Fishways

- Bangor Hydroelectric Company
- Fishway Prescription Process
- Prescription for a Fishway for the Jacobson's Hydro No. 1 Project
- Notice of Application Ready for Environmental Analysis for the Santa Ana River 1 and 3 Hydroelectric Project
- Prescription for Fishways Holyoke Water Power Company

U.S. Fish and Wildlife Service response to comments by Bangor Hydroelectric Company on the Prescription for Fishways for the Lower Penobscot River Hydroelectric Projects, including the proposed Basin Mills Dam, Maine.

(FERC Project Nos. 10981, 2534, 2712)

May 20, 1997

Response to Question 11.

11. BHE comments that the prescriptions for fishways include things that are not "fishways".

In the course of preparing its Prescription for Fishways (submitted with this filing), the Department determined that fish passage at the lower Penobscot River projects could be accomplished effectively based on a more specific set of conditions than were in the Department's modified Prescription for Fishways submitted with the Department's February 16, 1995, comments on the DEIS. Several of the conditions to which BHE refers are not included in the Prescription for Fishways submitted with this filing. As a result, any response in regard to those conditions would not be germane to this Prescription for Fishways. Nevertheless, the Department understands that this is an area of concern. Therefore, the Department is responding in some detail about how it is interpreting the law in the context of this Prescription for Fishways.

Accomplishing effective fish passage is in the public interest and is a legitimate project purpose. As such, this purpose should be an integral component of project design and operation whenever possible and practical. This applies equally to both existing and new projects. This purpose is best achieved when it is integrated into early project planning and design and continuously in force through the term of the license as needed. Accomplishing this purpose requires that either or both agencies with statutory fishway responsibilities are involved in both pre- and post-licensing related activities. This involvement is traditionally through consultation with the licensee and communication with the Commission. Typically, related post-licensing consultation is as or more important to this purpose than pre-licensing consultation. After licensing, related planning, modeling, and designing occur prior to construction, operations, and maintenance. After passage is in effect, evaluations and inspections should occur. Each of these activities is important and can influence whether or not effective fish passage is being or will be accomplished. This is the general context within which the Department has interpreted the following pertinent laws.

Section 18 of the Federal Power Act,[1] states in pertinent part:

> "the Commission shall require the construction, maintenance and operation by a licensee of ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior"

Section 1701(b) of the National Energy Policy Act of 1992,[2] states:

> "the items which may constitute a "fishway" under section 18 [16 USCS §811] for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and project operations and measures related to such structures, facilities or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish"

Thus, the term "fishway" is not only limited to: 1) physical structures, facilities and devices necessary to maintain all life stages of fish, but also 2) project operations and measures related to those structures, facilities and devices which are necessary to ensure their effectiveness in accomplishing the safe and timely upstream and downstream passage of the fish. To illustrate this in terms of the Prescription for Fishways, all of the following is included within the limits of the term "fishway" as interpreted and implemented by the Department.

The Department's Prescription for Fishways for the Basin Mills, Milford, and Stillwater projects includes physical structures, facilities, and devices. For example, structures are included such as fish-ladders and fish-lifts and screens (racks) for guiding or excluding. Facilities are included for fish bypass, fish collection (gallery), counting, and trap and transport. Devices are also included such as attraction flow systems (pumps and conduits). Project operations and measures necessary to ensure the effectiveness of these structures, facilities, and devices for passing fish safely, timely, and conveniently are also included. For example, the timing of project operations (first unit on, last off) during the migration period is specified to cause effective routing of migrating fish. Also, to ensure that the structures, facilities, and devices will be designed and located to the pass fish effectively, conditions requiring planning (including operations and maintenance), modeling, designing, and

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[1]16 USCS §811

[2]P.L. 102-486, Title, XVII, §1701(b), 106 Stat. 3008.

consultation during each are included. In particular, hydraulic modeling of project operations will be effective in designing and locating structures, facilities and devices, and in adjusting the effect of project operations on fish routing and movement. As a measure to ensure that flows for attraction and convenience will be provided, conditions specifying attraction flows are provided. To ensure that the structures, facilities, and devices will operate in synchrony with fish movement periods, schedules for initial and seasonal operations are provided with a mechanism on how the seasonal schedule can be changed. In regard to these operations, the maximum river flow at which upstream passage should be provided by the licensee is specified. And, to ensure that everything performs as expected, evaluations of fish passage effectiveness and inspection are provided. As part of the design of some structures, a walkway with hand railings is provided as a measure to allow inspections, maintenance, and evaluations to be more effective, convenient, and safe. Just as pre-filing consultation is advantageous, many of the above measures must be accomplished in cooperation and consultation with the fishery agencies and interested parties with vested interests if they are to be well informed throughout the process and have opportunity to provide comments to the licensee, the Department, and ultimately to the Commission concerning fish-passage effectiveness. Based on the Department's involvement and review of comments resulting from consultation, the Department, through its U.S. Fish and Wildlife Service, will notify the licensee and Commission as to its approval of many of the above measures. This approval would be in the context of fish passage. Thus, consultation and approval notification are essential effectiveness measures. Of course, all documents would have to be submitted to the Commission for its independent review and approval.

By prescribing that consultation occur between the Licensee, U.S. Fish and Wildlife Service and other parties on fishway-related matters, the U.S. Fish and Wildlife Service is fostering the development of a more complete record on which to base fishway-related decisions than would be created in the absence of consultation. Since consultation results in a richer record, it follows that decisions based on that record will better ensure the effectiveness of the structures, facilities, devices, project operations and other measures that are all necessary to pass fish. Input, through consultation, to early planning and design is as important to ensuring effectiveness as post operational studies. Therefore, consultation is an effectiveness measure. Moreover, developing a full administrative record, in part through consultation, is in keeping with Ellsworth.

U.S. Fish & Wildlife Service

Fishway Prescription Process

Project Planning (Prefiling Consultation)

Initial Consultation Package/Planning Meeting with Applicant, FWS and other Stakeholers

FWS conducts Preliminary Project Analysis, Including Project Effects, Resource Objectives and Study Needs

FWS Requests Applicant to Provide Fishway Studies and Shares Request with Other Stakeholers

FWS Ensures Fishway Study Results are Acceptable

Applicant Incorporates Fishway Study Results into Application

Application Filed (Formal Proceeding)

FERC Tendering Notice
FWS Requests Additional Studies on Fishway Prescriptions

FERC Acceptance Notice
FWS Files Motion to Intervene

FERC Scoping Notice
FWS Provides Input to Assist FERC

(Developing Fishway Prescriptions)

FERC "Ready for Environmental Analysis" Notice
FWS provides FERC with Preliminary Fishway Prescriptions
Applicant and Stakeholder Encouraged to Comment on Preliminary Prescriptions *

FWS Gathers Comments Received from the Applicant and Stakeholders on its Preliminary Fishway Presecriptions

FERC Issues Draft NEPA Document
FWS Provides Comments
Other Stakeholders Comment on Preliminary Prescriptions *

FWS Provides FERC with Modified Fishway Prescriptions after Reviewing all Public Comments on Preliminary Fishway Prescriptions

FWS Provides FERC Administrative Record, Responses to Fishway Comments and Other Support on the Modified Prescriptions

FERC Issues Final NEPA Document that Reflects FWS's Fishway Prescriptions

FERC Issues License

FWS and Solicitor Respond to Request for Rehearing **

Stakeholders Monitor Implementation of Fishway Prescriptions Throughout License Period

* Applicant has opportunity to provide comments on preliminary mandatory conditions

** Applicant has opportunity to provide comments on modified (final) mandatory conditions

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Clorado 80225

STREET LOCATION:
134 Union Blvd.
Lakewood, Colorado 80228

FWS/R6
ES

OCT 0 4 2000

Honorable David P. Boergers, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Re: Prescription for a Fishway
Eric R. Jacobson
Jacobson Hydro No. 1 Project
FERC No. 4515-014; Colorado

Dear Mr. Boergers;

Enclosed for filing with the Federal Energy Regulatory Commission in the above-referenced hydroelectric license proceedings are four copies of this cover letter (the fourth cover letter copy is so that you may file stamp and return it in the enclosed self-addressed stamped envelope), and an original and three copies of the following:

1. United States Department of the Interior's Decision Document including Prescription for a Fishway Pursuant to Section 18 of the Federal Power Act;

2. Administrative Record of the Department of the Interior for the Prescription for a Fishway for the Jacobson's Hydro No. 1 Project.

The number of copies of the originals was changed from your normally requested eight copies of each original. This change was authorized by the Commission's Project Manager for these proceedings during a telephone call made by Patty Schrader Gelatt of my staff on August 29, 2000, for the purpose of asking for permission on this narrow procedural matter.

Each party named on the service list for this proceeding is being provided with a copy of item 1 and the Index to item 2 (items listed above), at this time. Any party may request a copy of materials from the Administrative Record by writing to:

Patty Schrader Gelatt
U.S. Fish and Wildlife Service
Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506

We will respond promptly and documents will be mailed via first class mail. A written request may be faxed to (970) 245-6933, but the original must be mailed to the above address.

Thank you for your cooperation in filing these documents.

Sincerely,

Regional Director

Enclosures:

1. Decision Document (16 pp.)
2. Index to the Administrative Record (3 pp.)
3. Administrative Record (binders 1 and 2)

cc: with enclosures 1 and 2

Andrew Fahlund
Policy Director of Hydropower Issues
American Rivers
1025 Vermont Avenue, NW, Suite 720
Washington, D.C. 20005

Mindy Schlimgen-Wilson
Conservation Associate
American Rivers SW
4120 North 20th Street, Suite G
Phoenix, AZ 85016

Eric Jacobson
P.O. Box 745
Telluride, CO 81435

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Eric R. Jacobson	)	**Jacobson Hydro No. 1**
	)	**Colorado River**
	)	**Mesa County, Colorado**
	)	**Project No. 4515-014**

UNITED STATES DEPARTMENT OF THE INTERIOR'S DECISION DOCUMENT, PRESCRIPTION FOR A FISHWAY PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT

Approved this OCT 04, 2000, by:

for **Ralph O. Morgenweck, Regional Director**

United States Department of the Interior
Fish and Wildlife Service
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

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UNITED STATES DEPARTMENT OF THE INTERIOR'S DECISION DOCUMENT, PRESCRIPTION FOR A FISHWAY PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT

1. Introduction

The United States Department of the Interior hereby submits its Prescription for a Fishway for the Jacobson's Hydro No. 1[1], pursuant to section 18 of the Federal Power Act, as amended. The Department is submitting this Decision Document and supporting Administrative Record to the Federal Energy Regulatory Commission.

The Department developed its Prescription for a Fishway through consultation with fisheries biologists and fishway engineers from the Department's U.S. Fish and Wildlife Service and Bureau of Reclamation.

2. Description of Project Area

The proposed Jacobson's Hydro No. 1 project is located on the Colorado River at the existing Price-Stubb Dam, Mesa County, Colorado (Figure 1). The Price-Stubb Dam has been in place since 1911, when the Palisade Irrigation District and Mesa County Irrigation District completed construction. The dam was originally used to divert irrigation water, but has not been used for that purpose since 1919, when the two subject irrigation districts began to divert water at the Bureau of Reclamation's Grand Valley Project Diversion Dam. The Price-Stubb Dam is a complete barrier to upstream fish passage. The licensee currently proposes to construct a 0.999 megawatt hydropower facility on the Colorado River, which would have a hydraulic capacity of 1,000 cubic feet per second. The proposed project would have an average annual generation of about 8,467,200 kilowatt-hours. This is a proposed amendment to the original licensed project, which was never constructed. The proposed powerhouse would be located on the right side (looking downstream) of the 8-foot high Price-Stubb Dam. There is currently no fishway at the Price-Stubb Dam.

3. Resource Description

The Colorado River originates in the Rocky Mountains of Colorado and flows through Colorado, Utah, Arizona, Nevada, and California. To facilitate management of water resources, the Colorado River basin was divided into Upper and Lower Basins in the 1922 Colorado River

[1]The Jacobson's Hydro No. 1 Project, FERC No. 4515-014, is located on the Colorado River in Mesa County, Colorado.

Price-Stubb Diversion Dam
Vicinity Map

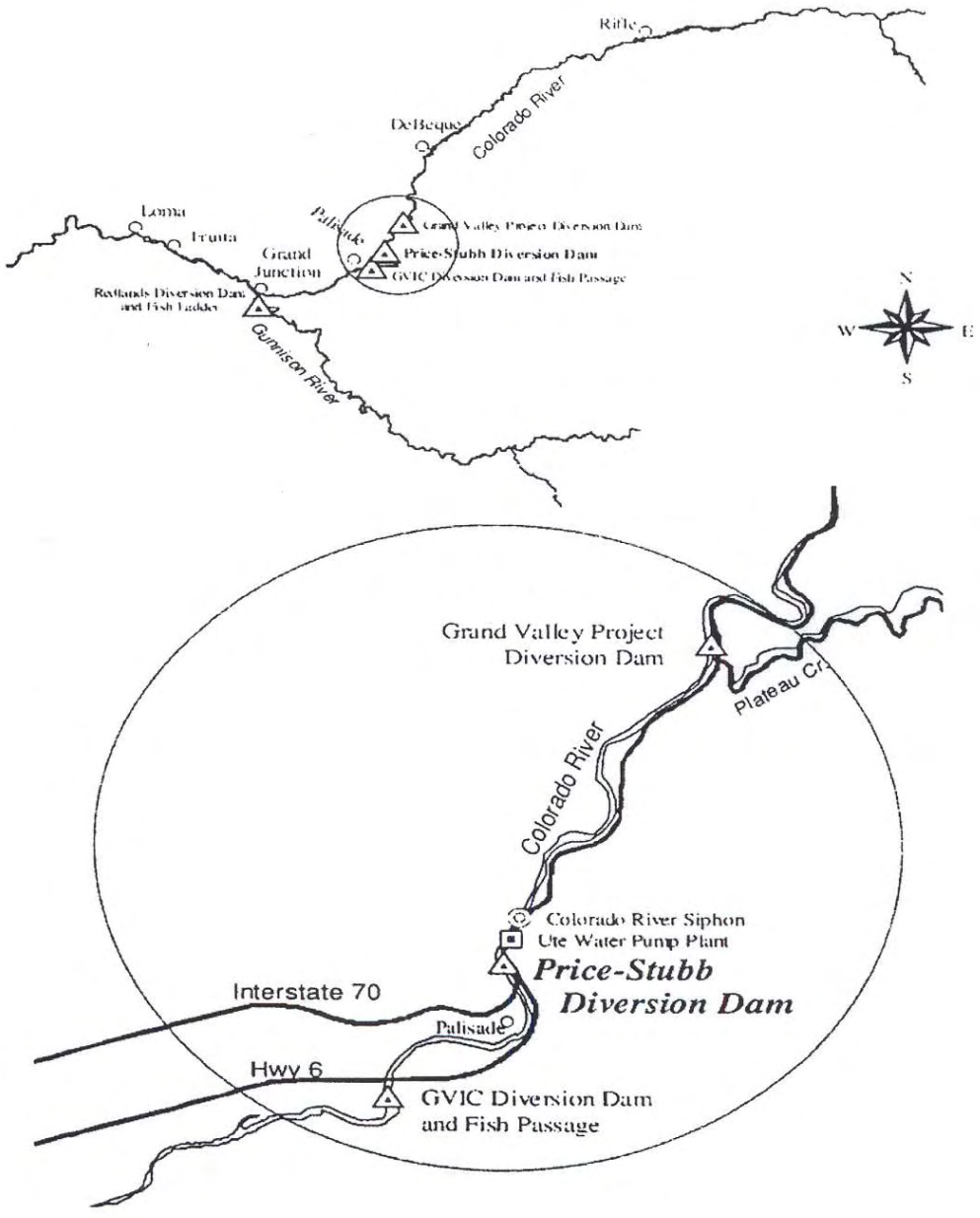

Figure 1

Compact, an agreement between the seven basin states. The major rivers in the Upper Basin include the Upper Colorado, Green, Gunnison, and San Juan Rivers.

The Colorado River watershed is a resource of tremendous importance. For example, it provides: 1) important habitats for numerous species of fish, wildlife, and plants, including four endangered fish species; 2) a multitude of recreational opportunities; and 3) a major source of water for irrigation, power production, industrial and municipal purposes. The Colorado River provides more water for consumptive uses than any other river in the United States.

The fish fauna of the Colorado River is composed of endemic fishes (found only in the basin), native nonendemic fishes, and nonnative fishes that have been introduced by humans. The native fish fauna is characterized by only 14 species. Because of geologic isolation, the Colorado River contains far fewer native species than other large river systems (e.g., Missouri River Basin has 150 native fish species). Changes in the aquatic resources of the Colorado River have had a profound effect on the native fish fauna.

3.1. Endangered Colorado Squawfish[2] (*Ptychocheilus lucius*)

The Colorado pikeminnow is the largest cyprinid fish (minnow family) native to North America and it evolved as the main predator in the Colorado River system. It is an elongated pike-like fish that during predevelopment times, may have grown as large as 6 feet in length and weighed nearly 100 pounds. Today, fish rarely exceed 3 feet in length or weigh more than 18 pounds; such fish are estimated to be 45-55 years old. The mouth of this species is large and nearly horizontal with long slender pharyngeal teeth (located in the throat), adapted for grasping and holding prey. The diet of Colorado pikeminnow longer than 3 or 4 inches consists almost entirely of other fishes. Males become sexually mature earlier and at a smaller size than do females, though both are mature by about age 7 and 500 mm (20 inches) in length. Adults are strongly countershaded with a dark, olive back, and a white belly. Young are silvery and usually have a dark, wedge-shaped spot at the base of the caudal fin.

Based on early fish collection records, archaeological finds, and other observations; the Colorado pikeminnow was once found throughout warmwater reaches of the entire Colorado River Basin down to the Gulf of California, and including reaches of the Upper Colorado River and its major tributaries, the Green River and its major tributaries, and the Gila River system in Arizona. Colorado pikeminnow apparently were never found in colder, headwater areas, but the species was abundant in suitable habitat throughout the entire Colorado River Basin prior to the 1850's. Suitable habitat exists for approximately 50 miles above the Price-Stubb Dam. The only reliable account of the species occurring upstream of the Price-Stubb Dam near Palisade, Colorado is

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[2]The American Fisheries Society has changed the common name of this species to Colorado pikeminnow (Nelson et al. 1998), therefore, it will be referred to as the Colorado pikeminnow in this document.

from a Service biologist who reports having captured Colorado pikeminnow 2-3 miles up Plateau Creek while angling there around 1960.

Jacobson's Hydro No. 1 is within critical habitat of the Colorado pikeminnow. Critical habitat is defined as the areas that provide physical or biological features that are essential for the survival and recovery of the species. Critical habitat was designated in 1994 within the 100-year floodplain of the Colorado pikeminnow's historical range in the following area of the Upper Colorado River (59 F.R. 13374).

> Colorado: Mesa and Garfield Counties; and Utah: Grand, San Juan, Wayne, and Garfield Counties. The Colorado River and its 100-year floodplain from the Colorado River Bridge at exit 90 north off Interstate 70 in T. 6 S., R. 93 W., section 16 (6th Principal Meridian) to North Wash, including the Dirty Devil arm of Lake Powell up to the full pool elevation, in T. 33 S., R. 14 E., section 29 (Salt Lake Meridian).

Major declines in Colorado pikeminnow populations occurred during the dam-building era of the 1930's through the 1960's. Dams, impoundments, and water use practices drastically modified the river's natural hydrology and channel characteristics throughout the Colorado River Basin. Dams on the mainstem broke the natural continuum of the river ecosystem into a series of disjunct segments, blocking native fish migrations, reducing temperatures downstream of dams, creating lacustrine habitat, and providing conditions that allowed competitive and predatory nonnative fishes to thrive both within the impounded reservoirs and in the modified river segments that connect them. The existing habitat has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering (USFWS 1991).

The estimated population of adult and subadult Colorado pikeminnow in the Colorado River (from Palisade to the confluence with the Green River, Figure 2) was 600-650 individuals during 1991-1994. This breaks down to an average of 4.0-4.2 fish per mile above Westwater Canyon, and 3.1-3.4 fish per mile below Westwater Canyon. Preliminary estimates from a 1998 survey indicate a population of over 750 subadults and adults in the Colorado River.

The Price-Stubb Dam has been a barrier to upstream fish movement since 1911. No Colorado pikeminnow have been captured above the dam since scientific studies of the endangered fishes began in 1979. One radio-tagged Colorado pikeminnow was documented at the base of the Price-Stubb Dam in 1986 (Osmundson and Kaeding 1989). During recent studies, 10 Colorado pikeminnow were captured above the Grand Valley Irrigation Company Diversion Dam 3 miles downstream of the project site (Burdick 1999). The Recovery Implementation Program for endangered fishes in the Upper Colorado River Basin began stocking Colorado pikeminnow in the Colorado River between Rifle and De Beque Canyon in the year 2000 to augment existing populations. This should result in the occurrence of stocked Colorado pikeminnow in the immediate project vicinity.

