonly used hourly time intervals.

Flows through the powerhouse may be measured using an annubar or sonic flow measurement device. Alternatively, the applicant could simultaneously record headwater, tailwater, and wattage by unit. With these data and a head and flow efficiency function, a data logger could record a flow surrogate. Automated measures of weir flows at the dam, the waste gate, and downstream fish passage gate could be calculated from a headpond elevation sensor.

CHMI should develop a plan for flow monitoring to enable the Commission to verify compliance with required flow releases.

DO Monitoring

CHMI does not propose any DO monitoring. NHF&G recommends that CHMI monitor DO levels in the impoundment and the project tailrace to ensure compliance with state water quality standards. NHF&G also recommends that CHMI use the data to ensure that state standards are met.

EPA (letter dated October 25, 1994) states that a field sampling study will be conducted during summer 1995 by EPA, MDEP, and NHDES. Agencies will collect these data to plan and review the effectiveness of treatment measures at local STPs and at other point source discharges to bring the river up to existing water quality standards. The extent of the water quality problems on the Salmon Falls River indicates, however, that the issue will not be quickly resolved during 1995 sampling. Some or all of the existing STPs in the lower Salmon Falls River will require construction of additional treatment facilities.

Even after the point source discharges are brought up to standards to eliminate algal blooms, several years may pass before sediment oxygen demand is reduced to a level where DO violations would be eliminated. A DO monitor provided by CHMI at the project would document if the minimum flow releases at the project were achieving the desired effect in the project tailrace. A monitor operating continuously from June through October also would supply agencies with measurements of DO throughout the critical season of the year.

NHF&G also recommends DO monitoring in the impoundment. Impoundment DO conditions are primarily a function of wasteload allocations by upstream project discharges. Operation of the South Berwick Project has a small influence on the algal blooms and high sediment oxygen demands that create low DO conditions in the impoundment. While such monitoring data may be somewhat useful for the agencies, we conclude that tailrace sampling provides necessary information for agencies to determine the influence of the South Berwick Project on water quality.

Finally NHF&G recommends that CHMI "...undertake any measures to assure state standards." NHF&G implies that CHMI has authority to alter operating conditions based on the results of DO monitoring. CHMI would have some flexibility in selecting unit operations, spill conditions, and impoundment fluctuations within the limits imposed by any license issued by the Commission.

Such flexibility would be exercised voluntarily by CHMI. We recommend that the Commission reserve authority to modify project operation in the future. If DO monitoring demonstrates that a change in operation would have a meaningful effect on the water quality of the Salmon Falls River, CHMI or any resource agency may petition the Commission for such a change in project operation.

We considered the need for DO monitoring, the feasibility of collecting the data, and how CHMI might use the data and alter

operations to ensure compliance with minimum flow conditions. Providing minimum flows would improve DO levels in the project tailrace. DO monitoring also may be needed to document how effective continuous flow releases are at eliminating violations of the DO standards downstream of the project.

In summary, we recommend DO monitoring that records hourly measurements from the project tailrace.

c. Cumulative impacts: Water quality and quantity in the Salmon Falls River is affected by multiple sources in the river watershed. Some 16 operating dams located upstream of the project (see Table 1) reregulate flows in an uncoordinated and possibly conflicting manner. NHDES regulates the large upstream lakes primarily for summer recreation use. The many hydroelectric projects store and release flows to maximize energy production within the constraints of their varied minimum flow requirements. Table 4 describes the minimum flow and operating conditions of some of the upstream dams.

During the low flow season, projects with minimum flows can store and release within the limits of fluctuation allowed in their license. The combined store and release operations from these small impoundments allows "cascades" of alternatively high and low flows to move through a 20-mile reach of river.

The cumulative impacts of variable instream flows could only be remedied by a combination of actions. These actions include: consistent flow releases from the NHDES impoundments, higher minimum flow requirements (especially at Lower Great Falls), and reduced active storage capacities (smaller impoundment level fluctuations).

The biggest factor that influences inflows to the South Berwick Project is the 6 cfs minimum flow release at Lower Great Falls. The applicant states that, when inflow to Lower Great Falls Project is less than 85 cfs, the instantaneous inflows to Rollinsford and South Berwick can drop to 6 cfs. MDEP identified the issue of minimum flows during low flow periods at Lower Great Falls in developing its draft 401 WQC for South Berwick. MDEP recognizes that flows that can meaningfully influence DO in the lower Salmon Falls River during the low flow season are controlled by releases at CHMI's Lower Great Falls Project. The ponding of water at Lower Great Falls when inflow is less than 85 cfs limits the continuity of flow in the season where flows are most critical to meeting DO standards. In a November 17, 1995, order, the Commission required CHMI to operate the Lower Great Falls Project as run-of-river. This clarification and change in operation represents a big improvement to water quality on the

lower Salmon Falls River. These increased minimum flow releases from the Lower Great Falls Project are now provided by CHMI.

Our analysis (Minimum Flows in Section V.D.1.b) shows a need for continuous minimum flows at South Berwick. These flows, which are now provided from the Lower Great Falls Project, are needed to reduce violations of DO standards in the project tailrace. We also consider a minimum flow of 61 cfs or inflow and the agency recommendation for a minimum flow of 117 cfs or inflow (Section V.D.1.b). In Section V.D.1.b. we recommend that the agency flow of 117 cfs, or inflow, be incorporated in our recommended flow condition (See Section V.D.2.b.).

There are also cumulative impacts on water quality associated with the many point source discharges on the river. As discussed, we consider minimum flows that should reduce any contribution that the South Berwick Project may make to nonattainment of water quality standards.

Table 4. Minimum flow operations for dams on the Salmon Falls River (Source: Staff)

<u>Dam</u>	<u>Location (RM)</u>	<u>Impoundment Size (acres)</u>	<u>Minimum Flows (cfs)</u>
Great East Lake	34.95	1,768	Variable-Operated by NHDES
Milton Three-Pond	21.35	1,142	Variable-Operated by NHDES
Milton Leatherboard Lower Dam (South Milton)	20.95	3	58 or inflow
Spaulding	18.80	65	66 or inflow
Salmon Falls II (Boston Felt)	13.80	58	70 or inflow
Somersworth	4.10	50	110 or inflow
Lower Great Falls	3.10	32	Run-Of-River
Rollinsford	0.90	57	115 or inflow
South Berwick	0	64	0

d. Unavoidable adverse impacts: The project impoundment would continue to fail to meet water quality standards because the violations are due mostly to upstream wasteload discharges. The project impoundment contributes marginally to the detention time of wastes in the river, which in turn leads to algal blooms and low DO conditions. The incremental impacts of increased detention time would be avoidable by either removing the project dam or by limiting the wastes input at upstream point source discharges.

The project impoundment contains 525 acre-feet of water. At an average flow of 100 cfs, the detention time in the reservoir is approximately 64 hours. Because upstream projects are already equipped with secondary treatment, this detention time is short relative to the expected oxygen demand of the treated discharges. Dam removal is not warranted because the incremental contribution of increased detention time would not eliminate water quality

standard violations in this river reach. Sediment oxygen demand would continue to affect water quality in this reach of river. Additional treatment at the point source discharges for nutrients (such as nitrogen and phosphorous) that may limit the growth of algae may be more effective than dam removal.

Fishery Resources

a. Affected environment: The existing fish community and available fish habitat in the South Berwick impoundment and in the project tailwaters are relatively diverse compared to other area projects. The community is diverse because the dam is located at the head of tide. Upstream of the dam the river supports a variety of common freshwater fish species. Downstream the tidal portion of the Salmon Falls River supports some freshwater, estuarine, and anadromous fish. Table 5 lists the species in the impoundment, based on netting and creel survey data presented in the application. Abundance data are not available because a limited number of samples and gear types were used to collect the data in the impoundment.

Table 5. Fish species observed in the South Berwick impoundment (Source: CHMI, 1991, application)

smallmouth bass
largemouth bass
bluegill
pumpkinseed
yellow perch
chain pickerel
golden shiner
white sucker
brown bullhead
American eel

Most of these species also could be found downstream of the project. Although the tidal portion of the river probably would not support large populations of most of these species, the low salinity in the reach of river immediately downstream of the project would not inhibit their habitation. These species are also tolerant of the relatively low DO levels found seasonally in the reservoir and project tailwaters.

Project tailwaters also support estuarine and marine fish species. Surveys in Great Bay and some tributaries using limited gear and sampling show 14 species of estuarine and marine fish (Table 6). Because of the limited sampling, however, the list is not quantitative.

There are no Atlantic salmon in the project tailwaters. The

Maine Atlantic Salmon Commission (letter dated January 17, 1991) reports no plans to restore Atlantic salmon to the Salmon Falls River.

Table 6. Marine and estuarine species in the project tailrace (Source: CHMI, 1991, application; Kinnear, 1977; DiStefano, 1995)

American shad striped bass Atlantic silversides rainbow smelt Atlantic tomcod American eel sea lamprey blueback herring alewife common killfish fourspine stickleback white perch shortnose sturgeon Atlantic sturgeon winter flounder smooth flounder

The project impoundment contains habitat suitable for river herring (alewife and blueback herring), and agencies have commented on the capacity of the impoundment to support and sustain river herring. The upstream end of the impoundment is narrow and, when the Rollinsford Project is generating, the water velocities appear suitable for river herring spawning. Rocky ledge is common on the banks of both sides of the impoundment near the Rollinsford tailrace. This combination of flowing waters and hard substrate appears well suited for river herring and American shad (Scott and Scott, 1988).

b. Environmental impacts: Project impacts on fisheries resources are related to fish passage, minimum flows, and impoundment fluctuations.

Fish Passage

CHMI does not propose fish passage at South Berwick dam. In a May 6, 1992, response to an AIR, CHMI has, however, developed conceptual plans for upstream and downstream fish passage.

NHF&G (letter dated March 31, 1993) recommends that CHMI revise its conceptual plans and install fish passage at the South Berwick Project. NHF&G rejected CHMI's proposed combined fish ladder and fish pump as a method of upstream fish passage.

FWS (letter dated April 5, 1993) comments on the need for immediate construction of fishways, rejects the conceptual design proposed for upstream passage, and suggests modification and details for the conceptual downstream passage design. FWS makes the recommendation pursuant to Section 10(a) of the FPA. The Section 18 prescription requires modification to fishway plans filed as part of the response to AIRs; requires fishways to conform to FWS specifications; and reserves authority to prescribe construction, operation, and maintenance of fishways.

For upstream passage, FWS recommends either a standard denil fishway, a vertical slot ladder, or a fish lift. It also recommends an attraction flow of at least 15 cfs and that the generating unit nearest the fishway entrance be used preferentially during the upstream passage season. For downstream passage, FWS recommends a 20 cfs bypass flow, a 2 foot per second (fps) approach velocity to the trashracks, and modifications to the discharge chute and plunge pool. FWS did not comment on the 1-inch clear spacing on the trashracks or on the angle of the racks to the approach flow as shown in the conceptual design.

CHMI questions the need for fish passage because the value of the anadromous fish resource, as a bait fish, is much less than the cost of providing fish passage. The agencies cite existing plans for restoration of river herring and shad in the region and the value of river herring as a food base for gamefish and birds. NHF&G cites the recreational American shad fishery in the project tailrace as a valued fish resource. NHF&G suggests that a minimum of 175,000 adult river herring may pass through a South Berwick fishway if passage were provided at the three upstream dams.

We considered the need for upstream and downstream fish passage on the Salmon Falls River. Fish passage at South Berwick would provide benefits in terms of prey species for gamefish in the impoundment and for the coastal bait fish industry. These benefits, however, are not easily quantified from stock recruitment or habitat data. River herring and American shad abundance has fluctuated in coastal Atlantic estuaries in recent years for unknown reasons. Based on habitat as observed at the site visit, however, the South Berwick impoundment probably would support spawning populations of river herring and possibly shad populations as well.

The capacity of the project impoundment to support anadromous fish is undefined. NHF&G (March 31, 1993) states that the South Berwick impoundment could support at least 14,400 adult

river herring, and could support runs of as much as 12,000 adults/acre (about 1,000,000 adults). NHF&G also states that fish passage at South Berwick would be expected to yield a minimum of 175,000 returning adults if passage is also eventually provided to the Rollinsford, Lower Great Falls, and Somersworth impoundments. Maine Department of Marine Fisheries (March 12, 1991) states that river herring access to the impoundment could double the Salmon Falls River commercial yield from 20,000 to 40,000 pounds.

CHMI in a June 3, 1993 letter and in an April 7, 1992, letter to FWS, state that, at best, fish passage to the South Berwick impoundment could yield 15,040 river herring and as many as 47,235 adult river herring if all four impoundments are opened to fish passage.

We looked at the available literature to estimate the population of river herring that might be established if fish passage is provided to the South Berwick impoundment. Rounsefell (1975) and Everhart et al. (1975) state that nursery space for juvenile river herring is probably the limiting factor in population size. River herring are plankton feeders and can exhaust the available food supply in an impoundment by the end of the season when they outmigrate to sea. Rounsefell (1975) also states that these species can have wide fluctuations in year-to-year abundance.

Kissil (1974) reports that in the first 2 years of operation of a fish ladder, 140,000 to 180,000 adult alewives entered and spawned in Brides Lake, Connecticut. Brides Lake is about one-half the size of the South Berwick impoundment. In the first year, about 257,000 young alewives (or about 2.88 young per adult female) exited Brides Lake in late summer and fall. In contrast, Havey (1973) reports that Love Lake, which is about 10 times the size of the South Berwick impoundment, had annual adult runs of 4 to 2,376 fish in an 11-year time period, and outmigrations of 220 to 439,000 juveniles in the same 11-year period. Of the two examples, the Brides Lake site is more similar to South Berwick based on its location near head-of-tide.

We have no data on plankton abundance but expect the nutrient enriched impoundment waters would have an abundance of plankton as a food source for juvenile herring. Our review concludes that the project could experience a return of at least 14,400 herring.

Another indirect benefit of improved passage would be the presence of juvenile fish to provide forage for gamefish. The presence of hundreds of thousands to a few million juvenile river

herring would likely improve production of pickerel and bass on the impoundment. A tailrace fishery for gamefish may also be developed in late summer and fall during the juvenile herring outmigration. Largemouth bass, smallmouth bass, and striped bass may congregate near the proposed Counting House Park during the outmigration.

We conclude that both upstream and downstream fish passage at South Berwick would enhance use of potential fish habitat resources on the Salmon Falls River. CHMI should revise fish passage plans in consultation with the agencies. A fish lift would provide the greatest potential for full development of upstream passage to the many impoundments on the river. The lift would allow placement of anadromous fish in any of the upstream impoundments or river reaches without requiring construction of additional upstream fish passage facilities. A lift on this first dam could be operated as a trap and truck or possibly more economically as a trap, lift, and sluice with a release sluice located well upstream of the proposed 1-inch trashrack. The lift would allow other project owners on the Salmon Falls River (including other CHMI projects) to cofund trap and truck facilities in lieu of fish passage that may be required at those sites in the future.

We recommend that CHMI modify the downstream fish passage gate to make use of the proposed waste gate that is to be automated to provide minimum flows. We recommend that CHMI consult with the agencies to develop a downstream fish passage plan. However, our analysis shows that fish bypass flows would need to be between 10 to 30 cfs.

Minimum Flows

Minimum flows (see Section V.D.1.b. Minimum Flows) also affect fisheries resources. Under the Commission's proposed operations, the tailrace of the South Berwick Project would attract migrating fish. If minimum flows are not maintained and DO in the tailrace drops, there could be a fish kill. The proposed minimum flows would provide good quality water for fish attracted to the tailrace.

The proposed minimum flows at the project would not have a great influence on downstream fish habitat, however, because the river below the project has a twice-daily, 2- to 3-foot tidal change in elevation. The tidal flows have a dominant influence on fish habitat and downstream river hydrology except during high spring flow conditions. Even then, tidal flows still play a major role in downstream hydrology and fish habitat.

Minimum flows from upstream projects could greatly affect the anadromous fish populations that may become established in the South Berwick impoundment. Minimum inflows into the South Berwick impoundment from the Rollinsford Project influence fish habitat at the head end of the South Berwick impoundment. River herring (especially alewife) should find most of the impoundment suitable for spawning (Pardue, 1983), but American shad may find only the Rollinsford tailrace area (in the South Berwick impoundment) suitable when generation or bypass flows at Rollinsford are great enough to provide current (1 to 3 feet/second) in this narrowed reach of the impoundment (Ross et al., 1993; Stier and Crance, 1985). The South Berwick minimum flows would have little influence on this spawning habitat. During the spring spawning period for river herring and American shad, river flows generally exceed the capacity of the Rollinsford facility, and minimum flows through the Rollinsford powerhouse should not typically influence fish habitat.

In summary, increased project minimum flows will be sufficient to enhance downstream water quality and will not adversely affect fish populations. The minimum flows from upstream projects (not a part of this license) may play a large role in development of impoundment anadromous fish populations.

Impoundment Fluctuations

CHMI proposes to operate with a 1 foot headpond fluctuation from May 15 through October 15 and with a 2 foot draw-down October 16 through May 14. Impoundment fluctuations may exceed these levels, however, due to floods, flashboard failure, and repair-related draw-downs.

FWS recommends (letter dated April 5, 1993) that CHMI limit draw-downs to 1-foot. NHF&G recommends that CHMI operate in run-of-river mode with no fluctuation from full pond level.

We considered the habitat needs of fish in the project impoundment and the possible effect of impoundment fluctuation on fish passage. The run-of-river condition (no fluctuation) recommended by NHF&G would have the lowest potential for impact on fish populations, but this no-fluctuation limitation may not be necessary.

Fluctuations can affect fish spawning and juvenile fish nursery habitat (e.g., high fluctuations can desiccate spawning habitat and flush juvenile fish from preferred nursery habitats). Some species currently inhabit areas with great fluctuations in water levels. Yellow perch and pickerel are early season spawners and typically spawn at a time of year when flows and

water levels are most variable. These species are not likely to have their spawning activities affected by 2-foot fluctuations. Other shallow water spawners such as sunfish and largemouth bass spawn in June when impoundment fluctuations would be limited to 1 foot.

River herring and shad, however, could be more affected because they are broadcast spawners. Their eggs, larvae, and juveniles could be stranded and desiccated by frequent and large fluctuations of the impoundment. Therefore, during the herring and shad spawning, incubation, and rearing period, impoundment fluctuations should be limited to 1 foot.

With the recommended fish passage facilities, alewives may move into the project impoundment by May 1 (Bigelow and Schroeder, 1953). Water temperatures in most years may be too low to initiate spawning as early as May 1. Spawning activity is typically initiated at 9°C (Scott and Scott, 1988) and is greatest when water temperatures exceed 10°C (Smith, 1985). But Scott and Scott (1988) report that spawning occurs as early as April in some Canadian waters. Because herring may spawn in the project impoundment as early as May 1, May 1 should be the first date of the 1 foot impoundment fluctuation season.

River herring outmigration peaks in October and may extend into November. Downstream passage facilities must be operational until at least November 1. Because shad and river herring are expected to rear in the project impoundment until approximately November 1, impoundment fluctuations would not need to be limited to 1 foot beyond this date.

Because inflow from the Lower Great Falls Project is run-of-river, however, additional habitat improvements can be achieved by providing run-of-river flows at the South Berwick Project. The existing project operating equipment is scheduled for upgrade to float control for all units. We recommend accelerating the improvements so that habitat improvements resulting from run-of-river operation can be realized at the South Berwick Project. Our recommendation for run-of-river operation incorporates the FWS' recommended minimum flow by requiring the passage of all inflow up to, and including, 117 cfs. For inflows in excess of 117 cfs, run-of-river operation results in flows greater than those recommended by the agency.

CHMI has included the proposed float control system on the remaining units as a part of the project's proposed cost. With the Lower Great Falls Project operating in run-of-river mode, the overall costs of operating run-of-river/stable pond at South Berwick are small. Therefore, we endorse, in part, the

recommendations made by FWS and NHDES to operate the project in run-of-river mode. We expect CHMI can operate with stable pond from May 1 through October 31 to within 0.1 feet of the crest of the flashboards whenever inflow is less than project hydraulic capacity. Flows in excess of the project's hydraulic capacity would be spilled at the dam.

Operation of the impoundment at the top of the flashboards in winter may result in flashboard failure due to ice load. To accommodate winter operation, CHMI must prepare a plan for seasonal stable pond operation at an elevation that can be maintained for the duration of the winter season (November 1 through April 30) or some portion of the winter season when ice load on the flashboards or high spring runoff would limit stable pond operation.

We recommend that CHMI be required to file a plan for any scheduled maintenance draw-downs for comment by the fish and wildlife agencies and approval by the Commission prior to implementation.

c. Cumulative impacts: The Salmon Falls River watershed has numerous obstructions (about 1 per mile) that require either fish passage facilities or a lift, trap, and truck facility at South Berwick if the full potential of anadromous fish production is to be achieved. We conclude that a fish lift and transport system is most suitable for establishing herring and possibly shad populations in the Salmon Falls watershed.

