

LOW-IMPACT HYDROPOWER POWER INSTITUTE CERTIFICATION APPLICATION

HOOKSETT HYDROELECTRIC DEVELOPMENT PART OF THE MERRIMACK PROJECT (FERC No. 1893)



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TABLE OF CONTENTS

1.0	FACILITY DESCRIPTION	1
1.1	PROJECT DESCRIPTION.....	6
2.0	STANDARDS MATRICES	16
2.1	IMPOUNDMENT ZOE	16
2.2	BYPASSED REACH ZOE	16
2.3	DOWNSTREAM ZOE.....	16
3.0	SUPPORTING INFORMATION	17
3.1	ECOLOGICAL FLOWS STANDARDS: IMPOUNDMENT ZOE	17
3.2	ECOLOGICAL FLOWS STANDARDS: BYPASSED REACH ZOE	19
3.3	ECOLOGICAL FLOWS STANDARDS: DOWNSTREAM ZOE.....	20
3.4	WATER QUALITY STANDARDS: ALL ZOES.....	21
3.5	UPSTREAM FISH PASSAGE STANDARDS: IMPOUNDMENT ZOE.....	23
3.6	UPSTREAM FISH PASSAGE STANDARDS: BYPASSED REACH ZOE	24
3.7	UPSTREAM FISH PASSAGE STANDARDS: DOWNSTREAM ZOE.....	28
3.8	DOWNSTREAM FISH PASSAGE AND PROTECTION STANDARDS: IMPOUNDMENT ZOE	29
3.9	DOWNSTREAM FISH PASSAGE STANDARDS: BYPASSED REACH ZOE	30
3.10	DOWNSTREAM FISH PASSAGE STANDARDS: DOWNSTREAM ZOE.....	31
3.11	SHORELINE AND WATERSHED PROTECTION STANDARDS: ALL ZOES	32
3.12	THREATENED AND ENDANGERED SPECIES STANDARDS: ALL ZOES.....	37
3.13	CULTURAL AND HISTORIC RESOURCES STANDARDS: ALL ZOES.....	40
3.14	RECREATIONAL RESOURCES STANDARDS: ALL ZOES.....	41
4.0	CONTACTS FORMS.....	42
5.0	SWORN STATEMENT	44

TABLE OF CONTENTS (CONT'D)

LIST OF TABLES

TABLE 1	HOOKSETT DEVELOPMENT FACILITIES AND DESCRIPTIONS	2
TABLE 2	FACILITY DESCRIPTION INFORMATION FOR THE HOOKSET HYDROELECTRIC DEVELOPMENT (PART OF FERC No. 1893)	12
TABLE 3	NHB COMMUNITIES AND SPECIES THAT ARE KNOWN TO OCCUR OR HAVE HISTORICALLY OCCURRED IN OR NEAR THE PROJECT	38

LIST OF FIGURES

FIGURE 1	PROJECT BOUNDARY MAP	3
FIGURE 2	GEOGRAPHIC OVERVIEW OF PROJECT LOCATION	4
FIGURE 3	ZONES OF EFFECT	5
FIGURE 4	PROJECT COVER CLASSIFICATION.....	33
FIGURE 5	PROJECT BOUNDARY	A-1
FIGURE 6	GEOGRAPHIC OVERVIEW OF PROJECT LOCATION	A-2
FIGURE 7	ZONES OF EFFECT	A-3
FIGURE 8	MERRIMACK RIVER BASIN.....	B-2
FIGURE 9	DAMS ON THE MERRIMACK RIVER.....	B-3

LIST OF PHOTOS

PHOTO 1	HOOKSETT SPILLWAY WITH 64 CFS.....	7
PHOTO 2	HOOKSETT BYPASSED REACH.....	7
PHOTO 3	HOOKSETT BYPASSED REACH LOOKING DOWNSTREAM TOWARD POWERHOUSE.....	8
PHOTO 4	WESTERN BYPASS WITH BYPASS FLOWS	9
PHOTO 5	HOOKSETT GENERATOR.....	10
PHOTO 6	HOOKSETT FISH PASSAGE GATE	11
PHOTO 7	HOOKSETT SPILLWAY WITH 64 CFS.....	A-4
PHOTO 8	HOOKSETT BYPASSED REACH.....	A-5
PHOTO 9	HOOKSETT BYPASSED REACH LOOKING DOWNSTREAM TOWARD POWERHOUSE	A-6
PHOTO 10	WESTERN BYPASS WITH BYPASS FLOWS	A-7
PHOTO 11	HOOKSETT GENERATOR.....	A-8
PHOTO 12	HOOKSETT FISH PASSAGE GATE	A-9
PHOTO 13	POSITIVE RESTRAINT SYSTEM	A-10
PHOTO 14	PORTAGE TAKEOUT	A-11
PHOTO 15	PORTAGE PUT-IN	A-12
PHOTO 16	OVERVIEW OF HOOKSETT PROJECT	B-1

TABLE OF CONTENTS (CONT'D)

LIST OF APPENDICES

APPENDIX A	PROJECT ZOES, DRAWINGS, AND PHOTOS
APPENDIX B	FACILITY AREA RIVER BASIN
APPENDIX C	WATER QUALITY CERTIFICATION
APPENDIX D	THREATENED AND ENDANGERED SPECIES
APPENDIX E	CONSULTATION

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HOOKSETT HYDROELECTRIC DEVELOPMENT PART OF THE MERRIMACK PROJECT (FERC No. 1893)

1.0 FACILITY DESCRIPTION

The Hooksett Development is one of three developments that comprise the Merrimack River Project (FERC No. 1893), located along 21 miles of the Merrimack River. The development is in the town of Hooksett and Bow, Merrimack County, New Hampshire. Hooksett is operated in run-of-river mode with an installed capacity of 1,600 kW. The development is approximately 8 miles upstream of the Amoskeag Dam at river mile 81.1 and has a drainage area of 2,805 square miles. The project reservoir extends upstream approximately 5.5 miles and has a surface area of 350 acres. The Merrimack River Project is owned by HSE Hydro NH, LLC and operated by Central Rivers Power NH, LLC (CRPNH).

Public Service of New Hampshire (PSNH) (prior owner before Central River Power (CRPNH)) applied to the New Hampshire DES for 401 Water Quality certification on December 16, 2003. The New Hampshire DES received the request on December 17, 2003 and issued a certification on December 16, 2004. PSNH appealed certain conditions and the New Hampshire DES issued a modified certification on May 10, 2005¹. The modified certification contains eleven conditions.

The Licensee provides a minimum flow of 64 cfs at all times into the Project bypassed reach for the protection of aquatic life.

The project boundary includes all project structures and facilities, including the project's dam, powerhouse, reservoir, canal, transmission facilities, and recreation facilities. The project boundary also incorporates all lands occupied by these structures and facilities, as well as all lands that serve a project purpose.

Table 1 summarizes the project facility.

¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10600709>

TABLE 1 HOOKSETT DEVELOPMENT FACILITIES AND DESCRIPTIONS

HOOKSETT DEVELOPMENT – FERC No. 1893	
Description	Number or Fact
GENERAL INFORMATION	
FERC Number	P-1893
License Issued	May 18, 2007
License Expiration Date	April 30, 2047
Licensed Capacity	1,600 kW
Project Location	On Merrimack River in Merrimack County, New Hampshire.
Project Boundary	5.9 acres
RESERVOIR AND DAM	
Surface Area of Reservoir	350 acres
Length of Reservoir	Approximately 5.5 miles
Gross Storage of Reservoir	1,650 acre-feet
Elevation Top of Dam	187 feet (USGS datum)
Height	Varies but generally 10-20 feet
Length of Dam	a 340-foot-long stone masonry section with 2-foot-high flashboards connected to a 250-foot-long concrete section with 2-foot-high flashboards
Gross head	16 feet
POWER CANAL	
Length	Approximately 245 feet
Width	Approximately 73 feet
POWERHOUSE	
Length (Superstructure)	40 feet
Width (Superstructure)	45 feet
TURBINES/GENERATORS	
Number of units	Single generating unit
Rated Net Head	16 feet
Total Hydraulic Capacity	1750 cfs
Average Annual Generation	8,020 MWh for 2010-2017
TAILRACE	
Length	Approximately 110 feet

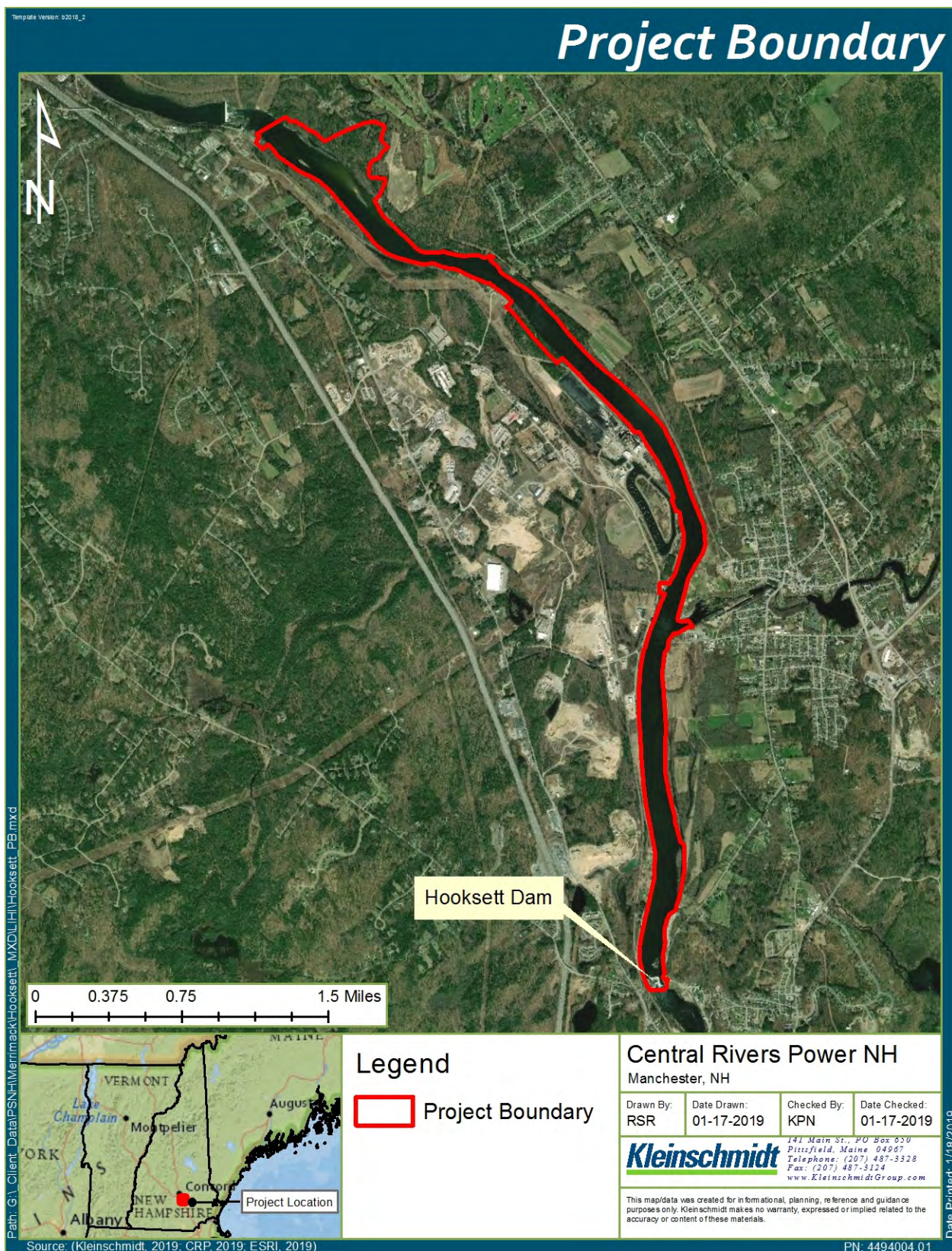


FIGURE 1 PROJECT BOUNDARY MAP

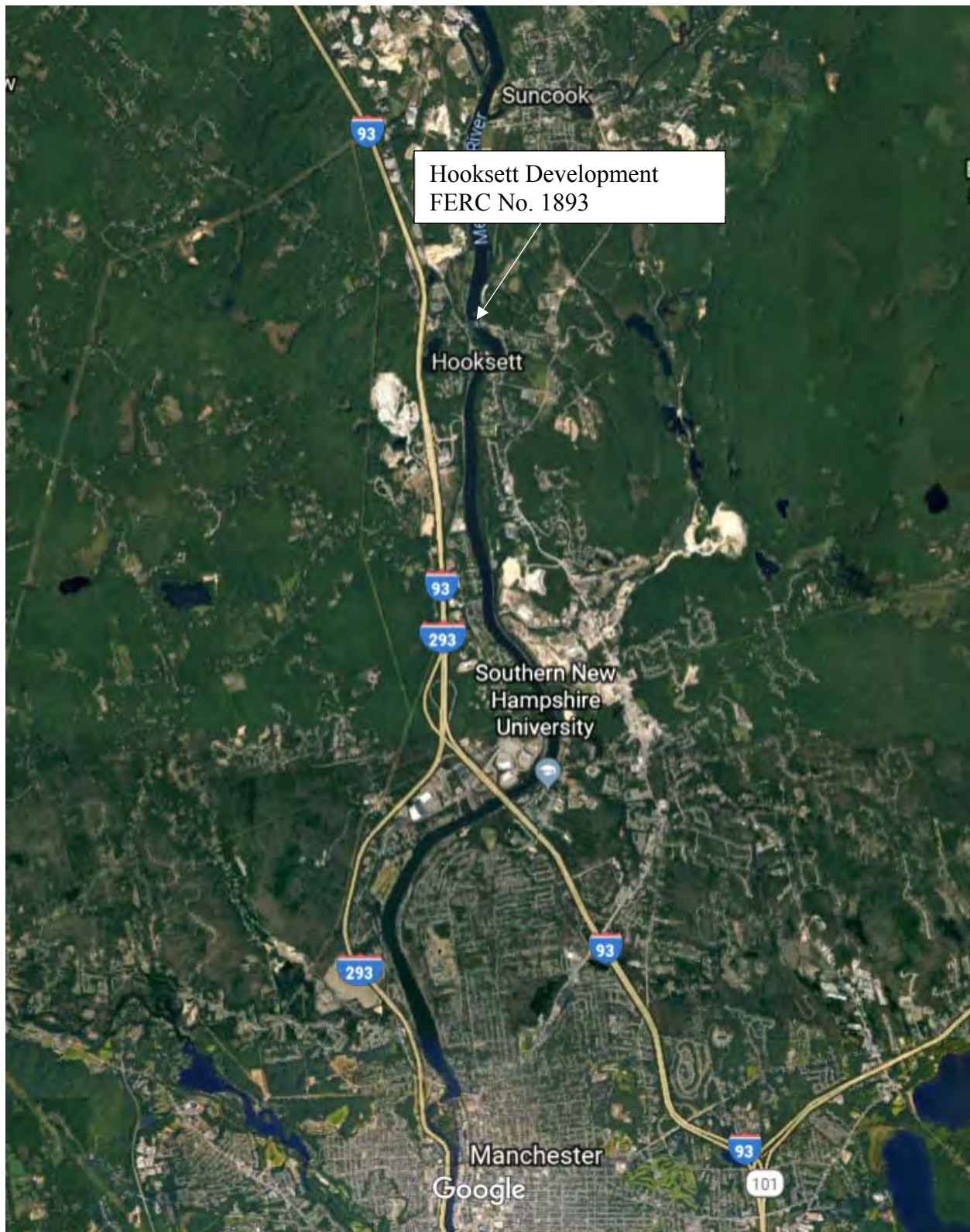


FIGURE 2 GEOGRAPHIC OVERVIEW OF PROJECT LOCATION

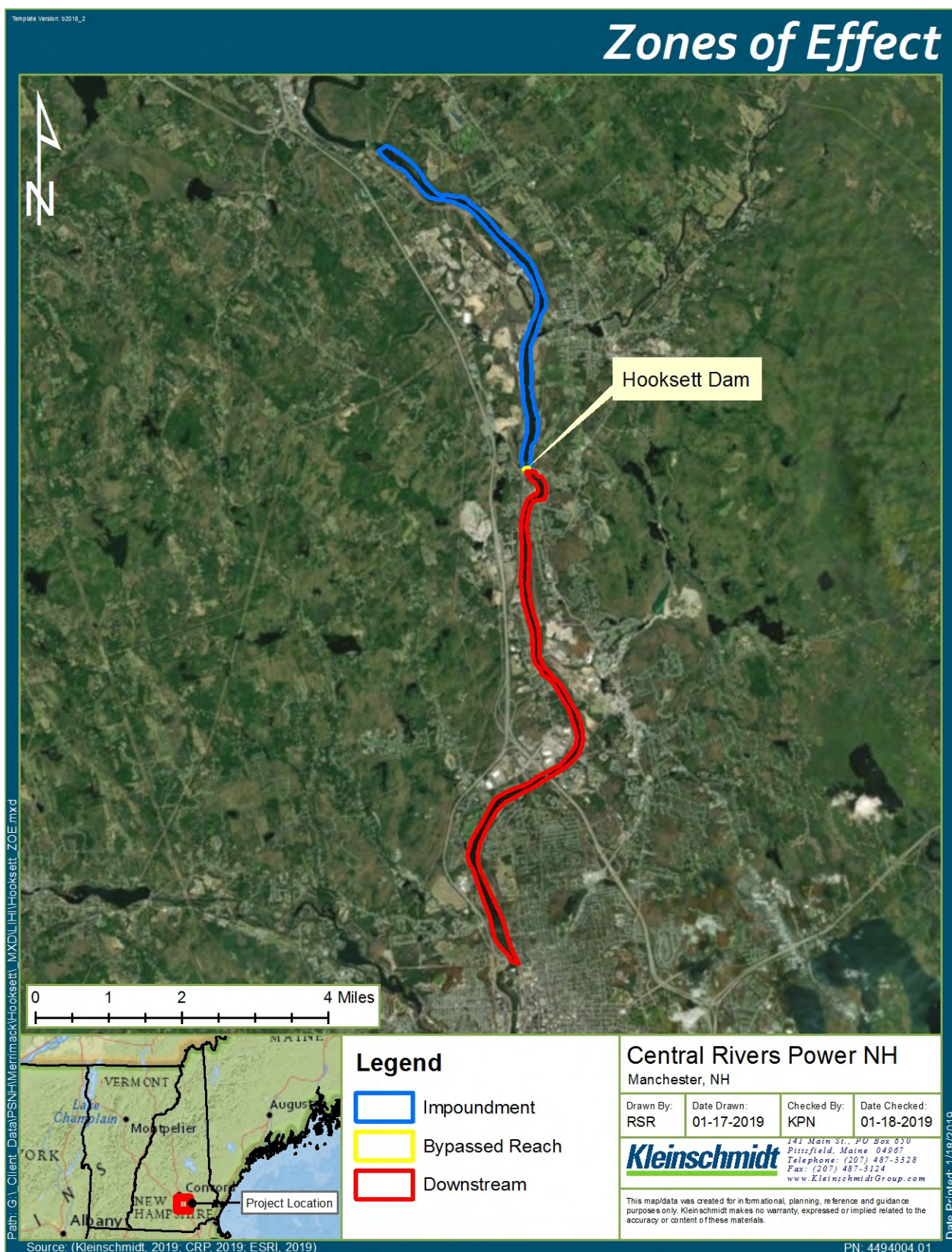


FIGURE 3 ZONES OF EFFECT

1.1 PROJECT DESCRIPTION

The Hooksett Development consists of a 5.5-mile-long, 350-acre reservoir, dam, power canal, powerhouse, tailrace channel, substation, and appurtenant facilities, which are described in further detail below. The run-of-river plant is operated automatically as a base load unit generating power whenever adequate river flows are available.

The Hooksett dam has two spillway sections. A stone masonry section, approximately 340 feet long, extends from the west bank of the river. The second section is approximately 250 feet long and made of concrete. This section runs longitudinally up and down the river near the east bank of the river and forms a canal that extends to the powerhouse, each section topped with 2-foot-high wooden flashboards and a crest at elevation 187 feet (USGS datum). There is a 13-foot-by-20-foot steel Taintor wastegate located between the second spillway section and the powerhouse; a power canal, located at the east of the dam, a brick powerhouse is approximately 40 feet long by 45 feet wide. The powerhouse contains a single 2,150 hp I.P. Morris vertical propeller turbine connected to an Allis-Chalmers generator with an installed capacity of 1,600 kW. The project has an approximate 110-foot long tailrace and a bypassed reach approximately 430 feet long. There is a substation; and other appurtenances.

The U.S. Department of the Interior (USDOI), Fish and Wildlife Service (USFWS) fishway prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. The trigger number for river herring was reached during the 2016 migration season. As such, former owner, Eversource, initiated consultation with state and federal agencies to begin preliminary design work. HSE continues to consult with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability.

The existing downstream fish passage is a gate between the Taintor gate and the powerhouse.



PHOTO 1 **HOOKSETT SPILLWAY WITH 64 CFS**



PHOTO 2 **HOOKSETT BYPASSED REACH**



PHOTO 3 HOOKSETT BYPASSED REACH LOOKING DOWNSTREAM TOWARD POWERHOUSE



PHOTO 4 WESTERN BYPASS WITH BYPASS FLOWS



PHOTO 5 HOOKSETT GENERATOR



PHOTO 6 HOOKSETT FISH PASSAGE GATE

PROJECT OPERATIONS

The run-of-river plant is operated automatically with a remote control via SCADA from the Control Center Customized Energy Solutions (CES) located in Philadelphia, Pennsylvania. The unit is equipped with control devices that allow manual control of all unit operating functions from the station's switch board.

The average annual power production of the Hooksett Development is 8,020 MWh (2010-2017) and the total rated capacity of the unit is 1,600 kW.

The Licensee provides a Minimum flow requirement for the project bypassed reach of 64 cfs at all times into the Project bypassed reach for the protection of aquatic life.

The maximum hydraulic capacity of the plant is approximately 1,750 cfs at a gross head of 16 feet.

TABLE 2 FACILITY DESCRIPTION INFORMATION FOR THE HOOKSET HYDROELECTRIC DEVELOPMENT (PART OF FERC NO. 1893)

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
<i>Name of the Facility</i>	Facility name (use FERC project name if possible)	Hooksett Development part of the Merrimack Project (FERC No. 1893)
<i>Location</i>	River name (USGS proper name)	Merrimack River
	River basin name	Merrimack River Basin
	Nearest town, county, and state	Town of Hooksett, Merrimack County, New Hampshire
	River mile of dam above next major river	River Mile 81.1
	Geographic latitude	43°06'05" N
	Geographic longitude	71°27'58" W
<i>Facility Owner</i>	Application contact names (IMPORTANT: you must also complete the Facilities Contact Form):	Curtis R. Mooney Project Manager Central Rivers Power 59 Ayers Island Road Bristol, NH 03222
	- Facility owner (individual and company names)	HSE Hydro NH AC, LLC Todd Wynn, CEO Portfolio Companies
	- Operating affiliate (if different from owner)	Central Rivers Power NH, LLC Brent Sowle, Hydro Manager
	- Representative in LIHI certification	Andy Qua Project Manager Kleinschmidt Associates 141 Main Street P.O. Box 650 Pittsfield, ME 04967
<i>Regulatory Status</i>	FERC Project Number (P-2457), issuance and expiration dates	FERC No. 1893, issued May 18, 2007; expires April 30, 2047.
	FERC License type or special classification (e.g., "qualified conduit")	Minor Project – Existing Dam
	Water Quality Certificate identifier and issuance date, plus source agency name	See Appendix C: Certification issued by the New Hampshire Department of Environmental Services
	Hyperlinks to key electronic records on FERC e-library website (e.g., most recent Commission Orders, WQC, ESA documents, etc.)	Hyperlinks can be found in the footnotes
<i>Power Plant Characteristics</i>	Date of initial operation (past or future for operational applications)	1927
	Total name-plate capacity (MW)	1.6
	Average annual generation (MWh)	8,020 MWh for 2010-2017

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Number, type, and size of turbines, including maximum and minimum hydraulic capacity of each unit	1 unit
	Modes of operation (run-of-river, peaking, pulsing, seasonal storage, etc.)	Run-of-river
	Dates and types of major equipment upgrades	Generator rewind- 2007
	Dates, purpose, and type of any recent operational changes	None
	Plans, authorization, and regulatory activities for any facility upgrades	None
<i>Characteristics of Dam, Diversion, or Conduit</i>	Date of construction	1920's
	Dam height	Approximately 14 feet
	Spillway elevation and hydraulic capacity	Spillway elevation 187 feet (USGS datum) The maximum hydraulic capacity of the Project's single generating unit is approximately 1,750 cfs.
	Tailwater elevation	174.0 feet mean sea level (msl)
	Length and type of all penstocks and water conveyance structures between reservoir and powerhouse	The project has an approximately 200-foot-long power canal.
	Dates and types of major, generation-related infrastructure improvements	None
	Designated facility purposes (e.g., power, navigation, flood control, water supply, etc.)	Hydropower
	Water source	Merrimack River
	Water discharge location or facility	Merrimack River
<i>Characteristics of Reservoir and Watershed</i>	Gross volume and surface area at full pool	The Project reservoir has a surface area of 350 acres.
	Maximum water surface elevation (ft. MSL)	189 feet – top of dam, with 2-foot flashboards
	Maximum and minimum volume and water surface elevations for designated power pool, if available	N/A Run of River Project
	Upstream dam(s) by name, ownership, FERC number (if applicable), and river mile	Upstream of the Hooksett Development is the Garvin Falls Development that is also part of the Merrimack River Project (FERC P-1893). RM 86.7

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)																												
		Additional upstream dams are shown on Figure 9.																												
	Downstream dam(s) by name, ownership, FERC number (if applicable), and river mile	Downstream of the Hooksett Development is the Amoskeag Development that is also part of the Merrimack River Project (FERC P-1893). RM 73.1 The next downstream dam is Lowell (FERC No. 2790), located approximately 32 river miles downstream. Downstream dams are shown on Figure 9.																												
	Operating agreements with upstream or downstream reservoirs that affect water availability, if any, and facility operation	None																												
	Area inside FERC project boundary, where appropriate	Less than 400 acres																												
<i>Hydrologic Setting</i>	Average annual flow at the dam	See Average monthly flows.																												
	Average monthly flows	01092000 MERRIMACK RIVER AT GOFFS FALLS, NH <table><tr><td colspan="2">HOOKSETT FLOW NOV 1936-JAN 2019 (CFS)</td></tr><tr><td>January</td><td>4377</td></tr><tr><td>February</td><td>4301</td></tr><tr><td>March</td><td>7199</td></tr><tr><td>April</td><td>12552</td></tr><tr><td>May</td><td>7756</td></tr><tr><td>June</td><td>4265</td></tr><tr><td>July</td><td>2477</td></tr><tr><td>August</td><td>2002</td></tr><tr><td>September</td><td>2018</td></tr><tr><td>October</td><td>3152</td></tr><tr><td>November</td><td>4634</td></tr><tr><td>December</td><td>5155</td></tr><tr><td>Annual</td><td>4986</td></tr></table>	HOOKSETT FLOW NOV 1936-JAN 2019 (CFS)		January	4377	February	4301	March	7199	April	12552	May	7756	June	4265	July	2477	August	2002	September	2018	October	3152	November	4634	December	5155	Annual	4986
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November	4634																													
December	5155																													
Annual	4986																													
Location and name of relevant stream gauging stations above and below the facility	01092000 MERRIMACK RIVER AT GOFFS FALLS, NH																													
Watershed area at the dam	The Hooksett Development has a drainage area of 2,805 square miles.																													

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
<i>Designated Zones of Effect</i>	Number of zones of effect	Three Zones of Effect, including, impoundment, bypassed reach and downstream.
	Upstream and downstream locations by river miles	Zone 1: RM 81.1 to RM 86.6 Zone 2: RM 81.1 to RM 81.2 Zone 3: RM 81.1 to RM 73.3
	Type of waterbody (river, impoundment, by-passed reach, etc.)	Zone 1: Impoundment Zone 2: Bypassed reach Zone 3: River
	Delimiting structures	Zone 1: Hooksett dam up to Garvin Falls Development. Zone 2: From the Hooksett dam downstream approximately 110 feet. Zone 3: from the Tail race end (110 feet downstream of the dam) to Amoskeag Dam.
	Designated uses by state water quality agency	Class B. Class B waters are acceptable for fishing, swimming and other recreational purposes, and after treatment, for water supply.
<i>Additional Contact Information</i>	Names, addresses, phone numbers, and e-mail for local state and federal resource agencies	See attached LIHI Facility Contact Form
	Names, addresses, phone numbers, and e-mail for local non-governmental stakeholders	See attached LIHI Facility Contact Form
<i>Photographs and Maps</i>	Photographs of key features of the facility and each of the designated zones of effect	See Appendix A
	Maps, aerial photos, and/or plan view diagrams of facility area and river basin	See Appendix A

2.0 STANDARDS MATRICES

2.1 IMPOUNDMENT ZOE

CRITERION		ALTERNATIVE STANDARDS				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Plus</i>
A	Ecological Flow Regimes		<i>X</i>			
B	Water Quality		<i>X</i>			
C	Upstream Fish Passage	<i>X</i>				
D	Downstream Fish Passage		<i>X</i>			
E	Watershed and Shoreline Protection		<i>X</i>			<i>X</i>
F	Threatened and Endangered Species Protection		<i>X</i>			
G	Cultural and Historic Resources Protection		<i>X</i>			
H	Recreational Resources		<i>X</i>			

2.2 BYPASSED REACH ZOE

CRITERION		ALTERNATIVE STANDARDS				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Plus</i>
A	Ecological Flow Regimes		<i>X</i>			
B	Water Quality		<i>X</i>			
C	Upstream Fish Passage		<i>X</i>			
D	Downstream Fish Passage		<i>X</i>			
E	Watershed and Shoreline Protection		<i>X</i>			<i>X</i>
F	Threatened and Endangered Species Protection		<i>X</i>			
G	Cultural and Historic Resources Protection		<i>X</i>			
H	Recreational Resources		<i>X</i>			

2.3 DOWNSTREAM ZOE

CRITERION		ALTERNATIVE STANDARDS				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Plus</i>
A	Ecological Flow Regimes		<i>X</i>			
B	Water Quality		<i>X</i>			
C	Upstream Fish Passage		<i>X</i>			
D	Downstream Fish Passage	<i>X</i>				
E	Watershed and Shoreline Protection		<i>X</i>			<i>X</i>
F	Threatened and Endangered Species Protection		<i>X</i>			
G	Cultural and Historic Resources Protection		<i>X</i>			
H	Recreational Resources		<i>X</i>			

3.0 SUPPORTING INFORMATION

3.1 ECOLOGICAL FLOWS STANDARDS: IMPOUNDMENT ZOE

CRITERION	STANDARD	INSTRUCTIONS
A	2	<p><u>Agency Recommendation</u> (see Appendix A for definitions):</p> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement.• Explain how the recommendation relates to agency management goals and objectives for fish and wildlife.• Explain how the recommendation provides fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow variations).

- The Impoundment ZOE does not have a bypassed reach.
- The New Hampshire Department of Environmental Services (NHDES) granted the licensee a modified water quality certification (WQC) for the Project on May 10, 2005 (Appendix C).
- As stated under the modified WQC, condition E-5², the Licensee provides a Minimum flow 64 cfs at all times into the Project bypassed reach for the protection of aquatic life.
- Under WQC condition E-5 and E-7, the Licensee, at all times, provide minimum flow releases in the Project bypass reach for the protection of aquatic life, of 64 cfs. The project is operated is run-of-river pursuant to the Operations Plan.
- Under WQC condition E-6, The Applicant shall evaluate the ability of the developments to maintain constant water surface elevations and/or constant downstream flows during times of daily power generation. The evaluation shall include, but not be limited to, a run-of-river scenario where water levels fluctuations in Project impoundments do not exceed 0.25 feet.
- Under condition E-7 and license article 405³, the applicant was required to develop an operations plan in coordination with the U.S. Fish and Wildlife Service (USFWS), New Hampshire Department of Fish and Game (NHDFG), and New Hampshire Department of Environmental Services (NHDES). This was submitted to FERC on October 24, 2007⁴ and approved by FERC on December 19, 2007⁵.

² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10600709>

³ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11345569>

⁴ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11501991>

⁵ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11535937>

- This is not a conduit project
- The Project's run-of-river operations create a stable impoundment environment.

3.2 ECOLOGICAL FLOWS STANDARDS: BYPASSED REACH ZOE

CRITERION	STANDARD	INSTRUCTIONS
A	2	<p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. Explain how the recommendation relates to agency management goals and objectives for fish and wildlife. Explain how the recommendation provides fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow

- The New Hampshire Department of Environmental Services (NHDES) granted the licensee a modified water quality certification (WQC) for the Project on May 10, 2005 (Appendix C).
- As stated under the modified WQC, condition E-5⁶, the Licensee provides a minimum flow 64 cfs at all times into the Project bypassed reach for the protection of aquatic life.
- Under WQC condition E-5 and E-7, the Licensee, at all times, provide minimum flow releases in the Project bypass reach for the protection of aquatic life, of 64 cfs. The project is operated is run-of-river pursuant to the Operations Plan.
- Under WQC condition E-6, The Applicant shall evaluate the ability of the developments to maintain constant water surface elevations and/or constant downstream flows during times of daily power generation. The evaluation shall include, but not be limited to, a run-of-river scenario where water levels fluctuations in Project impoundments do not exceed 0.25 feet.
- Under condition E-7 and license article 405⁷, the applicant was required to develop an operations plan in coordination with the U.S. Fish and Wildlife Service (USFWS), New Hampshire Department of Fish and Game (NHDFG), and New Hampshire Department of Environmental Services (NHDES). This was submitted to FERC on October 24, 2007⁸ and approved by FERC on December 19, 2007⁹.
- To protect aquatic habitat below the project development whenever the impoundments are being refilled after drawdowns for project maintenance or in other instances when the project deviates from run-of-river operation, the licensee shall release minimum flows in the tailrace of 1,403 cfs at Hooksett. If flows in the river are below these levels, then the licensee shall release 90 percent of the inflow to the respective reservoir (License article 404¹⁰).

⁶ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10600709>

⁷ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11345569>

⁸ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11501991>

⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11535937>

¹⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11345569>

3.3 ECOLOGICAL FLOWS STANDARDS: DOWNSTREAM ZOE

CRITERION	STANDARD	INSTRUCTIONS
A	2	<u>Agency Recommendation:</u> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement.• Explain how the recommendation relates to agency management goals and objectives for fish and wildlife.• Explain how the recommendation provides fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow

- The Downstream ZOE does not have a bypassed reach.
- The New Hampshire Department of Environmental Services (NHDES) granted the licensee a modified water quality certification (WQC) for the Project on May 10, 2005 (Appendix C).
- Under WQC condition E-5 and E-7, the Licensee, at all times, provide minimum flow releases in the Project bypass reach for the protection of aquatic life, of 64 cfs. The project is operated is run-of-river pursuant to the Operations Plan.
- Under WQC condition E-6, The Applicant shall evaluate the ability of the developments to maintain constant water surface elevations and/or constant downstream flows during times of daily power generation. The evaluation shall include, but not be limited to, a run-of-river scenario where water levels fluctuations in Project impoundments do not exceed 0.25 feet.
- Under condition E-7 and license article 405, the applicant was required to develop an operations plan in coordination with the U.S. Fish and Wildlife Service (USFWS), New Hampshire Department of Fish and Game (NHDFG), and New Hampshire Department of Environmental Services (NHDES). This was submitted to FERC on October 24, 2007 and approved by FERC on December 19, 2007 .
- This is not a conduit project.

3.4 WATER QUALITY STANDARDS: ALL ZOES

CRITERION	STANDARD	INSTRUCTIONS
B	2	<p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> • If facility is located on a Water Quality Limited river reach, provide an agency letter stating that the facility is not a cause of such limitation. • Provide a copy of the most recent Water Quality Certificate, including the date of issuance. • Identify any other agency recommendations related to water quality and explain their scientific or technical basis. • Describe all compliance activities related to the water quality related agency recommendations for the facility, including on-going monitoring, and how those are integrated into facility operations.

- The Merrimack River in the project area has been classified by New Hampshire as a Class B water. Class B waters are acceptable for fishing, swimming and other recreational purposes, and after treatment, for water supply¹¹.
- New Hampshire standards for DO are 75 percent saturation or an instantaneous minimum of 5 mg/l, temperature not to affect designated uses, pH in the 6.5-8.0 range, and turbidity of 10 Nephelometric Turbidity Units (NTUs) or less.
- The New Hampshire Department of Environmental Services (NHDES) granted the licensee a *modified* water quality certification (WQC) for the Project on May 10, 2005 (Appendix C).
- During the relicensing process, in 2002 and 2003, per request of NHDES, PSNH (former Licensee) collected water quality information from the Merrimack River. The study was conducted in accordance with the Merrimack River Hydroelectric Project Water Quality Study Plan developed with agency consultation in May 2002 (stated in the license application¹²). The study looked at the monthly water chemistry, diurnal temperature and dissolved oxygen (DO) profiles, and continuous temperature and DO monitoring. In summary, under extreme low flow conditions, hydropower generation has the potential to affect DO levels in the project tailraces, however changes in generation rarely result in a violation of the DO water quality standard. At Hooksett, during periods of no generation, DO concentrations displayed a diurnal pattern, varying throughout the day. However, when the project was operating, DO levels in the tailrace stabilized and there was no diurnal fluctuation.
- As part of condition E-9 of the WQC, the application shall operate and maintain the project consistent with the conditions of the 401 certification. The manner in which the Project is operated shall not contribute to violations of NH surface water quality standards. If it is determined that the manner of project operation contributes to violations of surface water quality standards, additional conditions may be imposed, or conditions

¹¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10039265>

¹² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10039265>

amended by the Department, when authorized by law and after notice and opportunity for hearing.

- The Applicant shall consult with the Department regarding any proposed modifications to the Project or its operation that may not be in accordance with this modified 401 Certification to determine whether this modified 401 Certification requires amendment or if a new 401 Certification is required for the Project. Any amendment of this modified 401 Certification or the issuance of a new 401 Certification, determined appropriate by the Department, shall be required prior to the implementation of any modifications to the Project.
- Per email dated January 15, 2019 (Appendix D), CRP NH requested that the NHDES verify the continued operations of the project will not contribute to water quality limitations. No response has been received.

3.5 UPSTREAM FISH PASSAGE STANDARDS: IMPOUNDMENT ZOE

CRITERION	STANDARD	INSTRUCTIONS
C	1	<u>Not Applicable / De Minimis Effect:</u> <ul style="list-style-type: none"> • Explain why the facility does not impose a barrier to upstream fish passage in the designated zone. • Document available fish distribution data and the lack of migratory fish species in the vicinity. • If migratory fish species have been extirpated from the area, explain why the facility is or was not the cause of this. •

- The project will not create a barrier for upstream eel passage, because an upstream eel passage facility will be installed pursuant to USDOJ's Section 18 prescription – see Bypassed Reach ZOE.
- *The project will not create a barrier for migratory species including American shad, alewife, blueback herring, rainbow smelt, and Atlantic salmon, because an upstream fish passage facility will be installed pursuant to USDOJ's Section 18 prescription – see Bypassed Reach ZOE.*
- Upon exiting upstream passage facilities into the impoundment, when they are constructed and operating, the project impoundment will create no barrier to upstream fish movements.

3.6 UPSTREAM FISH PASSAGE STANDARDS: BYPASSED REACH ZOE

CRITERION	STANDARD	INSTRUCTIONS
C	2	<p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. <p>Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.</p>

- Under license article 406¹³, Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to section 18 of the Federal Power Act.
- The anadromous fishery in the Merrimack River includes American shad, alewife, blueback herring, rainbow smelt, and Atlantic salmon. American eel, a catadromous species, also occurs in the project area.
- On May 16, 2005¹⁴, Interior filed its preliminary section 18 prescriptions. The preliminary prescription was later superseded by the Merrimack River Project Upstream and Downstream Fish Passage Plan filed with FERC in December of 2006¹⁵ addresses the new prescription requirements of Interiors modified prescription.
- On December 26, 2006¹⁶, Interior filed its modified prescriptions with the Commission, including a reservation of its authority to require fishways it may prescribe in the future. The final prescriptions (Appendix B of the license order¹⁷) retain the lower trigger numbers and shorter schedule for installing upstream fishways at Hooksett and Garvins Falls once the trigger numbers are met and also require installation of interim and permanent eelways at all three developments.
- Based on the fishway prescription of USFWS, Fishways at Hooksett and Garvins Falls shall be operational at river flows of up to 19,000 and 17,000 cfs respectively, based on the Goffs Falls gage prorated as appropriate for drainage area differences between the gage location and these dams. Downstream fishways shall be operated during the designated migration periods whenever turbines are operated at the three project developments. The timing of installation of upstream fish passage at Hooksett and Garvins Falls will be based upon the growth of migratory and riverine fish populations in

¹³ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11345569>

¹⁴ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10559588>

¹⁵ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11217218>

¹⁶ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11217218>

¹⁷ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11345569>

the Merrimack River. American eels are currently present in the river, and would benefit from the immediate implementation of safe, timely, and effective upstream and downstream eel fishways.

The licensee shall install upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. Within one (1) year after passage of the trigger number of fish at Amoskeag, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The permanent upstream passage facilities shall consist of (1) a 4-foot-wide Denil fishway on the west side of the project spillway, including a counting facility and measures for the provision of the necessary attraction water; or (2) an alternative design approved by the Service.

