



# **Great River Hydro, LLC**



## **LIHI Recertification Application for the Vernon Hydroelectric Project LIHI Certification # 40**

**Revised April 2019**



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## 1.0 Introduction

The Vernon Station Hydroelectric Project, located at river mile 142 on the Connecticut River, is owned by Great River Hydro, LLC (GRH). The Project was first certified by the Low Impact Hydro Institute (LIHI) in June 2009 (# 40). The second 5-year certification term expiring December 15, 2018 was issued September 19, 2016 after an extensive review period and deliberations. Although on March 8, 2016, LIHI published the 2<sup>nd</sup> Edition LIHI Certification Handbook, the Vernon Certificate expiring December 15, 2018 was issued under the 2014 LIHI certification criteria. The 2<sup>nd</sup> Edition LIHI Certification Handbook, while maintaining the eight existing criteria, makes significant changes to how each criterion is measured and ultimately met, through the creation of four similarly applied standards. GRH submits this application for certification applying the new standards in the revised Handbook.

The Certificate expiring December 15, 2018 includes six Conditions, four of which specifically were designed to address the on-going Federal Energy Regulatory Commission (FERC) relicensing proceeding. That proceeding continues with on-going study deliberation and consultation, no definitive agency proposals or recommendations, no 401 WQC application under review, and an anticipated revised application to be filed by GRH sometime by the 3<sup>rd</sup> quarter of 2019. There will unlikely be a FERC NEPA review until 2020 or a license issued before 2021. The continued relicensing proceeding creates a dilemma for GRH, where it is currently certified but finds it difficult to re-certify applying the new standards lacking formal agency recommendations, water quality certification, and incomplete study analysis and inter-study/operational balance that inherently is required and found within a new license.

The LIHI certification process should not include independent relicensing study reviews and determinations (by the reviewer or Technical Committee), particularly prior to the completion of all critical studies regarding aquatic habitat instream flows and the subsequent determination, stakeholder consultation and agency recommendations for such resource issues, and many others contemplated in the relicensing of this project. Equally important is the fact that the Vernon relicensing is tied to and will undergo a coordinated environmental review including the two upstream and two downstream projects. LIHI policy stated in the 2<sup>nd</sup> Edition Handbook requires, *“If a facility has been previously certified by LIHI but enters a new FERC licensing proceeding, then for LIHI purposes, the facility will be treated as it was under the previous FERC license until such time that that new FERC licensing is completed. In this [latter] case, the LIHI certificate will be conditioned to require updating and potential modification as soon as a new license is obtained, so as to be consistent with any new science-based agency recommendations that may have arisen.”*

The Vernon Project was constructed in 1909 with a powerhouse extension on the Vermont side adding two additional units (Unit Nos. 9–10) in 1925. The original license for the Project (FERC No. P-1904) was issued by the Federal Power Commission (predecessor to the FERC) on March 26, 1945. The original license expired on June 30, 1970, and the Project operated under annual licenses until the license was renewed on June 25, 1979. The current license expires April 30,

2019; however, it is anticipated that the current license will continue well into 2021 until the FERC relicensing proceeding is completed and a new License is issued.

In a 1992 license amendment, FERC authorized replacement of four 2.0-MW units (Units 5-8) with two 14.0-MW units, increasing the generating capacity of the project from 24.4 MW to 44.4 MW and raised the total hydraulic capacity from 15,530 cfs to 20,930 cfs. However, that unit replacement project was never initiated due to a drop in the value of electrical generating capacity (a.k.a. capacity value). After several ownership changes the Vernon Project was acquired by TransCanada in 2005. Subsequently, TransCanada filed a non-capacity license amendment to revise the 1979 License and 1992 Amendment, proposing replacement of the original four 2.0-MW turbines with four new 4.0-MW units. FERC approved the amendment in Order dated July 28, 2006 and the new units were installed and operational by May 1, 2008. A new 401 Water Quality Certificate (WQC) was issued by the State of NH, addressing construction aspects and operational instream impacts associated with the repowering project. No new Project flow and operational requirements were specified in the 2006 NH 401 WQC but there were several conditions including: 1.) an operations monitoring and reporting plan, 2.) a water quality monitoring and reporting plan, 3.) a shoreline and hydrographic survey and monitoring plan for areas downstream of the dam, 4.) a debris disposal plan, and 5.) continued operating fish passage facilities.

On October 30, 2012 TransCanada initiated relicensing of the Vernon, Bellows Falls (P-1855) and Wilder (P-1892) projects under FERC's Integrated Licensing Process (ILP). As the same time, FirstLight Power Resources (FirstLight) initiated relicensing of the Northfield Mountain Pumped Storage Project (P-2485) and Turners Falls Project (P-1889). The five projects, located sequentially on the Connecticut River (see Table 1), are on a similar ILP schedule and FERC intends to conduct a coordinated NEPA review and prepare a multi-project environmental impact statement (EIS) to determine whether, and under what conditions, to issue new licenses for each of the projects. The ILP's formal two-year field-study timeframe was extended by one year after Entergy announced the decommissioning of Vermont Yankee Nuclear Power Plant, located less than half a mile upstream of the Vernon dam. Since then, both FirstLight and GRH filed license applications to meet the statutory deadline of 2 years in advance of their respective license expiration dates, despite not being in a position to propose a reasonable alternative to existing operations. Additional stakeholder comments and study requests have necessitated both Licensees to continue studies and consultation as well as file anticipated revised final applications. FERC's current process plan does not specify a filing date for revised applications, but it is anticipated that both GRH and FirstLight will file such by 3<sup>rd</sup> Quarter 2019. Currently, GRH is continuing to conduct regular stakeholder meetings for its Instream Flow and Dwarf Wedgemussel Studies as well as completing various Historic Resource documents. Although not specified in a study request, GRH continues to evaluate the use and preference of the fish ladder for American eel and continues to implement measures to improve passage success for American shad (already very effective).

This GRH application for LIHI Re-certification has been prepared in such a way as to identify (in **bold text**) the Standards under each of the Criteria that the Vernon Project complies with and how.

## 2.0 Project Description

The Vernon Project dam and powerhouse are located on the Connecticut River at RM 141.9, about 2.0 miles upstream of the confluence of the Ashuelot River and 7.4 miles downstream of the West River, in the town of Vernon, Vermont, and the town of Hinsdale, New Hampshire (Figure 1). The Project consists of a concrete gravity dam; an approximate 26-mile long impoundment; a powerhouse, storage/maintenance building and yard; up and downstream fish passage facilities; and appurtenant facilities (Figure 2). Project information is summarized in Table 1.

The dam is a composite overflow and non-overflow ogee-type, concrete gravity structure extending across the Connecticut River between Hinsdale, New Hampshire, and Vernon, Vermont. The dam is 956 ft long with a maximum height of 58 ft. It consists of the integral powerhouse with a sluice gate block section that is about 356 ft long and a concrete overflow spillway section about 600 ft long. The spillway portion of the dam is divided into 12 bays containing, from west to east, a trash/ice sluice, 4 tainter gates, 2 hydraulic flashboard bays, 3 stanchion bays, and 2 tainter gates. In addition, 8 submerged hydraulic flood gates are located below the ogee spillway and the 10-ft by 50-ft tainter gates. The various bays are separated by concrete piers supporting a steel and concrete bridge that runs the length of the dam for access and for operation of flashboards. The trash/ice sluice is a skimmer gate that passes logs and other debris deflected away from the powerhouse by a log and ice boom in the powerhouse forebay.

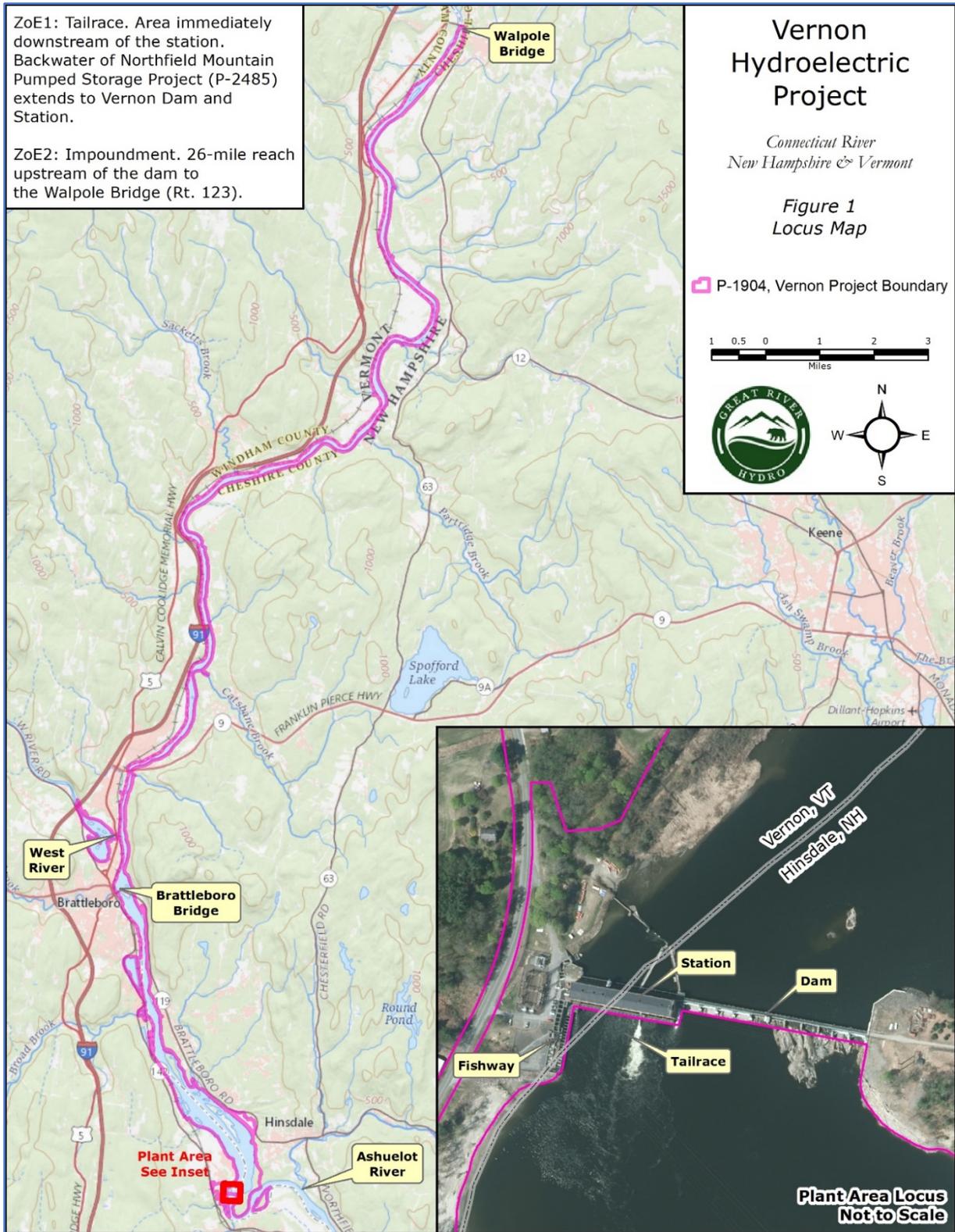
The Project impoundment is approximately 26 miles long and extends upstream approximately to the Walpole Bridge (Route 123 Bridge) at Westminster Station, Vermont. The Project has limited storage capacity because of the relatively flat terrain from the upper extent of the Project impoundment to the dam. The impoundment has a surface area of 2,550 acres, about 69 miles of shoreline, and a total volume of about 40,000 acre-ft at a full impoundment El. of 220.13 ft (National Geodetic Vertical Datum of 1929 [NGVD29]) at the top of the stanchion boards. Maximum drawdown to the spillway crest (at El. 212.13 ft) when hydraulic and stanchion flashboards are lowered or removed under high flow, equates to a maximum usable storage capacity of 18,300 acre-ft. The more typical impoundment operating range under non-spill conditions is between El. 218.3 and El. 220.1 for usable storage capacity of 4,489 acre-ft. This equates to about 54,315 cfs, or less than 4 hours of generation at maximum station capacity (absent inflow).

The powerhouse contains 10 turbine generating units. Unit Nos. 1–4 are single runner vertical Francis units each with a maximum hydraulic capacity of 1,465 cfs and minimum hydraulic capacity of 400 cfs. Unit Nos. 5–8 are vertical axial flow Kaplan units each with a maximum hydraulic capacity of 1,800 cfs and minimum hydraulic capacity of 300 cfs. Unit Nos. 9 and 10 are single runner vertical Francis units each with a maximum hydraulic capacity of 2,035 cfs and minimum hydraulic capacity of 500 cfs.

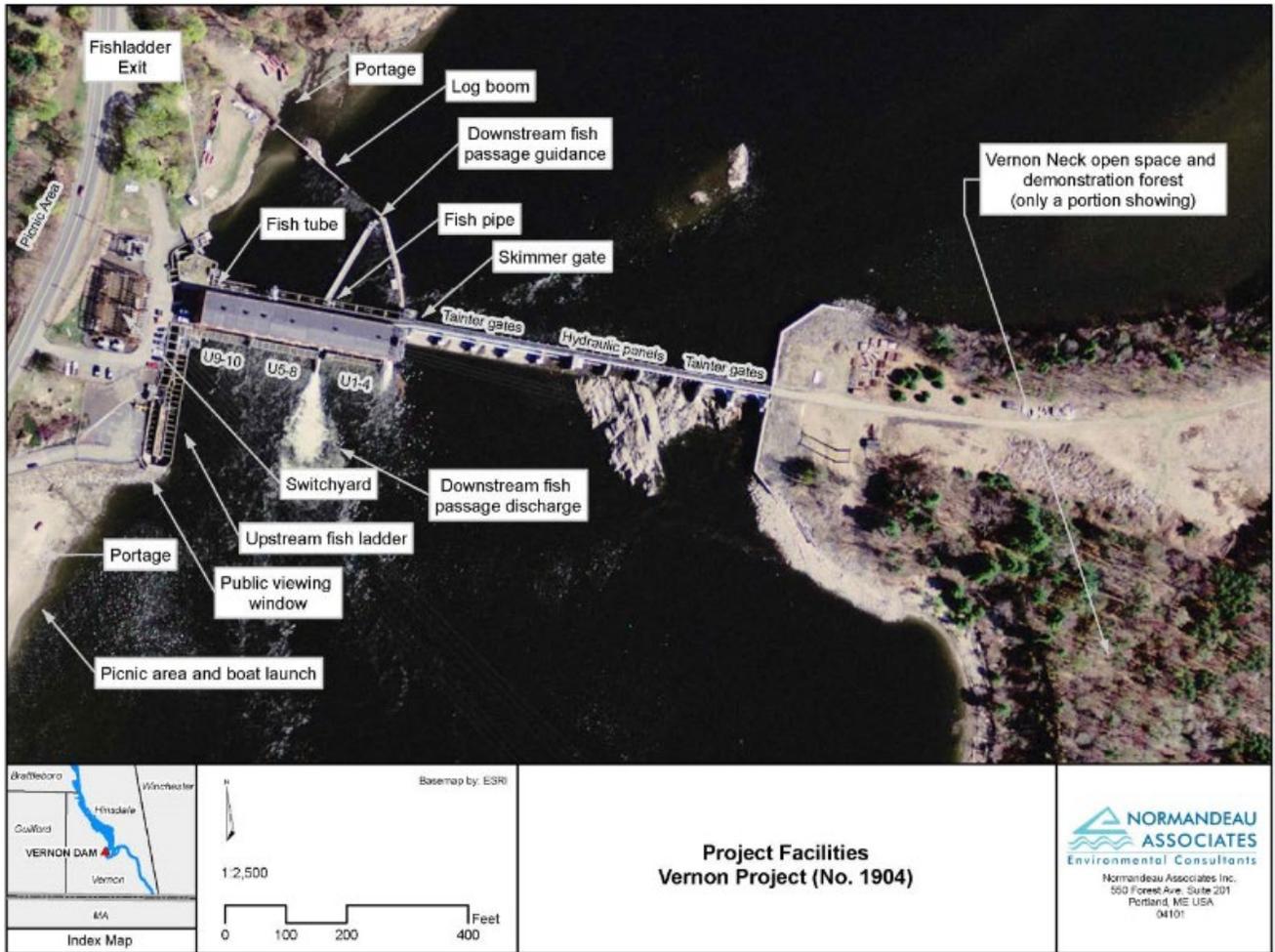
At full load, with inflow equaling a maximum station discharge of approximately 14,500 cfs, the Project has the capability of producing 32.0 MW. Nine-year average annual generation,

accounting for 2008 as first full year of re-developed Units 5-8 operation (2008 – 2016) is approximately 162,557 MWh.

The Project also includes upstream and downstream fish passage facilities, and recreation areas and facilities including a boat launch, portage, picnic areas, hiking trail, fish ladder viewing area, and fishing access.



**Figure 1. Locus Map of the Vernon Hydroelectric Station. (LIHI Certificate #40), Vernon VT, Hinsdale, NH. The two Zones of Effect are the tailrace area just below the dam, and the 26-mile impoundment from the dam to the Walpole Bridge.**



**Figure 2. Vernon Project facilities.**

**Table 1. Facility Description Information for Vernon Hydroelectric Project.**

<b>Information Type</b>	<b>Variable Description</b>	<b>Response (and reference to further details)</b>
<b>Name of the Facility</b>	Facility name (use FERC project name if possible)	Vernon Hydroelectric Project, P-1904
<b>Location</b>	River name (USGS proper name)	Connecticut River
	River basin name	Connecticut River
	Nearest town, county, and state	Vernon, Windham, Vermont Hinsdale, Cheshire, New Hampshire
	River mile of dam above next major river	141.9
	Geographic latitude	N 42° 46' 19.24"
	Geographic longitude	W 72° 30' 36.35"
<b>Facility Owner</b>	Application contact names (IMPORTANT: you must also complete the Facilities Contact Form):	John Ragonese, FERC License Manager Jennifer Griffin, FERC License Specialist
	- Facility owner (individual and company names)	Great River Hydro, LLC
	- Operating affiliate (if different from owner)	n/a
	- Representative in LIHI certification	John Ragonese
<b>Regulatory Status</b>	FERC Project Number (e.g., P-xxxxx), issuance and expiration dates	P-1904 Issued - June 25, 1979 Expires – April 30, 2019 (operating under continued “annual” license due to on-going licensing proceeding)
	FERC license type or special classification (e.g., "qualified conduit")	Major Project
	Water Quality Certificate identifier and issuance date, plus source agency name	New Hampshire Department of Environmental Services WQC # 2006-008, Issued June 3, 2006. (Previous Certificate from NH received September 7, 1972. On November 28, 1973 VT waived 401 WQC responsibility subject to inclusion of a 0.2 cfs low flow requirement.)
	Hyperlinks to key electronic records on FERC e-library website (e.g., most recent Commission Orders, WQC, ESA documents, etc.)	Order Extending License Term 1-year <a href="https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=13937807">https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=13937807</a> Order Approving Transfer of License <a href="https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=14498106">https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=14498106</a> Order Amending License – Licensee Name Change <a href="https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=14587511">https://elibrary.ferc.gov/idmws/common/open.nat.asp?fileID=14587511</a> Order Amending License, Revising Annual Charges – Replacement of Units 5-8

		<a href="https://elibrary.ferc.gov/idmws/common/open/nat.asp?fileID=11099700">https://elibrary.ferc.gov/idmws/common/open/nat.asp?fileID=11099700</a> NHDES WQC <a href="https://elibrary.ferc.gov/idmws/common/open/nat.asp?fileID=11088588">https://elibrary.ferc.gov/idmws/common/open/nat.asp?fileID=11088588</a>
<b>Power Plant Characteristics</b>	Date of initial operation (past or future for operational applications)	The original 8 units were put into operation in 1909 and 1910. Powerhouse extension, adding Units 9 and 10 completed in 1926.
	Total name-plate capacity (MW)	32.4
	Average annual generation (MWh)	162,557
	Number, type, and size of turbines, including maximum and minimum hydraulic capacity of each unit	10 units with the following characteristics: Units 1–4: single runner vertical Francis, 1465 cfs max capacity, 400 cfs min capacity. Units 5–8: vertical axial flow Kaplan, 1800 cfs max capacity, 300 cfs min capacity. Units 9–10: single runner vertical Francis, 2035 cfs max capacity, 500 cfs min capacity.
	Modes of operation (run-of-river, peaking, pulsing, seasonal storage, etc.)	Daily cycle run of river – with emphasis on maintaining head, peak energy hours when feasible and flows allow outside required conservation flow (minimum flow and fish passage related).
	Dates and types of major equipment upgrades	1981 – completed construction of upstream fish ladder. 1986 - major reconstruction of the spillway crest water control mechanisms. 1995 – downstream fish passage facilities constructed. 2008 – completed replacement of Units 5 through 8.
	Dates, purpose, and type of any recent operational changes	NA
	Plans, authorization, and regulatory activities for any facility upgrades	Not at this time. The project is currently in the middle of relicensing.
<b>Characteristics of Dam, Diversion, or Conduit</b>	Date of construction	1909
	Dam height	58 ft at max.
	Spillway elevation and hydraulic capacity	Spillway gate type and crest or sill elevations (NGVD29): Fishway sluice - 210.13 Trash/ice sluice - 209.13 Tainter gates - 202.13 (2) and 212.13 (4) Hydraulic panel bays - 212.13 Stanchion bays - 212.13 Hydraulic floodgates - 173.13  Total spill capacity - ~112,200 cfs

	Tailwater elevation	Normal - 184.63 ft, but tailwater elevation is also typically affected 3-4 feet by the downstream Turners Falls Dam and Northfield Pumped Storage Project operation.
	Length and type of all penstocks and water conveyance structures between reservoir and powerhouse	No penstocks. Flow through headgates integral with powerhouse structure.
	Dates and types of major, generation-related infrastructure improvements	2008 – replacement of original 2.0-MW Unit Nos. 5–8 with four new 4.0-MW units.
	Designated facility purposes (e.g., power, navigation, flood control, water supply, etc.)	Power
	Water source	Connecticut River
	Water discharge location or facility	Connecticut River
<b>Characteristics of Reservoir and Watershed</b>	Gross volume and surface area at full pool	Total volume about 40,000 acre-ft, and surface area of 2,550 acres at top of station boards (El. 220.13 ft NGVD29).
	Maximum water surface elevation (ft. MSL)	220.1
	Maximum and minimum volume and water surface elevations for designated power pool, if available	Full range between El. 212.13 ft and El. 220.13 ft providing about 18,300 acre-ft of storage in the 8-ft range used only during extreme high water requiring removal of stanchions and flashboards. The normal impoundment fluctuation is 1-2 feet. Operating range under non-spill conditions is between El. 218.3 and El. 220.1 ft for usable storage capacity of 4,489 acre-ft.
	Upstream dam(s) by name, ownership, FERC number (if applicable), and river mile	On Mainstem Connecticut River (Figure 3): Second Connecticut Lake (storage), GRH, NA, 389.5 First Connecticut Lake (storage), GRH, NA, 382.2 Lake Francis [Murphy] Dam (storage), State of NH, NA, 374.2 Canaan (power, streamflow), Eversource, P-7528, 370 Gilman (power, streamflow), Dalton Hydro, P-2392, 300 Moore (power, seasonal storage), GRH, P-2077, 283.5 Comerford power seasonal storage), GRH, P-2077, 275.2 McIndoes (power, daily cycle re-regulation), GRH, P-2077, 268.6 Dodge Falls (power, streamflow primarily), Essex Hydro, P-8011, 264.6 Wilder (power, daily cycle), GRH P-1892, 217.4

		Bellows Falls (power, daily cycle), GRH, P-1855, 173.7
	Downstream dam(s) by name, ownership, FERC number (if applicable), and river mile	On Mainstem Connecticut River: Northfield Mountain (power, pumped storage, lower reservoir, weekly cycle), FirstLight, P-2485, 127 Turners Falls (power, daily cycle), FirstLight, P-1899, 122 Holyoke (power, primarily streamflow), Holyoke Gas and Electric P-2004, 87
	Operating agreements with upstream or downstream reservoirs that affect water availability, if any, and facility operation	NA
	Area inside FERC project boundary, where appropriate	The Project boundary encompasses the areas necessary to operate the Project and includes the reservoir to the maximum shoreline elevation based on operating the project at Elevation 220.13 at the dam and the additional fee ownership of 287 acres. Most of the fee-owned land is in the vicinity of the dam and plant area, and therefore occupy portions of the ZOE 1 and 2. The vast majority of the project's impoundment shoreline is owned by others upon which we retain flowage rights. There is no acreage total associated with these rights.
<b>Hydrologic Setting</b>	Average annual flow at the dam	143,346 cfs
	Average monthly flows	For January 1979-December 2015 (cfs): January – 10,029 February – 8,775 March – 15,918 April – 29,832 May – 17,272 June – 10,537 July – 6,957 August – 5,939 September – 4,942 October – 9,453 November – 11,629 December – 12,063
	Location and name of relevant stream gauging stations above and below the facility	<u>Upstream of Vernon Dam:</u> 01154000 - Saxtons River at Saxton River, VT 01154500 - Connecticut River at North Walpole, NH 01154950 - Cold River at High Street, at Alstead, NH

		01155500 - West River at Jamaica, VT Additional gages in the basin upstream of Bellows Falls Dam Downstream of Vernon Dam: 01161000 - Ashuelot River at Hinsdale, NH
	Watershed area at the dam	6,266 square miles
<b>Designated Zones of Effect</b>	Number of zones of effect	2
	Upstream and downstream locations by river miles	Zone 1 RM 141.9 - < 141.4 Zone 2 RM 141.9 – 167.9
	Type of waterbody (river, impoundment, by-passed reach, etc.)	Zone 1 – Tailrace (also impoundment and lower reservoir of downstream project owned by others) Zone 2 – Impoundment
	Delimiting structures	Zone 1 – Vernon dam/powerhouse Zone 2 – Vernon dam/powerhouse and unregulated riverine reach
	Designated uses by state water quality agency	Zones 1 and 2 – NH Class B, VT Class B(2) and cold water fish habitat.  New Hampshire: <a href="http://www.gencourt.state.nh.us/rsa/html/L/485-A/485-A-8.htm">http://www.gencourt.state.nh.us/rsa/html/L/485-A/485-A-8.htm</a> , and <a href="https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1700.pdf">https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1700.pdf</a> Vermont: <a href="https://dec.vermont.gov/sites/dec/files/documents/wsm�_water_quality_standards_2016.pdf">https://dec.vermont.gov/sites/dec/files/documents/wsm�_water_quality_standards_2016.pdf</a>
<b>Additional Contact Information</b>	Names, addresses, phone numbers, and e-mail for local state and federal resource agencies	Appendix A.2
	Names, addresses, phone numbers, and e-mail for local non-governmental stakeholders	Appendix A.3
<b>Photographs and Maps</b>	Photographs of key features of the facility and each of the designated zones of effect	
	Maps, aerial photos, and/or plan view diagrams of facility area and river basin	Figures 1, 2, and 3.