A fish lift would allow upstream projects to participate in maintaining and operating the CHMI passage facilities and would provide upstream passage to suitable spawning sites upstream of the South Berwick Project. Supplying ladders at multiple projects is a costly alternative that would also lead to considerably more passage delay and mortality during upstream passage. Using a fish lift to accommodate fish passage would reduce much of the impacts of multiple dams on anadromous fish restoration on the Salmon Falls River. Upstream projects would also require modifications for downstream passage of postspawned adults and passage of outmigrating juveniles.

d. Unavoidable adverse impacts: None.

Terrestrial Resources

a. Affected environment: The project lands are within the primarily urban setting of South Berwick, Maine, and the more rural residential Rollinsford, New Hampshire. The banks of the Salmon Falls River along the impoundment and the tailrace are

largely forested. Vegetation includes both deciduous trees and shrubs and coniferous trees. Other cover types include lawns, paved areas, and industrial land.

Wetlands

Although primarily surrounded by upland, in or adjacent to the 58-acre impoundment are about 13 acres of wetlands. Because of the relatively steep shoreline, most of these areas (4 of 6) are small, isolated forested or shrub wetland patches. There is one exception in the cove along the northwestern shore of the impoundment where there is an approximately 7-acre palustrine emergent marsh and scrub-shrub wetland. On the eastern side of this cove, there is a separate 4-acre marsh and shrub swamp.

Below the powerhouse, the shoreline affected by the tailrace discharge is tidally influenced (experiencing a 2- to 3-foot tidal fluctuation) and is intertidal estuarine habitat.

Threatened and Endangered Species

The bald eagle and peregrine falcon are the only two federally listed species that may occur in the project area. Use of the project area by these species is limited to occasional foraging or perching. NHF&G's assessment of the Piscataqua River system (including the Salmon Falls River) did not identify the presence of shortnose sturgeon. There are no other federally listed plant or animal species in the project area.

Consultation with the New Hampshire Natural Heritage Inventory (September 21, 1994) identified the presence of four areas of concern within the project area from below the dam to the mouth of the Great Works River (April 5, 1993). The State of New Hampshire evaluates the status of identified occurrences of listed species and ranks them on a scale of 1 to 5. Those species most likely to go extinct are classified as critically imperiled while the next category is classified as imperiled.

Three areas are habitat for plant species (large bur-reed, small spike-rush, and mudwort) that are considered either critically imperiled or imperiled by New Hampshire. The fourth area of concern is a fresh/brackish intertidal flat community downstream of the dam. The characteristics of this area provide for a number of plant species that have experienced a reduction in suitable habitat within New Hampshire that imperils their continued existence as a community type.

The Maine Natural Heritage Program (MNHP) identifies three plants listed as Maine Special Concern species in the area

downstream of the dam (April 4, 1989). Two of these species, lilaeopsis and spicebush, are located along the river bank in the Vaughan Woods State Park, about 1.5 miles downstream of the South Berwick Project. The third species, pygmyweed, is historically identified in the Salmon Falls River estuary, but no plants were located during the field surveys nor has it been reported in recent times.

In the application, CHMI reports the possible siting of a Blandings turtle in the impoundment, but a positive identification was not made. The Blandings turtle is listed as threatened in Maine but not in New Hampshire, as the project area is near the northern limit of this turtle's range. No other Maine or New Hampshire listed animal species have been identified in the project area.

b. Environmental impacts:

Wetlands

CHMI states that its current impoundment water level management has resulted in minimal dewatering of the littoral areas, although the cove and associated wetlands may be affected by the 1-foot daily fluctuation. It claims that under the past, somewhat more extreme impoundment fluctuation regimes, the wetland vegetation has thrived and does not appear to have been adversely affected by the larger fluctuations. The proposed 1-foot maximum fluctuation during the summer and fall "should not result in adverse impacts on the impoundment's wetlands, and may in fact be beneficial for the dominant wetland species."

CHMI also claims that 2-foot winter fluctuations should have little or no impact on project wetlands because the ground is frozen and vegetation is dormant. It proposes no enhancements to benefit wetlands other than its impoundment-level management regime, which would limit draw-downs to a maximum of 1 foot from May 15 to October 15 and to 2 feet for the remainder of the year (exceptions are made for maintenance draw-downs or natural events beyond its control).

Because the applicant believes that there would be little or no impact on project wetlands and uplands from project operation, it states that the proposed impoundment fluctuations should not adversely affect wildlife and that some species using the cove wetlands may actually benefit. Thus, the applicant proposes no enhancements to benefit wildlife other than its impoundment level management regime.

FWS (letter dated April 5, 1993) stated that both the

existing and proposed water level fluctuations influence the diversity and abundance of wetland vegetation, which ultimately has an adverse impact on wildlife populations. To reduce these adverse impacts, FWS recommends that the maximum draw-down be limited to 1 foot throughout the year.

NHF&G (letter dated March 31, 1993) stated that run-of-river operation with a constant full pond would have the least impact on fish and wildlife inhabiting shallow water and wetland areas. NHF&G does not agree that CHMI's proposed operation provides adequate protection of natural resources and therefore recommends run-of-river operation with a stable full pond level.

The State of Maine issued a WQC for the South Berwick Project on May 25, 1995. The only aspects of this WQC that would affect terrestrial resources are the minimum flow recommendations and the impoundment-level fluctuation restrictions. The WQC requires the discharge of 44 cfs or inflow and restrictions on reservoir fluctuations to a maximum of 1 foot from June 1 through September 30 and 2 feet the remainder of the year.

The MDEP requirement for a 44 cfs minimum flow at South Berwick and run-of-river operation between June 1 to September 30 when the 3-day average of temperature times flow duration product is greater than 1,500 does not provide adequate spring-time protection of wetland habitats and associated breeding areas for waterfowl. Additionally, because the plant growing season and the bird migration period extend beyond September 30, the September 30 date does not adequately protect shoreline habitats and wetlands.

Our review of available information shows that the wetland systems in the cove provide the most important wetland and wildlife habitat and that these areas would be slightly enhanced under the applicant's proposed impoundment level management. Shoreline topography and impoundment bathymetry indicate that additional wetlands are unlikely to develop along much of the impoundment shoreline under reduced fluctuations, including run-of-river. The supplemental wetlands survey provided in the May 1992 AIR response indicates that 1.5 acres of the largest wetland system are exposed under a 1 foot draw-down, while 3.18 acres are exposed under a 2 foot draw-down. For all wetlands combined, the acreages exposed are 2.78 and 4.79 under 1 and 2 foot draw-downs, respectively. Results of CHMI's wetland surveys reveal that two of the small wetlands are above the elevation influenced by the impoundment and project operations. Therefore, we conclude that the greatest enhancement to wetland and wildlife resources would be obtained by run-of-river operation and stable impoundment levels year-round and recommend that the project be conditioned

to operate in this way.

We also conclude that additional protection of wetland resources and associated wildlife would be provided by prohibiting scheduled maintenance draw-downs during the period from May 1 through July 15. Draw-downs during this period can result in increased nest predation, increased predation on unfledged young, nest abandonment, increased physiological stress, and reduction in food sources. We recommend, therefore, that no maintenance draw-downs be scheduled during the period from May 1 through July 15. Conditions and events beyond the applicant's control and emergency draw-downs should be exempted from this condition, except that NHF&G and MDIFW should be contacted as soon as possible after such an event.

Threatened and Endangered Species

The applicant states that there are no federal- or state-listed threatened, rare, or endangered species of animals in the project vicinity and therefore no adverse impacts that would require mitigation. CHMI also states that no federal- or state-listed threatened, rare, or endangered species of plants are adversely affected by the operation of the project, either because they don't occur in the project area or because the flows from the Great Works River and tidal fluctuations are the dominant feature controlling the habitat characteristics below the project. CHMI does not propose any enhancements for plant species.

FWS (letter dated April 5, 1993) does not make any recommendations for listed species. Neither Maine nor New Hampshire identify any impacts on state-listed species and therefore make no recommendations for threatened and endangered species. We concur with this analysis.

c. Unavoidable adverse impacts: The applicant proposes to reduce the height of impoundment elevation fluctuations, thereby improving the environment over existing operating conditions. Any fluctuations at all constitute an adverse impact on wetlands and wildlife habitats to some extent, as compared to true run-of-river operation. The frequent and regular, periodic exposure of shoreline wetlands and other habitats reduces the number and diversity of plant and animal populations inhabiting this zone. Under the staff's recommended alternative, these adverse impacts would not occur.

Recreation Resources

a. Affected environment: Current recreation

activities in the project area include flatwater boating and fishing on the impoundment; bank fishing along the impoundment at the boat launch, behind the baseball field, and below the project; visits to the historic Counting House; and canoeing on the reach of the Salmon Falls River below South Berwick dam.

There are no available statistics on recreation use of the project area. During CHMI surveys conducted in 1989, 1990, and 1994, no anglers or boaters were observed. The number of trails that traverse the eastern bank of the river below the powerhouse indicate, however, that this area may be heavily utilized to gain access to the river.

The impoundment boat launch is located along Foundry Street in the town of Rollinsford (Figure 7). This access site, owned by the town of Rollinsford, consists of a dirt pull-off area approximately 30 to 50 feet wide by 160 feet long located between the road and the edge of the impoundment. Unorganized parking is available for some 15 to 20 vehicles. Additional parking is available at the adjacent American Legion baseball field (CHMI, 1992). The edge of this access site slopes into the impoundment, with a bituminous concrete slab extending into the water for trailered boat launching. This boat ramp is approximately 10 feet wide and extends from the shore into the impoundment some 15 to 20 feet. The ramp is presently in poor condition with large cracks and heaves, probably a result of changing water levels, icing, and improper material selection/installation.

Angler access to the impoundment is gained along the shoreline at the boat launch and along a path behind the American Legion baseball field. The town of Rollinsford owns a large parcel of land around a small cove between the baseball field and the water treatment plant. There are no restrictions on public use of these properties. The remainder of the impoundment's shoreline is privately owned and largely inaccessible due to topography or distance from the road. Anglers fishing in the impoundment catch brown bullhead, yellow perch, bluegill, largemouth bass, and chain pickerel (CHMI, 1992).

Figure 7. Recreation Facilities, South Berwick Hydroelectric Project

Canoe trips on the lower Salmon Falls River from Somersworth to the South Berwick Project, a distance of about 2 miles, are not recommended due to unrunnable rapids and dams that require lengthy portages (AMC, 1989). Portage around South Berwick dam is possible, but requires a takeout at the Rollinsford boat launch; carrying some 3,500 feet, which includes crossing the heavily traveled Route 4; and putting in below the powerhouse at the tailrace access point.

The Salmon Falls River immediately downstream of South Berwick dam can be accessed via several foot paths that cross CHMI property. These paths lead to a retaining wall adjacent to the powerhouse and to a car-top boat/river access point below the project. Parking is available at this site for 3 to 5 vehicles in a cleared area at the head of these trails. CHMI does not restrict public use of this area, and it is regularly used as an access point by bird watchers and anglers.

There is an unimproved boat launch downstream of the powerhouse located off a dirt lane accessed from a paved road leading to the South Berwick water treatment plant. This informal launching site is suitable for small trailered boats or as a location to carry car-top boats to the water's edge.

Developed trailered boat access to the Salmon Falls River is available at a town-owned facility adjacent to the Maine Route 101 bridge, some 3 miles below South Berwick dam. Paddling upriver from the Route 101 boat launch, boaters can enjoy the Vaughan Woods Memorial State Park, the Hamilton House (a Georgian mansion built in 1785), and the Counting House located adjacent to the South Berwick Project.

The Salmon Falls River is not listed on the Nationwide Rivers Inventory (NRI, 1993). No area near or within the project boundaries is designated as a wilderness area under the Wilderness Act or included in the National Trails System.

b. Environmental impacts:

Impoundment Access

CHMI maintains that the existing impoundment boat launch is adequate to meet current and anticipated future demand for public access to the impoundment (CHMI, 1992).

Interior commented that the present condition of the impoundment launching site is poor, possibly resulting from erosion related to reservoir draw-down (letter from William Patterson, Regional Environmental Officer, U.S. Department of the

Interior, dated April 5, 1993). The town of Rollinsford has expressed concern about the integrity of the boat launch, and indicated that it may consider closing the facility due to potential liability issues (letter from Albert Dionne, selectman, town of Rollinsford, to Wayne Nelson, CHMI, dated August 11, 1993).

The recreation activities associated with the South Berwick impoundment (canoeing, pleasure boating, and lake fishing) are identified by Maine as moderate growth activities — from 0.9 percent to 3 percent increase in annual user days. Population statistics for the counties surrounding the project (York, Maine, and Strafford and Rockingham, New Hampshire) show an average annual increase of 2.1 percent over the period 1969 to 1992 (BEA, 1994). User studies have shown that fishing use is much greater from central Maine south than it is for the rest of the state. In addition, state planners recognize a deficiency of boating and fishing access sites in this region (Maine, 1993).

New Hampshire also projects that water-based recreation of the types provided for on the South Berwick Project's impoundment will increase in the future. The New Hampshire Comprehensive Outdoor Recreation Plan projects an increase in demand for rowing, paddling, and canoeing of approximately 25 percent over 1987 levels by the year 2010. The study also projects that an additional 307 boating access points may need to be developed by the year 2010 to meet this demand (New Hampshire, 1994).

The public boat launch and access point to the South Berwick Project impoundment should be rebuilt because (a) this boat ramp affords the only access point to the project impoundment, (b) there is a state-identified need to increase public access to water bodies in southern Maine and New Hampshire, (c) there is a continuing increase in the region's population, and (d) there is an increase in demand for recreation facilities of this type. The shoreline area between Foundry Street and the water's edge is currently used by individuals for bank fishing and launching small boats. The boat ramp's current state of disrepair makes it difficult to use and creates potentially dangerous conditions for users and their equipment.

We recommend that CHMI develop and implement a plan to rebuild/improve the existing impoundment boat launch in the town of Rollinsford. To ensure continued safe operation of this facility during the license period, we also recommend that CHMI enter into an agreement with the town of Rollinsford for future maintenance and repair activities at the boat launch location. CHMI should include this facility in its recreation plan.

Canoe Portage

CHMI currently has no plans to develop a canoe portage route around the dam due to concerns about public safety. Site conditions would require the takeout point for any canoe portage route to be located upstream of the Route 4 bridge on the east side of the river. The portage route would cross the heavily traveled highway at the bottom of a hill on a curve in the road with limited lines of sight to the east (letter from CHMI to the town of South Berwick, April 6, 1992).

The Maine Department of Conservation (MDOC) stated (letter of April 30, 1992) that it's policy is to request canoe portage routes around dams, except when to do so would encourage public use in a potentially dangerous situation. MDOC recognizes the existing hazard of crossing the Route 4 highway bridge and suggests that CHMI consult with South Berwick town officials to discuss improving sight distance on the curve, adjusting speed limits, and installing a crosswalk if a portage route is ever warranted.

Development of a canoe portage at this project would require canoeists to cross the Route 4 bridge at an un signaled curve in the road. In addition, there is no indication that canoeists travel through the impoundment on continuous trips from upstream areas. The Appalachian Mountain Club River Guide does not recommend canoeing on this stretch of the Salmon Falls River due to numerous dams and lengthy portages (AMC, 1989). Because of limited use of the impoundment for through canoe trips and public safety issues related to the crossing of Route 4, we do not recommend that a canoe portage be developed at this project.

Downstream Access

Access to the area below the project for fishing and recreational boating is gained through informal trails and breaks in the stone walls on the east bank of the river. As a result of consultations between CHMI and the town of South Berwick, CHMI proposes to transfer a 1-acre parcel of land adjacent to the project to the town for the development of a park. The town has proposed to develop and maintain this facility. CHMI has also agreed to provide some initial site preparation for the construction of these facilities.

During our site visit we noted the presence of several informal trails and an area utilized for vehicle parking on the property adjacent to the powerhouse. Discussions with CHMI personnel and the evidence noted during the site visit indicate that this area receives substantial use by area recreationists

for bank fishing and the launching of small, car-top boats. Improvement of this site, in the form of the so called "Counting House Park," has been proposed by the town of South Berwick to enhance access to the river and establish a public area for picnicking, fishing, and birdwatching. The town has already developed plans for this facility and discussed its development with CHMI.

We conclude that the development of the proposed Counting House Park is warranted due to the existing recreation use of this site and the need for additional facilities at this location identified by the town of South Berwick. To ensure that this park facility is timely developed and properly maintained over the term of any license issued, we recommend that CHMI develop and implement a plan to construct and maintain the proposed Counting House Park on the property adjacent to the powerhouse. CHMI should include its plan for this facility in its recreation plan to be filed with the Commission.

Access for the Disabled

Currently there are no developed recreation facilities at the South Berwick Project that allow access for the disabled. CHMI does not propose to develop any new recreation facilities as part of its license application.

The Americans with Disabilities Act (ADA) of 1990 provides standards for addressing discrimination against individuals with disabilities in public accommodations. People with disabilities must have access to recreation sites, and everything feasible must be done to enable them to receive benefits equivalent to those received by other visitors.

CHMI did not receive any comments from the public or from agencies about access for the disabled at the South Berwick Project. As part of its recreation plan (see following discussion) we recommend that CHMI design and construct any recreation facilities to conform to the national standards established by the Architectural and Transportation Barriers Compliance Board (ATBCB) on July 26, 1991 (Federal Register, Volume 56, No. 144). Because the ATBCB is currently working on design standards for certain outdoor recreation facilities, CHMI should, in the interim, contact the National Center for Accessibility (1-800-424-1877) for recommended state-of-the-art standards that are not found in the above-referenced national standards.

Recreation Plan and Schedules

We recommend that CHMI submit, for Commission approval, and upon approval implement, a recreation plan that provides for all recommended recreation enhancements. The plan should be developed in consultation with the NHDES, MDEP, the town of South Berwick, and the town of Rollinsford and include: (1) final design drawings of all enhancements, (2) a discussion of how the needs of the disabled were considered in designing each access area or facility; (3) a description of signs to be used to identify public access areas; (4) drawings and specifications for each recreation enhancement; (5) costs of the improvements; (6) construction schedule; and (7) a description of the proposed operation and maintenance of each facility and access area.

CHMI should complete the recreation improvements for the South Berwick Hydroelectric Project within 1 year of any license issuance, and monitoring should be consistent with FERC Form 80 filings. Monitoring should include: (1) annual recreation use figures; (2) discussion of the adequacy and the project facilities and its ability to meet demand; (3) a description of the methods used to collect the data; (4) a plan to accommodate additional recreation needs; and (5) documentation of agency consultation.

c. Unavoidable adverse impacts: None.

E.No-action Alternative

Under the no-action alternative, none of the environmental recommendations discussed would be implemented to protect or enhance existing environmental resources. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

DEVELOPMENTAL ANALYSIS

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

We base our independent economic studies on current electric power conditions. We do not consider future inflation or prices. See Mead Corporation, Publishing Paper Division, 72□FERC ¶ 61,027 (July 13, 1995).
escalation of

We base our analysis on the assumptions

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

shown in Table 7.

Table 7. Staff's assumptions for economic analyses of the South Berwick Project (Source: Staff)¹¹

Assumption	Value	Source/Basis
Local property taxes	3.05%	Staff
Federal tax	34%	Staff
Annual O&M expenses	\$70,000	CHMI
Net Investment	\$1,920,500	CHMI
Application Preparation Costs	\$67,800	CHMI
Planned Capital Improvements ^a	\$818,500	CHMI
Discount rate	15%	CHMI

a

Planned capital improvements include: turbine-generator rehabilitation, utility protection upgrade, dam repairs, and penstock repairs. CHMI stated that these improvements would increase annual project generation from 3.0 to 4.5 GWh.

The annual cost of the existing project, including carrying charges on net investments and application preparation costs, is about \$318,400 (106.1 mills/kWh) for the existing generation of 3.0 GWh of energy annually. We estimate that the cost of

alternative power would be about 54.4

mills/kWh. We based our estimate of the cost of alternative capacity on an assumed capacity value of \$109/kW-year (at a fixed charge rate of 14 percent), which is based on a combined cycle combustion turbine plant - the cheapest, most reasonable capacity addition available - and the project cost of energy generation in fossil-fueled steam electric plants in the New England division of the country. We base our estimate of the amount of fuel that would be displaced by hydroelectric generation on the fuel consumption at a heat rate of 6,200 Btu/kWh. We estimate the cost of fuel based on the Energy Information Administration's 1995 publication:

The existing

project, therefore, produces power at an annual cost of about \$155,100 (51.7 mills/kWh) more than currently available alternative power.

Including CHMI's planned capital improvements increases the annual cost to about \$417,000 (92.7 mills/kWh) based on the generation of 4.5 GWh of energy annually. The cost of alternative power would be about 42.5 mills/kWh. The project would produce power at an annual cost of about \$225,800 (50.2 mills/kWh) more than currently available alternative energy.