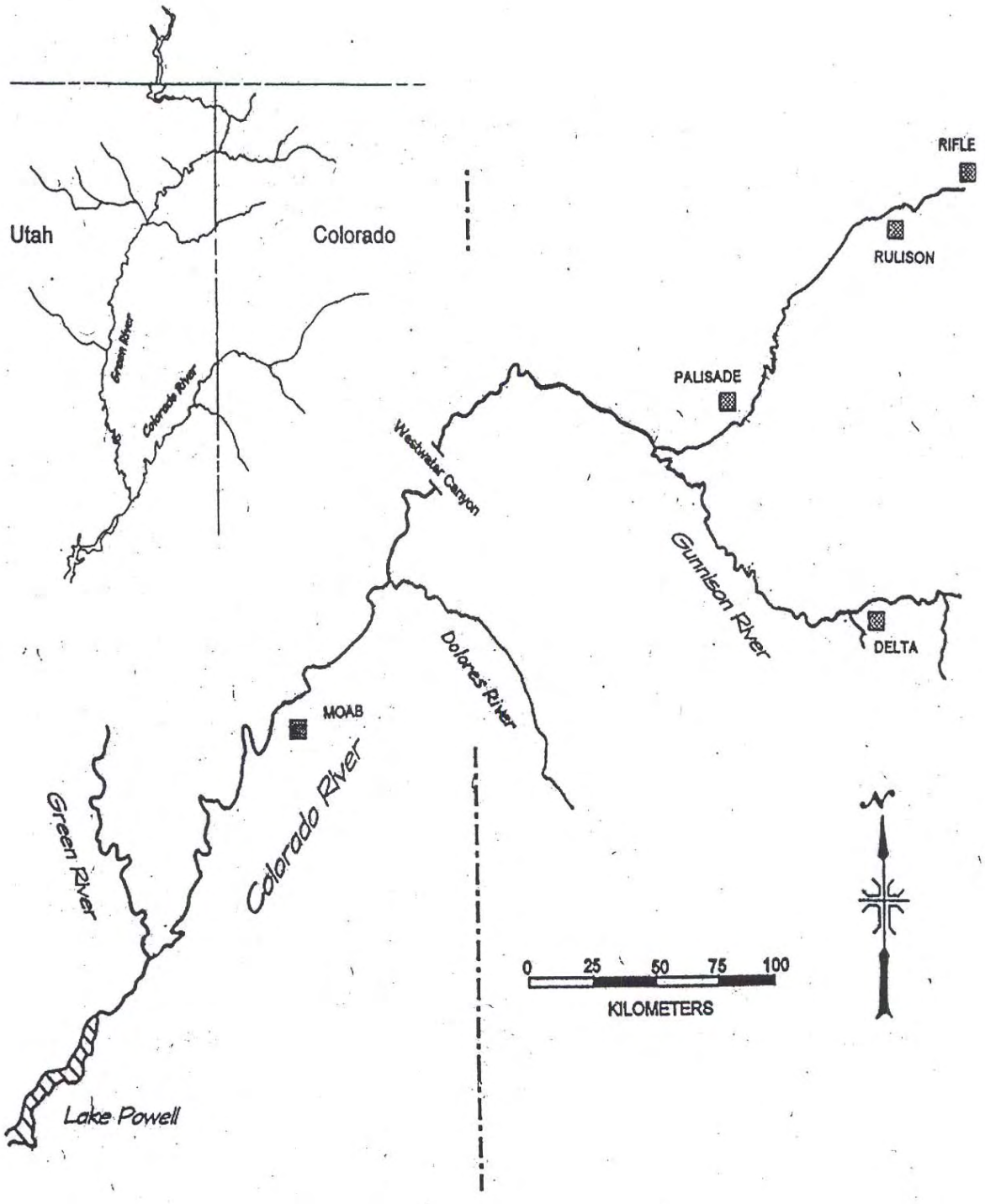
Utah
Colorado
Green River
Colorado River
RIFLE
RULISON
PALISADE
Westwater Canyon
Gunnison River
DELTA
Dolores River
MOAB
Green River
Colorado River
Lake Powell
0 25 50 75 100
KILOMETERS

Figure 2

Although the dam has blocked upstream fish movement since the early 1900's, anecdotal accounts show that Colorado pikeminnow historically occurred both upstream and downstream of the dam. The habitat above the dam has been designated critical habitat which is needed for survival and recovery of the Colorado pikeminnow. Critical habitat provides the physical and biological attributes that are essential to species conservation. The habitat above the dam provides space for individual and population growth; appropriate food; water of sufficient quality (temperature, dissolved oxygen, turbidity, etc.) and quantity; and physical habitat appropriate for potential spawning, nursery, feeding, and rearing areas (Anderson 1997, Osmundson 1999). In addition to the main river channel above the dam, critical habitat includes bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas within the floodplain that when inundated provide important spawning, nursery, feeding and rearing habitats.

Anderson (1997) identified 25 potential spawning sites above the Grand Valley Project Dam and determined that runs (deep moving water) and pools, which provide good wintering and feeding habitat, comprise 49 to 70 percent of the available habitat. Osmundson (1999) and Anderson (1997) both documented that an adequate forage base is available for the predatory Colorado pikeminnow. The Price-Stubb Dam and the Grand Valley Project Dam block an important corridor to access these areas, which are essential to the survival and recovery of the species. Survival and recovery of the species depends on increases in population, which can be accomplished by range expansion. Range expansion could be accomplished by providing passage at the Price-Stubb Dam and Grand Valley Project Dam (USFWS 2000c).

Therefore, the Service included a fishway as a reasonable and prudent alternative to avoid jeopardy to the continued existence of the Colorado pikeminnow and to avoid adverse modification to designated critical habitat in the August 4, 2000, biological opinion on the proposed amendment to Jacobson's Hydro No. 1 (USFWS 2000a), which we hereby incorporate into this document. Also, the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (USFWS 1987) has included fish passage at the Price-Stubb Dam as part of their Recovery Action Plan since 1993 (USFWS 2000b) in order to provide access to historic habitat and increase the size of the Colorado pikeminnow population. Both Osmundson (1999) and Anderson (1997) recommend providing passage at Price-Stubb Dam and the Grand Valley Project Dam to increase the carrying capacity of the Colorado River.

3.2. Endangered Razorback Sucker (*Xyrauchen texanus)*

The razorback sucker, an endemic species unique to the Colorado River Basin, was historically abundant and widely distributed within warmwater reaches throughout the Colorado River Basin. The razorback sucker is the only sucker with an abrupt sharp-edged dorsal keel behind its head. It has a large fleshy subterminal mouth that is typical of most suckers. Adults often exceed 3 kg (6 pounds) in weight and 600 mm (2 feet) in length.

Historically, razorback suckers were found in the mainstem Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and Mexico. This

species was once so numerous that it was commonly used as food by early settlers. Furthermore, commercially marketable quantities were caught in Arizona as recently as 1949. In the Upper Basin, razorback suckers were reported in the Green River to be very abundant near the town of Green River, Utah, in the late 1800's. An account in Osmundson and Kaeding (1989) reported that residents living along the Colorado River near Clifton, Colorado, observed several thousand razorback suckers during spring runoff in the 1930's and early 1940's.

A marked decline in populations of razorback suckers can be attributed to construction of dams and reservoirs, introduction of nonnative fishes, and removal of large quantities of water from the Colorado River system (USFWS 1998). Dams on the mainstem Colorado River and its major tributaries have segmented the river system, blocking migration routes. Dams also have drastically altered flows, temperatures, and channel geomorphology. These changes have modified habitats in many areas so that they are no longer suitable for breeding, feeding, or sheltering (USFWS 1998). Major changes in species composition have occurred due to the introduction of numerous nonnative fishes, many of which have thrived due to man-induced changes to the natural riverine system (USFWS 1998).

In the Upper Basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic and lotic environments. The largest population of razorback suckers in the Upper Basin is found in the Upper Green River and lower Yampa River. In 1989, it was estimated that from 758 to 1,138 razorback suckers inhabit the Upper Green River. No significant decrease in the population was reported between 1982 and 1992, and the continued presence of fish smaller than 480 mm during the study period suggest some level of recruitment. In the Colorado River, most razorback suckers occur in the Grand Valley area near Grand Junction, Colorado; however, Osmundson and Kaeding (1991) report that the number of razorback sucker captures in the Grand Junction area has declined dramatically since 1974. In 1991 and 1992, 28 adult razorback suckers were collected from isolated ponds adjacent to the Colorado River near De Beque, Colorado, upstream of the Price-Stubb Dam (Burdick 1992). The existing habitat has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering (USFWS 1998).

The current range of the razorback sucker in the Colorado River extends upstream to Rifle, Colorado (Burdick 1992). Osmundson and Kaeding (1989) found that 76 percent of the razorback suckers captured in the Colorado River between 1979 and 1985 were captured in the Grand Valley area. Most razorback suckers captured in the Grand Valley area have been located in flooded gravel-pit ponds adjacent to the river. However, Osmundson and Kaeding (1989) documented razorback sucker movement in various river habitats in the Grand Valley area. Additional surveys since 1988 have documented razorback suckers in riverside ponds as far upstream as river mile 235 near Rifle, Colorado (Burdick 1992). The existing habitat has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering (USFWS 1991). Over the next 5 years, the Recovery Program plans to stock juvenile and subadult razorback suckers (150-300 mm long) upstream of the Price-Stubb Dam; up to the

current date, it has stocked over 10,000 juveniles. The purpose of these stocking efforts is to reestablish populations of razorback sucker in the Colorado River.

Jacobson's Hydro No. 1 is within critical habitat of the razorback sucker. Critical habitat was designated in 1994 within the 100-year floodplain of the razorback sucker's historical range in the following area of the Upper Colorado River (59 F.R. 13374).

> Colorado: Mesa and Garfield Counties. The Colorado River and its 100-year floodplain from Colorado River Bridge at exit 90 north off Interstate 70 in T. 6 S., R. 93 W., section 16 (6th Principal Meridian) to Westwater Canyon in T. 20 S., R. 25 E., section 12 (Salt Lake Meridian) including the Gunnison River and its 100-year floodplain from the Redlands Diversion Dam in T. 1 S., R. 1 W., section 27 (Ute Meridian) to the confluence with the Colorado River in T. 1 S., R. 1 W., section 22 (Ute Meridian).

The Price-Stubb Dam has blocked upstream fish movement since the early 1900's, and records show that razorback sucker historically occurred both upstream and downstream of the dam (Burdick 1992). The habitat above the dam has been designated critical habitat which is needed for survival and recovery of the razorback sucker. Critical habitat provides the physical and biological attributes that are essential to species conservation. The habitat above the dam provides space for individual and population growth; appropriate food; water of sufficient quality (temperature, dissolved oxygen, turbidity, etc.)and quantity; physical habitat appropriate for spawning, nursery, feeding, and rearing (Anderson 1997). In addition to the main river channel above the dam, critical habitat includes bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas within the floodplain that when inundated provide important spawning, nursery, feeding and rearing habitats. While the area below the Price-Stubb Dam provides some of these habitat features, large diversions below the dam reduce the potential of bottom lands and other important off-channel habitats to be available to razorback suckers.

Floodplain habitats have been identified as important for razorback sucker nursery, rearing , feeding, and potentially spawning areas (Wydoski and Wick 1998). Anderson (1997) estimated 29 percent of the shoreline would be inundated during high flows, and 14 percent of the shoreline has adjacent wetlands that would be inundated and provide important habitat for razorback sucker. In an inventory of floodplain habitats (Irving and Burdick 1995), the Colorado River between Rifle and De Beque was identified as an area where floodplain habitats are concentrated. One area near De Beque was ranked the fourth most important area out of 158 sites considered on the Colorado and Gunnison Rivers, because of its proximity to recent adult razorback captures and the potential for a hydrologic connection to the river during June. The Price-Stubb Dam blocks an important corridor to access these areas, which are essential to the survival and recovery of the species.

Therefore, the Service included a fishway as a reasonable and prudent alternative to avoid jeopardy to the continued existence of the razorback sucker and to avoid adverse modification to designated critical habitat in the recent biological opinion on the proposed amendment to

Jacobson's Hydro No. 1 (USFWS 2000a). Also, the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (USFWS 1987) has included fish passage at the Price-Stubb Dam as part of their Recovery Action Plan since 1993 (USFWS 2000b) in order to provide access to historic habitat and increase the population size of the razorback sucker in the Colorado River.

3.3. Endangered Bonytail *(Gila elegans)*

Bonytail are medium-sized (less than 600 mm) fish in the minnow family. Adult bonytail are gray or olive colored on the back with silvery sides and a white belly. The adult bonytail has an elongated body with a long, thin caudal peduncle.

The bonytail is the rarest native fish in the Colorado River. It was listed as endangered April 23, 1980. Formerly reported as widespread and abundant in mainstem rivers, its populations have been greatly reduced. The fish is presently represented in the wild by a low number of old adult fish in Lake Mohave and perhaps other lower basin reservoirs (USFWS 1990a). The last known riverine area where bonytail were common was the Green River in Dinosaur National Monument, where 91 specimens were collected during 1962-1966. From 1977 to 1983, no bonytail were collected from the Colorado or Gunnison Rivers in Colorado or Utah. However, in 1984, a single bonytail was collected from Black Rocks on the Colorado River. Several suspected bonytail were captured in Cataract Canyon in 1985-1987.

Critical habitat was designated in 1994, within the bonytail's historical range in the following sections of the Upper Colorado River (59 F.R. 13374).

> Utah: Grand County; and Colorado: Mesa County. The Colorado River from Black Rocks (river mile 137) in T. 10 S., R. 104 W., section 25 (6th Principal Meridian) to Fish Ford in T. 21 S., R. 24 E., section 35 (Salt Lake Meridian).
>
> Utah: Garfield and San Juan Counties. The Colorado River from Brown Betty Rapid in T. 30 S., R. 18 E., section 34 (Salt Lake Meridian) to Imperial Canyon in T. 31 S., R. 17 E., section 28 (Salt Lake Meridian).

Black Rocks and Cataract Canyon, which are many miles downstream of the proposed project, are the only areas where bonytail have been found in the Upper Colorado River in the last 20 years. However, bonytail are scheduled to be stocked in the Colorado River downstream of the Price-Stubb Dam between Palisade and Loma (Figure 1) within the next 5 years to re-establish populations within the historic range of the species. After stocking, these fish could occupy the project area, and a fishway would provide access to habitat above the Price-Stubb Dam. The importance of the habitat upstream of the dam is not known at this time because of the lack of data on habitat requirements for the bonytail.

4. Management Goals

The following is a discussion of the management goals established by the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin for the fish species for which improved fish passage is targeted in this Prescription. In addition to these species, the Colorado River supports populations of roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis),* and bluehead sucker (*Catostomus discobolus*) that are also expected to utilize the fish passage facilities and will benefit from the fishway being constructed and operated as prescribed.

On January 21-22, 1988, the Secretary of the Interior; Governors of Wyoming, Colorado, and Utah; and the Administrator of the Western Area Power Administration cosigned a Cooperative Agreement to implement the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (USFWS 1987). Current participants in the Recovery Program include the following: the U.S. Fish and Wildlife Service, Bureau of Reclamation, Western Area Power Administration, States of Colorado, Utah, and Wyoming, Environmental Defense Fund, The Nature Conservancy, Colorado Water Congress, Utah Water Users Association, Wyoming Water Development Association, and the Colorado River Energy Distributors Association. The goal of the Recovery Program is to recover the listed fish species while providing for new and existing water development in the Upper Colorado River Basin. All participants agreed to cooperatively work toward the successful implementation of a recovery program that will provide for recovery of the endangered fish species, consistent with Federal law and all applicable State laws and systems for water resource development and use. Each signatory assumed certain responsibilities in implementing the Recovery Program.

The Recovery Program developed a Recovery Action Plan (USFWS 2000b) that outlines recovery actions that will be carried out to recover the Colorado River endangered fish species. The original plan was finalized on October 15, 1993, and is updated annually. The plan contains the following recovery elements:

I. Protect instream flows
II. Restore habitat
III. Reduce negative impacts of nonnative fishes and sportfish management activities
IV. Conserve genetic integrity and augment or restore populations
V. Monitor populations and habitat and conduct research to support recovery actions
VI. Increase public awareness and support for the endangered fishes and the Recovery Program
VII. Provide program planning and support

Element number two, restoration of habitat, includes the restoration of fish passage at barriers within historically occupied habitat of the endangered fishes. Providing passage at the Price-Stubb Dam is specifically identified in the Recovery Action Plan. Specifically, the Recovery Action Plan states: "Passage barriers have fragmented endangered fish population and

their habitats, resulting in confinement of the fishes to 20 percent of their former range. Blockage of Colorado pikeminnow movement by dams and water-diversion structures has been suggested as an important cause of the decline of this species in the Upper Basin." The Bureau of Reclamation has constructed a fish passage at the Grand Valley Irrigation Company Diversion Dam, is preparing the environmental assessment for a passage structure at the Price-Stubb Dam, and has initiated plans for passage at the Grand Valley Project's Government Highline Dam on the Upper Colorado River. Successfully providing fish passage at these diversions dams would benefit both Colorado pikeminnow and razorback suckers by providing access to approximately 50 miles of the river that was used historically by these fish and is still appropriate habitat for these species. Increases in population size are needed for the survival and recovery of these species, and expansion of the current range of the species is one recovery action that would help achieve this goal.

The Fish and Wildlife Service has developed recovery goals for each species, which are described in the individual recovery plans for each species (USFWS 1990,1991,1998). Recovery for the endangered fishes is considered according to two recovery units: the Upper Colorado River Basin (upstream of Lee's Ferry, Arizona) and the Lower Basin (downstream of Lee's Ferry). Updated recovery goals are currently being formulated to supplement each plan. The draft supplement to the Colorado pikeminnow recovery plan (USFWS 2000c) identifies the following recovery criteria for the Colorado River in the Upper Basin: when there are genetically and demographically viable, self-sustaining populations with adult estimates whose lower 95 percent confidence interval exceeds 800 adults in the Colorado River above Lake Powell (with sustainable recruitment). Also, if recovery cannot be achieved in the San Juan River (target of 800 adults maintained through natural recruitment and/or augmentation), the minimum population estimate for the Colorado River would be 1,000 adults.

The draft supplement to the razorback sucker recovery plan (USFWS 2000d) identifies a minimum population of 5,800 adults in the Upper Colorado River, with sustainable recruitment. The draft supplement to the bonytail recovery plan (USFWS 2000e) calls for a minimum estimated adult population of 4,350 bonytail in the Upper Colorado River subbasin (with sustainable recruitment). Establishing passage over dams and diversions to expand range and maintain unimpeded passage is listed as an action needed to meet the recovery goals for the Colorado pikeminnow, razorback sucker, and bonytail to increase their population size.

To carry out the recovery action of providing fish passage at the Price-Stubb Dam, the Bureau of Reclamation as a participant in the Recovery Program, prepared a draft Environmental Assessment on Price-Stubb Fish Passage (USBR 1999). The draft Environmental Assessment examined three alternatives for providing fish passage: 1) a fish ladder with the Jacobson's Hydro No. 1 project in place; 2) a fish ladder without a hydropower project; and 3) dam removal. The preferred alternative identified in the draft Environmental Assessment was the dam removal alternative because it would best meet project purposes, is the least costly alternative to construct, and eliminates operation and maintenance costs.

On December 20, 1999, the Service issued the final programmatic biological opinion for Bureau of Reclamation's Operations and Depletions, Other Depletions, and Funding and Implementation of Recovery Program Actions in the Upper Colorado River above the Confluence with the Gunnison River (USFWS 1999). This biological opinion identified fish recovery actions that are necessary to avoid jeopardy and adverse modification of critical habitat for the Colorado River endangered fishes caused by existing and future water depletions. Passage at the Price-Stubb Dam is one recovery action identified. The programmatic biological opinion did not address direct physical impacts of new actions (projects constructed after January 22, 1988) or projects other than those that cause a water depletion to the Colorado River. Therefore, in a letter to Mr. Eric R. Jacobson, dated December 17, 1999, the Service explained why Jacobson's Hydro No.1 is not addressed in the programmatic biological opinion and that a separate biological opinion dated August 4, 2000, was prepared to address the proposed hydropower project.

5. Statutory Authority

Section 18 of the Federal Power Act, 16 USCS §811, states in pertinent part:

> "the Commission shall require the construction, maintenance and operation by a licensee of...such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior."

Section 1701(b) of the National Energy Policy Act of 1992, P.L. 102-486, Title XVII, §1701(b), 106 Stat. 3008, states:

> "the items which may constitute a 'fishway' under section 18 [16 USCS §811] for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and project operations and measures related to such structures, facilities or devices necessary to ensure the effectiveness of such structures, facilities, or devices for such fish."

The Prescription for a Fishway herein is issued under authority delegated to the Regional Director from the Secretary of the Interior; the Assistant Secretary for Fish, Wildlife and Parks; and the Director of the U.S. Fish and Wildlife Service pursuant to section 18 of the Federal Power Act. (See 64 Stat. 1262; 209 Departmental Manual 6.1; 242 Departmental Manual 1.1A.)

6. Procedural Background

On April 13, 1990, the Service issued a biological opinion on the subject project. The opinion concluded that the proposed project was not likely to jeopardize the continued existence of the Colorado pikeminnow. The opinion stated that reinitiation of consultation will be required if the project is modified in ways that affect listed species beyond the scope of the opinion, if new proposed or listed species may be affected by the project, if new information becomes available which reveals impacts not considered, or if incidental take of Colorado pikeminnow results from

project construction or operation. On June 19, 1990, Eric R. Jacobson was issued a license for the Jacobson's Hydro No. 1 (Project Number 4515). The order issuing the license stated that the Department of the Interior reserved its right to prescribe fishways at the project, pursuant to section 18 of the Federal Power Act.