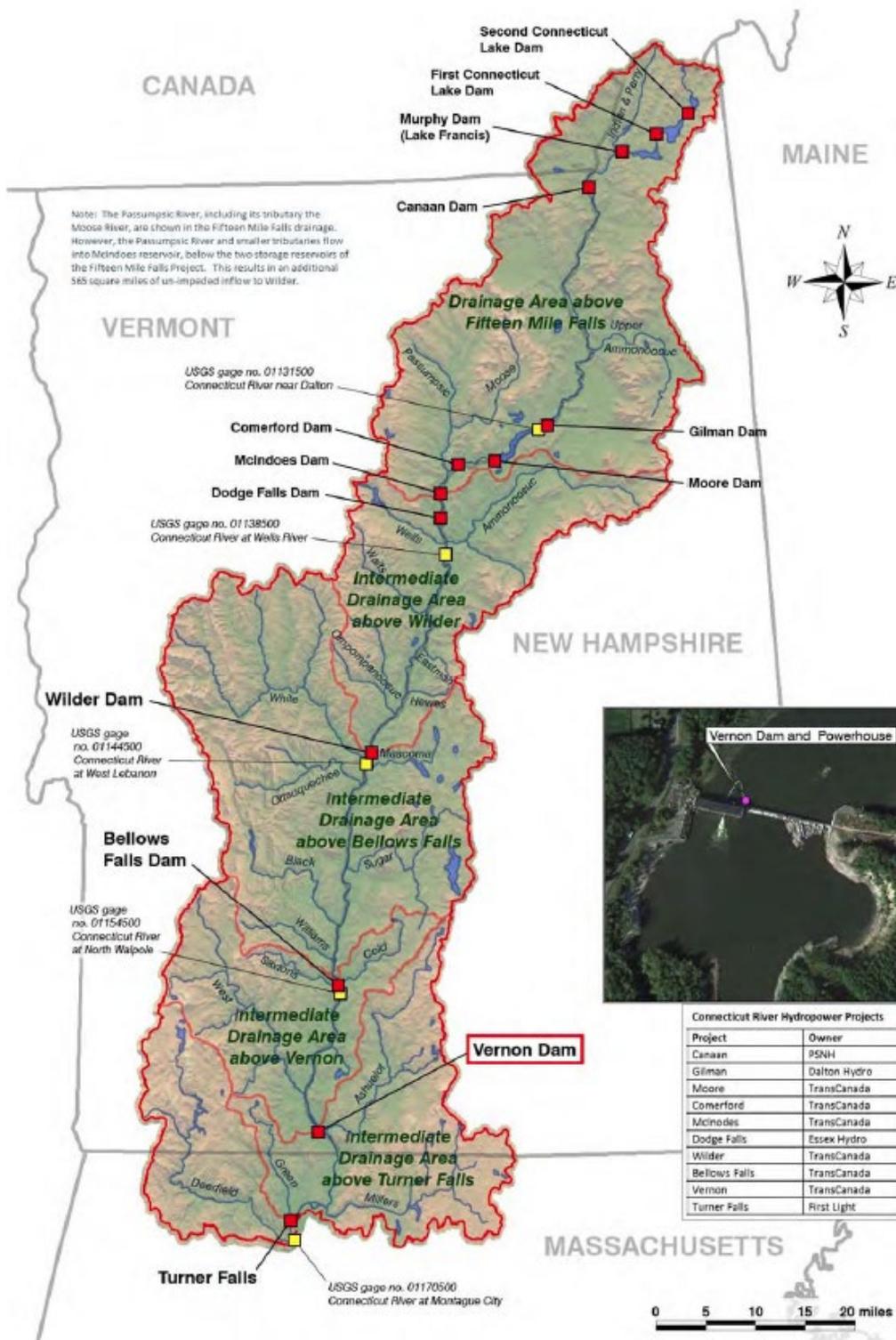


Figure 3. Location of dams on the mainstem Connecticut River above Vernon Dam and just below Vernon Dam.

### 3.0 Standards Matrices

For this application, the Project area has been divided into two Zones of Effect (ZoE): Zone 1 is the tailrace downstream of the Vernon powerhouse and dam, and Zone 2 is the impoundment (see Figure 1). Criterion applicable to Zone 1 are discussed in Section 3.1, and Criterion applicable to Zone 2 are discussed in Section 3.2.

#### 3.1 Zone of Effect 1 – Tailrace Downstream of Vernon Powerhouse and Dam

Table 2. Matrix of Alternative Standards for: Vernon, Zone of Effect 1 - Tailrace

Criterion		Alternative Standards Applied <sup>1</sup>				
		1	2	3	4	Plus
A	Ecological Flow Regimes		x			
B	Water Quality		x			
C	Upstream Fish Passage		x			
D	Downstream Fish Passage	x				
E	Watershed and Shoreline Protection	x				
F	Threatened and Endangered Species Protection		x			
G	Cultural and Historic Resources Protection		x			
H	Recreational Resources		x			x

<sup>1</sup> Shaded cells indicate that no such standard is available for that criterion.

##### 3.1.1 Criterion A: Ecological Flow Regime - Tailrace

##### GRH looks to qualify for this criterion under Standard 2.

Criterion	Standard	Instructions
A	2	<p><b>Agency Recommendation</b> (see Appendix A for definitions):</p> <ul style="list-style-type: none"> <li>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).</li> <li>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.</li> <li>Explain how the recommendation relates to agency management goals and objectives for fish and wildlife.</li> <li>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).</li> </ul>

Minimum flow at the project was identified in FERC's Order dated June 25, 1979 issuing a new license for the project <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13604305>, page 5:

In 1970, the FERC set a minimum flow release of 1,200 cfs for the Vernon Project, to prevent heat build-up in the reservoir from cooling system discharges from the Vermont Yankee Nuclear Power Plant.

In the previous relicensing proceeding, the Department of the Interior recommended that a minimum flow of 1,250 cfs or 0.20 cfsm (cubic feet per second per square mile of drainage) be released from the project at all times, except when limited by inflow. Similarly, the Environmental Protection Agency (EPA) recommended a flow of 1250 cfs or inflow if less as adopted by the Connecticut River Coordinating Committee. Vermont, Massachusetts, and the New England River Basins Commission also recommended 0.20 cfsm as the minimum flow release. The New Hampshire Water Supply and Pollution Control Commission certified the project's compliance with New Hampshire water quality standards at such a minimum flow. And the Vermont Agency of Environmental Conservation waived state 401 WQC on condition that 1250 cfs or inflow if less be maintained. The New Hampshire Fish and Game Department and the Policy Committee for Fisheries Management of the Connecticut River Basin favored a minimum release of 0.25 cfsm (1567 cfs). FERC license review staff recommended the 1250 or 0.20 cfsm or inflow if less be released, representing the consensus of the interested agencies. Under Article 34 of the 1979 FERC License, a minimum flow release of 1250 cfs, or 0.20 cfsm or inflow if less, from the project was set. Should this minimum flow release prove inadequate to protect the Connecticut River fishery, FERC reserved the right to require higher flow releases under Article 12 or Article 15. No such evidence or requests for a higher minimum flow have been filed with the FERC throughout the license term.

In its November 28, 1973 letter waiving 401 water quality certification, VT AEC states "...and the proposed discharge is not considered to be violative of applicable Vermont statute or water quality standards we are willing to consider that we have waived our certification responsibility under Section 401 subject to inclusion of the above mentioned 0.2 cfsm low flow requirement in the FPC licensing order for these projects." GRH has no further documentation as to the scientific or technical basis for the agency minimum flow requirement of 0.2 cfsm.

GRH rarely measures or exercises (unless in extreme, extended drought conditions) the "or inflow if less" clause in its minimum flow requirement. Additionally, mandatory flow requirements are necessary to operate upstream and downstream passage during fish passage season. The fish ladder passes approximately 230 cfs from approximately April 7 to July 15. In recent years, ladder operation has extended to later in the year (mid-November) as GRH, in consultation with VTFWD and USFWS, examines upstream passage for American eel (see Criterion C - Upstream Fish Passage for references). Approximately 390 cfs is additionally passed to the tailrace from downstream passage structures that are opened when fish ladder

operation begins and closed November 15. While these additional flow requirements are often accounted for in terms of meeting our minimum flow, the reality is such that the minimum flow below Vernon Dam is significantly higher throughout the year.

The data from three, most recent 2-year time periods show that while the minimum flow requirement of 1250 is met, it is often exceeded substantially during most of the year (Table 3). Appendix B.1 provides three hourly discharge flow duration curves for the periods of 2012-2013, 2014-2015, and 2016-2017.

**Table 3. Minimum, 99<sup>th</sup> percentile, and 95<sup>th</sup> percentile discharge flow at the Vernon dam over three 2-year time periods: 2012-2013, 2014-2015, and 2016-2017.**

<b>Period</b>	<b>Minimum</b> (exceeded 100% of hours)	<b>99<sup>th</sup> Percentile</b> (exceeded 99% of hours)	<b>95<sup>th</sup> Percentile</b> (exceeded 95% of hours)
2012 – 2013	1374 cfs	1526 cfs	1678 cfs
2014 - 2015	1514 cfs	1665 cfs	1863 cfs
2016 - 2017	1408 cfs	1461 cfs	1571 cfs

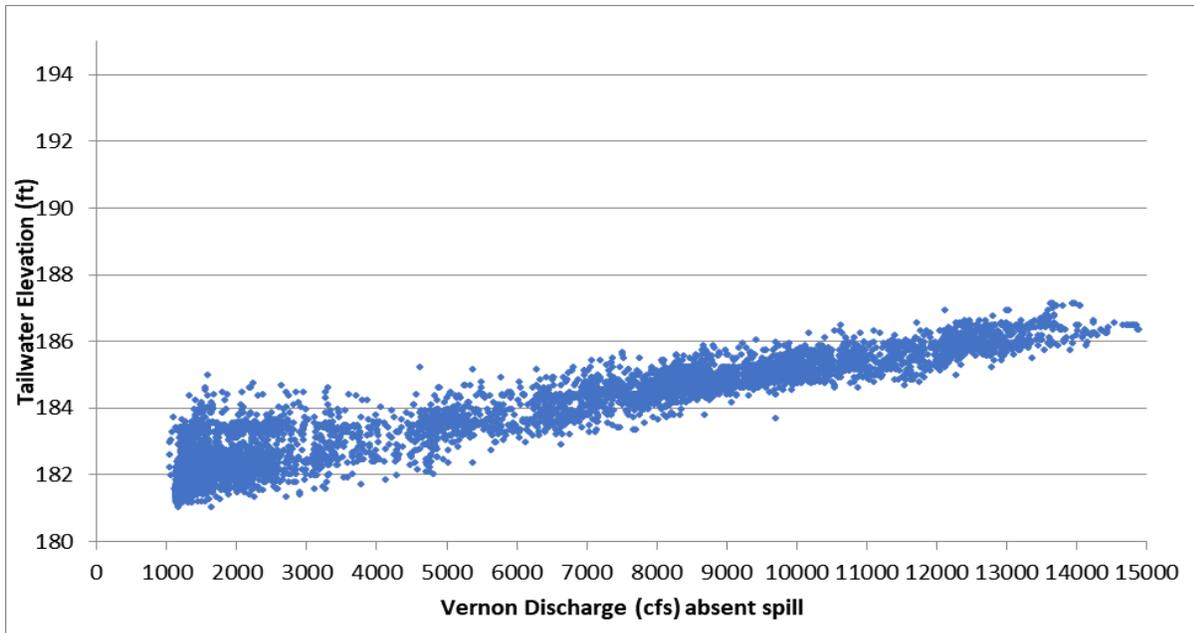
In addition to passing agency recommended minimum flows, the project operates with limited storage. A major reconstruction of the spillway crest water control system was completed in 1986 and included the addition of a trash sluice (skimmer) gate, six tainter gates, and two 50-foot bays of hydraulic panels in the spillway section. This extensive crest control investment provides much greater ability to maintain and operate at the high end of the impoundment operating range. Although Vernon Dam has an operating impoundment range from El. 212.13 ft to El. 220.13 ft, GRH does not utilize that range for normal operations. It is utilized only when natural flood flows exceed the capacity of the six tainter gates such that hydraulic flashboards or stanchion flashboards sections must be used. If that occurs, flows must subside, and the impoundment elevation dropped to the elevation of the concrete crest (212.13 ft) in order to reset stanchion beams and raise hydraulic flashboards. This can occur periodically but is wholly in response to natural high flow events. Once in a while, although rare, a dam emergency may require drawdown below normal operations. When this occurs, and as possible, GRH consults with federal and state fish and wildlife agencies to identify the periods when less impact is likely. An emergency related drawdown and agency consultation took place in Spring of 2019 when a 50-foot hydraulic panel lost hydraulic pressure requiring the impoundment elevation to be lowered to 212.13 in order to facilitate inspection and repair. Consultation occurred prior to the drawdown and a plan was developed to address agency comments and concerns regarding minimizing drawdown effects on reservoir littoral spawning and fish ladder operation.

As stated above, the normal operating elevation range is between 218.3 ft and 220.1 ft. This does not mean that the project fluctuates daily within this range as reservoir fluctuation is

typically in response to upstream inflow, natural inflow from the 852 square miles of drainage area above Vernon and below the upstream mainstem dam at Bellows Falls, Vermont or when the inflow might be less than the required minimum or fish passage flow. Similarly, as a daily run-of-river peaking project, corresponding hours of operation may not precisely coincide with the inflow. In order to accommodate anticipated inflow, the Vernon project may operate to lower the reservoir slightly in order to provide the necessary storage within the project. Although allowed by its FERC License, GRH rarely (if ever) calculates inflow and reduces minimum flow below 1250 cfs. Flows from upstream (upstream discharge plus natural) are calculated and managed through the Vernon impoundment in the most efficient manner possible to maintain head (elevation at the Vernon Dam), pass the required flows at Vernon and provide adequate storage capacity to handle predicted inflow.

### **Additional Factors affecting assessment of Ecological Flow Regime Criteria in the Tailrace Zone**

The Connecticut River immediately below the Vernon Dam is affected by the operations of both the Turners Falls Project and the Northfield Mountain Pumped Storage Project. It officially lies within the FERC Project Boundary of the Turners Falls Project but in their current relicensing proceeding, FirstLight proposes to combine these projects under a single license because the Turners Falls impoundment serves as the lower reservoir to the Northfield Mountain Pumped Storage Project. The two projects are intended to be operated independently but GRH has no data to support precisely how they are operated. The elevation of the impounded reach below Vernon can fluctuate 3-4 feet due to: elevation at Turners Falls Dam; when Northfield Mountain Pumped Storage Project is pumping water into or discharging water from the upper reservoir; natural inflow; and, station discharge from Vernon Station. Under natural spill conditions the tailrace can rise to an elevation greater than 20 feet above normal levels (Figure 3).



**Figure 4. Vernon station hourly discharge absent spill with corresponding tailwater elevation for calendar year 2017. The range in tailwater elevation (3-4 ft) indicates the elevation changes are not related to discharge.**

Lacking current agency recommendations, updated 401 WQC flow conditions, FERC License conditions, scientific or technical basis for either, and given that operational reservoir fluctuations are limited and kept at a minimum, and the fact that GRH passes additional flow beyond existing minimum flow requirements for much of the year; this criterion should be considered as met until such time as new operations set in the License document can be assessed under the standards listed for this criterion.

*3.1.2 Criterion B: Water Quality - Tailrace*

**GRH looks to qualify for this criterion under Standard 23.**

<b>Criterion</b>	<b>Standard</b>	<b>Information Required to Support Standard</b>
<b>B</b>	<b>2</b>	<u>Agency Recommendation:</u> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Provide a copy of the most recent Water Quality Certificate, including the date of issuance.</li> <li>• Identify any other agency recommendations related to water quality and explain their scientific or technical basis.</li> <li>• 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.</li> </ul>

Connecticut River water quality in the vicinity of the Vernon Project is monitored by the state of New Hampshire. In their Clean Water Act Section 303(d) List of Impaired Waters (<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2016/documents/r-wd-17-09-app-a1.pdf>), New Hampshire identified the Connecticut River below the Vernon dam (Assessment Unit ID NHRIV802010501-05) impaired by Aluminum and Copper for the use designation "Aquatic Life". In addition, for the 2016 cycle all surface waters in New Hampshire were considered impaired primarily as a result of the statewide fish consumption advisory for mercury in fresh waters primarily due to atmospheric deposition of mercury.

Atmospheric deposition of sulfur dioxide emissions contributes to low pH in New England waters. In its 2012 Section 305(b) and 303(d) report (<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/nh-2012-305b-r-wd-12-4.pdf>), NHDES states, "The passage of the Clean Air Act Amendments in 1990 resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources, which resulted in a decline in sulfate deposition to the state and a decline in sulfate concentrations in state surface waters. It did not however, result in much improvement in the acidity or acid neutralizing capacity status of New Hampshire surface waters. The lack of improvement is due to a number of reasons, including the loss of acid neutralizing minerals in the soils and the accumulation of sulfur and nitrogen in the soils. As a result, hundreds of waterbodies in the state do not meet state water quality standards for the protection of aquatic life due to low pH (i.e. acidic conditions). Additional reductions in nitrogen and sulfur emissions are necessary to expedite recovery from acid deposition in the Northeast." As it flows through the soil, acidic rain water can leach aluminum from soil clay particles and then flow into streams and lakes. The more acid that is introduced to the ecosystem, the more aluminum is released. This is a likely contributor to aluminum impairment below the Vernon dam.

In its freshwater criteria for copper (<https://www.epa.gov/sites/production/files/2019-02/documents/al-freshwater-copper-2007-revision-factsheet.pdf>), EPA indicates: "Mining, leather and leather products, fabricated metal products, and electric equipment are a few of the industries with copper-bearing discharges that contribute to manmade discharges of copper into surface waters. Municipal effluents may also contribute additional copper loadings to surface waters." Along the Ashuelot River, the primary tributary just below the Vernon dam, both a leather manufacturing facility and municipal waste-water treatment plants likely contribute to the copper impairment. The A.C. Lawrence Leather company in Winchendon, NH was designated a brownfields site after cleanup under EPA's superfund program. At the Keene wastewater treatment plant, both aluminum and copper are monitored in the effluent under the National Pollutant Discharge Elimination System program (<https://www3.epa.gov/region1/npdes/permits/2007/finalnh0100790permit.pdf>).

On July 3, 2006, New Hampshire Department of Environmental Services (NHDES) issued a 401 Water Quality Certificate

<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11099700>) for the Vernon Project under the 1992 License Amendment replacing Units 5-8. The NHDES, in consultation with the Vermont Department of Conservation (VTDEC), determined that any discharge associated with the amendment activity would not violate surface water quality standards, or cause additional degradation in surface waters not presently meeting water quality standards.

To support water quality elements of the WQC and the License Amendment, plans were developed in consultation with NHDES and VTDEC for: reservoir and minimum flow operations and monitoring, debris disposal, dissolved oxygen and water temperature monitoring, and erosion monitoring. All plans were originally filed on January 18, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11565249>), revised plans for debris disposal, and reservoir and minimum flow operations and monitoring were filed on April 18, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11654799>). All plans remain active except the dissolved oxygen and water temperature monitoring.

The Dissolved Oxygen and Water Temperature Monitoring Plan specified two years of monitoring starting in 2008 unless specified events occurred causing the study start date to be delayed. With agency concurrence, the studies were not initiated until 2011 and 2012 when low-flow conditions were observed. A final report was filed April 30, 2013 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13248744>) and no additional monitoring was required as the results show Vernon meeting State standards for water quality. As an aside, under relicensing, a water quality study (Study 6) was conducted in 2015 with expanded testing and monitoring parameters. The results all concur with the previous monitoring studies performed in compliance with the 2006 NH 401 WQC (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14435756>).

The Reservoir and Minimum Flow Operations and Monitoring Plan details reservoir management and provisions for providing minimum flow. Continuous reservoir and flow data are monitored in real time through a SCADA system and transmitted to the operations control center. Operating records documenting reservoir levels, inflows, gate settings, and discharges from turbines and spill are maintained electronically and utilized for compliance tracking. The documentation is supplied to NHDES and VTDEC if requested. In our December 30, 2015 certification renewal letter to LIHI we identified one deviation that occurred on November 26, 2014, no deviations have occurred since. Flow data is provided on a near real-time basis through a web site and flow information telephone. Agencies and the interested public have access to this information twenty-four hours per day.

The Debris Disposal Plan outlines management and proper disposal of debris generated or collected during project operations to protect downstream navigation and aesthetic quality and comply with state water quality and solid waste regulations. Four types of wastes are periodically generated or collected and have a potential to negatively impact water quality if improperly managed. These include river and trashrack debris, recreation area and found debris, construction and demolition debris and dredge materials. Other wastes not included in

the plan, such as recyclable materials, scrap metals, etc. are managed according to various state and federal solid and hazardous waste regulations and policies.

The Erosion Monitoring Plan provides a framework for the comparison of erosion protection immediately downstream of the project before and after installation of the new units. This is done by using an existing monitoring program, which addressed concerns along a cove area on the East Bank, raised by FERC’s New York Regional Office (NYRO) Division of Dam Safety in 1995. The program includes topographic and hydrographic surveys performed by licensed surveyors and are tied to established benchmarks that have known latitude, longitude and elevation. In addition to the topography of the East Bank, cross-sectional surveys of the submerged toe are also performed and provided to assess the submerged footing of the embankment. Visual observations of bank condition (e.g., gullies, slumping and presence of vegetation) are also noted. The plan also addresses the potential for erosion impacts associated with the new units to a downstream alluvial island noted in the WQC. Visual assessments of the island are made on the same frequency as the East Bank surveys for a period of at least two cycles to determine if any active erosion is occurring as a result of operational flows.

The biennial surveys have indicated that the East Bank remains relatively stable, with only minor and normal settling in the location and configuration of the top of the bank and the toe-of-slope observed over time. River bottom hydrography conducted since 1999 has not shown significant erosion or bottom scouring, despite periodic flood flow events having occurred between surveys. The survey indicates continued beach building since the initial Northfield Mountain Pumped Storage Project’s related increase in water level that corresponded to the increased in top of bank withdrawal and slope failure. The most recent biennial survey reports and maps can be found here:

- 2016: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14450082>.
- 2018: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=15131477>, <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=15131478>, <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=15131479>.

### 3.1.3 Criterion C: Upstream Fish Passage - Tailrace

#### **GRH looks to qualify for this criterion under Standard 2.**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>C</b>	<b>2</b>	<p><b><u>Agency Recommendation:</u></b></p> <ul style="list-style-type: none"> <li>• 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).</li> <li>• 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.</li> </ul>

		<ul style="list-style-type: none"> <li>• Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.</li> </ul>
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The Connecticut River Atlantic Salmon Commission (CRASC) was established by Congress in 1983 and reauthorized in 2002 for another 20 years through the Connecticut River Atlantic Salmon Compact (Public Law 98-138). The Compact authorized the interstate agreement with the states of Connecticut, Massachusetts, Vermont and New Hampshire, and allowed the Secretary of Commerce and the Secretary of the Interior to participate as members in a Connecticut River Atlantic Salmon Commission. The CRASC was developed “to promote the restoration of anadromous Atlantic salmon in the Connecticut River Basin by the development of a joint interstate program for stocking, protection, management, re-search, and regulation” with the purpose of restoring Atlantic salmon to the Connecticut River in numbers as near as possible to their historical abundance. Agency representation includes: U. S. Fish and Wildlife Service, National Marine Fisheries Service, Connecticut Department of Environmental Protection, Massachusetts Division of Fish and Wildlife, New Hampshire Department of Fish and Game, and Vermont Department of Fish and Wildlife. The CRASC has expanded to include all diadromous species in the Connecticut River and coordinates restoration and management activities of those species.