We based our estimate of the cost of alternative capacity on an assumed capacity value of \$109/kW-year (at a fixed charge rate of 14 percent), which is based on a combined cycle combustion turbine plant - the cheapest, most reasonable capacity addition available - and the project cost of energy generation in fossil-fueled steam electric plants in the New England division of the country. We base our estimate of the amount of fuel that would be displaced by hydroelectric generation on the fuel consumption at a heat rate of 6,200 Btu/kWh. We estimate the cost of fuel based on the Energy Information Administration's 1995 publication:

Supplement to the Annual Energy Outlook, end-use energy prices; reference case projections; Source: Electric utilities - fossil fuel average, p. 122, table 11.

A. Proposed Project

CHMI's proposal consists of continued operation of the South Berwick Project with environmental measures. Table 8 summarizes the cost and impact on project benefits of CHMI's proposal.

Table 8. Summary of CHMI's proposed project (Source: Staff)

Enhancements	Generation(GWh)	Capitol Cost of Enhancements(1995 \$)	Current Net AnnualBenefit (1995 \$)
Existing project with capital improvements	4.50	-	-\$225,800
Minimum flow release of 44 cfs ^a	-0.100	-	-\$1,200
Minimum flow gate- Capital cost	-	\$54,000	-\$11,300
- Annual O&M cost	-	\$8,200	
Maintain max daily water level fluctuation of 12 in. from 5/15 to 10/15 and 24 in. 10/16 to 5/14	-	NC	-
Minimum flow and pond level management	-	\$156,000	-\$17,000
Monitor flow and DO, plan and management cost	-	\$67,600	-\$10,800
- Annual O&M cost	-	\$5,200	
Downstream fish passage	-	\$187,200	-\$20,400
Trap & truck upstream fish passage - Capital cost	-	\$291,200	-\$42,000
- Annual O&M cost	-	\$15,600	
Transfer of 1 acre of land to town of South Berwick for Counting House Park Recreation	-	\$22,000	-\$2,400
enhancements ^b	-	\$8,000	-\$900
^c Totals	4.40	\$786,000	-\$331,800

^a CHMI proposed a 61 cfs minimum flow in its application for license. In its comments on the DEA, CHMI provided an economic analysis based on 44 cfs minimum flow required by MDEP's WQC. Lost generation includes 10 cfs fish passage

flow.

b

Recreation enhancements include assistance with the development of the town of South Berwick's planned tailwater access park and assistance with the redevelopment of the town of Rollinsford's boat launch.

c

Total operation and maintenance cost for enhancements is \$29,000.

B. Staff Alternative

Based on our consideration of all developmental and nondevelopmental resource interests related to the project, we recommend that the following measures to protect, mitigate, or enhance environmental resource values be included in any license issued for the South Berwick Project. The staff's alternative consists of the following measures:

- operating the project in run-of-river mode;
- developing and implementing a plan to monitor flows and DO;
- designing, installing, and operating both upstream and downstream fish passage facilities;
- operating the project with a stable pond elevation within 0.1-foot of the flashboard crest May 1 through October 31;
- developing and implementing a plan for seasonal stable pond operation that can be maintained from November 1 through April 30;
- rebuilding the impoundment boat launch in the town of Rollinsford;
- developing and maintaining Counting House Park downstream of the project; and
- developing and implementing a recreation plan for the project impoundment and tailrace recreation area.

These environmental measures would protect, mitigate, or enhance fisheries resources, water quality, and recreation. In addition, the electricity generated from the project would be beneficial because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and continue to reduce atmospheric pollution.

Below we present the project benefits of the staff's recommended alternative. Table 9 presents a summary of the project benefits for the staff alternative.

Table 9. Summary of project benefits - Staff's alternative
(Source: Staff)

Enhancements	Generation(GWh)	Capital Cost of Enhancements(1995 \$(1995 \$)	Current Net Annual Benefit (1995 \$)
CHMI's proposed project- Capital cost	4.40	\$786,000	-\$331,800
- Annual O&M cost		\$29,000	
Delete minimum flow	0.100	NC	\$1,200
^a release of 44 cfs			
Run-of-river including fish passage flow of 30 cfs from 4/15 through 11/15	-0.320	-	-\$24,600
Delete transfer of 1 acre of land to town of South Berwick for	-	-\$22,000	\$2,400
^a Counting House Park			
Delete CHMI recreation	-	-\$8,000	\$900
^a enhancements			
Staff recreation	-	\$9,000	-\$1,000
^b enhancements			
Develop & maintain Counting House Park - Capital cost	-	\$50,000	-\$6,100
- Annual O&M cost		\$1,000	
^e Totals	4.18	\$815,000	-\$359,000

^a
Item is part of CHMI's proposed project but is not included in staff alternative.

^b
Recreation enhancements include a concrete boat ramp in Rollinsford, development and maintenance of Counting House Park, directional signage, and development of a recreation plan for the project.

^c
Total operation and maintenance cost for enhancements is \$30,000.

C.No-action Alternative

Under the no-action alternative, there would be no change in current operation or facilities. The Commission would not issue an original license for the project, and the project would continue to operate as it does now. No measures would be provided, and the existing environment would not change.

The annual cost for the no-action alternative would be about \$155,100 (51.7 mills/kWh) more than currently available alternative power.

D.Economic Comparison of the Alternatives

Table 10 presents a summary of the levelized net annual benefits for the various alternatives.

Table 10.Comparison of economic analyses for South Berwick Project alternatives (Source: Staff)

	Existing Project	CHMI's Proposal	Staff's Alternative
Installed capacity (MW)	1.2	1.2	1.2
Annual generation (GWh)	3.00	4.40	4.18
Annual power value (thousand \$)	\$163.3	\$189.3	\$154.0
^a (mills/kWh)	54.4	43.0	36.8
Annual cost(thousand \$)	\$318.4	\$521.1	\$513.0
^a (mills/kWh)	106.1	118.0	122.7
Net annual benefit (thousand \$)	-\$155.1	-\$331.8	-\$359.0
^a (mills/kWh)	51.7	75.4	85.9

^a Based on average annual generations listed in the table.

COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

We considered the applicant's proposed mitigation and enhancement measures, Section 18 Fishway Prescription, agency-recommended terms and conditions, our recommended mitigation and enhancement measures, and the no-action alternative under Sections 4(e) and 10(a) of the FPA. From our independent analysis of the environmental and economic effects of the alternatives, we selected the following measures as the preferred

alternative (Staff Alternative):

- operating the project in run-of-river mode;
- developing and implementing a plan to monitor flows and DO;
- designing, installing, and operating both upstream and downstream fish passage facilities;
- operating the project with a stable pond elevation with 0.1-foot of the flashboard crest May 1 through October 31;
- developing and implementing a plan for seasonal stable pond operation that can be maintained from November 1 through April 30;
- rebuilding the impoundment boat launch in the town of Rollinsford;
- developing and maintaining the "Counting House Park" downstream of the project; and
- developing and implementing a recreation plan for the project impoundment and tailrace recreation area.

We recommend this alternative because implementation of these measures would enhance water quality, fisheries, and recreational resources.

Specifically, we consider four measures that could reduce the economic benefits of the project: (1) run-of-river operation, (2) DO and flow monitoring, (3) upstream and downstream fish passage, and (4) recreation.

A.Run-of-River Operation

Run-of-river operation would aid in reducing the low DO conditions that consistently appear on a seasonal basis in the immediate vicinity of the project tailrace. Eliminating the low DO conditions immediately below the impoundment helps reduce water quality standard violations in the project area.

We calculated that the annual cost of providing run-of-river operation via a minimum flow gate would be approximately \$35,900. The run-of-river operation would reduce violations of the DO standard below the project that are attributable to ponding operations at the South Berwick Project.

B.Flow and DO Monitoring

We recommend run-of-river operation that should eliminate or reduce DO violations in the project tailrace. Our analysis of the water quality issues leads us to conclude that a DO monitor that records hourly measurements from the project tailrace should be installed. A DO monitor would document if the flows released at the project were achieving the desired water quality effect in the project tailrace.

We calculated that the annual cost of monitoring flows and DO at the project would be approximately \$10,800.

C.Fish Passage

We considered the need for upstream and downstream fish passage on the Salmon Falls River. Fish passage at South Berwick would likely provide 20,000 pounds of fish for the commercial bait fishery, a run of 14,000 adults into the South Berwick impoundment, and indirect benefits in terms of prey species for gamefish in the impoundment.

Our analysis shows that both upstream and downstream fish passage at South Berwick are necessary to enhance use of potential fish habitat resources in the Salmon Falls River watershed. A fish lift would make future development of upstream passage to the many upstream impoundments on the river much less costly.

We calculated that the annual cost of developing and operating up- and downstream fish passage facilities at the project would be approximately \$62,400.

D.Recreation

We recommend that CHMI rebuild the impoundment boat launch located in the town of Rollinsford and develop an agreement for maintenance activities during the term of any license issued. This facility provides the only boat access to the project impoundment and is currently in a deteriorated condition.

We also recommend that CHMI improve the property adjacent to the powerhouse by developing and maintaining the proposed Counting House Park facility. We also require CHMI to develop a detailed recreation plan for the project that would include the impoundment access site and the downstream recreation area.

We calculated that the annual cost of providing these

recreation enhancements would be approximately \$7,100.

E. Conclusion

In conclusion, we recommend CHMI's proposal as modified by our recommended measures.

We estimate that, in addition to the annual cost of CHMI's planned capital improvements, it would cost CHMI about \$106,000 annually to implement its proposed enhancements and an additional \$27,200 annually to implement the staff alternative. Under the staff alternative, the project would produce power at an annual cost of about \$359,000 or 85.9 mills/kWh more than the currently available alternative.

RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of the FPA, as amended by the Electric Consumers Protection Act of 1986, each hydroelectric license issued by the Commission must include conditions based on recommendations of federal and state fish and wildlife agencies for the protection and enhancement of fish and wildlife and their habitat 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.

FWS, NHF&G, and MDEP commented in response to the Notice of Application Ready for Environmental Analysis issued on February 9, 1993. MDEP, in an April 2, 1993, letter, commented only on the status of the WQC. NHF&G submitted a March 31, 1993, comment letter, and FWS submitted its comments in an April 5, 1993, letter.

We evaluated all NHF&G and FWS comments and recommendations. We discuss these recommendations in our Environmental Analysis (Section V) in the water, fisheries, terrestrial, and recreation sections. We make conclusions on these recommendations in Section VII in our discussion of the comprehensive development and recommended alternative. We recommend that all agency recommendations determined to be within the scope of Section 10(j) be either partially or fully adopted.

We identified four resource agency recommendations that we

preliminarily determined are outside the scope of Section 10(j):

- CHMI should undertake provisions to prevent deviations from DO standards;
- monitor and report recreation use each 5 years;
- ensure public access to impoundment and tailrace; and
- ensure boat launch facilities in impoundment and tailrace.

Recommendations considered to be outside the scope of Section 10(j) are considered under Section 10(a) of the FPA. Table 11 summarizes all the fish and wildlife agency recommendations, shows whether they are within the scope of Section 10(j), and whether they are recommended for adoption under the staff-recommended alternative.

Table 11.South Berwick agency recommendations (Source: Staff)

Agency Recommendation	Within the Scope of 10(j)	Annual cost of environmental measures	Recommend Adopting
CHMI to revise upstream fish passage plan and install denil fishway or a fish lift	yes	\$42,000	Yes
CHMI to revise fish passage plans and install upstream and downstream fishways	Yes	\$62,400	Yes
CHMI to install 1-inch bar rack with 20 cfs minimum fish bypass flow	Yes	\$14,500	Yes
Minimum flow of 117 cfs or inflow	Yes	\$300	Yes-We recommend run-of-river that incorporates this flow.
Run-of-river operation	Yes	\$24,600	Yes
CHMI to develop a plan for	Yes	Low	Yes

implementing minimum flows CHMI to develop a plan for monitoring minimum flows	Yes	Low	Yes
CHMI to develop a plan and monitor DO in impoundment and tailrace	Yes	\$10,800	Partial - for tailrace only
CHMI to undertake provisions to prevent deviations from DO standards	No (a)	High	No - Run-of-river operation would improve DO conditions. No specific provisions or standards identified.
Limit impoundment fluctuations to 1 foot	Yes	NC	Yes - recommend more restrictive impoundment management.
CHMI to develop plan to meet impoundment fluctuation restrictions	Yes	Low	Yes
Monitor and report recreational use each 5 years	No (a)	Low	No - Recreation use already monitored through FERC's Form 80 reporting.
CHMI to ensure public access to impoundment and tailrace	No (a)	\$900	Yes - under Section 10(a).
CHMI to ensure boat launch in impoundment and tailrace	No (a)	\$6,100	Yes - under Section 10(a).

(a) - Not a specific measure to protect fish and wildlife resources.

NC - No additional cost.

Low - Approximate annual cost of \$300 or less.

High- Approximate annual cost greater than \$10,000.

We explain our reasons for not recommending adopting Section 10(j) recommendations in the individual resource sections in

Section V.D and summarize them in the following section.

NHF&G recommended a run-of-river operation for the project. It stated that run-of-river operation has the least impact on fish and wildlife. In the DEA, we did not adopt this recommendation due to the cost of implementing float control and because pulsed inflows from the upstream Lower Great Falls Project would not permit a meaningful run-of-river operation at South Berwick. We erred in our understanding of the applicant's proposed upgrades and the licensed operation of the Lower Great Falls Project. In this FEA we revise our decision on this recommendation. CHMI's proposed equipment upgrades in the license application include provisions for fully automating the project with float control. Also, the Commission (order dated November 17, 1995) clarified the licensed operation of the Lower Great Falls Project and ordered CHMI to operate in run-of-river mode. Because the cost of float control is included in CHMI's proposed upgrades, we recommend the timing of the upgrades be accelerated. With float control upgrade and the run-of-river operation at Lower Great Falls, adoption of NHF&G's run-of-river operation at South Berwick would bring meaningful enhancement with little project cost.

NHF&G recommended a plan to monitor DO in both the impoundment and project tailrace. NHF&G states DO monitoring is needed because violations of the DO standards may occur in both the impoundment and tailrace. Because minimum flows and project operation can influence only the tailrace DO conditions, only tailrace DO monitoring is needed to determine the effect of proposed operation on DO. Operation of South Berwick would not influence impoundment DO levels and the economic cost of monitoring would result in no environmental benefits. Even with knowledge of DO conditions in the impoundment, CHMI could not implement operational changes to modify impoundment conditions. Therefore, we recommend only tailrace DO monitoring.

FWS recommended limiting impoundment fluctuations to 1 foot to benefit wildlife resources. We recommend adopting NHF&G's recommendation for run-of-river/stable pond operation with a provision for a seasonal draw-down for winter operation. The recommendation we recommend adopting eliminates impoundment fluctuations within a season.

We summarize fish and wildlife agency recommendations considered outside the scope of Section 10(j) and not fully adopted below.

NHF&G recommended that CHMI undertake provisions, presumably in operation or equipment, to prevent violations of state water

quality. NHF&G does not specify what part of the state standards the CHMI discharge must meet, but we presume the issue is DO. If and when DO monitoring demonstrates project operation is contributing to violations of the state DO standard, NHF&G or other agencies may petition the Commission for a change in the project license to remedy the violations. Our analysis does not foresee that such a condition would occur, especially with adoption of run-of-river operating conditions at South Berwick. More importantly, NHF&G does not identify specific provisions to be implemented or the specific standard that must be met. This recommendation is therefore not a specific measure to enhance fish and wildlife and thus outside the scope of Section 10(j).

We list recommendations submitted by other agencies or individuals (i.e., not state or federal fish and wildlife agencies) in Table 12. Our corresponding conclusions are listed in the table and addressed in the appropriate resource sections. Table 12. Analysis of other agency and individual comments (Source: Staff)

Agency or Individual	Recommendation	Conclusion
Town of Rollinsford	Assist in repairing Foundry Street boat launch	Adopted
J. Dwight Poffenberger, Jr.	Reject the application for environmental reasons Knock out the dams, clean up the rivers, and the salmon will return Urge Congress for money for alternative energies	Not adopted. Not adopted. Dam removal was not considered a reasonable alternative. Not adopted. Beyond the scope of this EA.
Town of South Berwick	Seeks donation of land for Counting House Park	Not adopted. CHMI required to develop and maintain facility.

CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under Section 10(a)(2), federal and state agencies filed a total of 15 comprehensive plans that we identified to be applicable.

No conflicts were found. Comprehensive plans relevant to this project are listed in Section XI.

FINDING OF NO SIGNIFICANT IMPACT

We conclude that none of the resources that we studied, including water quantity and quality, and fishery, terrestrial, and recreational resources, would experience significant adverse effects under the recommended alternative considered in this EA. On the basis of the record and this EA, issuing an original license for the project with terms and conditions implementing the recommended alternative would not constitute a major federal action significantly affecting the quality of the human environment. For this reason and pursuant to Commission regulations, no Environmental Impact Statement is required.

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E. Kurkoski — Project Description and Economics (Civil Engineer; B.S., Civil Engineering — 23 years experience)

P. Martin — Terrestrial Resources (Terrestrial Ecologist; M.S., Zoology — 10 years experience)

J.H. Rump, Jr. — Project Management and Recreation Resources (Land Use Planner; M.A., Urban Affairs — 8 years experience)

APPENDIX A

**AGENCY COMMENT LETTERS ON THE DEA FOR THE SOUTH BERWICK PROJECT
AND COMMISSION'S STAFF RESPONSES**

Commenting EntitiesPage #

Consolidated Hydro Maine, Inc.A-2
(April 21, 1995)

United States Environmental Protection AgencyA-10
(April 6, 1995)

New Hampshire Dept. of Environmental ServicesA-15
(April 6, 1995)

New Hampshire Fish and Game DepartmentA- 17

U.S. Department of the Interior A-20
(Fish and Wildlife Service)
(April 7, 1995)

APPENDIX A

AGENCY COMMENT LETTERS ON THE DEA FOR THE SOUTH BERWICK PROJECT AND COMMISSION'S STAFF RESPONSES

Introduction

The Notice of Availability of the Draft Environmental Assessment (DEA) was published in the *Federal Register* on Wednesday, March 1, 1995. The DEA was mailed to federal, state, and local agencies and individuals for comments on February 23, 1995.

All timely letters of comment that address specific analyses in the DEA were reviewed by Commission staff. Suggestions for correcting text or data and requests for further discussion of a subject have been considered. Those editorial changes and suggestions that were practicable, reasonable, and that improved the quality of the EA are incorporated herein.

Constructive criticism presenting a major environmental point of view or one in opposition to staff, when persuasively supported, is treated by making revisions in the appropriate part of the FEIS. When the major point of view is not persuasive, reasons are given why the staff did not change its point of view.

Comment Letters Received on the DEA

Five comment letters were received on the DEA prior to the end of the 45-day comment period. This appendix of the FEA provides copies of the 5 comment letters. Specific comments within the comment letters have been bracketed and numbered sequentially for easy identification. Our responses are numbered to match the comments. Where possible, our responses are presented to the right of the beginning of the comments, which may extend for several pages.

The sections or pages of the DEA that we modified as a result of comments received are identified in the staff responses. Other staff responses are self-explanatory.

BILLING CODE 6717-01-M

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Consolidated Hydro Maine, Inc.) Project No. 11163-000
) Maine/New Hampshire

NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT

(December 23, 1996)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission's) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Hydropower Licensing has reviewed the application for a new license for the South Berwick Hydroelectric Project, located on the Salmon Falls River in the towns of South Berwick, Maine and Rollinsford, New Hampshire and has prepared a final Environmental Assessment (EA) for the project. In the EA, the Commission's staff has analyzed the potential environmental impacts of the existing project and has concluded that approval of the project, with appropriate environmental protection or enhancement measures, would not constitute a major federal action significantly affecting the quality of the human environment.

Copies of the EA are available for review in the Public Reference Branch, Room 2A, of the Commission's offices at 888 First Street, N.E., Washington, D.C. 20426.

Lois D. Cashell
Secretary

**ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE**

**South Berwick Hydroelectric Project
FERC Project No. 11163-000
Maine/New Hampshire**

**Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
888 First Street, N.E.
Washington, DC 20426**

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SUMMARY

On June 28, 1991, Consolidated Hydro Maine, Inc. (CHMI) filed an application with the Federal Energy Regulatory Commission (Commission) for an original license for the existing 1.2-megawatt (MW) South Berwick Hydroelectric Project. The project is on the Salmon Falls River in the towns of South Berwick, Maine, and Rollinsford, New Hampshire. No new capacity is proposed for this project.

In this Environmental Assessment (EA), we analyze and evaluate the effects associated with the issuance of an original license for the existing hydropower development and recommend terms and conditions to become a part of any license issued. For any license issued, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to the purpose of energy conservation; the protection and enhancement of fish and wildlife, aesthetics, and cultural resources; and the protection of recreation opportunities. This EA reflects the Commission's consideration of these factors.