- Fishways shall be maintained and operated, at the licensee's expense, to maximize fish passage effectiveness throughout the upstream and downstream migration periods for American shad, river herring, American eel and white sucker:
 - Upstream passage: April 1 to July 15 -- All species except American eel
 - April 1 to Nov. 15 -- American eel
 - Downstream passage: April to June 15 -- Atlantic salmon
 - June 1 to July 15 -- Spent adults of all species
 - Sept. 15 to Nov. 15 -- Adult eel, juvenile shad & herring
- The licensee shall develop plans for and conduct fishway effectiveness evaluations on all prescribed fish passage, in consultation with the Service and other fishery agencies. For each fishway to be constructed, the plans for fishway effectiveness evaluations shall be submitted to the Service for final review and approval simultaneously with the construction plans and schedule for each fishway. Each plan shall include proposed evaluation methods, and schedules for conducting the study and providing the results to the Service and the Commission. If the Service and the licensee cannot agree on the evaluation plan, the licensee shall submit the proposed plan to the Commission for approval, including all comments received from the Service.
- On January 19, 2017 (Appendix E), the USFWS wrote a letter stating that the trigger numbers for the downstream Amoskeag had been met and upstream fish passage for the Hooksett Development was warranted.
- An agency meeting was held on February 17, 2017, to discuss the planning of the upstream passage (Appendix E).
- In anticipation that agencies would confirm that the trigger number was met during the 2016 river herring migration, PSNH contracted with Gomez and Sullivan to conduct a ***Hooksett Upstream Fish Passage Feasibility Study*** (Appendix B) which was provided to agencies on November 4, 2016. The purpose of this study was to verify that the prescribed Denil fishway is still a cost effective means for providing upstream passage. A meeting was held on January 18, 2017 to review the study

results and share the initial conceptual designs and a follow-up meeting was held on March 22, 2017 with the USFWS fish passage engineer and NOAA hydraulic engineer. Agencies provided several comments about the proposed conceptual design, some of which were clarified at the follow-up meeting.

- HSE continues to consult with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability.
- A meeting was held on January 4, 2018 to review the Hooksett ***Nature-like Fishway Cost Estimates Memo*** prepared by Gomez and Sullivan Engineers (GSE), the engineering design consultant. A copy of the January 4, 2018 meeting minutes is included as Appendix E. GSE reviewed several pros and cons for each of two nature-like concepts, one developed by GSE and one recommended by NOAA Fisheries. The review included assessment of issues related to fish passage efficiency, site access, and operations and maintenance. All parties agreed additional information to be collected in the field was necessary to further evaluate the two concepts. Action items generated from the meeting included:
 - Eversource and GSE to prepare a schedule for data collection. This schedule and associated data collection items will be submitted to the agencies for comments and additions. Once all groups agree upon data collection content and schedule, Eversource and GSE will proceed with collection of the data
 - Following data collection, all groups will review the concept designs and schedule a meeting or conference call to discuss further.
 - A draft Hooksett Upstream Fish Passage data collection plan was sent to the agencies on February 26, 2018 for review and comment. Comments were received from agency engineers via a Technical Memorandum on March 5, 2018 and incorporated into the final data collection plan.
 - An update on the data collection effort was sent to the agencies on September 27, 2018. The updated included:
 - A description of why the bathymetry data had not been collected in August as planned due to high river flows and limited availability of equipment.
 - The sale of Eversource Hydro Generation to Hull Street Energy had been completed on August 26, 2018.
 - Proposed dates to meet with the agency engineers to discuss the raw data collected to date and 2D modeling parameters.
 - HSE Hydro held an Upstream Fish Passage Engineering Meeting on November 1, 2018 to discuss where the development of the upstream fish passage design concepts stands. This included a discussion of data collection to date and GSE's inability to collect the bathymetry data upstream of the western spillway due to high river flows and limited availability of equipment. The basic 2D modeling parameters were discussed, including model extents and mesh size. A copy of the November 1, 2018 meeting minutes is included as Appendix E.

- HSE Hydro distributed the updated Hooksett Fish Passage Schedule(s) memo on December 5, 2018, which was appended to the annual fish passage status report filed with the Commission on December 19, 2018¹⁸. This schedule includes:

<i>Phase</i>	<i>Date</i>
<i>Preliminary Fish Passage Design</i>	<i>July 15 – November 15, 2019</i>
<i>Final Design</i>	<i>November 18 – June 5, 2020</i>
<i>Procurement</i>	<i>July 20 – November 6, 2020</i>
<i>Construction</i>	<i>August 2 – November 19, 2021</i>

HSE Hydro held an annual fish passage meeting with agencies on January 30, 2019. A conference all was scheduled for March 1, 2019 to review the updated project timeline(s) and status of the 2-Dimensional Modeling of the conceptual designs. *No specific changes in schedule were identified.*

- CRPNH proposes to continue to operate the Hooksett Development Project as a run-of-river development with minimal impoundment drawdowns (except during brief periods of maintenance or emergency operations) and to provide a minimum bypass and downstream flow of 64 cfs for aquatic and aesthetic enhancement purposes.

¹⁸ <https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=15123883>

3.7 UPSTREAM FISH PASSAGE STANDARDS: DOWNSTREAM ZOE

CRITERION	STANDARD	INSTRUCTIONS
C	2	<u>Agency Recommendation:</u> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement.• Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.

- Please see answer to Bypassed Reach ZOE above.

3.8 DOWNSTREAM FISH PASSAGE AND PROTECTION STANDARDS: IMPOUNDMENT ZOE

CRITERION	STANDARD	INSTRUCTIONS
D	2	<p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.

- Under license article 406, Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to section 18 of the Federal Power Act.
- At the time of the relicensing there was no upstream fish passage. Part of the relicensing process, the licensee proposed to develop a final upstream and downstream fish passage plan in consultation with the agencies. This is included in the WQC condition E-8 (Appendix C).
- The anadromous fishery in the Merrimack River includes American shad, alewife, blueback herring, rainbow smelt, and Atlantic salmon. American eel, a catadromous species, also occurs in the project area. The Merrimack River Project Upstream and Downstream Fish Passage Plan filed with FERC in December of 2006¹⁹ addresses the new prescription requirements and new “modified” fishways prescription.
- Fish passage facilities at the development include a downstream fish bypass gate between the Taintor gate and the powerhouse.
- According to the USFWS prescription (Appendix E) the fishway shall be maintained and operated, at the licensee’s expense, to maximize fish passage effectiveness throughout the upstream and downstream migration periods for American shad, river herring, American eel and white sucker:
 - Downstream passage: April to June 15 -- Atlantic salmon
 - June 1 to July 15 -- Spent adults of all species
 - Sept. 15 to Nov. 15 -- Adult eel, juvenile shad & herring

¹⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11217218>

3.9 DOWNSTREAM FISH PASSAGE STANDARDS: BYPASSED REACH ZOE

CRITERION	STANDARD	INSTRUCTIONS
D	2	<u>Agency Recommendation:</u> <ul style="list-style-type: none">• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent).• Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement.• Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.

- Please see answer to Impoundment ZOE above.

3.10 DOWNSTREAM FISH PASSAGE STANDARDS: DOWNSTREAM ZOE

CRITERION	STANDARD	INSTRUCTIONS
D	1	<u>Not Applicable / De Minimis Effect:</u> <ul style="list-style-type: none">• Explain why the facility does not impose a barrier to downstream fish passage in the designated zone, considering both physical obstruction and increased mortality relative to natural downstream movement (e.g., entrainment into hydropower turbines).• For riverine fish populations that are known to move downstream, explain why the facility does not contribute adversely to the sustainability of these populations or to their access to habitat necessary for successful completion of their life cycles.• Document available fish distribution data and the lack of migratory fish species in the vicinity.• If migratory fish species have been extirpated from the area, explain why the facility is or was not the cause of this.

- Please see answer to Impoundment ZOE above, which describes downstream fish passage measures for the development. There are no barriers to downstream fish passage in the Downstream ZOE and downstream passage requirements for the Amoskeag facility downstream are specific to that development.

3.11 SHORELINE AND WATERSHED PROTECTION STANDARDS: ALL ZOES

CRITERION	STANDARD	INSTRUCTIONS
E	2	<u>Agency Recommendation:</u> <ul style="list-style-type: none">• Provide copies or links to any agency recommendations or management plans that are in effect related to protection, mitigation, or enhancement of shoreline surrounding the facility (e.g., Shoreline Management Plans).• Provide documentation that indicates the facility is in full compliance with any agency recommendations or management plans that are in effect.

- The current project boundary only extends to the normal high-water mark at the shoreline of each of the project's impoundments. As a result, there is virtually no buffer between project waters and adjacent lands.
- Land adjacent to Hooksett is developed and includes large blocks of residential, commercial, and industrial areas.
- Land cover units identified in the vicinity of the project can be found in the Land Cover map below as identified within the National Land Cover Database, 2011 (http://www.mrlc.gov/nlcd11_leg.php).
- *The Shoreline Management Plan encompasses the entire Merrimack River Project (FERC No. 1893) boundary from the upper limit of the Garvins Falls downstream to the island complex adjacent to the Amoskeag tailwater, which includes all ZOEs of the Hookset development.*

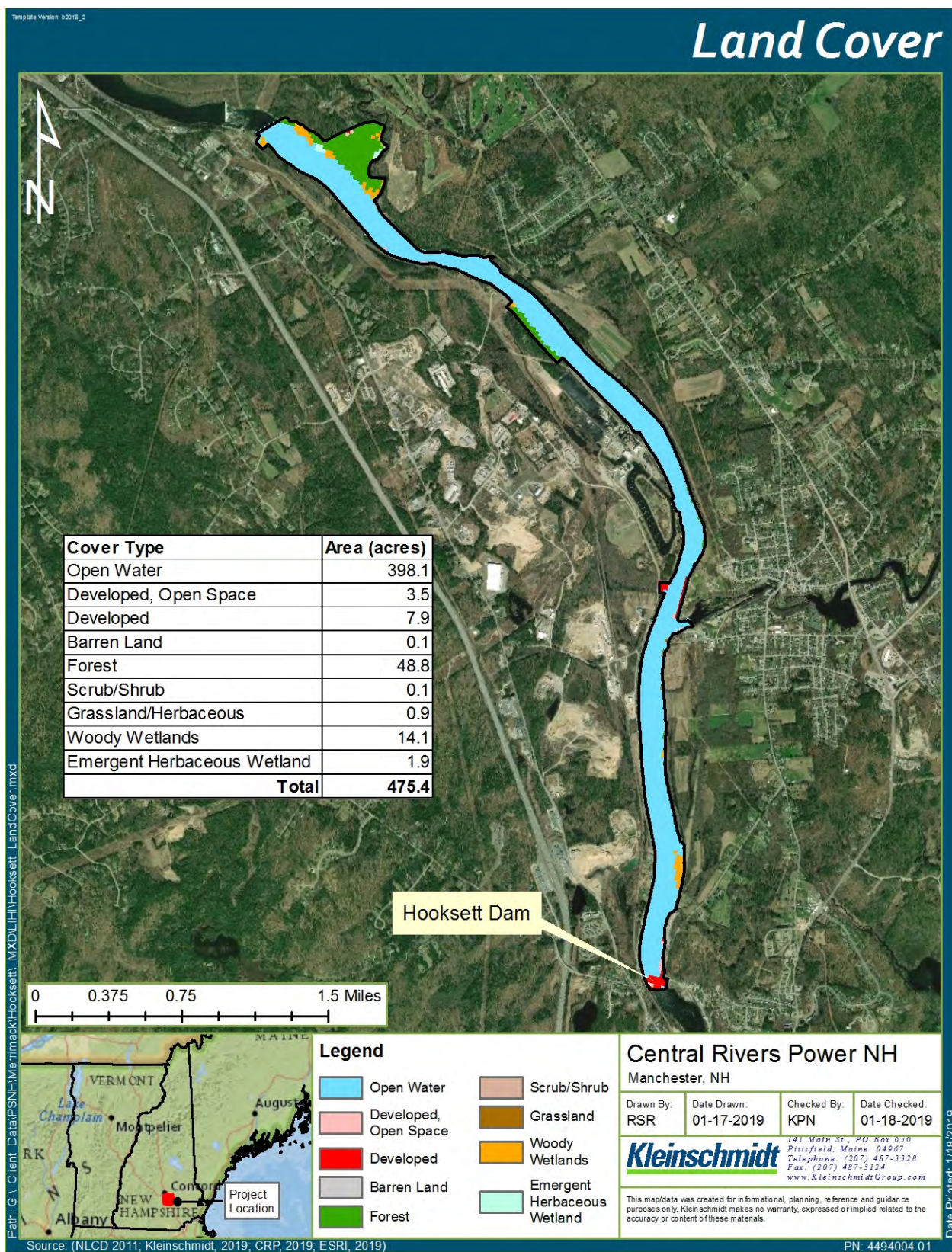


FIGURE 4 PROJECT COVER CLASSIFICATION

- License article 407 requires the licensee within one year of license issuance, to file with FERC a shoreline management plan (SMP). The plan would be in coordination with the recreation plan (article 408) and historic properties management plan (article 409). In addition, the plan would have measures to protect the bald eagle and its habitat within the project boundary. The plan was in consultation with USFWS, NHDFG, and NHDES. The plan was submitted on May 18, 2009²⁰, and modified and approved by FERC on August 16, 2010²¹.
- Beginning on April 1, 2015, and every six years thereafter, the licensee shall file a report of the results of its review of the adequacy of the project's shoreline management plan
- Beginning on May 18, 2011, and every year thereafter, the licensee shall file annual monitoring reports with the Commission on measures to protect the bald eagle and its habitat within the project boundary
- Beginning on January 1, 2011, the licensee shall file the six-month progress reports for parcels rated as a medium and high priority; and annually for parcels rated as low priority, as provided in the plan

	EVERY SIX YEARS FILE A REPORT OF THE ADEQUACY OF THE PROJECT'S SHORELINE MANAGEMENT PLAN	ANNUAL MONITORING REPORTS ON MEASURES TO PROTECT THE BALD EAGLE AND ITS HABITAT WITHIN THE PROJECT BOUNDARY	EVERY SIX MONTHS REPORTS FOR PARCELS RATED AS A MEDIUM AND HIGH PRIORITY; AND ANNUALLY FOR PARCELS RATED AS LOW PRIORITY, AS PROVIDED IN THE PLAN
2011		5/17/2011 ²²	01/25/2011 ²³
			08/01/2011 ²⁴
2012		5/18/2012 ²⁵	03/30/2012 ²⁶
			07/02/2012 ²⁷
2013		5/20/2013 ²⁸	01/02/2013 ²⁹
			07/01/2013 ³⁰
2014		05/16/2014 ³¹	01/02/2014 ³²
			07/01/2014 ³³
2015	04/01/2015 ³⁴	05/15/2015 ³⁵	01/02/2015 ³⁶

²⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12023001>

²¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12414341>

²² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12662250>

²³ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12553664>

²⁴ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12741253>

²⁵ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12987372>

²⁶ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12932359>

²⁷ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13022031>

²⁸ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13256471>

²⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13145882>

³⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13294974>

³¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13548401>

³² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13429765>

³³ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13583525>

³⁴ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13824839>

³⁵ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13876352>

³⁶ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13727513>

	EVERY SIX YEARS FILE A REPORT OF THE ADEQUACY OF THE PROJECT'S SHORELINE MANAGEMENT PLAN	ANNUAL MONITORING REPORTS ON MEASURES TO PROTECT THE BALD EAGLE AND ITS HABITAT WITHIN THE PROJECT BOUNDARY	EVERY SIX MONTHS REPORTS FOR PARCELS RATED AS A MEDIUM AND HIGH PRIORITY; AND ANNUALLY FOR PARCELS RATED AS LOW PRIORITY, AS PROVIDED IN THE PLAN
			07/01/2015 ³⁷
2016		05/16/2016 ³⁸	12/31/2015 ³⁹
			07/18/2016 ⁴⁰ no longer need to submit reports
2017		05/18/2017 ⁴¹	
2018		05/09/2018 ⁴²	

- A provision of the SMP was to conduct annual monitoring of bald eagle nesting and roosting locations within the project boundary. Given the recovery of bald eagles at the local, state and national level, CRP NH consulted with state and federal agencies and requested that FERC modify the SMP to suspend annual bald eagle monitoring⁴³, which was approved by FERC on February 6, 2019⁴⁴. Despite ceasing the annual monitoring, CRP NH maintain case-by-case review of proposed shoreline uses and will not allow any uses which have the potential to adversely affect bald eagles or their habitat. Should a proposed use be located in a Bald eagle habitat area, PSNH will ensure that USFWS, NHFG, and the Audubon Society are appropriately consulted by the applicant, to determine if the proposed timing or type of shoreline use has potential to adversely affect eagles and what measures may be necessary.

Bonus:

E	PLUS	<u>Bonus Activities:</u> <ul style="list-style-type: none"> • Provide documentation that the facility has a formal conservation plan protecting a buffer zone of 50% or more of the undeveloped shoreline that the facility owns around its reservoirs and river corridors. • In lieu of a formal conservation plan, provide documentation that the facility has established a watershed enhancement fund for ecological land management that will achieve the equivalent land protection value of an ecologically effective buffer zone of 50% or more around undeveloped shoreline.
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³⁷ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13918422>

³⁸ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14249428>

³⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14086670>

⁴⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14311116>

⁴¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14590781>

⁴² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14912923>

⁴³ <https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=15142880>

⁴⁴ <https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=15157198>

- As previously discussed, the Project has a FERC approved Shoreline Management Plan. The purpose of the plan is to manage, and permit shoreline uses, which are reviewed on a case-by-case bases. Permits are not issued without proof that appropriate state and local permits have been obtained. *CRP maintains a public website containing the SMP and most recent mapping of shoreline classifications at <https://www.centralriverspower.com/mk-river-smp>.*
- CRP NH periodically (about every six years) *contracts an environmental consultant to field survey project shorelines at all three developments, including Hooksett, to document uses, update the SMP database, and identify any unpermitted uses for follow-up actions, as necessary. The SMP database is a custom-built MS Access database containing GPS locations, photo documentation, physical descriptions, and permit documents for over 1,000 shoreline structures.*
- Based upon calculation within GIS of the shoreline boundary and shoreline development information illustrated in Figure 4 above, approximately 88% of the shoreline within the project boundary and subject to the Shoreline Management Plan is undeveloped.
- *PSNH develop a shoreline management plan (SMP) for the project and established a 2.9-mile-long, 200-foot-wide buffer zone on CRP-owned shoreline property extending from about two miles upstream of the Garvins Falls dam downstream into the Hooksett impoundment to the northwestern bank of the Soucook River approximately 0.9 miles downstream of the Garvins Falls dam. This buffer area covers about 70 acres of land on the east side of the river, including the 53 acres of an undeveloped habitat block of potential importance for the bald eagle discussed above. The area downstream of the Garvins Falls dam in the Hooksett impoundment includes approximately 13 acres of known perching and foraging habitat for the bald eagle. The remaining approximately four acres, located closest to the Soucook River, is not identified as eagle habitat.*
- *CRP also protects a stand of pines at Merrimack Station, bordering the Hooksett impoundment, for eagles through restrictions on development.*

3.12 THREATENED AND ENDANGERED SPECIES STANDARDS: ALL ZOES

CRITERION	STANDARD	INSTRUCTIONS
F	2	<p><u>Finding of No Negative Effects:</u></p> <ul style="list-style-type: none"> Identify all listed species in the facility area based on current data from the appropriate state and federal natural resource management agencies. Provide documentation of a finding of no negative effect of the facility on any listed species in the area from an appropriate natural resource management agency.

- At the time of relicensing, the bald eagle was listed as federally threatened on the Endangered Species list under the Endangered Species Act (ESA), and was known to be present at the project and to use project waters and lands for perching, foraging, and winter roosting.
- The EA concluded that relicensing the project with the staff-recommended measures, which include protecting identified bald eagle habitat on PSNH-owned lands within 200 feet of the project shoreline would not be likely to adversely affect the bald eagle.
- FERC required that five areas of bald eagle habitat, in addition to PSNH's proposed area at the Garvins Falls development, be included in the project and protected under the licensee's proposed shoreline management plan. The Garvins Falls area would be a 200-foot-wide buffer extending along about 2.9 miles of shoreline. The other areas are of varying sizes, but they also would include lands extending up to 200 feet from the shoreline.
- PSNH developed a shoreline management plan (SMP) for the project and establish a 2.9-mile-long, 200-foot-wide buffer zone on PSNH-owned shoreline property extending from about two miles upstream of the Garvins Falls dam down to the northwestern bank of the Soucook River approximately 0.9 miles downstream of the dam. This buffer area would cover about 70 acres of land on the east side of the river, including the 53 acres of an undeveloped habitat block of potential importance for the bald eagle discussed above. The area downstream of the dam includes approximately 13 acres of known perching and foraging habitat. The remaining approximately four acres, located closest to the Soucook River, is not identified as eagle habitat.
 - The SMP describes measures to protect the bald eagle and its habitat within the project boundary (including those lands identified in Article 203).
 - Reporting is required on the feasibility of protecting the areas, including approximately 5 acres of potential bald eagle roosting habitat in the Town of Hooksett which are adjacent to 3 additional acres that are already conservation lands (See section 3.13 for report filings)
 - The Natural Heritage Inventory site for blunt-leaved milkweed in the town of Hooksett
 - The Natural Heritage Inventory site for sweet goldenrod, Southern New England dry oak/pine forest on sandy/gravelly soils in the town of Hooksett
 - The Natural Heritage Inventory site for wild lupine in the town of Hooksett

- approximately 5 acres of potential bald eagle roosting habitat in town of Hooksett, which includes a Natural Heritage Inventory site for the noctuid moth, the barrens xylotype, the northern blazing star, and New England pitch pine/scrub oak barrens
- the Natural Heritage Inventory site for golden-heather in the town of Hooksett
- approximately 12 acres of potential bald eagle roosting habitat in the town of Hooksett
- the Natural Heritage Inventory site for Southern New England lake sediment/river terrace forest in the town of Hooksett
- the Natural Heritage Inventory site for Southern New England lake sediment/river terrace forest in the town of Hooksett
- The bald eagle was removed from the ESA list on June 28, 2007. However, bald eagles remain federally protected under the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act. Given the recovery of bald eagle populations in NH and the delisting, PSNH obtained agency support to amend the SMP to suspend further monitoring for bald eagles at the project, but to retain the habitat protection components of the SMP. The request to amend the SMP was filed with FERC on January 18, 2019⁴⁵, which was approved by FERC on February 6, 2019⁴⁶.
- Per request through the Natural Heritage Bureau (NHB) Datacheck Tool on January 3, 2019, CRPNH requested that the NHB verify the list of possible rare, threatened, and endangered species and determined that if the Project continued to operate is not expected to negatively affect listed species located in the vicinity of the Project.
- On January 24, 2019, additional information was sent to NHB and NHFG including project description, project operations, and when the dam was constructed (Appendix E).
- On January 29, 2019, NHB email explains that a S1 ranked natural community, two plant species, one historical plant species occur near the project (Table 3).
- *No S1 ranked aquatic species were identified by NHB.*

TABLE 3 NHB COMMUNITIES AND SPECIES THAT ARE KNOWN TO OCCUR OR HAVE HISTORICALLY OCCURRED IN OR NEAR THE PROJECT

COMMUNITY/SPECIES	OCCURRENCE	DETERMINATION
Acidic riverside seep	Found just north of the project area, at the base of the Garvins Falls dam. This is an S1 ranked natural community and there are only 4 documented exemplary occurrences in the state. It is found on the shoreline of the Merrimack River.	Unless the Hooksett dam causes prolonged flooding at this site, it is unlikely that its continued operation would threaten this occurrence.

⁴⁵ <https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=15142880>

⁴⁶ <https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=15157198>

COMMUNITY/SPECIES	OCCURRENCE	DETERMINATION
Golden heather (<i>Hudsonia ericoides</i>)	Record of occurring on an island within the river	This is an upland plant and is unlikely to be impacted by project operations.
Houghton's umbrella sedge (<i>Cyperus houghtonii</i>)	A historical record for under existing power lines	This occurrence would be unlikely to be impacted by the dam as it is found in an upland habitat.
Incurved umbrella sedge (<i>Cyperus squarrosus</i>)	Occurs on a sand bar in the Merrimack River, in a “shallowly inundated” area.	If the dam artificially impounds the Merrimack River for prolonged periods, then it could have an impact on the habitat for this species.

- Based on an official USFWS Species List populated on February 4, 2019, (Appendix D), northern long-eared bat (*Myotis septentrionalis*) and the small whorled pogonia (*Isotria medeoloides*) may occur in the Project Area.

It is unlikely that the northern long-eared bat would use the Project area for breeding and hibernating due to the urbanized development located around the Project. However, the species could use the area for feeding and transit place.

The small whorled pogonia occurs on upland sites in mixed-deciduous or mixed deciduous/coniferous forests that are generally in second- or third-growth successional stages. Characteristics common to most *I. medeoloides* sites include sparse to moderate ground cover in the species’ microhabitat, a relatively open understory canopy, and proximity to features that create long-persisting breaks in the forest canopy. Soils at most sites are highly acidic and nutrient poor, with moderately high soil moisture values. Light availability could be a limiting factor for this species⁴⁷. Because the Project is located in a lake/riverine area it is very unlikely that the species would occur at the project.

⁴⁷ https://ecos.fws.gov/docs/recovery_plan/921113b.pdf

3.13 CULTURAL AND HISTORIC RESOURCES STANDARDS: ALL ZOES

CRITERION	STANDARD	INSTRUCTIONS
G	2	<u>Approved Plan:</u> <ul style="list-style-type: none"> • Provide documentation of all approved state, provincial, federal, and recognized tribal plans for the protection, enhancement, and mitigation of impacts to cultural and historic resources affected by the facility. • Document that the facility is in compliance with all such plans.

- The licensee shall implement the “Programmatic Agreement Among the Federal Energy Regulatory Commission and the New Hampshire State Historic Preservation Officer for Managing Historic Properties That May Be Affected By Issuing a License to Public Service of New Hampshire For the Continued Operation of the Merrimack River Hydroelectric Project In Merrimack and Hillsborough Counties, New Hampshire (FERC Project No. 1893)” executed on May 16, 2006⁴⁸, including but not limited to the Historic Properties Management Plan (HPMP) for the project. Pursuant to the requirements of this Programmatic Agreement, the licensee shall file, for Commission approval, a HPMP within one year of issuance of this order.

- HPMP was submitted on May 19, 2008 and approved by FERC on January 27, 2009.⁴⁹

Annual Historical Reports:

SUBMITTED
06/17/2010 ⁵⁰
03/27/2012 ⁵¹
03/21/2013 ⁵²
03/07/2014 ⁵³
03/25/2015 ⁵⁴
03/04/2016 ⁵⁵
03/29/2017 ⁵⁶
04/03/2018 ⁵⁷

⁴⁸ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11027973>

⁴⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11914905>

⁵⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12369133>

⁵¹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12927234>

⁵² <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13210308>

⁵³ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13478129>

⁵⁴ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13814115>

⁵⁵ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14162915>

⁵⁶ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14537129>

⁵⁷ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14861319>

3.14 RECREATIONAL RESOURCES STANDARDS: ALL ZOES

CRITERION	STANDARD	INSTRUCTIONS
H	2	<u>Agency Recommendation:</u> <ul style="list-style-type: none">• Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations.• Document that the facility is in compliance with all such recommendations and plans.

- License article 408, requires a recreation plan. The plan was prepared in consultation with the NHDFG, NHDES, Appalachian Mountain Club, American Whitewater, New England FLOW, the New Hampshire Rivers Council, and the Concerned Citizens of BOW.
- On February 14, 2008⁵⁸, the Recreation Plan was submitted. FERC modified and approved the plan on June 9, 2008⁵⁹.
- Recreation facilities at the project include a canoe take-out portage facility at Hooksett dam in the impoundment ZOE.
- Recreation FORM 80 Reports
 - March 16, 2015⁶⁰

⁵⁸ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11593437>

⁵⁹ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11710117>

⁶⁰ <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13801790>

4.0 CONTACTS FORMS

1. All applications for LIHI Certification must include complete contact information to be reviewed.

Project Owner:	
Name and Title	Todd, Wynn; CEO Portfolio Companies
Company	Hull Street Energy
Phone	301-664-7701
Email Address	twynn@hullstreetenergy.com
Mailing Address	4920 Elm Street, Suite 205 Bethesda, MD 20814
Consulting Firm / Agent for LIHI Program (if different from above):	
Name and Title	Andy Qua
Company	Kleinschmidt Associates
Phone	207-416-1246
Email Address	Andy.Qua@kleinschmidtgroup.com
Mailing Address	141 Main Street P.O. Box 650 Pittsfield, Maine 04967
Compliance Contact (responsible for LIHI Program requirements):	
Name and Title	Curtis R. Mooney; Manager, Regulatory Affairs
Company	Central Rivers Power
Phone	(603)744-0846
Email Address	cmooney@centralriverspower.com
Mailing Address	59 Ayers Island Road Bristol, NH 03222
Party responsible for accounts payable:	
Name and Title	Ryan McQueeney; CFO, Portfolio Companies
Company	Hull Street Energy, LLC
Phone	(301)664-7702
Email Address	accounting@centralriverspower.com
Mailing Address	4920 Elm Street, Suite 205 Bethesda, MD 20814

2. Applicant must identify the most current and relevant state, federal, provincial, and tribal resource agency contacts (copy and repeat the following table as needed).

Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u> </u> , Fish/Wildlife Resources <u>X</u> , Watersheds <u>X</u> , T/E Spp. <u> </u> , Cultural/Historic Resources <u> </u> , Recreation <u> </u>):	
Agency Name	United States Fish and Wildlife Service (USFWS)
Name and Title	Julianne Rosset; Fish & Wildlife Biologist
Phone	603-227-6436
Email address	julianne_rosset@fws.gov
Mailing Address	USFWS New England Field Office 70 Commercial Street, Suite 300 Concord, NH 03301
Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources <u> </u> , Watersheds <u>X</u> , T/E Spp. <u> </u> , Cultural/Historic Resources <u> </u> , Recreation <u> </u>):	
Agency Name	New Hampshire Department of Environmental Services (NHDES)
Name and Title	Gregg Comstock, P.E.; Supervisor, Water Quality Planning Section
Phone	603-271-2983
Email address	gregg.comstock@des.nh.gov
Mailing Address	NH Department of Environmental Services 29 Hazen Drive, P.O. Box 95 Concord, NH 03302-0095

Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources <u>X</u> , Watersheds <u> </u> , T/E Spp. <u>X</u> , Cultural/Historic Resources <u> </u> , Recreation <u>X</u>):	
Agency Name	New Hampshire Fish and Game Department (NHFGD)
Name and Title	Carol Henderson; Environmental Review Coordinator
Phone	603-271-1138
Email address	Carol.Henderson@wildlife.nh.gov
Mailing Address	New Hampshire Fish and Game Department 11 Hazen Drive Concord, NH 03301

Agency Contact (Check area of responsibility: Flows <u> </u> , Water Quality <u> </u> , Fish/Wildlife Resources <u> </u> , Watersheds <u> </u> , T/E Spp. <u> </u> , Cultural/Historic Resources <u>X</u> , Recreation <u> </u>):	
Agency Name	New Hampshire Division of Historical Resources
Name and Title	Nadine Miller; Deputy State Historic Preservation Officer
Phone	603-271-6628
Email address	Nadine.Miller@dcr.nh.gov
Mailing Address	NH Division of Historical Resources 19 Pillsbury Street – 2 nd Floor Concord, NH 03301-3570

Agency Contact (Check area of responsibility: Flows <u>X</u> , Water Quality <u> </u> , Fish/Wildlife Resources <u> </u> , Watersheds <u> </u> , T/E Spp. <u> </u> , Cultural/Historic Resources <u> </u> , Recreation <u> </u>):	
Agency Name	Federal Energy Regulatory Commission
Name and Title	John Spain; Regional Engineer
Phone	212-273-5900
Email address	John.Spain@ferc.gov
Mailing Address	19 West 34 th Street Suite 400 New York, NY 1001-3006

B.3 Sworn Statement and Waiver Form

All applications for LIHI Certification must include the following sworn statement before they can be reviewed by LIHI:

SWORN STATEMENT

*As an Authorized Representative of **Central Rivers Power NH Hooksett, LLC**, the Undersigned attests that the material presented in the application is true and complete.*

The Undersigned acknowledges that the primary goal of the Low Impact Hydropower Institute's certification program is public benefit, and that the LIHI Governing Board and its agents are not responsible for financial or other private consequences of its certification decisions.

The Undersigned further acknowledges that if LIHI Certification of the applying facility is granted, the LIHI Certification Mark License Agreement must be executed prior to marketing the electricity product as LIHI Certified®.

The Undersigned further agrees to hold the Low Impact Hydropower Institute, the Governing Board and its agents harmless for any decision rendered on this or other applications, from any consequences of disclosing or publishing any submitted certification application materials to the public, or on any other action pursuant to the Low Impact Hydropower Institute's certification program.

PLEASE INSERT FOR PRE-OPERATIONAL CERTIFICATIONS (see [Section 4.5.3](#)):

The Undersigned acknowledges that LIHI may suspend or revoke the LIHI Certification should the impacts of the facility, once operational, fail to comply with the LIHI program requirements.


Company Name: CRP NH Hooksett, LLC

Authorized Representative:

Name: Ryan McQueeney

Title: CFO

Authorized Signature: _____

A handwritten signature in blue ink, appearing to read "R. McQueeney", is written over a horizontal line.