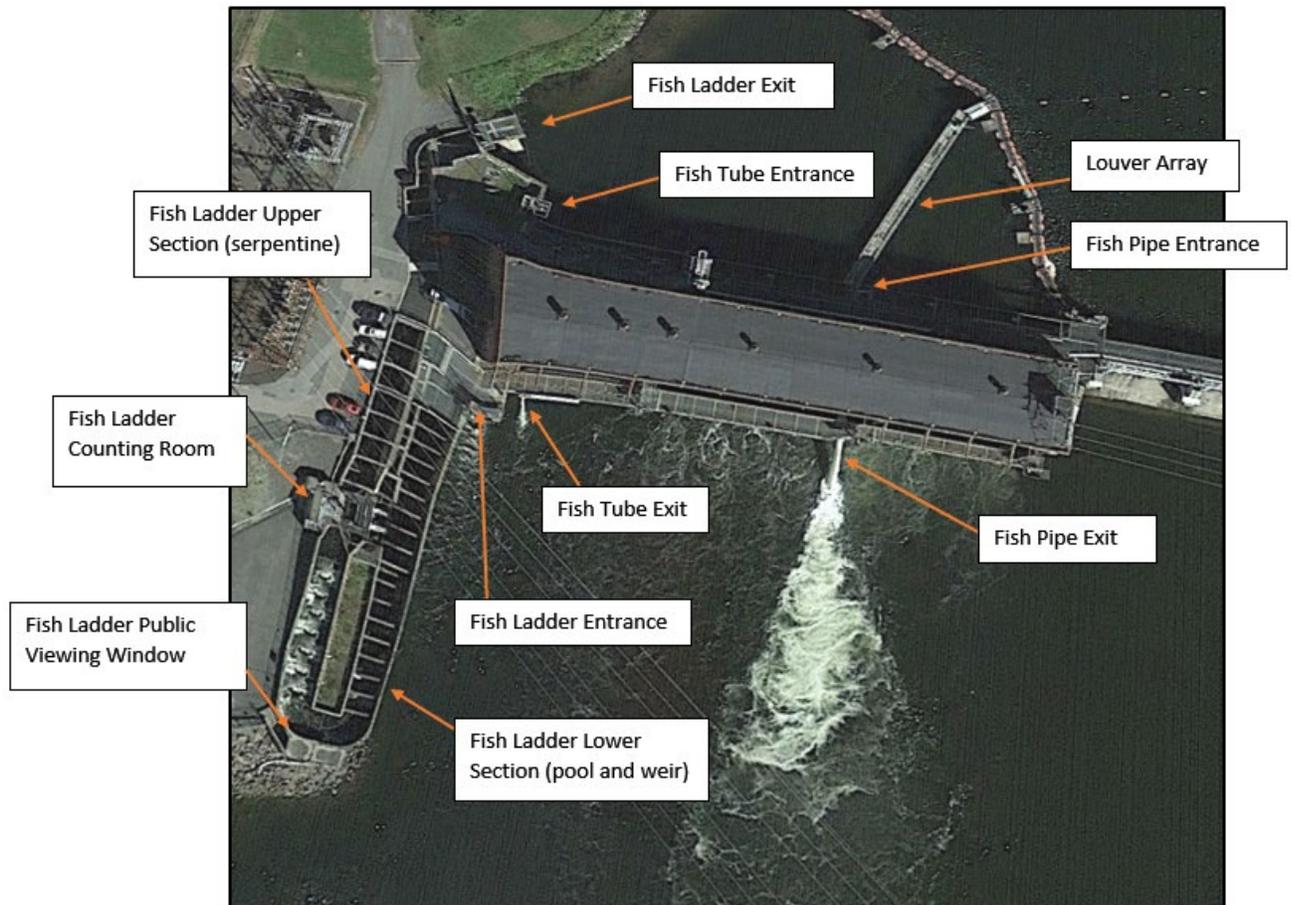
CRASC (1992) produced the Connecticut River American Shad Management Plan with the overarching goal “to restore and maintain a spawning shad population to its historic range in the Connecticut River basin and to provide and maintain sport and the traditional in-river commercial fisheries for the species.” This Plan was updated in 2017 in order to reflect current restoration and management priorities and new information ([https://www.fws.gov/r5csrc/pdf/CRASC\\_Shad\\_Plan\\_6\\_13\\_17\\_FINAL.pdf](https://www.fws.gov/r5csrc/pdf/CRASC_Shad_Plan_6_13_17_FINAL.pdf)). The revised plan bases production targets on accessible and potentially accessible spawning and nursery habitat area and future mixed age-class spawning stock returns. Population objectives of the revised plan include achieving and sustaining a minimum population of 1.7 million adult American shad entering the mouth of the Connecticut River annually based on 8,800 hectares of spawning and nursery habitat in the main stem and identified tributaries. For the Vernon project, the stated objective is to pass greater than 227,000 shad. This represents 57% of the production target of greater than 397,000 shad passing Turners Falls. Shad passage numbers at Vernon in 2017 and 2018 were 28,682 and 31,724, representing 59% and 74%, respectively, of the number of shad passing Turners Falls. This would suggest that the Vernon ladder is generally operating within its efficiency objective.

CRASC released a [Sea Lamprey Management Plan](#) in 2018 and is recognized as the first plan in North America with a focus on restoration and recovery rather than control of nuisance populations as are found in land-locked systems such as the Great Lakes and Lake Champlain. As described in the plan, the status of Sea Lamprey in the Connecticut River basin can be summarized as large and stable with potential for future growth. Yet, given the increasing

knowledge about this species in its native Connecticut River, agencies have elected to designate Sea Lamprey as a “Species of Greatest Conservation Need”, with the intent to “develop and implement conservation strategies and actions to improve Sea Lamprey’s status in the Connecticut River basin”.

CRASC prepared a [Management Plan for River Herring in the Connecticut River Basin](#) dated July 16, 2003 and amended July 8, 2004. River herring is a collective term for alewife, *Alosa pseudoharengus*, and blueback herring, *Alosa aestivalis*, two anadromous fish species related to the American shad. The Plan describes a significant decline in blueback herring at the Holyoke fish lift, with a recent slight increase that has have failed to be sustained. River herring spawn in coastal streams and ponds as well as tributaries and backwaters of major rivers from April to mid-July, therefore, operation of the fish ladder, which successfully passes shad, is similarly felt to provide opportunity for blueback herring should they migrate to the dam. From the Management Plan, *“Blueback passage at Holyoke was modest (i.e., several thousand) when the new fishlift was opened, but quickly increased to over 200,000 in just 5 years and to over half a million in 10 years. In the 12-year period from 1981-1992 the annual herring passage averaged 433,000 and 1985 saw the record passage of 630,000. However, passage at Holyoke plummeted during the 1990’s, averaging only 44,000 in the 9-year period from 1992-2001 and reaching a low of 156 in 2004.”* Returning numbers continued to decline to less than 100 fish in seven of the years between 2004 and 2017. See [https://www.fws.gov/r5csrc/pdf/Select\\_fish\\_passage\\_summary\\_count\\_data\\_2017.pdf](https://www.fws.gov/r5csrc/pdf/Select_fish_passage_summary_count_data_2017.pdf) for annual fish counts since 1967. In a recent [River Herring Spawning Stocking Report for the Lower Connecticut River Basin 2013-2017](#), the 2004 amended Management Plan has been identified as needing to be updated. The report indicated *“Blueback Herring population dynamics in large rivers remains poorly understood with limited monitoring for status and trends necessary for management.”* General restoration efforts have focused on opening available tributary spawning habitat through dam removals or bypass pipes. Restoration stocking of wild caught adult Blueback Herring occurred from 2010-2016 with fish collected below Hartford, Connecticut and released to tributaries upstream including two areas in Massachusetts above Holyoke Dam. The transfers ceased in 2017 with the intent to observe whether a positive response in the number of returns resulted.

On October 5, 1978, FERC approved a Settlement Agreement (Appendix B.2) concerning fish passage facilities including Vernon Dam (now owned and obligations transferred to GRH) for Atlantic Salmon and American Shad. In consultation with USFWS, an upstream fish ladder was designed to pass these two species with operation beginning in 1981. The ladder design is unique in that it includes two types of fishway’s, an ice harbor pool-and-weir design at the lower end and a serpentine vertical-slot design at the upper end. Between the two, a re-regulating bay is used to adjust the volume of water moving between the upper and lower sections. This bay also includes a fish trap mechanism and counting window. The 984-foot long ladder is constructed of reinforced concrete with accessory electrical, mechanical, and pneumatic equipment, and rises a vertical distance of about 35 feet from tailrace to impoundment (Figures 5, 6, and 7).



**Figure 5. Vernon Hydroelectric Project, Vernon Station fish passage facilities. Upstream passage is via the fish ladder; downstream passage facilities include a louver array, fish pipe, and fish tube.**



**Figure 6. Vernon fish ladder, lower section pool and weir configuration.**

**Figure 7. Vernon fish ladder, upper section serpentine configuration.**



Article 402 of FERC Order dated June 12, 1992

(<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=3458512>), as amended on July 28, 2006 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11099700>), required a monitoring plan to ensure the safe upstream passage of Atlantic Salmon, American Shad and other anadromous fish during operation of the new units authorized by the 2006 amendment. The Upstream Fish Passage Monitoring Plan was filed January 18, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11565249>) and approved on June 8, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11708096>). A spring 2009 field verification study was conducted with US Fish and Wildlife Service (USFWS) and Vermont Fish and Wildlife Department (VFWD) and as a result, a unit operating protocol was enacted to support fish ladder effectiveness. This protocol addressed the sequence to be followed for unit operation (last on – first off) to minimize changes in flow at the fish ladder.

Provisions for upstream fish passage, monitoring and implementing improvements, and best practices by species is shown below. Migratory species in the project area, or that have agency management or restoration plans that are associated with the Vernon Project area include Atlantic Salmon (*Salmo salar*), American Shad (*Alosa sapidissima*), Blueback Herring (*Alosa aestivalis*), Sea Lamprey (*Petromyzon marinus*), and American Eel (*Anguilla rostrata*).

- **Atlantic Salmon:** Connecticut River restoration efforts suspended at the Federal and State level in 2012 (Appendix B.3) although a fish ladder specifically designed for passing Atlantic Salmon exists at the dam and was successful in attracting and passing salmon upstream. It continues to operate during salmon migration for the primary purpose of passing American Shad.
- **American Shad:** October 5, 1978, FERC approved a Settlement Agreement (see Appendix B.2) concerning fish passage facilities including Vernon Dam for Atlantic Salmon and American Shad. An upstream fish ladder was designed to pass these two species with operation beginning in 1981. Since 2012 effort to inspect, test, and improve ladder operation and counting have improved the total numbers of shad migrating above Vernon (refer to [https://www.fws.gov/r5crc/pdf/Select\\_fish\\_passage\\_summary\\_count\\_data\\_2017.pdf](https://www.fws.gov/r5crc/pdf/Select_fish_passage_summary_count_data_2017.pdf) and [https://www.fws.gov/r5crc/pdf/2018-counts/CT-River-Fishway-Count-Rpt-10\\_29\\_18.pdf](https://www.fws.gov/r5crc/pdf/2018-counts/CT-River-Fishway-Count-Rpt-10_29_18.pdf)).

Most recently, the annual schedule of ladder operation commences within a few days of shad initiating migration through Turners Falls Dam and continues through July 15.

Entrance into the ladder and passage effectiveness was studied under relicensing and is estimated to be 73.5% and 55.2%, respectively

(<https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14503699>). GRH continues to consult with FWS fish passage engineering staff and implement improvements to address potential factors that could delay or impede shad ascent of the ladder in an efficient manner and time span. Currently, an interior guidance wall is being constructed in the off

season to eliminate a potential delay area near the public viewing window “180-degree turn”. This modification will be completed before the 2019 migration season. Additionally, modern, automated control systems were installed to maintain the optimum entrance flow into the ladder.

- **Sea Lamprey:** There are no direct restoration efforts for Sea Lamprey in the Connecticut River Basin. However, the species, which spawns primarily in the mainstem in the Spring, benefits from the annual fish ladder operation at Vernon and significant numbers (2,612 in 2017 and 3,121 in 2018) pass upstream. Observations of Connecticut River specific migration suggests the existing fish ladder operational season is satisfactory. The efficiency of the ladder for passing sea lamprey has not been evaluated and there have been no requests for such studies from fishery management agencies.
- **American Eel:** There is no current agency recommendation or requirement to provide upstream passage for American Eel. For the past 4-5 years, GRH has been studying the presence, congregation and corresponding need for upstream passage through its current relicensing study process as it is anticipated that an agency recommendation for such will be filed with the FERC once a final application has been accepted by the FERC. However, despite the completion of the formal studies, GRH, in consultation with federal and state agencies, has been continuing studies designed to evaluate use of the existing fish ladder by upstream migrating eels. Limited numbers of eels have been spotted below the dam and among those, even fewer exhibit upstream migratory behavior other than those observed in the fish ladder; although precise quantification of upstream migrants remains difficult. Efforts currently undertaken involve attempting to get an accurate count of American Eels migrating up the ladder (as numbers suggest up and down movement) as well as improve passage potential. Determining whether the ladder can provide a feasible method for upstream passage of eels both during and after the shad migration season will require further study and evaluation over a number of years. GRH anticipates continuing to monitor and evaluate passage feasibility and methods during the continuing relicensing proceeding and likely after a new License is issued. Study results on the presence of eels at the Vernon project have been reported for the years [2015](#), [2016](#), and [2017](#). Study results for the 2018 study year will be posted to GRH’s relicensing web site ([www.greatriverhydro-relicensing.com](http://www.greatriverhydro-relicensing.com)) when finalized.
- **Blueback Herring:** Blueback Herring made limited historical use of the Project area based on reported collections or observations in recent decades, but none have been observed since 2000. Their migration period corresponds with the fish ladder operating season but due to limited numbers arriving at Vernon, no efficiency studies have been requested for the Vernon ladder.

3.1.4 *Criterion D: Downstream Fish Passage - Tailrace*

**GRH looks to qualify for this criterion under Standard 1 – Not Applicable.**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>D</b>	<b>1</b>	<p><b>Not Applicable / De Minimis Effect:</b></p> <ul style="list-style-type: none"> <li>• 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).</li> <li>• 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.</li> <li>• Document available fish distribution data and the lack of migratory fish species in the vicinity.</li> <li>• If migratory fish species have been extirpated from the area, explain why the facility is or was not the cause of this.</li> </ul>

Below the dam, the Vernon Project does not create a barrier to downstream passage.

3.1.5 *Criterion E: Shoreline and Watershed Protection -Tailrace*

**GRH looks to qualify for this criterion under Standard 1 – Not Applicable.**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>E</b>	<b>1</b>	<p><b>Not Applicable / De Minimis Effect:</b></p> <ul style="list-style-type: none"> <li>• If there are no lands with significant ecological value associated with the facility, document and justify this (e.g., describe the land use and land cover within the project boundary).</li> <li>• Document that there have been no Shoreline Management Plans or similar protection requirements for the facility.</li> </ul>

The current license does not require a Shoreline Management Plan or similar protection at the facility and no new requirements have been mandated. All shorelines downstream of the Vernon dam are within the FERC Project Boundary of FirstLight’s Northfield Mountain Pumped Storage Project and Turner Fall Hydroelectric Project as the waters below the dam are all within the influence and are affected by these projects. The FirstLight project boundary includes the shoreline of GRH fee owned properties under the current Vernon license and therefore shares a common border along the shoreline with the upland areas within the Vernon Project boundary.

A small portion of the 287 acres fee-owned land within the Vernon Project Boundary lies above the shoreline associated within ZOE #1 and is largely associated with recreation, fish ladder or plant operations, including the dam, powerhouse, fish ladder, spillway, maintenance garage,

switchyard, substation, transmission easements by others (New England Power Company, d.b.a. National Grid), and developed and passive recreation including one developed picnic area and river accessible boat launch, parking for fish ladder public viewing, and canoe portage. It is protected from non-project related use without securing FERC approval. Change for non-project use or disposition requires FERC review which requires state and federal agency consultation regarding impacts to fish and wildlife resources, endangered species, recreation, and historic resources. The Historic Resource Management plan (a cover letter for the privileged document is found here: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12008949>) developed as a result of the 2006 Unit 5-8 repowering project stipulates provisions on these properties to protect historic resources.

### 3.1.6 Criterion F: Threatened and Endangered Species - Tailrace

#### **GRH looks to qualify for this criterion under Standard 2.**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>F</b>	<b>2</b>	<p><b>Finding of No Negative Effects:</b></p> <ul style="list-style-type: none"> <li>• Identify all listed species in the facility area based on current data from the appropriate state and federal natural resource management agencies.</li> <li>• 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.</li> </ul>

In support of relicensing, a list of all federally threatened and endangered species within the Wilder, Bellows Falls, and Vernon Project areas was obtained from map and database information provided by FWS. Five federally protected species were identified to either occur or have historically occurred within the three project areas: Puritan tiger beetle (*Cicindela puritana*), dwarf wedgemussel (*Alasmidonta heterodon*), Northern long-eared bat (*Myotis septentrionalis*), Jesup’s milk vetch (*Astragalus robbinsii* var. *jesupii*), and Northeastern bulrush (*Scirpus ancistrochaetus*). In consultation with resource agencies, targeted relicensing studies were conducted to search the three Project areas for the Jesup’s milk vetch in 2012 (Normandeau, 2013b) and Northeastern bulrush in 2014 (Study 29). In 2014, the three Project areas were also searched for suitable Puritan tiger beetle habitat as part of Study 26, and in 2011, 2013, and 2014, surveys were conducted to search for the dwarf wedgemussel (Study 24). None of the listed species identified above were found within the Vernon Project area.

The bald eagle, a protected species under the Bald and Golden Eagle Protection Act (16 United States Code [U.S.C.] § 668-688c), is present in the Project area. While the species remains on Vermont’s endangered species list it was removed from New Hampshire’s threatened and endangered species list in 2017 and is considered recovered. Bald eagle nests identified within the project area are located in Hinsdale, NH. Bald eagles are often found in the vicinity of large power dams on the Connecticut River, largely due to discharge below the dam keeping water

from icing-over during winter months and therefore providing foraging habitat. This could be considered a positive effect and has supported the recovery of the species.

In 2012, a pre-relicensing study was conducted to assess the presence of state listed threatened or endangered plant species within the three project areas. No species were identified in the Vernon tailrace zone. In 2015, Vermont listed Fowler's toad as state endangered (it is not listed federally or in NH). During relicensing field studies in 2014 Fowler's toad was found below the Vernon dam. Water elevation in this area below the dam is influenced by FirstLight's Turners Falls and Northfield Mountain hydro projects located downstream.

GRH has not been notified by any natural resource management agency associated with the Vernon Project that the Project has a negative effect on any of the species listed above. GRH anticipates discussion with Vermont state resource management agencies regarding Fowler's toad during relicensing.

### 3.1.7 Criterion G: Cultural and Historic Resources - Tailrace

#### **GRH looks to qualify for this criterion under Standard 2.**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>G</b>	<b>2</b>	<p><b>Approved Plan:</b></p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Document that the facility is in compliance with all such plans.</li> </ul>

In accordance with Article 404 of the FERC license a Memorandum of Agreement for Mitigation of Effects on Historic Resources was executed on April 17, 2006 with the VT and NH State Historic Preservation Offices, and FERC (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11003591>). An Historic Properties Management Plan, developed in consultation with the SHPO's was filed on May 1, 2009 (cover letter for the privileged document is found here <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12008949>). The project is in compliance with the HPMP. A Phase 1A Archaeological Reconnaissance Survey Update was filed on December 23, 2014 (a cover letter for the privileged document is found here: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13721844>), and Phase II Update filed on December 1, 2016 (cover letter for the privileged document is found here: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14414299>). Comments from VT SHPO (State of Vermont, Division of Historic Preservation) on the Phase II Update is found here (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14589495>). GRH responded to VT SHPO's comments in its response to all comments filed on 16 ILP Updated Study Reports filed between November 30, 2016 and March 22, 2017. Within the referenced document,

GRH’s response is found on page 44 under the header: Study 33 – Phase II Archaeological Site Evaluation Surveys, Wilder and Vernon Projects (Vermont). None of the identified active erosion areas on the New Hampshire side of the Connecticut River in the Vernon Project area were subjected to Phase IB, and therefore Phase II, investigations because requested landowner permission was not granted.

**Additional Supplemental Information regarding Historic Resources in the Tailrace Zone**

On March 15, 2018, the FERC issued an order on rehearing that required FirstLight to complete Phase IB and Phase II archaeological investigations on 24,425 meters (m) of shoreline in Vermont, New Hampshire, and Massachusetts as part of the relicensing process for the Turners Falls Hydroelectric Project and the Northfield Mountain Pumped Storage Project. This includes land below Vernon dam within the determined Area of Potential Effect for FirstLight’s projects but also within the Vernon Project Boundary as fee properties associated with the operation of the Vernon Project. The Rehearing Order required FirstLight to file the results of the Phase IB and Phase II investigations with FERC by September 1, 2018.

Despite requesting and receiving permission from GRH to conduct the surveys on GRH land, on May 31, 2018, FirstLight filed a request with FERC to waive the Phase IB survey requirement for 1,375 m of shoreline in New Hampshire based on the fact that the land is owned by GRH and is within the project boundary of GRH’s Vernon Hydroelectric Project. In its August 8, 2018 Order, FERC denied the waiver of the Phase IB survey requirement on the 1,375 m of shoreline. FirstLight has completed the investigations and filed its report to the NH State Historic Preservation Office (NH SHPO) indicating no archaeological finds were made in the surveyed segments and no further study is recommended. On November 11, 2018 the NH SHPO concurred with FirstLight’s opinion and on December 14, 2018 FirstLight filed its report with FERC, however, significant portions are non-public (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=15214602>).

Under relicensing, GRH compiled and filed with FERC a Traditional Cultural Properties report (<https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14249798>) and is consulting with local tribes in the development of a Programmatic Agreement and Historic Resources Management Plan.

*3.1.8 Criterion H: Recreation - Tailrace*

**GRH looks to qualify for this criterion under Standard 2 and PLUS.**

<i>Criterion</i>	<i>Standard</i>	<i>Instructions</i>
H	2	<p><b><u>Agency Recommendation:</u></b></p> <ul style="list-style-type: none"> <li>Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations.</li> </ul>

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
		<ul style="list-style-type: none"> <li>Document that the facility is in compliance with all such recommendations and plans.</li> </ul>
<b>H</b>	<b>PLUS</b>	<p><b><u>Bonus Activities:</u></b></p> <ul style="list-style-type: none"> <li>Document any new public recreational opportunities that have been created on facility lands or waters beyond those required by agencies (e.g., campgrounds, whitewater parks, boating access facilities and trails).</li> <li>Document that such new recreational opportunities did not create unmitigated impacts to other resources.</li> </ul>

Vernon is currently operating under its current FERC licensed Recreation Plan (Exhibit R to the License; Appendix B.4) under its current FERC License. Facilities are annually inspected and maintained on a weekly basis, except for significant capital improvements or major maintenance, which is conducted after design, permitting, and budget planning. Since the development of the Recreation Plan a public viewing window at the fish ladder was added to the projects recreation plan and is open to the public during daytime hours of the fish passage season. The Recreation Plan was filed September 2, 1971 and supplemented and revised November 5, 1973. The public viewing windows were part of the original design of the fish ladder and built as part of the fish ladder with completion in 1981. The most recent FERC Environmental and Public Use Inspection was conducted on June 9, 2009, no follow-up items were identified (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12103695>).

The current LIHI Certification includes Condition 3 related to major maintenance of the Governor Hunt Picnic Area. This Condition was met and reported to LIHI on August 11, 2017.

**STANDARD H-PLUS: Bonus Activities**

GRH staff constructed and maintain a canoe campsite (platforms, privy or outhouse, signage) on GRH fee lands in Zone of Effect 1 - Tailrace. This campsite is part of a larger system of campsites along the length of the Connecticut River referred to as the Connecticut River Paddlers’ Trail. The Paddlers’ Trail is a series of primitive campsites and river access points from the River’s headwaters in New Hampshire south to Long Island Sound. A variety of organizations assist with trail planning and development. In addition to the sites GRH manages within the Vernon Project, as a major donor to the program, GRH provides substantial financial support for the Connecticut River Paddlers’ Trail through an annual contribution. From 2011 to 2018, donations have ranged from \$3,500 to \$15,000 for a total of \$68,500 over the eight-year period.