On October 23, 1991, the razorback sucker was listed as endangered. On October 15, 1993, the Recovery Action Plan for the four Colorado River endangered fishes was finalized, and it identified the restoration of passage at the Price-Stubb Dam as an action necessary for recovery of the endangered fishes. On April 20, 1994, critical habitat was designated for the Colorado pikeminnow, razorback sucker, bonytail, and humpback chub. Therefore, because of the aforementioned activities, the Commission was required to reinitiate section 7 consultation under the Endangered Species Act, because reinitiation is required under the following circumstances where discretionary Federal involvement of control over the action has been retained: 1) if the amount or extent of taking specified in the incidental take statement is exceeded; 2) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; 3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or 4) if a new species is listed or critical habitat designated that may be affected by the identified action.

On December 8, 1994, the Commission issued an order granting the request of Eric R. Jacobson to stay the license to resolve Endangered Species Act issues. When the stay is lifted, the Commission will backdate the stay of the licence to allow for the 90-day pre-construction filing deadlines, plus one month to assemble the plans and materials to be filed. On June 27, 1996, the licensee filed a request to amend the license to address Endangered Species Act issues and to relocate the tail race because the original alignment, which followed an existing ditch, had been filled in with dirt.

On April 22, 1999, Endangered Species Act consultation was reinitiated. On August 4, 2000, the Service issued a final biological opinion that concluded that the proposed project is likely to jeopardize the Colorado pikeminnow, razorback sucker, and bonytail and adversely modify critical habitat of the Colorado pikeminnow and razorback sucker. One reasonable and prudent alternative to avoid the likelihood of jeopardy and adverse modification of critical habitat is to provide an upstream fishway at the Price-Stubb Dam (USFWS 2000a).

7. Administrative Record

Documents in support of the Department's Prescription for a Fishway are contained in the enclosed Administrative Record. This Decision Document summarizes the rationale and basis for its Prescription for a Fishway. The Service is filing the Administrative Record for its Prescription for a Fishway with the Commission Secretary and will make the Administrative Record available to all parties to this proceeding upon request.

8. Alternatives Considered

Before the final formulation of this Prescription, the Department reviewed and considered a variety of alternative fish passage facilities and measures, which are presented in the Bureau of Reclamation's Draft Environmental Assessment for the Price-Stubb Fish Passage. That analysis of alternatives is included in the Department's Administrative Record.

9. Reservation of Authority to Prescribe Fishways

The Commission shall include the following condition in any license amendment it may issue for the Jacobson's Hydro No. 1 Project:

> Pursuant to section 18 of the Federal Power Act, as amended, the Secretary of the Department of the Interior, as delegated to the U.S. Fish and Wildlife Service, exercises his/her authority under section 18 by reserving the authority to modify this Prescription for a Fishway at any time before the license amendment is issued, as well as any time during the term of any license issued, after review of new information or for other pertinent reason.

10. Prescription for Fishway

Pursuant to section 18 of the Federal Power Act, as amended, the Secretary of the Department of the Interior, as delegated to the U.S. Fish and Wildlife Service, exercises his/her authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary.

10.1. General Terms and Conditions

A. A fishway shall be constructed, operated, and maintained to provide safe, timely, and effective upstream passage for Colorado pikeminnow, razorback sucker, bonytail, roundtail chub, flannelmouth sucker, and bluehead sucker at the licensee's expense[3].

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[3]The Recovery Program has included fish passage at the Price-Stubb Dam as part of their Recovery Action Plan since 1993. The Recovery Program is intended to offset the direct impacts of historic projects occurring prior to January 22, 1988, but new projects within critical habitat are responsible for offsetting their own impacts to critical habitat. Therefore, the Recovery Program intends to fund fish passage at historic dams within the range of the endangered fishes, including the Price-Stubb Dam. Although the licensee may not assume he can rely on the Recovery Program to offset impacts, if Federal funds are available prior to hydropower construction, the Recovery Program would partially fund fish passage at the Price-Stubb Dam, and the applicant may take advantage of this funding to help fulfill the fishway requirements outlined above.

If Federal funds are available in a timely manner, they would only be available for the least expensive alternative for fish passage. As described in Reclamation's draft EA (April,1999), the least expensive alternative for fish passage at the Price-Stubb Dam is dam removal. Therefore, the Recovery Program is willing to assist the licensee in funding the fishway up to the amount required for the least expensive fish passage alternative. The estimated cost of construction, operation, and maintenance of a fishway is $2.2 million. The estimated cost to remove the dam

To ensure the immediate and timely contribution of the fishway to the ongoing fish recovery program in the Colorado River, the following measures are included to ensure the effectiveness of the fishway pursuant to section 1701(b) of the 1992 National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008). All plans shall be submitted to the U.S. Fish and Wildlife Service in draft with adequate review time for the purpose of obtaining the Service's approval before implementation.

B. Timing of fishway construction and initial operation--the fishway shall be fully operational as soon as possible. Except as identified in the construction schedules for specific measures identified below, the fishway facilities shall be fully operational no later than two years after the date of issuance of a license amendment so that benefits of passage improvements can be realized as soon as practicable.

C. The timely installation of the prescribed fishway structures, facilities, or devices is necessary to ensure the effectiveness of such structures, facilities or devices. Therefore, the Department of the Interior's Prescription includes the express requirement that the licensee both notify and obtain approval from the U.S. Fish and Wildlife Service for any extensions of time needed to comply with the provisions included in the Department's Prescription for a Fishway.

D. In consultation with the U.S. Fish and Wildlife Service, the licensee shall keep the fishway in proper order and shall keep the fishway area clear of trash, logs, and material that would hinder passage. In consultation with and the Service, the licensee shall develop a fishway maintenance plan describing the anticipated maintenance, a maintenance schedule, and contingencies. The plan shall be submitted to the Service for final review and approval prior to fishway construction. The Service and Bureau of Reclamation may be able to operate and provide maintenance for the fishway through an agreement with the licensee, any such agreement should be included in the maintenance plan.

E. The licensee shall develop plans and schedules for and conduct fishway effectiveness evaluations in consultation with the U.S. Fish and Wildlife Service. The plans and results of effectiveness studies shall be submitted to the Service for final approval.

F. The licensee shall provide personnel of the U.S. Fish and Wildlife Service and the Bureau of Reclamation, and other Service designated representatives, access to the project site

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currently is $1.9 million (USBR 1999). Due to several uncertainties, Reclamation feels this cost estimate is high and the actual removal cost could be significantly lower, perhaps $1.0 million. Therefore, the licensee would be responsible for the difference between $2.2 million and the removal cost as determined by a licensed professional engineering firm with demolition experience, as accepted by the Service and Reclamation. The cost of the estimate of dam removal by the licensed professional engineering firm must be evenly divided between the Recovery Program and the licensee.

and to pertinent project records for the purpose of inspecting the fishway to determine compliance with the Fishway Prescription. The licensee shall grant a temporary construction easement and permanent right-of-way to the Bureau of Reclamation for any construction, operation or maintenance activities determined by the Bureau to be of value to the Recovery Program.

G. The licensee shall develop all functional and final design plans, and construction schedules in consultation and cooperation with the U.S. Fish and Wildlife Service and Bureau of Reclamation, and submit all plans and schedules for approval by the Service.

H. The licensee shall develop plans for implementing general and specific terms and conditions for the design, construction, operation, and funding of the fishway and submit them for approval to the U.S. Fish and Wildlife Service and Bureau of Reclamation prior to submitting the plans to the Commission.

10.2 Specific Terms and Conditions

A. The design shall follow the specifications of the Bureau of Reclamation's proposed design for the "fish ladder with hydropower plant" alternative outlined in the draft Environmental Assessment for the Price-Stubb Fish Passage (USBR 1999).

B. The ladder shall be placed on the right bank of the river (looking downstream). The ladder shall consist of a 200- to 250-foot-long concrete channel, 6-feet wide and 8- to 10-feet deep. The upstream entrance to the channel shall have a trash rack to prevent debris from entering the ladder. Baffles shall divide the channel into series of small pools. The baffles shall be placed at intervals to keep flows at appropriate velocities for native fishes.

C. The fishway shall include a fish trap to allow selective removal/passage to prevent nonnative fishes from traveling upstream of the dam.

D. The fishway shall be operated year round.

E. A flow of 25 cfs shall be provided to operate the fish ladder. Discharge from the power plant will be directed so that it acts as the attractive flow for the passageway.

F. The applicant shall design, construct, and maintain a fish exclusion device that prevents adult, sub-adult (>200 mm), and juvenile (100mm-200mm) Colorado pikeminnow, razorback sucker, and bonytail from entering the powerhouse and coming in contact with the turbines. The plans for this exclusion device shall be submitted to the U.S. Fish and Wildlife Service for approval before the plans are submitted to FERC and before the device is constructed.

G. The applicant shall design, install, and maintain turbines that pass 95 percent of larval fishes without causing death or injury. The designs shall be approved by the U.S. Fish and Wildlife Service prior to implementation.

H. The applicant shall design the powerhouse so that, when the turbines are shut off, flow can be routed around the turbines and not harm fish.

I. For two weeks after each stocking of endangered fishes that occurs upstream of the dam, the turbines shall be shut down and flows routed around the powerhouse.

J. A monitoring plan shall be submitted to the U.S. Fish and Wildlife Service for approval. Quarterly monitoring reports shall be submitted to the Service and shall include turbine mortality study results. The monitoring shall determine the amount of take associated with the hydropower turbines, be developed prior to project construction, and be implemented within the first year of project operation.

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Eric R. Jacobson	)	**Jacobson Hydro No. 1**
	)	**Colorado River**
	)	**Mesa County, Colorado**
	)	**Project No. 4515-014**

UNITED STATES DEPARTMENT OF THE INTERIOR'S ADMINISTRATIVE RECORD IN SUPPORT OF PRESCRIPTION FOR A FISHWAY

United States Department of the Interior
Fish and Wildlife Service
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

INDEX

TO THE ADMINISTRATIVE RECORD FOR PRESCRIPTION FOR A FISHWAY, BY THE DEPARTMENT OF THE INTERIOR

This is the Index for the Administrative Record for the Prescription for a Fishway for the Jacobson's Hydro No. 1 Project (FERC No. 4515-014, Colorado), submitted by the Department of the Interior (Department). This Administrative Record supports the Department's Prescription for a Fishway made pursuant to section 18 of the Federal Power Act, and submitted to the Federal Energy Regulatory Commission (FERC or Commission) with the Department's Decision Document.

A. DOCUMENTS INCORPORATED BY REFERENCE

All public records and documents are currently part of the Commission's record for Project No. 4515-014.

B. REFERENCES CITED IN DECISION DOCUMENT

Tab 1. Anderson, R. 1997. An Evaluation of Fish Community Structure and Habitat Potential for Colorado Squawfish and Razorback Sucker in the Unoccupied Reach (Palisade to Rifle) of the Colorado River, 1993-1995. Final Report. Colorado Division of Wildlife, Fort Collins, Federal Aid Project SE-3. 81 pp.

Tab 2. Burdick, B.D. 1999. Evaluation of Fish Passage at the Grand Valley Irrigation Company Diversion Dam on the Colorado River near Palisade, Colorado. Final Report. Colorado River Recovery Program. Project Number CAP-17.

Tab 2. Burdick, B.D. 1992. A Plan to Evaluate Stocking to Augment or Restore Razorback Suckers in the Upper Colorado River. Final Report. U.S. Fish and Wildlife Service, Grand Junction, Colorado. 56 pp.

Tab 3. Federal Register, Volume 59, No. 54, March 21, 1994, Rules and Regulations. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangered Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub.

Tab 4. Irving, D.B. and B.D. Burdick. 1995. Reconnaissance Inventory and Prioritization of Existing and Potential Bottomlands in the Upper Colorado River Basin, 1993-1994. Final Report. U.S. Fish and Wildlife Service, Vernal, Utah. 57 pp. + appendices.

Tab. 5 Osmundson, D. B. 1999. Longitudinal Variation in Fish Community Structure and Water Temperature in the Upper Colorado River: Implications for Colorado Pikeminnow Habitat Suitability. Final Report. U.S. Fish and Wildlife Service, Grand Junction, Colorado.

Tab 5. Osmundson, D. B., and K. P. Burnham. 1998. Status and Trends of the Endangered Colorado Squawfish in the Upper Colorado River. Transaction of the American Fisheries Society 127:959-972.

Tab 5. Osmundson, D.B., and L.R. Kaeding. 1991. Recommendations for Flows in the 15-Mile Reach During October-June for Maintenance and Enhancement of Endangered Fish Populations in the Upper Colorado River. Final Report. U.S. Fish and Wildlife Service, Grand Junction, Colorado.

Tab 5. Osmundson, D.B., and L.R. Kaeding. 1989. Studies of Colorado Squawfish and Razorback Sucker Use of the "15-Mile Reach" of the Upper Colorado River as Part of Conservation Measures for the Green Mountain and Ruedi Reservoir Water Sales. Final Report. U.S. Fish and Wildlife Service, Grand Junction, Colorado.

Tab 5. Osmundson, D.B., M.E. Tucker, B.D. Burdick, W.R. Elmblad and T.E. Chart. 1997. Non-spawning Movements of Sub-adult and Adult Colorado Squawfish in the Upper Colorado River. Final Report. U.S. Fish and Wildlife Service, Grand Junction, Colorado.

Tab 6. U.S. Bureau of Reclamation. 1999. Price-Stubb Fish Passage Draft Environmental Assessment. Western Colorado Area Office, Grand Junction , Colorado.

Tab 7. U.S. Fish and Wildlife Service. 2000a. Final Biological Opinion for Jacobson Hydro No. 1 Project (FERC Project No. 4515-014).

Tab 7. U.S. Fish and Wildlife Service. 2000b. Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement and Recovery Action Plan (RIPRAP), Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, Colorado. 40 pp.

Tab 7. U.S. Fish and Wildlife Service. 2000c. Draft Final Recovery Goals for the Colorado Pikeminnow (*Ptychocheilus lucius*)of the Colorado River Basin. A Supplement to the Colorado Squawfish Recovery Plan. Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, Colorado.

Tab 8. U.S. Fish and Wildlife Service. 2000d. Draft Final Recovery Goals for the Razorback Sucker (*Xyrauchen texanus*) *lucius*)of the Colorado River Basin. A Supplement to the Razorback Sucker Recovery Plan. Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, Colorado.

Tab 8. U.S. Fish and Wildlife Service. 2000e. Draft Final Recovery Goals for the Bonytail (*Gila elegans*) of the Colorado River Basin. A Supplement to the Bonytail Chub Recovery Plan. Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, Colorado.

Tab 9. U.S. Fish and Wildlife Service. 1999. Final Programmatic Biological Opinion for Bureau of Reclamation's Operations and Depletions, Other Depletions, and Funding and Implementation of Recovery Program Actions in the Upper Colorado River above the Confluence with the Gunnison River. 90 pp. + appendices.

Tab 9. U.S. Fish and Wildlife Service. 1999. Letter Dated December 17, 1999, to Mr. Eric R. Jacobson Regarding the Draft Programmatic Biological Opinion.

Tab 10. U.S. Fish and Wildlife Service. 1998. Razorback Sucker (*Xyrauchen texanus)* Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 81 pp.

Tab 10. U.S. Fish and Wildlife Service. 1990a. Bonytail Chub Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 35 pp.

Tab 10. U.S. Fish and Wildlife Service. 1991. Colorado Squawfish Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 56 pp.

Tab 11. U.S. Fish and Wildlife Service. 1987. Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. Final Report. U.S. Fish and Wildlife Service, Denver, Colorado. 82 pp.

Tab 12. Wydoski, R. S. and E. J. Wick. 1998. Ecological Value of Floodplain Habitats to Razorback Suckers in the Upper Colorado River Basin. Upper Colorado River Basin Recovery Program, Denver, Colorado.

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1111 Jackson St., Suite 520
Oakland, CA 94607

October 12, 2001

ER 01/0432

Honorable David P. Boergers
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Notice of Application Ready for Environmental Analysis for the Santa Ana River 1 and 3 Hydroelectric Project, FERC No. 1933-010, Santa Ana River, San Bernardino County, California

Dear Mr. Boergers:

The Department of the Interior (Department) has reviewed the May 15, 2001, Notice of Application Ready for Environmental Analysis for the Santa Ana River 1 and 3 Hydroelectric Project, FERC No. 1933-010, Santa Ana River, San Bernardino County, California. The following comments reflect considerable concern about environmental impacts related to the issuance of a new license and the continued operation of the project.

The Department does not object to the issuance of a new license for the Santa Ana River 1 and 3 Project provided our comments, recommendations, terms and conditions, and prescriptions are considered by the Federal Energy Regulatory Commission (Commission) and incorporated in the new license as appropriate.

Because no Environmental Impact Statement (EIS) or Environmental Assessment (EA) has been issued by the Commission, this response contains preliminary recommendations and prescriptions only. We request the right to amend these comments, recommendations, and prescriptions, if warranted, based on the results of information and conclusions developed during the Commission's environmental analysis.

GENERAL COMMENTS

The Department is directed to employ an ecosystem approach to ensure conservation of fish and wildlife resources throughout all its programs. This includes participation in the Commission's relicensing process. The ecosystem approach requires adopting a more comprehensive view within regions and watersheds than in the past.

The Department encourages the development of comprehensive watershed management plans that examine ecosystem health through identification of dominant geomorphological features and processes, land use practices, and other activities that may be impacting the watershed. This approach provides more thorough analysis of impacts to fish and wildlife resources and other Departmental interests caused by activities such as hydroelectric development and other human disturbances, and identifies a broader range of opportunities for ecosystem improvements.

The Department also encourages adaptive management as a strategy because it allows for continued evaluation and adjustment of conservation, protection, mitigation, and enhancement measures over the term of the license thereby reducing uncertainty and providing more assurance that the desired level of protection for fish and wildlife and other resources will be met.

The Department's Fish and Wildlife Service (Service) has reviewed the applicant's Initial Consultation Package, draft license application, and final license application, dated November 15, 1991, November 18, 1993, and April 29, 1994, respectively, and met with the applicant during the first and second stage consultation process. Unless otherwise noted, all referenced information is from these sources.

The Service's letters dated February 28, 1992, and March 11, 1994, to the applicant and the Commission detail concerns about environmental impacts associated with the Santa Ana River Project.[1] Several of these concerns have been sufficiently addressed by the applicant in its final license application and require no further discussion. Substantive concerns that have not been satisfactorily addressed are discussed in the specific comments below.

Based on the aforementioned reviews and coordination with the applicant, the Department has determined that most of the project related adverse effects to fish and wildlife resources can be acceptably reduced. However, significant opportunities remain to better conserve, protect and enhance ecosystem values in the project affected area. These opportunities primarily involve the implementation of improved instream flows in the bypassed reaches. Both existing bypass reaches, i.e., Santa Ana River No.1 (SAR 1) and Santa Ana River No. 3 (SAR 3), have significant potential for habitat improvement.

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[1] These letters are included in the applicant's April 29, 1994, final license application.

Operation of these projects has resulted in, and continues to create, adverse ecological effects, and it is appropriate to require that these effects be mitigated. During typical non-storm conditions, the projects capture the entire stream flow, dramatically reducing habitat values. But for these projects, flows would be available to provide habitat for native fish, amphibian, and other riparian species, including species listed or proposed for listing under the Endangered Species Act.

The Department supports the restoration of stream flows in the bypassed reaches, with adaptive management to support the remaining native populations and the potential reintroduction of extirpated species as appropriate.

MANDATORY CONDITIONS REVIEW PROCESS

On January 19, 2001, the Department of the Interior and the Department of Commerce adopted a process for public review and comment on prescriptions and conditions developed under the Federal Power Act sections 18 (fishway prescriptions) and 4(e) (Federal reservations) called the Mandatory Conditions Review Process (MCRP). The MCRP provides a standardized opportunity for interested parties to provide comment on the conditions and prescriptions developed by the Departments.

At this time, the Department, through the U.S. Fish and Wildlife Service, has determined that it does not have sufficient information to support the filing of a prescription for fishways for the Santa Ana River 1 and 3 Project. Most native species have been extirpated. Rainbow trout (*Oncorhynchus mykiss*) and introduced brown trout (*Salmo trutta*) still exist in Bear Creek and Santa Ana River above the SAR 1 diversions, above the Alder Creek diversion, and in isolated pools in the bypass reaches. Seven Oaks Dam, Prado Dam, and other obstructions in the lower Santa Ana River prevent any upstream migration of anadromous fish into the project area.

Resource agency management priorities currently emphasize the protection of existing aquatic resources, and the restoration and recovery of aquatic and riparian habitat within the project's bypassed reaches through the provision of adequate instream flows. Accordingly, the Department will exercise its statutory authority pursuant to Section 18 of the Federal Power Act, as amended, by reserving the authority to prescribe the construction, operation, and maintenance of fishways in the future during the term of the license.

Pursuant to the MCRP, the Department hereby invites comments on its preliminary determination to reserve the Department's authority to prescribe fishways. Interested parties must submit all comments and any new information relevant to the Department's determination within 60 days immediately following the date of this document.