Date: April 29, 2019

APPENDIX A

PROJECT ZOE, DRAWINGS, AND PHOTOS

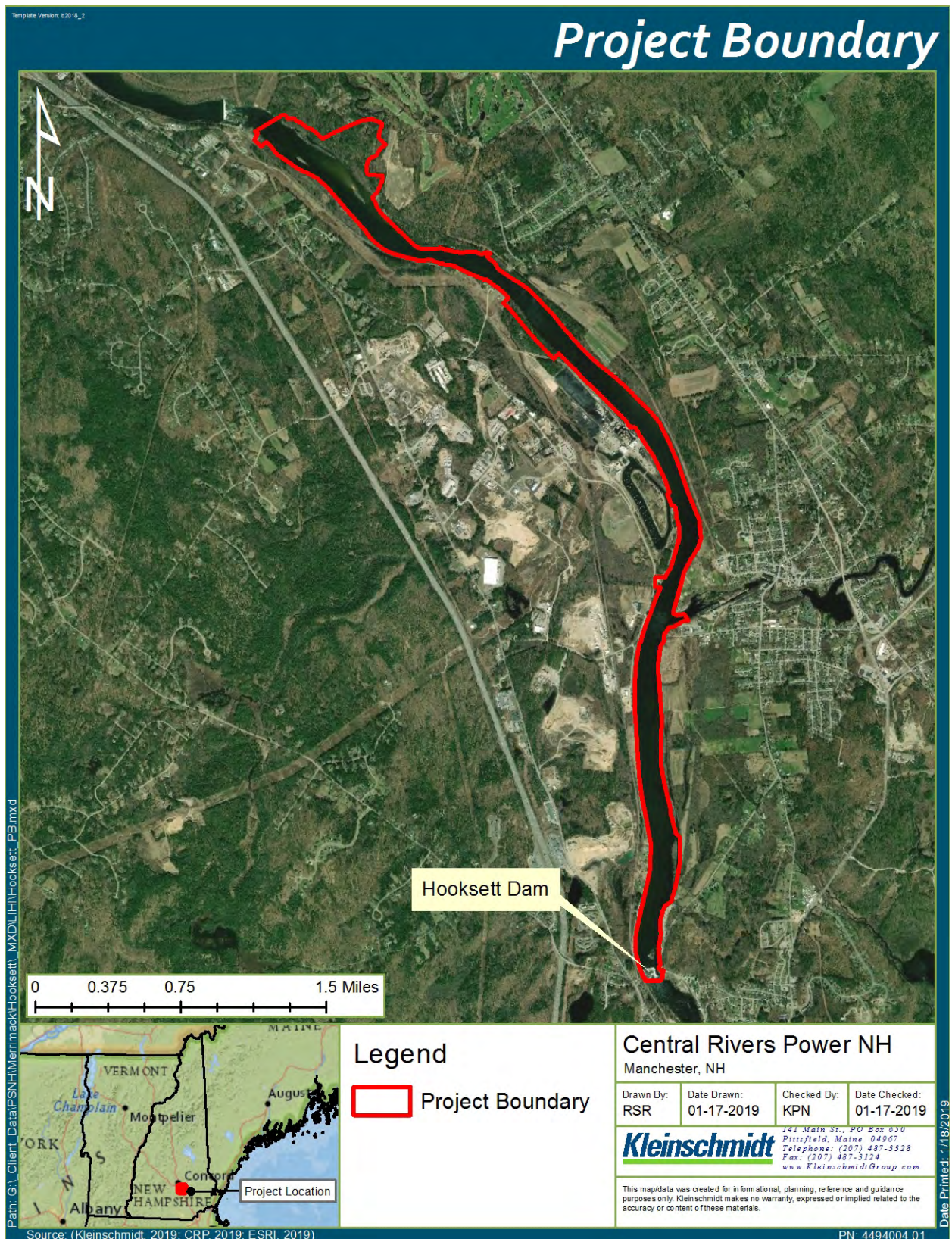


FIGURE 5 PROJECT BOUNDARY

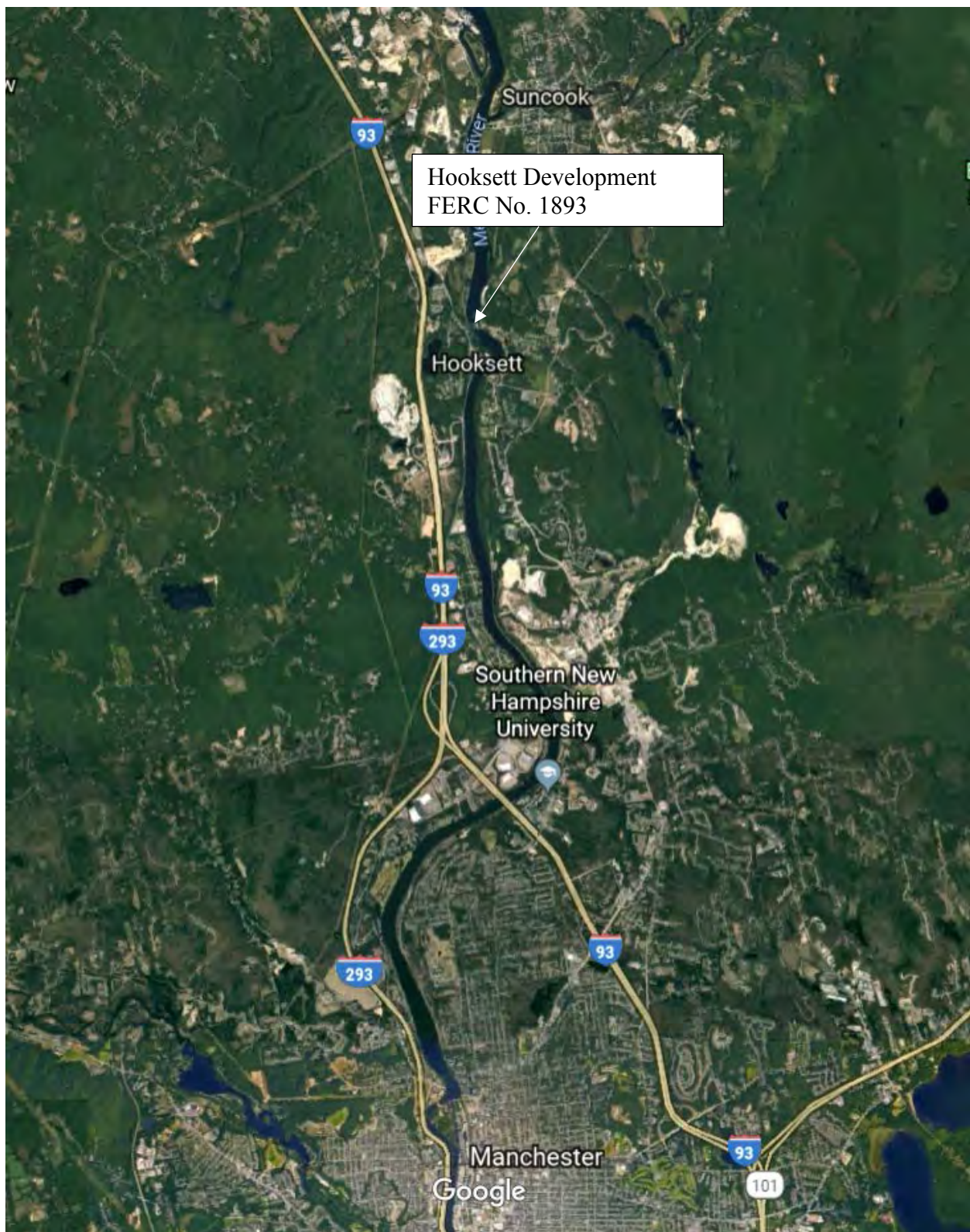


FIGURE 6 GEOGRAPHIC OVERVIEW OF PROJECT LOCATION

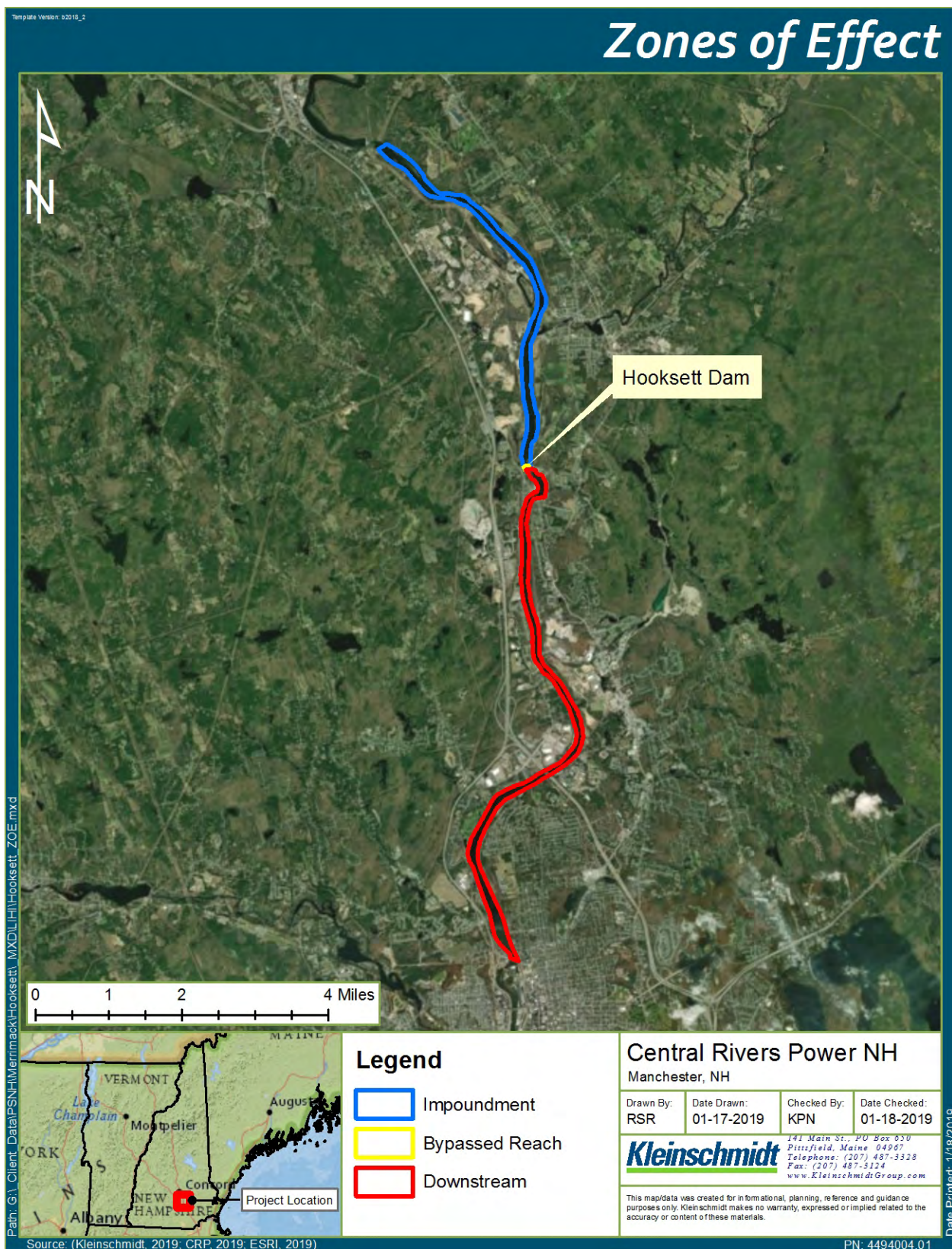


FIGURE 7 ZONES OF EFFECT



PHOTO 7 HOOKSETT SPILLWAY WITH 64 CFS



PHOTO 8 HOOKSETT BYPASSED REACH



PHOTO 9 HOOKSETT BYPASSED REACH LOOKING DOWNSTREAM TOWARD POWERHOUSE



PHOTO 10 WESTERN BYPASS WITH BYPASS FLOWS



PHOTO 11 HOOKSETT GENERATOR



PHOTO 12 HOOKSETT FISH PASSAGE GATE



PHOTO 13 POSITIVE RESTRAINT SYSTEM

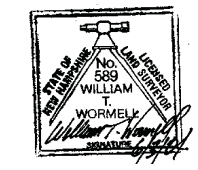
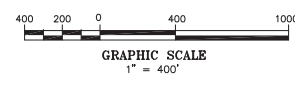
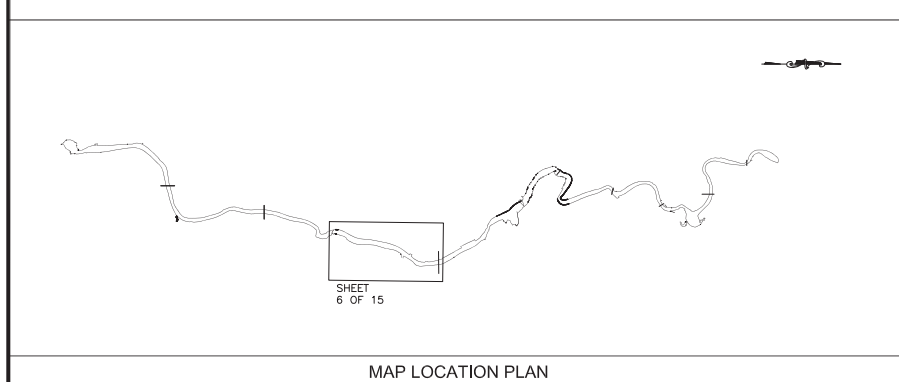
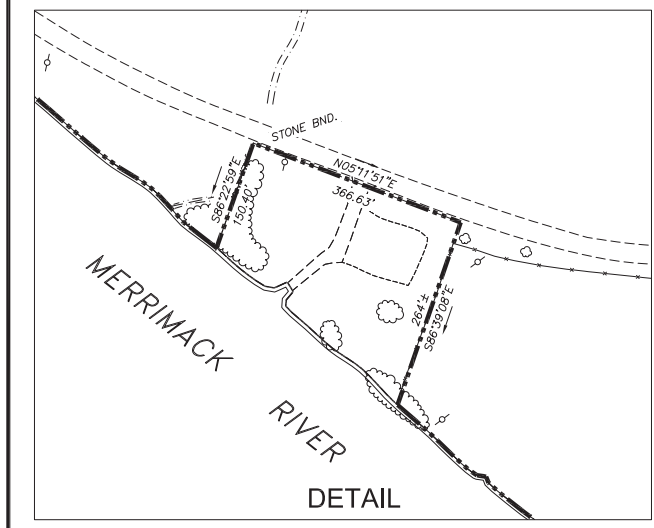
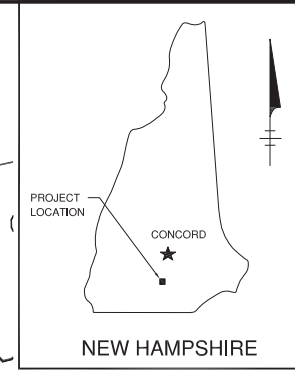
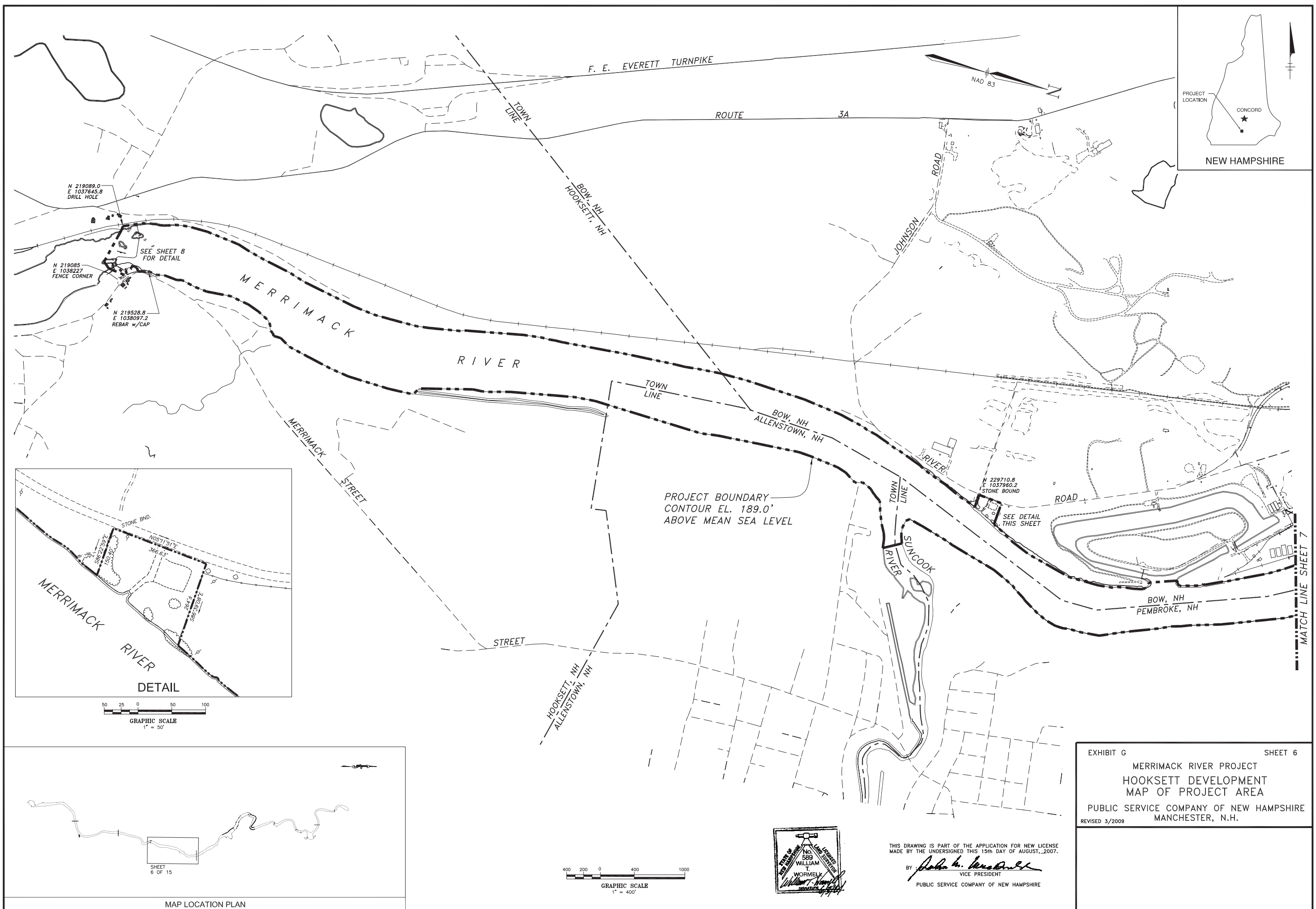


PHOTO 14 PORTAGE TAKEOUT



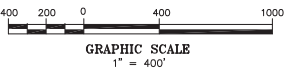
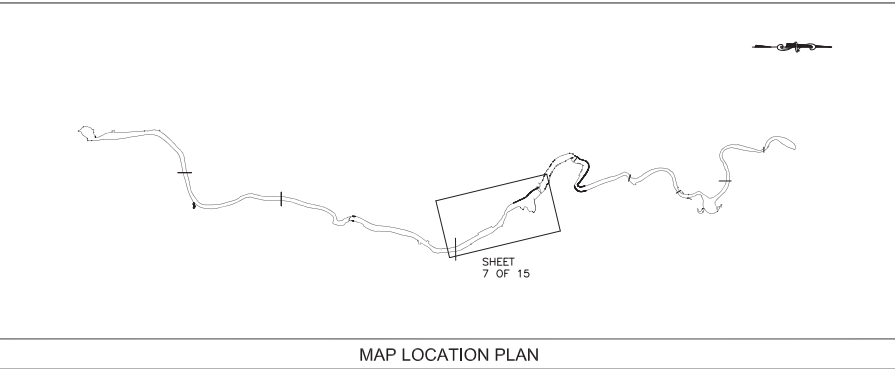
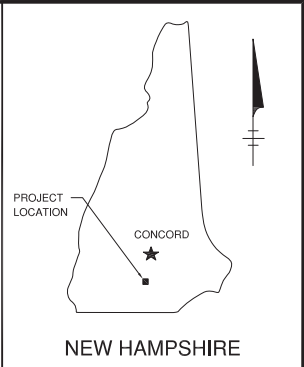
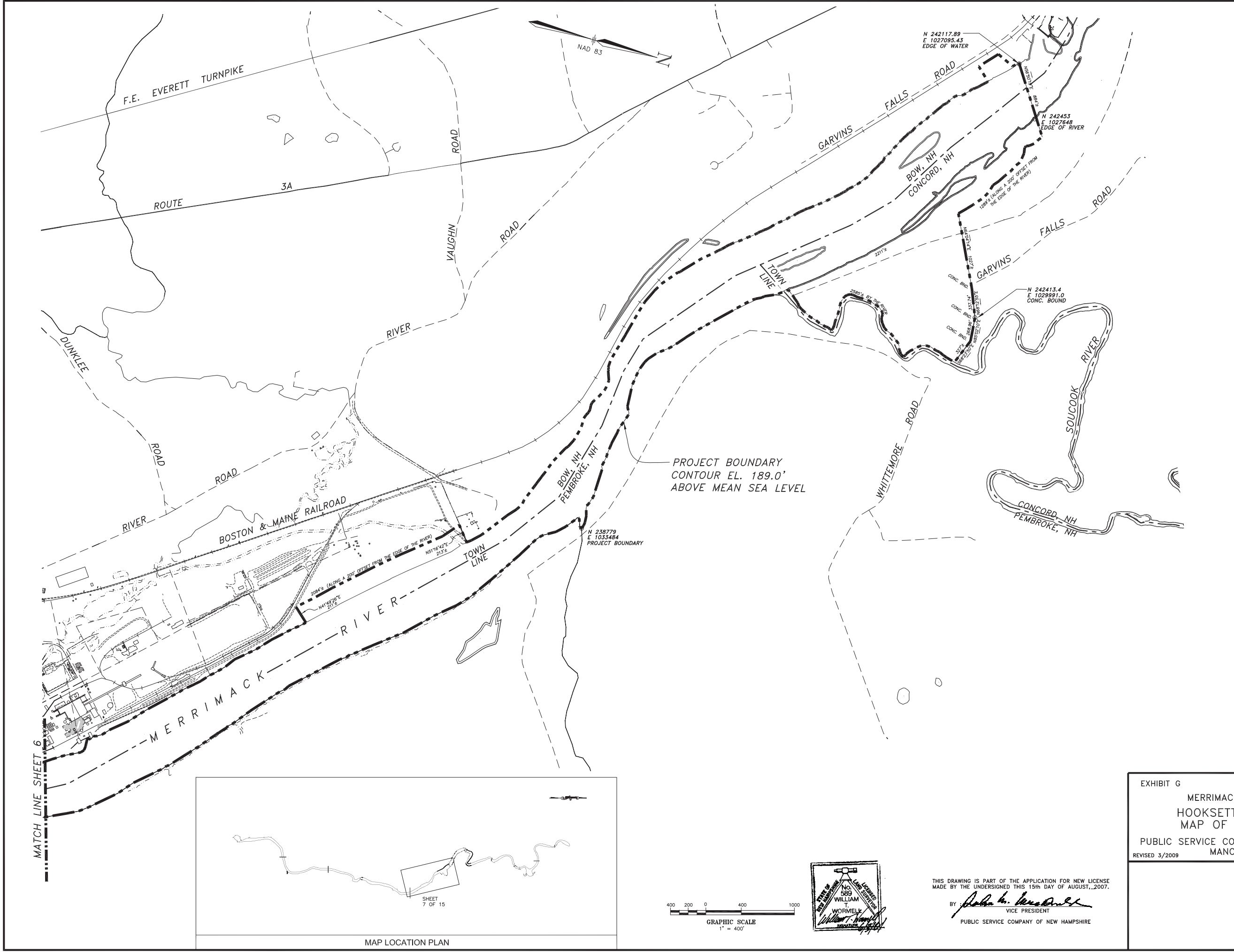
PHOTO 15 PORTAGE PUT-IN

PROJECT DRAWINGS



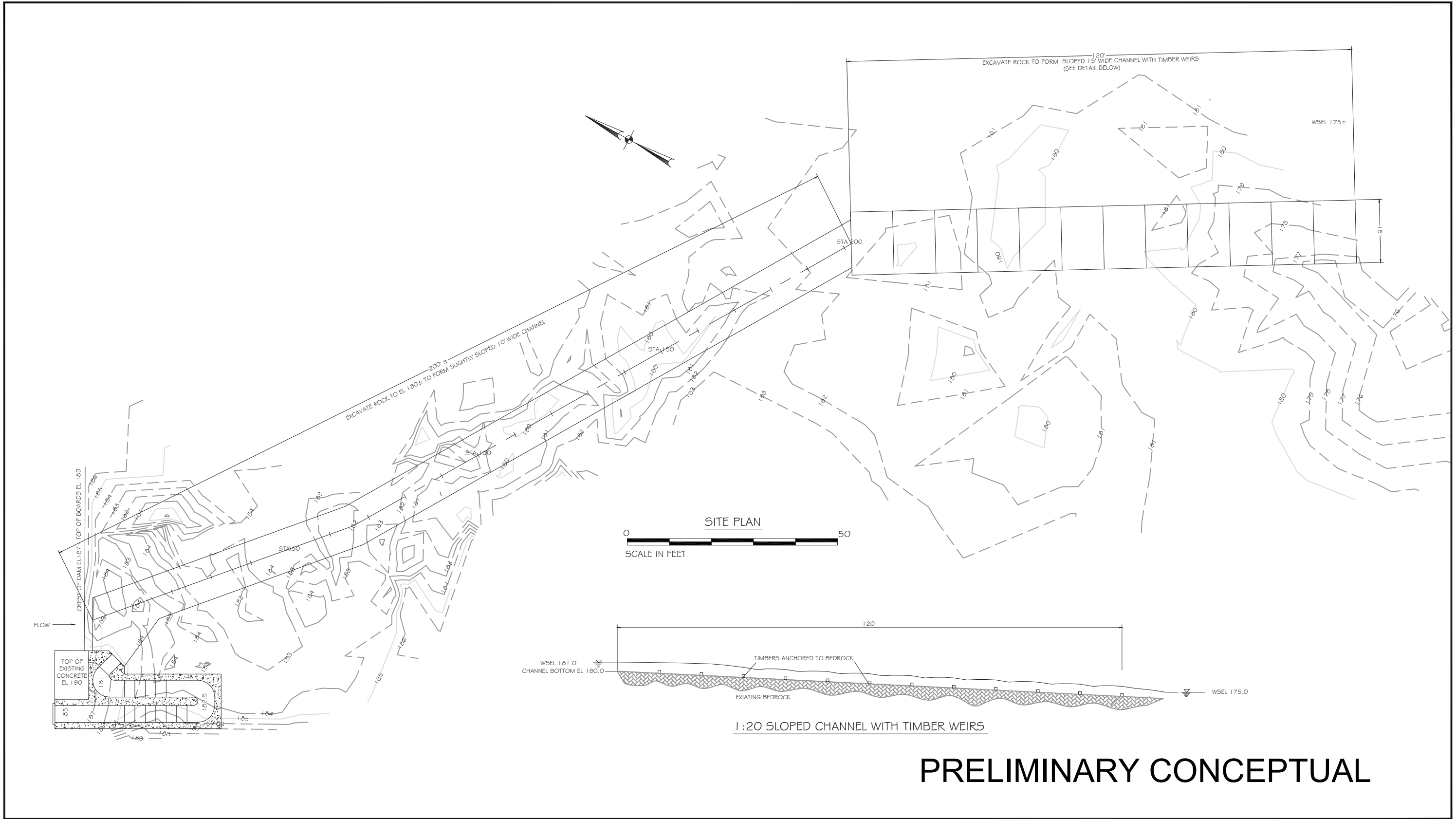
THIS DRAWING IS PART OF THE APPLICATION FOR NEW LICENSE
MADE BY THE UNDERSIGNED THIS 15th DAY OF AUGUST, 2007.
BY: *John H. Benard*
VICE PRESIDENT
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

EXHIBIT G	SHEET 6
MERRIMACK RIVER PROJECT HOOKSETT DEVELOPMENT MAP OF PROJECT AREA	
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE MANCHESTER, N.H.	
REVISED 3/2009	




THIS DRAWING IS PART OF THE APPLICATION FOR NEW LICENSE
MADE BY THE UNDERSIGNED THIS 15th DAY OF AUGUST, 2007.
BY: *John M. Benard*
VICE PRESIDENT
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

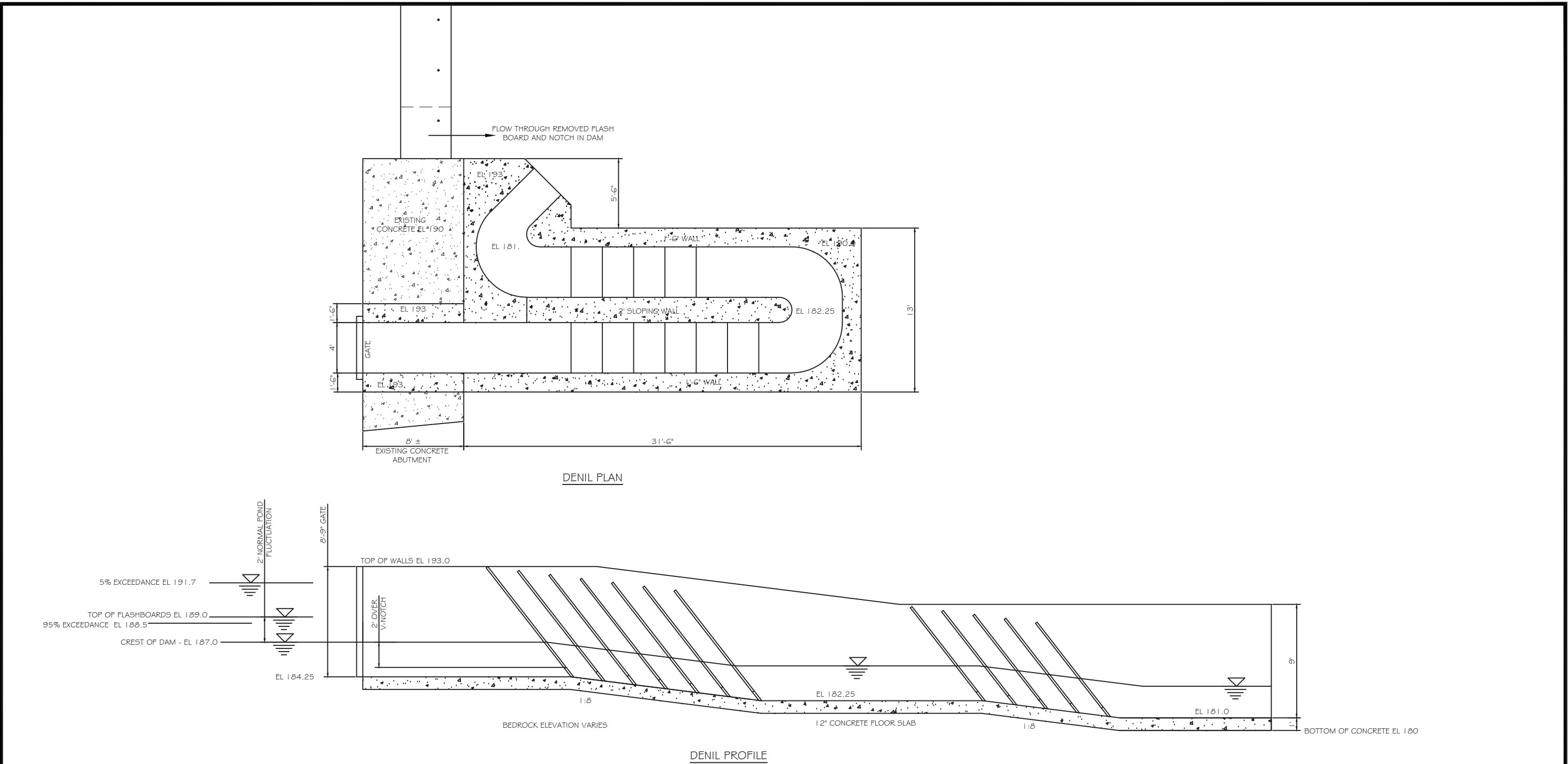
EXHIBIT G SHEET 7
MERRIMACK RIVER PROJECT
HOOKSETT DEVELOPMENT
MAP OF PROJECT AREA
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
MANCHESTER, N.H.
REVISED 3/2009




PRELIMINARY CONCEPTUAL

					FOR:	DESIGNED BY: DAR	HOOSETT PROPOSED UPSTREAM FISH PASSAGE	
						DRAWN BY: DAR		
						CHECKED BY:		
2	3-17-17	REVISED	DAR		BY: 	APPROVED BY: -	PLAN AND DETAILS	
1	12-19-16	ISSUED FOR REVIEW	DAR		Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH www.gomezandsullivan.com	PROJECT NO.: 1845		
NO.	DATE	DESCRIPTION	BY	APP		DATE: 12-16-16	SCALE: -	SHEET 1 of 2

IT IS A VIOLATION OF THE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANYWAY UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ALTERATIONS MUST HAVE THE ENGINEER'S SEAL AFFIXED ALONG WITH A DESCRIPTION OF THE ALTERATION, THE SIGNATURE AND DATE.



PRELIMINARY CONCEPTUAL

					FOR:	DESIGNED BY: DAR	HOOSETT PROPOSED DENIL	
						DRAWN BY: DAR		
						CHECKED BY:		
2	3-17-17	REVISED	DAR		BY: 	APPROVED BY: -	PLAN AND ELEVATION	
1	12-19-16	ISSUED FOR REVIEW	DAR		Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH www.gomezandsullivan.com	PROJECT NO.: 1845		
NO.	DATE	DESCRIPTION	BY	APP		DATE: 12-16-16	SCALE: -	SHEET 2 of 2

APPENDIX B

FACILITY AREA AND RIVER BASIN

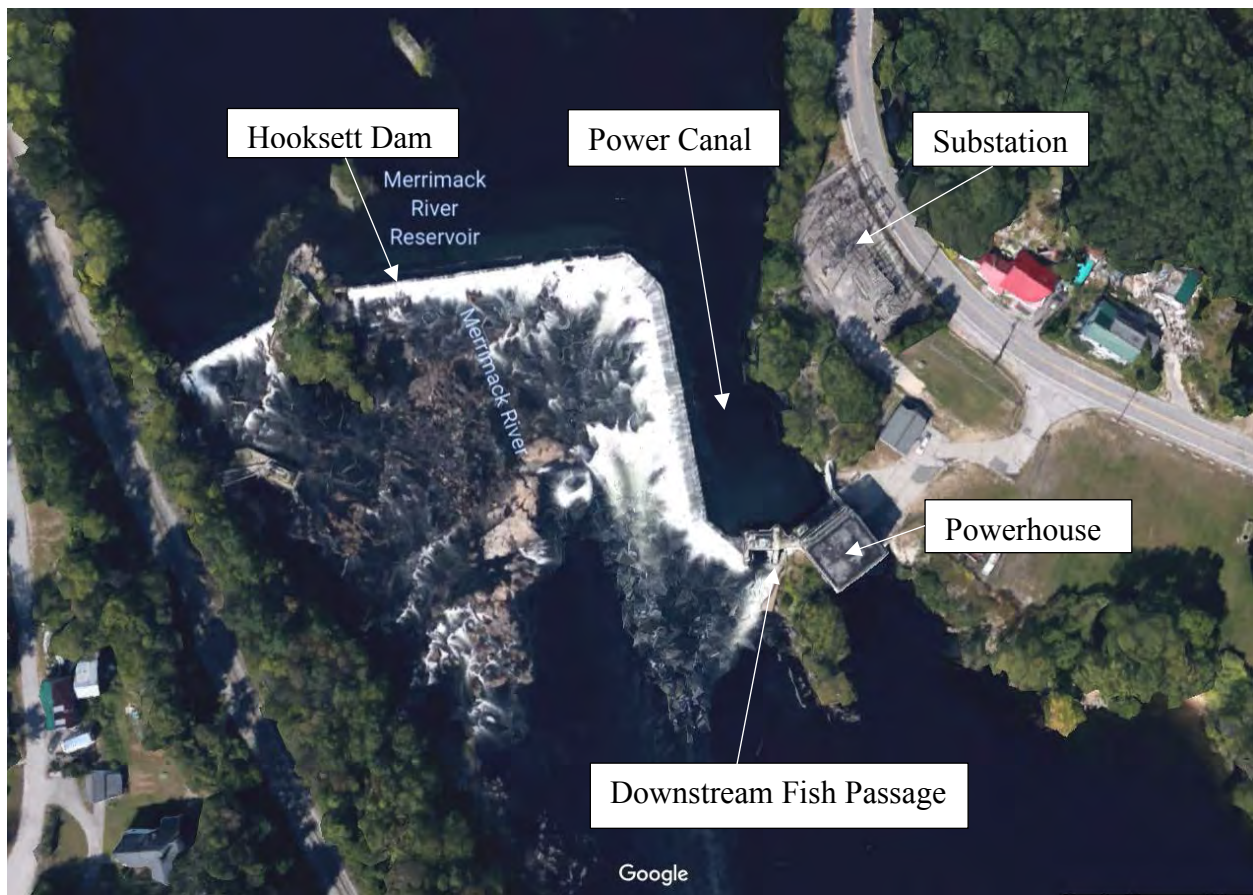


PHOTO 16 OVERVIEW OF HOOKSETT PROJECT

Merrimack River Watershed

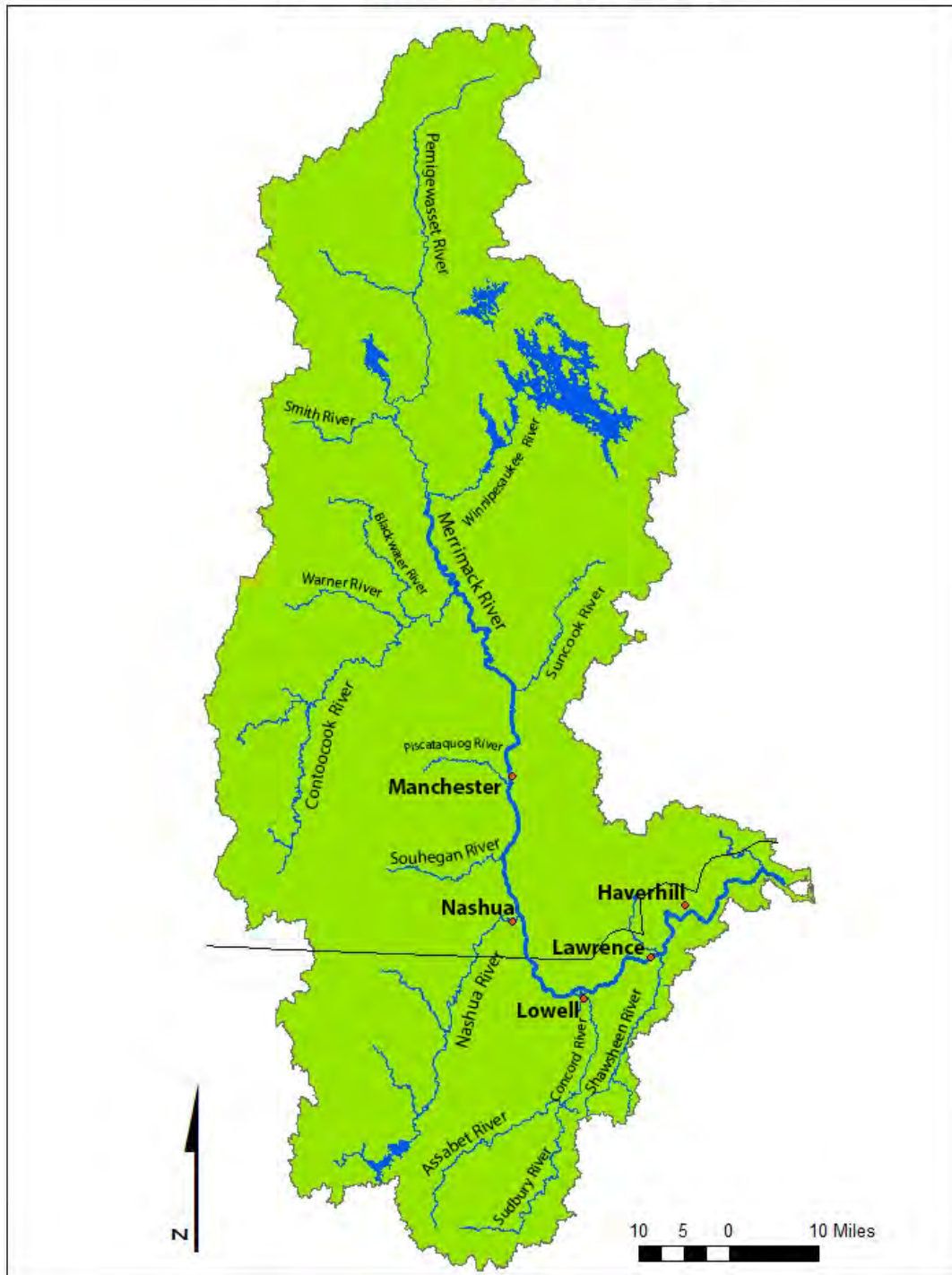


FIGURE 8 MERRIMACK RIVER BASIN⁶¹

⁶¹ <https://www.merrimack.org/web/map-of-merrimack-watershed/>

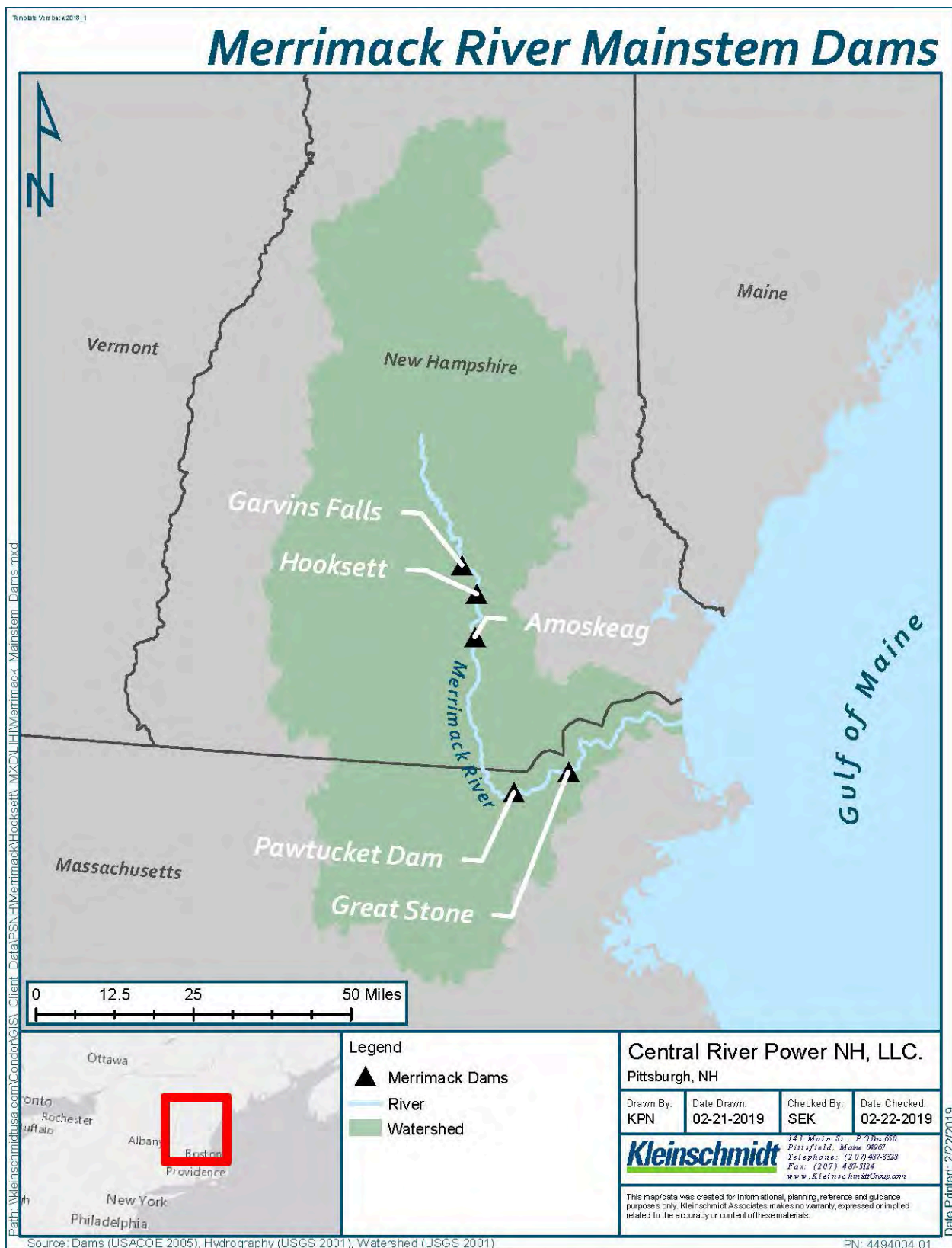


FIGURE 9 DAMS ON THE MERRIMACK RIVER

APPENDIX C

WATER QUALITY CERTIFICATION

APPENDIX A

Conditions filed by the New Hampshire Department of Environmental Services on May 10, 2005, pursuant to section 401 of the Clean Water Act, for the new license for Project No. 1893

E-1. A copy of this modified 401 Certification shall be posted within each of the Project powerhouses within seven days of issuance of the new Commission license.

E-2. The Applicant shall allow the Department to inspect the Project at any time to monitor compliance with the conditions of this modified 401 Certification.

E-3. The Applicant acknowledges a Total Maximum Daily Load (TMDL) study will occur in the Merrimack River that will include segments of the Merrimack River within the Project boundary. The issuance of this modified 401 Certification shall not affect or change the obligation of the Applicant to participate in any TMDL study and to comply with any TMDL requirement. Participation may include, but is not limited to, assistance with monitoring or dam operation to facilitate development of the TMDL. The Applicant may be asked to consult with the Department during the development of the TMDL and to comply with all applicable provisions of any final TMDL.

E-4. The Applicant shall provide minimum flow releases in Project tailwaters, as follows, for the protection of aquatic life until such time that the Project is operated in run-of-river mode in accordance with the approved operations plan described in section E-7 of this certification.

- a. Garvins Falls: 719 cfs or inflow, whichever is lower;
- b. Hooksett: 819 cfs or inflow, whichever is lower; and
- c. Amoskeag: 833 cfs or inflow, whichever is lower.

E-5. Unless otherwise permitted in the approved operations plan, and upon implementation of the approved operations plan as described in section E-7 of this modified 401 Certification, the Applicant shall, at all times, provide minimum flow releases in Project bypass reaches for the protection of aquatic life, as follows:

- a. Garvins Falls: 55 cfs in the mainstem bypass and 23 cfs in the downstream fish bypass channel;
- b. Hooksett: 64 cfs; and
- c. Amoskeag: In accordance with Table 1.

Table 1. Minimum river flow releases in the Amoskeag bypass for the Merrimack River Hydroelectric Project, FERC No. 1893.

West Channels						
	Description	East Channel	Riffle 15	Riffle 16	Total	Bypass Total
Apr. 1 – June 30 and Sept. 15 – Oct. 31	280 cfs from eastern spillway	249	5	26	31	429
	149 cfs from 2.0 ft. opening in the fish bypass gate (crest-gate)		125	24	149	
	Total	249	130	50	180	
July 1 – Sept. 14 and Nov. 1 – Mar. 31	280 cfs from eastern spillway	249	5	26	31	280

E-6. The Applicant shall evaluate the ability of the developments to maintain constant water surface elevations and/or constant downstream flows during times of daily power generation. The evaluation shall include, but not be limited to, a run-of-river scenario where water levels fluctuations in Project impoundments do not exceed 0.25 feet. Unless otherwise approved by the Department, the Applicant shall complete the evaluation by September 30, 2005, and submit a report containing the results of the evaluation to the Department by October 31, 2005. The results of the evaluation shall be used to develop the run-of-river operations plan described In E-7 of this modified 401 Certification.

E-7. The Applicant shall operate the Project in run-of-river mode, as follows:

- a. The Applicant shall develop an operations plan that shall
 - i. Define, in detail, run-of-river operations, including, but not limited to, provisions for the maintenance of constant water levels in the impoundments and/or constant river flows downstream from Project dams;
 - ii. Provide compliance monitoring, including reservoir levels, outflow, and if necessary, inflow, at the Garvins Falls, Hooksett, and Amoskeag developments unless otherwise approved by the Department;

- iii. Describe the spillway and downstream fish bypass configurations, including design drawings, used to maintain the minimum flows in the bypass reaches described in Condition E-5 of this modified 401 Certification;
 - iv. Describe contingency procedures to maintain minimum flows in the bypass reaches or tailraces during periods of failures of the spillway flashboards or fish bypass configurations (*e.g.*, obstructions) or emergency shutdowns;
 - v. Identify spillway and downstream fish passage facility configurations at the Amoskeag dam for distributing water to the east and west channels of the Amoskeag bypass reach;
 - vi. Describe how the tailrace and bypass channel flows will be impacted when inflows are less than the sum of the permitted minimum tailrace and bypass channel flows described in section E-4 and E-5 of this modified 401 Certification; and
 - vii. Provide a design and implementation schedule for all activities included in the operations plan.
- b. The Applicant shall develop the operations plan in consultation with the Department, New Hampshire Fish and Game Department (NH F&G), U.S. Fish and Wildlife Service (USFWS), and U.S. Environmental Protection Agency (USEPA). The operations plan shall be submitted to the Department for review and approval by December 31, 2005, unless otherwise approved by the Department.
- c. The Applicant shall implement the operations plan, excluding the construction of a new minimum river flow release structure, as soon as possible, but not later than 90 days after issuance of the new Commission license for the Project, unless otherwise approved by the Department. The construction and operation of a new minimum river flow release structure shall be completed no later than December 31, 2006. Any proposed modifications to the approved operations plan shall be submitted to the Department for review and approval. Proposed modifications shall not be implemented until after approval by the Department.
- d. The Applicant shall notify the Department not more than 24 hours after any substantial deviation from the approved operations plan and shall maintain a log of deviations, which shall be submitted annually to the Department not later than December 31 of each year.

- e. Exceptions to run-of-river operations may be granted by the Department, as necessary, in consultation with the Applicant, USFWS, NH F&G, and USEPA for reasons including, but not limited to, flashboard failure and reinstallation and the installation of new minimum flow release structures.

E-8. The Applicant shall enhance upstream and downstream fish passage at the Amoskeag, Hooksett, and Garvins Falls developments according to the prescriptions defined in *A Comprehensive Plan for the Provision of Anadromous Fish Passage Measures and Facilities at PSNH's Merrimack-Pemigewassett River Hydroelectric Dams, FERC Project Nos. 1893, 2456, and 2457* (Comprehensive Plan) published in 1986. The Applicant shall maintain the agreements established under the Comprehensive Plan, including, but not limited to, the construction of upstream fish passage at the Hooksett development after the fifth year following the annual passage of 15,000 American shad at the Amoskeag development, and the construction of upstream passage facilities at the Garvins Falls development after the fifth year following the annual passage of 15,000 American shad at the Hooksett development. The Applicant shall also conduct studies, as necessary, to determine the effectiveness of the downstream passage facilities at the Garvins Falls, Hooksett, and Amoskeag developments relative to Atlantic salmon smolts, American shad, and alewife. After the fourth year following the annual passage of 15,000 American shad at either the Amoskeag or Hooksett development, the Applicant shall submit annual status reports to the Department by December 31 regarding the design, construction, and anticipated completion date of fish passage facilities.

E-9. The Applicant shall operate and maintain the Project consistent with the conditions of this modified 401 Certification.

- a. The manner in which the Project is operated shall not contribute to violations of NH surface water quality standards. If it is determined that the manner of project operation contributes to violations of surface water quality standards, additional conditions may be imposed or conditions amended by the Department, when authorized by law and after notice and opportunity for hearing.

- b. The Applicant shall consult with the Department regarding any proposed modifications to the Project or its operation that may not be in accordance with this modified 401 Certification to determine whether this modified 401 Certification requires amendment or if a new 401 Certification is required for the Project. Any amendment of this modified 401 Certification or the issuance of

a new 401 Certification, determined appropriate by the Department, shall be required prior to the implementation of any modifications to the Project.