### 3.2 Zone of Effect 2 –Impoundment

**Table 4. Matrix of Alternative Standards for: Vernon, Zone of Effect 2 - Impoundment**

Criterion		Alternative Standards				
		1	2	3	4	Plus
A	Ecological Flow Regimes	x				
B	Water Quality		x			
C	Upstream Fish Passage	x				
D	Downstream Fish Passage		x			
E	Watershed and Shoreline Protection	x				
F	Threatened and Endangered Species Protection		x			
G	Cultural and Historic Resources Protection		x			
H	Recreational Resources		x			x

#### 3.2.1 Criterion A: Ecological Flow Regime - Impoundment

##### **GRH looks to qualify for this criterion under Standard 13**

Criterion	Standard	Instructions
A	1	<p><u>Not Applicable / De Minimis Effect:</u></p> <ul style="list-style-type: none"> <li>• Confirm the location of the powerhouse relative to other dam/diversion structures to establish that there are no bypassed reaches at the facility.</li> <li>• If Run-of-River operation, provide details on how flows, water levels, and operation are monitored to ensure such an operational mode is maintained.</li> <li>• In a conduit project, identify the water source and discharge points for the conduit system within which the hydropower plant is located.</li> <li>• For impoundment zones only, explain how fish and wildlife habitat within the zone is evaluated and managed – <i>NOTE:</i> this is required information, but it will not be used to determine whether the Ecological Flows criterion has been satisfied. All impoundment zones can apply Criterion A-1 to pass this criterion.</li> </ul>

Vernon Project consists of a dam and integral powerhouse. There are no bypassed portions of the Connecticut River. There are no penstocks. The trash racks and concrete intakes structures are integral features of the powerhouse located on the upstream face of the powerhouse. Fish and wildlife resources and habitat in and adjacent to the Vernon impoundment are evaluated and managed by the US Fish and Wildlife Service, New Hampshire Fish and Game Department and Vermont Fish and Wildlife Department. Setback areas are important rearing habitat for juvenile American Shad along with numerous other species.

The project operates on a daily run-of-river cycle designed to capture inflow, discharge as appropriate to provide conservation flows for habitat and fish passage, maintain optimal head, fit the daily energy demand curve, and avoid spill. Inflows are calculated based on upstream gage and hydropower discharge information and managed discharge from US Army Corp of Engineers dams. Natural inflow is calculated based on back calculation using discharge at Vernon, measured inflow from sources listed above and change in storage based on impoundment storage tables.

A major reconstruction of the spillway crest water control mechanisms was completed in 1986 and included the addition of a trash sluice (skimmer) gate, six tainter gates, and two 50-foot bays of hydraulic panels in the spillway section. This extensive crest control investment provides much greater ability to maintain and operate at the high end of the impoundment operating range. Although Vernon Dam has an operating range of impoundment elevation from 212.13 ft to 220.13 ft, GRH does not utilize that range for normal operations. It is utilized only when natural flood flows exceed the capacity of the six tainter gates such that hydraulic flashboards or stanchion flashboards sections must be used. If that occurs, flows must subside, and the impoundment elevation dropped to the elevation of the concrete crest (212.13 ft) in order to reset stanchion beams and raise hydraulic flashboards. This can occur periodically but is wholly in response to natural high flow events. Once in a while, although rare, a dam emergency may require drawdown below normal operations. When this occurs, and if possible, GRH consults with federal and state fish and wildlife agencies to identify the periods when less impact is likely.

As stated above, the normal operating elevation range is between 218.3 ft and 220.1 ft. This does not mean that the project fluctuates daily within this range as reservoir fluctuation is typically in response to upstream inflow, natural inflow from the 852 square miles of drainage area above Vernon and below the upstream mainstem dam at Bellows Falls, Vermont or when the inflow might be less than the required minimum or fish passage flow. Similarly, as a daily run-of-river peaking project, corresponding hours of operation may not precisely coincide with the inflow. In order to accommodate anticipated inflow, the Vernon project may operate to lower the reservoir slightly in order to provide the necessary storage within the project. Although allowed by its FERC License, GRH rarely (if ever) calculates inflow and reduces minimum flow below 1250 cfs. Flows from upstream (upstream discharge plus natural) are calculated and managed through the Vernon impoundment in the most efficient manner possible to maintain head (elevation at the Vernon Dam), pass the required flows at Vernon and provide adequate storage capacity to handle predicted inflow.

### 3.2.2 Criterion B: Water Quality - Impoundment

#### **GRH looks to qualify for this criterion under a combination of Standard 2 and 3**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>B</b>	<b>2</b>	<p><u>Agency Recommendation:</u></p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Provide a copy of the most recent Water Quality Certificate, including the date of issuance.</li> <li>• Identify any other agency recommendations related to water quality and explain their scientific or technical basis.</li> <li>• 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.</li> </ul>

Connecticut River water quality in the vicinity of the Vernon Project is monitored by the state of New Hampshire. In their Clean Water Act Section 303(d) List of Impaired Waters (<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2016/documents/r-wd-17-09-app-a1.pdf>), New Hampshire identified the Connecticut River above the Vernon dam (Assessment Unit ID NHRIV801070505-10) impaired by pH for the use designation “Aquatic Life”. In addition, for the 2016 cycle all surface waters in New Hampshire were considered impaired primarily as a result of the statewide fish consumption advisory for mercury in fresh waters primarily due to atmospheric deposition of mercury.

Atmospheric deposition of sulfur dioxide emissions contributes to low pH in New England waters. In its 2012 Section 305(b) and 3030(d) report (<https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/nh-2012-305b-r-wd-12-4.pdf>), NHDES states, “The passage of the Clean Air Act Amendments in 1990 resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources, which resulted in a decline in sulfate deposition to the state and a decline in sulfate concentrations in state surface waters. It did not however, result in much improvement in the acidity or acid neutralizing capacity status of New Hampshire surface waters. The lack of improvement is due to a number of reasons, including the loss of acid neutralizing minerals in the soils and the accumulation of sulfur and nitrogen in the soils. As a result, hundreds of waterbodies in the state do not meet state water quality standards for the protection of aquatic life due to low pH (i.e. acidic conditions). Additional reductions in nitrogen and sulfur emissions are necessary to expedite recovery from acid deposition in the Northeast.”

On July 3, 2006, New Hampshire Department of Environmental Services (NHDES) issued a 401 Water Quality Certificate (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11099700>) for the Vernon Project under the 1992 License Amendment replacing Units 5-8. The NHDES, in consultation

with the Vermont Department of Conservation (VTDEC), determined that any discharge associated with the amendment activity would not violate surface water quality standards, or cause additional degradation in surface waters not presently meeting water quality standards.

To support water quality elements of the WQC and the License Amendment, plans were developed in consultation with NHDES and VTDEC for: reservoir and minimum flow operations and monitoring, debris disposal, dissolved oxygen and water temperature monitoring, and erosion monitoring. All plans were originally filed on January 18, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11565249>), revised plans for debris disposal, and reservoir and minimum flow operations and monitoring were filed on April 18, 2008 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11654799>). All plans remain active except the dissolved oxygen and water temperature monitoring.

The Dissolved Oxygen and Water Temperature Monitoring Plan specified two years of monitoring starting in 2008 unless specified events occurred causing the study start date to be delayed. With agency concurrence, the studies were not initiated until 2011 and 2012 when low-flow conditions were observed. A final report was filed April 30, 2013 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13248744>) and no additional monitoring was required as the results show Vernon meeting State standards for water quality. As an aside, under relicensing, a water quality study (Study 6) was conducted in 2015 with expanded testing and monitoring parameters. The results all concur with the previous monitoring studies performed in compliance with the 2006 NH 401 WQC (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14435756>).

The Reservoir and Minimum Flow Operations and Monitoring Plan details reservoir management and provisions for providing minimum flow. Continuous reservoir and flow data are monitored in real time through a SCADA system and transmitted to the operations control center. Operating records documenting reservoir levels, inflows, gate settings, and discharges from turbines and spill are maintained electronically and utilized for compliance tracking. The documentation is supplied to NHDES and VTDEC if requested. A log of all deviations for the year is maintained and submitted to the agencies. In our December 30, 2015 certification renewal letter to LIHI we identified one deviation that occurred on November 26, 2014, no deviations have occurred since. Flow data is provided on a near real-time basis through a web site and flow information telephone. Agencies and the interested public have access to this information twenty-four hours per day.

The Debris Disposal Plan outlines management and proper disposal of debris generated or collected during project operations to protect downstream navigation and aesthetic quality and comply with state water quality and solid waste regulations. Four types of wastes are periodically generated or collected and have a potential to negatively impact water quality if improperly managed. These include river and trashrack debris, recreation area and found debris, construction and demolition debris and dredge materials. Other wastes not included in

the plan, such as recyclable materials, scrap metals, etc. are managed according to various state and federal solid and hazardous waste regulations and policies.

### 3.2.3 Criterion C: Upstream Fish Passage - Impoundment

#### **GRH looks to qualify for this criterion under Standard 1 – Not Applicable**

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

The Vernon impoundment contains no barriers to upstream movement.

### 3.2.4 Criterion D: Downstream Fish Passage - Impoundment

#### **GRH looks to qualify for this criterion under Standard 2.**

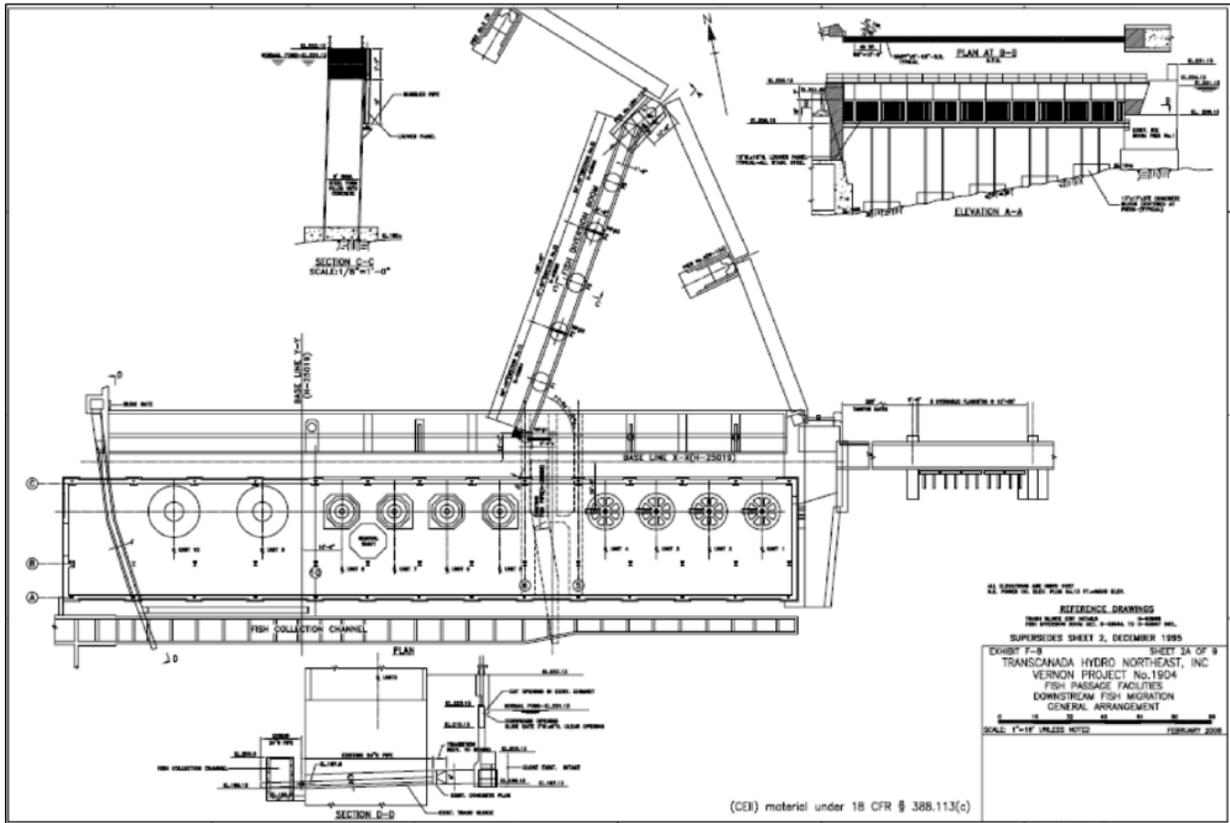
<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>D</b>	<b>2</b>	<p><b><u>Agency Recommendation:</u></b></p> <ul style="list-style-type: none"> <li>• Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain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

Current agency recommendations and requests for downstream passage at Vernon are limited to the ensuring downstream passage for anadromous fishes in the Connecticut River driven by the Atlantic Salmon restoration program. Interest by agencies and stakeholders regarding downstream passage for all other fish species are in the context of the active relicensing process; no agency recommendations have been submitted at this point in the process.

On July 26, 1990, New England Power Company (a predecessor to GRH) entered into a Memorandum of Agreement (MOA; Appendix B.5) with the CRASC, US Fish and Wildlife Service, National Marine Fisheries Service and the States of Connecticut, Massachusetts, New Hampshire and Vermont that specified measures and timing for permanent downstream fish

passage for Atlantic Salmon and fish from the family clupeidae (American Shad and Blueback Herring ). On the same day FERC issued an Order approving the downstream passage facilities (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=3455046>). The technical and scientific basis for these requirements were driven by the ever-evolving efforts to restore Atlantic Salmon to the Connecticut River Basin. The program evolved as a result of the program's success and failure to one that ultimately relied upon the basin-wide stocking of salmon smolts and fry. To ensure success of this approach, the timing and development of effective means of downstream passage that reduced mortality, injury and delay was essential. Rather than specifically tied to a scientific and technical basis, the requirement for downstream passage as specified in the MOA, was largely a management decision driven by the restoration effort and program.

Facilities, developed in consultation with CRASC and USFWS' hydraulic engineer, were constructed in 1995. Downstream fish passage facilities consist of a "fish pipe" that discharges about 350 cfs through the powerhouse, a second smaller "fish bypass" at the Vermont end of the powerhouse that discharges about 40 cfs, and a 156-foot-long louver array that extends from the forebay to the fish pipe entrance (see Figures 2 and 5). The louver array consists of stainless-steel louver panels with 3-inch spacing between louver vanes that extend to 15 feet depth at normal pond elevation. The louver intercepts and directs downstream-migrating fish that enter the forebay from mid-river and from the east (New Hampshire) shoreline into the fish pipe. The smaller fish bypass on the Vermont end of the powerhouse functions as a secondary passage route for fish that are not intercepted by the louver array and enter the western end of the forebay (Figure 5). CRASC publishes an annual schedule for downstream passage operations for diadromous species (for example see Appendix B.6).



**Figure 8. Downstream fish passage layout.**

Effectiveness studies for downstream passage were conducted in accordance with a Revised Downstream Fish Passage Monitoring Plan (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11654789>) (“the Plan”) developed in consultation with resource agencies and approved by FERC in Orders dated 6/12/92 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=3458512>) and 7/28/06 (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11099700>). The purpose of the Plan was to propose a downstream fish passage monitoring approach and implementation schedule to assure safe overall downstream passage of migrating Atlantic salmon and American shad, subsequent to the installation and operation of four new 4.0 MW generating turbines at the Vernon Project. The Plan summarizes results of downstream passage effectiveness studies conducted in 1995 and 1996 (prior to turbine upgrade), which included:

- Passage efficiency of the louver array, fishpipe, and fishtube for emigrating Atlantic salmon smolts, based on radio tagging of actively migrating smolts;
- In-situ turbine and fishway survival of salmon smolts; and
- Desktop estimate of entrainment and survival through the new units.

Proposed effectiveness studies conducted post turbine upgrade included:

- Salmon smolt survival through the four new generating turbines;
- If a turbine survival found to be less than 95%, conduct a passage effectiveness evaluation of the out-migrating population that chooses Unit 5-8 as the passage route. If turbine survival through the new turbines at least 95%, no additional studies.

- Visual assessments, from the surface and underwater, of juvenile shad movement in the forebay. Conducted with agency representatives and conclusions drawn would determine whether additional monitoring need be considered.

Provisions for monitoring and implementing improvements, and best practices by species is shown below. Migratory species in the project area, or that have agency management or restoration plans that are associated with the Vernon Project area include Atlantic Salmon, American Shad, Blueback Herring, Sea Lamprey, and American Eel.

- **Atlantic Salmon:** No formal downstream passage effectiveness studies have been performed on adult Atlantic Salmon due to, in large part, the lack of returning adults to the Connecticut River Basin overall, but in particular the small number passing the Turners Falls dam and arriving at the base of Vernon dam. While Atlantic Salmon have occurred historically in the Project area, current management and stocking efforts were discontinued in 2012 due to poor returns. Downstream passage operations for Atlantic Salmon adults is required from about mid-October to December 31, only if 50 or more pass upstream (see Appendix B.6). However, downstream passage is operated for other species, as described below, from mid-April through November 15, providing a window of time for downstream passage should fewer than 50 adults move upstream of the Vernon dam. Fewer than 5 adult salmon have ascended the Connecticut River to the Vernon dam in recent years.

Salmon smolts migrating downstream passed the Vernon dam were primarily the product of stocking efforts. Numerous downstream passage effectiveness studies were conducted for Atlantic Salmon smolts, showing high estimates of safe passage past the Project (95.5% in 1996 and >92% in 2008). However, as of February 11, 2016, CRASC no longer requires their passage at Vernon due to discontinuation of salmon stocking in the Connecticut River Basin (Appendix B.3).

- **Blueback Herring:** Blueback Herring made limited historical use of the Project area based on reported collections or observations in recent decades, but none have been observed since 2000. No formal downstream passage effectiveness studies have been performed due to the limited numbers passing upstream.
- **American Shad:** Downstream passage of juvenile shad was not studied, other than visual assessment, before the relicensing began primarily because no effective means was available. American Shad are more susceptible than other species to handling and tagging stress, often resulting in mortality, and no tagging mechanism sufficient to assess survival through the project, was small enough for use on juvenile shad. The 2015 study conducted for relicensing used miniature radio transmitters (approximately 6 x 12 mm, weighing 0.5 g) that had only recently become available. Those studies showed passage survival rates of 91% to greater than 95% through the project turbines (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14467826>). Studies for relicensing are also evaluating downstream passage effectiveness and survival for American Shad adults (<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14503699>,

<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14823689> ). The results of these studies are being evaluated by fish and wildlife agencies and will be used by FERC as they develop their NEPA assessment that will take into account data collected for up to 33 studies conducted for the relicensing.

- **Sea Lamprey:** There are no direct restoration efforts for Sea Lamprey in the Connecticut River Basin. Sea Lamprey are semelparous: adults die after spawning. Larva live within the stream bed for several years before emerging and migrating to the sea where they continue growing to adult stage. Juvenile sea lamprey passage through the project has not been evaluated and there have been no requests for such studies from fishery management agencies.
- **American Eel:** There is no current agency recommendation or requirement to provide downstream passage for American Eel. American Eel migrate up the Connecticut River and its tributaries during the juvenile stages of development. After many years in freshwater (ranging anywhere from about 10-25 years), adults migrate out to sea to spawn. For the past 4-5 years, GRH has been studying the presence, congregation and corresponding need for upstream passage through its current relicensing study process as it is anticipated that an agency recommendation for such will be filed with the FERC once a final application has been accepted by the FERC. Limited numbers of eels have been spotted below the dam and among those, even fewer exhibit upstream migratory behavior other than those observed in the fish ladder; although precise quantification of upstream migrants remains difficult. The apparent small number of eels migrating upstream suggests similarly small numbers attempting downstream migrations. In fact, for relicensing studies of downstream adult American Eel assessment (Study 19; <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14503697>), it was necessary to import eels from Nova Scotia because the low number of adults available for collection in the Connecticut River would not support the number required for study by various entities. GRH does not anticipate agency recommendations or requirements to provide downstream passage for American Eel until such time that upstream passage efforts yield a reproductive age class attempting downstream migration. That timeframe is not expected to be within the period of this application for continued LIHI Certification.

*3.2.5 Criterion E: Shoreline and Watershed Protection - Impoundment*

**GRH looks to qualify for this criterion under Standard 1**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>E</b>	<b>1</b>	<p><b>Not Applicable / De Minimis Effect:</b></p> <ul style="list-style-type: none"> <li>• If there are no lands with significant ecological value associated with the facility, document and justify this (e.g., describe the land use and land cover within the project boundary).</li> <li>• Document that there have been no Shoreline Management Plans or similar protection requirements for the facility.</li> </ul>

The vast majority of the shoreline upstream of Vernon dam is private property owned by others [than GRH] on which GRH exercises flowage rights. A portion of the 287 acres of fee ownership that lies in the vicinity of the dam within the FERC Project Boundary of the Vernon Project can be considered in ZOE #2 but it is largely necessary for project related uses including the dam, powerhouse, fish ladder, spillway, maintenance garage, switchyard, substation, transmission easements by others (New England Power Company, d.b.a. National Grid), and developed and passive recreation including a small picnic area and canoe portage. Also within the fee ownership is the natural feature known as Vernon Neck, which the eastern end of the dam abuts and is a significant natural feature important to the overall project impoundment. The base of this feature is rip-rapped and routinely inspected for stability.

The limited amount of fee-owned land above the shoreline is within the Vernon Project Boundary and as such is protected from non-project related use without securing FERC approval. Change for non-project use or disposition requires FERC review which requires state and federal agency consultation regarding impacts to fish and wildlife resources, endangered species, recreation, and historic resources. The Historic Resource Management plan developed as a result of the 2006 Unit 5-8 repowering project stipulates provisions on these properties to protect historic resources.

The current license does not require a Shoreline Management Plan or similar protection at the facility and no new requirements have been mandated.

### 3.2.6 Criterion F: Threatened and Endangered Species - Impoundment

#### **GRH looks to qualify for this criterion under Standard 2**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>F</b>	<b>2</b>	<p><b><u>Finding of No Negative Effects:</u></b></p> <ul style="list-style-type: none"> <li>• Identify all listed species in the facility area based on current data from the appropriate state and federal natural resource management agencies.</li> <li>• 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.</li> </ul>

In support of relicensing, a list of all federally threatened and endangered species within the Wilder, Bellows Falls, and Vernon Project areas was obtained from map and database information provided by FWS. Five federally protected species were identified to either occur or have historically occurred within the three project areas: Puritan tiger beetle, dwarf wedgemussel, Northern long-eared bat, Jesup's milk vetch, and Northeastern bulrush. Targeted

relicensing studies were conducted to search the [three] Project areas for the Jesup’s milk vetch in 2012 and Northeastern bulrush in 2014 (Study 29). In 2014, the Project areas were also searched for suitable Puritan tiger beetle habitat as part of Study 26, and in 2011, 2013, and 2014, surveys were conducted to search for the dwarf wedgemussel (Study 24). No listed species were identified within the Vernon Project area.

The bald eagle, a protected species under the Bald and Golden Eagle Protection Act (16 United States Code [U.S.C.] § 668-688c), is present in the Project area. While the species remains on Vermont’s endangered species list it was removed from New Hampshire’s threatened and endangered species list in 2017 and is considered recovered. Bald eagle nests identified within the project area are located in Hinsdale, NH. Bald eagles are often found in the vicinity of large power dams on the Connecticut River, largely due to discharge below the dam keeping water from icing-over during winter months and therefore providing foraging habitat. This could be considered a positive effect and has supported the recovery of the species.

In 2012, a pre-licensing study was conducted to assess the presence of state listed threatened or endangered plant species within the three project areas. One species listed as endangered in Vermont and New Hampshire was identified in the Vernon impoundment, pygmy weed (*Crassula aquatica*). A newly discovered population was found in the Vernon impoundment entirely within the Project operational range. Pygmy weed typically occurs in fresh tidal or other natural drawdown zones, ranging from submersed to emergent conditions. The location of the newly discovered population is consistent with the ecology of this primarily fresh-tidal species and may indicate a positive response to the daily fluctuations of operational conditions. Pygmy weed is protected by Vermont’s Endangered Species Law (10 V.S.A. Chap. 123) and the NH Native Plant Protection Act of 1987 (NH RSA 217-A).

There are no findings of “negative effect” from an appropriate natural resource management agency associated with the Vernon Project on any of the species listed above.

### 3.2.7 Criterion G: Cultural and Historic Resources - Impoundment

#### **GRH looks to qualify for this criterion under Standard 2**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>G</b>	<b>2</b>	<p><b>Approved Plan:</b></p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Document that the facility is in compliance with all such plans.</li> </ul>

In accordance with Article 404 of the FERC license a Memorandum of Agreement for Mitigation of Effects on Historic Resources was executed on April 17, 2006 with the VT and NH State Historic Preservation Offices, and FERC

(<https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=11003591>). An Historic Properties Management Plan, developed in consultation with the SHPO's was filed on May 1, 2009 (cover letter for the privileged document is found here <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12008949>). The project is in compliance with the HPMP. A Phase 1A Archaeological Reconnaissance Survey Update was filed on December 23, 2014 (a cover letter for the privileged document is found here: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13721844>), and Phase II Update filed on December 1, 2016 (cover letter for the privileged document is found here: <https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14414299>).

Under relicensing, GRH compiled and filed with FERC a Traditional Cultural Properties report (<https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14249798>) and is consulting with local tribes in the development of a Programmatic Agreement and Historic Resources Management Plan.