Based on our consideration of all developmental and nondevelopmental resource interests related to the project, we recommend to the Commission that the following measures to protect, mitigate, or enhance environmental resource values be included in any license issued for the South Berwick Project. The applicant should be required to:

- ù enhance water quality and meet state standards for dissolved oxygen (DO) at the project by operating the project in run-of-river mode;
- ù ensure that the flow recommendation is enhancing tailrace water quality by developing and implementing a plan to monitor flows and DO;
- ù enhance impoundment, tailrace, commercial baitfish, and anadromous fish populations by designing, installing, and operating both upstream and downstream fish passage facilities;
- ù enhance wetland vegetation and fish populations by operating the project with a seasonal stable pond elevation;
- ù develop and implement a recreation plan for facilities on the impoundment and below the powerhouse to help meet the recreational needs of the area;

- ù ensure trailered boat access to the impoundment by rebuilding the impoundment boat launch and developing an agreement with the town of Rollinsford for continued maintenance; and
- ù enhance recreation resources below the project by developing a park facility and directional signage in the area immediately below the powerhouse.

These environmental measures would protect, mitigate, or enhance fisheries resources, water quality, and recreation. In addition, the electricity generated from the project would be beneficial because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and continue to reduce atmospheric pollution.

If the license is denied, the project would cease to operate and about 3,000,000 kilowatt-hours of electric energy generation per year at the South Berwick Project would be lost. No measures would be implemented to protect, mitigate, or enhance existing environmental resources at this site. This loss of generation would affect the supply of energy in the region and a source of replacement energy may need to be identified.

The Maine Department of Environmental Protection (MDEP) received CHMI's original application for water quality certification (WQC) on July 9, 1991. CHMI subsequently withdrew and refiled its application for WQC on July 6, 1992, June 23, 1993, and again on June 8, 1994. On May 25, 1995, MDEP issued a final order granting WQC for the project.

Under Section 10(j) of the Federal Power Act (FPA), each hydroelectric license issued by the Commission must include conditions based on the recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. We have addressed the concerns of the federal and state fish and wildlife agencies and made recommendations. We recommend full or partial adoption of all agency recommendations that were determined to be within the scope of Section 10(j).

Under Section 18 of the FPA, the Secretary of the U.S. Department of the Interior reserved authority to prescribe the construction, operation, and maintenance of fishways at the project.

Based on our independent analysis, including consideration of all relevant economic and environmental concerns, we conclude that: (1) the South Berwick Project, with our recommended environmental measures for flows, flow monitoring, fishways, impoundment fluctuation limitations, and recreation enhancements, would be best adapted to a comprehensive plan for the proper use,

conservation, and development of the Salmon Falls River and other project-related resources; and (2) issuance of an original license for the South Berwick Project would not constitute a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF HYDROPOWER LICENSING,
DIVISION OF PROJECT REVIEWSouth Berwick Hydroelectric Project
FERC Project No. 11163 -- Maine/New Hampshire

I. APPLICATION

On September 30, 1988, the Commission issued an Order Finding Hydroelectric Project Jurisdiction determining that the South Berwick Project is subject to the Commission's licensing jurisdiction.¹ On June 28, 1991, Consolidated Hydro Maine, Inc. (CHMI or applicant) filed an application with the Commission for an original license for the South Berwick Hydroelectric Project. The 1.2-megawatt (MW) project is on the Salmon Falls River in the towns of South Berwick, Maine, and Rollinsford, New Hampshire (Figure 1). The project does not occupy any United States lands.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

In this Environmental Assessment (EA), we analyze the impacts associated with issuing an original license for the constructed project, alternatives to the proposed project, and make recommendations on whether to issue a license, and if so, the terms and conditions to become part of any license issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways and federal lands.

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

Figure 1. Project Location Map, South Berwick Hydroelectric

¹ The Commission determined that the Salmon Falls River, including the South Berwick Project Segment, is a navigable waterway as defined by Section 3(8) of the Federal Power Act (12 FERC • 61,028 (1980)).

Project

Issuing an original license for the project would allow CHMI to continue to own and operate the South Berwick Project for the term of the license, making electric power from a renewable resource for its customers. The existing project generates an average of about 3,000,000 kilowatt-hours (kWh) of energy annually.

In this EA, we, the Commission staff, assess the environmental and economic effects of: (1) continuing to operate the project with the enhancements proposed by CHMI, (2) operating the project as proposed by CHMI with additional recommended environmental measures, and (3) the no-action alternative (continued operation of the project with no changes or enhancements).

B. Need for Power

The project is located in the New England Power Pool (NEPOOL) subregion of the Northeast Power Coordination Council (NPCC) region of the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. NERC's most recent report² on annual supply and demand projections indicates that, for the 1994 to 2005, loads in the NEPOOL area will grow faster than planned capacity additions, resulting in decreased reserve margins. These margins could fall below 15 percent in later years of the forecast period.

The South Berwick Project has historically generated an annual average of 3,000 megawatt-hours (MWh) of power for CHMI. In addition, the project displaces nonrenewable fossil-fired generation and contributes to diversification of the generation mix in the NEPOOL area.

We conclude that present and future use of the project's power, its displacement of nonrenewable fossil-fired generation and contribution to diversified generation mix support a finding that the power from the South Berwick Project will help meet a need for power in the NEPOOL area in the short- and long-terms.

² NERC's Electricity Supply and Demand Database, 1995-2004 dataset (June 1995).

III. PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action

1. Project Description

The existing unlicensed South Berwick Project (Figure 2) consists of: (a) a concrete gravity dam that is an average of 18 feet high and 290 feet long with a 220-foot-long concrete spillway section, which uses 2-foot-high wooden flashboards; (b) an impoundment that is about 1 mile long, has a surface area of 58 acres, and contains 116 acre-feet of usable storage; (c) a concrete intake structure in the east abutment of the dam consisting of three headgates that lead to three, 8-foot-diameter penstocks and two sluice gates that may be used as flood gates and for lowering the headpond; (d) an 85-foot-long by 30-foot-wide powerhouse housing three turbine units; and (e) appurtenant facilities.

The total rated capacity of the three turbine-generators is 1,200 kW. The project's hydraulic range varies from 50 to 885 cubic feet per second (cfs). The project presently operates in a manual run-of-river mode most of the time, matching inflows from upstream projects as closely as possible. During periods of low flow, the project operates as a modified peaking project (12 inch elevation drop in the summer and fall and up to 24 inches in the winter to manage ice and protect against flashboard failure). CHMI proposes to continue this mode of operation.

CHMI does not own, operate, or maintain any recreation facilities within the project boundaries, but does allow recreationists to cross its property to gain access to the river below the project. Access for water-based recreation on the project impoundment is available at a public boat launch and parking area on Foundry Street in Rollinsford. There are also a dirt road and paths that allow access to the tailrace area. CHMI proposes to transfer a parcel of land below the powerhouse to the town of South Berwick for recreational development.

2. Proposed Environmental Measures

CHMI proposes to implement the following measures:

- ù provide a minimum flow release below the project of 61 cfs, or inflow, to the Salmon Falls River for enhancement of water quality and fisheries;
- ù manage the project impoundment with a maximum daily water level fluctuation of 12 inches from May 15 through October 15, and 24 inches from October 16 through May 14; and

Figure 2. Project Facilities, South Berwick Hydroelectric Project

- ù transfer ownership of a 1-acre parcel of land to the town of South Berwick for the development of a waterfront park below the project.

B. Other Action Alternatives

After evaluating CHMI's proposal and reviewing recommendations from resource agencies, we considered what, if any, additional protection, mitigation, or enhancement measures would be necessary and appropriate to include in a license. The staff alternative consists of the following enhancements or modifications to project operations:

- ù enhance water quality and meet state standards for dissolved oxygen (DO) in the project tailrace by providing alternate minimum flows below the project;
- ù ensure that the flow recommendation is enhancing tailrace water quality by developing and implementing a plan to monitor flows and DO;
- ù enhance impoundment, tailrace, commercial baitfish, and anadromous fish populations by designing, installing, and operating both upstream and downstream fish passage facilities;
- ù enhance wetland vegetation and fish populations by modifying the impoundment draw-down schedule;
- ù develop and implement a recreation plan for facilities on the impoundment and below the powerhouse to help meet the recreational needs of the area;
- ù ensure trailered boat access to the impoundment by rebuilding the impoundment boat launch and developing an agreement with the town of Rollinsford for continued maintenance; and
- ù enhance recreation resources below the project by developing a park facility and directional signage in the area immediately below the powerhouse.

C. No-action Alternative

Under the no-action alternative, the project would continue to operate as it has in the past, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

Denial of the original license application would be an

action alternative that could result in project decommissioning, which would change the existing environment. We discuss project decommissioning in Section III.D.

D. Alternatives Considered but Eliminated from Detailed Study

We considered one other alternative to the applicant's licensing proposal but eliminated it from detailed study because it is not reasonable in the circumstances of this case.

The South Berwick Project could be decommissioned with or without dam removal. Either alternative would involve denying the license application and terminating operations at the project. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. The dam creates an impoundment that provides wetlands and wildlife habitat and generates electricity that is important for meeting the energy needs of the region.

The second decommissioning alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative; therefore, we have no basis for recommending it. Because the power supplied by the project is being used, a source of replacement power may have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

IV. CONSULTATION AND COMPLIANCE

A. Consultation

The Commission's regulations require the applicant to consult with the appropriate resource agencies before filing a license application. After an application is accepted, the Commission issues a public notice and seeks formal comments in accordance with federal statutes. All comments become a part of the record and are considered during analysis of the project.

The Commission issued a public notice of CHMI's application for original license on February 9, 1993. The following entities commented on the application by April 12, 1993, the deadline specified in the public notice.

Commenting Entities

Date of Letter

The respondents commenting on the DEA are as follows:

Commenting Entities	Date of Letter
State of New Hampshire, Fish and Game Department	March 29, 1995
State of New Hampshire Department of Environmental Services	April 6, 1995
United States Environmental Protection Agency	April 6, 1995
U.S. Department of the Interior Fish and Wildlife Service	April 7, 1995
Consolidated Hydro Maine, Inc.	April 21, 1995

D. Water Quality Certification

Section 401 (a) (1) of the Clean Water Act (CWA)³ requires an applicant for a federal license or permit for any activity that may result in a discharge into navigable waters of the United States to provide to the licensing or permitting agency a certification from the state in which the discharge originated that such discharge will comply with certain sections of the CWA. If a state fails to act on a request for certification within one year, the certification requirement is waived.⁴ Section 401 (d) of the CWA⁵ provides that state certifications shall set forth conditions necessary to ensure that applicant's comply with specific portions of the CWA and with appropriate requirements of state law.⁶

3 33 U.S.C. • 1341 (1988).

4 33 U.S.C. • 1341 (a) (1) (1988).

5 33 U.S.C. • 1341 (d).

6 Section 401 (d) provides that:
Any certification provided under this section shall set forth any effluent limitations and other limitations, and monitoring requirements necessary to assure that any applicant for a federal license or permit will comply with any application effluent limitations and other limitations, under section 1311 or 1312 of this title, standard of performance under section 1316 of this title, or prohibition, effluent standard, or pretreatment standard under section 1317 of this title, and with any other appropriate requirement of state law set forth in such certification, and shall become a condition on any federal

The Salmon Falls River is the boundary between the states of New Hampshire and Maine, but the project tailrace and intake are located on the Maine bank of the river. The Maine Department of Environmental Protection (MDEP) received CHMI's original application for WQC on July 9, 1991. CHMI subsequently withdrew and refiled its application for WQC on July 6, 1992, June 23, 1993, and again on June 8, 1994.

On May 25, 1995, MDEP issued a WQC for the project.⁷ The WQC requires CHMI to operate in run-of-river mode from June 1 through September 30 if the 3-day average of water temperature times river flow duration is 1,500 at the three CHMI projects on the lower Salmon Falls River: Great Falls, Rollinsford, and South Berwick (Figure 1).

Additional conditions of the MDEP WQC include:

- ù a year-round minimum flow of 44 cfs or inflow;
- ù passage of all nongeneration flows as leakage or spillway flow from June 1 through September 30;
- ù definitions for operating emergencies beyond CHMI's control;
- ù requirements for flow and temperature monitoring plans;
- ù an impoundment fluctuation restriction of 1 foot for the June 1 through September 30 period, and a 2-foot restriction at all other times except full pond level is required when the 3-day average of temperature times flow duration product is greater than 1,500;
- ù requirements for a water level monitoring plan;
- ù land transfer to the town of South Berwick for development of Counting House Park;
- ù assistance with repair to the Foundry Street boat ramp;
- ù a plan for implementing development of Counting House Park and the Foundry Street boat ramp repairs;
- ù development of facilities for upstream and downstream fish passage within 3 years of a formal Maine

license or permit subject to the provisions of this section.

⁷ The State of New Hampshire has argued that CHMI must also obtain Water Quality Certification from New Hampshire. This is a legal issue, which will be addressed in the license order.

Department of Marine Resources (MDMR) anadromous fish restoration plan for the Salmon Falls River; and

- ũ design of fish passage facilities within 1 year and installation of upstream and downstream fish passage within 2 years of MDMR adopting a formal plan for anadromous fish restoration on the Salmon Falls River.

Our past experience with Section 401 water quality conditions indicates that some states routinely include measures that, in our opinion, do not relate to water quality and, therefore, are outside the scope of Section 401. Only those measures included in a WQC considered to be within the scope of Section 401 will become part of any license issued.

MDEP's WQC for the South Berwick Project lists items labeled "1" through "8." In the following section, we present the WQC conditions as listed in the MDEP order dated May 25, 1995.

1. MINIMUM FLOWS

- A. Except as temporarily modified by equipment limitations and by emergencies beyond the applicant's control, as defined below, the Lower Great Falls and South Berwick Projects shall discharge the following minimum flows:

June 1 - September 30: Effective June 1, 1995, the projects shall discharge a minimum flow of 44 cfs or inflow, whichever is less. All non-generation flows (except those flows passed through minimum flows gates and/or flows for fish passage facilities) at Rollinsford and South Berwick shall be passed as leakage or spillage at the dams.

When the 3-day running average of water temperature times river flow duration is greater than 1,500, Lower Great Falls, Rollinsford and South Berwick shall be operated in a run-of-river mode with outflow equal to inflow on an instantaneous basis.

October 1 - May 31: Effective October 1, 1995, the projects shall discharge a minimum flow of 44 cfs or inflow, whichever is less.

- B. Limitations in existing equipment and facilities and the installation of new automation equipment at the Lower Great Falls and South Berwick Hydroelectric Projects may make continuous compliance with the minimum flow requirements impossible. Therefore, compliance with the minimum flow of 44 cfs or inflow, whichever is less, at these dams will be on an "as best as can be reasonably achieved" basis until June 1,

1997, by which time any modifications necessary to comply with the minimum flow requirement shall be completed.

- C. Operating emergencies beyond the applicant's control include, but may not be limited to, equipment failure, flashboard failure or other temporary abnormal operating condition, generating unit operation or interruption under power supply emergencies, and orders from local, state, or federal law enforcement or public safety authorities.
- D. The applicant shall, within three months of issuance of this certification, submit plans for providing and monitoring the minimum flow required by Part A of this condition. These plans shall be reviewed by and must receive approval of the DEP Bureau of Land and Water Quality.
- E. The applicant shall, on an annual basis, submit daily flow, temperature, and operational records encompassing the period June 1 - September 30, to the Department for review. Operational records must include identification of run-of-river v. cycling operations.

2. WATER QUALITY CONDITIONS MONITORING PLAN

The applicant shall, within 15 days of the issuance of this certification, submit a plan to monitor temperature and flows in the Salmon Falls River during the period June 1 - September 30 annually. This plan shall be reviewed by and must receive approval of the Department prior to implementation of run-of-river operations.

3. WATER LEVELS

- A. Except as temporarily modified by (1) approved maintenance activities (2) inflows into the project area, or (3) by operating emergencies beyond the applicant's control, as defined below, water levels in South Berwick impoundment shall be maintained according to the following schedule:

June 1 - September 30: Within 1 foot of full pond elevation of 24.95 feet (msl), except when the 3-day average of temperature times flow duration product is greater than 1,500, the project will be operated in a strict run-of-river mode.

October 1 - May 31: Within 2 feet of full pond elevation of 24.95 feet (msl).

- B. Operating emergencies beyond the applicant's control include, but may not be limited to, equipment failure or other temporary abnormal operating condition, and orders from local, state, or federal law enforcement or public safety authorities.
 - C. The applicant shall, in accordance with the schedule established in a new license for the project, submit plans for providing and monitoring the water levels in South Berwick as required in Part A of this condition. These plans shall be reviewed by and must receive approval of the DEP Bureau of Land and Water Quality.
4. RECREATIONAL FACILITIES
- A. The applicant shall transfer land to the Town of South Berwick to assist in the development of a park downstream of the powerhouse; and assist the Town of Rollinsford, New Hampshire, with the repair of the existing boat launch site on Foundry Street.
 - B. In accordance with the schedule established in a new license for the project, the applicant shall prepare a plan for implementing the items required in Part A of this condition. The plan must be reviewed by and receive approval from the DEP Bureau of Land and Water Quality.
5. UPSTREAM AND DOWNSTREAM FISH PASSAGE FACILITIES
- A. Upstream and downstream fish passage facilities shall be installed and operated at the South Berwick Project within three years following the adoption of a formal anadromous fish restoration plan for the Salmon Falls River by the Maine Department of Marine Resources.
 - B. The applicant, shall within one year following the adoption of a DMR anadromous fish restoration plan for the Salmon Falls River, submit functional design drawings, a construction schedule, and operating and maintenance plans for the fish passage facilities required by Part A of this condition, prepared in consultation with state and federal fisheries agencies. These submittals shall be reviewed by and must receive approval of state and federal fisheries agencies and the DEP Bureau of Land and Water Quality prior to facilities construction.
6. LIMITS OF APPROVAL
- This approval is limited to and includes the proposals and plans contained in the application and supporting documents

submitted and affirmed to by the applicant. All variances from the plans and proposals contained in said documents are subject to the review and approval of the Bureau or Department prior to implementation.

7. COMPLIANCE WITH APPLICABLE LAWS

The applicant shall secure and appropriately comply with all applicable federal, state and local licenses, permits, authorizations, conditions, agreements and orders required for the operation of the project.

8. EFFECTIVE DATE

Except as otherwise noted in these conditions, this certification shall be effective on the date of issuance of a new project license by the Federal Energy Regulatory Commission (FERC) and shall expire with the expiration of this FERC license.

We conclude that conditions 2, 3, and 5 should become part of any license issued for the project. We recommend adopting conditions that contain measures to meet the goals of those requirements contained in Condition 1 that relate to the South Berwick Project in the license. We will also recommend adopting part A of Condition 4 that relates to recreation development on the Salmon Falls River. Nevertheless, part of Condition 4 and Conditions 6, 7, and 8 are considered beyond the scope of Section 401 because they attempt to control the timing of activities under a federal license and transfer final approval authority from the Commission to MDEP.

E. Section 18 Fishway Prescription

Section 18 of the FPA provides the U.S. Department of the Interior (Interior) the authority to prescribe fishways at Commission-licensed projects.⁸ Interior (April 5, 1993) prescribed the following measures pursuant to Section 18:

1. The Licensee shall ensure that the design, location, installation (including scheduling), maintenance, and operation of fishways at the South Berwick Dam Project conform to the specifications of the Fish and Wildlife Service.

⁸ Section 18 of the FPA provides: "The Commission shall require the construction, maintenance, and operation by a licensee at its own expense of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior, as appropriate."

2. The Secretary of the Interior's authority to prescribe the construction, operation, and maintenance of fishways is reserved under Section 18 of the Federal Power Act.

Interior also states that CHMI's fish passage plans should be modified based on additional consultation. Interior states that it will supplement its Section 18 Prescription with more information following further consultation.

Interior's comments and prescription indicate that it believes that CHMI has proposed to include fish passage as a part of its application. CHMI's fish passage plans were submitted to the Commission in response to an additional information request. CHMI does not propose to provide fish passage and CHMI repeatedly questioned the cost benefit of fish passage on the Salmon Falls River. For purposes of our analysis (Section V.D.2.b), we assume that item 1 of Interior's prescription is not a requirement to build a fishway at South Berwick at this time.

F. Dredge and Fill Permit Conditions

Pursuant to Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) issues dredge and fill permits for specified types of construction in wetlands. These permits generally include conditions applicable to project construction activities. If there is no discharge of dredged or filled materials in waterways or wetlands, no Section 404 permit would be required. Should secondary work such as for recreational enhancements or fish passage facilities be required, however, the activities should be reviewed to ensure that Corps permits are not required.

The applicant is not proposing any modifications that would require issuance of a Section 404 permit. However, some agency-recommended modifications, including fish passage and boat launch improvements would likely require a 404 permit. In an October 31, 1994, letter, the New England Division of the Corps commented on 404 requirements based on the scoping document and agreed that CHMI may need a permit for fishway or boat launch improvements.

G. Coastal Zone Management Program

The South Berwick Project is within the state-designated Coastal Zone Management (CZM) areas in Maine and New Hampshire. The State of Maine (letter dated October 10, 1995) determined that the project is consistent with applicable elements of the Maine Coastal Program.