E-10. The conditions of this modified 401 Water Quality Certification may be amended and additional terms and conditions added as necessary to ensure compliance with NH surface water quality standards, when authorized by law, and after notice and opportunity for hearing.

E-11. The Department may, at any time, request from the Commission the reopening of the license to consider modifications to the license as necessary to ensure compliance with NH surface water quality standards.

APPENDIX D

THREATENED AND ENDANGERED SPECIES

APPENDIX B

Prescriptions filed by the U.S. Department of the Interior, Fish and Wildlife Service, on December 26, 2006, pursuant to section 18 of the FPA, for the new license for Project No. 1893

10. Prescription for Fishways

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

10.1 General Prescriptions for the Merrimack River Projects

To ensure the immediate and timely contribution of the fishways to the ongoing and planned anadromous and catadromous fish restoration and enhancement program in the Merrimack River, the following 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 (Pub. L. 102-486, Title XVII, 106 Stat. 3008), and the Energy Policy Act of 2005 (Pub. L. 109-58)

a. Fishways shall be constructed, operated, and maintained to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife and American eels at the licensee's expense.

b. Design populations

The total number of returning fish reaching the project during the term of the new license will depend on a number of factors, including overall stock recruitment of fish populations undergoing restoration. Overall fishway efficiency and cumulative losses of fish attempting to use upstream and downstream fish passage facilities also will affect the total potential restored run of shad, river herring, salmon and eels.

(1) Shad and river herring:

The Merrimack River Basin includes over 430,000 100 yard units of habitat for American shad (USFWS 1982) or about 9,000 acres of habitat. This habitat has the potential to support a shad population approaching 1 million shad and 2.5 million river herring. Of this, 44% of the habitat is upstream from the project, yielding substantial returns of fish upstream from the project. However, reaching this population size would depend on at sea conditions for growth and survival, ocean harvest, effective fish passage facilities at

all dams and normal river flows during the passage season.

As restoration potential is realized, passage facilities at project dams would need to pass substantial numbers of fish. However, a more immediate need is to provide shad and herring access to currently unavailable habitat. Therefore, while the prescribed facilities will pass significant numbers of shad and herring, expansion of these facilities may be needed in the future if prescribed facilities cannot pass all returning fish as full restoration potential is realized.

(2) Atlantic salmon:

Adult Atlantic salmon returning to the Merrimack River are all trapped at the Lawrence Dam fishway and either transported to the Nashua National Fish Hatchery for spawning and egg collection or are transported to the Pemigewasset River for natural spawning. Therefore, only in very rare instances are adult salmon expected to reach the project dams. Regardless, even if salmon were permitted to freely migrate upstream, runs of salmon will not be large enough to affect the design of fishways at any of the project dams. The more numerous species (shad and river herring) typically determine the kind of fish passage that should be built at a hydroelectric project.

(3) American eel:

American eels are currently present in the area occupied by the three project developments, although problems with upstream migration past the downstream dams and the lack of upstream passage at the project dams restrict the numbers of eels in the project area or areas upstream from the project. While the Department does not have a precise estimate of the numbers of eels that would be expected to use fish passage at the project developments, upstream and downstream passage would enhance the eel stocks and help achieve overall management goals. In addition, upstream passage needs for eels differ from those of salmon, shad, and river herring. Separate upstream eel fishways typically are installed at barriers in addition to those that are provided for anadromous fish.

(4) Other species:

Fish passage facilities provided at the project dams would also be used by white sucker, trout, and other riverine species. The numbers of riverine fish using the fishways are, however, likely to be small, relative to anadromous and catadromous species.

c. Upstream fishways at Amoskeag shall be operational during the designated migration period at river flows up to 19,400 cfs as measured at the USGS gage at Goffs Falls (#01092000). Fishways at Hooksett and Garvins Falls shall be operational at river flows of up to 19,000 and 17,000 cfs respectively, based on the Goffs Falls gage prorated as appropriate for drainage area differences between the gage location and these dams.

Downstream fishways shall be operated during the designated migration periods whenever turbines are operated at the three project developments.

d. Scheduling

The timing of installation of upstream fish passage at Hooksett and Garvins Falls will be based upon the growth of migratory and riverine fish populations in the Merrimack River. American eels are currently present in the river, and would benefit from the immediate implementation of safe, timely, and effective upstream and downstream eel fishways. The Commission's EA also recommends permanent upstream eel fishways at all three developments.

A fishway must be installed at Hooksett Dam within three years after 9,500 shad or 22,500 river herring pass Amoskeag. A fishway at Garvins Falls must be installed within three years after passage of 9,800 shad or 23,200 river herring at Hooksett Dam, or passage of 19,300 shad or 45,800 herring at Amoskeag Dam if the Hooksett fishway design does not permit counting of fish.

Installation of eelways now at all three dams would be a benefit to the species. However, proper eelway construction at the Amoskeag spillway and at Garvins Falls will require some initial study to assess proper eelway location. At all three dams, assessment of eelway location and design using interim eelways will also be needed prior to permanent eelway installation. Interim eelways shall be fully operational at Hooksett during the second spring/summer period after licensing, and at the Amoskeag spillway and at Garvins Falls within three spring/summer periods after license issuance. Following assessment and design, permanent eelways shall be installed and operational by the spring/summer of 2012.

e. The timely installation of the prescribed fishway structures, facilities, or devices is a measure directly related to those 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 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 American shad, river herring, American eel and white sucker:

Upstream passage: April 1 to July 15 -- All species except American eel

April 1 to Nov. 15 -- American eel

Downstream passage: April to June 15 -- Atlantic salmon

June 1 to July 15 -- Spent adults of all species

Sept. 15 to Nov. 15 -- Adult eel, juvenile shad & herring

Upon mutual agreement, the Licensee and the Service may modify the above schedules in the event that upstream or downstream passage of fish has not yet begun, migration has substantially declined, or operating conditions (i.e. high flows, drought) or other conditions make continued operation of the fishways unnecessary or inappropriate under the circumstances. If monitoring indicates that these dates should be permanently adjusted, the Service shall use its reservation of authority to modify the operating schedule.

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.

h. Evaluation of Fish Passage Facilities

The licensee shall develop plans for and conduct fishway effectiveness evaluations on all prescribed fish passage, in consultation with the Service and other fishery agencies. For each fishway to be constructed, the plans for fishway effectiveness evaluations shall be submitted to the Service for final review and approval simultaneously with the construction plans and schedule for each fishway. Each plan shall include proposed evaluation methods, and schedules for conducting the study and providing the results to the Service and the Commission. If the Service and the licensee cannot agree on the evaluation plan, the licensee shall submit the proposed plan to the Commission for approval, including all comments received from the Service.

i. The licensee shall provide personnel of the 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 the Service, all functional and final design plans, construction schedules, and any hydraulic model studies for the fishways or modifications to existing fishways described herein.

10.2 Specific Prescriptions for the Merrimack River Projects

10.2.1 Amoskeag

- a. The licensee shall operate the existing tailrace pool-and-weir fish ladder according to the upstream passage operation schedule (Section 10.1 f).
As noted in Section 10.1 f, exact operation dates in any given year can be adjusted depending on the timing of fish migrations in that year.
- b. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule (Section 10.1 f).
- c. The licensee shall evaluate the effectiveness of the existing upstream tailrace fishway in passing American shad and river herring that reach the project. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.
The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation between the licensee and the Service, any modifications to the fishways or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications to the fishways or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.
- d. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.
The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

e. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim spillway eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishways (i.e., the existing tailrace facility and the new spillway facility). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

f. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation of the permanent eel fishway(s) by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

10.2.2 Hooksett

a. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule. (Section 10.1 f)

b. The license shall install upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. Within one (1) year after passage of the trigger number of fish at Amoskeag, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The permanent upstream passage facilities shall consist of (1) a 4-foot-wide Denil fishway on the west side of the project spillway, including a counting facility and measures for the provision of the necessary attraction water; or (2) an alternative design approved by the Service.

c. Within nine (9) months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service

for review and approval: 1) design plans for an interim eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

d. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

e. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

10.2.3 Garvins Falls

a. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule (Section 10.1 f) .

b. The license shall install upstream passage facilities at the Garvins Falls Dam for anadromous fish, to be operational within three years after the trigger number of fish is

reached. The trigger number shall be:

- (1) passage of either 9,800 American shad or 23,200 river herring at the Hooksett development;
- (2) if fish passage has been constructed at the Hooksett Development without a fish counting facility, passage of either 19,300 American shad or 45,800 river herring at the Amoskeag Development.

Within one (1) year after passage of the trigger number of fish, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The upstream fishway at the Garvins Falls development shall consist of either (1) an upstream fish lift located adjacent to the discharge of the older, river-side powerhouse, with an exit flume to convey fish to the headpond as depicted in Conceptual Design Drawings 19 through 24; or (2) an alternative design and/or location approved by the Service.

c. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

d. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim eel fishway(s) and a schedule for installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon

approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

e. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Request for NHB Review of "Potential Impacts" from the NHB DataCheck Tool**NHB File Number:** NHB19-0097**Data Requested:** 1/7/2019**Requested By:**

Name: Kayla Easler
141 Main Street, P.O. Box 650
Pittsfield, ME 04967
E-mail: kayla.easler@kleinschmidtgroup.com
Phone: 207-416-1271

Project Location:

Town: Hooksett
Description: 70 Merrimack St, Hooksett NH

Payment Information. These fields MUST be filled out.

Check Number: _____

Name of Account: _____

(as printed on the check)

Enclose this completed form with a check in the amount of \$25, made out to "Treasurer, State of NH".

Send the check and the completed form to the following address:

DRED - NHB
NHB Reviews
172 Pembroke Road
Concord, NH 03301



United States Department of the Interior

FISH AND WILDLIFE SERVICE

300 Westgate Center Drive
Hadley, MA 01035-9589



In Reply Refer To:
FWS/Region 5/ES

ORIGINAL

DEC 20 2006

Magalie Roman Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

P-1893-042

FILED
OFFICE OF THE
SECRETARY
2006 DEC 26 AM 10:03
REGULATORY COMMISSION

Dear Ms. Salas:

Enclosed for filing are eight copies of the Department of the Interior's (Department) Prescription for Fishways for the Merrimack River Project (Project). The Administrative Record in support of this Prescription for Fishways was filed with the Federal Energy Regulatory Commission (FERC) on July 12, 2006.

We have submitted hard copies of the Modified Prescription for Fishways with the Public Service Company of New Hampshire (PSNH). We have also distributed copies to American Whitewater Affiliation, which intervened in the Department's proceedings on PSNH's request for a Trial Type Hearing and submittal of its Alternative Fishway Prescription. We have distributed this cover letter to the remainder on FERC's Service List for the Project.

An additional copy of this letter is enclosed so that you may file stamp and return it in the enclosed self-addressed envelope. If you have any questions, please contact Michael G. Thabault, Assistant Regional Director, Ecological Services, at 413-253-8304, or Alex Hoar, Ecological Services, at 413-253-8631. Thank you for your cooperation in filing these documents.

Sincerely,

 Acting 

Marvin E. Moriarty
Regional Director

Enclosures

cc: FERC Service List

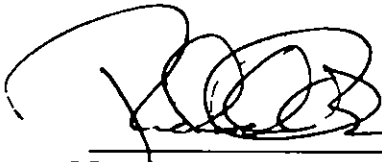
 **ORIGINAL**

**BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION**

Public Service of New Hampshire, Applicant	)	Merrimack River Project
	)	Merrimack River
	)	Hillsborough and Merrimack
	)	Counties
	)	New Hampshire
	)	FERC No. 1893-042

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

Approved this 20 day of Dec., 2006, by:



Marvin E. Moriarty, Regional Director *Acting*

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

TABLE OF CONTENTS

1.	Introduction.....	1
2.	Resource Description.....	3
2.1	Historical Fisheries	3
2.2	Current Fisheries.....	4
2.2.1	Atlantic Salmon	4
2.2.2	American Shad, Alewife and Blueback Herring.....	5
2.2.3	American Eel	6
2.2.4	Other Anadromous Species.....	8
3.	Management Goals	8
3.1	Published Plans	8
3.2	Restoration Objectives	9
4.	Statutory Authority.....	9
5.	Procedural Background	10
5.1	Initial Consultation Document.....	10
5.2	Draft License Application.....	10
5.3	Additional Information Requests	11
5.4	Commission Notice of Applications Ready for Environmental Analysis	11
5.5	Applicant's Response to the Preliminary Fishway Prescription.....	11
5.6	Petition for TTH and submission of an AFP.....	12
6.	Administrative Record	12
7.	Alternatives Considered.....	12
8.	Response to Public Comments	15
9.	Reservation of Authority to Prescribe Fishways.....	15
10.	Prescription for Fishways.....	15
10.1	General Prescriptions for the Merrimack River Projects.....	16
10.2	Specific Prescriptions for the Merrimack River Projects.....	19
10.2.1	Amoskeag Development.....	19
10.2.2	Hooksett Development.....	23
10.2.3	Garvins Falls Development.....	26

**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 (Department) hereby submits its Prescription for Fishways for the Merrimack River Project¹ (Project), pursuant to Section 18 of the Federal Power Act, as amended. The Department is submitting this Decision Document to the Federal Energy Regulatory Commission. The Department's supporting Administrative Record for this prescription was filed with the Commission on July 12, 2006.

The Department developed its Prescription 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 (Service) and the New Hampshire Fish and Game Department (NHFGD), as well as the applicant, Public Service of New Hampshire (PSNH), and the American Whitewater Affiliation.

During the development of the Prescription for Fishways for the Project, the procedures for prescribing fishways under Section 18 of the Federal Power Act were modified by provisions of the Energy Policy Act of 2005 (EPAAct).² The Department's Preliminary Fishway Prescription (PFP) was submitted under provisions of the Policy for Review of Mandatory Conditions Developed by the Departments of the Interior and Commerce in the Context of Hydropower Licensing (MCRP).³ Pursuant to this process, the Department solicited comments on its PFP and would have addressed them in this Prescription for Fishways. The EPAAct, however, required the Department to develop new regulations and procedures for fishway prescriptions. These regulations afford two new rights to participants in any licensing proceeding in which the Department exercises its mandatory authority under the Federal Power Act: an opportunity for Trial-Type Hearing (TTH) on material issues of disputed fact, and an opportunity to file Alternative Fishway Prescriptions (AFP) for consideration by the Department. The TTH offers applicants the opportunity to challenge material facts that the Department relied on for its PFP, while the AFP provides applicants the opportunity to propose an alternative to the Department's PFP.

¹ The Merrimack River Project includes the Amoskeag, Hooksett and Garvins Falls Dams and hydroelectric generating stations.

² Pub. L. No. 109-58 (2005).

³ Policy for Review of Mandatory Conditions Developed by the Departments of the Interior and Commerce in the Context of Hydropower Licensing, January 18, 2001.

The Department submitted its PFP by letter dated May 13, 2005. PSNH submitted comments on the PFP by letter dated July 15, 2005. The Department's regulations, issued November 17, 2005, allowed participants in ongoing licensing proceedings to avail themselves of their rights under the EPAct until December 19, 2005. PSNH timely raised concerns similar to those presented in its comments in a petition for a TTH and AFP, filed on December 19, 2005. On August 25, 2006, the Service and PSNH signed a Settlement Agreement (SA) resolving the TTH dispute and agreeing to terms of this Prescription for Fishways. Subsequently, on August 28, 2006, PSNH submitted a motion for dismissal of the TTH with the Department's Office of Hearings and Appeals and withdrew its AFP.

As PSNH's July 15, 2005 letter was submitted under the old MCRP process, and ultimately, issues of disagreement on the prescription were resolved with the August 25, 2006 Settlement Agreement (SA), we will treat the issues raised in that letter as resolved under the same process resolving the petition for TTH and the AFP. Accordingly, those comments are not specifically addressed herein. No comments were received from any other party.

This Prescription for Fishways covers the three developments that make up the project: Amoskeag, Hooksett and Garvins Falls, all three of which utilize existing dams and powerhouses. All three developments currently operate in a daily store-and-release/peaking mode, though the Hooksett development has limited daily storage capacity and therefore largely operates in a run-of-river mode.

The three developments have a combined generating capacity of 29.7 MW. The three project dams are located in succession on the river, with Amoskeag the most-downstream dam and Garvins Falls the most upstream of the project developments. There is an existing pool-and-weir upstream fishway and a temporary American eel trap at the Amoskeag tailrace but no other upstream passage measures at the other project dams. All three project dams have downstream fish bypasses which range from a simple fish bypass gate at Hooksett to a state-of-the-art louver system at Garvins Falls. The effectiveness of the upstream and downstream fish passage facilities for all species has not yet been established. Additional information on the project and their operation is included in PSNH's license application and supporting documents and in the Commission's Environmental Assessment for the Project, dated January 2006 (EA).⁴

Two dams—the Essex or Lawrence Dam, site of the Lawrence Project (FERC No. 2800) and the Pawtucket Dam or Lowell Dam, site of the Lowell Project, (FERC No. 2790)—are located downstream from Amoskeag. Both dams have existing upstream and downstream fishways, although passage efficiency of the Lowell fish lift is a concern and is currently being investigated.

⁴ FERC (Federal Energy Regulatory Commission). 2005. Environmental Assessment for Hydropower License, Merrimack River Project, FERC Project No. 1893-042. January 2006.

As discussed below in greater detail, the Department's Prescription for Fishways focuses on the need for eel passage, evaluations of existing downstream fishways and future upstream passage needs at the Hooksett and Garvins Falls developments. The Department's Prescription for Fishways will ensure that fish passage is provided at the three project developments in a safe, timely and effective manner.

2. Resource Description

The Merrimack River is located in central New Hampshire and northeastern Massachusetts and drains an area of approximately 5,014 square miles. As such, it is the second largest river in New England. The Merrimack is formed by the confluence of the Pemigewasset and Winnepesaukee Rivers in Franklin, New Hampshire and flows 116 miles southeast to its mouth in the Gulf of Maine in Newburyport, Massachusetts (Application, p. E-1).

The Merrimack River has a long industrial history. The river was utilized for transportation and diverted for industrial use in the early 1800s. The first complete barrier dam on the river was built at Amoskeag Falls in the 1830s and the Essex/Lawrence Dam was completed in 1847. There are currently five dams on the mainstem Merrimack, including the three Merrimack River Project dams.

Water quality in the river is generally good, and is classified as Class B waters by the State of New Hampshire. Additional background information on the Merrimack River can be found in the license application and the Commission's EA.

2.1 Historical Fisheries

The Merrimack River historically supported populations of anadromous Atlantic salmon, American shad, alewife and blueback herring that extended to the upper Merrimack River Basin. (License Application p. E-38). Atlantic salmon historically occurred in the Merrimack River until the mid-1800s when construction of impassable dams extirpated the population from the Merrimack. Shad and herring populations also declined largely from the construction of impassable barrier dams on the mainstem Merrimack and tributaries (Strategic Plan p. 18).

American eel were also present in the Merrimack River watershed, although information of historical population abundance and distribution is limited.

2.2 Current Fisheries

The Merrimack River supports a mixture of riverine, as well as anadromous⁵ and catadromous⁶ fish species. Migratory fish occurring in or near the Merrimack River estuary include American shad, alewife and blueback herring (collectively referred to as river herring), Atlantic salmon, shortnose sturgeon, striped bass and American eel. However, anadromous species are currently limited in distribution to below the Hooksett Dam, although some river herring have been observed passing the Hooksett Dam under some flow conditions.⁷

A fish lift was installed and began operating at the Lawrence Project in 1983. A similar fish lift at the powerhouse and a vertical slot fishway at the spillway were installed at the Lowell Project in 1986. Anadromous species and some riverine species have been recorded passing these facilities, although efficiency of the facilities is uncertain. In 1995, the Lawrence lift system was modified to improve passage effectiveness and resulted in improved passage (Strategic Plan, p. 57). Similar modifications were made at the Lowell Project, but the numbers of shad or herring that have been recorded passing Lowell since that time have been limited. In 2002, the Service's Central New England Fishery Resources Office conducted a study of shad migration and passage at the Lowell Project and found only 6% of radiotagged shad tagged at Lawrence passed the Lowell fish lift. This passage efficiency was similar to the overall percentage of shad that passed Lawrence and then passed Lowell that year of 10% (Sprankle 2004). Efforts to evaluate the causes of poor passage efficiency and to investigate ways to improve passage have been ongoing with ENEL Energy, the project owner. However, abnormally high flows during the spring passage seasons in 2005 and 2006 have prevented adequate assessment.

A variety of riverine fish species exist in the project waters, including indigenous (blacknose dace, white sucker, yellow perch and fallfish) and introduced (largemouth bass, smallmouth bass, walleye and bluegill) species (License application at Table E-4).

2.2.1 Atlantic Salmon

Atlantic salmon restoration on the Merrimack began in 1963 with a survey of basin habitat by NHFGD and in 1969, a formal cooperative was established among NHFGD, the Massachusetts Division of Fisheries and Wildlife, and the Bureau of Sport Fisheries and Wildlife (now the Service) and Bureau of Commercial Fisheries (now NOAA Fisheries). The U.S. Forest Service joined the cooperative in 1982. The program is managed by the Policy Committee for Anadromous Fishery Management (Policy Committee) of the Merrimack River and Technical Committee for Anadromous Fishery Management of the Merrimack River (Technical

⁵ Anadromous fish begin their life cycle in freshwater, migrate to sea where they grow to maturity over one or more years, and return to their natal rivers, streams, lakes or ponds to spawn.

⁶ Catadromous fish begin their life cycle at sea, migrate to freshwater to grow to maturity over a several-year period, and return to sea to spawn and die.

⁷ Letter dated July 15, 2005 from Catherine E. Sively, PSNH, to Secretary, FERC.

Committee). Restoration activities have included stocking of hatchery-reared salmon smolts and fry, habitat assessment and assessment of production. The Service and other member agencies worked with the Policy and Technical Committees to achieve upstream and downstream fish passage at hydro projects in the basin.

Atlantic salmon fry and smolts are stocked into the Merrimack River and its tributaries as part of the restoration program. Since 1975, approximately 20 million fry have been stocked in basin tributaries. Currently, approximately 1.4 million salmon fry are stocked annually. Of these, approximately 85% of these are stocked upstream from the project dams. Salmon smolts have also been an integral part of the restoration plan, though all salmon smolts are stocked downstream from the project below the Essex Dam in Lawrence.

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 into the open ocean by juvenile smolts and adults. Due to its anadromous life history, salmon must obtain safe and unrestricted access to their natal streams and the young must reach the ocean to successfully sustain local populations. The existing downstream bypasses at the project dams have largely been proven to be reasonably effective in safely passing salmon smolts downstream past the project turbines. Review of existing data and possibly additional evaluations on plunge pool conditions at Amoskeag are necessary, however, to assure safely bypassed smolts and post-spawned adult salmon are not injured when using the bypass gate.

Based on the current Strategic Plan, all returning adult salmon are transported to a hatchery to be spawned artificially, or will be transported to the Pemigewasset River upstream from the project.

2.2.2 American Shad, Alewife and Blueback Herring

Like salmon, American shad, blueback herring and alewife (collectively river herring) are managed by the Policy and Technical Committees. Prior to the start of the restoration program to restore these species, a limited population of American shad and river herring still inhabited the lower Merrimack downstream from the Lawrence Dam.

Habitat for shad and river herring exists in both the mainstem Merrimack and in major tributaries both upstream and downstream from the project. In total, there are 187,600 100 square yard units of shad habitat upstream of the project, which accounts for 44% of the estimated total habitat for the basin (USFWS 1982). The principal spawning habitat for alewives is likely to be in more ponded areas on tributaries, while blueback herring utilize more riverine habitat for spawning.

Management efforts to restore these species have included stocking of pre-spawned adult shad and herring into mainstem and tributary habitat, mostly upstream from the project. These efforts have yielded a range of results. Since the start of fish passage operations at Lawrence Dam, shad passage numbers have increased from approximately 5,500 in 1983 and 1984 to as high as 76,717 in 2001 (USFWS 2006). Shad totals in 2005 and 2006 have been severely suppressed by high spring flows that render the Lawrence fishway inefficient in passing fish. River herring passage totals have been variable, with as many as 387,970 herring passing Lawrence in 1989, but as few as 51 passing in 1996. The cause of such variation is thought to be a variety of biological and possible harvest issues in the ocean, predation by striped bass and other abundant predators offshore and in the river, and poor passage conditions, especially for alewives at Lawrence in early spring.

Like salmon, juveniles and post-spawned adults must migrate downstream to the sea. As such, downstream passage for these species/life stages is needed. The existing downstream bypass facilities may provide effective downstream passage for shad and herring, but they have not been fully evaluated. Such evaluations of effectiveness are needed.

2.2.3 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. The Sargasso Sea is situated in the Atlantic Ocean, northeast of the Bahamas. 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. Migrations to upriver tributaries may continue for many months or years, and generally coincide 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.⁸

⁸ ASMFC (Atlantic States Marine Fisheries Commission). 2000. Interstate Fishery Management Plan for American Eel (*Anguilla rostrata*). Fishery Management Report No. 36 of the Atlantic State Marine Fisheries Commission. 92 pp.

As sexual maturity begins, yellow eels metamorphose 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 generally starts for the silver eels with the onset of the fall rainy season and escalates until colder temperatures begin.⁸

Throughout the Atlantic seaboard, American eels traditionally have been used for regional and ethnic 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.⁸

The Merrimack River currently supports a population of maturing American eel, although the size of the historic or current eel population is unknown. Large numbers of eels were known to have migrated downstream from Lake Winnepesaukee, upstream of the project, in the 1980s, when large numbers were found killed by passage through hydroelectric turbines at the Lakeport Project (FERC No. 6440).⁹ More recently, mortality of adult eels at the same project were noted, demonstrating that at least some eels continue to inhabit this lake well upstream from the river mouth.⁹

There are no current estimates of eel populations in the Merrimack Basin. A study of eel abundance conducted by the Service in 2001 and 2002 found large numbers of eels downstream from the Lawrence Dam but limited numbers upstream from Lawrence due to lack of upstream passage facilities at Lawrence and Lowell Dams (Sprankle 2002).

Declines in the American eel population in the Merrimack River and elsewhere are attributed to a combination of causes, including commercial harvest, pollution, changes in oceanic currents, and the negative effects of dams and hydropower facilities.¹⁰ More specifically, hydropower facilities block or restrict migration routes into freshwater rearing habitats, and cause mortality to eels both during their residency in freshwater and as they migrate back to the Sargasso Sea. Passage through multiple hydropower turbines, as is the case on the Merrimack River, often results in significant cumulative mortality of eels.

⁹ Letter from the New Hampshire Department of Fish and Game to Hydro Dynamics Corporation. August 29, 1988.

¹⁰ Haro, A., W. Richkus, K. Whaler, A. Hoar, W.D. Busch, S. Lary and D. Dixon. 2000. Population Decline of the American Eel: Implications for Research and Management. Fisheries Vol. 25, No. 9, pp. 7-16.

The Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan for American Eel contains the following goal:

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

Improvements in upstream passage at dams on the Merrimack and tributaries will enhance the abundance of eels in the basin, consistent with regional fishery management goals. There are no downstream passage measures for eels currently in place at any mainstem Merrimack River dams. It is possible that the existing downstream passage facilities designed for anadromous species may pass outmigrating eels, however, these facilities are not designed for demersal species like eel and are untested. If, after evaluation, these facilities do not prove to be effective, additional physical structures or modifications to project operations will likely be needed to provide for safe, timely and effective passage for sexually maturing eels that are migrating downstream to the ocean.

2.2.4 Other anadromous species

Other species of anadromous fish that are present in the lower Merrimack River below Essex Dam include shortnose sturgeon and striped bass. Shortnose sturgeon have not been recorded upstream of the Lawrence Project. Small striped bass have been known to pass upstream in limited numbers using the fish lifts at the Lawrence and Lowell Projects. No striped bass are known to have passed Amoskeag using the existing fishway.

3. Management Goals

3.1 Published Plans

A number of published state, federal and regional fishery plans contain management goals that pertain to the Merrimack River. These plans include:

Strategic Plan and Status Review – Anadromous Fish Restoration Program – Merrimack River. 1997. Technical Committee for Anadromous Fishery Management of the Merrimack River Basin.

Fishery Management Plan for the American Shad and River Herring. 1985. Atlantic States Marine Fisheries Commission (amended in 1998).

Interstate Fishery Management Plan for American Eel. April 2000. Atlantic States Marine Fisheries Commission.

3.2 Restoration Objectives

The Strategic Plan and Status Review – Anadromous Fish Restoration Program – Merrimack River has three broad strategies: (1) implement a watershed approach to anadromous fish restoration; (2) develop partnerships to achieve restoration; and (3) implement education and outreach to promote anadromous fish restoration. Specific final target fish restoration goals are not included in the Strategic Plan. However, interim objectives of 300 or more Atlantic salmon adults, 35,000 adult shad, and 300,000 river herring past at the Lawrence Project have been established. Also, strategy 1.A.2 of the Plan relates to improvement of upstream and downstream fish passage for salmon, shad and river herring.

In 1986, a Comprehensive Plan for Provision of Anadromous Fish Passage Measures and Facilities at PSNH's Merrimack-Pemigewasett River Hydroelectric Dams, FERC Projects 1893, 2456, and 2457 was developed by the Policy and Technical Committees and PSNH. The Merrimack River Basin Fish Passage Action Plan for Anadromous Fish (Appendix to Strategic Plan), which guides passage actions at PSNH's project and other hydroelectric projects, incorporated the provisions of the 1986 Plan as they relate to upstream passage at PSNH's projects. The Action Plan called for operational upstream passage facilities for anadromous species at Hooksett and Garvins Falls Dams within five years after passage of 15,000 shad at Amoskeag and Hooksett Dams respectively. The Plan did not address passage for river herring or American eel. As such, the Plan for implementing passage at the Merrimack River Project needs to be revised. As part of this relicensing, the trigger numbers for implementing passage were reviewed and new triggers were developed for shad, river herring and eels (see PFP).

4. Statutory Authority

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

the Commission shall require the construction, maintenance and operation by a licensee at its own expense of...such fishways as may be prescribed by the Secretary of Commerce or the Secretary of 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 Fishways 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 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

The Department, through the Service, has been actively involved in the evaluation of fish and wildlife issues at the project since before the current license was issued in 1980. In 1979, the Service's Regional Engineering Office fishway engineer developed conceptual designs for future fish passage facilities at the project developments. Involvement in the project continued through the 1980s with negotiations and planning for fishway construction at Amoskeag in 1988. Subsequent to fishway construction, the Service continued consultation with PSNH on studies of and implementation of upstream and downstream passage measures at the project developments through the start of the current relicensing proceeding. The Department, through both the Service and the National Park Service, has been involved in all aspects of the current licensing proceeding since its commencement in 2001.

5.1 Initial Consultation Document

The Service provided comments on PSNH's Initial Consultation Document (ICD) by letter dated March 15, 2002. Those comments noted the impacts to fishery resources related to incomplete and untested fish passage facilities, project operation regime and diversion of flows from bypassed reaches, and recommended studies to assess adverse effects and develop mitigation. Fishway issues identified in the ICD included:

- Impacts of project-induced flow fluctuations on upstream movements and passage by American shad
- Need to evaluate the effectiveness of the Amoskeag fish ladder
- Need for upstream passage of American eel
- Need to address resident fish passage
- Need for future upstream fishways at Hooksett and Garvins Falls Dams
- Completion of salmon smolt downstream passage evaluations
- Downstream bypass evaluations for shad, river herring and American eel

The ICD comments also indicated the likelihood that the Service would, through the Department, prescribe fishways for the project pursuant to Section 18 of the Federal Power Act.

5.2 Draft License Application

The Service's comments on the draft license application (DLA), dated November 12, 2003, again indicated that a Fishway Prescription for the project would likely be issued by the Service. The DLA comments discussed many of the same issues identified in the ICD comments, noting that future upstream fishways at Hooksett and Garvins Falls, plans to evaluate upstream passage for

anadromous species and eels at Amoskeag, and downstream passage evaluations needed to be addressed in the final license application.

The DLA comments noted that the proposed conversion of the project to run-of-river operations would resolve the issue of the impacts that flow fluctuations have on fish migration and passage.

5.3 Additional Information Requests

On February 26, 2004, the Service provided comments in response to the Commission's Notice of Application Tendered for Filing with the Commission, Soliciting Additional Study Requests and Establishing a Schedule for Relicensing and a Deadline for Submission of Final Amendments. In that filing, the Service identified the need for PSNH to complete ongoing downstream passage evaluations and identified the need for PSNH to develop conceptual design drawings for eelways and future fishways at Hooksett and Garvins Falls.

5.4 Commission Notice of Applications Ready for Environmental Analysis

In its May 13, 2005 comments on the Commission's March 17, 2005 Notice of Applications REA and Soliciting Comments, Recommendations, Terms and Conditions, and Prescriptions, the Department reviewed project impacts and submitted the Service's Section 10(j) recommendations for the protection, mitigation of damages to, and enhancement of fish and wildlife resources.

The Department's May 13, 2005 comments also included the PFP. This document was prepared consistent with the Department's MCRP, and provided justification for fishways at the project, based on existing and developing plans for fish restoration. The PFP also provided estimates of design populations based on available information, a preliminary description of the types of facilities and project operations that would be needed for safe and effective fish passage at each of the project dams, and the triggers for installing upstream passage at Hooksett and Garvins Falls, based on the numbers of shad or herring passing the Amoskeag fishway. The PFP stated that future fishways would be designed in consultation with PSNH and other agencies and would be based on all available information at that time.

5.5 Applicant's Response to the Preliminary Fishway Prescription

By letter dated July 15, 2005, PSNH submitted comments on the Service's PFP in accordance with the existing MCRP rules that were in place at that time. In their comments, PSNH questioned the need for fishways at this time, the triggers for future fishway construction, the need to evaluate downstream fishways, the basis for the proposed rock-ramp fishway and cost-effectiveness of such a facility, and the timing of upstream eel migrations and downstream clupeid migrations.

5.6 Petition for TTH and submission of an AFP

PSNH filed a Petition for TTH and submitted an AFP on December 19, 2005. The Petition for a TTH raised questions similar to those in the July 15, 2005 comments on the PFP regarding the development of the Service's PFP. The AFP included PSNH's proposed alternative provisions to those in the PFP.

On August 25, 2006, PSNH and the Service signed an SA that resolved disputes regarding the provisions of the prescription. The SA includes language to be included in this Modified Fishway Prescription. In light of the SA on the fishway provisions, PSNH submitted a Motion for dismissal of their Petition for TTH and withdrew its AFP on August 28, 2006.

6. Administrative Record

Evidence to support the Department's Prescription for Fishways is contained in the Administrative Record before the Commission, filed on July 12, 2006.

7. Alternatives Considered

In the formulation of this Prescription, the Department has reviewed and considered a variety of alternative fish passage options, including the alternatives proposed in the Commission's DEIS and in comments provided by the applicant.

- a. PSNH (applicant): PSNH proposed an AFP. However, the SA between PSNH and the Service resolves the terms of this Prescription and the AFP has been withdrawn.
- b. Commission Environmental Assessment: The Commission's EA recommends a number of fishways, but does not adopt what the Department provided in its PFP.

Regarding new upstream passage facilities at Hooksett and Garvins Falls, the EA endorses the benefit that these fishways would provide in the future. The EA also generally supports the technical soundness of the proposed rock-ramp fishway at Hooksett and fish lift and Denil fishway at Garvins Falls, and acknowledges that the Department would, in the future, rely on the best available data to determine the best fishway to be installed at these dams in the future. The EA does not, however, support the proposed triggers for construction of these fishways based on the numbers of fish passed at Amoskeag, or the construction schedule for such facilities once the trigger number is reached. Instead, the EA supports the higher 1986 Comprehensive Fish Passage Plan shad trigger number and more extended construction schedules.

Regarding downstream passage effectiveness testing for shad and herring, the EA endorses the need for such evaluations, but states that such studies should not be done with test fish collected outside the project area.

Regarding eel passage, the EA endorses the need for installing upstream eelways and the benefit of evaluating eel downstream passage at the existing downstream passage facilities at each dam.

Notwithstanding the endorsements in principle of the major components of the PFP, the EA concludes by questioning why the Department did not just request a reservation of authority to prescribe fishways in the future.

- Discussion: The Commission staff's EA addresses the fish passage issues raised by the Department, and on some issues agrees with the proposals in the PFP. Regarding the installation of future upstream fishways and evaluation of existing downstream fishways for anadromous fish, however, the EA suggests that the Department should reserve authority to prescribe fishways in the future. If this alternative were adopted, no specific designs or specific schedules or triggers for passage implementation would be mandated, leaving these issues to be raised in a future proceeding.

This Prescription includes triggers for installing upstream passage for anadromous fish at Hooksett and Garvins Falls, based on the numbers of shad and/or river herring that pass the next downstream facility. These triggers are based on production capacity of habitat in each river reach in the project area. It is uncertain when the prescribed triggers will be reached, but populations should increase given the substantial available habitat (USFWS 1982), stocking upstream habitat with shad and herring as part of the restoration program (USFWS 1995), and ongoing efforts to improve passage at the Lowell Project.

Given that passage numbers above Amoskeag have been limited to date and have not reached the proposed trigger numbers, upstream fishways for anadromous fish would not be immediately required under the terms in the PFP. Prescribed designs, while justifiable given the state of knowledge on fishways at this time, could change in the future. If so, the Prescription includes provisions to make design changes as appropriate.

However, these facts do not outweigh the benefits of having specific designs identified or a definitive trigger for fishway construction which would expedite fishway construction when needed without further Fishway Prescription proceedings.

Under the provisions of the PFP, PSNH will be required to file downstream passage evaluation plans and schedules. As such, the downstream passage evaluations would not necessarily be implemented now. However, we cannot concur with the EA that the evaluation of these facilities requires there to be "enough naturally occurring clupeids" in the river. This conclusion appears to be based on the misconception that previous attempts at clupeid downstream passage evaluations were unsuccessful because the test fish used in the study were collected elsewhere and transported to the test site. This is not correct. While collections of clupeids from other locations and transportation to a test site can be time consuming and the numbers collected can be uncertain, the listed studies did not fail for these reasons. The Amoskeag evaluation failed

because the recapture net device was improperly designed to handle the flow and debris load encountered at the site. Similarly, the Garvins Falls evaluation was inconclusive due to heavy debris load in the recapture net and along the canal louver array.

Since the restoration of shad and herring into the Merrimack utilizes transfers of these species from downstream or from other river systems to areas upstream from the project, evaluation of downstream passage is needed for these fish, and such stocking programs can provide and have provided enough fish for evaluations in the past.

Given the need to evaluate clupeid downstream passage and benefits of requiring definitive upstream fishway designs and schedules in the license, the Department did not select the Commission staff's alternative for fish passage at the Merrimack River Project as described in the EA.

c. Preliminary Fishway Prescription Alternative: The PFP provided general fishway terms, including operations schedules, and specific designs and schedules for upstream fishway construction for anadromous fish, schedules for upstream eel fishway construction, and requirements for evaluation of existing downstream fishways and existing and new upstream fishways. Based on review of available information, comments from PSNH in their July 15, 2005 letter, their petition for TTH and their AFP, and discussions and negotiations on the SA, we agreed to modifications to the PFP. These modifications include changing the requirement for a rock-ramp fishway to a Denil fishway at Hooksett, flexibility in fishway design at Garvins Falls, scheduling of the construction of eelways, and flexibility in scheduling of fishway evaluations.

d. Department's Proposed Alternative: The Department considered the various alternatives described above in formulating its Prescription for Fishways for the Merrimack River Project. A "No Action" alternative, representing no improvements in fish passage at any of the five projects also was considered. The "No Action" alternative was dismissed from further analysis because it would not help accomplish fish restoration goals identified by the resource agencies, as described in this Prescription.

The basis for the Department's Prescription for Fishways is: (a) the need for evaluation of existing downstream fishways ; and (b) the need to implement upstream eelways at each of the three project dams, in a sequential manner, giving time to evaluate ideal eel fishway location before final facilities are built; (c)) the need for specified fishway designs; and (d) the need for a definitive schedule or trigger for future upstream passage implementation at Hooksett and Garvins Falls.

The Department's Prescription for Fishways is based on the SA signed between the Service and PSNH which includes changes from our PFP. The most significant changes were to the prescribed upstream fishway designs at Hooksett and Garvins Falls. For Hooksett, the PFP included a provision for installing a rock-ramp fishway based on the ability of such a fishway to operate at various pond levels and utilize varying spill amounts in its design, pass large numbers of fish, and our analysis that such a fishway would be less expensive to construct than a Denil

fishway, another alternative we considered. PSNH was concerned that a rock-ramp fishway was experimental and would, in fact, cost more than a Denil fishway. Since Denil fishways have successfully passed large numbers of clupeids at other projects, we can accept this design in lieu of the rock-ramp. The Prescription was, therefore, modified to require a Denil fishway.

At Garvins Falls, the PFP included a provision for simultaneous construction of a fish lift at the tailrace and a Denil ladder at the spillway. PSNH proposed instead that a preliminary study could determine the best location for a fishway and that it may be possible to manipulate project operations to assure that fish find a single fishway. This alternative is reasonable and would still assure that an effective fishway is constructed in a timely manner. The Reservation of Authority will permit future construction of a second fishway if the capacity or effectiveness of the constructed fishway proves to be inadequate.

Other changes from the PFP relate to eel fishway construction timing. The Service and PSNH jointly reviewed the timing of preliminary eel investigations, interim eelway installation, interim eelway evaluations, permanent eelway designing and permanent eelway construction. This analysis led to the definitive schedule for interim and permanent eelway installation in this Prescription versus an unspecified implementation schedule in the PFP.

8. Response to Public Comments

Other than the comments submitted by PSNH dated July 15, 2005 and the AFP discussed above, the Department has received no comments on its PFP.

9. Reservation of Authority to Prescribe Fishways

In order to allow for the timely implementation of fishways, including effectiveness measures, the Department requests that the Commission include the following condition in any license(s) it may issue for the Merrimack River Project:

Authority is hereby reserved to the Commission to require the licensee to construct, operate, and maintain such fishways as may be prescribed during the term of this license by the Secretary of the Interior pursuant to Section 18 of the Federal Power Act.