Comments and new information should be addressed to the Regional Director, U.S. Fish and Wildlife Service, 911 N.E. 11th Avenue, Portland, Oregon 97232-4181. In addition to the Commission, a copy must be sent to each of the following addresses:

1) Regional Environmental Officer, Department of the Interior, Office of Environmental Policy and Compliance, 600 Harrison Street, Suite 515, San Francisco, California 94107-1376;

2) Pacific Southwest Regional Solicitor, Office of the Solicitor, Department of the Interior, 2800 Cottage Way, Room W-2215, Sacramento, California 95825-1890;

3) Operations Manager, California Nevada Operations Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room W-2606, Sacramento, California 95825;

4) Field Supervisor, Carlsbad Fish and Wildlife Office, U.S. Fish and Wildlife Service, 2730 Loker Avenue West, Carlsbad, California 92008.

SPECIFIC COMMENTS

Existing Conditions

The applicant seeks a new license for the continued operation of the Santa Ana River Project which consists of two independent water conveyance and generation systems on the river: Santa Ana River No. 1 (SAR 1) and Santa Ana River No. 3 (SAR 3). The existing SAR 1 consists of:
(1) three concrete diversion dams and intakes with fixed trashracks on the Santa Ana River, Bear Creek and Breakneck Creek;
(2) a concrete-lined sand box;
(3) a 3-mile long flowline comprised of tunnels, open flumes, and steel pipes;
(4) a 12 acre-foot concrete lined forebay;
(5) two 3,111-foot long steel penstocks;
(6) a powerhouse containing four generating units with a combined installed capacity of 3,200 kW;
(7) a concrete-lined tailrace; and
(8) related appurtenant facilities.

The existing SAR 3 consists of:
(1) the SAR 3 river pick-up which consists of an earthen embankment and concrete diversion weir and intake adjacent to the SAR 1 powerhouse;
(2) two diversion dams and intakes on Keller Creek and Alder Creek;
(3) a 1.5-mile long flowline system from the SAR 1 tailrace to the SAR 3 forebay;
(4) the SAR 3 forebay;
(5) a concrete headbreaking structure;
(6) a 14,875-foot long buried steel penstock;
(7) a two-mile-long flowline from the headbreaking structure to the Greenspot Water Delivery Forebay;
(8) the Greenspot Water Delivery Forebay;

(9) a 737-foot long steel spillway pipe from the greenspot forebay to the SAR 3 tailrace;
(10) a powerhouse containing one generating unit with an installed capacity of 3,100 kW;
(11) a tailrace channel; and
(12) related appurtenant facilities.

Both developments operate run-of-the-river, with SAR 1 located further up the watershed. The SAR 3 powerhouse is located below the newly constructed Seven Oaks flood control dam. The former SAR 2, located within the innundation zone of the Seven Oaks dam, was removed and the flowline modified to deliver water directly to SAR 3. The relicensing schedule for SAR 3 was accelerated to coincide with former SAR 2. The applicant proposes to continue operating the existing SAR 1 and SAR 3 projects.

The mainstem Santa Ana River and its major tributaries, including Lytle Creek and Mill Creek, are regionally significant hydrological features, providing continuous stream flows relatively rare in the semi-arid south coast ecoregion of California. These perennial flows once supported a biologically healthy and diverse aquatic ecosystem and riparian habitat, but more than 100 years of water diversions has contributed to a reduction in the number and abundance of fish and amphibian species and in the amount and quality of riparian habitat in the project area.

The current and continuing operation of both project developments significantly affect fish and wildlife resources in the Santa Ana River Basin. During normal flow conditions the diversions remove essentially all perennial flow from the river. Though leakage and downstream accretion restores some flow, it is common for both bypassed reaches to be de-watered during the summer and fall.

The 3.2-mile long SAR 1 bypass reach and the 4.4-mile long SAR 3 bypass reach are largely de-watered during much of the summer and fall. SAR 1 has a reported diversion capacity of 93.3 cubic feet per second (cfs) and the SAR 3 capacity is 82.6 cfs. The diversions do not affect high flow storm events, which occur in both winter and summer. Storm flows overtop the diversions and continue downstream to the Seven Oaks Dam.

Brown and rainbow trout populations are found in Bear Creek, Santa Ana River, and Alder Creek above the diversions, and in isolated pools in both bypass reaches. No fish were found in Keller Creek. Because storm flows overtop the diversions, downstream fish movement occurs several times per year. Upstream fish movement around the diversions does not occur. Some level of ongoing entrainment mortality occurs at the existing diversions. Drum screens are in place at the SAR 1 and Alder Creek intakes. Fish protection facilities are not present at the SAR 3 river pick-up, the Keller Creek intake, or the Breakneck Creek diversion.

The expired license contained no minimum flow conditions. To enhance environmental resources such as fish habitat and riparian plant communities, the applicant proposes a minimum flow of 4 cfs to be released into the SAR 1 bypass reach. No minimum flow into the SAR 3 bypass reach is

proposed by the applicant. New fish screens are proposed at the Alder Creek diversion dam and at the SAR 3 river pick-up unit.

Threatened and Endangered Species

The analysis of Federally listed threatened and endangered species in the April 29, 1994, final license application needs to be updated. Several additional species have been listed since the application was prepared, including the endangered southwestern willow flycatcher (*Empidonax traillii extimus*), endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus*), endangered arroyo toad (*Bufo californicus*), threatened Santa Ana sucker (*Catostomus santaanae*), threatened California red-legged frog (*Rana aurora draytoni*), proposed endangered mountain yellow-legged frog (*Rana muscosa*), and proposed threatened mountain plover (*Charadrius montanus)*.

The western yellow-billed cuckoo (*Coccyzus americanus*) was recently listed as a candidate species. The bald eagle (*Haliaeetus leucocephalus*), a winter resident of the San Bernardino Mountains, has been proposed for delisting. The peregrine falcon (*Falco peregrinus anatum*) has been delisted.

The National Marine Fisheries Service (NMFS) listed the anadromous life forms of the southern California steelhead (*Oncorhynchus mykiss)* Evolutionary Significant Unit (ESU) as an endangered species in August 1997, and defined Malibu Creek in Los Angeles County as the southern limit of its range. On December 19, 2000, NMFS proposed a range extension of the endangered ESU to San Mateo Creek in northern San Diego County. The proposed range extension includes the Santa Ana River.

Because of the highly modified river system, major restoration efforts would be necessary before the Santa Ana River could support steelhead, even on the coastal plain. Prado Dam and the Seven Oaks Dam are also currently impassible barriers downstream of the Santa Ana River No. 1 and 3 Hydroelectric Project.

The final license application references a 1992 observation of the federally listed threatened coastal California gnatcatcher (*Polioptila californica californica*), reported in dense mountain mahogany in the lower Santa Ana canyon. The application also notes that several endangered least Bell's vireos (*Vireo bellii pusillus*) have been observed in the canyon, and documents an occurrence of endangered Santa Ana woolly-star (*Eriastrum densiflorum* ssp. *sanctorum*). The restoration of surface flow in the SAR 1 bypass reach is cited as a measure that could enhance habitat and provide management opportunities for the recovery of the vireo.

Southwestern willow flycatchers have recently (since 1999) been observed at several locations in the upper Santa Ana River watershed (e.g., Cienega Seca, Sand Creek, Jenk's Meadow, Rattlesnake Creek). The draft recovery plan for this bird identifies "reduction or elimination of surface and subsurface water due to diversion and groundwater pumping" as a primary reason for

its decline.[2] It is highly likely that restoration of streamflows in the SAR 1 and SAR 3 bypass reaches would lead to an increase in the flycatcher population. Such an increase is needed to achieve recovery objectives.

The draft recovery criteria for downlisting of this subspecies include increasing the flycatcher population within the Santa Ana (watershed) Management Unit from the 21 currently known territories to at least 50 active territories.[3] Re-watering the SAR 1 and SAR 3 bypass reaches should restore substantial amounts of flycatcher habitat. Most of the other occupied areas along the Santa Ana River are either in rapidly urbanizing sections of the Inland Empire (e.g., the lower Santa Ana River, San Timoteo Creek) or in small high-elevation tributaries where there is little potential to expand suitable habitat.

Historical records indicate that the Santa Ana sucker once extended up the Santa Ana River to at least where Seven Oaks Dam is currently located. They possibly extended up into the SAR 3 bypass reach, but that cannot be confirmed.

The notice for the Santa Ana River Project does not address the Commission's responsibilities under the Endangered Species Act of 1973, as amended (16 U.S. C. 1531 *et seq.*) (Act). No consultation pursuant to section 7 of the Act has been initiated to date. Therefore, the Department recommends that the Commission begin informal consultation immediately with the Service regarding completion of the necessary biological assessment.

Commission staff requested current species lists from the Service on February 7, 1997 and June 27, 2000. The Service provided the requested information on March 6, 1997 and September 6, 2000. The most recent species list is now over a year old, and should be updated.

Water Quality

The Santa Ana River drainage generally exhibits excellent water chemistry. However, due to reduced flows, summer and fall water temperatures in the bypass reaches frequently exceed optimal conditions for trout. Bypass flows and the implementation of adaptive management within the project area should improve physical water quality parameters, such as temperature.

To ensure that sufficient measures have been taken, the Service recommends that the applicant develop and implement, in consultation with the Service, the California Department of Fish and Game, and the California State Water Resources Control Board, a Water Quality Monitoring Plan to monitor the performance of the measures taken to improve water quality and reduce summer

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[2] U.S. Fish and Wildlife Service. 2001. Southwestern Willow Flycatcher Draft Recovery Plan. Albuquerque, New Mexico. xxx pp.

[3] *Ibid.* p83.

water temperatures to within acceptable standards for the protection and conservation of trout and other aquatic resources.

Erosion and Sedimentation

Soils in the Santa Ana River watershed are highly erodible and can serve as significant sources of sediment within and around the project area. The transport of these sediments to the alluvial fan at the mouth of the Santa Ana Canyon and to the San Bernardino Valley floodplain is an important process for maintaining alluvial terrace habitats. The San Bernardino kangaroo rat and the Santa Ana woolly-star typically occupy pioneer- and intermediate-phase alluvial terrace vegetation that is influenced by periodic flooding. This geomorphic process has been all but eliminated by the Seven Oaks Dam, downstream of the proposed project.

The SAR 1 and 3 diversions above the Seven Oaks Dam do not impede sediment transport, and the proposed project cannot reduce or offset the existing geomorphic effects created by the Seven Oaks Dam.

Instream Flow Studies and Proposed Flow Measures

The Santa Ana River project features have created two bypass reaches (Santa Ana River 1 and Santa Ana River 3). During pre-filing consultation, the applicant and the resource agencies determined the two reaches should be studied independently, and minimum instream flows should be proposed for each reach. Applicant employed the Service's Physical Habitat Simulation Model (PHABSIM) on both reaches as part of the Instream Flow Incremental Methodology (IFIM) recommended by the resource agencies.

In general, the Service has determined that the modeling and analysis were applied satisfactorily, however, no deliberate releases have been conducted to test or calibrate the model.

Minimum stream flows need to be established to improve overall biodiversity in the affected reach and its associated riparian zone. Enough water should be released to keep a continuous flow throughout the bypass reaches and to maintain fish in good condition, meaning viable population sizes with multiple age classes and healthy individuals, in an ecological community dominated by co-evolved species, including amphibians and other riparian wildlife.

Adaptive management plans should be designed to restore, maintain and enhance existing populations, and to support the potential reintroduction of extirpated species.

SAR 1 Reach

For the SAR 1 reach, the applicant's Instream Flow Study results suggest that a flow regime between 4 to12 cfs provides optimal habitat for the largest number of native species/life stages. The applicant's 4 cfs proposal is at the lower limit of the study recommendation. The Service

concludes that the higher range of bypass flow is prudent to ensure successful establishment of fish habitat, maintain cooler water temperatures, and encourage riparian vegetation growth, and recommends a varied flow regime in the range of 7 to 11 cfs. This flow would overlap the range of optimal habitat for the threatened Santa Ana sucker, predicted between 10 and 15 cfs, and the optimal habitat for adult trout, predicted between 6 to 11 cfs.

The expired license contained no minimum flow conditions. To enhance environmental resources such as fish habitat and riparian plant communities, the applicant proposes a minimum flow of 4 cfs to be released into the SAR 1 bypass reach. The applicant's proposed minimum instream flow would improve the existing conditions, but does not ensure the reach will remain watered year-round. De-watering and leaving portions of the streambed dry is not acceptable for the protection of aquatic resources. The proposed 4 cfs bypass flow is also insufficient to maintain the cooler water temperatures preferred by trout.

The level of flow necessary to meet depth criteria for fish passage, fish habitat, and other aquatic fauna needs in this portion of the SAR 1 reach remains uncertain. The Service anticipates that at least 7 cfs would be required to provide several inches of depth in the SAR 1 bypass reach.

Given the available information, 11 cfs would provide sufficient flow to generally maintain water temperatures at 20 degrees C, maximize the weighted useable area for adult rainbow trout and ensure that the entire SAR 1 reach remains watered to depths sufficient for other aquatic fauna. An instream flow of this magnitude would be a reasonable allocation for protecting aquatic resources and restoring some stream ecological functions.

Therefore, the Service recommends the release of a year-round instream flow of 7 to 11 cfs throughout the SAR 1 bypassed reach. Seasonal variations in the flow regime are proposed, to approximate natural flow conditions, and to attempt to promote rainbow trout over the introduced brown trout.

SAR 3 Reach

The Instream Flow Study found that slightly higher flows are needed to provide the optimal ranges for most species in the SAR 3 bypass reach, owing to the broader streambed. Flows between 12 and 15 cfs provide optimal habitat for the greatest number of species/life stages. The same 12 to 15 cfs flow regime is predicted to provide optimal habitat for the trout species present in the reach. The existing license contains no minimum flow conditions. The applicant proposes no additional flow into the SAR 3 bypass reach.

De-watering and leaving portions of the streambed dry is not acceptable for the protection of aquatic resources. Providing adequate flows would improve habitat values for native fish and amphibian species. Consequently, the Service recommends a year-round flow of 12 cfs for the SAR 3 bypass reach, to provide habitat for rainbow trout, and for other native fish and amphibian species.

Fish Passage

No upstream or downstream fish passage facilities are being required at this time. However, the Department reserves the right to require that the Licensee shall install fish passage facilities in the future. The Department requests that the Commission acknowledge such reservation in any license issued for this project. As previously mentioned, the Department invites comments on its preliminary determination to reserve the Department's authority to prescribe fishways.

TERMS AND CONDITIONS

Pursuant to Section 10(j) of the Federal Power Act, as amended, and the Fish and Wildlife Coordination Act, as amended, the Department requests that the following special articles be included in any license the Commission may issue for the Santa Ana River Hydroelectric Project, FERC No. 1933-010. Reporting and further consultation requirements should be added by the Commission to ensure timely and adequate compliance with these license articles.

1) The Licensee shall, for the protection, mitigation, and enhancement of fish and wildlife resources, maintain a continuous instream flow in the SAR 1 bypass reach of 7 cfs from September to January, 11 cfs from February to May, 7 cfs in June, and 9 cfs from July to September, or the natural stream flow, which ever is less.

2) The Licensee shall, for the protection, mitigation, and enhancement of fish and wildlife resources, maintain a continuous, year-round instream flow in the SAR 3 bypassed reach of 12 cfs, or the natural stream flow, which ever is less.

3) The Licensee shall, in consultation with the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the California State Water Resources Control Board, develop and implement a Water Quality Monitoring Plan to monitor the performance of the measures taken to improve water quality and reduce summer water temperatures to within acceptable standards for native trout and other aquatic life. Within 1 year of the issuance of this license, the Licensee shall submit the Water Quality Monitoring Plan, including evidence of consultation with and written approval by the agencies specified herein, to the Commission for formal review and incorporation into the new license.

4) The Licensee shall, in consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game, install fish screens in the intakes of the Santa Ana River No. 1 and 3 Project. Within 1 year of the issuance of this license, the Licensee shall submit functional design drawings illustrating the dimensions and operational details of fish screens to be installed, including evidence of consultation with and written approval by the agencies specified herein, to the Commission for formal review and incorporation as a final design component of the project.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
300 WESTGATE CENTER DRIVE
HADLEY, MA 01035-9589

In Response Refer to:
FWS/Region 5/ES

JUN -4 1999

VIA FEDERAL EXPRESS

David P. Boergers, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Prescription for Fishways
Holyoke Water Power Company (FERC No. 2004) -073
Ashburnham Municipal Light and Holyoke Gas & Electric (FERC No. 11607)
Holyoke Water Power Project, Connecticut River, Massachusetts

Dear Mr. Boergers:

Enclosed for filing with the Federal Energy Regulatory Commission in the above-referenced licensing proceeding are an original and eight copies of the Department of the Interior's Decision Document, including Prescription for Fishways, pursuant to Section 18 of the Federal Power Act. An additional copy of this letter is enclosed so that you may file stamp and return it in the enclosed self-addressed envelope.

The Department will be filing its Index to its Administrative Record and that Record as soon as possible, after each has been printed and packaged. The Department has not been able to completely accommodate the Commission's accelerated time frame due to the time and resources required to review and comment on the Commission's Draft Environmental Impact Statement for these two competing proposals and to simultaneously prepare the enclosed Decision Document. We remind the Commission that an extension of time for this purpose was requested twice by the Department, on May 4 and 20, 1999, and by the National Marine Fisheries Service on May 20, 1999, and by the Massachusetts Department of Fish and Wildlife during the same period for simply submitting comments on the DEIS.

Each party to this proceeding is being provided with a copy of this filing and will be provided with a copy of the Index when it is filed. When the Index is filed, instructions will be provided on how any party may file a request with this office for materials in the Administrative Record. Thank you for your cooperation in filing this document.

Sincerely,

Ronald E. Lambertson
Regional Director

Enclosure

cc w/encl: Original and 8 copies to FERC Secretary
FERC Service List (including applicant)

ORIGINAL

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Holyoke Water Power Company and	)	Holyoke Project
The City of Holyoke Gas and Electric	)	Connecticut River
Department, Ashburnham Municipal	)	Hampden, Hampshire and
Light Plant and Massachusetts Municipal	)	Franklin Counties
Wholesale Electric Company,	)	Holyoke, Massachusetts
Competing Applicants	)	Project Nos. 2004 and 11607

073

UNITED STATES DEPARTMENT OF THE INTERIOR'S DECISION DOCUMENT, PRESCRIPTIONS FOR FISHWAYS PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT

Approved this 4 day of June, 1999, by:

Ronald E. Lambertson, Regional Director

United States Department of the Interior
Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9589

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UNITED STATES DEPARTMENT OF THE INTERIOR'S DECISION DOCUMENT, PRESCRIPTIONS FOR FISHWAYS PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT

1. Introduction

The United States Department of the Interior hereby submits its Prescriptions for Fishways for the Holyoke Project[1], pursuant to Section 18 of the Federal Power Act, as amended. The Department is submitting this Decision Document to the Federal Energy Regulatory Commission, and will supplement this filing with its Administrative Record.

The Department developed its Prescriptions for Fishways through a review process that included consultation among fisheries biologists and fishway engineers from the Department's U.S. Fish and Wildlife Service and the Department of Commerce's National Marine Fisheries Service, the Massachusetts Division of Fisheries and Wildlife, the competing applicants: Holyoke Water Power Company, and the City of Holyoke Gas and Electric Department, Ashburnham Municipal Light Plant and Massachusetts Municipal Wholesale Electric Company, and other interested parties.

2. Resource Description

The Connecticut River is the longest river in New England. It originates 2,625 feet above sea level in Fourth Connecticut Lake, and accumulates water from several major tributaries as it flows south at a grade of about 6 feet per mile. The waterway serves as the boundary between the States of New Hampshire and Vermont for 238 miles (most of its first 271 miles), then runs through the States of Massachusetts and Connecticut. The river empties its water into Long Island Sound, at Old Saybrook, Connecticut, over 400 miles from its origin [CRASC, 1998].

The Connecticut River is a National Heritage River. The Connecticut River watershed forms the boundary authorized by Congress for the Silvio Conte National Wildlife Refuge, which is administered by the Service. The Connecticut River watershed is a resource of tremendous importance. For example, it provides: 1) important habitats for numerous species of fish, wildlife, and native plants, 2) a multitude of recreational opportunities to over two million people that live in the nearly 400 cites and towns in the basin [CTDEP, 1994] and, 3) a major source of

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[1]The Holyoke Hydroelectric Project, FERC No. 2004 (and the competing project, FERC No. 11607), is the first dam on the Connecticut River and is located in Hampden, Hampshire and Franklin Counties and the City of Holyoke and Town of South Hadley, Massachusetts.

water for irrigation, power production, industrial water supply and waste assimilation. Unfortunately, these uses often conflict with one another.

The environment of the 11,250 square mile drainage basin is variable, exemplifying both highly developed, urbanized areas and rural forested reaches. For most of the mainstem river's length and many of its tributaries, the stream bed gradient profiles are interrupted by man-made impoundments that provide over 3 million acre-feet of storage capacity. More than 1000 dams are located on the mainstem river and its tributaries. There are 16 dams, most of which are utility-owned, impounding nearly 200 miles of the mainstem river [CRJC, 1997].