CHMI (letter dated October 12, 1995) submitted a federal consistency certification to the Office of State Planning, New Hampshire Coastal Program, for a determination regarding the South Berwick Project's consistency with Federal and New

Hampshire Coastal Programs. The New Hampshire Coastal Program (letter dated April 29, 1996) denied concurrence with CHMI's consistency certification due to the lack of sufficient information to indicate that the project is consistent with the enforceable policies of New Hampshire's federally approved coastal management program. Final resolution of this issue will be addressed in any license issued for this project.

H. Scoping

We issued a Scoping Document on August 30, 1994, that describes the environmental resources we feel should be analyzed in detail, and identifies the resources that do not need analysis based on our preliminary review and comments received from agencies and the public. We visited the site and conducted scoping meetings on September 29, 1994. The site visit was attended by resource agencies, CHMI personnel, and Commission staff. About 13 people attended the scoping meeting held Thursday morning, September 29, 1994, in South Berwick. The meeting was also held that evening in South Berwick, and no one attended.

Five letters were received from resource agencies in response to the Scoping Document. Comments from these entities have been considered and are discussed in this EA as appropriate.

V. ENVIRONMENTAL ANALYSIS⁹

In this chapter, we present a general description of the river basin, describe existing and proposed hydropower projects in the basin, and summarize potential cumulative impacts of the project on environmental resources.

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

As part of our analysis, we examined resource areas including water quality, fisheries, terrestrial, and recreation resources in the context of how the South Berwick Project would affect them for the term of any license issued. We include only affected resources in detail. Continued operation of the South Berwick Project would not affect geology, land use, aesthetics, cultural, or socioeconomic resources, so we exclude them from

⁹ Unless otherwise indicated, the source of our information is CHMI's application (1991).

our detailed analysis for the following reasons:

a. Under current operations, the project does not adversely affect existing geologic conditions. Project operations under a license would not change geologic conditions. Further, no resource agency has commented on the status of the geology and soils of the project area.

b. Existing land use and aesthetic resources at the South Berwick Project consist of undeveloped forested river banks and scattered development along the river corridor. This project has existed in its present form since 1923 and is an accepted part of the natural landscape. Land use and aesthetic quality of the project area would not change as a result of any proposed enhancements, nor has any resource agency proposed measures to improve land use or aesthetics at the project.

c. Phase I archeological surveys of the project area discovered no resources within the potential project impact zone. The Maine State Historic Preservation Commission stated that there were no sites of historical, architectural, or archeological significance that would be affected by the continued operation of the South Berwick Project.

d. The project would not affect the socioeconomics of the region because no major construction activities are proposed that would affect employment, business, infrastructure, or local tax revenues.

A. General Setting

The Great Bay Estuary (Figure 3) is a complex bay formation on the New Hampshire-Maine border composed of the Piscataqua River, Little Bay, and Great Bay. The estuary is tidally dominated and the drainage confluence of seven major rivers, several small creeks and their tributaries, and ocean water from the gulf of Maine.

The Salmon Falls River lies within the Piscataqua River Basin. The Piscataqua River is an ocean-dominated system extending from the gulf of Maine at Portsmouth Harbor and forms the border of New Hampshire and Maine to the fork of its tributaries, the Salmon Falls and Cocheco Rivers. The ecology of the Piscataqua River is influenced by the heavy industrial development at its mouth, where the city of Portsmouth and the Portsmouth Naval Shipyard are located, as well as by the industrial development along the New Hampshire side of the river and residential development on the Maine side (Short, 1992).

Figure 3. Great Bay Estuary - New Hampshire and Maine

B. Salmon Falls River

The Salmon Falls River flows for about 40 miles, forming a boundary between New Hampshire and Maine. Beginning in the Great East Lake, in Acton, the river passes through farmland, countryside, woodland, urban areas, and tidal areas toward the town of South Berwick. At the confluence of the Salmon Falls and Cocheco Rivers just south of the Eliot/South Berwick line, the water course widens and becomes the Piscataqua River. A few miles south of this confluence the river enters the harbor at Portsmouth and eventually empties into the Atlantic Ocean.

The Salmon Falls River is impounded by 24 dams in the 35-mile freshwater reach of river between Wakefield and South Berwick (Figure 4 and Table 1). Several of these dams may have breached and may no longer impound water (DiStefano, 1995). In addition to CHMI's pending license application for the South Berwick Project, there are three licensed projects on the Salmon Falls River and three projects for which exemptions from licensing have been granted (FERC, 1996).

C. Cumulative Impact Summary

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

We reviewed the project's potential to cause adverse cumulative impacts. Given the project's location and the nature of the area's resources, we conclude that the South Berwick Project may have adverse impacts on water quality and fisheries in the river basin. The South Berwick Project, in conjunction with upstream hydropower projects and point source discharges, contributes to violations of state DO standards on the Salmon Falls River. Because the South Berwick Project is the first dam located on this river, it also presents the first obstacle to upstream migrating fish species in the basin. We present the project's potential cumulative impacts on these resources in sections V.D.1 and V.D.2.

Figure 4. Dams on the Salmon Falls River

Table 1. Dams on the Salmon Falls River

Source: New Hampshire Water Resources Board

Dam Name	River Mile (RM)	Dam Height (ft)
South Berwick Dam	0.00	18
Rollinsford	0.90	19
Somersworth (Lower Great Falls Dam)	3.10	35
Salmon Falls River Dam II	4.10	N/A
Great Falls Upper Dam	4.40	16.5
Mast Point	7.15	13
Baxter Mill Dam	13.65	10
Salmon Falls Dam II	13.80	13
Spaulding Pond Dam	18.80	30
Salmon Falls River I	20.05	18
Salmon Falls River II	20.80	16
Milton Leatherboard Lower Dam	20.95	20
Milton Leatherboard Dam	21.10	32
Salmon Falls River V	21.25	11
Milton Three Pond Dam	21.35	19
Salmon Falls River VII	28.60	10
Salmon Falls River VI	28.75	17
Salmon Falls River VIII	28.90	10
Salmon Falls River IX	29.15	12
Salmon Falls River X	29.45	14
Salmon Falls River XII	31.15	10
Salmon Falls River XI	31.55	N/A
Horn Pond Dam	33.35	14
Great East Lake Dam	34.95	15

D. Proposed Action and Action Alternatives

In the following sections we describe the applicant's proposal and agency recommendations for area resources that would be affected by this project. We then present our analysis and conclusions. After consideration of all developmental and nondevelopmental resource values and project economics, we present the recommended alternative in Section VII.

1. Water Resources

a. Affected environment: In this section, we discuss the quantity and quality of the water resources of the Salmon Falls River in the project area.

Water Quantity

The Salmon Falls River is a coastal tributary to the Piscataqua River. The entire river drains a watershed of 330 square miles, and South Berwick dam separates the riverine and tidal portions of the river. The watershed area drained by the Salmon Falls at South Berwick is 235 square miles.

The Salmon Falls River is impounded by 24 dams in the 35-mile freshwater reach of river between Wakefield and South Berwick. The operation of the impoundments influences the daily and seasonal flow rates above the dam, but the 4-mile tidal reach below South Berwick is unimpounded. NHDES operates two of the larger impoundments, Great East Lake dam (RM 35) and Milton Three-Pond dam (RM 21). These 1,800- and 1,100-acre impoundments are filled for flood control in spring, maintained near full pond for recreation, and drawn down in fall to accommodate expected spring flows (MDEP, 1994). NHDES (1991) states that it augments flows during natural low-flow periods of the year, and provides some spring flood abatement through reservoir operations on the Salmon Falls River.

CHMI also operates the Rollinsford (RM 0.90) and Lower Great Falls (RM 3.10) projects immediately upstream of the South Berwick facility (Figures 1 and 4). CHMI has little flexibility in operation at these two projects during low flow seasons which can influence inflow to the South Berwick impoundment. The license for the Lower Great Falls Project (FERC No. 4451), requires run-of-river operation. At the Rollinsford Project (FERC No. 3777), the minimum flow is 115 cfs or inflow. Therefore, when inflow to the Rollinsford impoundment exceeds 115 cfs, CHMI can cycle operation of the Rollinsford and South Berwick Projects.

Because of flow regulation through the many impoundments,

the flow duration rates for the river at South Berwick may not accurately reflect actual flows. The only existing USGS gauges are at Milton, New Hampshire (watershed drainage 108 square miles) and South Lebanon, Maine (watershed drainage 147 square miles). Both gauges are below the Milton Ponds Development regulated by NHDES. The closest gauge (at South Lebanon), operated from 1928 to 1969, is about 8 miles upstream of the South Berwick Project. Although the impoundments below this gauge are small and not likely to alter "average" daily flow for most of the year, they can influence hourly flow in the critical low-flow season.

CHMI provided flow duration curves prorated for the 21 years of data available from the Milton gauge (about 20 miles upstream of the project) (CHMI, 1991, Appendix E). CHMI also provided data on flow duration from the nearby Lamprey River to show comparison with a nearby unregulated river. Figures 5 and 6 show the annual and August flow duration for both the Lamprey and Salmon Falls Rivers prorated for the watershed area at South Berwick.

Figure 5 shows a consistent bias for higher flows for the Salmon Falls River. Part of the reason for this may be the different periods of record used for the Lamprey (1935-1985) and Salmon Falls-Milton (1969-1987) gauges. USGS (letter dated January 17, 1991) endorsed as logical CHMI's computation method used to derive unregulated flow duration conditions on the Salmon Falls from the Lamprey River data. USGS agreed with CHMI's assertion that the August median unregulated flow could be 61 cfs, because the data used for the computation were specific to the local region and not derived from data throughout New England. Even though USGS endorsed the method used by CHMI for deriving the 61 cfs estimate of the median August flow, they provide little justification for its appropriateness.

Table 2 shows high flows in March and April and low flows July through September. October median flows in the Lamprey River also were low. Although these median monthly flows are based on daily average flow data, they do not show the within-day variability that currently occurs near South Berwick during the low-flow season. During this season, the South Berwick and upstream projects operate in a store-and-release mode. At South Berwick, this leads to leakage-only releases of about 3 cfs during nongenerating periods. This within-day variability in inflow influences water quality.

Figure 5. Annual Flow Duration Curve, South Berwick Hydroelectric Project

Figure 6. August Flow Duration Curve, South Berwick Hydroelectric Project

Table 2. Prorated median monthly flows (cfs) at South Berwick dam based on Salmon Falls and Lamprey River gauges

Month	Gauges	
	Salmon Falls River	Lamprey River
January	330	270
February	360	290
March	550	600
April	910	730
May	350	350
June	180	160
July	105	95
August	95	60
September	110	45
October	290	80
November	320	190
December	360	290

a Values approximate and estimated from figures EAE-1 through EAE-12 in Appendix E of CHMI (1991, application).

Water Quality

The Salmon Falls River near South Berwick is classified as Class B and SB by Maine and as Class B by New Hampshire. The B classification is for fresh waters above South Berwick dam, and SB is for the tidal flows downstream of South Berwick. The specific definitions used by the two states for these classifications are similar.

Class B waters in Maine are defined as follows:

- A. Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, Section 403; navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired.
- B. The DO content of Class B water shall be no less than 7 parts per million or 75 percent of saturation, whichever is higher, except for the period from October 1 to May 14. To ensure spawning and egg incubation of indigenous fish species, the 7-day mean DO concentration shall not be less than 9.5 parts per million and the 1-day minimum DO concentration shall not be less than 8.0 parts per million in identified fish spawning areas. Between May 15 and September 30, the number of *Escherichia coli* (*E. coli*) bacteria of

human origin in these waters may not exceed a geometric mean of 64 per 100 milliliters or an instantaneous level of 427 per 100 milliliters.

- C. Discharges to Class B waters shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

Class SB waters in Maine are defined as follows:

- A. Class SB waters shall be of such quality that they are suitable for the designated uses of recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation, and as habitat for fish and other estuarine and marine life. The habitat shall be characterized as unimpaired.
- B. The DO content of Class SB waters shall be no less than 85 percent of saturation. Between May 15 and September 30, the numbers of enterococcus bacteria of human origin in these waters may not exceed a geometric mean of 8 per 100 milliliters or an instantaneous level of 54 per 100 milliliters. The number of total coliform bacteria or other specified indicator organisms in samples representative of the waters in shellfish harvesting areas may not exceed the criteria recommended under the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas, United States Department of Food and Drug Administration.
- C. Discharges to Class SB waters shall not cause adverse impact to estuarine and marine life in that the receiving waters shall be of sufficient quality to support all estuarine and marine species indigenous to the receiving water without detrimental changes in the resident biological community. There shall be no new discharge to Class SB waters which would cause closure of open shellfish areas by the Department of Marine Resources.

Class B waters in New Hampshire are defined as follows:

Class B waters shall be of the second highest quality and shall have no objectionable physical characteristics, shall contain a DO content of at least 75 percent of saturation, and shall contain no more than either a geometric mean based

on at least 3 samples obtained over a 60-day period of 126 E. coli per 100 milliliters, or greater than 406 E. coli per 100 milliliters in any one sample; and for designated beach areas shall contain no more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 E. coli per 100 milliliters, or 88 E. coli per 100 milliliters in any one sample; unless naturally occurring.

There shall be no disposal of sewage or waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical, or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters. The pH range for said waters shall be 6.5 to 8.0 except when due to natural causes.

Any stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with the uses assigned to this class. The waters of this classification shall be considered as acceptable for fishing, swimming, and other recreation purposes and, after adequate treatment, for use as water supplies. Where it is demonstrated to the satisfaction of the division that the Class B criteria cannot reasonably be met in certain surface waters at all times as a result of combined sewer overflow events, temporary partial use areas shall be established by rules adopted under RSA 485-A;6, XI-c, which meet, as a minimum, the standards specified in paragraph III.

Notwithstanding the foregoing, a temporary partial use area subject to the minimum standards specified in paragraph III shall be established for those surface waters which receive effluent from an existing municipal wastewater treatment facility and which are subject to extremely low flows and low dilution as specified in paragraph III.

New Hampshire classifies all waters as A or B. The SB equivalent is defined by the definition for Class B plus the following paragraph:

Tidal waters utilized for swimming purposes shall contain no more than either a geometric mean based on at least 3 samples obtained over 60-day period of 35 enterococci per 100 milliliters, or 104 enterococci per milliliters in any one sample, unless naturally occurring. Those tidal waters used for growing or taking of shellfish for human consumption shall, in addition to the foregoing requirements, be in accordance with the criteria recommended under the National Shellfish Program Manual of Operations, United States Department of Food and Drug Administration.

In the following discussion, we use Maine definitions because the data reports are primarily referenced to Maine classifications.

It is generally acknowledged by state water resource agencies that the lower Salmon Falls River does not meet the Class B and SB standards during the summer and fall low-flow season. The widespread summer exceedance of Class B and SB standards results from the numerous point source discharges in this reach of river. Table 3 shows some of the major point source discharges that affect water quality near the South Berwick Project.

Maine sampled water quality near the South Berwick Project in 1983, 1986, 1991, and 1992. New Hampshire conducted sampling in 1988. CHMI conducted sampling in 1989 in preparation of the license application and in 1992 as additional information for its WQC from Maine. These water quality studies were conducted during the critical low-flow season of the year. Each study showed some violations of the water quality standards, and most violations were related to the DO standard.

In general, there were three distinct regions relative to this project where water quality violations occurred: the impoundment, the project tailrace, and the 4-mile estuary below the project.

Impoundment. In the impoundment, low DO was observed both near the surface and near the bottom. The low DO levels in the impoundment surface waters were associated with algal blooms and samples collected in the early morning. During algal bloom events, mid-day samples often showed supersaturation of DO. The wide swings in DO in the impoundment surface waters are associated with algal respiration and photosynthesis. Low DO near the bottom of the impoundment was associated with high oxygen demand in the sediments. Mitnik (1994) collected sediment cores in the Rollinsford and South Berwick impoundments and in the tidal reach of river below the project. The sediment oxygen demand was the primary contributor to DO violations in the deeper water layers in the impoundment and estuary. Algal respiration was the primary contributor to DO violations in the surface waters.

Table 3. Permitted point source discharges near South Berwick
(Source: CHMI, 1991, application)

Name	Approx. River Mile Location	Flow Rate MGD a	Type of Effluent
Milton STPb	17	0.08	Municipal Secondary Treatment
Spaulding Composites	15	0.03	Cooling Water
Berwick STP	6	1.10	Municipal Secondary Treatment
General Electric	6	0.30	Cooling and Stormwater
Somersworth STP	6	2.41	Municipal Secondary Treatment
Rollinsford STP	5	0.14	Municipal Secondary Treatment
South Berwick STP	4c	0.28	Municipal Primary Treatment
Dover STP	0	4.70	Municipal Secondary Treatment

a Million gallons per day.

b Sewage treatment plant.

c Located about 0.1 mile downstream of South Berwick dam.

Tailrace. The pool immediately adjacent to the project tailrace was a second location where violations of DO standards were observed during sampling. At low tide, this pool spills into a riffle zone about 200 yards downstream of the powerhouse. Violations were observed in this pool during early morning sampling when project flows were only leakage. On behalf of CHMI, Normandeau (1993) conducted field sampling and tidal hydraulic modeling of the impacts of project flows. Normandeau concluded that project minimum flows and the upgrade of the South Berwick sewage treatment plant (STP), completed in February 1995 (South Berwick 1995), should reduce or eliminate DO violations in the immediate project tailrace. The flow modeling conducted by Mitnik (1994) supports this conclusion but was vague about the region influenced by continuous run-of-river operation on the lower Salmon Falls River.

Tidal Reach Below the Project. The tidal portion of the Salmon Falls River would continue to sustain low DO conditions even under a variety of alternative advanced treatment scenarios for the point source discharge (Mitnik, 1994). One conclusion of the wasteload allocation report is that even with zero loading at

all point source discharges there would continue to be violations of standards in the Rollinsford and South Berwick impoundments and 2 miles of the tidal reach of river. These violations occur because nonpoint source loading and sediment oxygen demand use all the available assimilative capacity of the river. Sediment oxygen demand has a major effect on the tidal water quality below the project. Mitnik (1994) also concluded that hydroelectric ponding operations contributed to low DO in the tidal river below South Berwick, but the extent of the contribution was not clear or well documented in the report. Normandeau concluded that operations at South Berwick could influence the flushing rate of the river near the South Berwick STP.

The Normandeau report also modeled flushing in the entire tidal portion of the lower Salmon Falls River. Normandeau (1993) concludes that, with typical summer flows of about 100 cfs, the South Berwick discharge accounts for only 4 percent of the daily exchange of tidal waters. It states that, in summer, tidal exchange dominates the water movement irrespective of the minimum flow at South Berwick. Although Mitnik (1994) presents results of modeling impacts at 7Q10 flows (the lowest 7-day flow that occurs in a 10-year interval), it does not provide comparable tidal hydraulic models to analyze the effect of freshwater flow rates on tidal exchange.

Mitnik (1994) also provides information on ammonia concentrations in the lower Salmon Falls River, including how present waste loadings lead to existing violations of water quality standards for ammonia. Mitnik's (1994) modeling demonstrated that summer and nonsummer reductions in the ammonia component of nitrogen levels are required at the upstream Berwick and Somersworth STPs to meet the EPA water quality criterion for ammonia toxicity.

b. Environmental impacts: Water resources impacts are related to effects of minimum flow releases and impoundment fluctuations on water quality.

Minimum Flows

CHMI and the state water resource agencies have discussed minimum flow issues since the initial consultation stage. CHMI proposes to release a flow of 61 cfs, or inflow, based on its construction of unregulated August median flow from the gauge on the nearby Lamprey River. CHMI (letter dated June 3, 1993) also proposed a compromise minimum flow of 73 cfs.

The New Hampshire Fish and Game Department (NHF&G) (letter dated March 3, 1993) and FWS (letter dated April 5, 1993) recommend a minimum flow of 117 cfs. They make this recommendation based on an FWS regional policy on minimum flows, which is to use a factor of 0.5 cfs/mi² of watershed to estimate

median August flow rates. The minimum flow is then set to equal the median August flow rate. Because the watershed at South Berwick dam is 235 mi², the agencies' flow recommendation, based on this policy, is 117 cfs.

We reviewed the effects of continuous flow releases on water quality. We then considered the methods proposed by CHMI to provide the minimum flow release and the availability of upstream flows to provide alternative flow releases.

State water quality standards are not being met at the project (see Section V.1.a). There are high concentrations of ammonia and low DO because of the existing point source discharge loadings that exceed the assimilative capacity of the river. Implementation of either the 61 or 117 cfs minimum flow release would change seasonal violations of the DO standards in the impoundment and tidal reach of river below the dam. A continuous release of either flow probably would reduce or eliminate the low DO conditions that consistently appear on a seasonal basis in the immediate vicinity of the project tailrace. The continuous releases limit the intrusion of the South Berwick STP discharge into the tailrace pool. Eliminating the low DO conditions immediately below the dam would reduce water quality standard violations.

CHMI proposes (May 6, 1992, response to the Commission's additional information request) to provide minimum flows through the generating units or through a waste gate. It proposes to install an automated gate with headpond level and unit trip-out sensors. Minimum flows would be provided through the operating turbines, unless the units have tripped-out. At unit trip-out, the gate would automatically open to a position where, based on pond level, the appropriate minimum flow would be released.