10. Prescription for Fishways

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

10.1 General Prescriptions for the Merrimack River Projects

To ensure the immediate and timely contribution of the fishways to the ongoing and planned anadromous and catadromous fish restoration and enhancement program in the Merrimack River, the following 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 (Pub. L. 102-486, Title XVII, 106 Stat. 3008), and the Energy Policy Act of 2005 (Pub. L. 109-58)

a. Fishways shall be constructed, operated, and maintained to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife and American eels at the licensee's expense.

b. Design populations

The total number of returning fish reaching the project during the term of the new license will depend on a number of factors, including overall stock recruitment of fish populations undergoing restoration. Overall fishway efficiency and cumulative losses of fish attempting to use upstream and downstream fish passage facilities also will affect the total potential restored run of shad, river herring, salmon and eels.

(1) Shad and river herring:

The Merrimack River Basin includes over 430,000 100 yard units of habitat for American shad (USFWS 1982) or about 9,000 acres of habitat. This habitat has the potential to support a shad population approaching 1 million shad and 2.5 million river herring. Of this, 44% of the habitat is upstream from the project, yielding substantial returns of fish upstream from the project. However, reaching this population size would depend on at sea conditions for growth and survival, ocean harvest, effective fish passage facilities at all dams and normal river flows during the passage season.

As restoration potential is realized, passage facilities at project dams would need to pass substantial numbers of fish. However, a more immediate need is to provide shad and herring access to currently unavailable habitat. Therefore, while the prescribed facilities will pass significant numbers of shad and herring, expansion of these facilities may be needed in the future if prescribed facilities cannot pass all returning fish as full restoration potential is realized.

(2) Atlantic salmon:

Adult Atlantic salmon returning to the Merrimack River are all trapped at the Lawrence Dam fishway and either transported to the Nashua National Fish Hatchery for spawning and egg collection or are transported to the Pemigewasset River for natural spawning. Therefore, only in very rare instances are adult salmon expected to reach the project dams. Regardless, even if salmon were permitted to freely migrate upstream, runs of salmon will not be large enough to affect the design of fishways at any of the project dams. The more numerous species (shad and

river herring) typically determine the kind of fish passage that should be built at a hydroelectric project.

(3) American eel:

American eels are currently present in the area occupied by the three project developments, although problems with upstream migration past the downstream dams and the lack of upstream passage at the project dams restrict the numbers of eels in the project area or areas upstream from the project. While the Department does not have a precise estimate of the numbers of eels that would be expected to use fish passage at the project developments, upstream and downstream passage would enhance the eel stocks and help achieve overall management goals. In addition, upstream passage needs for eels differ from those of salmon, shad, and river herring. Separate upstream eel fishways typically are installed at barriers in addition to those that are provided for anadromous fish.

(4) Other species:

Fish passage facilities provided at the project dams would also be used by white sucker, trout, and other riverine species. The numbers of riverine fish using the fishways are, however, likely to be small, relative to anadromous and catadromous species.

c. Upstream fishways at Amoskeag shall be operational during the designated migration period at river flows up to 19,400 cfs as measured at the USGS gage at Goffs Falls (#01092000). Fishways at Hooksett and Garvins Falls shall be operational at river flows of up to 19,000 and 17,000 cfs respectively, based on the Goffs Falls gage prorated as appropriate for drainage area differences between the gage location and these dams. Downstream fishways shall be operated during the designated migration periods whenever turbines are operated at the three project developments.

d. Scheduling

The timing of installation of upstream fish passage at Hooksett and Garvins Falls will be based upon the growth of migratory and riverine fish populations in the Merrimack River. American eels are currently present in the river, and would benefit from the immediate implementation of safe, timely, and effective upstream and downstream eel fishways. The Commission's EA also recommends permanent upstream eel fishways at all three developments.

A fishway must be installed at Hooksett Dam within three years after 9,500 shad or 22,500 river herring pass Amoskeag. A fishway at Garvins Falls must be installed within three years after passage of 9,800 shad or 23,200 river herring at Hooksett Dam, or passage of 19,300 shad or 45,800 herring at Amoskeag Dam if the Hooksett fishway design does not permit counting of

fish.

Installation of eelways now at all three dams would be a benefit to the species. However, proper eelway construction at the Amoskeag spillway and at Garvins Falls will require some initial study to assess proper eelway location. At all three dams, assessment of eelway location and design using interim eelways will also be needed prior to permanent eelway installation. Interim eelways shall be fully operational at Hooksett during the second spring/summer period after licensing, and at the Amoskeag spillway and at Garvins Falls within three spring/summer periods after license issuance. Following assessment and design, permanent eelways shall be installed and operational by the spring/summer of 2012.

e. The timely installation of the prescribed fishway structures, facilities, or devices is a measure directly related to those 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 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 American shad, river herring, American eel and white sucker:

Upstream passage:	April 1 to July 15	All species except American eel
	April 1 to Nov. 15	American eel
Downstream passage:	April 1 to June 15	Atlantic salmon
	June 1 to July 15	Spent adults of all species
	Sept. 15 to Nov. 15	Adult eel; juvenile shad & herring

Upon mutual agreement, the Licensee and the Service may modify the above schedules in the event that upstream or downstream passage of fish has not yet begun, migration has substantially declined, or operating conditions (i.e. high flows, drought) or other conditions make continued operation of the fishways unnecessary or inappropriate under the circumstances. If monitoring

indicates that these dates should be permanently adjusted, the Service shall use its reservation of authority to modify the operating schedule.

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.

h. Evaluation of Fish Passage Facilities

The licensee shall develop plans for and conduct fishway effectiveness evaluations on all prescribed fish passage, in consultation with the Service and other fishery agencies. For each fishway to be constructed, the plans for fishway effectiveness evaluations shall be submitted to the Service for final review and approval simultaneously with the construction plans and schedule for each fishway. Each plan shall include proposed evaluation methods, and schedules for conducting the study and providing the results to the Service and the Commission. If the Service and the licensee cannot agree on the evaluation plan, the licensee shall submit the proposed plan to the Commission for approval, including all comments received from the Service.

i. The licensee shall provide personnel of the 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 the Service, all functional and final design plans, construction schedules, and any hydraulic model studies for the fishways or modifications to existing fishways described herein.

10.2 Specific Prescriptions for the Merrimack River Projects

10.2.1 Amoskeag

a. The licensee shall operate the existing tailrace pool-and-weir fish ladder according to the upstream passage operation schedule (Section 10.1 f).

Justification - Fish passage facilities must be operated throughout the period that target species of anadromous, catadromous and resident fish are migrating. The specified operation dates are intended to encompass the full extent of the passage seasons for respective fish species and life stages and are based on known information regarding run timing on the Merrimack and other New England rivers. The identified operation dates are consistent with the operation dates of the downstream Lawrence (FERC Project No. 2800) and Lowell (FERC Project No. 2790)

hydroelectric projects. As noted in Section 10.1 f, exact operation dates in any given year can be adjusted depending on the timing of fish migrations in that year.

b. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule (Section 10.1 f).

Justification - See Section 10.2.1, prescription item a above.

c. The licensee shall evaluate the effectiveness of the existing upstream tailrace fishway in passing American shad and river herring that reach the project. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation between the licensee and the Service, any modifications to the fishways or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications to the fishways or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The tailrace pool-and-weir fishway was completed in 1988 and has operated each year since then. Over those years, relatively few American shad have successfully passed the fishway and river herring passage has varied widely. For both species, the number of fish that could reach Amoskeag varies year to year and is based on the numbers of returning adults to the river and the success these fish have in passing the Lawrence and Lowell fishways downstream. However, the effectiveness of the Amoskeag tailrace fishway in passing those fish trying to move upstream is unknown. Preliminary evaluation of the facility in 2002 and 2003 suggests that the fishway is not passing all shad attempting to migrate upstream. A complete evaluation of the fishway is needed to assure its effective in passing fish or to identify measures to improve effectiveness. Plans for such an evaluation and a schedule for its completion are needed.

d. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed

methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Amoskeag is a 10-foot-wide modified crest gate located on the west end of the spillway adjacent to the powerhouse intakes. Based on evaluations done in 2001 and 2004, this facility has proven to be reasonably effective in bypassing downstream migrating Atlantic salmon smolts at a gate discharge of 125 cfs and with the hydro units dispatched such that Unit 3 (closest to bypass) is the first-on/last-off unit and Unit 1 (far end of the powerhouse) is the last-on/first-off unit. A study in 2003 attempted to evaluate the effectiveness of this facility in passing juvenile clupeids (shad and river herring), but results were inconclusive. The effectiveness of the fishway in passing American eels has not been evaluated.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary habitat upstream from Amoskeag as part of fish restoration activities must also pass Amoskeag. The existing fish bypass, therefore, must be evaluated to assure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids and/or to identify measures that could be implemented to improve passage success.

e. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim spillway eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishways (i.e., the existing tailrace facility and the new spillway facility). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway during late spring, summer and fall periods when the pool and weir fishway is not in operation.

This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

f. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation of the permanent eel fishway(s) by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.

10.2.2 Hooksett

- a. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule. (Section 10.1 f)

Justification - See Section 10.2.1, prescription item a above.

- b. The license shall install upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. Within one (1) year after passage of the trigger number of fish at Amoskeag, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The permanent upstream passage facilities shall consist of (1) a 4-foot-wide Denil fishway on the west side of the project spillway, including a counting facility and measures for the provision of the necessary attraction water; or (2) an alternative design approved by the Service.

Justification - The fishery agencies' plans for restoring runs of American shad and river herring require upstream passage facilities at the Hooksett development in the future. River herring and, to a lesser extent shad, have passed the Amoskeag fish ladder in some years. Although there have been sightings of herring ascending the western side of the Hooksett spillway during years of very high herring passage at Amoskeag, successful passage is likely to occur only under very specific river flow and spill conditions. Even if some herring may pass under these conditions, the efficiency of passage is likely poor. In addition, we do not expect that shad can similarly ascend this dam at all without installation of a fishway or substantial channel and spillway modifications.

The construction of such a fishway is not warranted at this time, as in recent years, passage of herring and shad at the downstream Lawrence and Lowell Dams have been low, and subsequently few fish were counted passing Amoskeag. However, when passage numbers upstream from Amoskeag increase, construction will be warranted. To establish a criteria or trigger for such construction, we calculated the production capacity of the Amoskeag impoundment using formulas used by the Connecticut Department of Environmental Protection and the Maine Department of Marine Resources (MDMR). As described in the PFP, we selected the use of the MDMR formula given the proximity of the Merrimack to Maine rivers.

We calculated that the Amoskeag impoundment could support the production of shad and river herring that would produce a run of 47,500 shad and/or 112,800 river herring. We based our passage construction trigger on the MDMR criteria that passage at the next upstream dam be based on passage of 20% of the carrying capacity of the downstream impoundment. This criteria

permits expansion of the returning fish to substantially increased habitat in advance of intraspecific competition due to population density or reaching the carrying capacity.

As such, we have established triggers for constructing a fishway at Hooksett on passage of 9,500 or more shad or 22,500 or more river herring at Amoskeag. Construction would need to be undertaken and completed within three years after passage of the trigger number of fish. This time frame provides ample time for final designs, approval by the Service and the Commission, permitting and construction.

A standard full-size Denil fish ladder that includes provisions for operation and attraction flow discharges would meet agency objectives for safe, timely, and effective passage of anadromous fish at Hooksett. A standard Denil fishway is expected to be able to pass up to 25,000 shad or 250,000 river herring, based on the Service fishway sizing criteria,¹¹ though more or fewer fish could pass the facility depending upon run timing and duration. If the capacity of this fishway is exceeded, additional passage measures can be prescribed at that time using the Reservation of Authority.

Some of the upstream migrating fish may be attracted to discharge from the project powerhouse. Therefore, the fishway design may need to include a tailrace exclusions screen to guide fish past the powerhouse to the spillway to permit access to the fishway entrance.

c. Within nine (9) months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway at Amoskeag during late spring, summer and fall periods when the pool and weir fishway is not in operation. This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

¹¹ U.S. Fish and Wildlife Service. 1986-2002. Fish Passage Facilities Design, Siting and Sizing Criteria and Standards Used in the Northeast. Northeast Region, Hadley, MA.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

d. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.

e. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Hooksett consists of a 2.5-foot-wide modified ice and trash sluice that passes a minimum of two feet of spill over the bypass gate (approximately 20 cfs discharge), located on the east side of the project spillway adjacent to the powerhouse. Based on evaluations done in 2005, all released salmon smolts passed the dam in spill. The project is generally undersized for spring flows and spills flow frequently and at substantial volume during the smolt downstream passage season. This is the likely route for

emigrating salmon smolts. PSNH is compiling data on the history of spill and river flow to verify that spill will effectively protect emigrating smolts. The effectiveness of this facility in passing juvenile clupeids (shad and river herring) or outmigrating mature American eels, however, has not been evaluated and passage of these species comes during lower flow periods.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary habitat upstream from Hooksett as part of fish restoration activities must safely pass Hooksett Dam. In addition, it is possible that limited numbers of river herring may be able to traverse Hooksett Dam via the west-side spillway under certain flow conditions. The progeny of these fish would also need safe downstream passage. The existing fish bypass, therefore, must be evaluated to assure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids or to identify measures that could be implemented to improve passage success.

10.2.3 Garvins Falls

a. The licensee shall operate the existing downstream fish bypass facility according to the

passage operation schedule (Section 10.1 f).

Justification - See Section 10.2.1, prescription item a above.

b. The license shall install upstream passage facilities at the Garvins Falls Dam for anadromous fish, to be operational within three years after the trigger number of fish is reached. The trigger number shall be:

- (1) passage of either 9,800 American shad or 23,200 river herring at the Hooksett development;
- (2) if fish passage has been constructed at the Hooksett Development without a fish counting facility, passage of either 19,300 American shad or 45,800 river herring at the Amoskeag Development.

Within one (1) year after passage of the trigger number of fish, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The upstream fishway at the Garvins Falls development shall consist of either (1) an upstream fish lift located adjacent to the discharge of the older, river-side powerhouse, with an exit flume to convey fish to the headpond as depicted in Conceptual Design Drawings 19 through 24; or (2) an alternative design and/or location approved by the Service.

Justification - The fishery agencies' plans for restoring runs of American shad and river herring require upstream passage facilities at the Garvin Falls development in the future. As noted for Hooksett above, the fishway construction trigger for Garvins Falls is based on the production capacity of the Hooksett impoundment and the number of shad or herring passing the Hooksett fishway.

The prescribed design of a Denil fishway at Hooksett would permit counting of shad and herring passing the facility. However, alternative designs for a fishway at Hooksett could include a rock-ramp fishway. This more natural fishway design does not permit fish enumeration. If this were to be the approved and installed facility, the construction of an upstream fishway at Garvins Falls would be triggered based on passage counts at Amoskeag.

We calculated that the Hooksett impoundment could support the production of shad and river herring that would produce a run of 48,500 shad and/or 116,100 river herring. Using MDMR criteria, fishway construction at Garvins Falls will be required when 9,800 or more shad or 23,200 or more river herring pass Hooksett. If counting fish is not possible at the Hooksett fishway, the construction trigger would be 19,300 American shad or 45,800 river herring passing Amoskeag. Construction would need to be undertaken and completed within three years after

passage of the trigger number of fish. This time frame provides ample time for designs, approval by the Service and the Commission, permitting and construction.

Given site configuration, fishways may be needed at the tailrace and/or spillway. Attraction of shad and herring to the tailrace is most likely and would likely provide more consistent attraction to fish. Given site constraints, a fish lift would be the most effective fishway design for Garvins Falls, and design drawings of such a facility have been prescribed and attached herein for such a facility. The licensee may propose any other alternatives for Service approval, should alternative and equally effective designs become available between license issuance and construction.

Upstream habitat is estimated to support future populations of over 200,000 shad and over 500,000 river herring. The estimated maximum capacity of the prescribed lift is 6,000 shad per hour or 5,000 shad and 80,000 river herring per hour (or an equivalent biomass involving both species). If the capacity of this fishway is exceeded, or if, upon evaluation of the installed fishway, it is determined that additional fishways are required, additional passage measures can be prescribed at that time using the Reservation of Authority.

c. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Garvins Falls consists of a 240-foot-long louver array in the project power canal, a fish collections chute, and fishway plunge pool and a conveyance sluice to the river. Based on evaluations done in 2000, this facility has proven to be reasonably effective in bypassing downstream migrating Atlantic salmon smolts. A study in 2003 attempted to evaluate the effectiveness of this facility in passing juvenile clupeids (shad and river herring), but results were inconclusive. The facility has not been evaluated with outmigrating mature American eels.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary

habitat upstream from Garvins Falls as part of fish restoration activities must safely pass Hooksett Dam. The existing fish bypass, therefore, must be evaluated to ensure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids or to identify measures that could be implemented to improve passage success. A plan for this evaluation and a schedule for completing this study is needed.

d. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim eel fishway(s) and a schedule for installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway at Amoskeag during late spring, summer and fall periods when the pool and weir fishway is not in operation. This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

e. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway

evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.



United States Department of the Interior

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REF: FERC No. 1893
Eversource Energy
Merrimack River
Upstream Passage at Hooksett Development

January 19, 2017

Mr. Michael Hitchko
Hydro Manager
Eversource Energy
780 North Commercial Street
Manchester, NH 03101-1134

Dear Mr. Hitchko:

This letter is in regards to the need to implement upstream fish passage measures at the Hooksett Dam development of the Merrimack River Project, FERC No. 1893 (Project), located on the Merrimack River in New Hampshire. Implementation of upstream passage at Hooksett is governed under the terms of an August 25, 2006 settlement agreement between Public Service of New Hampshire (PSNH, now Eversource) and the Department of the Interior's (Department) Prescription for Fishways. The trigger for upstream passage implementation at Hooksett is based on the passage of American shad (*Alosa sapidissima*) and/or river herring (collectively refers to alewife [*Alosa pseudoharengus*] and blueback herring [*Alosa aestivalis*]) at the Project's Amoskeag Dam development.

Background

As part of the relicensing of the Merrimack River Project, on August 25, 2006, the U.S. Fish and Wildlife Service (Service) and PSNH signed a settlement agreement to resolve disputes over fish passage measures at the Project. On December 20, 2006, the Department issued a Modified Prescription for Fishways consistent with the terms of the settlement that codified the provisions of the settlement agreement. The Prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett development, to be operational within 3 years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development.

Fish Returns in 2016

River herring returns to the Merrimack increased dramatically between 2011 and 2016 in response to a herring stocking program implemented by the Service and the New Hampshire Fish and Game Department (NHFGD). Returns to the River based on counts at the Lawrence Project (FERC No. 2800) fishway (first dam on the Merrimack River) increased from 740 in 2011 to 128,692 in 2015. In 2016, 417,240 river herring were counted at the Lawrence Project. Despite less than ideal passage conditions at the Lowell Project (FERC No. 2790) fishways and incomplete counts at the project's spillway fish ladder, 142,087 river herring were counted passing the Lowell Project in 2016.

Fish passage at the Amoskeag fishway is monitored using video recording of the counting window that is retained for later review and fish enumeration. There are no on-site fish counters or real time review of passage data. However, due to the large number of herring utilizing the fish ladder in 2016, NHFGD and the Service used the fish collection, trapping and trucking facilities at Amoskeag to transport river herring to upstream Merrimack River and tributary habitat as part of the program to restore river herring to the Merrimack River Basin. The agencies transported 20,340 river herring, which was only a portion of the total herring observed in the ladder. With the transport total reaching very close to the trigger numbers for requiring passage implementation at Hooksett, efforts were made to review a portion of the counting window video footage to verify that the passage trigger was reached. Counts were made by reviewing 5-minute subsample periods for each hour of video on 6 days when no trapping occurred (May 13, 14, 15, 20, 24, 31) during the peak trapping period. When these counts were expanded to full daily counts, a total of 19,236 herring were estimated to have passed the Amoskeag project fishway during those 6 days. Adding counts from those 6 days to the trucking total of 20,340 yields a minimum total of 39,576 herring passing Amoskeag in 2016. This does not account for herrings passed before and after trapping was undertaken. These data clearly demonstrate that the 22,500 herring trigger was attained by late May 2016.

Next Steps

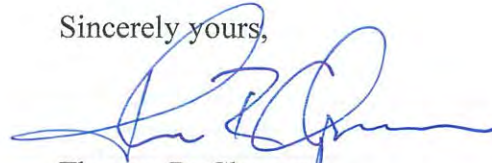
Pursuant to the Prescription of Fishways, implementation of upstream passage facilities at Hooksett for anadromous fish is required, given the number of river herring that passed the Amoskeag fishway in 2016. The Service and personnel from other fisheries agencies met on July 14, 2016 to discuss the incomplete Amoskeag passage counts and the potential that the passage trigger for Hooksett had been reached. Eversource subsequently contracted to have an Upstream Fish Passage Feasibility Study completed, which was distributed to the Service and other agencies on November 4, 2016. A meeting is scheduled for January 18, 2017 to discuss this report and upstream fish passage designs for Hooksett. Subsequent to this meeting, Eversource will be finalizing passage facility designs and a construction schedule in consultation with the Service.

Mr. Michael Hitchko
January 19, 2017

3

We thank Eversource for their proactive work on Hooksett passage planning and look forward to working collaboratively towards the design and construction of the facilities by 2019 (3 years after reaching the passage trigger). If you have any questions, please contact Mr. John Warner of this office at 603-223-2541, extension 6420.

Sincerely yours,

A handwritten signature in blue ink, appearing to read 'T. Chapman', with a stylized flourish extending to the right.

Thomas R. Chapman
Supervisor
New England Field Office

Mr. Michael Hitchko
January 19, 2017

4

cc: Eversource – William Smagula, VP Generation
Eversource Energy
780 North Commercial Street
Manchester, NH 03101-1134
Eversource – Curt Mooney
Eversource Energy
59 Ayers Island Road
Bristol, NH 03222
FERC Secretary
FWS/Merrimack River Coordinator - Joe McKeon, Mike Bailey (via email)
FWS-RO/Fisheries Engineering – Bryan Sojkowski (via email)
NHDES – Greg Comstock (via email)
NHFGD – Carol Henderson, Matt Carpenter (via email)
NMFS – Bill McDavitt (via email)
NMFS – Bjorn Lake (via email)
MDFW – Caleb Slater (via email)
MDMF – Ben Gahagen (via email)
Reading file
ES: JWarner:1-19-17:603-223-2541

EVERSOURCE
HOOKSETT UPSTREAM FISH PASSAGE EVALUATION
Agency Meeting
January 18, 2017. 1:00 pm to 3:30 pm
Amoskeag Hydro Office
February 17, 2017

Attendee	Affiliation	Email
Carla Stauber	Gomez and Sullivan	cstauber@gomezandsullivan.com
Dave Robinson	Gomez and Sullivan	daverobinson111@yahoo.com
Curt Mooney	Eversource	curtis.mooney@eversource.com
William Smagula	Eversource	William.smagula@eversource.com
Steve Robinson	Eversource	steve.robinson@eversource.com
Brent Sowle	Eversource	brent.sowle@eversource.com
Michael Hitchko	Eversource	michael.hitchko@eversource.com
Rick Simmons	Normandeau	rsimmons@normandeau.com
Matt Carpenter	NHFG	Matthew.A.Carpenter@wildlife.nh.gov
Bryan Sojkowski	USFWS	bryan_sojkowski@fws.gov
Michael Bailey	USFWS	Michael_Bailey@fws.gov
Joe McKeon	USFWS	Joe_McKeon@fws.gov
Attendees on Call		
John Warner	USFWS	john_warner@fws.gov
Julianne Rosset	USFWS	Julianne_Rosset@fws.gov

Introductions

Curt Mooney introduced the team and the reason for the meeting.

Trigger Number

Bill Smagula noted that a letter was just received the morning before the January 18, 2017, which indicated that the trigger number was met at Amoskeag; however, it was not an official signed letter. He requested a signed letter that specifically states that the trigger has been met.

Rick Simmons asked Mike Bailey what methodology was used for counting the fish. Mike explained that they reviewed 5-minute subsample periods for each hour of video during a time where there was no trapping. Rick questioned the method used and suggested that in future years a more robust and accurate method be utilized.

Upstream Fish Passage Evaluation Report

Carla Stauber presented the report and discussed the details of each section. She then handed out conceptual design drawings for a Denil fishway.

Bryan Sojkowski made the following initial comments:

- The USFWS attraction flow criteria of 3% of the hydro capacity does not hold for Hooksett, as the hydro capacity is far less than the river flow during fish passage season. USFWS would refer to NOAA guidelines, which states that attraction flows of 5% to 10% of the high fish passage design flow (high flow = 19,000 cfs) would be required. This attraction flow would be 950 cfs (5%) to 1900 cfs (10%).
 - Bryan later clarified in a comment dated **February 3, 2017** the following: *“the USFWS criteria for upstream passage attraction flow of 3-5% (now a minimum of 5% within the upcoming 2017 criteria) is grounded on the fact that a typical hydro facility is sized around the 30% exceedance flow, meaning for most of the time the unit discharge is the bulk of the far-field attraction flow (i.e., fish will most likely be attracted to the tailrace). Hooksett is sized for the 90% exceedance flow and therefore spillway flows will be the dominant attraction to fish. In cases like this, USFWS refers to NOAA guidelines to ensure that the fishway is capable of competing with the spillway flows.”*
- A Denil would not be sufficient to pass the future restored American shad and river herring populations listed in the restoration plan.
- A vertical slot would be a far better choice in order to accommodate the shad and herring population targets and account for the 3.5-foot headpond fluctuation. He said that a vertical slot will consistently put out the same flow (~35 to 50 cfs) whereas a Denil’s flow capacity decreases as the headpond level decreases.
 - Eversource inquired as to whether the April 1st start date for upstream fish passage specified in the License is really necessary, as fish aren’t seen passing the Amoskeag ladder until late April to early May. Joe McKeon concurred that a later starting date would be more appropriate.
 - The group agreed that a later starting date would lower the required “high design” operation flow of the fishway, thereby reducing the design headpond fluctuation. Joe told Carla to hold off on re-calculating the high design flow until he could verify what that revised start date would be.
- Denil’s require a lot of maintenance, and he would prefer building a fishway that didn’t require significant maintenance. Maintenance and adjustments to a west-side fishway would require access to the West side of the dam which is not easily accessible, making the additional maintenance activity needed for a Denil even more problematic.
 - Bryan later commented on **February 3, 2017** the following: *“Denils that have to operate within a headpond range greater than 2.0 ft (the typical design range) require more maintenance due to the fact that flow reducing baffles are required to ensure the Denil is not overwhelmed during higher flows.”*
 - Dave Robinson did not agree with Bryan that flow reducing baffles would be necessary, and stated that a Denil would not require significant maintenance at Hooksett.
- Significantly more data on bathymetry and tailwater levels are needed downstream of the dam to assess routes of passage to a fishways and understand flow fields.

Dave Robinson stated that maintenance on a Denil fishway would not be an issue, as Bryan had indicated. Dave also stated that the headpond fluctuation would not be an issue in operating the Denil, as long as flow control baffles/gates are installed at the upstream end. Bryan agreed that the Denil would require flow control baffles/gates but noted that they were not shown on the conceptual design provided at the meeting.

- Bryan later clarified in a comment dated **February 3, 2017** the following: *“As drawn, the Denil would have 7.1 ft of water within the fishway at the high design flow of 19,000 cfs which would completely overwhelm the fishway (e.g. create hydraulic conditions that would hinder upstream passage, especially for Alosines). There is an 8’ gate slot depicted within the exit channel but this would not be an appropriate way to control the flow within the Denil as it would create a hydraulic drop at the exit.”*
 - Dave Robinson later clarified that the 8-ft gate drawn on the conceptual design is to function as a fully open or fully closed gate – it is not meant to control flow.
- Bryan asked Dave if there were any example projects that had Denil fishways with high headpond fluctuations – Dave couldn’t think of any off the top of his head but would check.

Bryan pointed to the aerial photograph presented in the report (under the low flow condition) and expressed concern that all the flow was shown to be spilling over the dam, as compared to the tailrace. Eversource informed him that the hydro was not operating in that photo, and that normally under that flow condition the hydro would be operating.

Bryan indicated that even when the hydro is still operating, during fish passage season when the river flows are higher than the capacity of the unit, there is a lot of “false” attraction flow spilling over the spillway which could prevent fish from locating the entrance on the western side of the spillway. He also inquired if there was any consideration of fish entering the tailrace.

- Bryan cited this “false” attraction from water spilling over the dam as his basis for the 950 cfs attraction flow.
- USFWS asked if we had considered installing some sort of tailrace barrier.
- Steve Robinson suggested that lowering the flashboard height on the western spillway section could improve attraction to the fishway.
- John Warner suggested focusing the ZOP channel on river right (western side of bypass reach).
- USFWS is concerned that the flashboards are not typically installed until mid-May to June.

Action Items

1. USFWS to follow-up with Eversource on revised fish passage season start date (May 1 instead of April 1) and Eversource to provide flashboard installation history.
2. Eversource/G&S will further refine the tailwater and near dam bathymetry data
3. Gomez and Sullivan to meet internally with Eversource to discuss flashboard system, operational requirements and attraction flow.
4. Eversource and Gomez and Sullivan to host another meeting with Bryan Sojkowski to discuss hydraulics of Denil and attraction flow.
5. Eversource will develop and provide to the agencies revised passage plans including any needed channel modifications and before or after have another agency meeting to discuss alternatives



December 19, 2018

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Mr. Gregg Comstock
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive
Concord, NH 03302

RE: FERC Project No. 1893, Merrimack River Project
Annual status report regarding the design, construction, and anticipated completion date of fish passage facilities

Dear Ms. Bose and Mr. Comstock:

As outlined in section E-8 of the final New Hampshire Department of Environmental Services (NHDES) Water Quality Certification (WQC # 2003-006.1) dated May 10, 2005 and Federal Energy Regulatory Commission (FERC) License Article 401, Hull Street Energy Hydro NH AC, LLC ("HSE Hydro") is submitting the following fish passage facility annual status report for 2018.

Hooksett

The U.S. Department of the Interior, Fish and Wildlife Service fishway prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of **either 9,500 or more shad or 22,500 or more river herring** in any given year at the Amoskeag development. The trigger number for river herring was reached during the 2016 migration season. As such, former owner, Eversource, initiated consultation with state and federal agencies to begin preliminary design work. HSE continues to consult with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability.

A meeting was held on January 4, 2018 to review the Hooksett *Nature-like Fishway Cost Estimates Memo* prepared by Gomez and Sullivan Engineers (GSE), the engineering design consultant. A copy of the January 4, 2018 meeting minutes is included as Attachment 1. GSE reviewed several pros and cons for each of three nature-like concepts,

one developed by GSE, one recommended by the USFWS and one recommended by NOAA Fisheries. The review included an assessment of issues related to fish passage efficiency, site access, and operations and maintenance. All parties agreed additional information to be collected in the field was necessary to further evaluate the G&S concept NOAA concept. Action items generated from the meeting included:

- Eversource and GSE to prepare a schedule for data collection. This schedule and associated data collection items will be submitted to the agencies for comments and additions. Once all groups agree upon data collection content and schedule, Eversource and GSE will proceed with collection of the data.
- Following data collection, all groups will review the concept designs and schedule a meeting or conference call to discuss further.

A draft Hooksett Upstream Fish Passage Data Collection Plan was sent to the agencies on February 26, 2018 for review and comment. Comments were received from agency engineers via a Technical Memorandum on March 5, 2018 and incorporated into the final data collection plan. The Plan and associated correspondence is included in Attachment 2.

An update on the data collection effort was sent to the agencies on September 27, 2018. The update included:

- A description of why the bathymetry data had not been collected in August as planned due to high river flows and limited availability of equipment.
- The sale of Eversource Hydro Generation to Hull Street Energy had been completed on August 26, 2018.
- Proposed dates to meet with the agency engineers to discuss the raw data collected to date and 2D modeling parameters.

HSE Hydro held an Upstream Fish Passage Engineering Meeting on November 1, 2018 to discuss where the development of the upstream fish passage design concepts stands. This included a discussion of data collection to date and GSE's inability to collect the bathymetry data upstream of the western spillway due to high river flows and limited availability of equipment. The basic 2D modeling parameters were discussed, including model extents and mesh size. A copy of the November 1, 2018 meeting minutes is included as Attachment 3.

HSE Hydro distributed the updated Hooksett Fish Passage Schedule(s) memo on December 5, 2018 and is currently scheduling a meeting with the agencies to review the updated project timeline(s) and 2-dimensional flow modeling of the conceptual designs. A copy of this correspondence and attachments is included with this filing as Attachment 4.

Garvins Falls

The U.S. Department of the Interior, Fish and Wildlife Service fishway prescription requires the installation of upstream passage facilities for anadromous fish at the Garvins Falls Dam, to be operational within three years after passage of: (1) **either 9,800 American shad or 23,200 river herring** at the Hooksett development; (2) if fish passage has been constructed at the Hooksett Development without a fish counting facility, passage of **either 19,300 American shad or 45,800 river herring** at the Amoskeag Development. No activity specific to fish passage design at Garvins Falls was necessary in 2018.

HSE Hydro looks forward to continuing productive consultation with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability of a fish passage facility at Hooksett.

If you have any questions, please call Mr. Curtis R. Mooney at (603) 744-8855 Ext. 2 or cmooney@centralriverspower.com.

Sincerely,



Brent Sowle
Hydro Manager

Attachments

cc:

FWS/NEFO – Julianne Rosset (via email)
FWS/ – Mike Bailey (via email)
FWS-RO/ Fisheries Engineering – Bryan Sojkowski (via email)
NHFGD –Matt Carpenter (via email)
NOAA- Bjorn Lake (via email)

Attachment 1

Hooksett Upstream Fish Passage Consultation Meeting
Thursday, January 4, 2018
10:00 AM – 11:00 AM

Meeting Minutes

Attendees:

John Warner (USFWS)	Julianne Rosset (USFWS)
Bryan Sojkowski (USFWS)	Mike Bailey (USFWS)
Matt Carpenter (NHFGD)	Bjorn Lake (NOAA)
Bill Smagula (Eversource)	Curt Mooney (Eversource)
Brent Sowle (Eversource)	Steve Robinson (Eversource)
Mike Hitchko (Eversource)	Ryan McQueeney (Hull Street)
Tom Sullivan (G&S)	Ben Sawyer (G&S)

Notes:

- Due to a winter storm, many participants used the conference number to participate in the meeting. A PowerPoint presentation (attached) was tendered on Wednesday afternoon for participants to follow.
- Meeting began with a review of the Hooksett Nature-like fishway cost estimates memo submitted by Gomez and Sullivan to Eversource on November 11, 2017. The memo was subsequently shared with USFWS and NOAA on December 8, 2017.
 - The memo addressed action items 1, 2, and 4 from the October 2, 2017 meeting with revised cost estimates for the nature-like fishway concepts.
 - The memo also noted that a design flow of 800 cfs was assumed based on 5% of the 5% exceedance flow.
 - The nature-like concepts were assumed to be the current preferred design based on the cost estimates, biological capacity, and access and constructability concerns.
- Ben Sawyer reviewed several pros and cons for each nature-like concept noting in particular issues related to fish passage efficiency, site access, and operations and maintenance. Several comments were made in response to these items.
- Bryan Sojkowski noted that he had looked more into the details of the USFWS concept. The 15 foot weir spacing is too tight. Either the low flow notch would have to be widened to 40 feet or the weir spacing increased to 30 feet (similar to the G&S design).
- Bryan also discussed concerns with the entrance efficiency of the G&S concept. It was suggested that a barrier dam would be needed to prevent fish from following flow to the base of the spillway.
- John Warner noted that velocity barriers may also be an issue for the G&S design at certain flows. Entrance jet velocities and velocities over weirs should be checked against design

criteria for eels, shad and herring. Bryan referenced the West Enfield project where eels successfully navigate the weirs through velocities of 4-6 fps.

- Tom Sullivan suggested that the velocity calculations could be performed, though flaring the entrance may also have value for increasing entrance efficiency and controlling velocities.
- Bjorn Lake questioned the concern that a passively controlled roughened channel concept would not be able to maintain headpond level within the project license.
 - He referenced the Howland and Cape Fear projects which have not had issues with controlling headpond levels, as well as the York Haven project which is a hydroelectric project planned to have a nature-like fishway.
 - Bjorn performed rough calculations for the low flow notch in the NOAA design and estimated a flow of 85 cfs for 2 feet of water depth. He noted the Merrimack River has historically had more than 227 cfs.
 - Leakage through the flashboards and the gate would need to be reduced.
- Steve Robinson noted that precise headpond control is needed to meet the project's license requirements, and the ability to stop flow over the spillway is also needed for maintenance of the project.
- Curt Mooney also noted that with the NOAA concept there is risk of material moving during high flow events and removing such a large section of the existing dam is a risk.
- Bjorn noted that it is too early to say what issues the designs have and more information is needed. Matt Carpenter said that all groups should check for legitimate concerns before ruling on concept out.
- Some of the information noted by USFWS and NOAA that would help evaluate the concepts includes:
 - Bathymetry upstream of the west spillway
 - Tailwater levels at the proposed fishway entrance
 - Velocities through the proposed structures and tailrace
- John Warner said that both the G&S and NOAA nature-like concepts should be further investigated, and due to the information needed the fishway likely won't be constructed this year.
- Curt Mooney asked for verification that the 800 cfs maximum design flow is acceptable. Bjorn, Bryan, and John all agreed that this flow is acceptable.

Action Items:

1. Eversource and Gomez and Sullivan will prepare a schedule for data collection. This schedule and associated data collection items will be submitted to the agencies for comments and additions. Once all groups have agreed upon a data collection content and schedule, Eversource and Gomez and Sullivan will proceed with collection of the data.
2. Following data collection, all groups will review the concept designs and schedule a meeting or conference call to discuss.

Attachment 2

Hooksett Dam

Nature-like Fishway Concept Data Collection Plan

Merrimack River, Hooksett, NH



Prepared for:

EVERSOURCE

Prepared by:

 **GOMEZ AND SULLIVAN**
ENGINEERS

March 19, 2018

1.0 INTRODUCTION

Eversource contracted with Gomez and Sullivan Engineers (GSE) to evaluate upstream fish passage options for the western side of the Hooksett Dam spillway. Several potential fishways designs were evaluated in order to determine the most feasible design in terms of size, location, project operations, cost and constructability. Following the evaluation and several meetings with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), the options were narrowed down to two nature-like fishway concepts. Concept 1 involves a partial notch of the existing western spillway containing elements of a roughened channel with weirs. Concept 2 involves modification of the western spillway resulting in a roughened channel spanning the full western channel, plus building a new concrete crest at the upstream end of the proposed fishway to maintain pond elevations during the non-passage season. A meeting between representatives of Eversource, GSE, USFWS, and NMFS was held on January 4, 2018 to discuss these concepts. During this meeting, all three parties agreed that additional data was required to determine which of the two designs is more feasible.

2.0 DATA COLLECTION

The data proposed for collection to help evaluate the two nature-like fishway concepts includes bathymetry upstream of the west spillway, tailwater elevations expected for various flows at the proposed fishway entrances, and velocities through the proposed structures and tailrace. To collect this data, a combination of data collected from the field and computer models is required.

2.1 Field Data

Bathymetry data will be collected from the west spillway to 125 feet upstream and between the shoreline and the island separating the west spillway from the main spillway. The data will be collected at a frequency sufficient for creating contours accurate to 1-foot intervals. Additional elevation data between the west spillway and 125 feet downstream will also be collected as needed to supplement the existing contours to match the resolution of the upstream contours. The sediment upstream of the spillway will also be probed to determine depth to refusal at approximately 20 foot spacings. The region upstream of the spillway constitutes an area of approximately 17,000 square feet that encompasses the proposed exits of both fishway concepts and the data collected there will be used to evaluate the constructability, velocities, and required material quantities for each concept. This data will be distributed to all parties once collected and processed.

To collect the tailwater elevation data, two options have been identified. The first option is to place three water level loggers at key locations. One logger will be placed in the headpond to act as a control and to

confirm elevations recorded by Eversource. If a suitable location cannot be found to install this logger or if conditions do not accommodate installation, this logger can be omitted and the headpond elevation data recorded by Eversource will be used instead. Another logger will be placed on the shoreline as an air pressure gage to record barometric pressure for converting the non-vented pressure gages' readings to water depth. The last logger will be placed in the tailwater attached to the downstream end of the stone pier using rock pins and pipe clamps. Ideally, these loggers will be placed before spring flows, but if ice or high flows and unsafe conditions prevent installation the second option will be used. Once installed, the loggers will be checked at least once a month and physical measurements may also be recorded at this time to confirm the logger data.

The second option for recording tailwater elevations is physically measuring the tailwater elevation to an established reference point (i.e. top of west spillway abutment, top of flashboards, top of concrete spillway crest) during several different flows. The reference point will have an elevation established by surveying before spring flows occur. During spring flows, the tailwater elevations will be measured for a minimum of five to six different flows throughout the proposed fishway design flow range of approximately 1,100 cfs (95% exceedance) to 16,800 cfs (5% exceedance). Though the fishways will be designed to pass between 200-800 cfs depending on river flow and headpond levels; the fishway must remain operational and effective throughout the entire design flow range with the remainder of the flow passed through other project structures. The data points collected will be used to create a tailwater elevation curve, which is a key input for any hydraulic modeling efforts. Additional measurements will be collected if GSE, Eversource, and USFWS agree the curve is not defined well enough for use in evaluation of the fishway concepts. Regardless of the method used, the tailwater rating curve will be distributed to all parties once collected and processed.



Figure 2.1-1. Looking upstream at stone pier and west spillway.

2.2 Model Data

Using the headpond elevation data, the tailwater elevation data, and the proposed layouts of the two fishway concepts, a 2D (depth-averaged) hydraulic model of the fishways will be developed by GSE. The model objectives will be to:

- 1) Estimate the flows passing through each concept at potential variety of headpond elevations. The headpond elevations will be based on recorded headpond elevations as well as flow calculations across the full Hooksett Dam spillway.
- 2) Determine velocities through each concept fishway for flow and headwater/tailwater combinations throughout the design flow range. The velocities will then be evaluated against known design criteria for the design species.
- 3) Determine tailwater impacts on the fishway entrances for flows throughout the design flow range.

Following completion of the data collection and modeling work, GSE will compile all the data and results into a technical memorandum which will be distributed to all parties.