The Connecticut River was a natural highway for commerce in New England prior to the development of the railroad. Several canals were built between 1791 and 1828 to facilitate transportation around natural falls[2] [Moffitt et al.,1982]. Flow regulation, as a result of the combined operation of electrical generating facilities and maintenance of the canal system, has greatly influenced the flow regime, water quality, aquatic habitat, and movement of anadromous[3], catadromous[4] and riverine fish in the Connecticut River.

From the turn-of-the-century onward, the Connecticut River received considerable municipal and industrial pollution. However, during the 1960's and 1970's pollution abatement programs resulted in significantly improved water quality. Today, the water quality of the Connecticut River is vastly improved and supports a diverse and valuable aquatic community.

2.1. Atlantic Salmon

The Atlantic salmon is an anadromous fish species that once inhabited coastal streams as far south as the Hudson River. The Commission's Draft Environmental Impact Statement for the Holyoke Hydroelectric Project, dated April, 1999 (DEIS) [FERC, 1999] includes a general description of Atlantic salmon life history and stock status in the Connecticut River. We have reviewed the Commission's description and concur with its findings. As this information is already before the Commission and is included in the Commission's official record of the proceeding, there is no reason, therefore to repeat this background information in this Decision Document.

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[2]Canals were located at: Wilder and Hartland, Vermont; Turners Falls and South Hadley, Massachusetts; and Enfield, Connecticut.

[3]Anadromous fish start their life in freshwater, mature at sea, and must return to freshwater in order to spawn and complete their life cycle.

[4]Catadromous fish spend the majority of their lives in fresh or brackish waters but must return to the ocean to spawn and complete their life cycle.

The Connecticut River is now the southernmost extent of the Atlantic salmon's range. The Atlantic salmon has a relatively complex life history which includes the spawning of adults and maturation of juveniles in natal rivers and associated water bodies, as well as a migration out into the open ocean by both sub-adult and adult individuals. Due to its anadromous life history, salmon must obtain effective (safe, timely, convenient) access to its natal streams and the young must reach the ocean to successfully sustain local populations. The location and nature of the Holyoke Dam and associated structures represent an impediment to the restoration of this species to the Connecticut River.

To restore Atlantic salmon to the Connecticut River, a partnership between the Service, NMFS and the States bordering on the Connecticut River was established in 1967. The partnership was formally authorized by Congress in 1983 as the Connecticut River Atlantic Salmon Commission. The CRASC administers the inter-jurisdictional, cooperative effort to restore Atlantic salmon to the Connecticut River basin (Public Law 98-138). CRASC's mission is to protect, conserve, restore and enhance the Atlantic salmon population in the Connecticut River basin [CRASC, 1998]. Both the Department of the Interior through the Service and the Department of Commerce through the NMFS are members of the CRASC.

The Holyoke Hydroelectric Project currently has upstream passage facilities in the form of two fish lifts that allow Atlantic salmon to move past the dam on their upstream spawning migration. Ninety percent of the adult salmon that use the fish lifts at the Holyoke Project are intercepted at the fish trapping facility and used as an egg source for fry, smolt and domestic broodstock production as part of the CRASC's restoration program. The remaining ten percent are allowed to proceed upstream to seek out natal spawning areas.

Post-spawned adults and stocked or native offspring require downstream passage facilities to effectively (safely, timely, conveniently) pass the Holyoke Project on their seaward migration. The existing facilities currently include a louver and bypass facility in the First Level Canal, and seasonal attraction flows and conveyance discharges at the Hadley Falls Station bascule gate, which is fitted with a weir insert (NU/Alden Weir) to make passage more effective. The canal louver bypass facility is the more effective passage. The main Hadley Falls Station facility is less efficient. Although both systems provide downstream migrating fish an alternative to impingement or entrainment at the Hadley Falls Station and various canal intakes, these facilities need improvements.

Additional studies on life history, smolt production and migration in the Connecticut River and on-going improvements in water quality and river flow management within the Connecticut River, could all help increase Connecticut River Atlantic salmon populations. However, the value of these measures will be diminished if the new licensee fails to undertake steps and measures to improve fish passage at the Holyoke Hydroelectric Project.

2.2. American Shad

The American shad is an anadromous fish that is geographically distributed along the Atlantic coast from Newfoundland to Florida. We have reviewed the description of the biology and status of American shad included in the DEIS [FERC, 1999] DEIS and find that it adequately summarizes this information. As this information is already before the Commission and is included in the Commission's official record of the proceeding, there is no reason, to repeat it in this Decision Document.

Of the anadromous fish that enter the Connecticut River, American shad are by far, the most abundant. An estimator based on daily shad lift rates at the Holyoke Project fish lift at Hadley Falls suggests that, in this decade, the Connecticut River shad population ranged from a high of 1.6 million individuals in 1992 to a low of 304,000 in 1995 [MCFWRU, 1998; Crecco and Savoy, 1985]. The American shad population appears to demonstrate natural variability typical of many clupeids in response to differences in recruitment of individual year classes and annual environmental conditions. The population trend for the latter half of the decade, based on the 1997 juvenile index, suggests that the run is experiencing a slight recovery (with estimates near 650,000 individuals annually) [MCFWRU, 1998; CTDEP, 1998].

At the present time, the Holyoke Hydroelectric Project possesses facilities to allow adult American shad, and other migratory fish species, to move past the dam on their upstream spawning migration. Specifically, the fish are elevated over the dam in one of two fish lifts, located in the bypassed reach and the project tailrace. Fish are cued to the fish lift entrances by the release of attraction flows. Although these fish lifts function, improvements are needed. Issues of concern for upstream passage include: 1) the efficiency of the attraction to, and passage through, the lifts; 2) stress and injury shad are subjected to when using the facilities; 3) false attraction and stranding; and 4) the need for additional fish lift capacity.

Spent adults and outmigrating juveniles are provided with several outmigration routes past the project. Existing facilities currently include: a) an angled louver and bypass system in the Holyoke Canal; b) a specially designed bypass weir (NU/Alden Weir) that is inserted at the existing bascule gate adjacent to the main Hadley Falls Station; and 3) a bypass with an electroshocking system at Boatlock Station for adult shad who bypass the louver device and continue down the first level canal. The need for continuing the use of this Boatlock Station bypass is unclear at this time.

2.3. Shortnose Sturgeon

The shortnose sturgeon is an anadromous fish species that was federally listed as endangered in 1967. The species is primarily restricted to eastern North America in nearshore marine, estuarine and riverine habitats associated with large tidal rivers. The DEIS presents a general review of shortnose sturgeon biology and status in the Connecticut River. We have reviewed and generally concur with this review. As this information is already before the Commission and is included in

the Commission's official record of the proceeding, there is no reason, to repeat this background information in this Decision Document.

In the Connecticut River, the Holyoke Dam artificially separates the population into an "up-river group" and a "lower-river group." The most recent population abundance for the "up-river group" is estimated by mark-recapture techniques and ranges from 297 to 714 adult sturgeon. The "lower-river group" mark-recapture data are stratified by total fish length greater than 50 cm, but provides a mean value of 875 adult sturgeon [NOAA, 1998]. These estimates are from 1980 and 1993, respectively. The biological characteristics of the species, combined with tracking and mark-recapture data appears to suggest that yearlings, older juveniles and adults will regularly undertake downstream migration to forage at concentration areas below the Holyoke Dam.

Between 1981 and 1998, 104 shortnose sturgeon were captured and/or lifted over Holyoke Dam. In most years, only a small number of sturgeon have been recorded at the fish lifts, with less than six counted in 14 of the last 18 years, including five years with none. In contrast, four years account for 71 of the 104 total. Of particular note are the 18 sturgeon counted in 1996 and the 25 sturgeon counted in 1998. These large counts both occurred following a substantial spill event during the summer. All fish in these years were recorded at the spillway, with no tailrace lift passages. This historical movement of sturgeon past the dam has resulted in limited interchange between upper-river and lower-river shortnose sturgeon.

In 1983, researchers concluded that a site below the Holyoke Power Project was used for spawning, based solely on the relatively high numbers of sturgeon that congregated below the dam during the spring spawning season. Congregation of these fish below the dam led resource management agencies to assume that each "population" contained a spawning segment. However, successful reproduction usually indicated by the presence of eggs or larvae, could not be, and still has not been thoroughly documented. Conversely, successful spawning in the Holyoke Pool, 30 miles upstream, has been corroborated with the collection of both eggs and larvae. It is known that sexually mature fish congregate below the Holyoke Dam. However, even in those years where the fish have been netted with ripe eggs or running sperm, successful reproduction has not been verified by sampling. Failure to document reproduction in the lower river could mean that: 1) the designated site is not a valid spawning area; 2) environmental conditions (river flow, water velocity, substrate, water temperature etc.) are not normally conducive to successful reproduction below the Holyoke Dam; 3) environmental conditions or riverine habitat have been modified to such an extent that successful reproduction cannot occur; or 4) the behavior of the fish has been altered in such a manner as to interfere with normal reproductive processes. The passage of numerous adult sturgeon during high flow events in the summers of 1996 and 1998 demonstrate that at least a segment of the sturgeon congregating below Holyoke are oriented to move upstream to upstream spawning areas. This provides evidence that there is a need for providing upstream passage opportunities for sturgeon at this time of the year.

Data from Kynard et. al. (1999) indicates that entrainment and mortality of downstream running adult sturgeon does occur and at alarming rates. Therefore, an effective (safe, timely, convenient) passage route for downstream migrating adult and juvenile shortnose sturgeon must be provided at the Holyoke Hydroelectric Project now, if the species is to stand any chance of recovery in the Connecticut River. Following the implementation of measures to protect downstream migrating sturgeon, implementation of measures to assure effective upstream migration is warranted.

2.4. Blueback Herring

The blueback herring is an anadromous fish species geographically distributed along the Atlantic Coast from Nova Scotia, Canada to the St. Johns River in Florida. As with the other species described above, the DEIS provides an acceptable general review of herring biology and management status which does not need to be repeated here.

Blueback herring utilize the existing upstream passage facilities at the project similar to American shad. Blueback herring, though less susceptible to obvious injury and mortality in the fish lift system, are similarly impacted by the inadequacies of the existing facilities. Outmigration routes for herring at Holyoke are the same as described above for post-spawned and juvenile shad and Atlantic salmon smolts. Passage success for juvenile herring is considered to be the same as that for juvenile shad.

2.5. American Eel

The American eel is a catadromous species and is also panmictic (single spawning site and complete mixing of the gene pool at each spawning), with all adults spawning in the Sargasso Sea [ASMFC, 1999]. The Sargasso Sea is situated in the Atlantic Ocean, east of the Bahamas, and south of Bermuda. American eel eggs hatch into a transparent, protracted larval stage, called "leptocephali." Leptocephali drift and swim with the ocean currents for several months before changing shape to resemble miniature, transparent eels. These "glass eels" or "elvers" enter estuaries in spring and begin an active migratory river ascent of Atlantic coast waterways [ASMFC, 1999]. Ascents to up-river tributaries may continue for many months or years [Haro, 1996, Haro and Krueger, 1991] and the active migration generally coincides with warmer temperatures (peak activity occurring in July and August). Colonization of the upper reaches of a river is continued by the older, but still juvenile, individuals called "yellow eels" Yellow eels may remain in freshwater for up to 24 years.

As sexual maturity begins, yellow eels metamorphosis into the sub-adult "silver eel" and begin the out-migration back to the Sargasso Sea where maturity is attained prior to spawning and subsequent death. Downstream movement can occur during the summer, fall, and spring.

Throughout the Atlantic seaboard, fishing has traditionally supplied American eels for regional, ethnic and European food markets, domestic trot line bait, and sport fishing. Glass eels and elvers harvested in the United States are often exported for aquaculture ventures and direct

consumption. Consequently, each life history stage of the American eel, except the egg and larval stages, represents a targeted fishery. In some areas of the east coast there are also recreational harvests of American eels.

Commercial fishing records, and data gathered at the Moses-Saunders eel ladder on the St. Lawrence River, indicate the American eel population has declined severely. Recruitment of upstream migrating juvenile eels at the Moses-Saunders eel ladder has declined from almost 1.3 million eels in 1983 to 8,289 eels in 1993 [Lary and Busch, 1997]. A 60 percent decline in the Canadian Lake Ontario commercial eel fishery was reported between 1992 and 1996, and commercial fishermen in Quebec reported a 50 percent decrease in eel harvest from the beginning of the 1980's to 1996 [Lary and Busch, 1997]. Declines in the American eel population have prompted the Atlantic States Marine Fisheries Commission to prepare an American eel management plan [ASMFC, 1999]. Although data specific to the Connecticut River is not available, the panmictic nature of this species (with all recruitment initiating from one location, the Sargasso Sea) means a decline in recruitment is reflected throughout the entire population and its range. The declining status of the American eel in relation to hydroelectric dams and other matters was reported on by the Electric Power Research Institute [EPRI, 1999].

Declines in the American eel population are attributed to a combination of causes, including commercial harvest, pollution, changes in oceanic currents, and the negative effects of dams and hydropower facilities [ASMFC, 1999]. More specifically, hydropower facilities negatively affect American eels by blocking migration routes into freshwater rearing habitat, altering rearing habitat, and causing mortality both to eels during their residency in freshwater, and to eels trying to migrate back to the Sargasso Sea. The primarily nocturnal, passive migration that sub-adult eels undertake almost completely ensures that the downstream migrants follow the main riverine current. This behavior, along with the substantial length of sub-adult eels, makes them very vulnerable to turbine passage-induced mortality.

The number of maturing American eels migrating upstream past the Holyoke Power Project has not been assessed. However, the American eel's ability to ascend damp, uneven surfaces, combined with its flexible food and habitat preferences, have allowed some individuals to move upstream of some dams that have no fishways for eels. American eel has been collected in the past from the headwater Connecticut Lakes in New Hampshire [Bigelow and Schroeder, 1953]. Although American eels currently occur in areas upstream from Holyoke, its distribution in the watershed is limited and appears to correlate directly to the number of dams eels must negotiate on their upstream migrations. For example, eels are not known to currently inhabit the upper Westfield River, the entire Swift River system upstream from Windsor Dam, the West River upstream from Ball Mountain Dam, any waters within the Green Mountain National Forest or the mainstem Connecticut and its tributaries upstream from Wilder Dam[5]. Improvements in upstream

[5] Personal communications from: John O'Leary, Massachusetts Executive Office of Environmental Affairs, Jay McMenemy, Vermont Department of Fish and Wildlife - Springfield,

passage of eels are needed on many dams in the Connecticut River Basin in order to provide the eel with effective access to its historical range. Because Holyoke Dam is the first barrier on the River, providing fishways designed for eels is critical to the restoration of this fish to its historical range and increasing eel numbers in the watershed above Holyoke Dam.

American eels in the Connecticut River are subject to hydropower turbine mortality during their long freshwater residency, and most importantly, as they migrate downstream en route to spawning grounds in the Sargasso Sea. Hydro Quebec of Canada has determined that up to 24 percent of out migrating American eels are killed or mortally injured passing through turbines at the Beauharnois hydro facility on the St. Lawrence River [Verdon, 1996]. Other studies indicate mortality of eels moving through hydropower turbines ranges from 5 to 30 percent Hadderingh, 1990; MEDFW,1996 and NMPC, 1995]. In addition, American eels are often injured during turbine passage, causing delayed mortality [MEDFW,1996 and NMPC, 1995]. Verdon [1996] found that cuttings and internal injuries were common, with damage to the vertebral column being the most frequent internal injury (usually fatal). Because American eels spawn only once in their lifetime, all pre-reproductive mortality affects recruitment into the American eel population.

During out migration from the Connecticut River, American eels may pass through up to as many as five hydropower projects (including the Northfield Mountain Pumped Storage Project (FERC No. 2485) on the mainstem river (assuming no successful upstream passage above Wilder Dam) plus numerous hydropower dams on Connecticut River tributaries. Based on the above reported mortality rates (5-30 percent), cumulative mortality of American eels passing downstream in the Connecticut River could be as high as 100 percent.

Turbine injury and mortality is unacceptable if the decline in the American eel population is to be reversed, and if the system is to attain and sustain its best contribution to the American eel spawning population. Consequently, downstream fishways at hydropower projects on the Connecticut River are needed to provide for American eel movement and protection during the freshwater residency period, and while sexually maturing eels are outmigrating through the system on their spawning migration to the Sargasso Sea.

3. Management Goals

The following is a discussion of the management goals for five fish species for which improved fish passage is targeted in this prescription. In addition to these species, the Connecticut River supports populations of anadromous sea lamprey, striped bass, and gizzard shad, all of which utilize the fish passage facilities at the project. Numerous riverine species including white sucker,

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Steve Roy, U.S. Forest Service - Green Mountain National Forest and Len Gerardi, Vermont Department of Fish and Wildlife - St. Johnsbury.

smallmouth bass and channel catfish also utilize the fish passage facilities and will benefit from passage improvements.

3.1. Atlantic Salmon

The efforts to restore the extirpated Connecticut River stock, and similar efforts in other New England rivers have required a substantial effort and expense by state and federal fishery agencies and was the impetuous for the creation of the Connecticut River Atlantic Salmon Commission (CRASC) in 1983 (Public Law 98-138). The CRASC is responsible for administering the inter-jurisdictional, cooperative effort to restore Atlantic salmon to the Connecticut River basin. The CRASC's mission is to protect, conserve, restore and enhance the Atlantic salmon population in the Connecticut River basin. The CRASC released a revised *Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River* in 1998.[CRASC, 1998] The goals, objectives and strategies outlined in the plan, broad in scope and flexible, are designed to guide restoration activities by providing a framework that supports actions intended to increase the abundance of Atlantic salmon in the basin and define expectations and benchmarks for program evaluation. One specific goal (No. 2) defined in the plan is to "enhance and maintain the quantity, quality and accessibility of salmon habitat necessary to support re-established spawning populations." Objectives under this goal include:

I. Protect, maintain and restore existing Atlantic salmon habitat in all 38 selected tributaries of the Connecticut River basin.

II. Provide adult Atlantic salmon access to selected upstream spawning habitat in the mainstem Connecticut and 13 identified tributaries.

III. Minimize passage obstructions, migratory delays and mortality of Atlantic salmon smolts and kelts downstream of areas stocked with fry, parr, smolts or adults.

To fulfill these goals, it is imperative that upstream and downstream fish passage facilitates offer the most efficient passage possible at Holyoke. This is especially important as Holyoke is the site of most of the captures of uprunning adult salmon for use in CRASC's hatchery production activities and the majority of outmigrating smolts and adult salmon must pass this project on their seaward migration. Without effective passage at Holyoke, the benefits of implementing passage measures at upstream hydro projects are reduced.

Atlantic salmon require upstream passage facilities to access spawning areas, and as part of the restoration program, trapping facilities at Holyoke are needed to allow for transport of adults to hatcheries for artificial spawning to support both fry and smolt stocking efforts. The existing fish lifts are not known to present problems for adult salmon passage although undersized lifts and exit flume structures and inadequate trapping facilities could result in delays in passage or mortality and stress of pre-spawned adults.

Outmigrating salmon smolts require passage past numerous hydroelectric facilities on the Connecticut River. Smolts that reach Holyoke have already successfully negotiated as many as 14 hydro projects on their journey to the ocean (smolts from the upper Passumpsic River) and most smolts from the major stocking rivers; the West, White and Ammonoosuc must negotiate three, four and nine projects respectively. The value of smolts that arrive at Holyoke, is therefore even more pronounced as attrition due to delays, turbine mortality and predation have already reduced the numbers of potential successful migrants. Fish passage conditions for salmon smolts at hydro projects on the Connecticut River are summarized in the 1998 Strategic Plan [CRASC 1998].

Entrainment mortality of salmon smolts passing through the Hadley Falls Station turbines has been determined to be 13% [Stier and Kynard, 1986]. Since passage efficiency is higher for smolts that enter the canal and are guided by the louver array, encouraging greater canal passage versus attraction to the Hadley Falls Station passage is warranted.

3.2. American Shad

In 1991 an updated plan for shad management in the Connecticut River was completed by the CRASC Shad Studies Subcommittee. [CRASC,1992] The goal of the CRASC management plan is to achieve the restoration and maintenance of a spawning population of American shad within its historical range in the Connecticut River Basin. Seven management objectives are listed in support of the restoration goal. In short summary, the CRASC calls for an adult return population of 1.5 to 2 million individuals, a maximum rate of exploitation of 40 percent of the population, annual passage of 40 to 60 percent of the spawning run at each successive upstream barrier on the mainstem river and the maximization of outmigrant survival of juvenile, and spent adult shad.

The fish lifts at the Holyoke Project were sized primarily for handling the expected runs of American shad. These facilities, while effectively passing thousands of shad each year, are undersized for the one million shad targeted for passage upstream from Holyoke. The existing facilities need both expansion and improvement to provide effective (safe, timely and convenient) passage without mortality, stress or delay.