CHMI proposes that the turbine units would provide the minimum flows the majority of the time, and adding a gate with operation tied to project operation would ensure minimum flows would be provided at all other times. The automatic operation of the gates would reduce time lags in continuity of flow at the project to, at most, a few minutes. Lags as small as this should not lead to intrusion of flows from the South Berwick STP. We conclude, therefore, that CHMI's proposed method for providing minimum flows is reasonable and appropriate.

We also reviewed the flows that are available at the site (Section V.D.1.a). CHMI contends that the flow duration curve from the Lamprey River closely approximates unregulated flows in the Salmon Falls River. FWS and NHF&G state that 117 cfs or 0.5 cfs/mi² is a more appropriate equivalent to August median flows. We considered the prorated flows from gauges in both rivers. Even though the period of record may alter actual median flow rates, the August median unregulated flow is not likely to reach

117 cfs using data from either gauge station and any other 20 to 25 year period of record.

Table 2 shows that August median monthly flow from the Salmon Falls gauge is about 95 cfs. If NHDES operations are supplementing flows in this period, then 95 cfs is probably greater than the unregulated median August flow rate. USGS endorsed the 61 cfs median monthly flow (letter dated January 17, 1991) as an estimator of August median flows in a review of methods conducted by USGS. From the flow data available, we conclude that 117 cfs is not available during most of the low flow season of the year.

Minimum flows greater than local leakage (about 3 cfs) would provide positive benefits in meeting water quality goals below the project by reducing violations of state DO standards in the tailrace. CHMI's proposed minimum flow of 61 cfs can be provided with existing project equipment and is more likely to be available during critical summer low flow periods than the 117 cfs flow recommended by FWS and NHF&G. Additionally, there is no quantifiable resource benefit from providing the 117 cfs flow over the 61 cfs flow. However, because the agency has made this flow recommendation under Section 10(j) and it appears to be consistent with the FPA, we recommend that the agency's minimum flow of 117 cfs, or inflow, be incorporated in our recommended minimum flow condition (Section V.D.2.b.).

Flow Monitoring

CHMI proposes to provide minimum flow monitoring using an operator's log to record unit operation, impoundment level, and waste gate positioning (AIR No. 4, May 6, 1992). Flows through the waste gate would be calibrated with a stage discharge survey. USGS (letter dated April 8, 1992) reviewed and commented on CHMI's plan for flow monitoring. USGS commented that the proposed plan should provide the minimum flows, but did not comment on the functionality of the proposed plan.

NHF&G (letter dated March 31, 1993) agreed with CHMI's proposed method of monitoring minimum flows. NHF&G believes that CHMI must develop a plan to provide the minimum flows during any maintenance refill period. FWS requests that CHMI develop a flow monitoring plan.

For our analysis, we looked at the need for flow monitoring and available methods for providing flow monitoring. The project currently provides only leakage flows (about 3 cfs) during part of the year, and the present water quality of the river does not meet state water quality standards. Although minimum flows alone would not eliminate low DO conditions in the project area, we recommend a minimum flow that should eliminate or reduce DO violations in the tailrace. We recommend flow monitoring be

required for compliance.

CHMI's proposed method of recording project operation, gate positions, and headpond elevations will not supply flow information in an easily usable manner. The tailwater is tidally influenced, and common monitoring methods do not apply. CHMI could do more to collect flow data through the project, such as taking surrogate measurements of actual flows. CHMI may need to use a data logger to tally estimated flows at four locations: over the dam, through the powerhouse, through the minimum flow waste gate, and through the fishway(s). Automated recording would allow measurements at the commonly used hourly time intervals.

Flows through the powerhouse may be measured using an annubar or sonic flow measurement device. Alternatively, the applicant could simultaneously record headwater, tailwater, and wattage by unit. With these data and a head and flow efficiency function, a data logger could record a flow surrogate. Automated measures of weir flows at the dam, the waste gate, and downstream fish passage gate could be calculated from a headpond elevation sensor.

CHMI should develop a plan for flow monitoring to enable the Commission to verify compliance with required flow releases.

DO Monitoring

CHMI does not propose any DO monitoring. NHF&G recommends that CHMI monitor DO levels in the impoundment and the project tailrace to ensure compliance with state water quality standards. NHF&G also recommends that CHMI use the data to ensure that state standards are met.

EPA (letter dated October 25, 1994) states that a field sampling study will be conducted during summer 1995 by EPA, MDEP, and NHDES. Agencies will collect these data to plan and review the effectiveness of treatment measures at local STPs and at other point source discharges to bring the river up to existing water quality standards. The extent of the water quality problems on the Salmon Falls River indicates, however, that the issue will not be quickly resolved during 1995 sampling. Some or all of the existing STPs in the lower Salmon Falls River will require construction of additional treatment facilities.

Even after the point source discharges are brought up to standards to eliminate algal blooms, several years may pass before sediment oxygen demand is reduced to a level where DO violations would be eliminated. A DO monitor provided by CHMI at the project would document if the minimum flow releases at the project were achieving the desired effect in the project

tailrace. A monitor operating continuously from June through October also would supply agencies with measurements of DO throughout the critical season of the year.

NHF&G also recommends DO monitoring in the impoundment. Impoundment DO conditions are primarily a function of wasteload allocations by upstream project discharges. Operation of the South Berwick Project has a small influence on the algal blooms and high sediment oxygen demands that create low DO conditions in the impoundment. While such monitoring data may be somewhat useful for the agencies, we conclude that tailrace sampling provides necessary information for agencies to determine the influence of the South Berwick Project on water quality.

Finally NHF&G recommends that CHMI "...undertake any measures to assure state standards." NHF&G implies that CHMI has authority to alter operating conditions based on the results of DO monitoring. CHMI would have some flexibility in selecting unit operations, spill conditions, and impoundment fluctuations within the limits imposed by any license issued by the Commission.

Such flexibility would be exercised voluntarily by CHMI. We recommend that the Commission reserve authority to modify project operation in the future. If DO monitoring demonstrates that a change in operation would have a meaningful effect on the water quality of the Salmon Falls River, CHMI or any resource agency may petition the Commission for such a change in project operation.

We considered the need for DO monitoring, the feasibility of collecting the data, and how CHMI might use the data and alter operations to ensure compliance with minimum flow conditions. Providing minimum flows would improve DO levels in the project tailrace. DO monitoring also may be needed to document how effective continuous flow releases are at eliminating violations of the DO standards downstream of the project.

In summary, we recommend DO monitoring that records hourly measurements from the project tailrace.

c. Cumulative impacts: Water quality and quantity in the Salmon Falls River is affected by multiple sources in the river watershed. Some 16 operating dams located upstream of the project (see Table 1) reregulate flows in an uncoordinated and possibly conflicting manner. NHDES regulates the large upstream lakes primarily for summer recreation use. The many hydroelectric projects store and release flows to maximize energy production within the constraints of their varied minimum flow requirements. Table 4 describes the minimum flow and operating conditions of some of the upstream dams.

During the low flow season, projects with minimum flows can store and release within the limits of fluctuation allowed in their license. The combined store and release operations from these small impoundments allows "cascades" of alternatively high and low flows to move through a 20-mile reach of river.

The cumulative impacts of variable instream flows could only be remedied by a combination of actions. These actions include: consistent flow releases from the NHDES impoundments, higher minimum flow requirements (especially at Lower Great Falls), and reduced active storage capacities (smaller impoundment level fluctuations).

The biggest factor that influences inflows to the South Berwick Project is the 6 cfs minimum flow release at Lower Great Falls. The applicant states that, when inflow to Lower Great Falls Project is less than 85 cfs, the instantaneous inflows to Rollinsford and South Berwick can drop to 6 cfs. MDEP identified the issue of minimum flows during low flow periods at Lower Great Falls in developing its draft 401 WQC for South Berwick. MDEP recognizes that flows that can meaningfully influence DO in the lower Salmon Falls River during the low flow season are controlled by releases at CHMI's Lower Great Falls Project. The ponding of water at Lower Great Falls when inflow is less than 85 cfs limits the continuity of flow in the season where flows are most critical to meeting DO standards. In a November 17, 1995, order, the Commission required CHMI to operate the Lower Great Falls Project as run-of-river. This clarification and change in operation represents a big improvement to water quality on the lower Salmon Falls River. These increased minimum flow releases from the Lower Great Falls Project are now provided by CHMI.

Our analysis (Minimum Flows in Section V.D.1.b) shows a need for continuous minimum flows at South Berwick. These flows, which are now provided from the Lower Great Falls Project, are needed to reduce violations of DO standards in the project tailrace. We also consider a minimum flow of 61 cfs or inflow and the agency recommendation for a minimum flow of 117 cfs or inflow (Section V.D.1.b). In Section V.D.1.b. we recommend that the agency flow of 117 cfs, or inflow, be incorporated in our recommended flow condition (See Section V.D.2.b.).

There are also cumulative impacts on water quality associated with the many point source discharges on the river. As discussed, we consider minimum flows that should reduce any contribution that the South Berwick Project may make to nonattainment of water quality standards.

Table 4. Minimum flow operations for dams on the Salmon Falls River (Source: Staff)

Dam	Location (RM)	Impoundment Size (acres)	Minimum Flows (cfs)
Great East Lake	34.95	1,768	Variable-Operated by NHDES
Milton Three-Pond	21.35	1,142	Variable-Operated by NHDES
Milton Leatherboard Lower Dam (South Milton)	20.95	3	58 or inflow
Spaulding	18.80	65	66 or inflow
Salmon Falls II (Boston Felt)	13.80	58	70 or inflow
Somersworth	4.10	50	110 or inflow
Lower Great Falls	3.10	32	Run-Of-River
Rollinsford	0.90	57	115 or inflow
South Berwick	0	64	0

d. Unavoidable adverse impacts: The project impoundment would continue to fail to meet water quality standards because the violations are due mostly to upstream wasteload discharges. The project impoundment contributes marginally to the detention time of wastes in the river, which in turn leads to algal blooms and low DO conditions. The incremental impacts of increased detention time would be avoidable by either removing the project dam or by limiting the wastes input at upstream point source discharges.

The project impoundment contains 525 acre-feet of water. At an average flow of 100 cfs, the detention time in the reservoir is approximately 64 hours. Because upstream projects are already equipped with secondary treatment, this detention time is short relative to the expected oxygen demand of the treated discharges. Dam removal is not warranted because the incremental contribution of increased detention time would not eliminate water quality standard violations in this river reach. Sediment oxygen demand would continue to affect water quality in this reach of river. Additional treatment at the point source discharges for nutrients

(such as nitrogen and phosphorous) that may limit the growth of algae may be more effective than dam removal.

2. Fishery Resources

a. Affected environment: The existing fish community and available fish habitat in the South Berwick impoundment and in the project tailwaters are relatively diverse compared to other area projects. The community is diverse because the dam is located at the head of tide. Upstream of the dam the river supports a variety of common freshwater fish species. Downstream the tidal portion of the Salmon Falls River supports some freshwater, estuarine, and anadromous fish. Table 5 lists the species in the impoundment, based on netting and creel survey data presented in the application. Abundance data are not available because a limited number of samples and gear types were used to collect the data in the impoundment.

Table 5. Fish species observed in the South Berwick impoundment (Source: CHMI, 1991, application)

smallmouth bass
largemouth bass
bluegill
pumpkinseed
yellow perch
chain pickerel
golden shiner
white sucker
brown bullhead
American eel

Most of these species also could be found downstream of the project. Although the tidal portion of the river probably would not support large populations of most of these species, the low salinity in the reach of river immediately downstream of the project would not inhibit their habitation. These species are also tolerant of the relatively low DO levels found seasonally in the reservoir and project tailwaters.

Project tailwaters also support estuarine and marine fish species. Surveys in Great Bay and some tributaries using limited gear and sampling show 14 species of estuarine and marine fish (Table 6). Because of the limited sampling, however, the list is not quantitative.

There are no Atlantic salmon in the project tailwaters. The Maine Atlantic Salmon Commission (letter dated January 17, 1991) reports no plans to restore Atlantic salmon to the Salmon Falls River.

Table 6. Marine and estuarine species in the project

tailrace (Source: CHMI, 1991, application;
Kinneer, 1977; DiStefano, 1995)

American shad
striped bass
Atlantic silversides
rainbow smelt
Atlantic tomcod
American eel
sea lamprey
blueback herring
alewife
common killfish
fourspine stickleback
white perch
shortnose sturgeon
Atlantic sturgeon
winter flounder
smooth flounder

The project impoundment contains habitat suitable for river herring (alewife and blueback herring), and agencies have commented on the capacity of the impoundment to support and sustain river herring. The upstream end of the impoundment is narrow and, when the Rollinsford Project is generating, the water velocities appear suitable for river herring spawning. Rocky ledge is common on the banks of both sides of the impoundment near the Rollinsford tailrace. This combination of flowing waters and hard substrate appears well suited for river herring and American shad (Scott and Scott, 1988).

b. Environmental impacts: Project impacts on fisheries resources are related to fish passage, minimum flows, and impoundment fluctuations.

Fish Passage

CHMI does not propose fish passage at South Berwick dam. In a May 6, 1992, response to an AIR, CHMI has, however, developed conceptual plans for upstream and downstream fish passage.

NHF&G (letter dated March 31, 1993) recommends that CHMI revise its conceptual plans and install fish passage at the South Berwick Project. NHF&G rejected CHMI's proposed combined fish ladder and fish pump as a method of upstream fish passage.

FWS (letter dated April 5, 1993) comments on the need for immediate construction of fishways, rejects the conceptual design proposed for upstream passage, and suggests modification and details for the conceptual downstream passage design. FWS makes the recommendation pursuant to Section 10(a) of the FPA. The Section 18 prescription requires modification to fishway plans

filed as part of the response to AIRs; requires fishways to conform to FWS specifications; and reserves authority to prescribe construction, operation, and maintenance of fishways.

For upstream passage, FWS recommends either a standard denil fishway, a vertical slot ladder, or a fish lift. It also recommends an attraction flow of at least 15 cfs and that the generating unit nearest the fishway entrance be used preferentially during the upstream passage season. For downstream passage, FWS recommends a 20 cfs bypass flow, a 2 foot per second (fps) approach velocity to the trashracks, and modifications to the discharge chute and plunge pool. FWS did not comment on the 1-inch clear spacing on the trashracks or on the angle of the racks to the approach flow as shown in the conceptual design.

CHMI questions the need for fish passage because the value of the anadromous fish resource, as a bait fish, is much less than the cost of providing fish passage. The agencies cite existing plans for restoration of river herring and shad in the region and the value of river herring as a food base for gamefish and birds. NHF&G cites the recreational American shad fishery in the project tailrace as a valued fish resource. NHF&G suggests that a minimum of 175,000 adult river herring may pass through a South Berwick fishway if passage were provided at the three upstream dams.

We considered the need for upstream and downstream fish passage on the Salmon Falls River. Fish passage at South Berwick would provide benefits in terms of prey species for gamefish in the impoundment and for the coastal bait fish industry. These benefits, however, are not easily quantified from stock recruitment or habitat data. River herring and American shad abundance has fluctuated in coastal Atlantic estuaries in recent years for unknown reasons. Based on habitat as observed at the site visit, however, the South Berwick impoundment probably would support spawning populations of river herring and possibly shad populations as well.

The capacity of the project impoundment to support anadromous fish is undefined. NHF&G (March 31, 1993) states that the South Berwick impoundment could support at least 14,400 adult river herring, and could support runs of as much as 12,000 adults/acre (about 1,000,000 adults). NHF&G also states that fish passage at South Berwick would be expected to yield a minimum of 175,000 returning adults if passage is also eventually provided to the Rollinsford, Lower Great Falls, and Somersworth impoundments. Maine Department of Marine Fisheries (March 12, 1991) states that river herring access to the impoundment could double the Salmon Falls River commercial yield from 20,000 to 40,000 pounds.

CHMI in a June 3, 1993 letter and in an April 7, 1992, letter to FWS, state that, at best, fish passage to the South Berwick impoundment could yield 15,040 river herring and as many as 47,235 adult river herring if all four impoundments are opened to fish passage.

We looked at the available literature to estimate the population of river herring that might be established if fish passage is provided to the South Berwick impoundment. Rounsefell (1975) and Everhart et al. (1975) state that nursery space for juvenile river herring is probably the limiting factor in population size. River herring are plankton feeders and can exhaust the available food supply in an impoundment by the end of the season when they outmigrate to sea. Rounsefell (1975) also states that these species can have wide fluctuations in year-to-year abundance.

Kissil (1974) reports that in the first 2 years of operation of a fish ladder, 140,000 to 180,000 adult alewives entered and spawned in Brides Lake, Connecticut. Brides Lake is about one-half the size of the South Berwick impoundment. In the first year, about 257,000 young alewives (or about 2.88 young per adult female) exited Brides Lake in late summer and fall. In contrast, Havey (1973) reports that Love Lake, which is about 10 times the size of the South Berwick impoundment, had annual adult runs of 4 to 2,376 fish in an 11-year time period, and outmigrations of 220 to 439,000 juveniles in the same 11-year period. Of the two examples, the Brides Lake site is more similar to South Berwick based on its location near head-of-tide.

We have no data on plankton abundance but expect the nutrient enriched impoundment waters would have an abundance of plankton as a food source for juvenile herring. Our review concludes that the project could experience a return of at least 14,400 herring.

Another indirect benefit of improved passage would be the presence of juvenile fish to provide forage for gamefish. The presence of hundreds of thousands to a few million juvenile river herring would likely improve production of pickerel and bass on the impoundment. A tailrace fishery for gamefish may also be developed in late summer and fall during the juvenile herring outmigration. Largemouth bass, smallmouth bass, and striped bass may congregate near the proposed Counting House Park during the outmigration.

We conclude that both upstream and downstream fish passage at South Berwick would enhance use of potential fish habitat resources on the Salmon Falls River. CHMI should revise fish passage plans in consultation with the agencies. A fish lift would provide the greatest potential for full development of upstream passage to the many impoundments on the river. The lift

would allow placement of anadromous fish in any of the upstream impoundments or river reaches without requiring construction of additional upstream fish passage facilities. A lift on this first dam could be operated as a trap and truck or possibly more economically as a trap, lift, and sluice with a release sluice located well upstream of the proposed 1-inch trashrack. The lift would allow other project owners on the Salmon Falls River (including other CHMI projects) to cofund trap and truck facilities in lieu of fish passage that may be required at those sites in the future.

We recommend that CHMI modify the downstream fish passage gate to make use of the proposed waste gate that is to be automated to provide minimum flows. We recommend that CHMI consult with the agencies to develop a downstream fish passage plan. However, our analysis shows that fish bypass flows would need to be between 10 to 30 cfs.

Minimum Flows

Minimum flows (see Section V.D.1.b. Minimum Flows) also affect fisheries resources. Under the Commission's proposed operations, the tailrace of the South Berwick Project would attract migrating fish. If minimum flows are not maintained and DO in the tailrace drops, there could be a fish kill. The proposed minimum flows would provide good quality water for fish attracted to the tailrace.

The proposed minimum flows at the project would not have a great influence on downstream fish habitat, however, because the river below the project has a twice-daily, 2- to 3-foot tidal change in elevation. The tidal flows have a dominant influence on fish habitat and downstream river hydrology except during high spring flow conditions. Even then, tidal flows still play a major role in downstream hydrology and fish habitat.

Minimum flows from upstream projects could greatly affect the anadromous fish populations that may become established in the South Berwick impoundment. Minimum inflows into the South Berwick impoundment from the Rollinsford Project influence fish habitat at the head end of the South Berwick impoundment. River herring (especially alewife) should find most of the impoundment suitable for spawning (Pardue, 1983), but American shad may find only the Rollinsford tailrace area (in the South Berwick impoundment) suitable when generation or bypass flows at Rollinsford are great enough to provide current (1 to 3 feet/second) in this narrowed reach of the impoundment (Ross et al., 1993; Stier and Crance, 1985). The South Berwick minimum flows would have little influence on this spawning habitat. During the spring spawning period for river herring and American shad, river flows generally exceed the capacity of the Rollinsford facility, and minimum flows through the Rollinsford

powerhouse should not typically influence fish habitat.

In summary, increased project minimum flows will be sufficient to enhance downstream water quality and will not adversely affect fish populations. The minimum flows from upstream projects (not a part of this license) may play a large role in development of impoundment anadromous fish populations.

Impoundment Fluctuations

CHMI proposes to operate with a 1 foot headpond fluctuation from May 15 through October 15 and with a 2 foot draw-down October 16 through May 14. Impoundment fluctuations may exceed these levels, however, due to floods, flashboard failure, and repair-related draw-downs.

FWS recommends (letter dated April 5, 1993) that CHMI limit draw-downs to 1-foot. NHF&G recommends that CHMI operate in run-of-river mode with no fluctuation from full pond level.

We considered the habitat needs of fish in the project impoundment and the possible effect of impoundment fluctuation on fish passage. The run-of-river condition (no fluctuation) recommended by NHF&G would have the lowest potential for impact on fish populations, but this no-fluctuation limitation may not be necessary.