3.0 SCHEDULE

In order to collect a sufficient amount of data to have an informed discussion on the selection of a fishway design, the water level loggers must be installed for an appropriate period of time to collect usable data. This data needs to be collected during the first half of 2018 to avoid delays in proceeding with the design and construction of an upstream fishway. The collection of the bathymetry data also needs to be scheduled during a time that the area upstream of the west spillway can be safely accessed and traversed. Once the water level data has been collected, additional time is necessary to create and run the 2D model as well. GSE proposes that the following schedule be used for the collection of data and development of the 2D model.

3.1 Tailwater Elevations

The water level loggers should be installed for a period long enough to experience as close to the full range of fishway design flows as possible. To achieve this, the water level loggers will be installed before the spring flows and removed in the summer. This will provide a variety of flows and corresponding tailwater elevations and will cover a large portion of the period considered for upstream fish passage. If the river flows and water levels allow, the loggers will be installed in mid-March and removed in mid-July. This will provide approximately four months of data during a period that typically contains low and high flows. If the water level loggers cannot be installed, physical measurements will be gathered during the same timeline instead.

3.2 Bathymetry

For safety reasons, the bathymetry data will be collected after spring flow recede. Since the area the data will be collected from is immediately upstream of the spillway, no flow or minimal flow over the west spillway will provide safe conditions for traversing the headpond. GSE expects the data for a study area of this size can be collected in a single day. Therefore, the bathymetry data will be collected between June 4, 2018 and August 17, 2018 when flows and weather permit.

3.3 Velocities

Once the tailwater elevations and bathymetry data have been collected, the 2D models of the nature-like fishways will be developed. Allowing for two weeks to process the data gathered in the field, an additional two week period will be provided for review of the rating curves and site plan followed by a design meeting between representatives of GSE, Eversource, USFWS, and NMFS. This meeting will be used to discuss and come to consensus on the concept layouts and parameters used in the models. Following the meeting, work on the models will begin on September 4, 2018. Based on the size of the models, the complexity, and

GSE's experience with creating 2D models, the models will take four weeks to create, run, and compile the results. Once the results have been compiled, they will be shared with Eversource, USFWS, and NMFS in the first week of October 2018.

3.4 Proposed Start and End Dates

Table 3.3-1 below provides an list of expected start and end dates for the components of this data collection plan, however the dates are not final since they may change due to weather and flow conditions.

Table 3.3-1. Data Collection Schedule

Phase	Start Date	End Date
Install water level loggers/establish physical measurement benchmarks	March 19, 2018	March 30, 2018
Gather tailwater elevation data	March 19, 2018	July 13, 2018
Remove water level loggers	July 16, 2018	August 17, 2018
Collect bathymetry data	June 4, 2018	August 17, 2018
Data review and design meeting	August 20, 2018	August 31, 2018
Develop and run 2D model	September 4, 2018	October 1, 2018

All the data collected will be provided to Eversource, USFWS, and NMFS immediately after it has been processed. All parties will also be regularly updated on the progress of data collection and any delays or changes in the schedule.

Curtis Mooney

From: Mooney, Curtis R <curtis.mooney@eversource.com>
Sent: Tuesday, March 20, 2018 11:09 AM
To: Bailey, Michael (Michael_Bailey@fws.gov); Bjorn Lake - NOAA Federal; Bryan Sojkowski; John Warner (John_Warner@fws.gov); Julianne Rosset (julianne_rosset@fws.gov); Matthew A Carpenter (Matthew.A.Carpenter@wildlife.nh.gov); Susan Tuxbury - NOAA Federal
Cc: Ben Sawyer (bsawyer@gomezandsullivan.com); Brent M. Sowle (brent.sowle@eversource.com); Tom Sullivan
Subject: Hooksett Fish Passage Data Collection Plan and Project Timeline

Good morning:

Attached is the revised Hooksett Data Collection Plan and Schedule.

Also attached, is a Project Timeline that includes where we have been, where we are now and where we plan to be in the future.

Please let me know if you have any questions.

Thanks,
Curt

Curtis R. Mooney, MS
Eversource Hydro
Senior Engineering Specialist

59 Ayers Island Road
Bristol, NH 03222

Office: (603) 744-8855 Ext. 2
Cell: (603) 345-8531

From: Ben Sawyer [mailto:bsawyer@gomezandsullivan.com]
Sent: Monday, March 19, 2018 4:22 PM
To: Curtis R. Mooney <curtis.mooney@eversource.com>
Cc: Tom Sullivan <tsullivan@gomezandsullivan.com>
Subject: Hooksett Fish Passage Data Collection Plan

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Hello Curt,

Please see attached the Data Collection Plan for the ongoing fish passage work at Hooksett. The plan has been revised to address the agencies' comments given in the technical memorandum dated March 5, 2018 and account for collection of the data we expect will be needed to better evaluate the two nature-like fishway options currently being considered.

In addition, I've attached a timeline of the project to date with expected dates when future steps will be completed. Please note that this timeline reflects the recorded dates of events prior to March 19, 2018 and the projected dates for future events after March 19, 2018. These projected dates are based on experience with similar projects and are not final. The projected dates may change due to unforeseen circumstances, delays due to weather, permitting issues, or other issues that arise. This schedule is only intended for use as a guideline for planning.

Let me know if you have any questions.

Thanks,
Ben

Benjamin Sawyer, E.I.T.
Civil/Structural Engineer
Gomez and Sullivan Engineers, DPC
P.O. Box 2179
Henniker, NH 03242
O: (603) 428-4960
bsawyer@gomezandsullivan.com



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Curtis Mooney

From: Susan Tuxbury - NOAA Federal <susan.tuxbury@noaa.gov>
Sent: Monday, March 05, 2018 12:26 PM
To: Curt Mooney
Cc: Bjorn Lake - NOAA Federal; Matthew A Carpenter; Michael_bailey; Rosset, Julianne; Sojkowski, Bryan; Warner, John
Subject: Hooksett NLF Concept Data Collection Plan comments
Attachments: Hooksett Engineering Tech Memo_March 2018.pdf

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Curt,

Attached are agency engineering comments on The Nature-like Fishway Concept Data Collection Plan, received February 26, 2017.

Please let us know if you have any questions. Thank you.

Sue Tuxbury
Fishery Biologist
Habitat Conservation Division
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930
978-281-9176 (phone)
978-281-9301 (fax)
susan.tuxbury@noaa.gov



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

TECHNICAL MEMORANDUM

TO: Curt Mooney, Eversource
FROM: Bjorn Lake, NOAA Fisheries; Bryan Sojkowski, USFWS
CC: Sue Tuxbury, NOAA Fisheries; Julianne Rosset, USFWS; Michael Bailey, USFWS; John Warner, USFWS; Matt Carpenter, NHFG
DATE: March 5, 2018
RE: Nature-like Fishway Concept Data Collection Plan

INTRODUCTION

On February 26, 2017, the resource agencies (NOAA Fisheries, USFWS, and NHFG) received a *Nature-like Fishway Concept Data Collection Plan* from Eversource for the Hooksett Hydroelectric Project (FERC No. 1893). The purpose of this technical memorandum is to provide comments on the plan before the 2018 field season.

In the plan, Eversource proposes the following:

- Collect bathymetry upstream of the west spillway
- Measure tailwater elevations for representative flows during the upstream migratory period
- Conduct two-dimensional modeling of the proposed nature-like fishway (NLF) concepts

RECOMMENDATIONS

Eversource proposes collecting data from the west spillway to 100 feet upstream and between the shorelines and the island separating the west spillway from the main spillway. However, it is our opinion that the topographic/hydrographic data already collected downstream of the dam is insufficient for developing the design of the NLF. Therefore, we recommend augmenting the existing survey data to provide better resolution and coverage. Upstream of the dam, the bathymetric survey should match the resolution of the downstream area. We expect the final deliverable to be a topographic map that has a sufficient point cloud coverage to show accurate 1-foot contour intervals from shoreline to shoreline (i.e., ordinary high water mark), extending approximately 125 feet upstream and downstream from the dam. A nature-like fishway at a 3% slope is approximately 200 feet long and we recommend adding a buffer totaling at least 50 feet to ensure we find the ideal location for siting the fishway. We have attached a figure showing the general coverage area we recommend for further design development.



In addition to the topographic/hydrographic site plan, we recommend probing the sediment upstream of the dam to determine the depth to refusal. Understanding the depth to bedrock will be important for determining feasibility of various layouts of the proposed fishway that extend upstream of the dam. We anticipate that most of the substrate upstream of the dam will be bedrock with thin layers of sediment, but it is better to confirm that now than during the design or construction. We suggest a 20-foot on center resolution will be sufficient to estimate the sediment deposition behind the dam. If sediment is upstream of the dam, the substrate should be characterized using visual and tactile observations (e.g., silt, sand, gravel, and cobble). To collect data upstream of the dam safely and accurately, we recommend installing temporary flashboards on the west spillway, during annual installation that are deeper than normal to force flow to the eastern spillway. Once the bathymetric and sediment data is collected, replace the temporary west spillway flashboards with normal depth boards. This method would facilitate accurate and safe data collection during lower flows without sacrificing minimum flow requirements in the bypass reach. We anticipate the data collection will take more than one day to complete.

We concur with the approach to collect tailwater elevations with our preference being to use surveyed data loggers instead of physical measurements, if feasible. We anticipate that it will be highly unlikely that safe physical measurements of tailwater at high flow will be possible. The proposed duration of the measurements should cover most, if not all, of the full range of fish passage operational flows.

We concur with the approach to use the two-dimensional model to evaluate hydraulic conditions for the proposed concepts. Pending the data collected from the tailwater elevation loggers, we would expect to simulate at least three scenarios per fishway layout corresponding to the 5%, 50%, and 95% exceedance flow values during the migratory season. If the results of one of those scenario simulations approaches passage criteria limits for velocity or depth, we may request additional simulations to confirm performance.

We recommend adding another milestone to the proposed schedule. After collecting the water surface elevation data and the topographic survey data, we would like to be able to review the rating curves and site plan before starting the modeling exercise. We anticipate this would include a minimum of two weeks review time culminating in a design meeting. The purpose would be to come to consensus on the concept layout(s) and parameters for the modeling exercise before building the model and running the simulations.

Thank you for the opportunity to review the data collection plan. We look forward to continuing the design effort for the Hooksett upstream fishway.

Curtis Mooney

From: Rosset, Julianne <julianne_rosset@fws.gov>
Sent: Wednesday, March 07, 2018 2:03 PM
To: Susan Tuxbury - NOAA Federal
Cc: Bjorn Lake - NOAA Federal; Curt Mooney; Matthew A Carpenter; Michael_bailey; Sojkowski, Bryan; Warner, John
Subject: Re: Hooksett NLF Concept Data Collection Plan comments

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Hi Curt,

Just to clarify, the Hooksett Engineering Tech memo also represents the Service's comments on the Nature-like Fishway Concept Data Collection Plan.

Kind regards,
Julianne

Julianne Rosset
Fish & Wildlife Biologist
USFWS New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301
603-227-6436
julianne_rosset@fws.gov

On Mon, Mar 5, 2018 at 12:25 PM, Susan Tuxbury - NOAA Federal <susan.tuxbury@noaa.gov> wrote:
Curt,

Attached are agency engineering comments on The Nature-like Fishway Concept Data Collection Plan, received February 26, 2017.

Please let us know if you have any questions. Thank you.

Sue Tuxbury
Fishery Biologist
Habitat Conservation Division
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930
978-281-9176 (phone)
978-281-9301 (fax)
susan.tuxbury@noaa.gov

Attachment 3

Hooksett Upstream Fish Passage Engineering Meeting
Thursday, November 1, 2018
10:00 AM – 11:00 AM

Meeting Minutes

Attendees:

Bryan Sojkowski (USFWS)	Bjorn Lake (NMFS)
Brent Sowle (HSE)	Curt Mooney (HSE)
Steve Robinson (HSE)	Tom Sullivan (G&S)
John Hart (G&S)	Ben Sawyer (G&S)
Drew Trested (Normandeau)	

Notes:

- Tom Sullivan opened with a review of where the development of the upstream fish passage design concepts stands. Gomez and Sullivan collected data to aid with the review of the two concepts under consideration. This data was collected to aid in modeling the two concepts.
- John Hart outlined the basic parameters for the models and noted that HEC-RAS 2D is the software that will be used.
- He then proposed model extents on the downstream side of the spillway:
 - A no flow boundary is planned on the river left channel below the spillway.
 - The rocky ledge outcropping that acts as a hydraulic control will be the downstream boundary.
- Bjorn Lake asked how G&S planned to account for the difference in tailwater elevation between the island and rock outcropping.
- John Hart said this would be determined as the model is constructed. He noted that for the upstream extents, the location of the headpond logger (± 200 feet upstream of west abutment) would be used. He also noted that G&S plans to model the existing conditions in the area of conceptual upstream fish passage areas to help calibrate the model and ensure the headpond and tailwater rating curves are reasonable.
- Bjorn Lake asked if the model would be tied into the FEMA model for long distance calculations.
 - John Hart said that the FEMA model would mainly be good for high flow, ballpark estimates, but Bjorn noted that FEMA models can still provide good cross-section geometry especially in rock ledge areas such as the Hooksett project.
 - Tom Sullivan said that the dam break model for the project could provide similar cross-sectional information.
- All parties agreed that the discussed geographic extents look reasonable.
- John Hart next discussed the mesh size proposed for the model.

- G&S plans to use a 0.25-foot mesh size in the vicinity of the fish passage structures so the model can pick up the smaller details such as walls of possible structures.
 - The mesh size would enlarge further away from the fish passage structures.
- Tom Sullivan noted that due to runtime, model stability, and other factors, mesh size is important and may change if needed as the model is developed. John Hart stated that the mesh size may also be decreased in certain areas to inspect velocities at key areas.
- All parties agreed that the planned mesh size was reasonable.
- Next, Ben Sawyer summarized the data that had been collected since the last meeting.
 - Five months of flow and water level data was collected. The readings were taken by the loggers at 15-minute intervals. The flow data was prorated from the Goffs Falls USGS gage.
 - There was a 2-month gap in the tailwater level data during the months of April and May due to a malfunctioning logger. This data has been supplemented with field measurements.
 - Upstream bathymetry has not been collected yet due to high river flows in August and limited availability of equipment.
- Tom Sullivan stated that a consensus on the low design flow through the fishway is still needed.
 - Curt Mooney noted that the current minimum bypass flow is 64 cfs.
 - Bjorn Lake said that we may set that as the low design flow.
 - John Hart said that passing the 64 cfs flow through the fishway would not account for leakage through the flashboards, gate, or dam.
 - Bjorn Lake also noted that when he looked at the past approximately 30 years of flow data, he did not recall seeing any flows below ± 130 to 140 cfs.
 - Consensus is still needed on the low design flow.
- Bjorn Lake stated that the upstream bathymetry is still needed because it will help determine the most economic locations for features. Sediment depth (if present) and/or bedrock ledge conditions would also be good information to have and might affect the feasibility of the fish passage conceptual designs.
- Bryan Sojkoswki asked if there is an updated schedule for the fishway project.
 - Curt Mooney said that G&S will provide an updated schedule.
 - Tom Sullivan noted that G&S will provide two schedules with one assuming the remaining field work (upstream bathymetry) can be completed before the end of the year and the other assuming the field work will be delayed to next summer.

Action Items:

1. Gomez and Sullivan will evaluate the low design flow for discussion with all groups.

2. Gomez and Sullivan will provide two revised schedules for the full project timeline. One will reflect the completion of field work this year. The other will reflect the completion of field work early next summer.
3. Gomez and Sullivan will begin developing the 2D model starting with the area downstream of the spillway. Once the bathymetry data has been collected, the remainder of the model will be developed and run.

Attachment 4

Curtis Mooney

From: Curtis Mooney
Sent: Wednesday, December 05, 2018 8:34 AM
To: Rosset, Julianne; Bailey, Michael; Carpenter, Matthew; Sojkowski, Bryan; - NOAA Federal, Bjorn Lake; McDermott, Sean
Cc: Brent Sowle (bsowle@centralriverspower.com); Sullivan, Tom; Sawyer, Ben; Trested, Drew
Subject: Hooksett Updated Schedule
Attachments: Hooksett Fish Passage Schedule 20181204 Scenario 1.pdf; Hooksett Fish Passage Schedule 20181204 Scenario 2.pdf

Good morning:

Please see the attached updated Hooksett Fish Passage Schedule(s). As requested at the November 1, 2018 2D Modeling inputs meeting, G&S has provided two schedules: one- depicting if the remaining bathymetry data is collected this year and two- if the data is collected in 2019.

If you would like, we can schedule a meeting or conference call with Gomez & Sullivan to discuss the schedules.

Thanks,
Curt

Curtis R. Mooney, MS
Central Rivers Power
Manager, Regulatory Affairs

59 Ayers Island Road
Bristol, NH 03222

Office: (603) 744-8855 Ext. 2

From: Ben Sawyer <bsawyer@gomezandsullivan.com>
Sent: Tuesday, December 04, 2018 2:27 PM
To: Curtis Mooney <cmooney@centralriverspower.com>
Subject: Hooksett Updated Schedule

Hello Curt,

I've attached the two updated versions of the schedule for Hooksett. Scenario 1 is if we are able to collect the remaining field data before the end of the year, and scenario 2 is if we are not able to collect the data until July of next year. Both schedules estimate procurement and permitting for construction beginning near the end of 2020 and construction in 2021. The main difference between the two scenarios is when the remaining field data is collected. For scenario 2 this results in a tighter schedule with less leniency for delays in order for construction to finish in 2021.

Let me know if you have any questions.

Thanks,
Ben

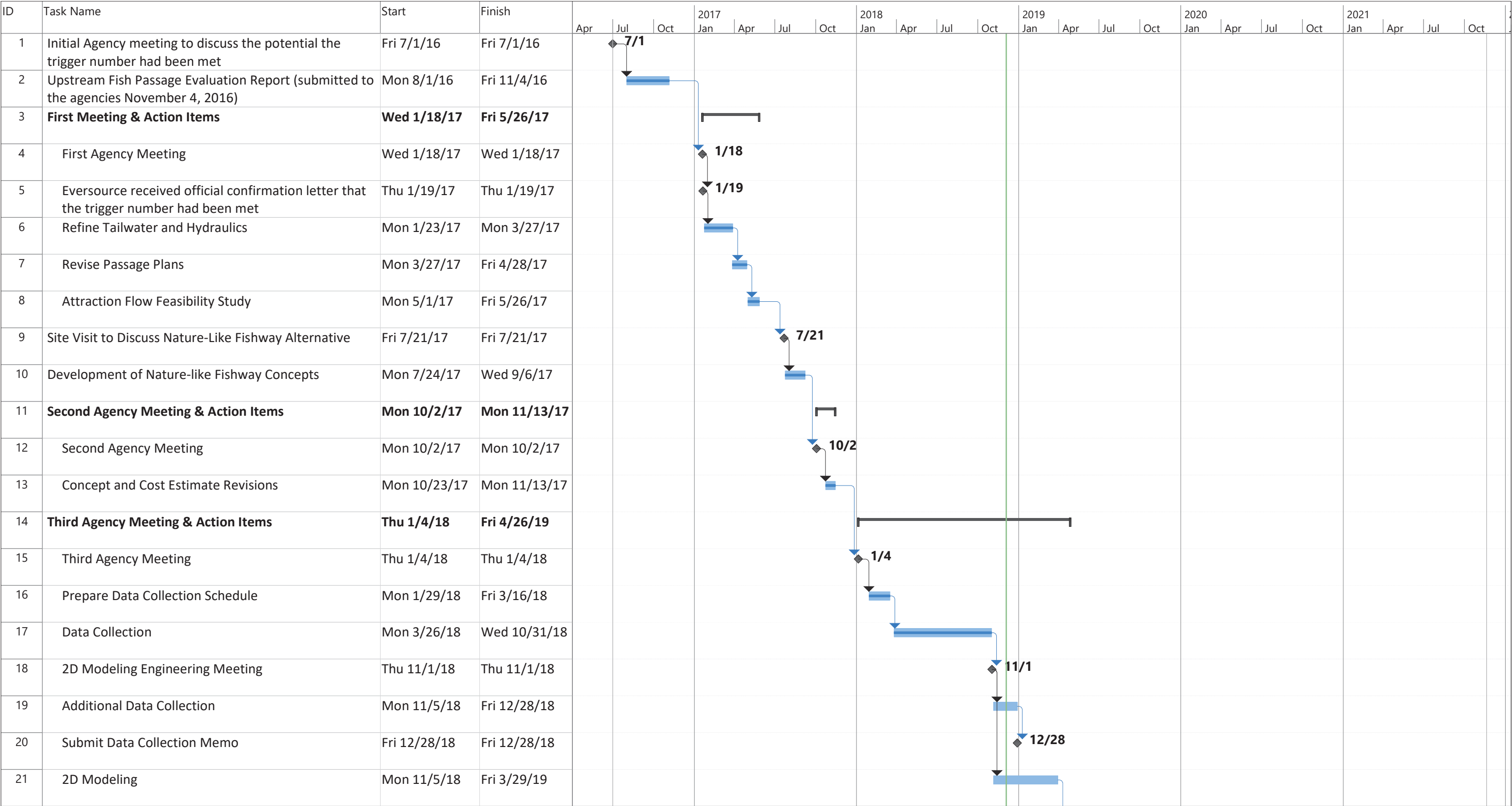
Benjamin Sawyer, E.I.T.

Civil/Structural Engineer
Gomez and Sullivan Engineers, DPC
P.O. Box 2179
Henniker, NH 03242
O: (603) 428-4960
bsawyer@gomezandsullivan.com



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NOTE: This timeline reflects the recorded dates of events prior to December 4, 2018 and the projected dates for future events after December 4, 2018. These projected dates are based on experience with similar projects and are not final. The projected dates may change due to unforeseen circumstances, delays due to weather, permitting issues, or other issues that arise. This schedule is only intended for use as a guideline for planning.



Project: Hooksett Schedule_REV
Date: Tue 12/4/18

Task

Split

Milestone

Summary

Project Summary

Inactive Task

Inactive Milestone

Inactive Summary

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Start-only

Finish-only

External Tasks

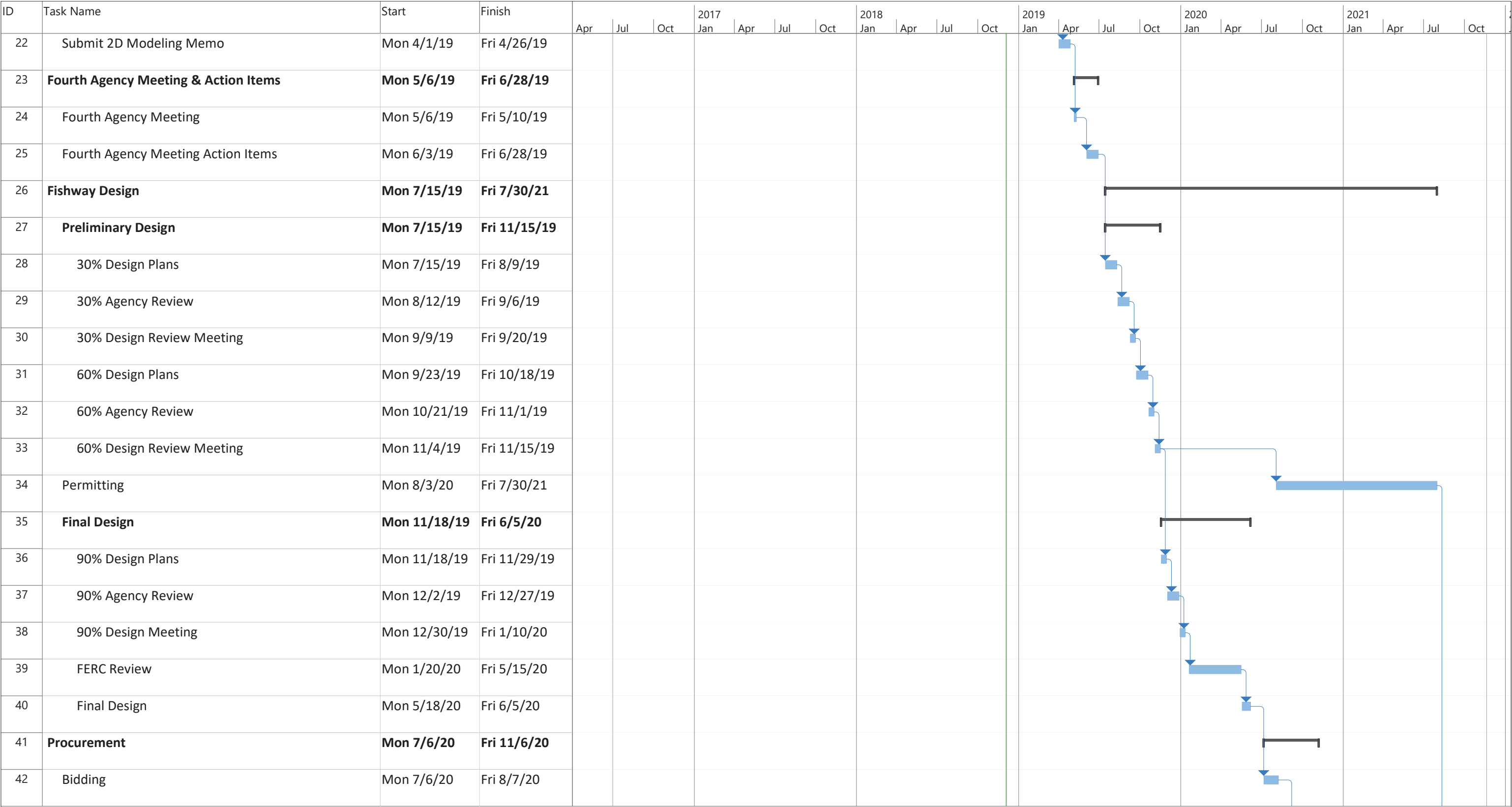
External Milestone

Deadline

Progress

Manual Progress

NOTE: This timeline reflects the recorded dates of events prior to December 4, 2018 and the projected dates for future events after December 4, 2018. These projected dates are based on experience with similar projects and are not final. The projected dates may change due to unforeseen circumstances, delays due to weather, permitting issues, or other issues that arise. This schedule is only intended for use as a guideline for planning.



Project: Hooksett Schedule_REV
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Project Summary

Inactive Task

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Duration-only

Manual Summary Rollup

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Start-only

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External Tasks

External Milestone

Deadline

















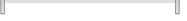


Progress

Manual Progress

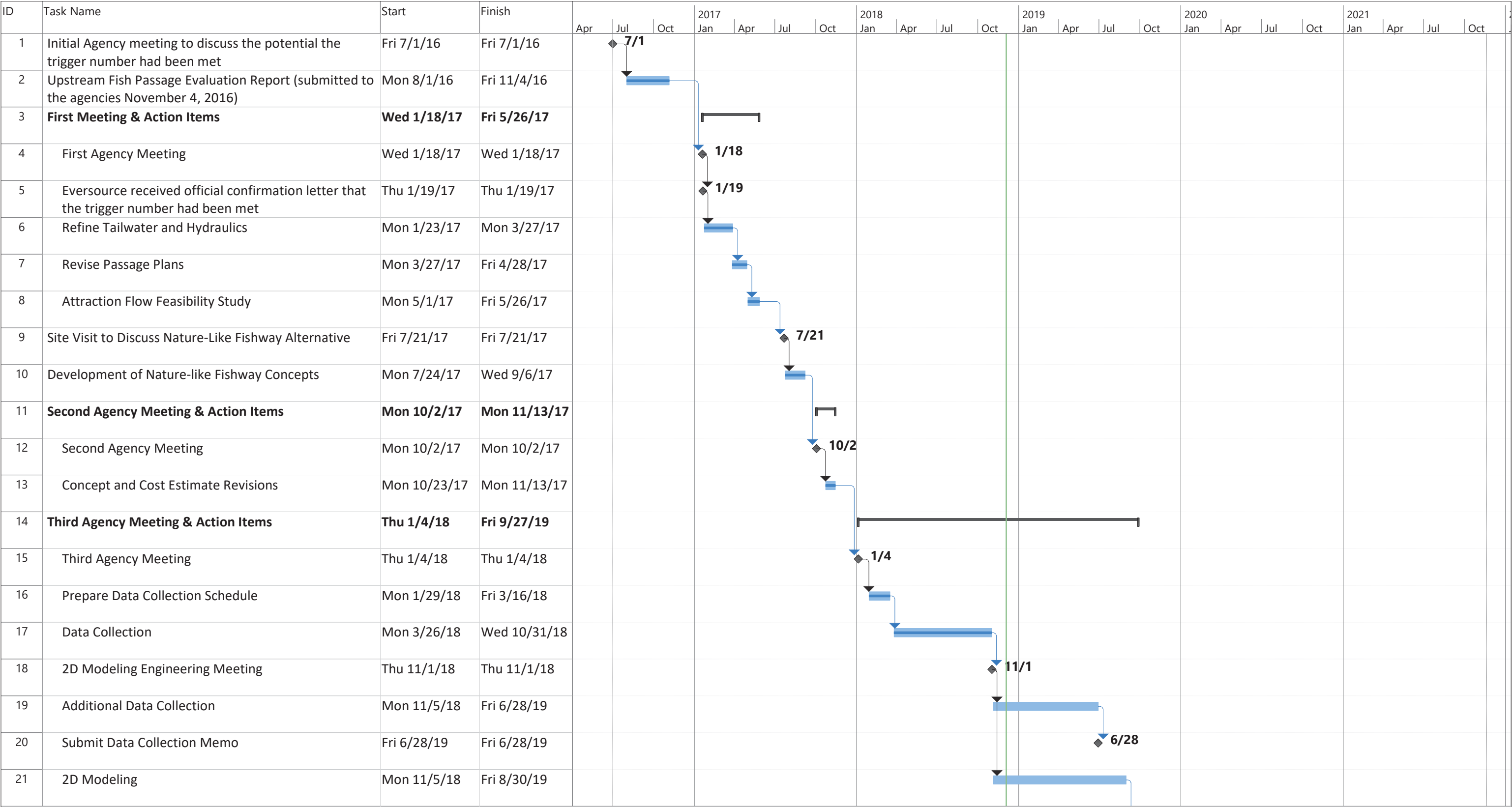
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ID	Task Name	Start	Finish	2017			2018				2019				2020				2021				2022
				Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan
43	Selection and Contract Finalization	Mon 9/7/20	Fri 11/6/20																				
44	Construction	Mon 8/2/21	Fri 11/19/21																				

Project: Hooksett Schedule_REV Date: Tue 12/4/18	Task		Project Summary		Manual Task		Start-only		Deadline	
	Split		Inactive Task		Duration-only		Finish-only		Progress	
	Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
	Summary		Inactive Summary		Manual Summary		External Milestone			

NOTE: This timeline reflects the recorded dates of events prior to December 4, 2018 and the projected dates for future events after December 4, 2018. These projected dates are based on experience with similar projects and are not final. The projected dates may change due to unforeseen circumstances, delays due to weather, permitting issues, or other issues that arise. This schedule is only intended for use as a guideline for planning.



Project: Hooksett Schedule_REV
Date: Tue 12/4/18

Task

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External Tasks

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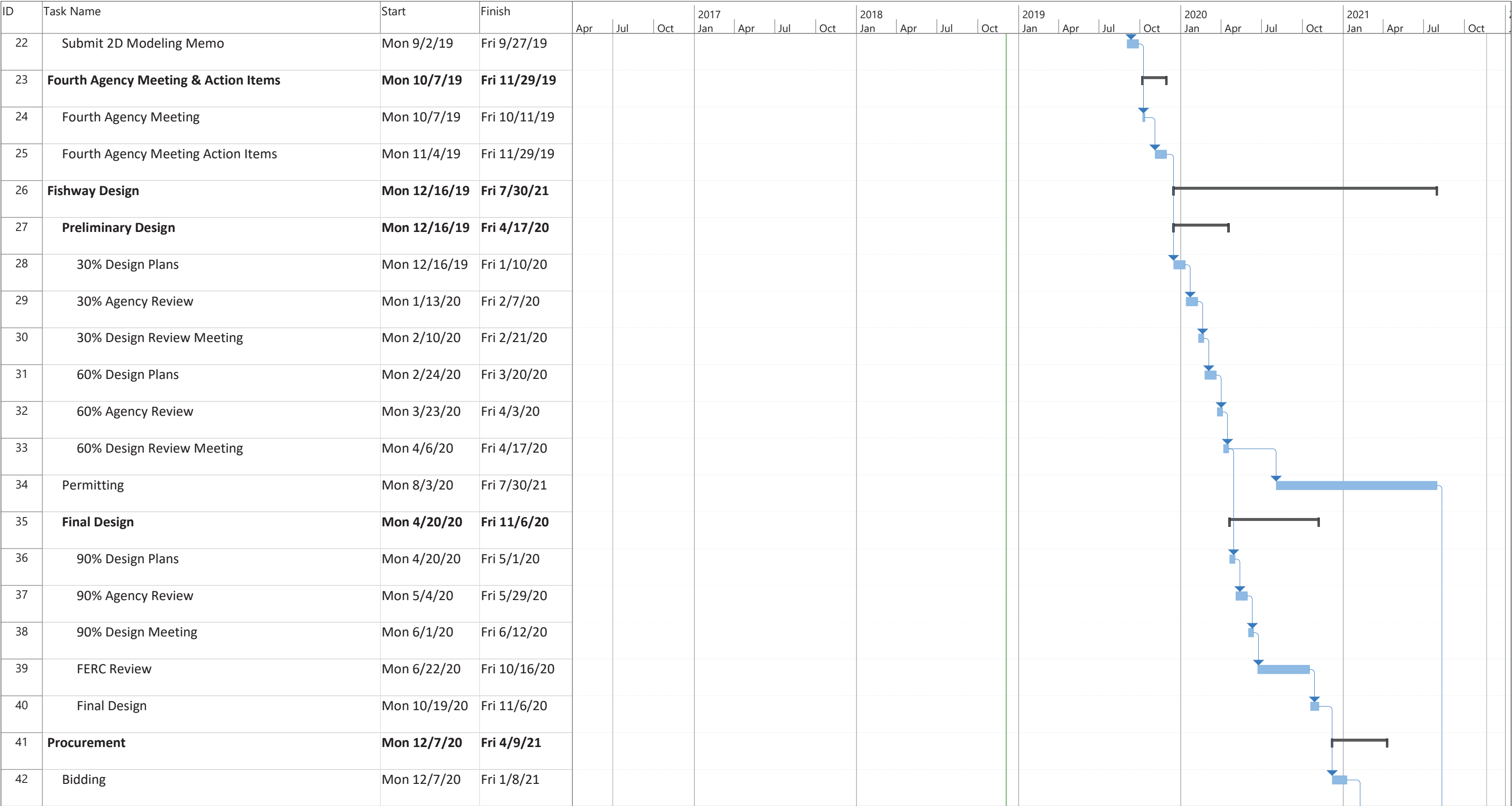
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Deadline

Progress

Manual Progress

NOTE: This timeline reflects the recorded dates of events prior to December 4, 2018 and the projected dates for future events after December 4, 2018. These projected dates are based on experience with similar projects and are not final. The projected dates may change due to unforeseen circumstances, delays due to weather, permitting issues, or other issues that arise. This schedule is only intended for use as a guideline for planning.



Project: Hooksett Schedule_REV
Date: Tue 12/4/18

Task

Split

Milestone

Summary

Project Summary

Inactive Task

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Manual Task

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Manual Summary Rollup

Manual Summary

Start-only

Finish-only

External Tasks

External Milestone

















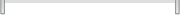


Deadline

Progress

Manual Progress

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ID	Task Name	Start	Finish				2017				2018				2019				2020				2021			
				Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
43	Selection and Contract Finalization	Mon 2/8/21	Fri 4/9/21																							
44	Construction	Mon 8/2/21	Fri 11/19/21																							

Project: Hooksett Schedule_REV Date: Tue 12/4/18	Task		Project Summary		Manual Task		Start-only		Deadline	
	Split		Inactive Task		Duration-only		Finish-only		Progress	
	Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
	Summary		Inactive Summary		Manual Summary		External Milestone			

From: Kayla Easler
To: ["Lamb, Amy"; Tuttle, Kim](#)
Cc: [Henderson, Carol](#); [Andy Qua](#)
Subject: RE: NHB review: NHB19-0097
Date: Thursday, January 24, 2019 11:11:00 AM
Attachments: [Hooksett_PB.jpg](#)
[Project Description for NHB.docx](#)

Amy,

Attached is the project description and operations for Hooksett.

The Hooksett Falls Development was established in 1926 by Manchester Tractor, Light, and Power Company, as a unit of PSNH. An existing powerhouse at the falls, likely constructed by the Hooksett Manufacturing Company, and a wood crib dam were replaced, while two stone dams were left in place.

Kayla A. Easler
Regulatory Coordinator



Direct: (207) 416-1271

www.KleinschmidtGroup.com

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From: Lamb, Amy <Amy.Lamb@dnrc.nh.gov>
Sent: Thursday, January 24, 2019 10:07 AM
To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>; Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Can you provide some information about the dam operations? There is a population of incurved umbrella sedge (*Cyperus squarrosus*) on a sandbar in the Merrimack River, which would only have habitat available during low-water periods. Is the water ponded at all behind the dam, and if so, does it impact the area where this species is mapped (near the northern end of the project area)? Before we can make a determination about effects of dam operations on rare plant species, we will need to know whether the dam causes alterations in available habitat for this species due to ponding.

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dnrc.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands

172 Pembroke Rd
Concord, NH 03301

From: Kayla Easler [<mailto:Kayla.Easler@KleinschmidtGroup.com>]
Sent: Thursday, January 24, 2019 9:00 AM
To: Tuttle, Kim; Lamb, Amy
Cc: Henderson, Carol
Subject: RE: NHB review: NHB19-0097

Thank you Kim.

Kayla A. Easler
Regulatory Coordinator

Kleinschmidt

Direct: (207) 416-1271

www.KleinschmidtGroup.com

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and the environment*

From: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>
Sent: Thursday, January 24, 2019 8:59 AM
To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>; Lamb, Amy <Amy.Lamb@dn-cr.nh.gov>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Carol Henderson, our NHFG Environmental Review Coordinator, takes care of Low Impact Hydropower Institute (LIHI) Certification requests. She is cc'd on this email.

Thank you,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Kayla Easler [<mailto:Kayla.Easler@KleinschmidtGroup.com>]
Sent: Thursday, January 24, 2019 8:53 AM
To: Lamb, Amy
Cc: Tuttle, Kim
Subject: RE: NHB review: NHB19-0097

Amy and Kim,

What additional information would like on the project? As I put in the project description, Central Rivers Power (CRP) is applying for Low Impact Hydropower Institute (LIHI) Certification and as part of the process, CRP needs to reach out to agencies and update their project information with the most up-to-date information. No changes to the Project are expected at this time.

Along with getting the most up-to-date information on listed species, LIHI is looking for a written response from the agencies, showing the continued operation of the project will not contribute to the status of the species and that no significant affect is expected.

If you have questions, feel free to call me at 207-416-1271

Thanks,

Kayla A. Easler
Regulatory Coordinator

Kleinschmidt

Direct: (207) 416-1271

www.KleinschmidtGroup.com

*Providing **practical** solutions for **complex** problems affecting energy, water, and the environment*

From: Lamb, Amy <Amy.Lamb@dncr.nh.gov>

Sent: Friday, January 18, 2019 12:29 PM

To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>

Cc: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>

Subject: NHB review: NHB19-0097

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,
Amy

Amy Lamb
Ecological Information Specialist

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834

PROJECT DESCRIPTION

The Hooksett Development consists of a 5.5-mile-long, 350-acre reservoir, dam, power canal, powerhouse, tailrace channel, substation, and appurtenant facilities, which are described in further detail below. The run-of-river plant is operated automatically as a base load unit generating power whenever adequate river flows are available.

The Hooksett dam has two spillway sections. A stone masonry section, approximately 340 feet long, extends from the west bank of the river. The second section is approximately 250 feet long and made of concrete. This section runs longitudinally up and down the river near the east bank of the river and forms a canal that extends to the powerhouse, each section topped with 2-foot-high flashboards and a crest at elevation 187 feet (USGS datum). There is a 13-foot-by 20-foot steel Taintor wastegate located between the second spillway section and the powerhouse; a power canal. Located at the east of the dam, a brick powerhouse is approximately 40 feet long by 45 feet wide. The powerhouse containing a single 2,150 hp I.P. Morris vertical propeller turbine connected to an Allis-Chalmers generator with an installed capacity of 1,600 kW. The project has an approximate 110-foot long tailrace and a bypassed reach approximately 430 feet long. There is a substation; and other appurtenances.

The U.S. Department of the Interior (USDOI), Fish and Wildlife Service (USFWS) fishway prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. The trigger number for river herring was reached during the 2016 migration season. As such, and former owner, Eversource, initiated consultation with state and federal agencies to begin preliminary design work. HSE continues to consult with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability.

Existing downstream fish passage is a bypass system between the Taintor gate and the powerhouse.