### 3.2.8 Criterion H: Recreation - Impoundment

#### **GRH looks to qualify for this criterion under Standard 2 and PLUS**

<b>Criterion</b>	<b>Standard</b>	<b>Instructions</b>
<b>H</b>	<b>2</b>	<p><b>Agency Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations.</li> <li>• Document that the facility is in compliance with all such recommendations and plans.</li> </ul>
<b>H</b>	<b>PLUS</b>	<p><b>Bonus Activities:</b></p> <ul style="list-style-type: none"> <li>• Document any new public recreational opportunities that have been created on facility lands or waters beyond those required by agencies (e.g., campgrounds, whitewater parks, boating access facilities and trails).</li> <li>• Document that such new recreational opportunities did not create unmitigated impacts to other resources.</li> </ul>

Vernon is currently operating under its current FERC licensed Recreation Plan (Exhibit R to the License; Appendix B.4) under its current FERC License. Facilities are annually inspected and maintained on a weekly basis, except for significant capital improvements or major maintenance, which is conducted after design, permitting, and budget planning.

#### **STANDARD H-PLUS: Bonus Activities**

GRH staff constructed and maintain a canoe campsite (platforms, privy or outhouse, signage) on GRH fee lands in Zone of Effect 2 - Impoundment. This campsite is part of a larger system of campsites along the length of the Connecticut River referred to as the Connecticut River

Paddlers' Trail. The Paddlers' Trail is a series of primitive campsites and river access points from the River's headwaters in New Hampshire south to Long Island Sound. A variety of organizations assist with trail planning and development. In addition to the sites GRH manages within the Vernon Project, as a major donor to the program, GRH provides substantial financial support for the Connecticut River Paddlers' Trail through an annual contribution. From 2011 to 2018, donations have ranged from \$3,500 to \$15,000 for a total of \$68,500 over the eight-year period.

# APPENDIX A - CONTACTS

## A.1 - Facility Contacts

<b>Project Owner:</b>	
Name and Title	Scott Hall
Company	Great River Hydro, LLC
Phone	603-268-2802
Email Address	<a href="mailto:shall@greatriverhydro.com">shall@greatriverhydro.com</a>
Mailing Address	112 Turnpike Road, Suite 202, Westborough, MA 01581
<b>Project Operator (if different from Owner):</b>	
Name and Title	
Company	
Phone	
Email Address	
Mailing Address	
<b>Consulting Firm / Agent for LIHI Program (if different from above):</b>	
Name and Title	
Company	
Phone	
Email Address	
Mailing Address	
<b>Compliance Contact (responsible for LIHI Program requirements):</b>	
Name and Title	John Ragonese
Company	Great River Hydro, LLC
Phone	603-498-2851
Email Address	<a href="mailto:jragonese@greatriverhydro.com">jragonese@greatriverhydro.com</a>
Mailing Address	One Harbour Place, Suite 330; Portsmouth NH 03801
<b>Party responsible for accounts payable:</b>	
Name and Title	Marie LeBlanc
Company	Great River Hydro, LLC
Phone	413-773-6700
Email Address	<a href="mailto:mleblanc@greatriverhydro.com">mleblanc@greatriverhydro.com</a>
Mailing Address	112 Turnpike Road, Suite 202, Westborough, MA 01581

**A.2 - Agency Contacts** Applicant must identify the most current and relevant state, federal, provincial, and tribal resource agency contacts.

<b>Agency Contact</b> (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation __):	
Agency Name	VT Fish and Wildlife Department
Name and Title	Lael Will, Fisheries Biologist
Phone	802-885-8890 (office), 802-777-0827 (cell)
Email address	<a href="mailto:Lael.will@vernont.gov">Lael.will@vernont.gov</a>
Mailing Address	100 Mineral Street, Suite 302, Springfield, VT 05156-3168

<b>Agency Contact</b> (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation <u>X</u> ):	
Agency Name	Vermont Department of Environmental Conservation
Name and Title	Jeff Crocker, Supervising River Ecologist
Phone	802-490-6151
Email address	<a href="mailto:Jeff.crocker@vermont.gov">Jeff.crocker@vermont.gov</a>
Mailing Address	1 National Life Drive, Main 2, Montpelier, VT 05620-3522

<b>Agency Contact</b> (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources <u>X</u> , Recreation __):	
Agency Name	Vermont Division for Historic Preservation
Name and Title	Elizabeth Peebles, Historic Resources Specialist
Phone	802-828-3049
Email address	<a href="mailto:Elizabeth.peebles@vermont.gov">Elizabeth.peebles@vermont.gov</a>
Mailing Address	1 National Life Drive, Davis Bldg, 6 <sup>th</sup> Floor, Montpelier, VT 05620-0501

<b>Agency Contact</b> (Check area of responsibility: Flows <u>X</u> , Water Quality <u>X</u> , Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation <u>X</u> ):	
Agency Name	New Hampshire Department of Environmental Services
Name and Title	Gregg Comstock, Supervisor, Water Quality Planning Section
Phone	603-271-2983
Email address	<a href="mailto:Gregg.comstock@des.nh.gov">Gregg.comstock@des.nh.gov</a>
Mailing Address	29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

<b>Agency Contact</b> (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	New Hampshire Fish and Game
Name and Title	Matthew Carpenter, Fisheries Biologist
Phone	603-271-2612
Email address	<a href="mailto:Matthew.carpenter@wildlife.nh.gov">Matthew.carpenter@wildlife.nh.gov</a>
Mailing Address	29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

<b>Agency Contact</b> (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources <u>X</u> , Recreation __):	
Agency Name	New Hampshire Division of Historical Resources
Name and Title	Dave Trubey, Archaeologist and Review & Compliance Coordinator
Phone	603-271-2813
Email address	David.trubey@dncr.nh.gov
Mailing Address	19 Pillsbury Street, Concord, NH 03301-3570

<b>Agency Contact</b> (Check area of responsibility: Flows __, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. <u>X</u> , Cultural/Historic Resources __, Recreation __):	
Agency Name	US Fish and Wildlife Service
Name and Title	Melissa Grader, Fish and Wildlife Biologist
Phone	413-548-8002 x8124
Email address	<a href="mailto:melissa_grader@fws.gov">melissa_grader@fws.gov</a>
Mailing Address	103 East Plumtree Road, Sunderland, MA 01375

### A.3 – Non-governmental Stakeholders

<b>Non-Governmental Stakeholder</b>	
Organization	Appalachian Mountain Club
Name and Title	Norman Sims
Phone	
Email address	<a href="mailto:normansims1@gmail.com">normansims1@gmail.com</a>
Mailing Address	77 Back Ashuelot Rd, Winchester, NH 03470-2710

<b>Non-Governmental Stakeholder</b>	
Organization	New England Flow
Name and Title	Tom Christopher, Secretary/Director
Phone	
Email address	<a href="mailto:tom.christopher@comcast.net">tom.christopher@comcast.net</a>
Mailing Address	252 Fort Pond Inn Road, Lancaster, MA 05123

<b>Non-Governmental Stakeholder</b>	
Organization	American Whitewater
Name and Title	Bob Nasdor, Northeast Stewardship Director
Phone	617-584-4566
Email address	<a href="mailto:bob@americanwhitewater.org">bob@americanwhitewater.org</a>
Mailing Address	365 Boston Post Road, Suite 250, Sudbury, MA 01776

<b>Non-Governmental Stakeholder</b>	
Organization	Windham Regional Commission
Name and Title	Chris Campany, Executive Director
Phone	802-257-4547
Email address	<a href="mailto:ccampany@windhamregional.org">ccampany@windhamregional.org</a>
Mailing Address	139 Main Street, Suite 505 Brattleboro, VT 05301

<b>Non-Governmental Stakeholder</b>	
Organization	Connecticut River Conservancy
Name and Title	Kathy Urffer, River Steward
Phone	413-772-2020 ext. 215
Email address	<a href="mailto:kurffer@ctriver.org">kurffer@ctriver.org</a>
Mailing Address	15 Bank Row, Greenfield, MA 01301

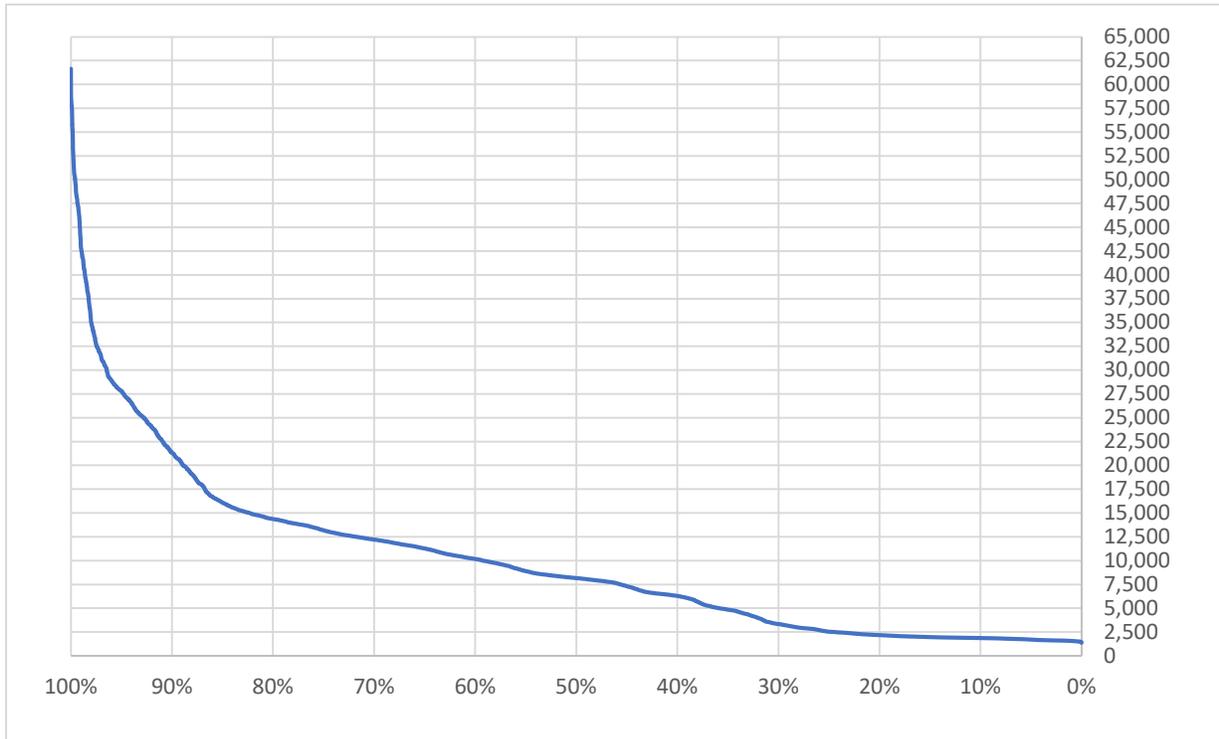
<b>Non-Governmental Stakeholder</b>	
Organization	The Nature Conservancy
Name and Title	Katie Kennedy, Connecticut River Program
Phone	413-586-2349
Email address	<a href="mailto:kkennedy@tnc.org">kkennedy@tnc.org</a>
Mailing Address	25 Main Street, Suite 220, Northampton MA 01060

<b>Non-Governmental Stakeholder</b>	
Organization	Vermont River Conservancy
Name and Title	Noah Pollock
Phone	802-229-0820
Email address	<a href="mailto:Noah.pollock@gmail.com">Noah.pollock@gmail.com</a>
Mailing Address	29 Main Street, Suite 11, Montpelier, VT 05602

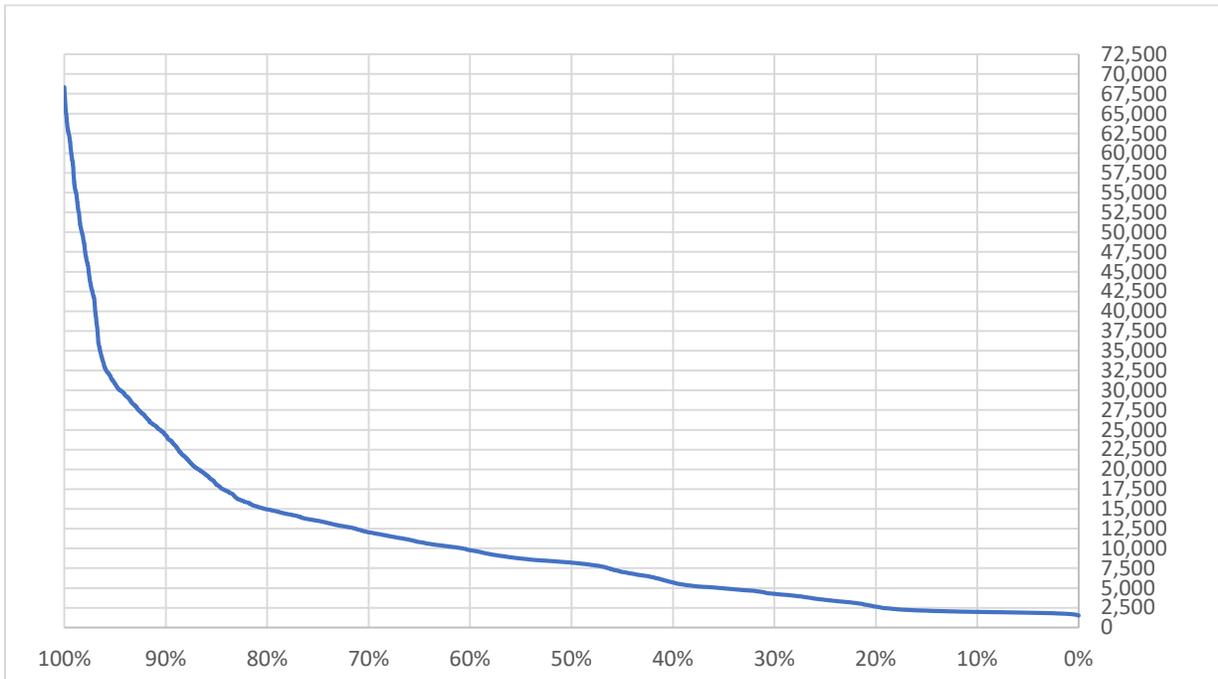
# APPENDIX B – SUPPORTING DOCUMENTATION

## B.1 – Discharge Duration Curves

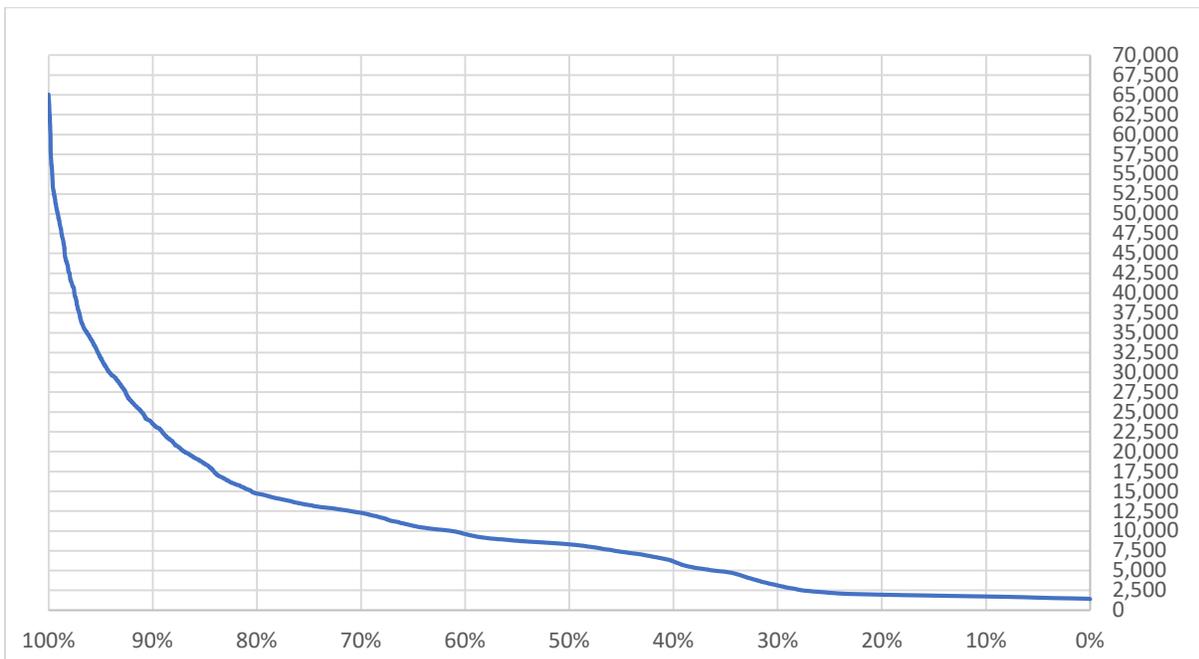
Hourly discharge (cfs) below Vernon station for the period 1/1/12 through 12/31/13.



Hourly discharge (cfs) below Vernon station for the period 1/1/14 through 12/31/15.



Hourly discharge (cfs) below Vernon station for the period 1/1/14 through 12/31/15.



## **B.2 – October 5, 1978 Fish Passage Settlement Agreement**

**COMM-OPINION-ORDER, 5 FERC ¶61,019, New England Power Company, Docket No. E-7561, Project Nos. 1904, 1855, and 1982, (Oct. 05, 1978)**

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**New England Power Company, Docket No. E-7561, Project Nos. 1904, 1855, and 1982**

[61,032]

[¶61,019]

**New England Power Company, Docket No. E-7561, Project Nos. 1904, 1855, and 1982**

**Order Approving Settlement Agreement Concerning Fish Passage Facilities At Project Nos. 1904, 1855, and 1982 and Approving Preliminary Plans for Fish Passage Facilities at Project No. 1904**

**(Issued October 5, 1978)**

**Before Commissioners: Charles B. Curtis, Chairman; Don S. Smith, Georgiana Sheldon, Matthew Holden, Jr. and George R. Hall.**

On December 30, 1977, the Commonwealth of Massachusetts filed for Commission <sup>1</sup> approval a proposed settlement agreement concerning fish passage facilities at three hydroelectric projects on the Connecticut River licensed to the New England Power Company (NEPCO). Proceeding upstream in order, these projects are the Vernon Project, No. 1904, the Bellows Falls Project, No. 1855, and the Wilder Project, No. 1892. The signatories to the settlement agreement are NEPCO, the States of Massachusetts, Connecticut, New Hampshire, and Vermont, the U.S. Fish and Wildlife Service (USFWS), the Environmental Defense Fund, the Massachusetts Public Interest Research Group, Inc., For Land's Sake (FLS), and Trout Unlimited. <sup>2</sup>

On January 30, 1978, NEPC filed for Commission approval four sheets of Exhibit S drawings depicting functional plans for construction of fish passage facilities at the Vernon Project. These drawings were filed pursuant to the fish facility settlement agreement referred to above.

**BACKGROUND**

American shad and Atlantic salmon are anadromous fish native to the Connecticut River. The construction of dams for five licensed projects on the river <sup>3</sup> created barriers to the natural upstream migration of these anadromous fish. Docket No. E-7561 is the result of a 1971 Commission order <sup>4</sup>

establishing an investigation into the possibility of restoring annual runs of shad and salmon to the Connecticut River and any appropriate measures to be taken at the five licensed projects to aid the restoration effort. The Commission has already provided for modification or construction of fish passage facilities at the Holyoke and Turners Falls Projects, pursuant to earlier settlement agreements.<sup>5</sup>

### *THE SETTLEMENT AGREEMENT*

The settlement agreement before us now sets forth a schedule for the design, construction, and operation of fish passage facilities by NEPCO at Vernon, Bellows Falls, and Wilder. Public notice of

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the settlement agreement was given on February 3, 1978, with March 13, 1978 as the last day for filing protests or petitions to intervene. None was received. Commission staff filed comments on March 13, 1978 seeking to clarify some of the provisions of the settlement agreement. The signatories to the settlement filed a response to staff's comments on July 14, 1978.

#### 1. *Design.*

Section I of the settlement agreement provides the timetable for decision on the facilities at each project.<sup>6</sup> Final design of the Vernon facilities will begin within 30 days of either approval of the preliminary design by the fisheries agencies and the Commission<sup>7</sup> or completion of model studies -- whichever comes later -- and be completed within a year. For facilities at Bellows Falls, preliminary design of fish passage facilities will begin before the year ends and will be filed within six months after commencement. Final design will begin 30 days after either approval of the preliminary design by the fisheries agencies and the Commission or the return of 30 adult salmon to the Holyoke Project in a single year -- whichever comes later -- and be completed within nine months. At Wilder, preliminary design will begin by May 1, 1981 and will be completed within six months. The final design steps will be similar to and will follow by two years those for Bellows Falls.

#### 2. *Construction.*

Section II of the agreement contains the schedule for construction of the facilities. The dates are subject generally to timely approval of the final design at each project by the fisheries agencies and the Commission. Section IV provides that any time limits in the settlement agreement may be modified at any time by up to twelve months upon mutual written agreement of the signatories.

The construction schedule in Section II calls for the Vernon facilities to be ready to operate by May 1, 1981. The facilities at Bellows Falls are to be ready to operate within approximately two years after either issuance and acceptance of a new long-term license for the project, or the return of 30 adult salmon to the Holyoke Project in a single year, or May 1, 1981 -- whichever is latest. The Wilder facilities are to be ready to operate within approximately two years after either issuance and acceptance of a new long-term license for that project, or May 1, 1983, or if certain minimum numbers of salmon continue to return to Holyoke, two years after construction is commenced at Bellows Falls -- whichever is latest.

The principal question raised in staff's comments related to the number (thirty) of Atlantic salmon returning to Holyoke that triggers final design and construction of the Bellows Falls fishway. Staff considered this triggering figure in conjunction with the provision that the states may release as few as 10 percent of those salmon to continue migrating upstream after the Bellows Falls fishway is operating.<sup>8</sup> Staff noted that under these provisions very few fish (as low as three) might be released for upstream migration and spawning. Staff contended that, if only a few salmon were released, it would be unreasonable to expect a significant number to find their way successfully to tributary spawning areas, resulting in the waste of the released fish. In such circumstances, it might be better either to use the 10 percent to augment the 90 percent being collected to establish a brood stock or to increase the triggering number.

In response, the signatories indicated that returning adult Atlantic salmon will be collected for brood stock at fishways on downstream tributaries -- Farmington River and Salmon River -- as well as at Holyoke. Therefore, it is expected that at least 60 fish would be collected for brood stock before construction of upstream fishways would begin. The signatories also stated that the 10 percent release figure is only a minimum, and was included in the agreement of assure NEPCO that when the fishway is completed at Bellows Falls, salmon will be released for passage through it. The signatories further advised that they would not release only a few fish if it appeared that those fish would be wasted. Their response indicates that the actual number of fish released will depend upon the fishery management decisions made by the fisheries agencies. Staff has concurred with the statement of clarification and has encouraged all decisions on the distribution of returning adult fish to be made by the fisheries agencies.

### *3. Other Fish Facility Provisions.*

Section III requires NEPCO to report every other month to the Commission on the status of the work on fish passage facilities at the three projects. Section V permits NEPCO to seek outside sources of funding for the facilities, but provides that failure or delay in securing such funding would not relieve NEPCO of its obligations under the settlement agreement.

Sections VI and VII provide guidelines for the operation of fish passage facilities at the three projects and for the maintenance of minimum flows. IF NEPCO and the States failed to agree on the actual operating regime of the facilities, it would be determined by a panel of three fish biologists (NEPCO, the States, and the Commission would each appoint one). In Section IX, the fisheries agencies and intervenors agree to certain limitations on the construction of further fish passage facilities at the three projects.

### *4. Erosion.*

Finally, Section X of the settlement provides that inclusion of standard Article 19 of the Commission's Form L-3 (See 54 FPC 1817) in any new long-term licenses for the three projects would satisfy all issues regarding possible erosion raised by the intervenors in 1973. We note, however, that

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FLS has taken action that might be interpreted to contradict this provision of the Settlement Agreement partially. On September 5, 1978, FLS filed a motion<sup>9</sup> which asks that we not issue a new long-term license for the Wilder Project until a current Army Corps of Engineers' study of erosion along the Connecticut River is completed and the findings have been reviewed.<sup>10</sup> FLS also moves that we "require implementation of any relevant recommendations regarding the method of operation of the dam that may be made in the Corps study, specifying same in the license." As the sole ground for its motion, FLS states that a license granted before the results of the Corps' study are available:

\* \* \* could only contain the standard erosion clause [Article 19 of Form L-3 (Rev. October, 1975)], which is applicable to all hydroelectric facilities and therefore is abstract and general, whereas if the Commission waits \* \* \* until the recommendations of the completed Corps' study are available, it would spell out specifically in the language of the license the methods of operation that will cause the least erosion in the Wilder Pool.

To eliminate any possible uncertainty about the effect of FLS's motion on the settlement agreement, we believe it proper and desirable to rule on the motion now. We shall deny the motion.

In the first place, standard Article 19 of Form L-3 in itself would retain ample means for us to address any erosion problems the Corps' study might establish. That Article provides:

Article 19. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

This article's very generality, which FLS seems to find troublesome, is advantageous. Under its provisions we would be able to order NEPCO to take whatever erosion control measures we found necessary upon review of the Corps' study.<sup>11</sup> The Commission could still "spell out specifically" then any changes in "the methods of operation" of the Wilder Project required to control erosion.

In any event, contrary to FLS's belief, in licensing the Wilder Project we would not be limited to inclusion of only standard Article 19. If we should determine on the record before us at the time of any licensing decision that more specific conditions related to the Corps of Engineers' erosion study are suitable for protection of the public interest, we could include an appropriate special article in the license. And nothing in Section X of the settlement agreement purports to restrict our authority to issue special conditions related to erosion. We do not, however, suggest here that we will or will not include any such special article in a new license for the Wilder Project; deciding that now would simply be premature.