3.3. Shortnose Sturgeon

The Department of Commerce, through the NMFS directed the development of a recovery plan, pursuant to Section 4(f) of the Endangered Species Act (ESA) to promote conservation and recovery of the species. The plan, released in 1998, was developed by a recovery team of shortnose sturgeon experts from state and federal government and private sector. The overall goal of the plan is to "delist shortnose sturgeon populations throughout their range" by recovering populations to levels of abundance at which they no longer require protection under the ESA. The priority of recovery tasks vary among discrete population segments because not all segments experience the same sets of problems or receive the same level of research. The critical

parts of the plan relative to the Holyoke Project relicensing include the following sections of plan:

IV. Protect shortnose sturgeon populations and habitats.

V. Rehabilitate habitats and population segments.

The objectives are further broken down into sub-objectives and strategies. Identified as the highest priority in the Connecticut River are:

Task 1.1B Determine abundance, age structure and recruitment of shortnose sturgeon population segments.

Task 2.4A Insure that fish passage devices on all proposed and relicensed structures allow adequate passage of shortnose sturgeon and do not alter migration or spawning behavior.

Task 3.1A Identify natural migration patterns of each life stage and any barriers to movement between habitats. Devise methods to pass shortnose sturgeon above and below existing barriers.

Task 3.1D Restore flows, in regulated rivers, during spawning periods to promote spawning success and rehabilitate degraded spawning substrate.

Establishment of effective upstream and downstream passage at the project is necessary to meet those recovery goals.

3.4. American Eel

Following the apparent range-wide decline of the American eel, in combination with a resurgence with expanded commercial use of the species, the Atlantic States Marine Fisheries Commission voted to begin development of a fisheries management plan in 1995. A Public Information Document, seeking input from the public and interested commercial and recreational users on alternatives and recommendations for state management programs, was released in 1997. The ASMFC's Public Hearing Draft of the Fishery Management Plan for American Eel was released on April 20, 1999 [ASMFC, 1999]. The plan seeks to:

VI. Protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic States and contribute to the viability of the American eel spawning population.

VII. Provide for sustainable commercial, subsistence, and recreational fisheries by preventing over harvest of any eel life stage

Primary objectives include, but are not limited to, the protection and enhancement of American eel abundance in all watersheds where eel now occur, and where practical, restore American eel to those waters where they had historical abundance, but may now be absent by providing access to inland waters for glass eel, elvers, and yellow eel, and adequate escapement to the ocean for pre-spawning adult silver eel.

Installation of upstream eel fishways at Holyoke is needed to expand eel populations in the Connecticut River. Effective downstream passage measures for eels are likewise needed as turbine mortality and injury of prespawned adults is biologically unacceptable if the decline in the American eel population is to be reversed, and if the Connecticut River is to increase its contribution to the American eel spawning population.

3.5. Blueback Herring

Although no formal plan exists for blueback herring in the Connecticut River, historical abundance in the river has been high, with a peak of 630,000 herring passing Holyoke in 1985 [MCFRU, 1997]. Recent declines in abundance in the Connecticut river parallel similar declines coastwide. The unofficial goal for herring in the Connecticut River is for the passage of 1,000,000 upstream of Holyoke Dam. Improvements in and expansion of the passage facilities at Holyoke will assure that passage inefficiencies prevent attainment of this goal. However, effective downstream passage at Holyoke is critical to restoration efforts.

4. Statutory Authority

Section 18 of the Federal Power Act, 16 USCS §811, states in pertinent part:

> "the Commission shall require the construction, maintenance and operation by a licensee of...such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior."

Section 1701(b) of the National Energy Policy Act of 1992, P.L. 102-486, Title XVII, §1701(b), 106 Stat. 3008, states:

> "the items which may constitute a 'fishway' under section 18 [16 USCS §811] for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and project operations and measures related to such structures, facilities or devices for are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish."

The Prescriptions for Fishways herein are issued under authority delegated to the Regional Director from the Secretary of the Interior; the Assistant Secretary for Fish, Wildlife and Parks;

and the Director of the U.S. Fish and Wildlife Service pursuant to Section 18 of the Federal Power Act. (See 64 Stat. 1262; 209 Departmental Manual 6.1; 242 Departmental Manual 1.1A.)

5. Procedural Background

Fish passage has been an issue at Holyoke since the first timber dam was constructed on Hadley Falls in 1849, blocking upstream passage of anadromous fish and further reducing the shad fishery on the River. In *Holyoke Company v. Lyman* the U.S. Supreme Court [U.S. Supreme Court, 1872] confirmed that: 1) passage was a right of fishery, 2) dam owners were responsible historically for providing passage convenient for fish as a condition of operation, 3) the Holyoke Company had to build fishways at its expense, as ordered by the state, even thought Holyoke Company had already paid upstream riparian land owners $40,000 for reducing the shad fishery; 4) the state had an inherent reservation of authority to require fishways. In 1873, the first fishway was constructed at Holyoke Dam. No shad used this fishway and it was abandoned. In 1940, a fishway was constructed on the east side of Holyoke Dam. This was unsuccessful apparently due to poor entrance location, insufficient attraction water, and excessive pool turbulence, i.e., poor design and understanding of fish behavior.

The Department has been actively involved in fish passage issues at the Holyoke Project since 1951 when the Service began consultation on what would become known as the first successful upstream passage facilities for shad on the East Coast. Since that time, the Service has played a leading role in the pursuit of effective upstream and downstream passage at the site (Hoar, 1990). The Services' actions have included direct consultation with HWP regarding operation of and upgrading of the fish lift system and consultation on effectiveness testing of installed facilities.

In 1972, the CRASC and its member agencies including the Service, signed a settlement agreement with HWP that resulted in improved upstream passage facilities at Holyoke. The agreement called for a two phase plan with initial passage facility upgrades followed by additional measures when numbers of shad passing Holyoke increased. Phase 2 was never implemented and the existing facilities are largely the Phase 1 facilities implemented from that agreement. In 1976 and 1977, agreements were signed with Western Massachusetts Electric Company (WMECO) and New England Power Company (NEP) respectively to install upstream passage at the next four dams on the river (Turners Falls, Vernon, Bellows Falls, and Wilder).

In 1988, the Commission added three license articles to the Holyoke Project license to require implementation of downstream fish passage measures at the project. In 1990, separate settlement agreements between CRASC and its member agencies, and Northeast Utilities (on behalf of HWP and WMECO) and NEP were signed that required the implementation of downstream passage at the lower five mainstem hydro dams and at the Northfield Mountain Pumped Storage Project.

The Service played a key role in the development of the settlement agreements and their implementation through facility design, testing and modification.

Regarding the subject relicensing proceeding, the Department's involvement began with the review of the Applicant's initial consultation documents. The Department's involvement in the licensing proceeding is summarized below.

5.1. Holyoke Water Power Company

5.1.1. Initial Consultation Document

By letter dated April 14, 1995, the Service provided comments to the HWP on their Initial Consultation Document for the Holyoke Water Power Project, dated January 10, 1995. In that letter, the Service stated that the issues of greatest concern at the project included upstream and downstream fish passage, and identified the need for modification to the existing passage facilities at the project.

5.1.2. Pre-filing Coordination

The Service actively participated in several licensing-related meetings and discussions with the applicant directly pertaining to fish passage.

5.1.3. Application for License and Additional Information Requests

The Service received and reviewed HWP's Draft Application for New Major License dated April 16, 1997. Comments were provided to HWP in a letter dated July 31, 1997. HWP filed their application with the Commission on September 2, 1997. The Service subsequently filed comments in response to the application and requests for additional scientific studies on December 1, 1997. In response to the application the Commission issued three Additional Information Requests (AIR) dated March 26, 1998, August 28, 1998, and November 9, 1998. By letter dated September 25, 1998, the Service submitted comments to the Commission regarding HWP's AIR responses.

5.2. Holyoke Gas and Electric Department

5.2.1. Initial Consultation Document

By letter dated February 8, 1995, the Service provided comments and recommendations on scientific studies in response to HGE's Initial Consultation Package for their competing application for the Holyoke Hydroelectric Project, dated January 31, 1996. Similar to the comments on HGE's application, the Service noted the importance of fish passage issues at the project.

5.2.2. Pre-filing Coordination

The Service actively participated in licensing-related meetings and discussions with the applicant directly pertaining to fisheries and habitat management. In addition, written comments related to fish passage issues were submitted to the HGE's consultants by letters dates April 2, 1996, April 4, 1996, April 30, 1996, May 2, 1996, and May 3, 1996.

5.2.3. Application for License and Additional Information Requests

The Service received and reviewed HGE's Draft Application for New Major License dated February 17, 1997. Comments were provided to HGE in a letter dated June 25, 1997. The HG&E filed their application with the Commission on August 29, 1997. The Service filed comments in response to the application and requests for additional scientific studies on December 1, 1997. In response to the application, the Commission issued three Additional Information Requests (AIR) dated March 26, 1998, August 28, 1998 and November 9, 1998. By letter dated November 3, 1998, the Service provided comments on HGE's July 1998 AIR submission.

Additionally, the Service provided written comments to HGE on June 22, 1998 pertaining to AIR responses about zone-of-passage issues relative to the Instream Flow Incremental Methodology Report.

6. Administrative Record

Evidence in support of the Department's Prescriptions for Fishways is contained in its Administrative Record. This Decision Document summarizes the rationale and basis for its Prescriptions for Fishways. The Service is filing the Administrative Record for its Prescriptions for Fishways with the Commission and will make the Administrative Record available to all parties to this proceeding.

7. Alternatives Considered

In the formulation of these prescriptions, the Department has reviewed and considered a variety of alternative fish passage facilities and measures, including the alternatives proposed by the applicants, and those endorsed in the Commission's DEIS. This analysis of alternatives is included in the Department's Administrative Record [FWS, 1999].

8. Reservation of Authority to Prescribe Fishways

The Commission shall include the following condition in any license it may issue for the Holyoke Project:

Pursuant to Section 18 of the Federal Power Act, as amended, the Secretary of the Department of the Interior, as delegated to the U.S. Fish and Wildlife Service, exercises his authority under Section 18 by reserving the authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary, including measures to evaluate the need for fishways, and to determine, ensure, or improve the effectiveness of such fishways. This reservation includes authority to prescribe fishways for existing riverine fish species, any fish species, (including American eels) to be managed, enhanced, protected, or restored in the basin during the term of the license.

Also, authority is reserved for the U.S. Fish and Wildlife Service to modify these Prescriptions for Fishways at any time before licenses are issued, as well as any time during the term of any license issued, after review of new information or for other pertinent reason.

9. Prescriptions for Fishways

Additionally, pursuant to Section 18 of the Federal Power Act, as amended, the Secretary of the Department of the Interior, as delegated to the U.S. Fish and Wildlife Service, exercises his authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary.

9.1. General Terms and Conditions for both HWP and HGE Projects

A. Fishways shall be constructed, operated, and maintained to provide effective (safe, timely, convenient) passage for Atlantic salmon, American shad, blueback herring, shortnose sturgeon and American eels at the licensee's expense.

To ensure the immediate and timely contribution of the fishways to the ongoing fish restoration program in the Connecticut River, the following measures are included and shall be incorporated by the Licensee to ensure the effectiveness of the fishways pursuant to Section 1701(b) of the 1992 National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008).

B. The design population for each target species is:

Target Species	Upstream Fishway Design Populations
American shad	1,000,000
Blueback herring	1,000,000
Atlantic salmon	6,000
American eel	(unquantified)
Shortnose sturgeon	(unquantified--est approx 500 adults)

C. Upstream fishways shall be operational during the designated migration period at river flows up to 40,000 cfs, as measured at the USGS gage #01172003 below the Holyoke Dam (plus the flow in the First Level Canal as measured at the Canal gatehouse). Downstream fishways shall be operated during the designated migration period whenever units are operated at Hadley Falls Station or generation flows are provided in the First Level Canal.

D. Timing of fishway construction and initial operation -- fishways shall be fully operational as soon as possible. Except as specified below, or as identified in the schedule identified below for specific measures, modifications to existing facilities shall be fully operational no later than two years after the date of issuance of a new license so that benefits of passage improvements can be realized as soon as practicable.

E. The timely installation of the prescribed fishway structures, facilities, or devices is a measure directly related to the structures, facilities or devices and is necessary to ensure the effectiveness of such structures, facilities or devices. Therefore, the Department's prescription includes the express requirement that the licensee (1) notify and (2) obtain approval from, the U.S. Fish and Wildlife Service for any extensions of time to comply with the provisions included in the Department's prescriptions for fishways.

F. Timing of Seasonal Fishway Operations -- fishways shall be maintained and operated, at the licensee's expense, to maximize fish passage effectiveness throughout the upstream and downstream migration periods for Atlantic salmon, American shad, blueback herring, shortnose sturgeon, and American eel. The eel upstream migration period is not refined at this time, but is assumed to encompass the spring, summer, and fall period. The downstream migration period for eels is not refined either, but can include a spring run including those eels that did not complete outmigration during the preceding season. The migration periods for anadromous and catadromous fish in the Connecticut River at Holyoke are:

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	April 1- July 15 and Sept. 15 - Nov. 15	April 7 - June 15 (smolts) and fall/winter (adults)
American shad	April 1 -------- July 15	June 1 - July 31 (adults) and Sept. 1 - Nov. 15 (juv.)
blueback herring	April 1 -------- July 15	June 1 - July 31 (adults) and Sept. 1 - Nov. 15 (juv.)
shortnose sturgeon	June 1 - November 15	undetermined
American eel	April 1- November 15	August 15 - November 15 undetermined spring run

Any of these migration periods may be amended or otherwise changed during the term of the license by the U.S. Fish and Wildlife Service in consultation with the CRASC, other fishery agencies and the Licensee, based on experience, data, or new information.

G. The licensee shall keep the fishways in proper order and shall keep fishway areas clear of trash, logs, and material that would hinder passage. Anticipated maintenance shall be performed sufficiently before a migratory period such that fishways can be tested and inspected, and will operate effectively prior to and during the migratory periods. In consultation with the U.S. Fish and Wildlife Service, CRASC, and other fishery agencies, the licensee shall develop a fishway maintenance plan describing the anticipated maintenance, a maintenance schedule, and contingencies. The plan shall be submitted to the U.S. Fish and Wildlife Service for final review and approval, and the plan shall contain the consultation comments of the fishery agencies. If any agency recommendation is not incorporated, the licensee's explanation shall be in the plan. Upon approval by the U.S. Fish and Wildlife Service, the licensee shall submit the plan to the Commission for approval.

H. The licensee shall develop plans for, and conduct fishway effectiveness evaluations in consultation with the U.S. Fish and Wildlife Service, CRASC, and other fishery agencies on all prescribed facilities as needed. The plans and results of effectiveness studies shall be submitted to the U.S. Fish and Wildlife Service, CRASC, and other fishery agencies for review and comment prior to being filed for approval by the Commission. If the licensee disagrees with any of the comments and recommendations from the agencies, it shall provide an explanation in its filing with the Commission.

I. The licensee shall provide personnel of the U.S. Fish and Wildlife Service, and other Service designated representatives, access to the project site and to pertinent project records for the purpose of inspecting the fishways to determine compliance with the fishway prescriptions.

J. The licensee shall develop in consultation with, and submit for approval by U.S. Fish and Wildlife Service, all functional and final design plans, construction schedules, and any hydraulic model or other studies for the fishways or modifications to existing fishways described herein.

K. A continuous minimum zone-of-passage flow of 1,300 cfs shall be provided in the reach below the spillway during the designated upstream passage periods. This provision will be implemented upon license issuance.

L. The licensee shall, based on an evaluation of the bypass reach under the zone-of-passage flow described in item K, develop, in consultation with the U.S. Fish and Wildlife Service, CRASC, NMFS and MDFW, a plan and schedule for implementing channel modifications to improve the zone-of-passage through the bypass reach. The plan and schedule shall be submitted to the U.S. Fish and Wildlife Service for approval within six months after license

issuance, prior to filing with the Commission. The modifications shall be completed according to the approved schedule.

9.2. HWP Project (FERC # 2004) Specific Prescription

9.2.1. Upstream Fishways

1. Undertake necessary modifications to the spillway and powerhouse fish entrances, collection gallery and fish crowders to allow fish lift operation at river flows up to 40,000 cfs, to provide at least 12 inches of freeboard from operating water levels in the fishways to the top of the fishway walls and fish crowders (See Item #1 on Figure 1).

2. Expand the spillway and powerhouse fish lifts to accommodate the fishway design population designated above as follows: (See Items # 2 - #4 on Figure 1).

- Increase width of spillway entrance and spillway entrance channel to 8-feet wide.

- Provide attraction flow of 200 cfs at spillway entrance and 120 cfs at each of two powerhouse entrances.

- Increase the fish lift hopper capacity to 33.0 cubic feet per minute of cycle time (330 cubic feet for 10 minute cycle) at the powerhouse lift and 46.0 cubic feet per minute of cycle time (460 cubic feet for 10 minute cycle) at the spillway lift.

- Increase the width of the fishlift exit channel to 14 feet from the fishlift hopper to the fish counting station and to 10 feet from the counting station to the exit.

- Construct a second fish counting and trapping station in the expanded fish exit channel opposite the existing fish counting and trapping station.

- Provide an adjustable back lighted panel at all fish counting station windows to facilitate fish passage counting operations during periods of high turbidity.

3. Remove rock outcropping at the west-side of the powerhouse tailrace downstream from the currently non-functional entrance to fish lift at Unit #2, to allow effective operation of this entrance. (See Item #5 on Figure 1).

4. Construct three special fishways for American eel at the east side of the Holyoke Dam, at the powerhouse fishlift, and at the spillway lift. (See Item #8 on Figure 1).

5. Construct a fish barrier at the confluence of the powerhouse tailrace channel and the overflow channel from Boatlock Station to prevent upstream migrants from dead ending in this channel. (See Item #9 on Figure 1).

Note: After further evaluation, the U.S. Fish and Wildlife Service has determined that construction of a downstream entrance channel, with multi-level entrances at the Hadley Station tailrace, is not warranted at this time. (Item #6 in Figure 1). Therefore, this downstream entrance is deferred for future consideration and will be prescribed if effectiveness studies of the passage measures prescribed herein demonstrate the need for this additional measure.

9.2.2. Downstream Fishways

1. Construct a downstream fishway at the spillway bascule gate (Flyover Structure). The Flyover Structure shall conform to the design depicted in hydraulic model studies undertaken by the Licensee. (A preliminary design of the Flyover Structure is depicted in Item 5.C of the HWP AIR -Vol 2, dated July/98). Final designs shall include measures to manage flows that are shed through the Flyover Structure, such that the interference with upstream passage via the spillway lift that currently exists is eliminated. The operating flow at the Flyover Structure will be 600 cfs. Effectiveness studies of the Flyover Structure shall be undertaken by the licensee for all target species. (See Item # 10 on Figure 1)

2. Construct a new full depth angled rack at the Hadley Falls Station forebay to facilitate the downstream passage of target species. (See Items #12 on Figure 1). During initial modeling, the clear spacing of the screen of one inch will be evaluated. The final clear bar spacing and configuration of the angled rack will be determined by the U.S. Fish and Wildlife Service in consideration of hydraulic model studies and evaluation to be undertaken by the licensee and other pertinent information. Generation restrictions during portions of the year may be proposed or required in conjunction with the angled screen to achieve successful downstream passage.

3. During the interim period between license issuance and construction, and successful evaluation of the new angled rack structure identified in item #2 above, the flows from the project should be distributed to maximize effective (safe, timely, convenient) upstream and downstream passage of salmon smolts (April 1 through June 15) as follows:

Priority #1-- Flows to operate fish passage facilities
Priority #2-- Zone-of-passage flows in bypassed reach (1,300 cfs)
Priority #3-- Minimum canal flows of 810 cfs
Priority #4-- Hadley Station Unit 1 Operation to 4,200 cfs capacity
Priority #5-- First Level Canal to 6,000 cfs capacity
Priority #6-- Hadley Station Unit #2

This priority schedule of flows may be revised based on project operation data and the results of fishway effectiveness studies.

4. Evaluate the effectiveness of the existing surface bypass and partial depth louver structure (downstream fishway), in the First Level Canal for the downstream passage of adult and juvenile

shortnose sturgeon, and adult American eel. Provide a full depth louver or generation restrictions if effectiveness studies demonstrate the need.

5. Continue operation of existing Boatlock Station downstream migrant facilities (downstream fishway) pending verification by effectiveness study results that the louver bypass facilities in the First Level Canal are effective for downstream passage of designated target species for all canal flows. (See Item # 14 on Figure 1).

9.3. HGE Project (FERC # 11607) Specific Prescriptions

The HGE is proposing to construct, as part of the proposed project expansion, almost all of the upstream and downstream migrant facilities identified by the Service and has submitted conceptual plans for these recommended fishways in the license application. After further evaluation, the U.S. Fish and Wildlife Service has determined that construction of a downstream entrance channel, with multi-level entrances at the Hadley Station tailrace, is not warranted at this time. (Item #5 in Figure 1). Therefore, this downstream entrance is deferred for future consideration and will be prescribed if effectiveness studies of the passage measures prescribed herein demonstrate the need for this additional measure.

9.3.1. Upstream Fishways at Existing Project

1. Undertake necessary modifications to the existing spillway and powerhouse fish entrances, collection gallery and fish crowders to allow fish lift operation at river flows up to 40,000 cfs, to provide at least 12 inches of freeboard from operating water levels in the fishways to the top of the fishway walls and fish crowders. (See Item #1 on Figure 1).

2. Expand the existing spillway and powerhouse fish lifts to accommodate the fishway design population designated in Section 9.1 as follows: (See Items #2 & 3 on Figure 1).