Fluctuations can affect fish spawning and juvenile fish nursery habitat (e.g., high fluctuations can desiccate spawning habitat and flush juvenile fish from preferred nursery habitats). Some species currently inhabit areas with great fluctuations in water levels. Yellow perch and pickerel are early season spawners and typically spawn at a time of year when flows and water levels are most variable. These species are not likely to have their spawning activities affected by 2-foot fluctuations. Other shallow water spawners such as sunfish and largemouth bass spawn in June when impoundment fluctuations would be limited to 1 foot.

River herring and shad, however, could be more affected because they are broadcast spawners. Their eggs, larvae, and juveniles could be stranded and desiccated by frequent and large fluctuations of the impoundment. Therefore, during the herring and shad spawning, incubation, and rearing period, impoundment fluctuations should be limited to 1 foot.

With the recommended fish passage facilities, alewives may move into the project impoundment by May 1 (Bigelow and Schroeder, 1953). Water temperatures in most years may be too low to initiate spawning as early as May 1. Spawning activity is typically initiated at 9 C (Scott and Scott, 1988) and is greatest when water temperatures exceed 10 C (Smith, 1985). But

Scott and Scott (1988) report that spawning occurs as early as April in some Canadian waters. Because herring may spawn in the project impoundment as early as May 1, May 1 should be the first date of the 1 foot impoundment fluctuation season.

River herring outmigration peaks in October and may extend into November. Downstream passage facilities must be operational until at least November 1. Because shad and river herring are expected to rear in the project impoundment until approximately November 1, impoundment fluctuations would not need to be limited to 1 foot beyond this date.

Because inflow from the Lower Great Falls Project is run-of-river, however, additional habitat improvements can be achieved by providing run-of-river flows at the South Berwick Project. The existing project operating equipment is scheduled for upgrade to float control for all units. We recommend accelerating the improvements so that habitat improvements resulting from run-of-river operation can be realized at the South Berwick Project. Our recommendation for run-of-river operation incorporates the FWS' recommended minimum flow by requiring the passage of all inflow up to, and including, 117 cfs. For inflows in excess of 117 cfs, run-of-river operation results in flows greater than those recommended by the agency.

CHMI has included the proposed float control system on the remaining units as a part of the project's proposed cost. With the Lower Great Falls Project operating in run-of-river mode, the overall costs of operating run-of-river/stable pond at South Berwick are small. Therefore, we endorse, in part, the recommendations made by FWS and NHDES to operate the project in run-of-river mode. We expect CHMI can operate with stable pond from May 1 through October 31 to within 0.1 feet of the crest of the flashboards whenever inflow is less than project hydraulic capacity. Flows in excess of the project's hydraulic capacity would be spilled at the dam.

Operation of the impoundment at the top of the flashboards in winter may result in flashboard failure due to ice load. To accommodate winter operation, CHMI must prepare a plan for seasonal stable pond operation at an elevation that can be maintained for the duration of the winter season (November 1 through April 30) or some portion of the winter season when ice load on the flashboards or high spring runoff would limit stable pond operation.

We recommend that CHMI be required to file a plan for any scheduled maintenance draw-downs for comment by the fish and wildlife agencies and approval by the Commission prior to implementation.

c. Cumulative impacts: The Salmon Falls River

watershed has numerous obstructions (about 1 per mile) that require either fish passage facilities or a lift, trap, and truck facility at South Berwick if the full potential of anadromous fish production is to be achieved. We conclude that a fish lift and transport system is most suitable for establishing herring and possibly shad populations in the Salmon Falls watershed.

A fish lift would allow upstream projects to participate in maintaining and operating the CHMI passage facilities and would provide upstream passage to suitable spawning sites upstream of the South Berwick Project. Supplying ladders at multiple projects is a costly alternative that would also lead to considerably more passage delay and mortality during upstream passage. Using a fish lift to accommodate fish passage would reduce much of the impacts of multiple dams on anadromous fish restoration on the Salmon Falls River. Upstream projects would also require modifications for downstream passage of postspawned adults and passage of outmigrating juveniles.

d. Unavoidable adverse impacts: None.

3. Terrestrial Resources

a. Affected environment: The project lands are within the primarily urban setting of South Berwick, Maine, and the more rural residential Rollinsford, New Hampshire. The banks of the Salmon Falls River along the impoundment and the tailrace are largely forested. Vegetation includes both deciduous trees and shrubs and coniferous trees. Other cover types include lawns, paved areas, and industrial land.

Wetlands

Although primarily surrounded by upland, in or adjacent to the 58-acre impoundment are about 13 acres of wetlands. Because of the relatively steep shoreline, most of these areas (4 of 6) are small, isolated forested or shrub wetland patches. There is one exception in the cove along the northwestern shore of the impoundment where there is an approximately 7-acre palustrine emergent marsh and scrub-shrub wetland. On the eastern side of this cove, there is a separate 4-acre marsh and shrub swamp.

Below the powerhouse, the shoreline affected by the tailrace discharge is tidally influenced (experiencing a 2- to 3-foot tidal fluctuation) and is intertidal estuarine habitat.

Threatened and Endangered Species

The bald eagle and peregrine falcon are the only two federally listed species that may occur in the project area. Use of the project area by these species is limited to occasional foraging or perching. NHF&G's assessment of the Piscataqua River

system (including the Salmon Falls River) did not identify the presence of shortnose sturgeon. There are no other federally listed plant or animal species in the project area.

Consultation with the New Hampshire Natural Heritage Inventory (September 21, 1994) identified the presence of four areas of concern within the project area from below the dam to the mouth of the Great Works River (April 5, 1993). The State of New Hampshire evaluates the status of identified occurrences of listed species and ranks them on a scale of 1 to 5. Those species most likely to go extinct are classified as critically imperiled while the next category is classified as imperiled.

Three areas are habitat for plant species (large bur-reed, small spike-rush, and mudwort) that are considered either critically imperiled or imperiled by New Hampshire. The fourth area of concern is a fresh/brackish intertidal flat community downstream of the dam. The characteristics of this area provide for a number of plant species that have experienced a reduction in suitable habitat within New Hampshire that imperils their continued existence as a community type.

The Maine Natural Heritage Program (MNHP) identifies three plants listed as Maine Special Concern species in the area downstream of the dam (April 4, 1989). Two of these species, lilaopsis and spicebush, are located along the river bank in the Vaughan Woods State Park, about 1.5 miles downstream of the South Berwick Project. The third species, pygmyweed, is historically identified in the Salmon Falls River estuary, but no plants were located during the field surveys nor has it been reported in recent times.

In the application, CHMI reports the possible siting of a Blandings turtle in the impoundment, but a positive identification was not made. The Blandings turtle is listed as threatened in Maine but not in New Hampshire, as the project area is near the northern limit of this turtle's range. No other Maine or New Hampshire listed animal species have been identified in the project area.

b. Environmental impacts:

Wetlands

CHMI states that its current impoundment water level management has resulted in minimal dewatering of the littoral areas, although the cove and associated wetlands may be affected by the 1-foot daily fluctuation. It claims that under the past, somewhat more extreme impoundment fluctuation regimes, the wetland vegetation has thrived and does not appear to have been adversely affected by the larger fluctuations. The proposed 1-foot maximum fluctuation during the summer and fall "should not

result in adverse impacts on the impoundment's wetlands, and may in fact be beneficial for the dominant wetland species."

CHMI also claims that 2-foot winter fluctuations should have little or no impact on project wetlands because the ground is frozen and vegetation is dormant. It proposes no enhancements to benefit wetlands other than its impoundment-level management regime, which would limit draw-downs to a maximum of 1 foot from May 15 to October 15 and to 2 feet for the remainder of the year (exceptions are made for maintenance draw-downs or natural events beyond its control).

Because the applicant believes that there would be little or no impact on project wetlands and uplands from project operation, it states that the proposed impoundment fluctuations should not adversely affect wildlife and that some species using the cove wetlands may actually benefit. Thus, the applicant proposes no enhancements to benefit wildlife other than its impoundment level management regime.

FWS (letter dated April 5, 1993) stated that both the existing and proposed water level fluctuations influence the diversity and abundance of wetland vegetation, which ultimately has an adverse impact on wildlife populations. To reduce these adverse impacts, FWS recommends that the maximum draw-down be limited to 1 foot throughout the year.

NHF&G (letter dated March 31, 1993) stated that run-of-river operation with a constant full pond would have the least impact on fish and wildlife inhabiting shallow water and wetland areas. NHF&G does not agree that CHMI's proposed operation provides adequate protection of natural resources and therefore recommends run-of-river operation with a stable full pond level.

The State of Maine issued a WQC for the South Berwick Project on May 25, 1995. The only aspects of this WQC that would affect terrestrial resources are the minimum flow recommendations and the impoundment-level fluctuation restrictions. The WQC requires the discharge of 44 cfs or inflow and restrictions on reservoir fluctuations to a maximum of 1 foot from June 1 through September 30 and 2 feet the remainder of the year.

The MDEP requirement for a 44 cfs minimum flow at South Berwick and run-of-river operation between June 1 to September 30 when the 3-day average of temperature times flow duration product is greater than 1,500 does not provide adequate spring-time protection of wetland habitats and associated breeding areas for waterfowl. Additionally, because the plant growing season and the bird migration period extend beyond September 30, the September 30 date does not adequately protect shoreline habitats and wetlands.

Our review of available information shows that the wetland systems in the cove provide the most important wetland and wildlife habitat and that these areas would be slightly enhanced under the applicant's proposed impoundment level management. Shoreline topography and impoundment bathymetry indicate that additional wetlands are unlikely to develop along much of the impoundment shoreline under reduced fluctuations, including run-of-river. The supplemental wetlands survey provided in the May 1992 AIR response indicates that 1.5 acres of the largest wetland system are exposed under a 1 foot draw-down, while 3.18 acres are exposed under a 2 foot draw-down. For all wetlands combined, the acreages exposed are 2.78 and 4.79 under 1 and 2 foot draw-downs, respectively. Results of CHMI's wetland surveys reveal that two of the small wetlands are above the elevation influenced by the impoundment and project operations. Therefore, we conclude that the greatest enhancement to wetland and wildlife resources would be obtained by run-of-river operation and stable impoundment levels year-round and recommend that the project be conditioned to operate in this way.

We also conclude that additional protection of wetland resources and associated wildlife would be provided by prohibiting scheduled maintenance draw-downs during the period from May 1 through July 15. Draw-downs during this period can result in increased nest predation, increased predation on unfledged young, nest abandonment, increased physiological stress, and reduction in food sources. We recommend, therefore, that no maintenance draw-downs be scheduled during the period from May 1 through July 15. Conditions and events beyond the applicant's control and emergency draw-downs should be exempted from this condition, except that NHF&G and MDIFW should be contacted as soon as possible after such an event.

Threatened and Endangered Species

The applicant states that there are no federal- or state-listed threatened, rare, or endangered species of animals in the project vicinity and therefore no adverse impacts that would require mitigation. CHMI also states that no federal- or state-listed threatened, rare, or endangered species of plants are adversely affected by the operation of the project, either because they don't occur in the project area or because the flows from the Great Works River and tidal fluctuations are the dominant feature controlling the habitat characteristics below the project. CHMI does not propose any enhancements for plant species.

FWS (letter dated April 5, 1993) does not make any recommendations for listed species. Neither Maine nor New Hampshire identify any impacts on state-listed species and therefore make no recommendations for threatened and endangered species. We concur with this analysis.

c. Unavoidable adverse impacts: The applicant proposes to reduce the height of impoundment elevation fluctuations, thereby improving the environment over existing operating conditions. Any fluctuations at all constitute an adverse impact on wetlands and wildlife habitats to some extent, as compared to true run-of-river operation. The frequent and regular, periodic exposure of shoreline wetlands and other habitats reduces the number and diversity of plant and animal populations inhabiting this zone. Under the staff's recommended alternative, these adverse impacts would not occur.

4. Recreation Resources

a. Affected environment: Current recreation activities in the project area include flatwater boating and fishing on the impoundment; bank fishing along the impoundment at the boat launch, behind the baseball field, and below the project; visits to the historic Counting House; and canoeing on the reach of the Salmon Falls River below South Berwick dam.

There are no available statistics on recreation use of the project area. During CHMI surveys conducted in 1989, 1990, and 1994, no anglers or boaters were observed. The number of trails that traverse the eastern bank of the river below the powerhouse indicate, however, that this area may be heavily utilized to gain access to the river.

The impoundment boat launch is located along Foundry Street in the town of Rollinsford (Figure 7). This access site, owned by the town of Rollinsford, consists of a dirt pull-off area approximately 30 to 50 feet wide by 160 feet long located between the road and the edge of the impoundment. Unorganized parking is available for some 15 to 20 vehicles. Additional parking is available at the adjacent American Legion baseball field (CHMI, 1992). The edge of this access site slopes into the impoundment, with a bituminous concrete slab extending into the water for trailered boat launching. This boat ramp is approximately 10 feet wide and extends from the shore into the impoundment some 15 to 20 feet. The ramp is presently in poor condition with large cracks and heaves, probably a result of changing water levels, icing, and improper material selection/installation.

Angler access to the impoundment is gained along the shoreline at the boat launch and along a path behind the American Legion baseball field. The town of Rollinsford owns a large parcel of land around a small cove between the baseball field and the water treatment plant. There are no restrictions on public use of these properties. The remainder of the impoundment's shoreline is privately owned and largely inaccessible due to topography or distance from the road. Anglers fishing in the impoundment catch brown bullhead, yellow perch, bluegill, largemouth bass, and chain pickerel (CHMI, 1992).

Figure 7. Recreation Facilities, South Berwick Hydroelectric Project

Canoe trips on the lower Salmon Falls River from Somersworth to the South Berwick Project, a distance of about 2 miles, are not recommended due to unrunnable rapids and dams that require lengthy portages (AMC, 1989). Portage around South Berwick dam is possible, but requires a takeout at the Rollinsford boat launch; carrying some 3,500 feet, which includes crossing the heavily traveled Route 4; and putting in below the powerhouse at the tailrace access point.

The Salmon Falls River immediately downstream of South Berwick dam can be accessed via several foot paths that cross CHMI property. These paths lead to a retaining wall adjacent to the powerhouse and to a car-top boat/river access point below the project. Parking is available at this site for 3 to 5 vehicles in a cleared area at the head of these trails. CHMI does not restrict public use of this area, and it is regularly used as an access point by bird watchers and anglers.

There is an unimproved boat launch downstream of the powerhouse located off a dirt lane accessed from a paved road leading to the South Berwick water treatment plant. This informal launching site is suitable for small trailered boats or as a location to carry car-top boats to the water's edge.

Developed trailered boat access to the Salmon Falls River is available at a town-owned facility adjacent to the Maine Route 101 bridge, some 3 miles below South Berwick dam. Paddling upriver from the Route 101 boat launch, boaters can enjoy the Vaughan Woods Memorial State Park, the Hamilton House (a Georgian mansion built in 1785), and the Counting House located adjacent to the South Berwick Project.

The Salmon Falls River is not listed on the Nationwide Rivers Inventory (NRI, 1993). No area near or within the project boundaries is designated as a wilderness area under the Wilderness Act or included in the National Trails System.

b. Environmental impacts:

Impoundment Access

CHMI maintains that the existing impoundment boat launch is adequate to meet current and anticipated future demand for public access to the impoundment (CHMI, 1992).

Interior commented that the present condition of the impoundment launching site is poor, possibly resulting from erosion related to reservoir draw-down (letter from William Patterson, Regional Environmental Officer, U.S. Department of the Interior, dated April 5, 1993). The town of Rollinsford has expressed concern about the integrity of the boat launch, and

indicated that it may consider closing the facility due to potential liability issues (letter from Albert Dionne, selectman, town of Rollinsford, to Wayne Nelson, CHMI, dated August 11, 1993).

The recreation activities associated with the South Berwick impoundment (canoeing, pleasure boating, and lake fishing) are identified by Maine as moderate growth activities from 0.9 percent to 3 percent increase in annual user days. Population statistics for the counties surrounding the project (York, Maine, and Strafford and Rockingham, New Hampshire) show an average annual increase of 2.1 percent over the period 1969 to 1992 (BEA, 1994). User studies have shown that fishing use is much greater from central Maine south than it is for the rest of the state. In addition, state planners recognize a deficiency of boating and fishing access sites in this region (Maine, 1993).

New Hampshire also projects that water-based recreation of the types provided for on the South Berwick Project's impoundment will increase in the future. The New Hampshire Comprehensive Outdoor Recreation Plan projects an increase in demand for rowing, paddling, and canoeing of approximately 25 percent over 1987 levels by the year 2010. The study also projects that an additional 307 boating access points may need to be developed by the year 2010 to meet this demand (New Hampshire, 1994).

The public boat launch and access point to the South Berwick Project impoundment should be rebuilt because (a) this boat ramp affords the only access point to the project impoundment, (b) there is a state-identified need to increase public access to water bodies in southern Maine and New Hampshire, (c) there is a continuing increase in the region's population, and (d) there is an increase in demand for recreation facilities of this type. The shoreline area between Foundry Street and the water's edge is currently used by individuals for bank fishing and launching small boats. The boat ramp's current state of disrepair makes it difficult to use and creates potentially dangerous conditions for users and their equipment.

We recommend that CHMI develop and implement a plan to rebuild/improve the existing impoundment boat launch in the town of Rollinsford. To ensure continued safe operation of this facility during the license period, we also recommend that CHMI enter into an agreement with the town of Rollinsford for future maintenance and repair activities at the boat launch location. CHMI should include this facility in its recreation plan.

Canoe Portage

CHMI currently has no plans to develop a canoe portage route around the dam due to concerns about public safety. Site conditions would require the takeout point for any canoe portage

route to be located upstream of the Route 4 bridge on the east side of the river. The portage route would cross the heavily traveled highway at the bottom of a hill on a curve in the road with limited lines of sight to the east (letter from CHMI to the town of South Berwick, April 6, 1992).

The Maine Department of Conservation (MDOC) stated (letter of April 30, 1992) that it's policy is to request canoe portage routes around dams, except when to do so would encourage public use in a potentially dangerous situation. MDOC recognizes the existing hazard of crossing the Route 4 highway bridge and suggests that CHMI consult with South Berwick town officials to discuss improving sight distance on the curve, adjusting speed limits, and installing a crosswalk if a portage route is ever warranted.

Development of a canoe portage at this project would require canoeists to cross the Route 4 bridge at an un signaled curve in the road. In addition, there is no indication that canoeists travel through the impoundment on continuous trips from upstream areas. The Appalachian Mountain Club River Guide does not recommend canoeing on this stretch of the Salmon Falls River due to numerous dams and lengthy portages (AMC, 1989). Because of limited use of the impoundment for through canoe trips and public safety issues related to the crossing of Route 4, we do not recommend that a canoe portage be developed at this project.

Downstream Access

Access to the area below the project for fishing and recreational boating is gained through informal trails and breaks in the stone walls on the east bank of the river. As a result of consultations between CHMI and the town of South Berwick, CHMI proposes to transfer a 1-acre parcel of land adjacent to the project to the town for the development of a park. The town has proposed to develop and maintain this facility. CHMI has also agreed to provide some initial site preparation for the construction of these facilities.

During our site visit we noted the presence of several informal trails and an area utilized for vehicle parking on the property adjacent to the powerhouse. Discussions with CHMI personnel and the evidence noted during the site visit indicate that this area receives substantial use by area recreationists for bank fishing and the launching of small, car-top boats. Improvement of this site, in the form of the so called "Counting House Park," has been proposed by the town of South Berwick to enhance access to the river and establish a public area for picnicking, fishing, and birdwatching. The town has already developed plans for this facility and discussed its development with CHMI.

We conclude that the development of the proposed Counting House Park is warranted due to the existing recreation use of this site and the need for additional facilities at this location identified by the town of South Berwick. To ensure that this park facility is timely developed and properly maintained over the term of any license issued, we recommend that CHMI develop and implement a plan to construct and maintain the proposed Counting House Park on the property adjacent to the powerhouse. CHMI should include its plan for this facility in its recreation plan to be filed with the Commission.

Access for the Disabled

Currently there are no developed recreation facilities at the South Berwick Project that allow access for the disabled. CHMI does not propose to develop any new recreation facilities as part of its license application.

The Americans with Disabilities Act (ADA) of 1990 provides standards for addressing discrimination against individuals with disabilities in public accommodations. People with disabilities must have access to recreation sites, and everything feasible must be done to enable them to receive benefits equivalent to those received by other visitors.

CHMI did not receive any comments from the public or from agencies about access for the disabled at the South Berwick Project. As part of its recreation plan (see following discussion) we recommend that CHMI design and construct any recreation facilities to conform to the national standards established by the Architectural and Transportation Barriers Compliance Board (ATBCB) on July 26, 1991 (Federal Register, Volume 56, No. 144). Because the ATBCB is currently working on design standards for certain outdoor recreation facilities, CHMI should, in the interim, contact the National Center for Accessibility (1-800-424-1877) for recommended state-of-the-art standards that are not found in the above-referenced national standards.