Nor should our action in denying FLS' motion be interpreted as suggesting either that we will or will not issue a new license to NEPCO; or that we will or will not issue such a license before the Corps' erosion report is available.<sup>12</sup> We will decide these matters in the relicensing proceeding, when the time is ripe. Here we decide only that FLS has not shown any good reason for us to postpone licensing of the Wilder Project until after the Corps' erosion report is available. We are well aware of the Corps' erosion

report is available. We are well aware of the Corps' study and have no intention of ignoring its results. We will retain adequate regulatory control to require any measures we find proper to mitigate demonstrated project-induced erosion even if we should license the project before the Corps has reported.

#### *5. Approval of Settlement Agreement.*

The settlement agreement is the result of extended negotiations by the signatories to establish a schedule of fish facility construction at these three projects. The agreement provides for an acceptable general method of constructing the proposed fish facilities in stages, as anadromous fish extend their migratory range upstream. Based on our review of the agreement and Staff's comments and the response from the signatories, we believe that the agreement adequately provides for upstream fish passage facilities at Vernon, Bellows Falls, and Wilder, and that the agreement is thus in the public interest and should be approved.

#### *FACILITIES AT THE VERNON PROJECT*

Pursuant to the settlement agreement above, NEPCO filed for Commission approval Exhibit S Drawings showing the preliminary design of fish passage facilities at the Vernon Project. Copies of the Exhibit S drawings were sent for comment to appropriate state and Federal agencies on May 11, 1978. The agencies responding <sup>13</sup> all commented favorably on the proposed preliminary design.

The proposed fishway at the Vernon Dam was developed cooperatively by NEPCO and the interagency Technical Committee for Fisheries Management of the Connecticut River Basin, with active participation by a Commission staff fishery biologist. The fishway is an "Ice Harbor" type, with a vertical slot-type ladder leading from the gatehouse to the reservoir. This same type of design was used for the Turners Falls fishway, and it has a long record of success in passing salmon and shed at hydroelectric dams in the Pacific Northwest. Commission staff considers this type of ladder to be the most efficient design in passing anadromous fish at large dams and the most economical type of large fish ladder to construct and to operate. The design

**[61,035]**

appears to use the existing project structures, insofar as possible, and takes into account the hydraulics of the project's operation to attract migratory fish for collection.

The Exhibit S functional drawings include the general plan for the fish passage facilities, various sections of the fish ladder from the entrance at the downstream face of the powerhouse to the exit into the reservoir, cross sections of a typical weir, and flow diagrams at four different tailwater elevations. Hydraulic model studies of the entrance and exit sections of the fishway are still in progress, but Commission staff states that this work will not result in a significant change in the configuration of the ladder as shown in the preliminary design.

The fish passage facility proposed at the Vernon Project is designed to pass an annual migration of

750,000 American shad and 40,000 Atlantic salmon. (A fish counting station to enumerate migrating fish would be located about midway up the ladder.) NEPCO has indicated that, upon receipt of Commission approval, it is prepared to begin final design of the fish facilities as shown on the functional Exhibit S drawings. Construction is scheduled to start by May 1, 1979. A detailed cost estimate of the facilities has not been completed, but Commission staff reports that preliminary estimates of capital costs discussed during technical meetings have ranged from five to seven million dollars.

The environmental effects of constructing the proposed facilities would be minimal. The work on land would be concentrated in small areas already cleared of vegetation. Construction activities within the meander of the river would be enclosed within cofferdams. The collection galleries would be concrete and would rest on concrete supports anchored to rock foundations. The work would occur during two construction seasons. There would be some construction noise during this period, and possibly some minor turbidity when the cofferdams are installed and removed. These temporary effects would be minor and would cease upon completion of construction. The state and Federal agencies commenting favorably on the Exhibit S drawings are thoroughly familiar with the anadromous fish restoration program and with any environmental consequences of its implementation, but have identified no significant adverse effects from installation of the proposed facilities. For these reasons and considering our staff's independent analysis, we conclude that approval of the functional Exhibit S drawings and the subsequent construction of the fish facilities as depicted by the drawings is not a major Federal action significantly affecting the quality of the human environment.

The proposed Exhibit S drawings conform substantially to the requirements of our Regulations. We find it appropriate and in the public interest to approve the Exhibit S drawings for fish passage facilities at the Vernon Project submitted by NEPCO.

*The Commission orders:*

(A) The Settlement Agreement filed December 30, 1977, concerning fish passage facilities on the Connecticut River at Project Nos. 1904, 1855, and 1892, is approved and incorporated by reference in this order. New England Power Company shall comply with the provisions of the settlement agreement.

(B) Nothing in this order shall prejudice any past or future Commission findings or orders or any claims or contentions that may be made by the Commission, its staff, or any party or persons affected by this order, in any other proceeding now pending or that may be instituted.

(C) The following Exhibit S drawings showing the preliminary design for fish passage facilities at Project No. 1904, filed January 30, 1978, consisting of four sheets, are approved and made a part of the license for Project No. 1904:

Exhibit S	FERC No.	Showing
Sheet 1	1904 -67	General Plan
Sheet 2	1904 -68	Fishway Sections
Sheet 3	1904 -69	Fishway Sections

1 This proceeding was commenced before the FPC. By the joint regulation of October 1, 1977 (10 CFR 1000.1), it was transferred to the FERC. The term "Commission," when used in the context of action taken prior to October 1, 1977, refers to the FPC; otherwise, it refers to the FERC.

2 The term "fisheries agencies" in this order will be used to refer collectively to the four states and USFWS.

3 The three projects named above plus two others further downstream, the Holyoke (or Hadley Falls) Project No. 2004 and the Turners Falls Project No. 1889.

4 *Holyoke Water Power Co., New England Power Co., Western Massachusetts Electric Co., Docket No. E-7561*, Order Instituting Investigations, Consolidating Proceedings, and Directing that a Hearing be Held, 45 FPC 939 (1971).

5 *Holyoke Water Power Co., et al., Docket No. E-7561*, Order Prescribing Modifications to Fish Facilities and Continuing Proceeding, 49 FPC 1067 (1973); *Holyoke Water Power Co., et al., Docket No. E-7561*. Order Approving Settlement Agreement with Modification (November 8, 1976, 56 FPC 2914).

6 In its comments of March 13, 1978, staff stated its interpretation of these provisions. The signatories concurred in staff's construction in their response of July 14, 1978. We will follow the parties' agreed interpretation.

7 As noted above, NEPCO filed the preliminary design at the Vernon facilities for Commission approval on January 30, 1978.

8 Section VI (C). The agreement contemplates that before releasing any Atlantic salmon above Holyoke, the fisheries agencies will collect the first returning adults in trapping facilities and take them to a hatchery to establish a brood stock.

9 The motion is captioned with reference to both this proceeding and the proceeding on relicensing of the Wilder Project No. 1892.

10 FLS states that: This study is scheduled for completion

[61,036]

early in 1979, to be followed by a Final Report outlying conclusions about the causes of erosion behind the [Wilder, Bellows Falls, Vernon, and Turners Falls] dams and containing recommendations for any changes in the operations of the dams that may minimize erosion on the banks of the river.

11 Assessment of the Corps' study and recommendations, as well as other relevant matters of record, would clearly be prerequisite to our imposing any particular erosion control measures recommended. Thus, we deny FLS's request that we categorically include in the license for Wilder *any* measures regarding the project's method of operation that the Corps' report might recommend. We will consider the recommendations on their individual merits when the time comes.

12 For instance, should the Corps' report be imminent or issued at the time when we might otherwise be ready to act on the application for license, we might on our own motion decide to consider the implications of the Corps' study before acting on the application.

13 New Hampshire Fish and Game Department, Vermont Agency of Environmental Conservation, Connecticut Department of Environmental Protection, Massachusetts Division of Fisheries and Game, U.S. Department of the Interior, and the Policy Committee for Fisheries Management of the Connecticut River Basin.

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### **B.3 - Suspension of Connecticut River Atlantic Salmon Restoration Program**

CONNECTICUT

MASSACHUSETTS

NATIONAL MARINE FISHERIES SERVICE

103 East Plumtree Road  
Telephone: 413/548-9138

VERMONT

NEW HAMPSHIRE

U.S. FISH AND WILDLIFE SERVICE

Sunderland, Massachusetts 01375  
Fax: 413/548-9622

February 11, 2016

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

Dear Secretary Bose:

The Connecticut River Atlantic Salmon Commission (CRASC), a Congressional-authorized fisheries management body, has required hydroelectric facilities in the basin to operate downstream passage facilities and certain operational measures to protect migrating Atlantic Salmon smolts and post-spawn adults. These measures were established by a Memorandum of Agreement (1990) as well as other complementary instruments implemented by State agencies, and are enforced by the Federal Energy Regulatory Commission (FERC). The CRASC issues an annual "Fish Passage Notification Letter" to the ten main-stem Connecticut River hydroelectric projects. This letter sets the dates for both upstream and downstream passage measures and is used to monitor compliance with these agreements.

The cooperative restoration effort for Atlantic Salmon was terminated in 2012 by CRASC, with a final basin-wide stocking of salmon fry in the spring of 2013. Stream sampling and assessments have led CRASC to conclude that all smolts produced from this final stocking in the upper basin migrated out of the basin by 2015. As a result CRASC has determined:

- 1) It is no longer necessary to require downstream passage measures for salmon smolts at the main stem hydroelectric facilities identified in the 1990 CRASC MOA, or as included in past Annual Fish Passage Notification letters; and
- 2) It is no longer necessary to require downstream passage measures for adult salmon at any hydroelectric facility unless that facility passed 50 or more adult salmon through its fishway the previous spring.

The CRASC believes these changes in downstream passage measures, specifically for salmon smolts and post-spawn sea-run salmon, are warranted but reserves the right to reinstate these requirements in the future if the status of Atlantic Salmon and its restoration changes. The CRASC remains committed to ensuring all other diadromous fishes in the basin have safe, timely, and effective upstream and downstream passage to complete all life history

requirements. We look forward to working with FERC on ensuring those passage elements and other elements of hydropower facility operations support our ongoing restoration of the public's fishery resources.

Sincerely,



William Hyatt  
Chair, Connecticut River Atlantic Salmon Commission  
Director, Connecticut Dept. Energy and Environmental Protection  
Bureau of Natural Resources

Electronics copies:

Holyoke Gas and Electric, Richard Murray  
TransCanada, John Ragonese  
FirstLight Power, John Donohue  
CRASC, Commissioners  
CRASC, Technical Committee  
USFWS, John Warner  
USFWS, Brett Towler  
FERC Compliance

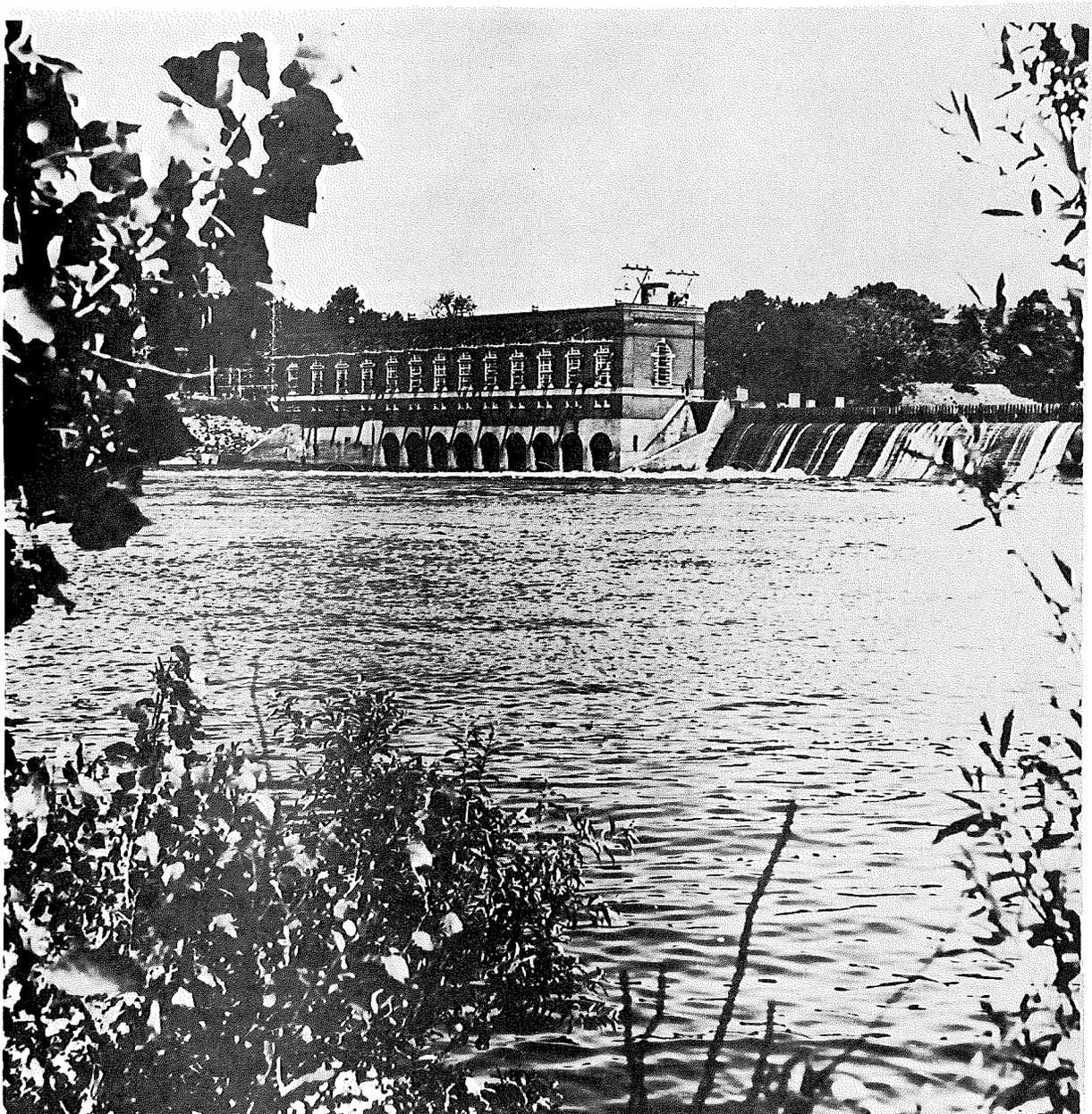
Mailed copies:

Essex Hydro, Dave Sherman  
Ampersand Gilman Hydro, Gregory Cloutier

**B.4 – Vernon Recreation Plan (Exhibit R to FERC License)**

## FOREWORD

In compliance with the requirements of the Federal Power Commission for relicensing of the Vernon hydroelectric project (No. 1904) on the Connecticut River, the Company hereby submits the accompanying proposed recreational use plan. Proposals and guidelines included in this plan are, for the most part, a continuation of the Company's existing recreation program, and take into consideration prevailing features and conditions unique to this particular area. The improvements and expansion of the Company's recreation program at this site will be instituted as necessary to meet the expected increase in public usage. This expansion program, which will utilize all of the remaining recreation land at Vernon, is scheduled for full development, before the summer of 1975.



VERNON STATION

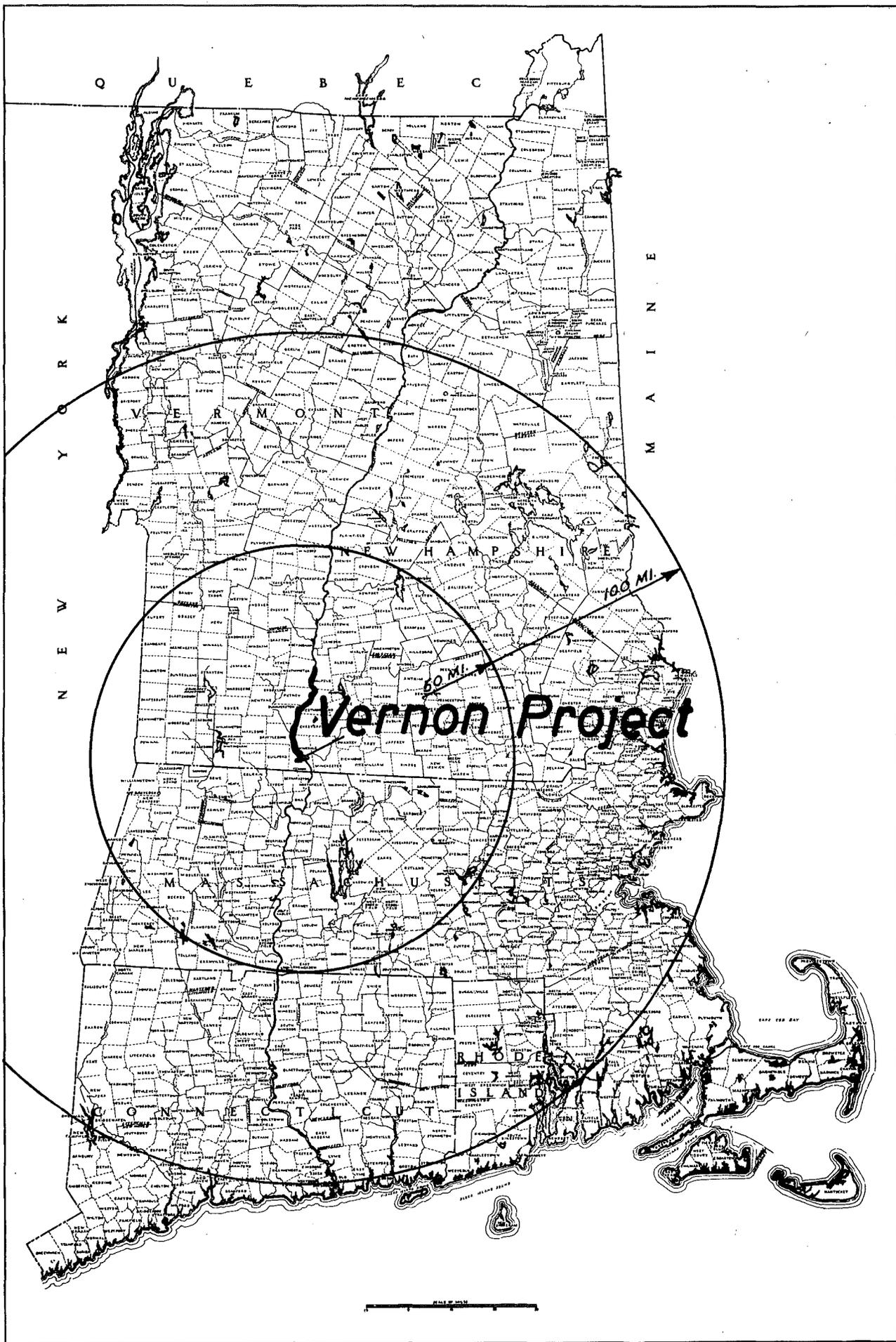
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## EXHIBIT R - VERNON PROJECT

### I. DESCRIPTION OF PROJECT AREA

#### A. Location

The Vernon project is located on the Connecticut River just above the mouth of the Ashuelot River. The dam and powerhouse span the River between Vernon, Windham County, Vermont, and Hinsdale, Cheshire County, New Hampshire.

The project area is 27 miles long. Vermont Route 142, U. S. Route 5 and Interstate 91 run along the Vermont side of the valley, while New Hampshire Route 119 runs along the New Hampshire side. The Boston and Maine Railroad runs along the New Hampshire side crossing into Vermont at Brattleboro. The Central Vermont Railroad runs along the Vermont side.

#### B. Population

The project lands are situated in parts of nine communities. The communities are Hinsdale, Chesterfield, Westmoreland and Walpole in New Hampshire, and Vernon, Brattleboro, Dummerston, Putney and Westminster in Vermont. The estimated total population in 1960 was 16,250 for the Vermont communities, and 4,513 for the New Hampshire communities. The town of Brattleboro, Vermont, is the largest community having a 1960 population of 11,734.

It is estimated that more than 1,500,000 people live within a 50-mile radius and that more than 9,400,000 live within a 100-mile radius of the Vernon dam.

#### C. Topography and Cover

Vernon pond is contained in a fertile valley with slopes rising steeply on both sides. The River between Vernon, Vermont, and Brattleboro, Vermont, flows lazily in a deep, wide bed bordered by numerous large "setbacks." The peninsula known as Vernon Neck acts as a huge earth dam working in conjunction with the concrete gravity dam and the powerhouse to form the pond. Without the effective bank stabilization methods that have been employed at the narrow part of the "Neck" by New England Power Company, it is felt that this earth barrier would have long ago yielded to the forces of nature by which river ox-bows are formed.

The rural lands along Vernon pond are sparsely populated and consist almost entirely of gently sloping pastures amid steeper sloping woodlands. Numerous rock outcrops and curious geological formations are evident everywhere and serve as monuments to the tremendous glaciers that once overran this region.

I. DESCRIPTION OF PROJECT AREA (Continued)

D. Climate

The mean annual temperature at Vernon for the period 1952-1966, was 46.1°F. The average annual precipitation for the period 1944-1966 was 40.9 inches.

E. Runoff

The flow which reaches Vernon dam is comprised of the runoff from a drainage area of 6,266 square miles. A U.S.G.S. gaging station at Vernon, Vermont, indicates that since 1944 the average annual runoff has been 21.8 inches, which is approximately 53% of the mean annual precipitation.

II. HYDROELECTRIC POWER DEVELOPMENT

A. History of Vernon Development

On June 7, 1907, a small group of men gathered at an island in the Connecticut River near Brattleboro, Vermont. Their purpose was to form a corporation to be known as the Connecticut River Power Company of New Hampshire. At this meeting, construction of a 27,000 HP hydroelectric plant between Vernon, Vermont, and Hinsdale, New Hampshire, was authorized. Construction of the Vernon station began very shortly thereafter and continued until completion in 1909. The first power from Vernon was carried over a steel tower transmission line system to the highly industrialized area of central Massachusetts.

The original plant contained eight generating units of 3,200 HP each. In 1921, an extension was built on the Vermont end of the powerhouse and two units of 6,000 HP were added. In 1924 and 1925, the four original units on the New Hampshire end were replaced with 4,200 HP units.

B. River Development Pattern

The pattern of water resource development in the Connecticut River Basin has been characterized by a large number of developments on both the main and the tributary streams, each predominantly satisfying one basic need such as water supply, flood control or hydroelectric power, and in most cases, filling secondary needs which usually include recreation. These developments, constructed by various private interests and governmental agencies, constitute a multipurpose system that will continue to be flexible enough to meeting changing conditions.

## II. HYDROELECTRIC POWER DEVELOPMENT (Continued)

### B. River Development Pattern (Continued)

Today, on the Connecticut River, the New England Power Company has a series of six hydro stations and two upstream storage reservoirs, plus a contract for the use of the contents of a third reservoir, Lake Francis, owned by the state of New Hampshire. The total generating capacity of these plants is 456,000 kilowatts utilizing a total developed head of 516 feet. The operation of these plants is carefully scheduled to meet the increased power requirements of the Company's service area during the peak demand hours of the five working days of the week. Most of these plants are interdependent to such a degree that the operation of one requires corresponding operation from the upstream and downstream stations. All of them are operated as a unit serving the Company's interconnected utility load. (See Profile of the Connecticut River on Page 4).

### C. Importance of Development

New England's inherent disadvantage in being located a great distance from sources of coal, oil and gas, makes it essential that the hydroelectric resources of this region be afforded maximum economic utilization, as well as assured freedom of operation. The Vernon hydroelectric plant, as part of an integrated power system on the Connecticut River, furnishes peak power to a large segment of New England's homes and industries. In combination with conventional and atomic fueled steam generating facilities, the Vernon plant will continue to play an essential role in providing reliable and economical power for the region.