- Provide attraction flow of 200 cfs at spillway entrance and 120 cfs at each of two entrances to Hadley Station entrance gallery.

- Increase both the existing spillway and powerhouse fish lift hoppers to 33.0 cubic feet per minute of cycle time (330 cubic feet for 10 minute cycle). The hopper capacity at the spillway lift may be increased in approved stages above the current 180 cubic feet capacity.

- Increase the width of the existing fish exit channel to 14 feet from the hopper discharge to the fish counting station, and to 10 feet from the fish counting station to the upstream end of the exit channel.

- Construct a second fish counting and trapping station in the expanded fish exit channel, opposite the existing fish counting station.

- Provide an adjustable back lighted panel at all fish counting windows to facilitate fish passage operations during periods of high turbidity.

3. Remove rock outcropping at the west side of the existing powerhouse tailrace collection gallery to create a suitable entrance channel to the existing non-functional fish lift entrance at Unit #2. (See Item #4 on Figure 1).

4. Construct three special fishways for American eel at the east side of the Holyoke Dam, at the powerhouse fish lift, and the spillway lift. (See Item #7 on Figure 1). Conceptual plans for the eel fishways are included in Figure 6(A)-1 & 2 of July/98 Schedule B Additional Information Response - Vol 1.

5. Construct a fish barrier at the confluence of the powerhouse tailrace channel and the overflow channel from Boatlock Station to prevent upstream migrants from dead ending in this channel. (See Item #8 on Figure 1). Details of the proposed fish barrier are shown on Figure 11(B)-1 of July/98 Schedule B Additional Information Response--Vol 1.

9.3.2. Upstream Fishways at new Unit #3

1. The licensee must provide continued operation of existing upstream and downstream migrant facilities during the construction of Unit #3. To provide continued upstream passage at the spillway lift during the construction of the new spillway fish lift and Unit #3, the licensee will install the temporary measures shown on Scheme A - Figure 11(F)-2 of Dec/98 Schedule B, Additional Information Response.

2. Construct a new spillway lift and powerhouse lift for Unit #3 (each with 330 cubic feet hopper capacity for a 10 minute cycle time), with a collection gallery and two gated entrances at the powerhouse lift, and a fish exit channel extension (10' wide). (See Items 12--15 on Figure 1). Operating flows at new fish lifts are 150 cfs at spillway lift entrance and 135 cfs at each of the two powerhouse entrances at Unit #3. Final design and layout of proposed upstream fishways at Unit #3 shall be verified by hydraulic model studies to be undertaken by licensee in cooperation with the Service. Proposed upstream facilities are shown on Exhibit F-24 to F-26 of License Application Vol 1.

3. The Licensee shall construct a 40-foot long segment of rubber dam at the spillway crest to control spillway discharge and create a suitable flow field at the new spillway fish lift entrance. (See Item #16 on Figure 1).

4. If Proposed Unit #3 is deferred beyond 2006, the licensee shall implement the improvements to the existing upstream facilities shown on Figure 2. Specifics are included in the Prescription for the HWP Project.

9.3.3. Downstream Fishways at Existing Project

1. Construct a downstream fishway at the spillway bascule gate (Flyover Structure). The Flyover Structure shall conform to the design depicted in hydraulic model studies undertaken by the licensee in cooperation with the U.S. Fish and Wildlife Service. (A preliminary design of the Flyover Structure is depicted in Item 5.C of the HWP AIR -Vol 2, dated July/98). Final designs shall include measures to manage flows that are shed through the Flyover Structure, such that the interference with upstream passage via the spillway lift that currently exists is eliminated. The operating flow at the Flyover Structure will be 600 cfs. Effectiveness studies of the flyover structure shall be undertaken by the licensee. (See Item # 9 on Figure 1).

2. Construct a new full depth angled rack at the Hadley Falls Station forebay to facilitate the downstream passage of target species. (See Items #12 on Figure 2). During initial modeling, the clear spacing of the screen of one inch will be evaluated. The final clear bar spacing and configuration of the angled rack will be determined by the U.S. Fish and Wildlife Service in consideration of hydraulic model studies and evaluation to be undertaken by the licensee and other Generation restrictions during portions of the year may be proposed or required in conjunction with the angled screen to achieve successful downstream passage.

3. Deferral of construction of certain items listed in Items #1 and 2 above may be granted by Service, provided effective downstream passage can be provided in the interim, if the licensee agrees to expedite construction of Unit #3 and related downstream fishways soon after license is issued.

4. During the interim period between license issuance and construction and successful evaluation of the new angled rack structure identified in item #2 above, or the new facilities associated with unit #3, the flows from the project should be distributed to maximize effective (safe, timely, convenient) upstream and downstream passage of salmon smolts (April 1 through June 15), as follows:

Priority #1-- Flows to operate fish passage facilities
Priority #2-- Zone-of-passage flows in bypassed reach (1,300 cfs)
Priority #3-- Minimum canal flows of 810 cfs
Priority #4-- Hadley Station Unit 1 Operation to 4,200 cfs capacity
Priority #5-- First Level Canal to 6,000 cfs capacity
Priority #6-- Hadley Station Unit #2

This priority schedule of flows may be revised based on project operation data and the results of fishway effectiveness studies.

5. Evaluate the effectiveness of the existing surface bypass and partial depth louver structure (downstream fishway) in the First Level Canal for the downstream passage of adult and juvenile

Shortnose sturgeon and adult American eel. Provide a full depth louver or generation restrictions if effectiveness studies demonstrate the need.

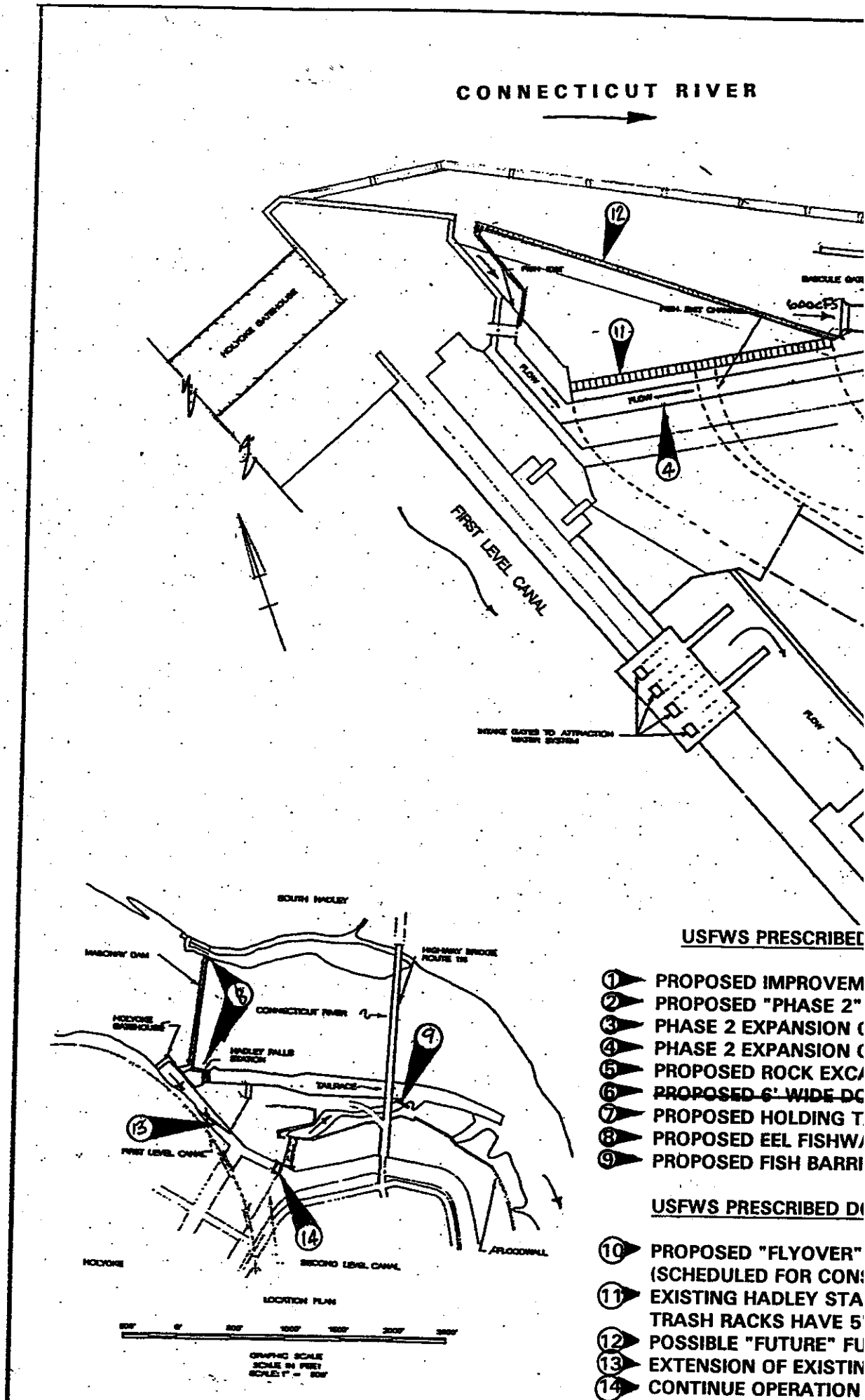
6. Continue operation of existing Boatlock Station downstream migrant facilities (downstream fishway) pending verification by effectiveness study results that the louver bypass facilities in the First level canal are effective for downstream passage of designated target species for all canal flows. (See Item # 11 on Figure 1).

9.3.4. Downstream Fishways at new Unit #3

1. The licensee must provide continued operation of existing downstream passage facilities during the construction of Unit #3.

2. Construct full depth angled trashrack structure and multi-level fish bypass structure as proposed by the licensee on Exhibit F-27 and F-28 of License Application, Vol 1. (See Items # 17, 18 & 19 on Figure 1). Operating flows at the bypass are to be a minimum of 350 cfs. Final design, layout, and clear bar spacing at angled rack are to be determined by hydraulic model studies and evaluation to be undertaken by the licensee in cooperation with the Service.

3. If proposed Unit #3 is deferred beyond 2006, the licensee shall construct the downstream facilities shown on Figure 2. Specifics are included in the Prescription for the HWP Project. (See Figure 2).


CONNECTICUT RIVER
12
11
4
FIRST LEVEL CANAL
FLOW
INTAKE GATES TO ATTRACTION WATER SYSTEM
SOUTH HADLEY
HIGH-WAY BRIDGE ROUTE 116
MASONRY DAM
CONNECTICUT RIVER
HOLYOKE GATEHOUSE
HADLEY FALLS STATION
TAILRACE
FIRST LEVEL CANAL
SECOND LEVEL CANAL
HOLYOKE
LOCATION PLAN
GRAPHIC SCALE
SCALE IN FEET
SCALE: 1" = 800'
USFWS PRESCRIBED
1 PROPOSED IMPROVEM
2 PROPOSED "PHASE 2"
3 PHASE 2 EXPANSION
4 PHASE 2 EXPANSION
5 PROPOSED ROCK EXCA
6 PROPOSED 6' WIDE DO
7 PROPOSED HOLDING T
8 PROPOSED EEL FISHWA
9 PROPOSED FISH BARRI
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10 PROPOSED "FLYOVER"
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11 EXISTING HADLEY STA
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12 POSSIBLE "FUTURE" FU
13 EXTENSION OF EXISTIN
14 CONTINUE OPERATION
EFFECTIVE FOR TARGET

ORIGINAL

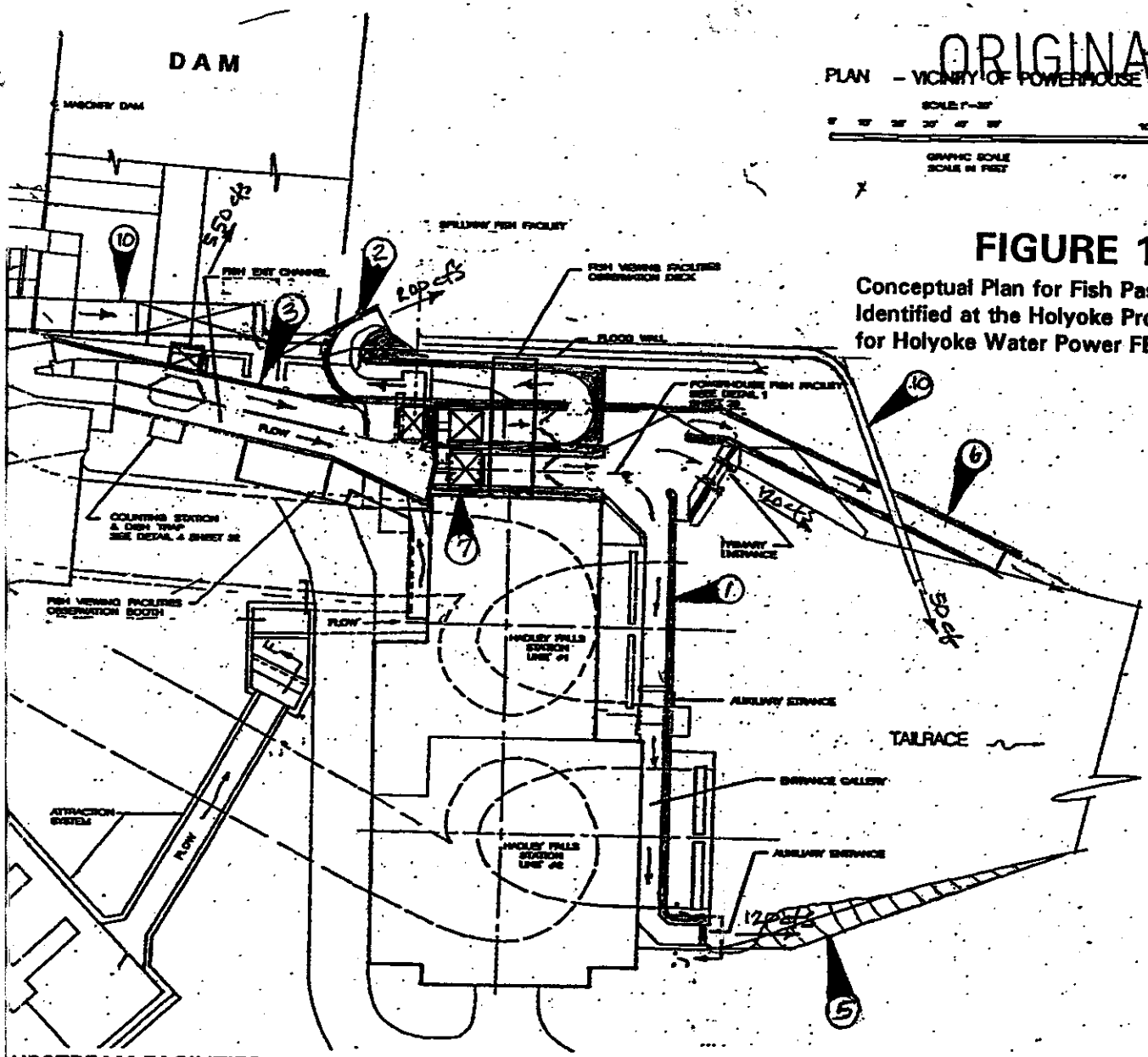


FIGURE 1

Conceptual Plan for Fish Passage Facilities Identified at the Holyoke Project for Holyoke Water Power FERC# 2004

UPSTREAM FACILITIES

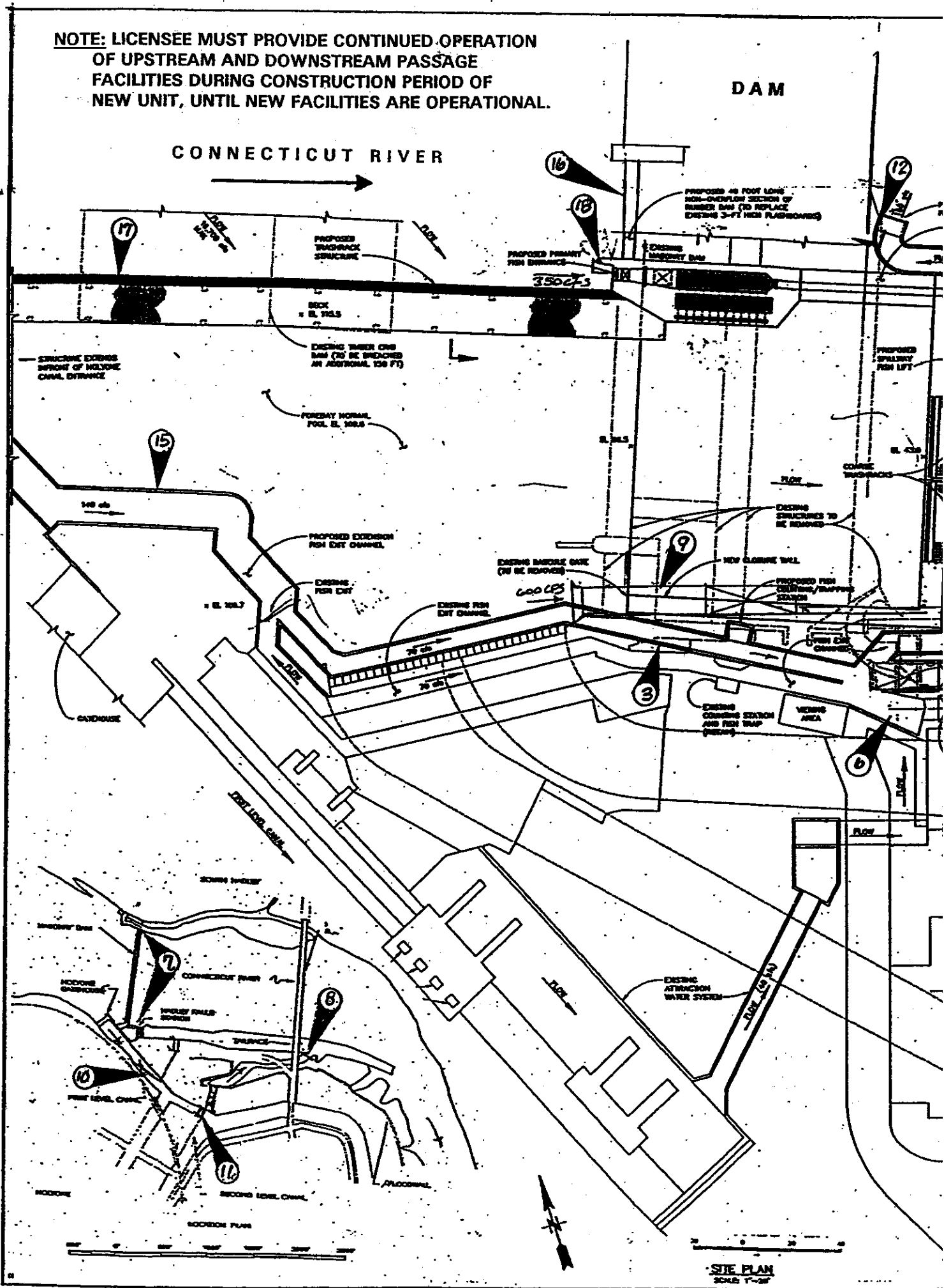
FIGURE 1

NTS TO FISH LIFT COLLECTION GALLERY, ENTRANCES AND CROWDERS FOR OPERATION AT 40,000 CFS RIVER FLOW.
SPILLWAY AND POWERHOUSE FISH LIFT EXPANSION TO ALLOW PASSAGE OF DESIGN POPULATION.
F FISH EXIT CHANNEL TO 14' WIDE, WITH NEW FISH COUNTING STATION OPPOSITE EXISTING COUNTING STATION.
F FISH EXIT CHANNEL TO 10' WIDE UPSTREAM OF COUNTING STATION, INCLUDING EXTENSION AT UPSTREAM END.
VATION IN TAILRACE CHANNEL TO ALLOW OPERATION OF EXISTING FISH LIFT ENTRANCE AT UNIT #2.
~~WNSTREAM ENTRANCE CHANNEL TO POWERHOUSE LIFT WITH MULTI-LEVEL GATED ENTRANCES~~ (FUTURE).
NKS TO ALLOW DIRECT SLUICING OF SHAD FROM MAIN HOPPERS TO EXPEDITE SHAD TRAPPING AND HAULING
YS AT EAST BANK OF SPILLWAY AND AT FISH LIFTS.
R TO PREVENT UPSTREAM MIGRANTS FROM ENTRY INTO BOATLOCK STATION #2 OVERFLOW CHANNEL TAILRACE.

WNSTREAM FACILITIES

DOWNSTREAM MIGRANT BYPASS STRUCTURE AT BASCULE GATE WITH FISH DISCHARGE CONDUIT TO TAILRACE.
TRUCTION IN 1999 BY HWP.
ION TRASH RACKS WITH OVERLAY PANELS AT UPPER 10 FT. TO GUIDE MIGRANTS TO BASCULE GATE/FLYOVER.
CLEAR OPENINGS.
L DEPTH TRASH RACK WITH 1" CLEAR OPENINGS TO FACILITATE DOWNSTREAM PASSAGE OF EELS AND STURGEON
LOUVER PANELS TO FULL DEPTH FOR DOWNSTREAM PASSAGE OF EELS AND STURGEON IN FIRST LEVEL CANAL.
OF BOATLOCK STATION DOWNSTREAM BYPASS PENDING VERIFICATION THAT LOUVERS IN FIRST LEVEL CANAL ARE
SPECIES AT ALL CANAL FLOWS.