Recreation Plan and Schedules

We recommend that CHMI submit, for Commission approval, and upon approval implement, a recreation plan that provides for all recommended recreation enhancements. The plan should be developed in consultation with the NHDES, MDEP, the town of South Berwick, and the town of Rollinsford and include: (1) final design drawings of all enhancements, (2) a discussion of how the needs of the disabled were considered in designing each access area or facility; (3) a description of signs to be used to identify public access areas; (4) drawings and specifications for each recreation enhancement; (5) costs of the improvements; (6) construction schedule; and (7) a description of the proposed

operation and maintenance of each facility and access area.

CHMI should complete the recreation improvements for the South Berwick Hydroelectric Project within 1 year of any license issuance, and monitoring should be consistent with FERC Form 80 filings. Monitoring should include: (1) annual recreation use figures; (2) discussion of the adequacy and the project facilities and its ability to meet demand; (3) a description of the methods used to collect the data; (4) a plan to accommodate additional recreation needs; and (5) documentation of agency consultation.

c. Unavoidable adverse impacts: None.

E. No-action Alternative

Under the no-action alternative, none of the environmental recommendations discussed would be implemented to protect or enhance existing environmental resources. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

VI. DEVELOPMENTAL ANALYSIS

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

We base our independent economic studies on current electric power conditions. We do not consider future inflation or escalation of prices.¹⁰ We base our analysis on the assumptions shown in Table 7.

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

Table 7. Staff's assumptions for economic analyses of the South Berwick Project (Source: Staff)¹¹

Assumption	Value	Source/Basis
Local property taxes	3.05%	Staff
Federal tax	34%	Staff
Annual O&M expenses	\$70,000	CHMI
Net Investment	\$1,920,500	CHMI
Application Preparation Costs	\$67,800	CHMI
Planned Capital Improvements ^a	\$818,500	CHMI
Discount rate	15%	CHMI

^a Planned capital improvements include: turbine-generator rehabilitation, utility protection upgrade, dam repairs, and penstock repairs. CHMI stated that these improvements would increase annual project generation from 3.0 to 4.5 GWh.

The annual cost of the existing project, including carrying charges on net investments and application preparation costs, is about \$318,400 (106.1 mills/kWh) for the existing generation of 3.0 GWh of energy annually. We estimate that the cost of alternative power would be about 54.4 mills/kWh.¹¹ The existing project, therefore, produces power at an annual cost of about \$155,100 (51.7 mills/kWh) more than currently available alternative power.

Including CHMI's planned capital improvements increases the annual cost to about \$417,000 (92.7 mills/kWh) based on the generation of 4.5 GWh of energy annually. The cost of alternative power would be about 42.5 mills/kWh. The project would produce power at an annual cost of about \$225,800 (50.2 mills/kWh) more than currently available alternative energy.

¹¹ We based our estimate of the cost of alternative capacity on an assumed capacity value of \$109/kW-year (at a fixed charge rate of 14 percent), which is based on a combined cycle combustion turbine plant - the cheapest, most reasonable capacity addition available - and the project cost of energy generation in fossil-fueled steam electric plants in the New England division of the country. We base our estimate of the amount of fuel that would be displaced by hydroelectric generation on the fuel consumption at a heat rate of 6,200 Btu/kWh. We estimate the cost of fuel based on the Energy Information Administration's 1995 publication: Supplement to the Annual Energy Outlook, end-use energy prices; reference case projections; Source: Electric utilities - fossil fuel average, p. 122, table 11.

A. Proposed Project

CHMI's proposal consists of continued operation of the South Berwick Project with environmental measures. Table 8 summarizes the cost and impact on project benefits of CHMI's proposal.

Table 8. Summary of CHMI's proposed project (Source: Staff)

Current Net	Enhancements	Generation (GWh)	Capitol Cost of Enhancements (1995 \$)
Annual			
Benefit			
(1995 \$)			
- \$225,800	Existing project with capital improvements	4.50	-
- \$1,200	Minimum flow release of 44 cfsa	-0.100	-
- \$11,300	Minimum flow gate - Capital cost	-	\$54,000
	- Annual O&M cost		\$8,200
-	Maintain max daily water level fluctuation of 12 in. from 5/15 to 10/15 and 24 in. 10/16 to 5/14	-	NC
- \$17,000	Minimum flow and pond level management	-	\$156,000
- \$10,800	Monitor flow and DO, plan and management - Capital cost	-	\$67,600
	- Annual O&M cost		\$5,200
- \$20,400	Downstream fish passage	-	\$187,200
- \$42,000	Trap & truck upstream fish passage - Capital cost	-	\$291,200
	- Annual O&M cost		\$15,600
- \$2,400	Transfer of 1 acre of land to town of South Berwick for Counting House Park Recreation enhancementsb	-	\$22,000
- \$900		-	\$8,000
- \$331,800	Totalsc	4.40	\$786,000

a CHMI proposed a 61 cfs minimum flow in its application for license. In its comments on the DEA, CHMI provided an economic analysis based on 44 cfs minimum flow required by MDEP's WQC. Lost generation includes 10 cfs fish passage flow.

b Recreation enhancements include assistance with the development of the

assistance town of South Berwick's planned tailwater access park and
launch. with the redevelopment of the town of Rollinsford's boat
c Total operation and maintenance cost for enhancements is
\$29,000.

B. Staff Alternative

Based on our consideration of all developmental and nondevelopmental resource interests related to the project, we recommend that the following measures to protect, mitigate, or enhance environmental resource values be included in any license issued for the South Berwick Project. The staff's alternative consists of the following measures:

- ù operating the project in run-of-river mode;
- ù developing and implementing a plan to monitor flows and DO;
- ù designing, installing, and operating both upstream and downstream fish passage facilities;
- ù operating the project with a stable pond elevation within 0.1-foot of the flashboard crest May 1 through October 31;
- ù developing and implementing a plan for seasonal stable pond operation that can be maintained from November 1 through April 30;
- ù rebuilding the impoundment boat launch in the town of Rollinsford;
- ù developing and maintaining Counting House Park downstream of the project; and
- ù developing and implementing a recreation plan for the project impoundment and tailrace recreation area.

These environmental measures would protect, mitigate, or enhance fisheries resources, water quality, and recreation. In addition, the electricity generated from the project would be beneficial because it would continue to reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and continue to reduce atmospheric pollution.

Below we present the project benefits of the staff's recommended alternative. Table 9 presents a summary of the project benefits for the staff alternative.

Table 9. Summary of project benefits - Staff's alternative
(Source: Staff)

Enhancements	Generation (GWh)	Capital Cost of Enhancements (1995 \$)	Current Net Annual Benefit (1995 \$)
CHMI's proposed project			
- Capital cost	4.40	\$786,000	-\$331,800
- Annual O&M cost		\$29,000	
Delete minimum flow release of 44 cfs	0.100	NC	\$1,200
Run-of-river including fish passage flow of 30 cfs from 4/15 through 11/15 ^a	-0.320	-	-\$24,600
Delete transfer of 1 acre of land to town of South Berwick for Counting House Park	-	-\$22,000	\$2,400
Delete CHMI recreation enhancements ^a	-	-\$8,000	\$900
Staff recreation enhancements ^b	-	\$9,000	-\$1,000
Develop & maintain Counting House Park	-		
- Capital cost		\$50,000	-\$6,100
- Annual O&M cost		\$1,000	
Total	4.18	\$815,000	-\$359,000

a Item is part of CHMI's proposed project but is not included in staff alternative.

b Recreation enhancements include a concrete boat ramp in Rollinsford, development and maintenance of Counting House Park, directional signage, and development of a recreation plan for the project.

c Total operation and maintenance cost for enhancements is \$30,000.

C. No-action Alternative

Under the no-action alternative, there would be no change in current operation or facilities. The Commission would not issue an original license for the project, and the project would continue to operate as it does now. No measures would be provided, and the existing environment would not change.

The annual cost for the no-action alternative would be about \$155,100 (51.7 mills/kWh) more than currently available alternative power.

D. Economic Comparison of the Alternatives

Table 10 presents a summary of the levelized net annual benefits for the various alternatives.

Table 10. Comparison of economic analyses for South Berwick Project alternatives (Source: Staff)

	Existing Project	CHMI's Proposal	Staff's Alternative
Installed capacity (MW)	1.2	1.2	1.2
Annual generation (GWh)	3.00	4.40	4.18
Annual power value (thousand \$) (mills/kWh)	\$163.3	\$189.3	\$154.0
36.8	a	54.4	43.0
Annual cost (thousand \$) (mills/kWh)	\$318.4	\$521.1	\$513.0
122.7	a	106.1	118.0
Net annual benefit (thousand \$) (mills/kWh) ^a	-\$155.1 51.7	-\$331.8 75.4	-\$359.0 85.9

a Based on average annual generations listed in the table.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

We considered the applicant's proposed mitigation and enhancement measures, Section 18 Fishway Prescription, agency-recommended terms and conditions, our recommended mitigation and enhancement measures, and the no-action alternative under Sections 4(e) and 10(a) of the FPA. From our independent analysis of the environmental and economic effects of the alternatives, we selected the following measures as the preferred alternative (Staff Alternative):

- ù operating the project in run-of-river mode;
- ù developing and implementing a plan to monitor flows and DO;
- ù designing, installing, and operating both upstream and downstream fish passage facilities;
- ù operating the project with a stable pond elevation with 0.1-foot of the flashboard crest May 1 through October 31;
- ù developing and implementing a plan for seasonal stable pond operation that can be maintained from November 1 through April 30;
- ù rebuilding the impoundment boat launch in the town of Rollinsford;
- ù developing and maintaining the "Counting House Park" downstream of the project; and
- ù developing and implementing a recreation plan for the project impoundment and tailrace recreation area.

We recommend this alternative because implementation of these measures would enhance water quality, fisheries, and recreational resources.

Specifically, we consider four measures that could reduce the economic benefits of the project: (1) run-of-river operation, (2) DO and flow monitoring, (3) upstream and downstream fish passage, and (4) recreation.

A. Run-of-River Operation

Run-of-river operation would aid in reducing the low DO conditions that consistently appear on a seasonal basis in the immediate vicinity of the project tailrace. Eliminating the low DO conditions immediately below the impoundment helps reduce water quality standard violations in the project area.

We calculated that the annual cost of providing run-of-river operation via a minimum flow gate would be approximately \$35,900. The run-of-river operation would reduce violations of the DO standard below the project that are attributable to ponding operations at the South Berwick Project.

B. Flow and DO Monitoring

We recommend run-of-river operation that should eliminate or reduce DO violations in the project tailrace. Our analysis of

the water quality issues leads us to conclude that a DO monitor that records hourly measurements from the project tailrace should be installed. A DO monitor would document if the flows released at the project were achieving the desired water quality effect in the project tailrace.

We calculated that the annual cost of monitoring flows and DO at the project would be approximately \$10,800.

C. Fish Passage

We considered the need for upstream and downstream fish passage on the Salmon Falls River. Fish passage at South Berwick would likely provide 20,000 pounds of fish for the commercial bait fishery, a run of 14,000 adults into the South Berwick impoundment, and indirect benefits in terms of prey species for gamefish in the impoundment.

Our analysis shows that both upstream and downstream fish passage at South Berwick are necessary to enhance use of potential fish habitat resources in the Salmon Falls River watershed. A fish lift would make future development of upstream passage to the many upstream impoundments on the river much less costly.

We calculated that the annual cost of developing and operating up- and downstream fish passage facilities at the project would be approximately \$62,400.

D. Recreation

We recommend that CHMI rebuild the impoundment boat launch located in the town of Rollinsford and develop an agreement for maintenance activities during the term of any license issued. This facility provides the only boat access to the project impoundment and is currently in a deteriorated condition.

We also recommend that CHMI improve the property adjacent to the powerhouse by developing and maintaining the proposed Counting House Park facility. We also require CHMI to develop a detailed recreation plan for the project that would include the impoundment access site and the downstream recreation area.

We calculated that the annual cost of providing these recreation enhancements would be approximately \$7,100.

E. Conclusion

In conclusion, we recommend CHMI's proposal as modified by our recommended measures.

We estimate that, in addition to the annual cost of CHMI's

planned capital improvements, it would cost CHMI about \$106,000 annually to implement its proposed enhancements and an additional \$27,200 annually to implement the staff alternative. Under the staff alternative, the project would produce power at an annual cost of about \$359,000 or 85.9 mills/kWh more than the currently available alternative.

VIII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of the FPA, as amended by the Electric Consumers Protection Act of 1986, each hydroelectric license issued by the Commission must include conditions based on recommendations of federal and state fish and wildlife agencies for the protection and enhancement of fish and wildlife and their habitat 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.

FWS, NHF&G, and MDEP commented in response to the Notice of Application Ready for Environmental Analysis issued on February 9, 1993. MDEP, in an April 2, 1993, letter, commented only on the status of the WQC. NHF&G submitted a March 31, 1993, comment letter, and FWS submitted its comments in an April 5, 1993, letter.

We evaluated all NHF&G and FWS comments and recommendations. We discuss these recommendations in our Environmental Analysis (Section V) in the water, fisheries, terrestrial, and recreation sections. We make conclusions on these recommendations in Section VII in our discussion of the comprehensive development and recommended alternative. We recommend that all agency recommendations determined to be within the scope of Section 10(j) be either partially or fully adopted.

We identified four resource agency recommendations that we preliminarily determined are outside the scope of Section 10(j):

- ù CHMI should undertake provisions to prevent deviations from DO standards;
- ù monitor and report recreation use each 5 years;
- ù ensure public access to impoundment and tailrace; and
- ù ensure boat launch facilities in impoundment and tailrace.

Recommendations considered to be outside the scope of Section 10(j) are considered under Section 10(a) of the FPA. Table 11 summarizes all the fish and wildlife agency recommendations, shows whether they are within the scope of Section 10(j), and whether they are recommended for adoption under the staff-recommended alternative.

Table 11. South Berwick agency recommendations (Source: Staff)

Agency Recommendation	Within the Scope of 10(j)	Annual cost of environmental measures	Recommend Adopting
CHMI to revise upstream fish passage plan and install denil fishway or a fish lift	yes	\$42,000	Yes
CHMI to revise fish passage plans and install upstream and downstream fishways	Yes	\$62,400	Yes
CHMI to install 1-inch bar rack with 20 cfs minimum fish bypass flow	Yes	\$14,500	Yes
Minimum flow of 117 cfs or inflow	Yes	\$300	Yes-We recommend run-of-river that incorporates this flow.
Run-of-river operation	Yes	\$24,600	Yes
CHMI to develop a plan for implementing minimum flows	Yes	Low	Yes
CHMI to develop a plan for monitoring minimum flows	Yes	Low	Yes
CHMI to develop a plan and monitor DO in impoundment and tailrace	Yes	\$10,800	Partial - for tailrace only

Agency Recommendation	Within the Scope of 10(j)	Annual cost of environmental measures	Recommend Adopting
CHMI to undertake provisions to prevent deviations from DO standards	No (a)	High	No - Run-of-river operation would improve DO conditions. No specific provisions or standards identified.
Limit impoundment fluctuations to 1 foot	Yes	NC	Yes - recommend more restrictive impoundment management.
CHMI to develop plan to meet impoundment fluctuation restrictions	Yes	Low	Yes
Monitor and report recreational use each 5 years	No (a)	Low	No - Recreation use already monitored through FERC's Form 80 reporting.
CHMI to ensure public access to impoundment and tailrace	No (a)	\$900	Yes - under Section 10(a).
CHMI to ensure boat launch in impoundment and tailrace	No (a)	\$6,100	Yes - under Section 10(a).

(a) - Not a specific measure to protect fish and wildlife resources.

NC - No additional cost.

Low - Approximate annual cost of \$300 or less.

High- Approximate annual cost greater than \$10,000.

We explain our reasons for not recommending adopting Section 10(j) recommendations in the individual resource sections in Section V.D and summarize them in the following section.

NHF&G recommended a run-of-river operation for the project. It stated that run-of-river operation has the least impact on fish and wildlife. In the DEA, we did not adopt this recommendation due to the cost of implementing float control and because pulsed inflows from the upstream Lower Great Falls Project would not permit a meaningful run-of-river operation at South Berwick. We erred in our understanding of the applicant's proposed upgrades and the licensed operation of the Lower Great Falls Project. In this FEA we revise our decision on this recommendation. CHMI's proposed equipment upgrades in the license application include provisions for fully automating the project with float control. Also, the Commission (order dated November 17, 1995) clarified the licensed operation of the Lower Great Falls Project and ordered CHMI to operate in run-of-river mode. Because the cost of float control is included in CHMI's proposed upgrades, we recommend the timing of the upgrades be accelerated. With float control upgrade and the run-of-river operation at Lower Great Falls, adoption of NHF&G's run-of-river operation at South Berwick would bring meaningful enhancement with little project cost.

NHF&G recommended a plan to monitor DO in both the impoundment and project tailrace. NHF&G states DO monitoring is needed because violations of the DO standards may occur in both the impoundment and tailrace. Because minimum flows and project operation can influence only the tailrace DO conditions, only tailrace DO monitoring is needed to determine the effect of proposed operation on DO. Operation of South Berwick would not influence impoundment DO levels and the economic cost of monitoring would result in no environmental benefits. Even with knowledge of DO conditions in the impoundment, CHMI could not implement operational changes to modify impoundment conditions. Therefore, we recommend only tailrace DO monitoring.

FWS recommended limiting impoundment fluctuations to 1 foot to benefit wildlife resources. We recommend adopting NHF&G's recommendation for run-of-river/stable pond operation with a provision for a seasonal draw-down for winter operation. The recommendation we recommend adopting eliminates impoundment fluctuations within a season.

We summarize fish and wildlife agency recommendations considered outside the scope of Section 10(j) and not fully adopted below.

NHF&G recommended that CHMI undertake provisions, presumably in operation or equipment, to prevent violations of state water quality. NHF&G does not specify what part of the state standards the CHMI discharge must meet, but we presume the issue is DO. If and when DO monitoring demonstrates project operation is contributing to violations of the state DO standard, NHF&G or other agencies may petition the Commission for a change in the

project license to remedy the violations. Our analysis does not foresee that such a condition would occur, especially with adoption of run-of-river operating conditions at South Berwick. More importantly, NHF&G does not identify specific provisions to be implemented or the specific standard that must be met. This recommendation is therefore not a specific measure to enhance fish and wildlife and thus outside the scope of Section 10(j).

We list recommendations submitted by other agencies or individuals (i.e., not state or federal fish and wildlife agencies) in Table 12. Our corresponding conclusions are listed in the table and addressed in the appropriate resource sections.

Table 12. Analysis of other agency and individual comments
(Source: Staff)

Agency or Individual	Recommendation	Conclusion
Town of Rollinsford	Assist in repairing Foundry Street boat launch	Adopted
J. Dwight Poffenberger, Jr.	Reject the application for environmental reasons Knock out the dams, clean up the rivers, and the salmon will return	Not adopted. Not adopted. Dam removal was not considered a reasonable alternative.
	Urge Congress for money for alternative energies	Not adopted. Beyond the scope of this EA.
Town of South Berwick	Seeks donation of land for Counting House Park	Not adopted. CHMI required to develop and maintain facility.

IX. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under Section 10(a)(2), federal and state agencies filed a total of 15 comprehensive plans that we identified to be applicable. No conflicts were found. Comprehensive plans relevant to this project are listed in Section XI.

X. FINDING OF NO SIGNIFICANT IMPACT

We conclude that none of the resources that we studied, including water quantity and quality, and fishery, terrestrial, and recreational resources, would experience significant adverse effects under the recommended alternative considered in this EA.

On the basis of the record and this EA, issuing an original license for the project with terms and conditions implementing the recommended alternative would not constitute a major federal action significantly affecting the quality of the human environment. For this reason and pursuant to Commission regulations, no Environmental Impact Statement is required.

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APPENDIX A

AGENCY COMMENT LETTERS ON THE DEA FOR THE SOUTH BERWICK PROJECT
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AND COMMISSION'S STAFF RESPONSES

Introduction

The Notice of Availability of the Draft Environmental Assessment (DEA) was published in the Federal Register on Wednesday, March 1, 1995. The DEA was mailed to federal, state, and local agencies and individuals for comments on February 23, 1995.

All timely letters of comment that address specific analyses in the DEA were reviewed by Commission staff. Suggestions for correcting text or data and requests for further discussion of a subject have been considered. Those editorial changes and suggestions that were practicable, reasonable, and that improved the quality of the EA are incorporated herein.

Constructive criticism presenting a major environmental point of view or one in opposition to staff, when persuasively supported, is treated by making revisions in the appropriate part of the FEIS. When the major point of view is not persuasive, reasons are given why the staff did not change its point of view.

Comment Letters Received on the DEA

Five comment letters were received on the DEA prior to the end of the 45-day comment period. This appendix of the FEA provides copies of the 5 comment letters. Specific comments within the comment letters have been bracketed and numbered sequentially for easy identification. Our responses are numbered to match the comments. Where possible, our responses are presented to the right of the beginning of the comments, which may extend for several pages.

The sections or pages of the DEA that we modified as a result of comments received are identified in the staff responses. Other staff responses are self-explanatory.

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