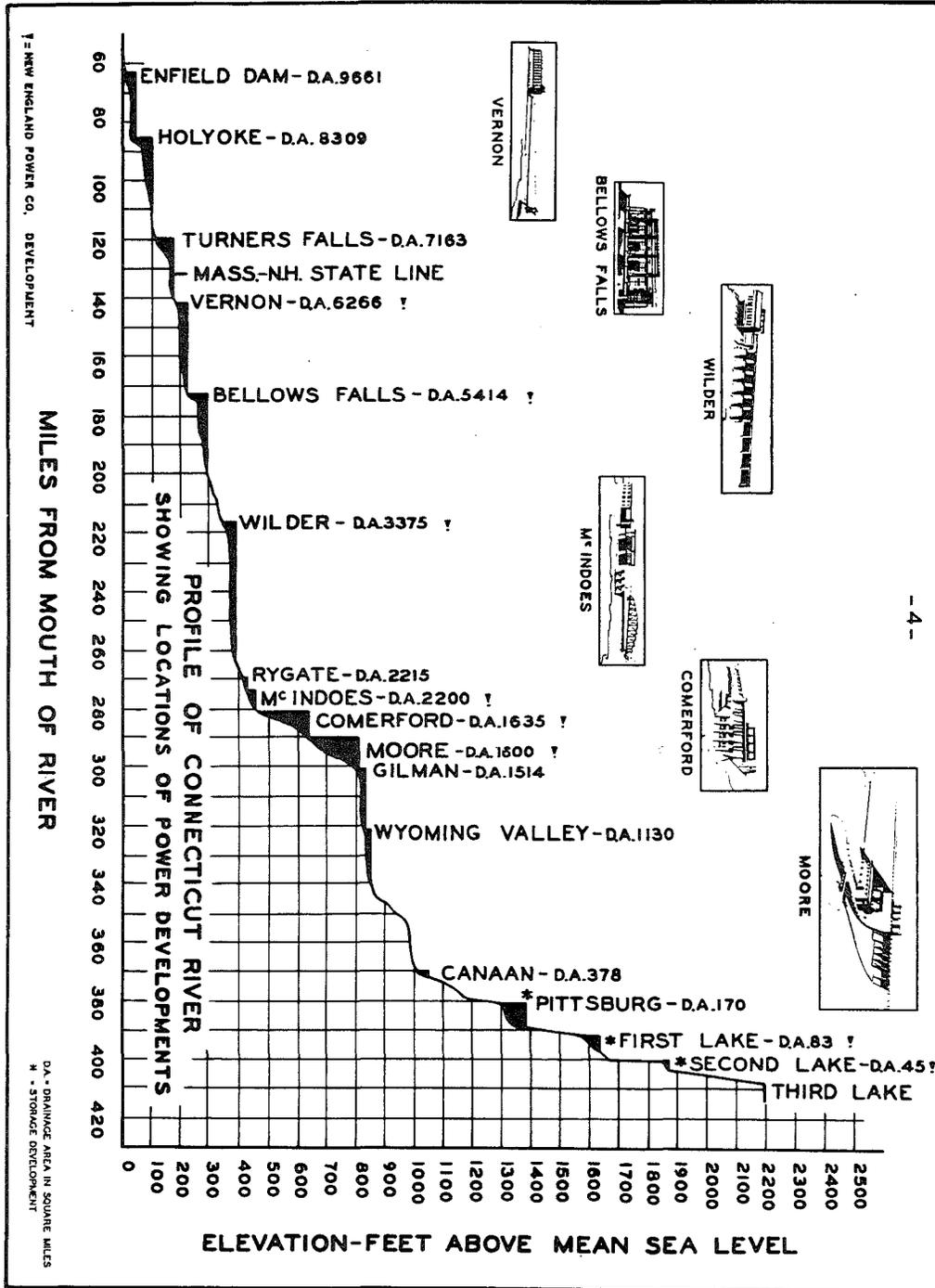
### D. Associated Benefits

#### 1. Recreation

Although the Vernon project was constructed primarily for the purpose of electric power production, it also contributes additional benefits by providing public access and free use of facilities for picnicking, hiking, fishing and boat launching on the project lands. In this way, the hydroelectric development, initially a single purpose project, has been adapted through planning to provide substantial recreation benefits.

#### 2. Fish and Wildlife

The fish and wildlife resources in and around the project area provide sportsmen of all ages and skills with many happy hours. As the River cleanup and land conservation programs progress, this area will provide improved hunting and fishing opportunities.



## II. HYDROELECTRIC POWER DEVELOPMENT (Continued)

### D. Associated Benefits (Continued)

#### 2. Fish and Wildlife (Continued)

The Vernon pond and the tailrace area are very popular with local fishermen. The most common species reported by the sportsmen of the area are pickerel, pike, perch and bass. Occasionally, a brook trout that has wandered from one of the tributary streams is observed in the pond.

Although there is not sufficient area for any extensive hunting activity on the Company lands, hunters often park and use the available facilities before hiking into the forest in quest of the whitetailed deer, ruffed grouse, snowshoe hare, woodchuck, squirrel, raccoon, bear and wildcat. (See Exhibit S--Fish and Wildlife Plan).

## III. RECREATION DEVELOPMENT

### A. History

The Company has long encouraged public use of its hydroelectric land and water resources for recreational purposes.

Early recreation activities in this area consisted mainly of fishing and hunting. Since the late 1940's and early 1950's, however, recreational interests have become increasingly more family oriented. This new concept in family-type recreation became particularly evident upon the lifting of World War II travel restrictions and was brought about by rapidly expanding technology resulting in higher per capita income and increased leisure time of the people.

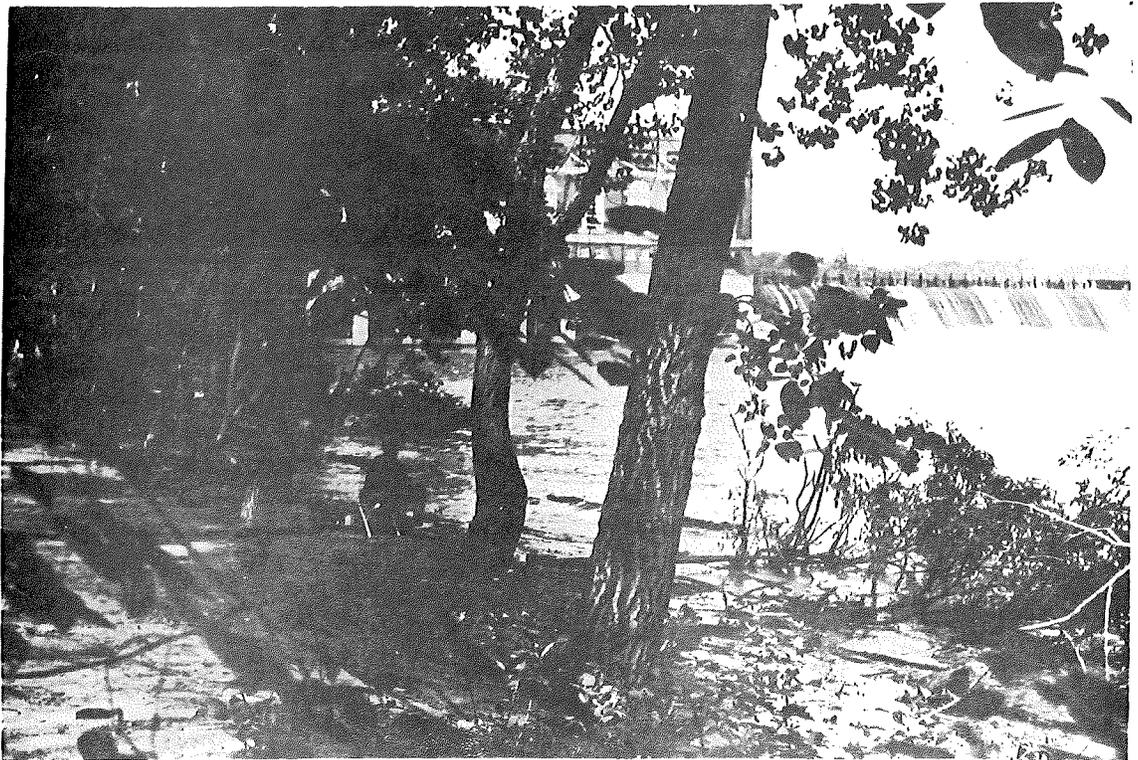
### B. Policy

From the experience gained at Company lands on which recreation facilities were developed, and with an eye toward the effective and desirable management of the natural resources of the region, the Company established a comprehensive public recreational use policy in the early 1950's.

It is the policy of the Company to allow the public free access and daytime recreational use of its water and related land resources where this can be done with safety to the public and without impairing the operation of these properties for their primary purpose of producing power. All recreation developments within these properties are the sole responsibility of the Company and are operated and maintained for the public use without charge. Under these conditions, full public utilization of these properties for outdoor recreation purposes is encouraged and supported by the Company.



PICNIC AREA - GOVERNOR HUNT ROAD  
VERNON, VERMONT



FISHING - NEAR THE PICNIC AREA  
VERNON, VERMONT

### III. RECREATION DEVELOPMENT (Continued)

#### B. Policy (Continued)

This policy, established through many years of participation in providing outdoor recreation areas on both the Connecticut and Deerfield rivers, is geared to provide maximum public recreation benefits of the Company's available land and water resources without adversely affecting power producing functions.

In the early stages of this program, the Company recognized that the providing of camp sites and camping areas had long been a mainstay of Federal and State forest park systems. Also, in this same general region, the renting of privately-owned camps and camp sites is an established and growing business. It is to be noted that many such overnight facilities are located within reasonable distances of project lands. The Company does not wish to compete with these governmental agencies and private enterprises and, therefore, does not provide camping facilities.

Since its recreation program has been in effect, it has been the Company's objective to provide a variety of recreation facilities and opportunities for efficient use of the available land resources by the greatest possible number of people. In carrying out this program, picnic areas, boat launching areas, trails and other daytime recreation facilities have been located so as to preserve the natural appeal and beauty of the Company's water and land areas.

#### C. New England Power Company Recreation Development

##### 1. Facilities

On the Vermont side of the River, below the powerhouse, there is a picnic area on a high bank overlooking a group of small islands in the River below. There is a portage trail around the powerhouse and a flat hardpacked sand beach near the lower end of the portage trail that is used for launching small boats.

Up and down both sides of the River, there are many public and private boat launching ramps and marinas.

The picnic area has 11 tables, 10 charcoal grilladiers, 2 chemical toilets and parking for 18 autos.

##### 2. Attendance

A mechanical traffic counter was placed across the entrance to the picnic area at the beginning of the 1968 recreation season. From observations made on random days, the average number of occupants per vehicle was determined and the total traffic count then used to determine the number of visitors using the facilities during the year.

III. RECREATION DEVELOPMENT (Continued)

C. New England Power Company Recreation Development (Continued)

2. Attendance (Continued)

It is estimated that more than 12,500 persons utilized the Company's lands at Vernon for recreation in 1968.

From the trends that have been evident at other Company recreation facilities and due to increased traffic in this area generated by the nearby Vermont Yankee Nuclear Power Plant and the new Interstate Route 91, it is felt that this recently developed recreation facility and the proposed new development will enjoy heavy visitor attendance.

3. Recreation Investment and Operating Expenses

Since work began in 1967 to expand recreational opportunities through formal development, \$2,742 has been expended for recreation facilities, exclusive of land and land rights, at Vernon.

Operation and maintenance costs for the year ending December 31, 1968, totaled \$1,263.

The initial stage of development of the proposed Vernon Glen Recreation Area, to include picnic, parking and sanitary facilities, will be undertaken during the 1969 recreation season at an estimated cost of \$5,000. Additional funds will be appropriated as the need is demonstrated by public use, for the second and third stages, to include a ballfield, playground facilities and hiking trails in the Glen.

D. Other Recreation Development

In addition to the New England Power Company recreation facilities, many private and State-owned and operated recreation facilities are available for public use on and near the Vernon pond. Some of the larger recreation attractions in the immediate vicinity of the project area are indicated by arrow and notation on the "General Recreation Map" which is found on Page 11 of this Report.

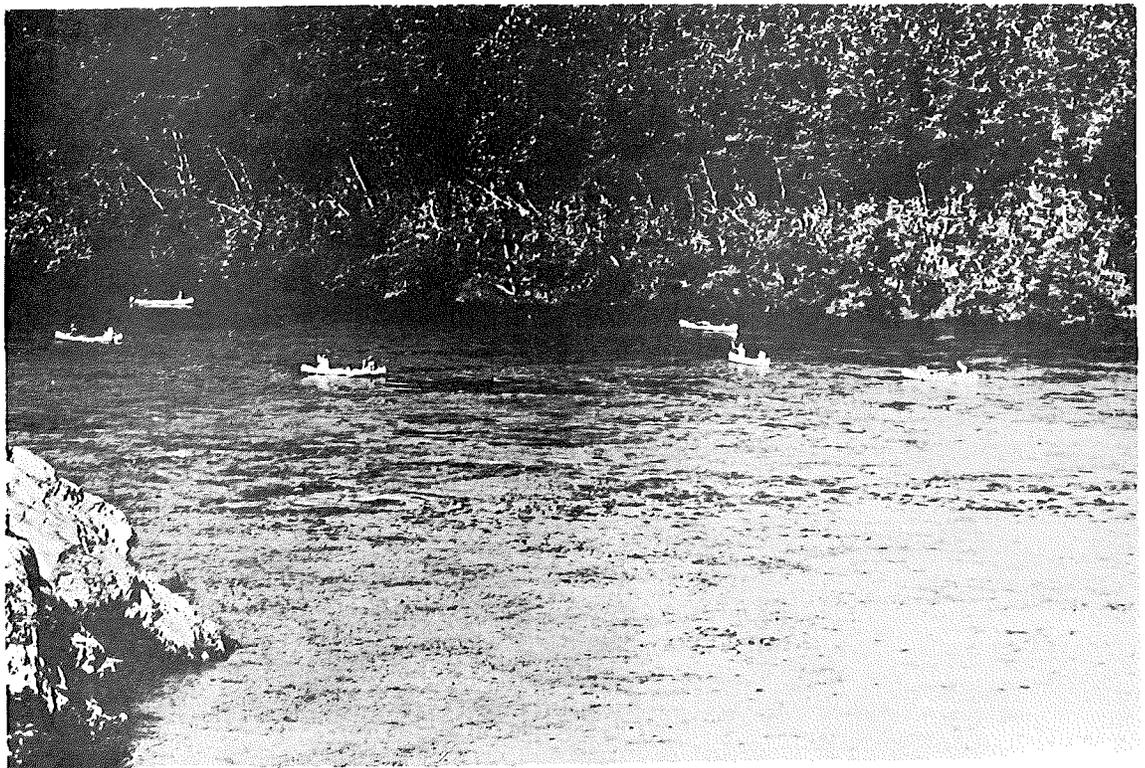
IV. PROPOSED RECREATIONAL DEVELOPMENT

A. Guidelines

In developing a long-range recreational use plan, the Company has used as guidelines its established recreational use program, proposals and projections prepared by the Outdoor Recreation Resources Review Commission (ORRRC) in their Report "Outdoor Recreation for America" which was submitted to the President and Congress in 1962, the "New Hampshire Outdoor Recreation Plan" prepared as part of the "New Hampshire State Planning Project", the "Comprehensive Plan for Outdoor



PROPOSED BALLFIELD AND PLAYGROUND AREA  
VERNON, VERMONT



CANOEISTS AFTER PORTAGE AROUND VERNON DAM  
CONNECTICUT RIVER

IV. PROPOSED RECREATIONAL DEVELOPMENT (Continued)

A. Guidelines (Continued)

Recreation in Vermont" prepared by the Central Planning Office of the state of Vermont, and recreation studies and population projections by other Federal, State and private organizations.

It has been estimated that the demand for outdoor recreation would increase some four times by the year 2020. The Company's existing recreation facilities will have to be expanded, new facilities developed and more land made available for recreation purposes to satisfy this increased demand.

The Company will set aside the most desirable wooded areas with scenic backdrops for development as free public picnic areas. At the larger tracts of land, these areas will serve as the starting point of hiking and nature trails leading the user through wooded wildlife areas and by many and varied scenic vistas. Large open areas will be set aside, where possible, in conjunction with the picnic grounds, as ball-fields and group activity areas. These areas are to be graded and seeded to facilitate this purpose.

The River, which serves to attract the people to these picnic areas, serves as a still stronger attraction to thousands of pleasure boaters each year; and so, the Company will seek out strategic locations for construction of boat launching ramps on project lands.

In areas not as readily adaptable to formal recreational activity, the Company will establish what are to be called "natural areas". It is felt that these areas are fully as valuable to the recreation environment as are the picnic, boat launching and game areas; for, without these expanses of undisturbed wild land in which nature is left free to display its beauty and to foster wildlife, this region would lose much of its attraction as a recreational retreat. Public access will be permitted to these areas, but just as much value will be derived if they are only viewed at a distance from a passing automobile or pleasure boat. Their contribution is in the preservation of a desirable environment providing wildlife habitat amidst a scenic natural setting.

Both Vermont and New Hampshire have raised the water quality standard of the Connecticut River from Class C to Class B, which is rated as being suitable for swimming. At the present time, the Company provides no bathing facilities; however, as the quality of water in the River improves, suitable shore locations will be developed as beaches.

The operation of the Vernon Project will be compatible with the public use of these recreational facilities.

IV. PROPOSED RECREATIONAL DEVELOPMENT (Continued)

B. Available Land and Water Resources

The pond created by Vernon dam has a water area of 2,550 acres, a length of 26 miles and a shoreline of 69 miles of which 8.0% or 5.5 miles is owned in fee by the Company. Many of the recreation facilities on Vernon pond have been developed by others including the states of Vermont and New Hampshire. Of the 287 acres fee property of the Company above full pond, 14 acres are leased to local farmers for tillage and for other purposes, 16 acres are used for plant facility area. Of the remaining 257 acres, 98 acres are set aside as natural areas, 125 acres as demonstration forest and 34 acres to be developed for recreation between now and 1975. Of the 16 acres of plant facility area, limited recreational activity is allowed on approximately two acres.

C. Recreation Development Plan

1. Vermont

a. Governor Hunt Road Picnic and Boat Launching Area

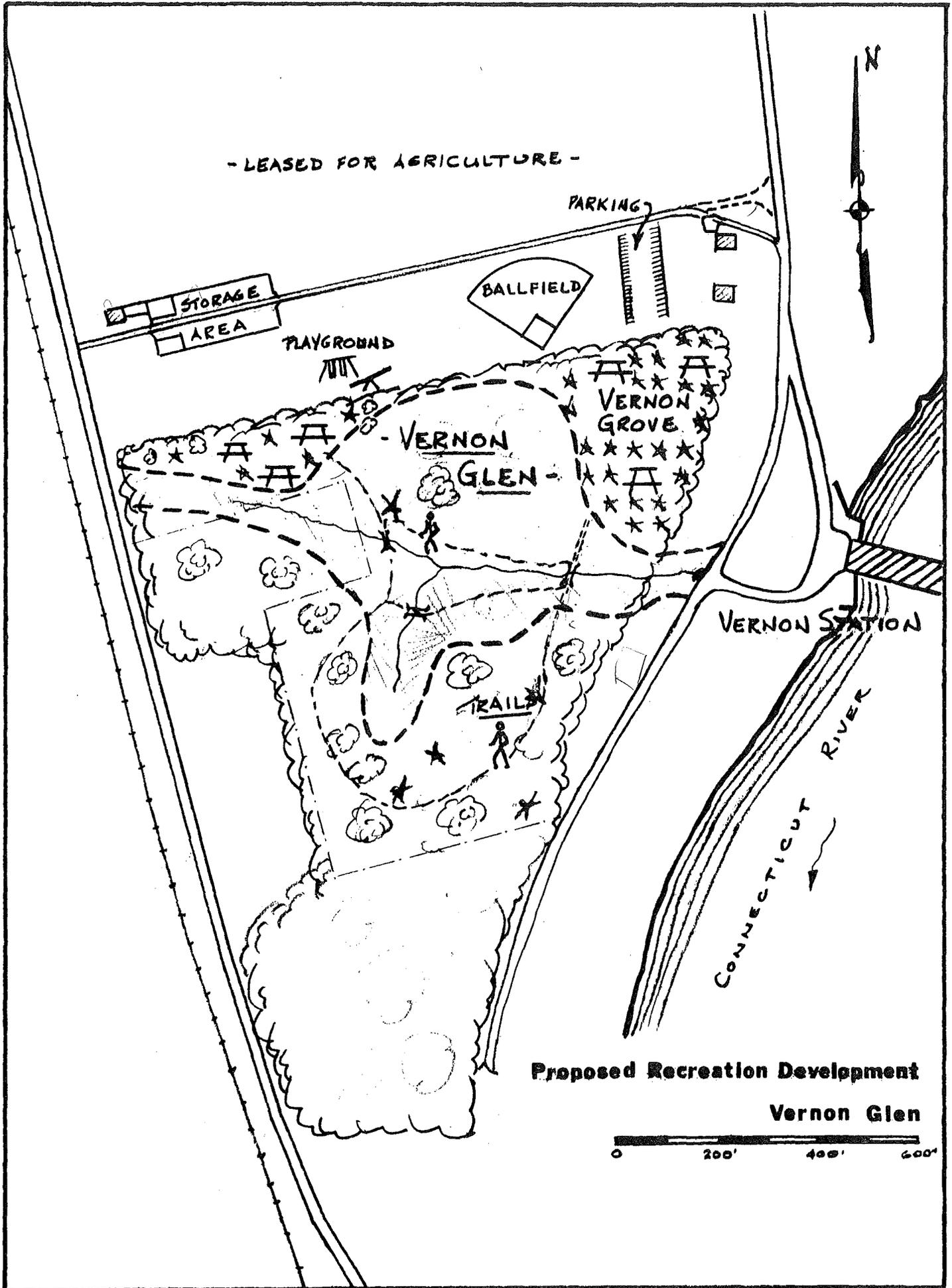
On the downstream side of the powerhouse, just off Governor Hunt Road, there is a 4.5-acre tract of land that has been developed as a roadside picnic area. This area is on a bank overlooking a number of small islands in the River below. Access to the River is gained by means of a hardpacked gravel road which also serves as the lower end of the portage trail. The roadway and launching area will be improved and the parking area expanded to provide greater opportunities for fishermen and pleasure boaters.

b. Portage Trail

The portage trail begins approximately 450 feet north of the powerhouse and follows Governor Hunt Road to the lower end at the Governor Hunt Road Picnic and Boat Launching Area.

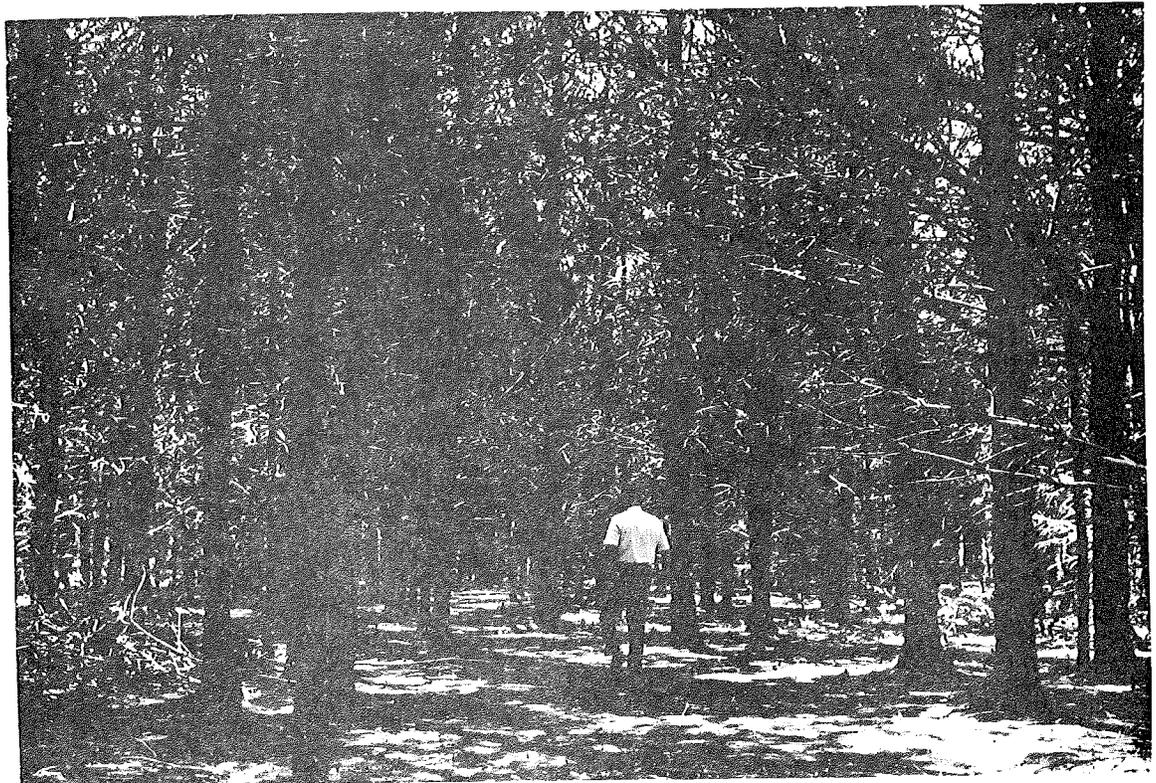
c. Vernon Glen Recreation Area

Directly across the road from the powerhouse and behind two woodframe dwellings, which are used as station operators' quarters, is a 29.5-acre tract of land which is to be developed between now and 1975 as part of the Company's continuing recreation program.





PATHWAY TO PROPOSED PICNIC GROVE  
VERNON, VERMONT



PROPOSED PICNIC GROVE  
VERNON, VERMONT

IV. PROPOSED RECREATIONAL DEVELOPMENT (Continued)

C. Recreation Development Plan (Continued)

1. Vermont (Continued)

c. Vernon Glen Recreation Area (Continued)

The northerly portion of this tract consists of a large flat meadow which will be developed with a ball-field and playground facilities. There is an existing gravel roadway through the meadow which will provide access to the area from either Vermont Route 142 on the west, or Governor Hunt Road on the east.

The southerly portion of the tract consists of a springfed brook running along the floor of a steep and rugged glen, embellished by some of the largest pines and hardwoods in the region. It is planned to develop a trail down the steep sides and along the floor of the glen. The brook will be bridged with log stringers at the trail crossings.

Overlooking the glen and just south of the meadow is a shady pine grove with ample room for a large picnic area. The picnic grove will be the starting point for the hiking trail and will serve as the center of the recreation development at Vernon.