(HWP)


NOTE: LICENSEE MUST PROVIDE CONTINUED OPERATION OF UPSTREAM AND DOWNSTREAM PASSAGE FACILITIES DURING CONSTRUCTION PERIOD OF NEW UNIT, UNTIL NEW FACILITIES ARE OPERATIONAL.
DAM
CONNECTICUT RIVER
PROPOSED TRASHRACK STRUCTURE
PROPOSED PRIMARY FISH ENTRANCE
3500 CFS
DECK = EL. 115.5
EXISTING TIMBER CRIB DAM (TO BE BREACHED AN ADDITIONAL 150 FT)
STRUCTURE EXTENDS INFRONT OF HOLYOKE CANAL ENTRANCE
FOREBAY NORMAL POOL EL. 108.5
PROPOSED EXTENSION FISH EXIT CHANNEL
EXISTING FISH EXIT
EXISTING FISH EXIT CHANNEL
EXISTING SPILLWAY FISH LIFT
CONCRETE TRASHRACKS
EXISTING STRUCTURES TO BE REMOVED
EXISTING EMERGENCY GATE (TO BE REMOVED)
600 CFS
NEW CLOSURE WALL
PROPOSED FISH COLLECTION/TRAPPING STATION
FISH EXIT CHANNEL
EXISTING COLLECTION STATION AND FISH TRAP (REMOVE)
WELDING AREA
GATEHOUSE
FIRST LEVEL CANAL
SECOND LEVEL CANAL
HOLYOKE DAM
CONNECTICUT RIVER
HOLYOKE GATEHOUSE
SPILLWAY
ENTRANCE
FLOODWALL
EXISTING ATTRACTION WATER SYSTEM
HOLYOKE PLAN
SITE PLAN
SCALE: 1"=20'

USFWS PRESCRIBED FISH PASSAGE FACILITIES FOR NEW UNIT #3

ORIGINAL

12 PROPOSED SPILLWAY FISH LIFT.
13 PROPOSED POWERHOUSE FISH LIFT ENTRANCE GALLERY WITH MULTI-LEVEL GATED ENTRANCE.
14 PROPOSED POWERHOUSE FISH LIFT CROWDER AND HOPPER TOWER FOR NEW UNIT 3.
15 PROPOSED EXTENTION OF EXPANDED FISH LIFT EXIT CHANNEL THRU NEW TRASHRACK STUCTURE.
16 PROPOSED 40' LONG RUBBER DAM SPILLWAY TO CONTROL FLOW AT SPILLWAY FISH LIFT ENTRANCE.
17 PROPOSED FULL DEPTH ANGLED TRASHRACK AND FISH GUIDING DEVICE TO GUIDE DOWNSTREAM MIGRANTS TO NEW BYPASS STRUCTURE.
18 PROPOSED MULTI-LEVEL DOWNSTREAM MIGRANT BYPASS INTAKE STRUCTURE.
19 PROPOSED DOWNSTREAM MIGRANT BYPASS CONDUIT TO PASS MIGRANTS TO TAILRACE VIA NEW FISH SORTING FACILITY.

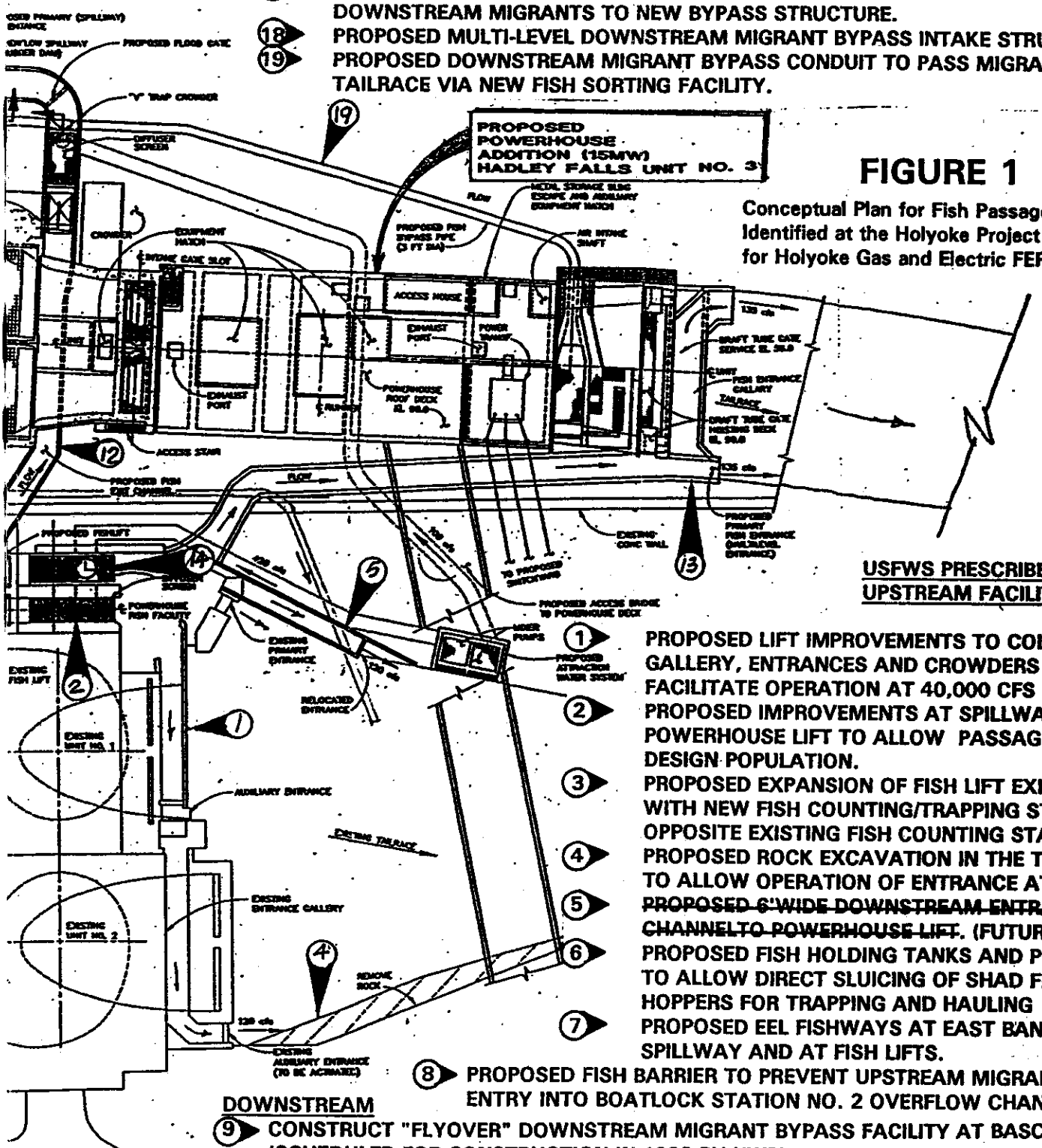


FIGURE 1

Conceptual Plan for Fish Passage Facilities Identified at the Holyoke Project for Holyoke Gas and Electric FERC# 11607

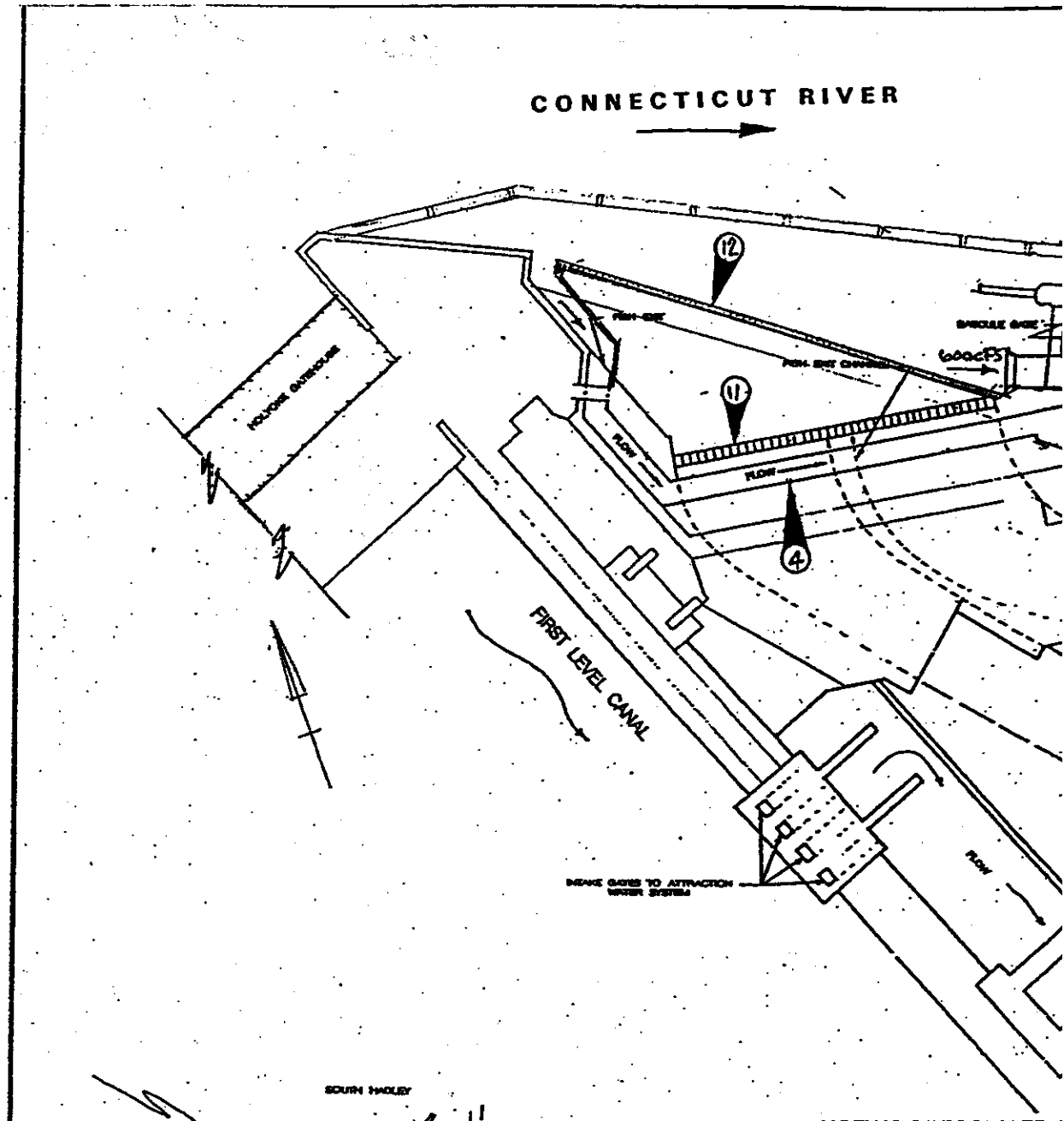
USFWS PRESCRIBED UPSTREAM FACILITIES

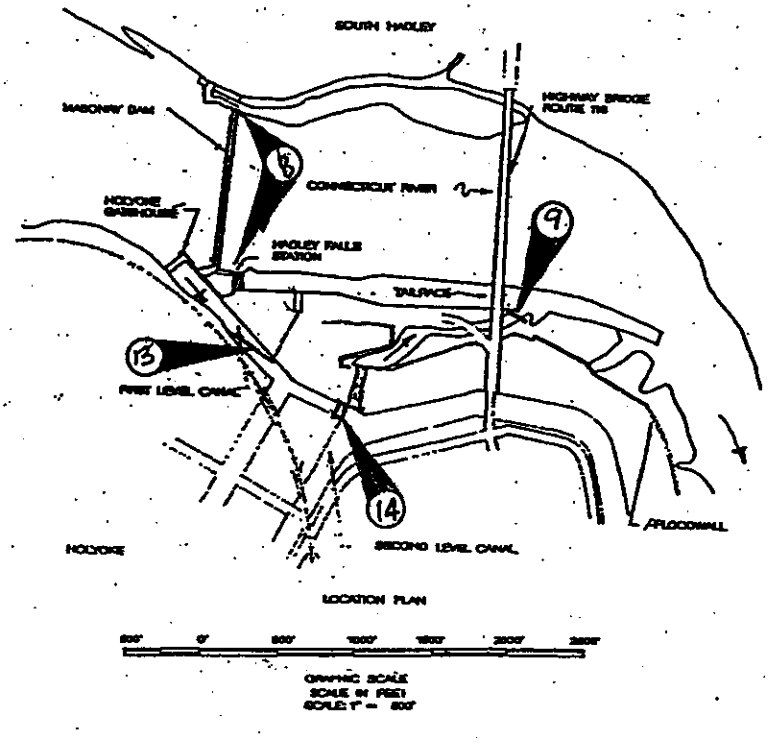
1 PROPOSED LIFT IMPROVEMENTS TO COLLECTION GALLERY, ENTRANCES AND CROWDERS TO FACILITATE OPERATION AT 40,000 CFS FLOW.
2 PROPOSED IMPROVEMENTS AT SPILLWAY AND POWERHOUSE LIFT TO ALLOW PASSAGE OF THE DESIGN POPULATION.
3 PROPOSED EXPANSION OF FISH LIFT EXIT CHANNEL WITH NEW FISH COUNTING/TRAPPING STATION OPPOSITE EXISTING FISH COUNTING STATION.
4 PROPOSED ROCK EXCAVATION IN THE TAILRACE TO ALLOW OPERATION OF ENTRANCE AT UNIT #2.
5 ~~PROPOSED 6'WIDE DOWNSTREAM ENTRANCE CHANNELTO POWERHOUSE LIFT.~~ (FUTURE)
6 PROPOSED FISH HOLDING TANKS AND PLATFORM TO ALLOW DIRECT SLUICING OF SHAD FROM LIFT HOPPERS FOR TRAPPING AND HAULING
7 PROPOSED EEL FISHWAYS AT EAST BANK OF SPILLWAY AND AT FISH LIFTS.
8 PROPOSED FISH BARRIER TO PREVENT UPSTREAM MIGRANTS FROM ENTRY INTO BOATLOCK STATION NO. 2 OVERFLOW CHANNEL.

DOWNSTREAM

9 CONSTRUCT "FLYOVER" DOWNSTREAM MIGRANT BYPASS FACILITY AT BASCULE GATE (SCHEDULED FOR CONSTRUCTION IN 1999 BY HWP).
10 POSSIBLE EXTENTION OF EXISTING LOUVER PANELS TO FULL DEPTH TO FACILITATE DOWNSTREAM PASSAGE OF EELS AND STURGEON.
11 CONTINUE OPERATION OF BOATLOCK STATION DOWNSTREAM BYPASS PENDING VERIFICATION BY LICENSEE THAT LOUVERS IN FIRST LEVEL CANAL ARE EFFECTIVE FOR TARGET SPECIES AT ALL CANAL FLOWS.

(HGE)





USFWS PRESCRIBED

1. PROPOSED IMPROVEME
2. PROPOSED "PHASE 2" S
3. PHASE 2 EXPANSION OF
4. PHASE 2 EXPANSION OF
5. PROPOSED ROCK EXCAV
6. ~~PROPOSED 6' WIDE DOV~~
7. PROPOSED HOLDING TA
8. PROPOSED EEL FISHWA
9. PROPOSED FISH BARRIE

USFWS PRESCRIBED DO

10. PROPOSED "FLYOVER" D (SCHEDULED FOR CONST
11. EXISTING HADLEY STAT TRASH RACKS HAVE 5"
12. POSSIBLE "FUTURE" FUL
13. EXTENSION OF EXISTING
14. CONTINUE OPERATION O EFFECTIVE FOR TARGET

ORIGINAL

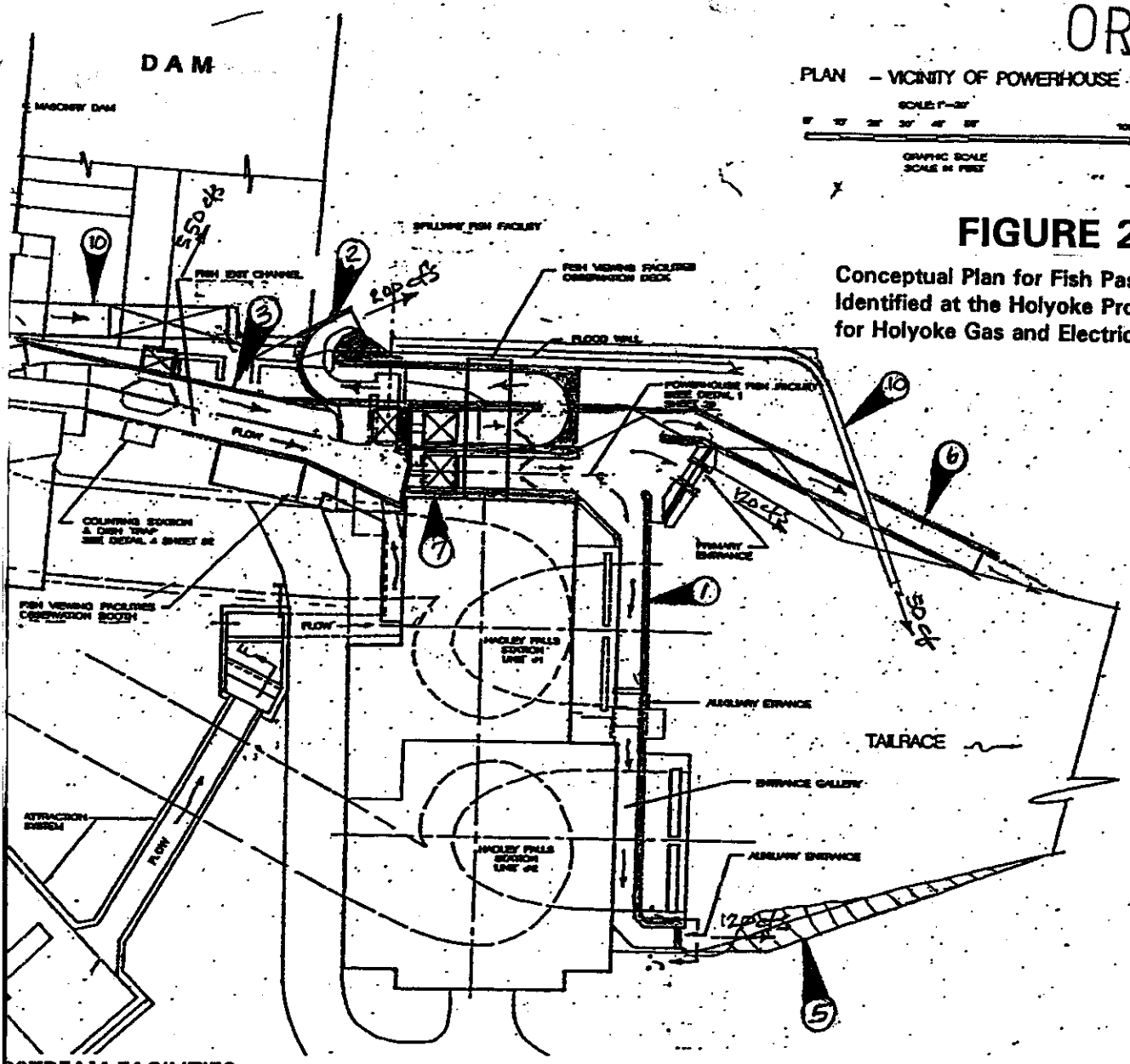


FIGURE 2

Conceptual Plan for Fish Passage Facilities Identified at the Holyoke Project for Holyoke Gas and Electric FERC# 11607

FIGURE 2

PSTREAM FACILITIES

TS TO FISH LIFT COLLECTION GALLERY, ENTRANCES AND CROWDERS FOR OPERATION AT 40,000 CFS RIVER FLOW.
LLWAY AND POWERHOUSE FISH LIFT EXPANSION TO ALLOW PASSAGE OF DESIGN POPULATION.
FISH EXIT CHANNEL TO 14' WIDE, WITH NEW FISH COUNTING STATION OPPOSITE EXISTING COUNTING STATION.
FISH EXIT CHANNEL TO 10' WIDE UPSTREAM OF COUNTING STATION, INCLUDING EXTENSION AT UPSTREAM END.
ATION IN TAILRACE CHANNEL TO ALLOW OPERATION OF EXISTING FISH LIFT ENTRANCE AT UNIT #2.
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NSTREAM FACILITIES

WNSTREAM MIGRANT BYPASS STRUCTURE AT BASCULE GATE WITH FISH DISCHARGE CONDUIT TO TAILRACE.
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LEAR OPENINGS.
DEPTH TRASH RACK WITH 1" CLEAR OPENINGS TO FACILITATE DOWNSTREAM PASSAGE OF EELS AND STURGEON
LOUVER PANELS TO FULL DEPTH FOR DOWNSTREAM PASSAGE OF EELS AND STURGEON IN FIRST LEVEL CANAL.
BOATLOCK STATION DOWNSTREAM BYPASS PENDING VERIFICATION THAT LOUVERS IN FIRST LEVEL CANAL ARE
PECIES AT ALL CANAL FLOWS.

(HGE)