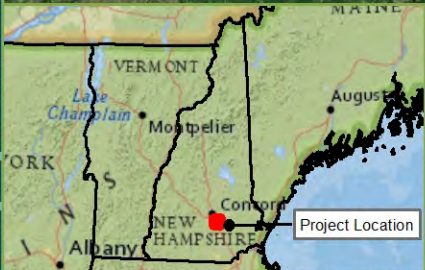
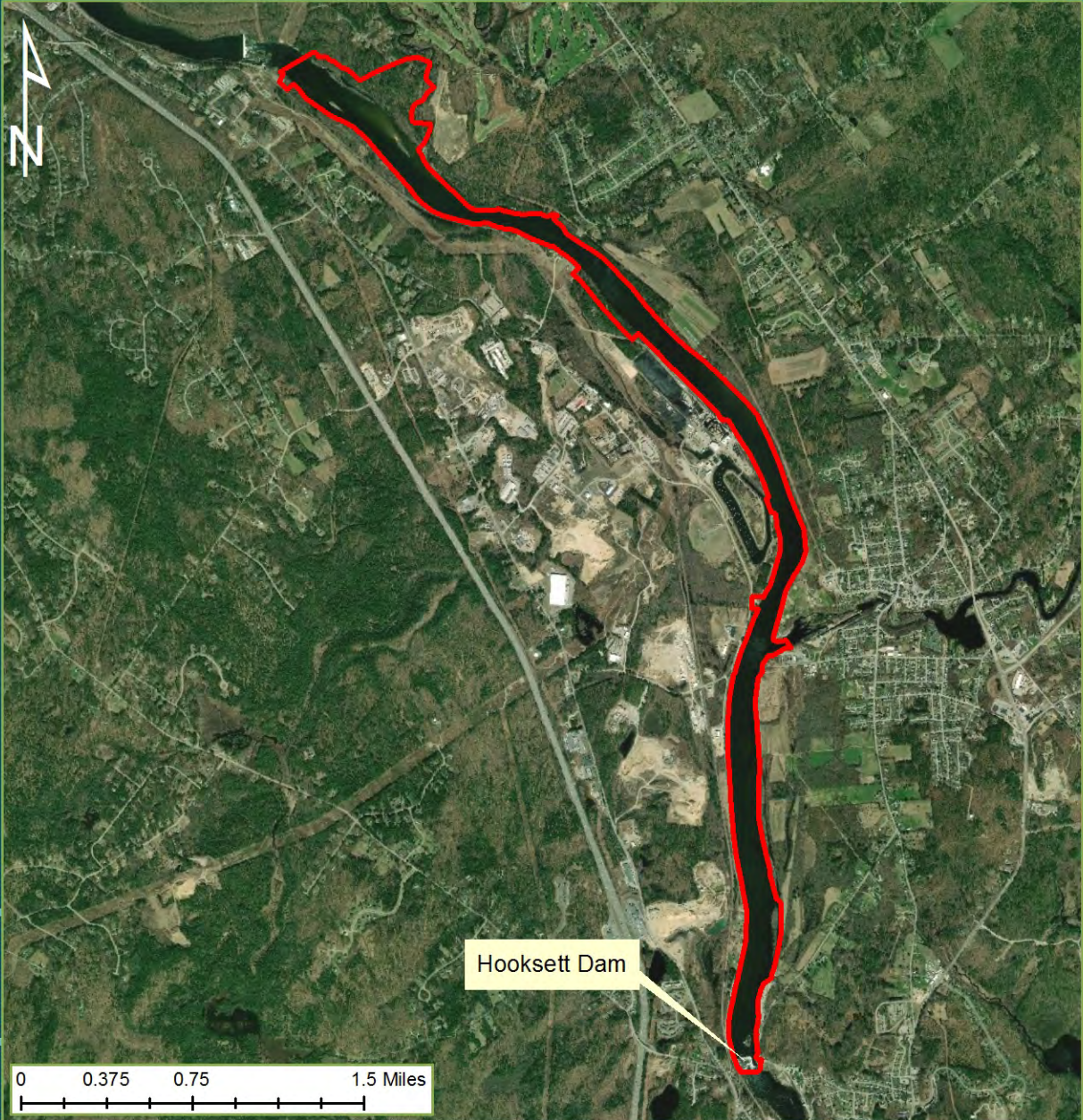
PROJECT OPERATIONS

The run-of-river plant is operated automatically with a remote control via SCADA from the Electric System Control Center in Manchester, New Hampshire. The unit is equipped with control devices that allow manual control of all unit operating functions from the station's switch board.

CRPNH provides a minimum flow of 819 cfs or inflow, whichever is lower to the tailrace and a minimum flow 64 cfs to the bypassed reach for aquatic enhancement purposes.

The maximum hydraulic capacity of the plant is about 1750 cfs at a gross head of 16 feet.

Project Boundary



Legend

Project Boundary

Central Rivers Power NH Manchester, NH

Drawn By: RSR	Date Drawn: 01-17-2019	Checked By: KPN	Date Checked: 01-17-2019
------------------	---------------------------	--------------------	-----------------------------

Kleinschmidt

141 Main St., PO Box 550
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtGroup.com

This map/data was created for informational, planning, reference and guidance purposes only. Kleinschmidt makes no warranty, expressed or implied related to the accuracy or content of these materials.

From: [Lamb, Amy](#)
To: [Kayla Easler](#)
Cc: [Henderson, Carol](#); [Andy Qua](#)
Subject: RE: NHB review: NHB19-0097
Date: Tuesday, January 29, 2019 2:58:35 PM

Kayla,

Below is my response to the Hooksett project (NHB19-0097)

An *acidic riverside seep* is found just north of the project area, at the base of the Garvins Falls dam. This is an S1 ranked natural community and there are only 4 documented exemplary occurrences in the state. It is found on the shoreline of the Merrimack River. This community could be impacted by operations of either dam, but this is not certain. The occurrence was likely larger at one time, prior to the installation of the upstream Garvins Falls dam; however this is not the subject of the recertification. Unless the Hooksett dam causes prolonged flooding at this site, it is unlikely that its continued operation would threaten this occurrence.

There is a record for golden heather (*Hudsonia ericoides*) on an island within the river. This is an upland plant and is unlikely to be impacted by project operations.

There is a historical record for Houghton's umbrella sedge (*Cyperus houghtonii*) under existing power lines; this occurrence would be unlikely to be impacted by the dam as it is found in an upland habitat.

Incurved umbrella sedge (*Cyperus squarrosus*) occurs on a sand bar in the Merrimack River, in a "shallowly inundated" area. If the dam artificially impounds the Merrimack River for prolonged periods, then it could have an impact on the habitat for this species.

-
-

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Kayla Easler [mailto:Kayla.Easler@KleinschmidtGroup.com]
Sent: Thursday, January 24, 2019 11:12 AM
To: Lamb, Amy; Tuttle, Kim
Cc: Henderson, Carol; Andy Qua
Subject: RE: NHB review: NHB19-0097

Amy,

Attached is the project description and operations for Hooksett.

The Hooksett Falls Development was established in 1926 by Manchester Tractor, Light, and Power Company, as a unit of PSNH. An existing powerhouse at the falls, likely constructed by the Hooksett Manufacturing Company, and a wood crib dam were replaced, while two stone dams were left in place.

Kayla A. Easler
Regulatory Coordinator



Direct: (207) 416-1271
www.KleinschmidtGroup.com

Providing **practical** solutions for **complex** problems affecting energy, water, and the environment

From: Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Sent: Thursday, January 24, 2019 10:07 AM
To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>; Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>
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Amy Lamb
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Cc: Henderson, Carol
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Thank you Kim.

Kayla A. Easler
Regulatory Coordinator
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Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Carol Henderson, our NHFG Environmental Review Coordinator, takes care of Low Impact Hydropower Institute (LIHI) Certification requests. She is cc'd on this email.

Thank you,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

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Along with getting the most up-to-date information on listed species, LIHI is looking for a written response from the agencies, showing the continued operation of the project will not contribute to the status of the species and that no significant affect is expected.

If you have questions, feel free to call me at 207-416-1271

Thanks,

Kayla A. Easler
Regulatory Coordinator

Kleinschmidt

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Cc: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>

Subject: NHB review: NHB19-0097

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,

Amy

Amy Lamb
Ecological Information Specialist

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>

In Reply Refer To:

February 04, 2019

Consultation Code: 05E1NE00-2019-SLI-0785

Event Code: 05E1NE00-2019-E-01814

Project Name: Hooksett Development (FERC No. 1893)

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2019-SLI-0785

Event Code: 05E1NE00-2019-E-01814

Project Name: Hooksett Development (FERC No. 1893)

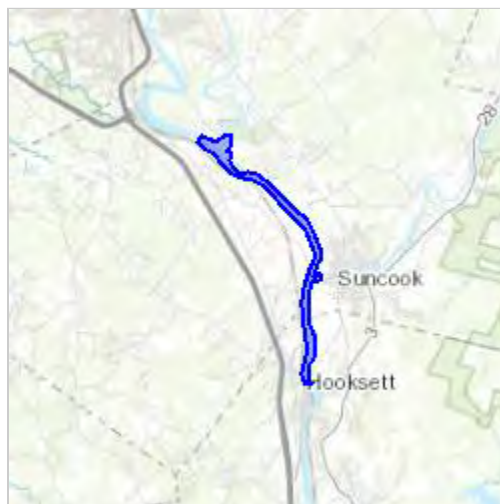
Project Type: DAM

Project Description: The Hooksett Development is one of three developments that comprise the Merrimack River Project (FERC No. 1893), located along 21 miles of the Merrimack River. The development is in the town of Hooksett and Bow, Merrimack County, New Hampshire. Hooksett is operated in run-of-river mode with an installed capacity of 1,600 kW. The development is approximately 8 miles upstream of the Amoskeag Dam at river mile 81.1 and has a drainage area of 2,805 square miles. The project reservoir extends upstream approximately 5.5 miles and has a surface area of 350 acres. The Merrimack River Project is owned by HSE Hydro NH, LLC and operated by Central Rivers Power NH, LLC (CRPNH).

CRPNH is applying for a Low Impact hydropower Institute certification

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/43.13307434895571N71.46231842162089W>



Counties: Merrimack, NH

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Flowering Plants

NAME	STATUS
Small Whorled Pogonia <i>Isotria medeoloides</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

APPENDIX E

CONSULTATION

Request for NHB Review of "Potential Impacts" from the NHB DataCheck Tool**NHB File Number:** NHB19-0097**Data Requested:** 1/7/2019**Requested By:**

Name: Kayla Easler
141 Main Street, P.O. Box 650
Pittsfield, ME 04967
E-mail: kayla.easler@kleinschmidtgroup.com
Phone: 207-416-1271

Project Location:

Town: Hooksett
Description: 70 Merrimack St, Hooksett NH

Payment Information. These fields MUST be filled out.

Check Number: _____

Name of Account: _____

(as printed on the check)

Enclose this completed form with a check in the amount of \$25, made out to "Treasurer, State of NH".

Send the check and the completed form to the following address:

DRED - NHB
NHB Reviews
172 Pembroke Road
Concord, NH 03301



January 9, 2018

VIA-EMAIL

Gregg Comstock
Supervisor, Water Quality Planning Section
NH Department of Environmental Services
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095
Gregg.Comstock@des.nh.gov

Hooksett Hydroelectric Project (FERC No. 1893)
LIHI application Project Review of Continued Use

Dear Gregg:

The following is a request for review of water quality resources for the Low Impact Hydropower Institute (LIHI) certification application for Central Rivers Power: Hooksett Hydroelectric Project, part of the Merrimack Project (FERC No. 1893) located on the Merrimack River in the town of Hooksett, Merrimack County, New Hampshire.

Part of the LIHI application process requires the applicant to receive conformation from the state water resource agency that the continued operation of the project does not and will not contribute to the impaired waters of the state.

We ask that you please confirm, to your best abilities, that this is still true for the project and that the continued operations of the project do not contribute to water quality limitations.

If you have any questions, please contact me at (207) 416-1271 or by email at Kayla.Easler@KleinschmidtGroup.com.

Sincerely,

KLEINSCHMIDT ASSOCIATES

A handwritten signature in black ink that reads "Kayla A. Easler". The script is fluid and cursive.

Kayla A. Easler
Regulatory Coordinator

KAE:TMJ

cc: Curt Mooney, Central Rivers Power
Andy Qua, Kleinschmidt

\\kleinschmidtusa.com\Condor\Jobs\4494\004\Docs\Hooksett\4494004 DES request_Hooksett.docx

From: Kayla Easler
To: ["Carol.Henderson@wildlife.nh.gov"](mailto:Carol.Henderson@wildlife.nh.gov)
Subject: Additional species review for LIHI certification
Date: Thursday, January 24, 2019 9:35:00 AM
Attachments: [NHB18-3938 Easler \(002\).pdf](#)
[NHB19-0070 Easler \(002\).pdf](#)
[NHB19-0097 Easler.pdf](#)
[image001.png](#)

Good morning Carol,

I have three projects Gorham, Canaan, and Hooksett (attached) that are going through the application process for LIHI certification.

Kim Tuttle directed me to you for the additional review of the projects. Please let me know what additional information you need for review. As part of the LIHI process they require written responses from the agencies, showing the continued operation of the project will not contribute to the status of the species and that no significant affect is expected.

Thank you,

Kayla A. Easler
Regulatory Coordinator



Direct: (207) 416-1271

www.KleinschmidtGroup.com

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From: Kayla Easler
To: ["Lamb, Amy"; Tuttle, Kim](#)
Cc: [Henderson, Carol](#); [Andy Qua](#)
Subject: RE: NHB review: NHB19-0097
Date: Thursday, January 24, 2019 11:11:00 AM
Attachments: [Hooksett_PB.jpg](#)
[Project Description for NHB.docx](#)

Amy,

Attached is the project description and operations for Hooksett.

The Hooksett Falls Development was established in 1926 by Manchester Tractor, Light, and Power Company, as a unit of PSNH. An existing powerhouse at the falls, likely constructed by the Hooksett Manufacturing Company, and a wood crib dam were replaced, while two stone dams were left in place.

Kayla A. Easler
Regulatory Coordinator

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Amy Lamb
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DNCR - Forests & Lands

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Thank you Kim.

Kayla A. Easler
Regulatory Coordinator

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Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Carol Henderson, our NHFG Environmental Review Coordinator, takes care of Low Impact Hydropower Institute (LIHI) Certification requests. She is cc'd on this email.

Thank you,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Kayla Easler [<mailto:Kayla.Easler@KleinschmidtGroup.com>]
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If you have questions, feel free to call me at 207-416-1271

Thanks,

Kayla A. Easler
Regulatory Coordinator

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Best,
Amy

Amy Lamb
Ecological Information Specialist

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834

PROJECT DESCRIPTION

The Hooksett Development consists of a 5.5-mile-long, 350-acre reservoir, dam, power canal, powerhouse, tailrace channel, substation, and appurtenant facilities, which are described in further detail below. The run-of-river plant is operated automatically as a base load unit generating power whenever adequate river flows are available.

The Hooksett dam has two spillway sections. A stone masonry section, approximately 340 feet long, extends from the west bank of the river. The second section is approximately 250 feet long and made of concrete. This section runs longitudinally up and down the river near the east bank of the river and forms a canal that extends to the powerhouse, each section topped with 2-foot-high flashboards and a crest at elevation 187 feet (USGS datum). There is a 13-foot-by 20-foot steel Taintor wastegate located between the second spillway section and the powerhouse; a power canal. Located at the east of the dam, a brick powerhouse is approximately 40 feet long by 45 feet wide. The powerhouse containing a single 2,150 hp I.P. Morris vertical propeller turbine connected to an Allis-Chalmers generator with an installed capacity of 1,600 kW. The project has an approximate 110-foot long tailrace and a bypassed reach approximately 430 feet long. There is a substation; and other appurtenances.

The U.S. Department of the Interior (USDOI), Fish and Wildlife Service (USFWS) fishway prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. The trigger number for river herring was reached during the 2016 migration season. As such, and former owner, Eversource, initiated consultation with state and federal agencies to begin preliminary design work. HSE continues to consult with the agencies to determine the most feasible design in terms of size, location, target species, project operations, cost and constructability.

Existing downstream fish passage is a bypass system between the Taintor gate and the powerhouse.

PROJECT OPERATIONS

The run-of-river plant is operated automatically with a remote control via SCADA from the Electric System Control Center in Manchester, New Hampshire. The unit is equipped with control devices that allow manual control of all unit operating functions from the station's switch board.

CRPNH provides a minimum flow of 819 cfs or inflow, whichever is lower to the tailrace and a minimum flow 64 cfs to the bypassed reach for aquatic enhancement purposes.

The maximum hydraulic capacity of the plant is about 1750 cfs at a gross head of 16 feet.

Project Boundary



Path: G:\Client Data\PSNH\Herrinack\Hooksett.MXD\LI\H\Hooksett_PB.mxd



Legend

Project Boundary

Central Rivers Power NH Manchester, NH

Drawn By: RSR	Date Drawn: 01-17-2019	Checked By: KPN	Date Checked: 01-17-2019
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Kleinschmidt

141 Main St., PO Box 550
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtGroup.com

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-
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Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

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Amy,

Attached is the project description and operations for Hooksett.

The Hooksett Falls Development was established in 1926 by Manchester Tractor, Light, and Power Company, as a unit of PSNH. An existing powerhouse at the falls, likely constructed by the Hooksett Manufacturing Company, and a wood crib dam were replaced, while two stone dams were left in place.

Kayla A. Easler
Regulatory Coordinator



Direct: (207) 416-1271
www.KleinschmidtGroup.com

Providing **practical** solutions for **complex** problems affecting energy, water, and the environment

From: Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Sent: Thursday, January 24, 2019 10:07 AM
To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>; Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Can you provide some information about the dam operations? There is a population of incurved umbrella sedge (*Cyperus squarrosus*) on a sandbar in the Merrimack River, which would only have habitat available during low-water periods. Is the water ponded at all behind the dam, and if so, does it impact the area where this species is mapped (near the northern end of the project area)? Before we can make a determination about effects of dam operations on rare plant species, we will need to know whether the dam causes alterations in available habitat for this species due to ponding.

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Kayla Easler [<mailto:Kayla.Easler@KleinschmidtGroup.com>]
Sent: Thursday, January 24, 2019 9:00 AM
To: Tuttle, Kim; Lamb, Amy
Cc: Henderson, Carol
Subject: RE: NHB review: NHB19-0097

Thank you Kim.

Kayla A. Easler
Regulatory Coordinator
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*Providing **practical** solutions for **complex** problems affecting energy, water, and the environment*

From: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>
Sent: Thursday, January 24, 2019 8:59 AM
To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>; Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Cc: Henderson, Carol <Carol.Henderson@wildlife.nh.gov>
Subject: RE: NHB review: NHB19-0097

Kayla,

Carol Henderson, our NHFG Environmental Review Coordinator, takes care of Low Impact Hydropower Institute (LIHI) Certification requests. She is cc'd on this email.

Thank you,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Kayla Easler [<mailto:Kayla.Easler@KleinschmidtGroup.com>]
Sent: Thursday, January 24, 2019 8:53 AM
To: Lamb, Amy
Cc: Tuttle, Kim
Subject: RE: NHB review: NHB19-0097

Amy and Kim,

What additional information would like on the project? As I put in the project description, Central Rivers Power (CRP) is applying for Low Impact Hydropower Institute (LIHI) Certification and as part of the process, CRP needs to reach out to agencies and update their project information with the most up-to-date information. No changes to the Project are expected at this time.

Along with getting the most up-to-date information on listed species, LIHI is looking for a written response from the agencies, showing the continued operation of the project will not contribute to the status of the species and that no significant affect is expected.

If you have questions, feel free to call me at 207-416-1271

Thanks,

Kayla A. Easler
Regulatory Coordinator

Kleinschmidt

Direct: (207) 416-1271

www.KleinschmidtGroup.com

*Providing **practical** solutions for **complex** problems affecting energy, water, and the environment*

From: Lamb, Amy <Amy.Lamb@dncr.nh.gov>

Sent: Friday, January 18, 2019 12:29 PM

To: Kayla Easler <Kayla.Easler@KleinschmidtGroup.com>

Cc: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>

Subject: NHB review: NHB19-0097

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,

Amy

Amy Lamb
Ecological Information Specialist

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834



United States Department of the Interior

FISH AND WILDLIFE SERVICE

300 Westgate Center Drive
Hadley, MA 01035-9589



In Reply Refer To:
FWS/Region 5/ES

ORIGINAL

DEC 20 2006

Magalie Roman Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

P-1893-042

FILED
OFFICE OF THE
SECRETARY
2006 DEC 26 AM 03
REGULATORY COMMISSION

Dear Ms. Salas:

Enclosed for filing are eight copies of the Department of the Interior's (Department) Prescription for Fishways for the Merrimack River Project (Project). The Administrative Record in support of this Prescription for Fishways was filed with the Federal Energy Regulatory Commission (FERC) on July 12, 2006.

We have submitted hard copies of the Modified Prescription for Fishways with the Public Service Company of New Hampshire (PSNH). We have also distributed copies to American Whitewater Affiliation, which intervened in the Department's proceedings on PSNH's request for a Trial Type Hearing and submittal of its Alternative Fishway Prescription. We have distributed this cover letter to the remainder on FERC's Service List for the Project.

An additional copy of this letter is enclosed so that you may file stamp and return it in the enclosed self-addressed envelope. If you have any questions, please contact Michael G. Thabault, Assistant Regional Director, Ecological Services, at 413-253-8304, or Alex Hoar, Ecological Services, at 413-253-8631. Thank you for your cooperation in filing these documents.

Sincerely,

 Acting 

Marvin E. Moriarty
Regional Director

Enclosures

cc: FERC Service List

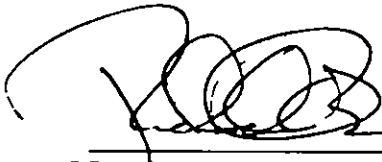
 **ORIGINAL**

**BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION**

Public Service of New Hampshire, Applicant	)	Merrimack River Project
	)	Merrimack River
	)	Hillsborough and Merrimack
	)	Counties
	)	New Hampshire
	)	FERC No. 1893-042

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

Approved this 20 day of Dec., 2006, by:



Marvin E. Moriarty, Regional Director *Acting*

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

TABLE OF CONTENTS

1.	Introduction.....	1
2.	Resource Description.....	3
2.1	Historical Fisheries	3
2.2	Current Fisheries.....	4
2.2.1	Atlantic Salmon	4
2.2.2	American Shad, Alewife and Blueback Herring.....	5
2.2.3	American Eel	6
2.2.4	Other Anadromous Species.....	8
3.	Management Goals	8
3.1	Published Plans	8
3.2	Restoration Objectives	9
4.	Statutory Authority.....	9
5.	Procedural Background	10
5.1	Initial Consultation Document.....	10
5.2	Draft License Application.....	10
5.3	Additional Information Requests	11
5.4	Commission Notice of Applications Ready for Environmental Analysis	11
5.5	Applicant's Response to the Preliminary Fishway Prescription.....	11
5.6	Petition for TTH and submission of an AFP.....	12
6.	Administrative Record	12
7.	Alternatives Considered.....	12
8.	Response to Public Comments	15
9.	Reservation of Authority to Prescribe Fishways.....	15
10.	Prescription for Fishways.....	15
10.1	General Prescriptions for the Merrimack River Projects.....	16
10.2	Specific Prescriptions for the Merrimack River Projects.....	19
10.2.1	Amoskeag Development.....	19
10.2.2	Hooksett Development.....	23
10.2.3	Garvins Falls Development.....	26

**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 (Department) hereby submits its Prescription for Fishways for the Merrimack River Project¹ (Project), pursuant to Section 18 of the Federal Power Act, as amended. The Department is submitting this Decision Document to the Federal Energy Regulatory Commission. The Department's supporting Administrative Record for this prescription was filed with the Commission on July 12, 2006.

The Department developed its Prescription 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 (Service) and the New Hampshire Fish and Game Department (NHFGD), as well as the applicant, Public Service of New Hampshire (PSNH), and the American Whitewater Affiliation.

During the development of the Prescription for Fishways for the Project, the procedures for prescribing fishways under Section 18 of the Federal Power Act were modified by provisions of the Energy Policy Act of 2005 (EPAAct).² The Department's Preliminary Fishway Prescription (PFP) was submitted under provisions of the Policy for Review of Mandatory Conditions Developed by the Departments of the Interior and Commerce in the Context of Hydropower Licensing (MCRP).³ Pursuant to this process, the Department solicited comments on its PFP and would have addressed them in this Prescription for Fishways. The EPAAct, however, required the Department to develop new regulations and procedures for fishway prescriptions. These regulations afford two new rights to participants in any licensing proceeding in which the Department exercises its mandatory authority under the Federal Power Act: an opportunity for Trial-Type Hearing (TTH) on material issues of disputed fact, and an opportunity to file Alternative Fishway Prescriptions (AFP) for consideration by the Department. The TTH offers applicants the opportunity to challenge material facts that the Department relied on for its PFP, while the AFP provides applicants the opportunity to propose an alternative to the Department's PFP.

¹ The Merrimack River Project includes the Amoskeag, Hooksett and Garvins Falls Dams and hydroelectric generating stations.

² Pub. L. No. 109-58 (2005).

³ Policy for Review of Mandatory Conditions Developed by the Departments of the Interior and Commerce in the Context of Hydropower Licensing, January 18, 2001.

The Department submitted its PFP by letter dated May 13, 2005. PSNH submitted comments on the PFP by letter dated July 15, 2005. The Department's regulations, issued November 17, 2005, allowed participants in ongoing licensing proceedings to avail themselves of their rights under the EPAct until December 19, 2005. PSNH timely raised concerns similar to those presented in its comments in a petition for a TTH and AFP, filed on December 19, 2005. On August 25, 2006, the Service and PSNH signed a Settlement Agreement (SA) resolving the TTH dispute and agreeing to terms of this Prescription for Fishways. Subsequently, on August 28, 2006, PSNH submitted a motion for dismissal of the TTH with the Department's Office of Hearings and Appeals and withdrew its AFP.

As PSNH's July 15, 2005 letter was submitted under the old MCRP process, and ultimately, issues of disagreement on the prescription were resolved with the August 25, 2006 Settlement Agreement (SA), we will treat the issues raised in that letter as resolved under the same process resolving the petition for TTH and the AFP. Accordingly, those comments are not specifically addressed herein. No comments were received from any other party.

This Prescription for Fishways covers the three developments that make up the project: Amoskeag, Hooksett and Garvins Falls, all three of which utilize existing dams and powerhouses. All three developments currently operate in a daily store-and-release/peaking mode, though the Hooksett development has limited daily storage capacity and therefore largely operates in a run-of-river mode.

The three developments have a combined generating capacity of 29.7 MW. The three project dams are located in succession on the river, with Amoskeag the most-downstream dam and Garvins Falls the most upstream of the project developments. There is an existing pool-and-weir upstream fishway and a temporary American eel trap at the Amoskeag tailrace but no other upstream passage measures at the other project dams. All three project dams have downstream fish bypasses which range from a simple fish bypass gate at Hooksett to a state-of-the-art louver system at Garvins Falls. The effectiveness of the upstream and downstream fish passage facilities for all species has not yet been established. Additional information on the project and their operation is included in PSNH's license application and supporting documents and in the Commission's Environmental Assessment for the Project, dated January 2006 (EA).⁴

Two dams—the Essex or Lawrence Dam, site of the Lawrence Project (FERC No. 2800) and the Pawtucket Dam or Lowell Dam, site of the Lowell Project, (FERC No. 2790)—are located downstream from Amoskeag. Both dams have existing upstream and downstream fishways, although passage efficiency of the Lowell fish lift is a concern and is currently being investigated.

⁴ FERC (Federal Energy Regulatory Commission). 2005. Environmental Assessment for Hydropower License, Merrimack River Project, FERC Project No. 1893-042. January 2006.

As discussed below in greater detail, the Department's Prescription for Fishways focuses on the need for eel passage, evaluations of existing downstream fishways and future upstream passage needs at the Hooksett and Garvins Falls developments. The Department's Prescription for Fishways will ensure that fish passage is provided at the three project developments in a safe, timely and effective manner.

2. Resource Description

The Merrimack River is located in central New Hampshire and northeastern Massachusetts and drains an area of approximately 5,014 square miles. As such, it is the second largest river in New England. The Merrimack is formed by the confluence of the Pemigewasset and Winnepesaukee Rivers in Franklin, New Hampshire and flows 116 miles southeast to its mouth in the Gulf of Maine in Newburyport, Massachusetts (Application, p. E-1).

The Merrimack River has a long industrial history. The river was utilized for transportation and diverted for industrial use in the early 1800s. The first complete barrier dam on the river was built at Amoskeag Falls in the 1830s and the Essex/Lawrence Dam was completed in 1847. There are currently five dams on the mainstem Merrimack, including the three Merrimack River Project dams.

Water quality in the river is generally good, and is classified as Class B waters by the State of New Hampshire. Additional background information on the Merrimack River can be found in the license application and the Commission's EA.

2.1 Historical Fisheries

The Merrimack River historically supported populations of anadromous Atlantic salmon, American shad, alewife and blueback herring that extended to the upper Merrimack River Basin. (License Application p. E-38). Atlantic salmon historically occurred in the Merrimack River until the mid-1800s when construction of impassable dams extirpated the population from the Merrimack. Shad and herring populations also declined largely from the construction of impassable barrier dams on the mainstem Merrimack and tributaries (Strategic Plan p. 18).

American eel were also present in the Merrimack River watershed, although information of historical population abundance and distribution is limited.

2.2 Current Fisheries

The Merrimack River supports a mixture of riverine, as well as anadromous⁵ and catadromous⁶ fish species. Migratory fish occurring in or near the Merrimack River estuary include American shad, alewife and blueback herring (collectively referred to as river herring), Atlantic salmon, shortnose sturgeon, striped bass and American eel. However, anadromous species are currently limited in distribution to below the Hooksett Dam, although some river herring have been observed passing the Hooksett Dam under some flow conditions.⁷

A fish lift was installed and began operating at the Lawrence Project in 1983. A similar fish lift at the powerhouse and a vertical slot fishway at the spillway were installed at the Lowell Project in 1986. Anadromous species and some riverine species have been recorded passing these facilities, although efficiency of the facilities is uncertain. In 1995, the Lawrence lift system was modified to improve passage effectiveness and resulted in improved passage (Strategic Plan, p. 57). Similar modifications were made at the Lowell Project, but the numbers of shad or herring that have been recorded passing Lowell since that time have been limited. In 2002, the Service's Central New England Fishery Resources Office conducted a study of shad migration and passage at the Lowell Project and found only 6% of radiotagged shad tagged at Lawrence passed the Lowell fish lift. This passage efficiency was similar to the overall percentage of shad that passed Lawrence and then passed Lowell that year of 10% (Sprankle 2004). Efforts to evaluate the causes of poor passage efficiency and to investigate ways to improve passage have been ongoing with ENEL Energy, the project owner. However, abnormally high flows during the spring passage seasons in 2005 and 2006 have prevented adequate assessment.

A variety of riverine fish species exist in the project waters, including indigenous (blacknose dace, white sucker, yellow perch and fallfish) and introduced (largemouth bass, smallmouth bass, walleye and bluegill) species (License application at Table E-4).

2.2.1 Atlantic Salmon

Atlantic salmon restoration on the Merrimack began in 1963 with a survey of basin habitat by NHFGD and in 1969, a formal cooperative was established among NHFGD, the Massachusetts Division of Fisheries and Wildlife, and the Bureau of Sport Fisheries and Wildlife (now the Service) and Bureau of Commercial Fisheries (now NOAA Fisheries). The U.S. Forest Service joined the cooperative in 1982. The program is managed by the Policy Committee for Anadromous Fishery Management (Policy Committee) of the Merrimack River and Technical Committee for Anadromous Fishery Management of the Merrimack River (Technical

⁵ Anadromous fish begin their life cycle in freshwater, migrate to sea where they grow to maturity over one or more years, and return to their natal rivers, streams, lakes or ponds to spawn.

⁶ Catadromous fish begin their life cycle at sea, migrate to freshwater to grow to maturity over a several-year period, and return to sea to spawn and die.

⁷ Letter dated July 15, 2005 from Catherine E. Sively, PSNH, to Secretary, FERC.

Committee). Restoration activities have included stocking of hatchery-reared salmon smolts and fry, habitat assessment and assessment of production. The Service and other member agencies worked with the Policy and Technical Committees to achieve upstream and downstream fish passage at hydro projects in the basin.

Atlantic salmon fry and smolts are stocked into the Merrimack River and its tributaries as part of the restoration program. Since 1975, approximately 20 million fry have been stocked in basin tributaries. Currently, approximately 1.4 million salmon fry are stocked annually. Of these, approximately 85% of these are stocked upstream from the project dams. Salmon smolts have also been an integral part of the restoration plan, though all salmon smolts are stocked downstream from the project below the Essex Dam in Lawrence.

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 into the open ocean by juvenile smolts and adults. Due to its anadromous life history, salmon must obtain safe and unrestricted access to their natal streams and the young must reach the ocean to successfully sustain local populations. The existing downstream bypasses at the project dams have largely been proven to be reasonably effective in safely passing salmon smolts downstream past the project turbines. Review of existing data and possibly additional evaluations on plunge pool conditions at Amoskeag are necessary, however, to assure safely bypassed smolts and post-spawned adult salmon are not injured when using the bypass gate.

Based on the current Strategic Plan, all returning adult salmon are transported to a hatchery to be spawned artificially, or will be transported to the Pemigewasset River upstream from the project.

2.2.2 American Shad, Alewife and Blueback Herring

Like salmon, American shad, blueback herring and alewife (collectively river herring) are managed by the Policy and Technical Committees. Prior to the start of the restoration program to restore these species, a limited population of American shad and river herring still inhabited the lower Merrimack downstream from the Lawrence Dam.

Habitat for shad and river herring exists in both the mainstem Merrimack and in major tributaries both upstream and downstream from the project. In total, there are 187,600 100 square yard units of shad habitat upstream of the project, which accounts for 44% of the estimated total habitat for the basin (USFWS 1982). The principal spawning habitat for alewives is likely to be in more ponded areas on tributaries, while blueback herring utilize more riverine habitat for spawning.

Management efforts to restore these species have included stocking of pre-spawned adult shad and herring into mainstem and tributary habitat, mostly upstream from the project. These efforts have yielded a range of results. Since the start of fish passage operations at Lawrence Dam, shad passage numbers have increased from approximately 5,500 in 1983 and 1984 to as high as 76,717 in 2001 (USFWS 2006). Shad totals in 2005 and 2006 have been severely suppressed by high spring flows that render the Lawrence fishway inefficient in passing fish. River herring passage totals have been variable, with as many as 387,970 herring passing Lawrence in 1989, but as few as 51 passing in 1996. The cause of such variation is thought to be a variety of biological and possible harvest issues in the ocean, predation by striped bass and other abundant predators offshore and in the river, and poor passage conditions, especially for alewives at Lawrence in early spring.

Like salmon, juveniles and post-spawned adults must migrate downstream to the sea. As such, downstream passage for these species/life stages is needed. The existing downstream bypass facilities may provide effective downstream passage for shad and herring, but they have not been fully evaluated. Such evaluations of effectiveness are needed.

2.2.3 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. The Sargasso Sea is situated in the Atlantic Ocean, northeast of the Bahamas. 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. Migrations to upriver tributaries may continue for many months or years, and generally coincide 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.⁸

⁸ ASMFC (Atlantic States Marine Fisheries Commission). 2000. Interstate Fishery Management Plan for American Eel (*Anguilla rostrata*). Fishery Management Report No. 36 of the Atlantic State Marine Fisheries Commission. 92 pp.

As sexual maturity begins, yellow eels metamorphose 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 generally starts for the silver eels with the onset of the fall rainy season and escalates until colder temperatures begin.⁸

Throughout the Atlantic seaboard, American eels traditionally have been used for regional and ethnic 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.⁸

The Merrimack River currently supports a population of maturing American eel, although the size of the historic or current eel population is unknown. Large numbers of eels were known to have migrated downstream from Lake Winnepesaukee, upstream of the project, in the 1980s, when large numbers were found killed by passage through hydroelectric turbines at the Lakeport Project (FERC No. 6440).⁹ More recently, mortality of adult eels at the same project were noted, demonstrating that at least some eels continue to inhabit this lake well upstream from the river mouth.⁹

There are no current estimates of eel populations in the Merrimack Basin. A study of eel abundance conducted by the Service in 2001 and 2002 found large numbers of eels downstream from the Lawrence Dam but limited numbers upstream from Lawrence due to lack of upstream passage facilities at Lawrence and Lowell Dams (Sprankle 2002).

Declines in the American eel population in the Merrimack River and elsewhere are attributed to a combination of causes, including commercial harvest, pollution, changes in oceanic currents, and the negative effects of dams and hydropower facilities.¹⁰ More specifically, hydropower facilities block or restrict migration routes into freshwater rearing habitats, and cause mortality to eels both during their residency in freshwater and as they migrate back to the Sargasso Sea. Passage through multiple hydropower turbines, as is the case on the Merrimack River, often results in significant cumulative mortality of eels.

⁹ Letter from the New Hampshire Department of Fish and Game to Hydro Dynamics Corporation. August 29, 1988.

¹⁰ Haro, A., W. Richkus, K. Whaler, A. Hoar, W.D. Busch, S. Lary and D. Dixon. 2000. Population Decline of the American Eel: Implications for Research and Management. Fisheries Vol. 25, No. 9, pp. 7-16.

The Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan for American Eel contains the following goal:

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

Improvements in upstream passage at dams on the Merrimack and tributaries will enhance the abundance of eels in the basin, consistent with regional fishery management goals. There are no downstream passage measures for eels currently in place at any mainstem Merrimack River dams. It is possible that the existing downstream passage facilities designed for anadromous species may pass outmigrating eels, however, these facilities are not designed for demersal species like eel and are untested. If, after evaluation, these facilities do not prove to be effective, additional physical structures or modifications to project operations will likely be needed to provide for safe, timely and effective passage for sexually maturing eels that are migrating downstream to the ocean.

2.2.4 Other anadromous species

Other species of anadromous fish that are present in the lower Merrimack River below Essex Dam include shortnose sturgeon and striped bass. Shortnose sturgeon have not been recorded upstream of the Lawrence Project. Small striped bass have been known to pass upstream in limited numbers using the fish lifts at the Lawrence and Lowell Projects. No striped bass are known to have passed Amoskeag using the existing fishway.

3. Management Goals

3.1 Published Plans

A number of published state, federal and regional fishery plans contain management goals that pertain to the Merrimack River. These plans include:

Strategic Plan and Status Review – Anadromous Fish Restoration Program – Merrimack River. 1997. Technical Committee for Anadromous Fishery Management of the Merrimack River Basin.

Fishery Management Plan for the American Shad and River Herring. 1985. Atlantic States Marine Fisheries Commission (amended in 1998).

Interstate Fishery Management Plan for American Eel. April 2000. Atlantic States Marine Fisheries Commission.

3.2 Restoration Objectives

The Strategic Plan and Status Review – Anadromous Fish Restoration Program – Merrimack River has three broad strategies: (1) implement a watershed approach to anadromous fish restoration; (2) develop partnerships to achieve restoration; and (3) implement education and outreach to promote anadromous fish restoration. Specific final target fish restoration goals are not included in the Strategic Plan. However, interim objectives of 300 or more Atlantic salmon adults, 35,000 adult shad, and 300,000 river herring past at the Lawrence Project have been established. Also, strategy 1.A.2 of the Plan relates to improvement of upstream and downstream fish passage for salmon, shad and river herring.

In 1986, a Comprehensive Plan for Provision of Anadromous Fish Passage Measures and Facilities at PSNH's Merrimack-Pemigewasett River Hydroelectric Dams, FERC Projects 1893, 2456, and 2457 was developed by the Policy and Technical Committees and PSNH. The Merrimack River Basin Fish Passage Action Plan for Anadromous Fish (Appendix to Strategic Plan), which guides passage actions at PSNH's project and other hydroelectric projects, incorporated the provisions of the 1986 Plan as they relate to upstream passage at PSNH's projects. The Action Plan called for operational upstream passage facilities for anadromous species at Hooksett and Garvins Falls Dams within five years after passage of 15,000 shad at Amoskeag and Hooksett Dams respectively. The Plan did not address passage for river herring or American eel. As such, the Plan for implementing passage at the Merrimack River Project needs to be revised. As part of this relicensing, the trigger numbers for implementing passage were reviewed and new triggers were developed for shad, river herring and eels (see PFP).

4. Statutory Authority

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

the Commission shall require the construction, maintenance and operation by a licensee at its own expense of...such fishways as may be prescribed by the Secretary of Commerce or the Secretary of 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 Fishways 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 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

The Department, through the Service, has been actively involved in the evaluation of fish and wildlife issues at the project since before the current license was issued in 1980. In 1979, the Service's Regional Engineering Office fishway engineer developed conceptual designs for future fish passage facilities at the project developments. Involvement in the project continued through the 1980s with negotiations and planning for fishway construction at Amoskeag in 1988. Subsequent to fishway construction, the Service continued consultation with PSNH on studies of and implementation of upstream and downstream passage measures at the project developments through the start of the current relicensing proceeding. The Department, through both the Service and the National Park Service, has been involved in all aspects of the current licensing proceeding since its commencement in 2001.

5.1 Initial Consultation Document

The Service provided comments on PSNH's Initial Consultation Document (ICD) by letter dated March 15, 2002. Those comments noted the impacts to fishery resources related to incomplete and untested fish passage facilities, project operation regime and diversion of flows from bypassed reaches, and recommended studies to assess adverse effects and develop mitigation. Fishway issues identified in the ICD included:

- Impacts of project-induced flow fluctuations on upstream movements and passage by American shad
- Need to evaluate the effectiveness of the Amoskeag fish ladder
- Need for upstream passage of American eel
- Need to address resident fish passage
- Need for future upstream fishways at Hooksett and Garvins Falls Dams
- Completion of salmon smolt downstream passage evaluations
- Downstream bypass evaluations for shad, river herring and American eel

The ICD comments also indicated the likelihood that the Service would, through the Department, prescribe fishways for the project pursuant to Section 18 of the Federal Power Act.

5.2 Draft License Application

The Service's comments on the draft license application (DLA), dated November 12, 2003, again indicated that a Fishway Prescription for the project would likely be issued by the Service. The DLA comments discussed many of the same issues identified in the ICD comments, noting that future upstream fishways at Hooksett and Garvins Falls, plans to evaluate upstream passage for

anadromous species and eels at Amoskeag, and downstream passage evaluations needed to be addressed in the final license application.

The DLA comments noted that the proposed conversion of the project to run-of-river operations would resolve the issue of the impacts that flow fluctuations have on fish migration and passage.

5.3 Additional Information Requests

On February 26, 2004, the Service provided comments in response to the Commission's Notice of Application Tendered for Filing with the Commission, Soliciting Additional Study Requests and Establishing a Schedule for Relicensing and a Deadline for Submission of Final Amendments. In that filing, the Service identified the need for PSNH to complete ongoing downstream passage evaluations and identified the need for PSNH to develop conceptual design drawings for eelways and future fishways at Hooksett and Garvins Falls.

5.4 Commission Notice of Applications Ready for Environmental Analysis

In its May 13, 2005 comments on the Commission's March 17, 2005 Notice of Applications REA and Soliciting Comments, Recommendations, Terms and Conditions, and Prescriptions, the Department reviewed project impacts and submitted the Service's Section 10(j) recommendations for the protection, mitigation of damages to, and enhancement of fish and wildlife resources.

The Department's May 13, 2005 comments also included the PFP. This document was prepared consistent with the Department's MCRP, and provided justification for fishways at the project, based on existing and developing plans for fish restoration. The PFP also provided estimates of design populations based on available information, a preliminary description of the types of facilities and project operations that would be needed for safe and effective fish passage at each of the project dams, and the triggers for installing upstream passage at Hooksett and Garvins Falls, based on the numbers of shad or herring passing the Amoskeag fishway. The PFP stated that future fishways would be designed in consultation with PSNH and other agencies and would be based on all available information at that time.

5.5 Applicant's Response to the Preliminary Fishway Prescription

By letter dated July 15, 2005, PSNH submitted comments on the Service's PFP in accordance with the existing MCRP rules that were in place at that time. In their comments, PSNH questioned the need for fishways at this time, the triggers for future fishway construction, the need to evaluate downstream fishways, the basis for the proposed rock-ramp fishway and cost-effectiveness of such a facility, and the timing of upstream eel migrations and downstream clupeid migrations.

5.6 Petition for TTH and submission of an AFP

PSNH filed a Petition for TTH and submitted an AFP on December 19, 2005. The Petition for a TTH raised questions similar to those in the July 15, 2005 comments on the PFP regarding the development of the Service's PFP. The AFP included PSNH's proposed alternative provisions to those in the PFP.

On August 25, 2006, PSNH and the Service signed an SA that resolved disputes regarding the provisions of the prescription. The SA includes language to be included in this Modified Fishway Prescription. In light of the SA on the fishway provisions, PSNH submitted a Motion for dismissal of their Petition for TTH and withdrew its AFP on August 28, 2006.

6. Administrative Record

Evidence to support the Department's Prescription for Fishways is contained in the Administrative Record before the Commission, filed on July 12, 2006.

7. Alternatives Considered

In the formulation of this Prescription, the Department has reviewed and considered a variety of alternative fish passage options, including the alternatives proposed in the Commission's DEIS and in comments provided by the applicant.

- a. PSNH (applicant): PSNH proposed an AFP. However, the SA between PSNH and the Service resolves the terms of this Prescription and the AFP has been withdrawn.
- b. Commission Environmental Assessment: The Commission's EA recommends a number of fishways, but does not adopt what the Department provided in its PFP.

Regarding new upstream passage facilities at Hooksett and Garvins Falls, the EA endorses the benefit that these fishways would provide in the future. The EA also generally supports the technical soundness of the proposed rock-ramp fishway at Hooksett and fish lift and Denil fishway at Garvins Falls, and acknowledges that the Department would, in the future, rely on the best available data to determine the best fishway to be installed at these dams in the future. The EA does not, however, support the proposed triggers for construction of these fishways based on the numbers of fish passed at Amoskeag, or the construction schedule for such facilities once the trigger number is reached. Instead, the EA supports the higher 1986 Comprehensive Fish Passage Plan shad trigger number and more extended construction schedules.

Regarding downstream passage effectiveness testing for shad and herring, the EA endorses the need for such evaluations, but states that such studies should not be done with test fish collected outside the project area.

Regarding eel passage, the EA endorses the need for installing upstream eelways and the benefit of evaluating eel downstream passage at the existing downstream passage facilities at each dam.

Notwithstanding the endorsements in principle of the major components of the PFP, the EA concludes by questioning why the Department did not just request a reservation of authority to prescribe fishways in the future.

- Discussion: The Commission staff's EA addresses the fish passage issues raised by the Department, and on some issues agrees with the proposals in the PFP. Regarding the installation of future upstream fishways and evaluation of existing downstream fishways for anadromous fish, however, the EA suggests that the Department should reserve authority to prescribe fishways in the future. If this alternative were adopted, no specific designs or specific schedules or triggers for passage implementation would be mandated, leaving these issues to be raised in a future proceeding.

This Prescription includes triggers for installing upstream passage for anadromous fish at Hooksett and Garvins Falls, based on the numbers of shad and/or river herring that pass the next downstream facility. These triggers are based on production capacity of habitat in each river reach in the project area. It is uncertain when the prescribed triggers will be reached, but populations should increase given the substantial available habitat (USFWS 1982), stocking upstream habitat with shad and herring as part of the restoration program (USFWS 1995), and ongoing efforts to improve passage at the Lowell Project.

Given that passage numbers above Amoskeag have been limited to date and have not reached the proposed trigger numbers, upstream fishways for anadromous fish would not be immediately required under the terms in the PFP. Prescribed designs, while justifiable given the state of knowledge on fishways at this time, could change in the future. If so, the Prescription includes provisions to make design changes as appropriate.

However, these facts do not outweigh the benefits of having specific designs identified or a definitive trigger for fishway construction which would expedite fishway construction when needed without further Fishway Prescription proceedings.

Under the provisions of the PFP, PSNH will be required to file downstream passage evaluation plans and schedules. As such, the downstream passage evaluations would not necessarily be implemented now. However, we cannot concur with the EA that the evaluation of these facilities requires there to be "enough naturally occurring clupeids" in the river. This conclusion appears to be based on the misconception that previous attempts at clupeid downstream passage evaluations were unsuccessful because the test fish used in the study were collected elsewhere and transported to the test site. This is not correct. While collections of clupeids from other locations and transportation to a test site can be time consuming and the numbers collected can be uncertain, the listed studies did not fail for these reasons. The Amoskeag evaluation failed

because the recapture net device was improperly designed to handle the flow and debris load encountered at the site. Similarly, the Garvins Falls evaluation was inconclusive due to heavy debris load in the recapture net and along the canal louver array.

Since the restoration of shad and herring into the Merrimack utilizes transfers of these species from downstream or from other river systems to areas upstream from the project, evaluation of downstream passage is needed for these fish, and such stocking programs can provide and have provided enough fish for evaluations in the past.

Given the need to evaluate clupeid downstream passage and benefits of requiring definitive upstream fishway designs and schedules in the license, the Department did not select the Commission staff's alternative for fish passage at the Merrimack River Project as described in the EA.

c. Preliminary Fishway Prescription Alternative: The PFP provided general fishway terms, including operations schedules, and specific designs and schedules for upstream fishway construction for anadromous fish, schedules for upstream eel fishway construction, and requirements for evaluation of existing downstream fishways and existing and new upstream fishways. Based on review of available information, comments from PSNH in their July 15, 2005 letter, their petition for TTH and their AFP, and discussions and negotiations on the SA, we agreed to modifications to the PFP. These modifications include changing the requirement for a rock-ramp fishway to a Denil fishway at Hooksett, flexibility in fishway design at Garvins Falls, scheduling of the construction of eelways, and flexibility in scheduling of fishway evaluations.

d. Department's Proposed Alternative: The Department considered the various alternatives described above in formulating its Prescription for Fishways for the Merrimack River Project. A "No Action" alternative, representing no improvements in fish passage at any of the five projects also was considered. The "No Action" alternative was dismissed from further analysis because it would not help accomplish fish restoration goals identified by the resource agencies, as described in this Prescription.

The basis for the Department's Prescription for Fishways is: (a) the need for evaluation of existing downstream fishways ; and (b) the need to implement upstream eelways at each of the three project dams, in a sequential manner, giving time to evaluate ideal eel fishway location before final facilities are built; (c)) the need for specified fishway designs; and (d) the need for a definitive schedule or trigger for future upstream passage implementation at Hooksett and Garvins Falls.

The Department's Prescription for Fishways is based on the SA signed between the Service and PSNH which includes changes from our PFP. The most significant changes were to the prescribed upstream fishway designs at Hooksett and Garvins Falls. For Hooksett, the PFP included a provision for installing a rock-ramp fishway based on the ability of such a fishway to operate at various pond levels and utilize varying spill amounts in its design, pass large numbers of fish, and our analysis that such a fishway would be less expensive to construct than a Denil

fishway, another alternative we considered. PSNH was concerned that a rock-ramp fishway was experimental and would, in fact, cost more than a Denil fishway. Since Denil fishways have successfully passed large numbers of clupeids at other projects, we can accept this design in lieu of the rock-ramp. The Prescription was, therefore, modified to require a Denil fishway.

At Garvins Falls, the PFP included a provision for simultaneous construction of a fish lift at the tailrace and a Denil ladder at the spillway. PSNH proposed instead that a preliminary study could determine the best location for a fishway and that it may be possible to manipulate project operations to assure that fish find a single fishway. This alternative is reasonable and would still assure that an effective fishway is constructed in a timely manner. The Reservation of Authority will permit future construction of a second fishway if the capacity or effectiveness of the constructed fishway proves to be inadequate.

Other changes from the PFP relate to eel fishway construction timing. The Service and PSNH jointly reviewed the timing of preliminary eel investigations, interim eelway installation, interim eelway evaluations, permanent eelway designing and permanent eelway construction. This analysis led to the definitive schedule for interim and permanent eelway installation in this Prescription versus an unspecified implementation schedule in the PFP.

8. Response to Public Comments

Other than the comments submitted by PSNH dated July 15, 2005 and the AFP discussed above, the Department has received no comments on its PFP.

9. Reservation of Authority to Prescribe Fishways

In order to allow for the timely implementation of fishways, including effectiveness measures, the Department requests that the Commission include the following condition in any license(s) it may issue for the Merrimack River Project:

Authority is hereby reserved to the Commission to require the licensee to construct, operate, and maintain such fishways as may be prescribed during the term of this license by the Secretary of the Interior pursuant to Section 18 of the Federal Power Act.

10. Prescription for Fishways

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

10.1 General Prescriptions for the Merrimack River Projects

To ensure the immediate and timely contribution of the fishways to the ongoing and planned anadromous and catadromous fish restoration and enhancement program in the Merrimack River, the following 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 (Pub. L. 102-486, Title XVII, 106 Stat. 3008), and the Energy Policy Act of 2005 (Pub. L. 109-58)

a. Fishways shall be constructed, operated, and maintained to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife and American eels at the licensee's expense.

b. Design populations

The total number of returning fish reaching the project during the term of the new license will depend on a number of factors, including overall stock recruitment of fish populations undergoing restoration. Overall fishway efficiency and cumulative losses of fish attempting to use upstream and downstream fish passage facilities also will affect the total potential restored run of shad, river herring, salmon and eels.

(1) Shad and river herring:

The Merrimack River Basin includes over 430,000 100 yard units of habitat for American shad (USFWS 1982) or about 9,000 acres of habitat. This habitat has the potential to support a shad population approaching 1 million shad and 2.5 million river herring. Of this, 44% of the habitat is upstream from the project, yielding substantial returns of fish upstream from the project. However, reaching this population size would depend on at sea conditions for growth and survival, ocean harvest, effective fish passage facilities at all dams and normal river flows during the passage season.

As restoration potential is realized, passage facilities at project dams would need to pass substantial numbers of fish. However, a more immediate need is to provide shad and herring access to currently unavailable habitat. Therefore, while the prescribed facilities will pass significant numbers of shad and herring, expansion of these facilities may be needed in the future if prescribed facilities cannot pass all returning fish as full restoration potential is realized.

(2) Atlantic salmon:

Adult Atlantic salmon returning to the Merrimack River are all trapped at the Lawrence Dam fishway and either transported to the Nashua National Fish Hatchery for spawning and egg collection or are transported to the Pemigewasset River for natural spawning. Therefore, only in very rare instances are adult salmon expected to reach the project dams. Regardless, even if salmon were permitted to freely migrate upstream, runs of salmon will not be large enough to affect the design of fishways at any of the project dams. The more numerous species (shad and

river herring) typically determine the kind of fish passage that should be built at a hydroelectric project.

(3) American eel:

American eels are currently present in the area occupied by the three project developments, although problems with upstream migration past the downstream dams and the lack of upstream passage at the project dams restrict the numbers of eels in the project area or areas upstream from the project. While the Department does not have a precise estimate of the numbers of eels that would be expected to use fish passage at the project developments, upstream and downstream passage would enhance the eel stocks and help achieve overall management goals. In addition, upstream passage needs for eels differ from those of salmon, shad, and river herring. Separate upstream eel fishways typically are installed at barriers in addition to those that are provided for anadromous fish.

(4) Other species:

Fish passage facilities provided at the project dams would also be used by white sucker, trout, and other riverine species. The numbers of riverine fish using the fishways are, however, likely to be small, relative to anadromous and catadromous species.

c. Upstream fishways at Amoskeag shall be operational during the designated migration period at river flows up to 19,400 cfs as measured at the USGS gage at Goffs Falls (#01092000). Fishways at Hooksett and Garvins Falls shall be operational at river flows of up to 19,000 and 17,000 cfs respectively, based on the Goffs Falls gage prorated as appropriate for drainage area differences between the gage location and these dams. Downstream fishways shall be operated during the designated migration periods whenever turbines are operated at the three project developments.

d. Scheduling

The timing of installation of upstream fish passage at Hooksett and Garvins Falls will be based upon the growth of migratory and riverine fish populations in the Merrimack River. American eels are currently present in the river, and would benefit from the immediate implementation of safe, timely, and effective upstream and downstream eel fishways. The Commission's EA also recommends permanent upstream eel fishways at all three developments.

A fishway must be installed at Hooksett Dam within three years after 9,500 shad or 22,500 river herring pass Amoskeag. A fishway at Garvins Falls must be installed within three years after passage of 9,800 shad or 23,200 river herring at Hooksett Dam, or passage of 19,300 shad or 45,800 herring at Amoskeag Dam if the Hooksett fishway design does not permit counting of

fish.

Installation of eelways now at all three dams would be a benefit to the species. However, proper eelway construction at the Amoskeag spillway and at Garvins Falls will require some initial study to assess proper eelway location. At all three dams, assessment of eelway location and design using interim eelways will also be needed prior to permanent eelway installation. Interim eelways shall be fully operational at Hooksett during the second spring/summer period after licensing, and at the Amoskeag spillway and at Garvins Falls within three spring/summer periods after license issuance. Following assessment and design, permanent eelways shall be installed and operational by the spring/summer of 2012.

e. The timely installation of the prescribed fishway structures, facilities, or devices is a measure directly related to those 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 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 American shad, river herring, American eel and white sucker:

Upstream passage:	April 1 to July 15	All species except American eel
	April 1 to Nov. 15	American eel
Downstream passage:	April 1 to June 15	Atlantic salmon
	June 1 to July 15	Spent adults of all species
	Sept. 15 to Nov. 15	Adult eel; juvenile shad & herring

Upon mutual agreement, the Licensee and the Service may modify the above schedules in the event that upstream or downstream passage of fish has not yet begun, migration has substantially declined, or operating conditions (i.e. high flows, drought) or other conditions make continued operation of the fishways unnecessary or inappropriate under the circumstances. If monitoring

indicates that these dates should be permanently adjusted, the Service shall use its reservation of authority to modify the operating schedule.

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.

h. Evaluation of Fish Passage Facilities

The licensee shall develop plans for and conduct fishway effectiveness evaluations on all prescribed fish passage, in consultation with the Service and other fishery agencies. For each fishway to be constructed, the plans for fishway effectiveness evaluations shall be submitted to the Service for final review and approval simultaneously with the construction plans and schedule for each fishway. Each plan shall include proposed evaluation methods, and schedules for conducting the study and providing the results to the Service and the Commission. If the Service and the licensee cannot agree on the evaluation plan, the licensee shall submit the proposed plan to the Commission for approval, including all comments received from the Service.

i. The licensee shall provide personnel of the 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 the Service, all functional and final design plans, construction schedules, and any hydraulic model studies for the fishways or modifications to existing fishways described herein.

10.2 Specific Prescriptions for the Merrimack River Projects

10.2.1 Amoskeag

a. The licensee shall operate the existing tailrace pool-and-weir fish ladder according to the upstream passage operation schedule (Section 10.1 f).

Justification - Fish passage facilities must be operated throughout the period that target species of anadromous, catadromous and resident fish are migrating. The specified operation dates are intended to encompass the full extent of the passage seasons for respective fish species and life stages and are based on known information regarding run timing on the Merrimack and other New England rivers. The identified operation dates are consistent with the operation dates of the downstream Lawrence (FERC Project No. 2800) and Lowell (FERC Project No. 2790)

hydroelectric projects. As noted in Section 10.1 f, exact operation dates in any given year can be adjusted depending on the timing of fish migrations in that year.

b. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule (Section 10.1 f).

Justification - See Section 10.2.1, prescription item a above.

c. The licensee shall evaluate the effectiveness of the existing upstream tailrace fishway in passing American shad and river herring that reach the project. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation between the licensee and the Service, any modifications to the fishways or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications to the fishways or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The tailrace pool-and-weir fishway was completed in 1988 and has operated each year since then. Over those years, relatively few American shad have successfully passed the fishway and river herring passage has varied widely. For both species, the number of fish that could reach Amoskeag varies year to year and is based on the numbers of returning adults to the river and the success these fish have in passing the Lawrence and Lowell fishways downstream. However, the effectiveness of the Amoskeag tailrace fishway in passing those fish trying to move upstream is unknown. Preliminary evaluation of the facility in 2002 and 2003 suggests that the fishway is not passing all shad attempting to migrate upstream. A complete evaluation of the fishway is needed to assure its effective in passing fish or to identify measures to improve effectiveness. Plans for such an evaluation and a schedule for its completion are needed.

d. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed

methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Amoskeag is a 10-foot-wide modified crest gate located on the west end of the spillway adjacent to the powerhouse intakes. Based on evaluations done in 2001 and 2004, this facility has proven to be reasonably effective in bypassing downstream migrating Atlantic salmon smolts at a gate discharge of 125 cfs and with the hydro units dispatched such that Unit 3 (closest to bypass) is the first-on/last-off unit and Unit 1 (far end of the powerhouse) is the last-on/first-off unit. A study in 2003 attempted to evaluate the effectiveness of this facility in passing juvenile clupeids (shad and river herring), but results were inconclusive. The effectiveness of the fishway in passing American eels has not been evaluated.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary habitat upstream from Amoskeag as part of fish restoration activities must also pass Amoskeag. The existing fish bypass, therefore, must be evaluated to assure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids and/or to identify measures that could be implemented to improve passage success.

e. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim spillway eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishways (i.e., the existing tailrace facility and the new spillway facility). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway during late spring, summer and fall periods when the pool and weir fishway is not in operation.

This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

f. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation of the permanent eel fishway(s) by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.

10.2.2 Hooksett

- a. The licensee shall operate the existing downstream fish bypass facility according to the passage operation schedule. (Section 10.1 f)

Justification - See Section 10.2.1, prescription item a above.

- b. The license shall install upstream passage facilities for anadromous fish at the Hooksett Dam, to be operational within three years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development. Within one (1) year after passage of the trigger number of fish at Amoskeag, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The permanent upstream passage facilities shall consist of (1) a 4-foot-wide Denil fishway on the west side of the project spillway, including a counting facility and measures for the provision of the necessary attraction water; or (2) an alternative design approved by the Service.

Justification - The fishery agencies' plans for restoring runs of American shad and river herring require upstream passage facilities at the Hooksett development in the future. River herring and, to a lesser extent shad, have passed the Amoskeag fish ladder in some years. Although there have been sightings of herring ascending the western side of the Hooksett spillway during years of very high herring passage at Amoskeag, successful passage is likely to occur only under very specific river flow and spill conditions. Even if some herring may pass under these conditions, the efficiency of passage is likely poor. In addition, we do not expect that shad can similarly ascend this dam at all without installation of a fishway or substantial channel and spillway modifications.

The construction of such a fishway is not warranted at this time, as in recent years, passage of herring and shad at the downstream Lawrence and Lowell Dams have been low, and subsequently few fish were counted passing Amoskeag. However, when passage numbers upstream from Amoskeag increase, construction will be warranted. To establish a criteria or trigger for such construction, we calculated the production capacity of the Amoskeag impoundment using formulas used by the Connecticut Department of Environmental Protection and the Maine Department of Marine Resources (MDMR). As described in the PFP, we selected the use of the MDMR formula given the proximity of the Merrimack to Maine rivers.

We calculated that the Amoskeag impoundment could support the production of shad and river herring that would produce a run of 47,500 shad and/or 112,800 river herring. We based our passage construction trigger on the MDMR criteria that passage at the next upstream dam be based on passage of 20% of the carrying capacity of the downstream impoundment. This criteria

permits expansion of the returning fish to substantially increased habitat in advance of intraspecific competition due to population density or reaching the carrying capacity.

As such, we have established triggers for constructing a fishway at Hooksett on passage of 9,500 or more shad or 22,500 or more river herring at Amoskeag. Construction would need to be undertaken and completed within three years after passage of the trigger number of fish. This time frame provides ample time for final designs, approval by the Service and the Commission, permitting and construction.

A standard full-size Denil fish ladder that includes provisions for operation and attraction flow discharges would meet agency objectives for safe, timely, and effective passage of anadromous fish at Hooksett. A standard Denil fishway is expected to be able to pass up to 25,000 shad or 250,000 river herring, based on the Service fishway sizing criteria,¹¹ though more or fewer fish could pass the facility depending upon run timing and duration. If the capacity of this fishway is exceeded, additional passage measures can be prescribed at that time using the Reservation of Authority.

Some of the upstream migrating fish may be attracted to discharge from the project powerhouse. Therefore, the fishway design may need to include a tailrace exclusions screen to guide fish past the powerhouse to the spillway to permit access to the fishway entrance.

c. Within nine (9) months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim eel fishway and a schedule for its installation; and 2) a proposed evaluation plan and a schedule for the evaluation of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway at Amoskeag during late spring, summer and fall periods when the pool and weir fishway is not in operation. This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

¹¹ U.S. Fish and Wildlife Service. 1986-2002. Fish Passage Facilities Design, Siting and Sizing Criteria and Standards Used in the Northeast. Northeast Region, Hadley, MA.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

d. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.

e. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Hooksett consists of a 2.5-foot-wide modified ice and trash sluice that passes a minimum of two feet of spill over the bypass gate (approximately 20 cfs discharge), located on the east side of the project spillway adjacent to the powerhouse. Based on evaluations done in 2005, all released salmon smolts passed the dam in spill. The project is generally undersized for spring flows and spills flow frequently and at substantial volume during the smolt downstream passage season. This is the likely route for

emigrating salmon smolts. PSNH is compiling data on the history of spill and river flow to verify that spill will effectively protect emigrating smolts. The effectiveness of this facility in passing juvenile clupeids (shad and river herring) or outmigrating mature American eels, however, has not been evaluated and passage of these species comes during lower flow periods.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary habitat upstream from Hooksett as part of fish restoration activities must safely pass Hooksett Dam. In addition, it is possible that limited numbers of river herring may be able to traverse Hooksett Dam via the west-side spillway under certain flow conditions. The progeny of these fish would also need safe downstream passage. The existing fish bypass, therefore, must be evaluated to assure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids or to identify measures that could be implemented to improve passage success.

10.2.3 Garvins Falls

a. The licensee shall operate the existing downstream fish bypass facility according to the

passage operation schedule (Section 10.1 f).

Justification - See Section 10.2.1, prescription item a above.

b. The license shall install upstream passage facilities at the Garvins Falls Dam for anadromous fish, to be operational within three years after the trigger number of fish is reached. The trigger number shall be:

- (1) passage of either 9,800 American shad or 23,200 river herring at the Hooksett development;
- (2) if fish passage has been constructed at the Hooksett Development without a fish counting facility, passage of either 19,300 American shad or 45,800 river herring at the Amoskeag Development.

Within one (1) year after passage of the trigger number of fish, the licensee shall file design drawings and a construction schedule for the fishway with the Service and obtain approval of the Service for any such fish passage design drawings and construction schedule. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The upstream fishway at the Garvins Falls development shall consist of either (1) an upstream fish lift located adjacent to the discharge of the older, river-side powerhouse, with an exit flume to convey fish to the headpond as depicted in Conceptual Design Drawings 19 through 24; or (2) an alternative design and/or location approved by the Service.

Justification - The fishery agencies' plans for restoring runs of American shad and river herring require upstream passage facilities at the Garvin Falls development in the future. As noted for Hooksett above, the fishway construction trigger for Garvins Falls is based on the production capacity of the Hooksett impoundment and the number of shad or herring passing the Hooksett fishway.

The prescribed design of a Denil fishway at Hooksett would permit counting of shad and herring passing the facility. However, alternative designs for a fishway at Hooksett could include a rock-ramp fishway. This more natural fishway design does not permit fish enumeration. If this were to be the approved and installed facility, the construction of an upstream fishway at Garvins Falls would be triggered based on passage counts at Amoskeag.

We calculated that the Hooksett impoundment could support the production of shad and river herring that would produce a run of 48,500 shad and/or 116,100 river herring. Using MDMR criteria, fishway construction at Garvins Falls will be required when 9,800 or more shad or 23,200 or more river herring pass Hooksett. If counting fish is not possible at the Hooksett fishway, the construction trigger would be 19,300 American shad or 45,800 river herring passing Amoskeag. Construction would need to be undertaken and completed within three years after

passage of the trigger number of fish. This time frame provides ample time for designs, approval by the Service and the Commission, permitting and construction.

Given site configuration, fishways may be needed at the tailrace and/or spillway. Attraction of shad and herring to the tailrace is most likely and would likely provide more consistent attraction to fish. Given site constraints, a fish lift would be the most effective fishway design for Garvins Falls, and design drawings of such a facility have been prescribed and attached herein for such a facility. The licensee may propose any other alternatives for Service approval, should alternative and equally effective designs become available between license issuance and construction.

Upstream habitat is estimated to support future populations of over 200,000 shad and over 500,000 river herring. The estimated maximum capacity of the prescribed lift is 6,000 shad per hour or 5,000 shad and 80,000 river herring per hour (or an equivalent biomass involving both species). If the capacity of this fishway is exceeded, or if, upon evaluation of the installed fishway, it is determined that additional fishways are required, additional passage measures can be prescribed at that time using the Reservation of Authority.

c. The licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad, river herring and American eels. Within six (6) months from the date of issuance of the license, the licensee shall submit to the Service for review and approval, a proposed evaluation plan and a schedule for the evaluation. The plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval.

The licensee shall conduct the evaluation and file the results with the Service according to the approved schedule. Following review of the results of the evaluation and consultation, any modifications or additional evaluations shall be submitted for review and approval by the Service and subsequently filed with the Commission for approval. If agreement cannot be reached between the Service and the licensee concerning any modifications or additional evaluations, the Service may require modifications to the fishway and/or additional evaluations pursuant to FPA § 18, or submit the matter to the Commission for approval.

Justification - The existing downstream fishway at Garvins Falls consists of a 240-foot-long louver array in the project power canal, a fish collections chute, and fishway plunge pool and a conveyance sluice to the river. Based on evaluations done in 2000, this facility has proven to be reasonably effective in bypassing downstream migrating Atlantic salmon smolts. A study in 2003 attempted to evaluate the effectiveness of this facility in passing juvenile clupeids (shad and river herring), but results were inconclusive. The facility has not been evaluated with outmigrating mature American eels.

Shad and river herring can access habitat upstream from Amoskeag at this time using the tailrace fishway. Progeny of adult shad and river herring stocked in mainstem Merrimack and tributary

habitat upstream from Garvins Falls as part of fish restoration activities must safely pass Hooksett Dam. The existing fish bypass, therefore, must be evaluated to ensure that the fishway is effective in providing safe, timely and effective passage for outmigrating clupeids or to identify measures that could be implemented to improve passage success. A plan for this evaluation and a schedule for completing this study is needed.

d. Within 24 months from the date of issuance of the license, the licensee shall, after consultation with the Service on eel fishway design and evaluation, submit to the Service for review and approval: 1) design plans for an interim eel fishway(s) and a schedule for installation; and 2) a proposed evaluation plan and a schedule for the evaluation(s) of the interim eel fishway(s). The evaluation plan shall include proposed methods of capture, tagging and monitoring fish, and provisions for filing results with the Service. Upon approval by the Service, the licensee shall submit the plans to the Commission for approval. The licensee shall install the eel fishway and conduct the evaluation(s) and file the results with the Service and the Commission according to the approved schedule.

Justification - American eel currently access the Merrimack River below Amoskeag. An interim upstream eel fishway is in place inside the entrance gallery of the tailrace pool and weir fishway at Amoskeag during late spring, summer and fall periods when the pool and weir fishway is not in operation. This facility has captured and permitted the upstream transfer of 6,300 eels over the four years the eelway has been in operation. Under the existing license, there is no flow requirement to release flow to the Amoskeag bypass reach. As such, there is flow to this area only periodically during periods when eels would likely move upstream.

The new license, however, will include a requirement for a continuous habitat flow to be provided in the bypass reach. As such, eels are likely to be attracted to the project bypass reach and spillway and would be unable to access the eelway located in the tailrace. A separate eelway is needed in the bypass reach. However, the design and location of such a facility needs to be developed. Initial studies of eel locations and an interim eelway are appropriate steps to undertake prior to installing a permanent eelway at the site. As such, it is appropriate to provide 24 months after license issuance for the submittal of interim eelway design plans.

Evaluations of the effectiveness of the interim tailrace and spillway eelways are needed to assess if the location of these facilities is appropriate for placement of permanent eelways and to assess the adequacy of design features of the interim eelways that could be incorporated into permanent eelway designs. Plans and schedules for such evaluations are needed.

e. Within 120 days after the date of submission of the evaluation results for the interim eel fishways to the Commission, the licensee shall, after consultation with the Service on eel fishway design, submit to the Service for review and approval, plans for permanent eel fishway(s) and a schedule for completion of installation by the 2012 spring/summer passage season. The number, design and siting of permanent eel fishway(s) will be based on the interim eel fishway

evaluations and will be developed in consultation with and approved by the Service. Upon approval by the Service, the licensee shall submit the plan to the Commission for approval. The eel fishway(s) shall be installed according to the approved schedule.

Justification - The evaluations of the interim eelways will provide needed information to locate and design permanent eelways that would likely be more formidable structures and provide continuous passive upstream movement by eels, versus capture, holding and transporting eels. Given the need for conducting initial evaluations, filing interim eelway design plans, constructing interim eelways and evaluating the interim eelways, it is appropriate to extend the installation date for the eelways to 2012 to provide the necessary time for these activities.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Concord, NH 03301-5087
<http://www.fws.gov/newengland>



REF: FERC No. 1893
Eversource Energy
Merrimack River
Upstream Passage at Hooksett Development

January 19, 2017

Mr. Michael Hitchko
Hydro Manager
Eversource Energy
780 North Commercial Street
Manchester, NH 03101-1134

Dear Mr. Hitchko:

This letter is in regards to the need to implement upstream fish passage measures at the Hooksett Dam development of the Merrimack River Project, FERC No. 1893 (Project), located on the Merrimack River in New Hampshire. Implementation of upstream passage at Hooksett is governed under the terms of an August 25, 2006 settlement agreement between Public Service of New Hampshire (PSNH, now Eversource) and the Department of the Interior's (Department) Prescription for Fishways. The trigger for upstream passage implementation at Hooksett is based on the passage of American shad (*Alosa sapidissima*) and/or river herring (collectively refers to alewife [*Alosa pseudoharengus*] and blueback herring [*Alosa aestivalis*]) at the Project's Amoskeag Dam development.

Background

As part of the relicensing of the Merrimack River Project, on August 25, 2006, the U.S. Fish and Wildlife Service (Service) and PSNH signed a settlement agreement to resolve disputes over fish passage measures at the Project. On December 20, 2006, the Department issued a Modified Prescription for Fishways consistent with the terms of the settlement that codified the provisions of the settlement agreement. The Prescription requires the installation of upstream passage facilities for anadromous fish at the Hooksett development, to be operational within 3 years after passage of either 9,500 or more shad or 22,500 or more river herring in any given year at the Amoskeag development.

Fish Returns in 2016

River herring returns to the Merrimack increased dramatically between 2011 and 2016 in response to a herring stocking program implemented by the Service and the New Hampshire Fish and Game Department (NHFGD). Returns to the River based on counts at the Lawrence Project (FERC No. 2800) fishway (first dam on the Merrimack River) increased from 740 in 2011 to 128,692 in 2015. In 2016, 417,240 river herring were counted at the Lawrence Project. Despite less than ideal passage conditions at the Lowell Project (FERC No. 2790) fishways and incomplete counts at the project's spillway fish ladder, 142,087 river herring were counted passing the Lowell Project in 2016.

Fish passage at the Amoskeag fishway is monitored using video recording of the counting window that is retained for later review and fish enumeration. There are no on-site fish counters or real time review of passage data. However, due to the large number of herring utilizing the fish ladder in 2016, NHFGD and the Service used the fish collection, trapping and trucking facilities at Amoskeag to transport river herring to upstream Merrimack River and tributary habitat as part of the program to restore river herring to the Merrimack River Basin. The agencies transported 20,340 river herring, which was only a portion of the total herring observed in the ladder. With the transport total reaching very close to the trigger numbers for requiring passage implementation at Hooksett, efforts were made to review a portion of the counting window video footage to verify that the passage trigger was reached. Counts were made by reviewing 5-minute subsample periods for each hour of video on 6 days when no trapping occurred (May 13, 14, 15, 20, 24, 31) during the peak trapping period. When these counts were expanded to full daily counts, a total of 19,236 herring were estimated to have passed the Amoskeag project fishway during those 6 days. Adding counts from those 6 days to the trucking total of 20,340 yields a minimum total of 39,576 herring passing Amoskeag in 2016. This does not account for herrings passed before and after trapping was undertaken. These data clearly demonstrate that the 22,500 herring trigger was attained by late May 2016.

Next Steps

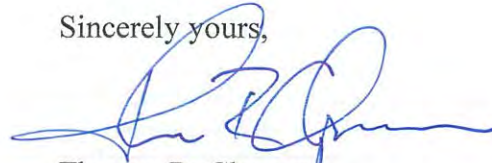
Pursuant to the Prescription of Fishways, implementation of upstream passage facilities at Hooksett for anadromous fish is required, given the number of river herring that passed the Amoskeag fishway in 2016. The Service and personnel from other fisheries agencies met on July 14, 2016 to discuss the incomplete Amoskeag passage counts and the potential that the passage trigger for Hooksett had been reached. Eversource subsequently contracted to have an Upstream Fish Passage Feasibility Study completed, which was distributed to the Service and other agencies on November 4, 2016. A meeting is scheduled for January 18, 2017 to discuss this report and upstream fish passage designs for Hooksett. Subsequent to this meeting, Eversource will be finalizing passage facility designs and a construction schedule in consultation with the Service.

Mr. Michael Hitchko
January 19, 2017

3

We thank Eversource for their proactive work on Hooksett passage planning and look forward to working collaboratively towards the design and construction of the facilities by 2019 (3 years after reaching the passage trigger). If you have any questions, please contact Mr. John Warner of this office at 603-223-2541, extension 6420.

Sincerely yours,

A handwritten signature in blue ink, appearing to read 'T. Chapman', with a stylized flourish extending to the right.

Thomas R. Chapman
Supervisor
New England Field Office

Mr. Michael Hitchko
January 19, 2017

4

cc: Eversource – William Smagula, VP Generation
Eversource Energy
780 North Commercial Street
Manchester, NH 03101-1134
Eversource – Curt Mooney
Eversource Energy
59 Ayers Island Road
Bristol, NH 03222
FERC Secretary
FWS/Merrimack River Coordinator - Joe McKeon, Mike Bailey (via email)
FWS-RO/Fisheries Engineering – Bryan Sojkowski (via email)
NHDES – Greg Comstock (via email)
NHFGD – Carol Henderson, Matt Carpenter (via email)
NMFS – Bill McDavitt (via email)
NMFS – Bjorn Lake (via email)
MDFW – Caleb Slater (via email)
MDMF – Ben Gahagen (via email)
Reading file
ES: JWarner:1-19-17:603-223-2541

EVERSOURCE
HOOKSETT UPSTREAM FISH PASSAGE EVALUATION
Agency Meeting
January 18, 2017. 1:00 pm to 3:30 pm
Amoskeag Hydro Office
February 17, 2017

Attendee	Affiliation	Email
Carla Stauber	Gomez and Sullivan	cstauber@gomezandsullivan.com
Dave Robinson	Gomez and Sullivan	daverobinson111@yahoo.com
Curt Mooney	Eversource	curtis.mooney@eversource.com
William Smagula	Eversource	William.smagula@eversource.com
Steve Robinson	Eversource	steve.robinson@eversource.com
Brent Sowle	Eversource	brent.sowle@eversource.com
Michael Hitchko	Eversource	michael.hitchko@eversource.com
Rick Simmons	Normandeau	rsimmons@normandeau.com
Matt Carpenter	NHFG	Matthew.A.Carpenter@wildlife.nh.gov
Bryan Sojkowski	USFWS	bryan_sojkowski@fws.gov
Michael Bailey	USFWS	Michael_Bailey@fws.gov
Joe McKeon	USFWS	Joe_McKeon@fws.gov
Attendees on Call		
John Warner	USFWS	john_warner@fws.gov
Julianne Rosset	USFWS	Julianne_Rosset@fws.gov

Introductions

Curt Mooney introduced the team and the reason for the meeting.

Trigger Number

Bill Smagula noted that a letter was just received the morning before the January 18, 2017, which indicated that the trigger number was met at Amoskeag; however, it was not an official signed letter. He requested a signed letter that specifically states that the trigger has been met.

Rick Simmons asked Mike Bailey what methodology was used for counting the fish. Mike explained that they reviewed 5-minute subsample periods for each hour of video during a time where there was no trapping. Rick questioned the method used and suggested that in future years a more robust and accurate method be utilized.

Upstream Fish Passage Evaluation Report

Carla Stauber presented the report and discussed the details of each section. She then handed out conceptual design drawings for a Denil fishway.

Bryan Sojkowski made the following initial comments:

- The USFWS attraction flow criteria of 3% of the hydro capacity does not hold for Hooksett, as the hydro capacity is far less than the river flow during fish passage season. USFWS would refer to NOAA guidelines, which states that attraction flows of 5% to 10% of the high fish passage design flow (high flow = 19,000 cfs) would be required. This attraction flow would be 950 cfs (5%) to 1900 cfs (10%).
 - Bryan later clarified in a comment dated **February 3, 2017** the following: *“the USFWS criteria for upstream passage attraction flow of 3-5% (now a minimum of 5% within the upcoming 2017 criteria) is grounded on the fact that a typical hydro facility is sized around the 30% exceedance flow, meaning for most of the time the unit discharge is the bulk of the far-field attraction flow (i.e., fish will most likely be attracted to the tailrace). Hooksett is sized for the 90% exceedance flow and therefore spillway flows will be the dominant attraction to fish. In cases like this, USFWS refers to NOAA guidelines to ensure that the fishway is capable of competing with the spillway flows.”*
- A Denil would not be sufficient to pass the future restored American shad and river herring populations listed in the restoration plan.
- A vertical slot would be a far better choice in order to accommodate the shad and herring population targets and account for the 3.5-foot headpond fluctuation. He said that a vertical slot will consistently put out the same flow (~35 to 50 cfs) whereas a Denil’s flow capacity decreases as the headpond level decreases.
 - Eversource inquired as to whether the April 1st start date for upstream fish passage specified in the License is really necessary, as fish aren’t seen passing the Amoskeag ladder until late April to early May. Joe McKeon concurred that a later starting date would be more appropriate.
 - The group agreed that a later starting date would lower the required “high design” operation flow of the fishway, thereby reducing the design headpond fluctuation. Joe told Carla to hold off on re-calculating the high design flow until he could verify what that revised start date would be.
- Denil’s require a lot of maintenance, and he would prefer building a fishway that didn’t require significant maintenance. Maintenance and adjustments to a west-side fishway would require access to the West side of the dam which is not easily accessible, making the additional maintenance activity needed for a Denil even more problematic.
 - Bryan later commented on **February 3, 2017** the following: *“Denils that have to operate within a headpond range greater than 2.0 ft (the typical design range) require more maintenance due to the fact that flow reducing baffles are required to ensure the Denil is not overwhelmed during higher flows.”*
 - Dave Robinson did not agree with Bryan that flow reducing baffles would be necessary, and stated that a Denil would not require significant maintenance at Hooksett.
- Significantly more data on bathymetry and tailwater levels are needed downstream of the dam to assess routes of passage to a fishways and understand flow fields.

Dave Robinson stated that maintenance on a Denil fishway would not be an issue, as Bryan had indicated. Dave also stated that the headpond fluctuation would not be an issue in operating the Denil, as long as flow control baffles/gates are installed at the upstream end. Bryan agreed that the Denil would require flow control baffles/gates but noted that they were not shown on the conceptual design provided at the meeting.

- Bryan later clarified in a comment dated **February 3, 2017** the following: *“As drawn, the Denil would have 7.1 ft of water within the fishway at the high design flow of 19,000 cfs which would completely overwhelm the fishway (e.g. create hydraulic conditions that would hinder upstream passage, especially for Alosines). There is an 8’ gate slot depicted within the exit channel but this would not be an appropriate way to control the flow within the Denil as it would create a hydraulic drop at the exit.”*
 - Dave Robinson later clarified that the 8-ft gate drawn on the conceptual design is to function as a fully open or fully closed gate – it is not meant to control flow.
- Bryan asked Dave if there were any example projects that had Denil fishways with high headpond fluctuations – Dave couldn’t think of any off the top of his head but would check.

Bryan pointed to the aerial photograph presented in the report (under the low flow condition) and expressed concern that all the flow was shown to be spilling over the dam, as compared to the tailrace. Eversource informed him that the hydro was not operating in that photo, and that normally under that flow condition the hydro would be operating.

Bryan indicated that even when the hydro is still operating, during fish passage season when the river flows are higher than the capacity of the unit, there is a lot of “false” attraction flow spilling over the spillway which could prevent fish from locating the entrance on the western side of the spillway. He also inquired if there was any consideration of fish entering the tailrace.

- Bryan cited this “false” attraction from water spilling over the dam as his basis for the 950 cfs attraction flow.
- USFWS asked if we had considered installing some sort of tailrace barrier.
- Steve Robinson suggested that lowering the flashboard height on the western spillway section could improve attraction to the fishway.
- John Warner suggested focusing the ZOP channel on river right (western side of bypass reach).
- USFWS is concerned that the flashboards are not typically installed until mid-May to June.

Action Items

1. USFWS to follow-up with Eversource on revised fish passage season start date (May 1 instead of April 1) and Eversource to provide flashboard installation history.
2. Eversource/G&S will further refine the tailwater and near dam bathymetry data
3. Gomez and Sullivan to meet internally with Eversource to discuss flashboard system, operational requirements and attraction flow.
4. Eversource and Gomez and Sullivan to host another meeting with Bryan Sojkowski to discuss hydraulics of Denil and attraction flow.
5. Eversource will develop and provide to the agencies revised passage plans including any needed channel modifications and before or after have another agency meeting to discuss alternatives