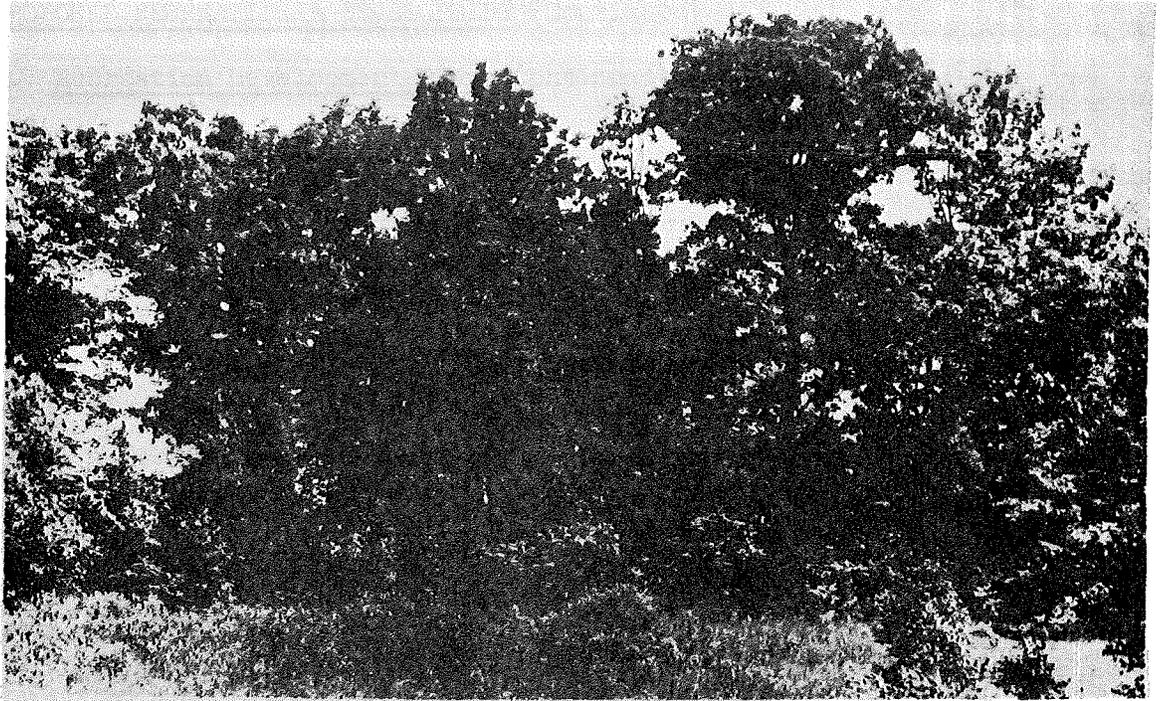
d. Vernon Natural Area

The Company owns 36.5 acres of land in two tracts between Mile 1 and 3 along the Vermont shore. This property consists of steep river bank land and is separated from the highway at all points by the roadbed of the Central Vermont Railroad. The land is unsuited for formal development; however, public access to the River and fishing from the shores is carried on here and will be encouraged in the future.

e. Fort Dummer Fishermens' Access

Approximately  $4\frac{1}{2}$  miles above the dam, the Company owns a long narrow parcel of land which runs for approximately  $\frac{2}{3}$  mile along both sides of the Central Vermont Railroad tracks. This parcel separates the River from a setback near Fort Dummer State Park in Brattleboro and is located amidst the expanding industrial complex of South Brattleboro. While not aesthetically pleasing for outdoor recreation, the setback provides excellent fishing. Public access for fishermen will be encouraged here.





TYPICAL AREA FOR PLANTING  
DEMONSTRATION FOREST - VERNON NECK, HINSDALE, NEW HAMPSHIRE



TYPICAL AREA FOR BRUSH REMOVAL AND RELEASE CUTTING  
DEMONSTRATION FOREST - VERNON NECK, HINSDALE, NEW HAMPSHIRE

V. COOPERATION AND COORDINATION (Continued)

installation of fish nets above the powerhouse intake and also in 1968, the Company cooperated with the FWPCA study of temperatures on the Connecticut River by assisting in the installation of a temperature probe on the boom at the Vernon station.

In providing water-based recreation facilities for picnicking, boating, fishing, hiking and nature studies; in proposing facilities for swimming as it becomes practical; in cooperating with Federal, State and local agencies in matters of fish studies, ecological studies, flow gaging and river regulation studies; in actively pursuing a Company policy of preserving or enhancing the natural beauty of the riverway through strict control over the use of the Company's riverfront lands; in granting easements and deeds to the states and various communities for recreation, fish and wildlife propagation and waste treatment facilities; and in cooperating in various programs and activities which tend to improve the Connecticut River Basin and its environment, the New England Power Company is in harmony with ideals set forth by the Department of the Interior, BOR, in their study "New England Heritage--The Connecticut River National Recreation Area Study"; the states of Vermont and New Hampshire in their publications cited herein; and various Federal and State agencies in their interim releases in connection with studies now under way.

ESTIMATED PUBLIC VISITATION 1968;1975; ULTIMATE

<u>YEAR</u>	<u>1968</u>	<u>1975</u>	<u>Ultimate *</u>
NO. OF VISITORS (IN THOUSANDS)	12.5	25.0	50.0

ESTIMATED ACTIVITY OCCASIONS - 1968

	PUBLIC VISITATION 1968 (1,000's)	ESTIMATED ACTIVITY OCCASIONS AS PERCENT OF VISITATION								Total	
		Pic- nicking %	Boating %	Canoeing %	Hunting & Hiking %	Fishing %	Swimming %	Sight- seeing %	Other ** %	%	(1,000's)
<u>RECREATION AREAS</u>											
Governor Hunt	7.5	80	10	15	10	20	0	20	10	165	12.4
Vernon Glen	0	0	0	0	0	0	0	0	0	0	0
<u>UNDEVELOPED AREAS</u>	<u>5.0</u>	0	15	20	30	30	0	25	15	135	<u>6.8</u>
TOTAL	<u>12.5</u>										<u>19.2</u>

\* Public demand for water-based outdoor recreation is expected to increase four times its present level by the year 2020.

\*\* Includes such activities as games, bird watching, nature study and berry picking.

## **B.5 – July 26, 1990 Memorandum of Agreement**

CONNECTICUT RIVER DOWNSTREAM FISH PASSAGE

NEW ENGLAND POWER COMPANY

CONNECTICUT RIVER ATLANTIC SALMON COMMISSION

U.S. FISH AND WILDLIFE SERVICE

NATIONAL MARINE FISHERIES SERVICE

STATES OF CONNECTICUT, MASSACHUSETTS, NEW HAMPSHIRE, AND VERMONT

MEMORANDUM OF AGREEMENT

THIS AGREEMENT, is made and entered into this 26th day of July, 1990, among New England Power Company ("the Company"), a Massachusetts Corporation; the Connecticut River Atlantic Salmon Commission ("the Salmon Commission"), an interstate Commission chartered by and composed of the member States of New Hampshire, Vermont, Connecticut, and Massachusetts and the Congress of the United States (P.L. 98-138); the U.S. Fish and Wildlife Service (FWS), an agency of the Department of the Interior; the National Marine Fisheries Service (NMFS), an agency of the U.S. Department of Commerce; the Connecticut Department of Environmental Protection; the Massachusetts Division of Fisheries and Wildlife; the New Hampshire Fish and Game Department; and the Vermont Fish and Wildlife Department. The FWS and NMFS are together herein "the Services". The foregoing State fishery management agencies are together herein "the States".

WHEREAS, the Company holds licenses which shall expire on April 30, 2018, from the Federal Energy Regulatory Commission (hereinafter "FERC") for the following hydroelectric Projects

located on the Connecticut River: Vernon Project, L. P. No. 1904, Vernon, Vermont-Hinsdale, New Hampshire ("Vernon"); Bellows Falls Project, L. P. No. 1855, Rockingham, Vermont-Walpole, New Hampshire ("Bellows Falls"); and Wilder Project, L. P. No. 1892, Hartford, Vermont-Lebanon, New Hampshire ("Wilder"); (Vernon, Bellows Falls, and Wilder, collectively the "Projects"); and

**WHEREAS**, the Salmon Commission includes State appointed citizens, representatives of participating States' fishery management agencies, and representatives of the Services, and is charged with managing the Atlantic salmon resource in the Connecticut River; and

**WHEREAS**, the States, the Services, and the Salmon Commission have as a common goal to ensure that downstream fish passage systems are constructed at all barriers and hazards to migration of anadromous fishes in the Connecticut River Basin, and that such systems not cause mortality, injury, or delay to the anadromous fish using them, and further that such systems be monitored to assess the contribution made toward attainment of this common goal; and

**WHEREAS**, the Company wishes to cooperate with the States, the Services, and the Salmon Commission in ensuring downstream fish passage at the Projects; and

**WHEREAS**, the Company has in the past cooperated with the States, the Services, and the Salmon Commission in promoting the restoration of anadromous fishes to the Connecticut River, and has made significant expenditures to construct and operate upstream

fishway systems for anadromous fishes at the Projects; and

**WHEREAS**, the States, the Services, and the Salmon Commission have expended significant resources to restore anadromous fishes in the Connecticut River; and

**WHEREAS**, all parties wish to cooperate for the successful restoration of anadromous fishes to the Connecticut River by providing downstream fish passage systems for the out-migration of anadromous fishes from the River in accordance with the schedules set forth in Articles I and II below; and

**NOW, THEREFORE**, in consideration of the premises and mutual promises contained herein, the Parties agree to the following:

#### ARTICLE I

##### PASSAGE DATES

The Company agrees to provide downstream passage systems for Atlantic salmon and fish from the family clupeidae at Vernon, and for Atlantic salmon at Bellows Falls and Wilder by April 1994. Downstream passage systems may include physical facilities, spillage plans and reasonable operational modifications. The Salmon Commission, upon petition by the Company, may extend the dates for providing said passage systems at any or all of the Projects subject to the conditions of Article V herein.

ARTICLE IISCHEDULE NECESSARY TO MEET PASSAGE DATESA. Overall Schedule

The Company will follow the schedule of activities which is outlined below:

VERNON

- \* Through Spring 1990 Physical model testing
- \* Spring 1990 Study and identify alternative systems. Conduct radio-tagged fish studies.
- \* Summer 1990 Install and operate Vernon "fish pipe"
- \* 1991 Evaluate alternative systems with radio-tagged fish studies
- \* 1992-1993 Engineer and design preferred system
- \* Spring 1993 \*\*Issue a notice to proceed with construction of preferred system
- \* April 1994 Operate preferred system and monitor passage
- \* 1994-1996 Evaluate effectiveness and modify facility as necessary

BELLOWS FALLS

- \* Through Spring 1990 Physical model testing
- \* 1990 - 1992 Evaluate alternative systems with radio-tagged fish studies
- \* 1992 - 1993 Engineer and design preferred system
- \* Spring 1993 \*\*Issue a notice to proceed with construction of preferred system
- \* April 1994 Operate preferred system and monitor passage
- \* 1994-1996 Evaluate effectiveness and modify facility as necessary

WILDER

- \* 1991 - 1993 Evaluate alternative spillage with radio-tagged fish
- \* 1993 Develop spillage plan
- \* April 1994 Implement spillage plan and monitor passage
- \* 1994-1996 Evaluate effectiveness and modify spillage plan as necessary

\*\* The issuance of a notice to proceed in this agreement means, notification of the selected contractor to proceed with construction as described and defined in the agreed on contract.

B. Construction at Vernon and Bellows Falls

The Company agrees to begin the physical construction of downstream fish passage systems at Vernon and Bellows Falls during the Spring of 1993. The Company agrees to complete construction of the fish passage systems in time for them to be operational during the Atlantic salmon downstream migration period beginning April 1994.

C. Wilder Operational Plan

The Company agrees to develop a spillage plan in time for it to be operational during the Atlantic salmon downstream migration period beginning April 1994.

ARTICLE III

COOPERATION AMONG THE PARTIES

A. General Considerations

The parties agree to cooperate in the implementation of the terms of this Agreement.

B. Review and Assistance

In order to ensure that downstream fish passage systems at the Projects are provided in accordance to the schedule contained in Article II.A., the Company agrees to provide requests for assistance and reviews in a timely manner. The primary obligation for obtaining applicable permits and licenses shall be the Company's responsibility. The States, the Services, and the Salmon Commission will cooperate with the Company in a manner consistent with applicable State and Federal laws and policies regarding the Company's application for any permit or license necessary to provide said fish passage systems, and agree to provide review, comments, or advice to the Company in a timely manner.

C. Agency Consultation and Review

Consultation and review reasonably requested by the Company according to the terms of this Article will be provided to the Company by the States, the Services, and the Salmon Commission at no cost to the Company.

D. Submittal to FERC

The parties shall submit this Agreement to the FERC upon its execution.

E. Anti-Deficiency Provision

This Agreement does not bind the Services and the States to expend funds in any fiscal year in excess of appropriations made by their respective legislative bodies or administratively allocated for the purpose of this Agreement.

ARTICLE IV

REPORTS BY THE COMPANY

Upon execution of this Agreement the Company shall submit written quarterly progress reports to the Salmon Commission, the States and the Services, with particular reference to whether the work is on schedule.

ARTICLE V

MODIFICATION OF TIME LIMITS

The parties may, by mutual written agreement, modify any time limit in this Agreement. Approval of such modifications shall not be withheld by any party in the event of: (1) floods, war, acts of God, natural disasters, fires, environmental orders, equipment failure, strikes, shortages of fuel and materials, and similar events beyond the control of the Company, or (2) the need for construction of a separate downstream fish passage facility at

Wilder; provided that the time which the Company would otherwise be required to complete construction of any of the downstream fish passage systems shall be extended for a reasonable period of time relevant to the facts and circumstances on a case-by-case basis. Additionally, approval of such modification of time limits shall not be withheld whenever all of the parties are in agreement that all downstream fish passage systems under consideration cannot achieve the expected results at any of the Projects based upon testing and study conducted according to the terms of this Agreement.

## ARTICLE VI

### OPERATION AND MAINTENANCE

#### A. Responsibility for Operation and Maintenance

To ensure the successful operation of downstream fish passage systems provided pursuant to this Agreement, the Company shall be responsible for the effective operation and maintenance of those facilities.

#### B. Periods of Operation

The downstream fish passage systems provided at Vernon pursuant to this Agreement will be operated throughout the periods of downstream migration for Atlantic salmon and clupeids. The downstream passage systems provided at Bellows Falls and Wilder pursuant to this Agreement will be operated throughout the periods of Atlantic salmon downstream migration. The operating schedules shall be determined annually by the Salmon Commission after consultation with the Company. The Company may petition the Salmon Commission in writing for changes to the operations schedule based on operations experience or other related data.

## ARTICLE VII

### ADDITIONAL CONSTRUCTION

The downstream fish passage systems at the Projects will be designed in accordance with design plans developed by the Company in cooperation with the States, the Services, and the Salmon Commission, and it is the expectation of all parties that such systems will accommodate the downstream passage at the Projects of the fish species for which they were designed. The States, the Services, and the Salmon Commission agree they will not seek construction of different or additional downstream fish passage systems at the Projects for a ten year period following commencement of system operation, except that said parties retain such rights during said period and thereafter for replacement of systems destroyed or damaged by acts of God or similar events and for reasonable minor modifications. However, any party may initiate negotiations to seek modification of the fish passage facilities at these projects when new technology has been developed which allows for a cost effective and significant improvement in fish passage capabilities at these projects.

## ARTICLE VIII

### NOTICES

All notices relating to this Agreement (including all reports) shall be in writing and shall be deemed to have been properly given if mailed by first class mail addressed in the following manner:

If to the Company: New England Power Company  
 25 Research Drive  
 Westborough, Massachusetts 01582  
Attention: Director, Environmental  
 Affairs

If to the Services: Regional Director  
 United States Department of Interior  
 Fish and Wildlife Service  
 One Gateway Center, Suite 700  
 Newton Corner, Massachusetts 02158

and:

Director, Northeast Region  
 National Marine Fisheries Service  
 One Blackburn Drive  
 Gloucester, Massachusetts 01930

If to New Hampshire: Executive Director  
 New Hampshire Fish and Game Dept.  
 2 Hazen Drive  
 Concord, New Hampshire 03301

If to Vermont: Director of Fisheries  
 Vermont Dept. of Fish and Wildlife  
 103 South Main Street  
 Center Building  
 Waterbury, Vermont 05676

If to Massachusetts: Director  
 MA Division of Fisheries & Wildlife  
 100 Cambridge Street  
 Boston, Massachusetts 02202

If to Connecticut: Chief, Bureau of Fisheries & Wildlife  
 CT Dept. of Env't. Protection  
 State Office Building  
 Hartford, Connecticut 06115

If to Salmon Commission: Executive Assistant  
 Connecticut River Atlantic Salmon  
 Commission  
 P. O. Box 71  
 Turners Falls, Massachusetts 01376

Or such other address as any party may from time to time designate by notice in writing to the other parties.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized representatives and officers all as of the date set forth above.

NEW ENGLAND POWER COMPANY  
BY:

*Lydia M. Pastuszek*  
LYDIA M. PASTUSZEK  
Vice-President

July 26, 1990  
Date

CONNECTICUT RIVER ATLANTIC SALMON COMMISSION  
BY:

*David F. Egan*  
DAVID F. EGAN  
Chairman

July 26, 1990

THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BY:

*Robert A. Jones*  
ROBERT A. JONES  
Chief, Bureau of Fisheries and Wildlife

July 26, 1990

MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE  
BY:

*Wayne F. MacCallum*  
WAYNE F. MACCALLUM  
Director

July 26, 1990

NEW HAMPSHIRE FISH AND GAME DEPARTMENT  
BY:

*Donald A. Normandeau*  
DONALD A. NORMANDEAU, Ph.D  
Executive Director

July 30, 1990

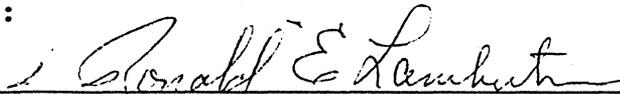
VERMONT FISH AND WILDLIFE DEPARTMENT  
BY:

*Timothy Van Zandt*  
TIMOTHY VAN ZANDT  
Commissioner

August 6, 1990

## U. S. FISH AND WILDLIFE SERVICE

BY:



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RONALD E. LAMBERTSON  
Regional Director

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July 26, 1990  
Date

## NATIONAL MARINE FISHERIES SERVICE

BY:



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RICHARD G. SEAMANS, JR.  
Acting Management Division Chief  
for Regional Director

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July 26, 1990

cc: L. M. Pastuszek, Concord  
G. P. Sardi  
M. E. Slade  
H. W. Sullivan, Lebanon

## **B.6 – CRASC’s 2018 Up and Downstream Fish Passage Operations Schedule**

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CONNECTICUT

MASSACHUSETTS

NATIONAL MARINE FISHERIES SERVICE

103 East Plumtree Road  
Telephone: 413/548-9138



VERMONT

NEW HAMPSHIRE

U.S. FISH AND WILDLIFE SERVICE

Sunderland, Massachusetts 01375  
Fax: 413/548-9622

Re: CRASC's 2018 Up and Downstream  
Fish Passage Operations Schedule  
FERC Project Nos.: 1855, 1892, 1904, 2077

John Ragonese, FERC License Manager  
Great River Hydro, LLC  
One Harbour Place, Suite 330  
Portsmouth, NH 03801

February 27, 2018

Dear Mr. Ragonese,

Enclosed is the 2018 Schedule of Operations that the Connecticut River Atlantic Salmon Commission (CRASC) believes is necessary for both up and downstream fish passage under current conditions at the identified projects on the main stem Connecticut River. Full implementation of this schedule provides juvenile and adult diadromous fish alternatives to turbine passage and river obstacles essential to the protection of adult Atlantic Salmon, American Shad, American Eel, Blueback Herring, and Sea Lamprey populations in the Connecticut River.

The proposed schedule for 2018 downstream passage of smolts is the same as in 2017, with the CRASC decision to no longer require the operation of downstream passage measures for Atlantic salmon smolts at the identified main stem projects. Downstream passage for adult Atlantic salmon will only be triggered with 50 or more adults passing upstream of a project. All adult salmon returning to the river in 2018 may be briefly processed for tag application (T-bar, visible streamer only) at first barrier trap facilities and will be released to continue their upstream migration. The CRASC is again requesting in the event adult salmon have not already triggered the operation of the Bellows Falls Dam fish ladder, that ladder be opened and operated once 100 sea lamprey have been passed at the Vernon Dam fish ladder.

The upstream passage schedule has been slightly modified for American Shad upstream passage timing, given variable early spring conditions. Vernon Fish Ladder's operational start date is to be triggered by the timing of the Turners Falls fishways opening. Given the documented short

transit time of 1.6 days (median for 36 radio tagged shad) for upstream migrating shad passing Turners Falls to reach Vernon, we request Vernon be operational within three days of Turners Falls fishways being opened (data from 2011 USGS Conte Lab Study, Ted Castro-Santos). This may advance the opening date from previous years, dependent on shad passage at the passage facilities downstream of Vernon. Once upstream passage measures are initiated for American Shad, downstream passage project operations must also be initiated.

Any in-season changes to the operation schedule will be addressed cooperatively as the need arises. To enable us to work with you in a timely manner when considering such adjustments, the suggested protocol is for you to contact John Warner of the U.S. Fish and Wildlife Service's (USFWS) New England Field Office at 603/223-2541, ext. 15 or me at 413/548-9128, ext. 8121.

The Commission greatly appreciates the cooperation we have experienced with the pre-season fishway inspections. This annual pre-season inspection will be scheduled soon by Dr. Brett Towler (USFWS) who will coordinate with you directly as well as the other partner agencies.

We look forward to continued cooperation with Great River Hydro.

Sincerely,



Kenneth Sprankle  
Executive Assistant

Enclosures (2)

c: CRASC Commissioners  
CRASC Technical Committee  
CRASC Fish Passage Subcommittee  
FERC-DLC

**Connecticut River Atlantic Salmon Commission  
2018  
Connecticut River Schedule of Upstream Fish Passage Operations**

Location (Project)	Upstream Fish Passage	Species	Life Stage	Dates of Operation <sup>1</sup>	Hours of Operation
Wilder	Ladder	salmon	adult	May 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
Bellows Falls	Ladder <sup>2</sup>	salmon	adult	May 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
Vernon	Ladder <sup>2</sup>	salmon	adult	April 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
	Ladder	shad & herring	adults	April 7 <sup>(1)</sup> - July 15	24 hrs/day
Turners Falls	Cabot Ladder, Gatehouse Ladder, and Spillway Ladder	salmon	adult	April 7 - July 15	24 hrs/day
	3 facility ladders	salmon	adult	September 15 - Nov 15	24 hrs/day
	3 facility ladders	shad & herring	adults	April 4 <sup>(1)</sup> - July 15	24 hrs/day
Holyoke	Zone-of-Passage Flows <sup>3</sup>	salmon, shad, herring and sturgeon	adult	April 1 - November 15	24 hrs/day
	Tailrace and Spillway lifts	salmon	adult	April 1 - July 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	salmon	adult	September 15 - Nov 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	shad & herring	adult	April 1 - July 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	sturgeon	adult	April 1 - November 15	up to 12 hrs/day <sup>4</sup>
	Tailrace and Spillway Eelways	eel	juvenile	April 15 - November 15 <sup>5</sup>	24 hrs/day

1 - Actual dates of operation are based on passage of fish at the previous downstream fishway (excluding Holyoke). Turners Falls fishways shall be operational as soon as 50 shad have been counted passing Holyoke Fishlifts. Vernon Fish Ladder shall be operational within three days of the Turners Falls fishways being opened. Due to lack of real-time fish counting at Turners Falls, once those fishways are triggered open, a three day lag period is identified to reflect relatively quick upstream movement from the Turners Falls project by passed shad (1.6 day median) to Vernon (Castro-Santos 2011).

2 - Agencies have requested the operation of Bellows Falls fish ladder either once 100 sea lamprey are passed at the Vernon Dam Ladder or an adult salmon is passed, whichever occurs first.

3 - Zone -of-passage flow of 1,300 cfs or more to the bypass reach below the dam

4 - Actual hours of operation on a day-to-day basis are to be determined by the MADFW in consultation with the project owner.

5 - Actual eelpass installation dates are dependent on river flow conditions and in consultation between project owner and MADFW and USFWS

**Reference**

Castro-Santos, T. 2012. Preliminary analysis of American shad passage at Vernon Dam 2011. Draft Report. S. O. Conte Anadromous Fish Research Center. Turners Falls, MA.

**Connecticut River Atlantic Salmon Commission  
2018**

**Connecticut River Schedule of Downstream Fish Passage Operations**

<b>Location (Project)</b>	<b>Downstream Fish Passage Exit</b>	<b>Species</b>	<b>Life Stage</b>	<b>Dates of Operation</b>	<b>Hours of Operation</b>
<b>Gilman/Dalton</b>	Interim Bypass Sluice	salmon	smolt	Not required	
<b>Moore</b>	Bypass Sluice and Trap	salmon	smolt	Not required	
<b>McIndoes</b>	Log Sluice	salmon	smolt	Not required	
<b>Ryegate (Dodge Falls)</b>	Fish Bypass Facility	salmon	smolt	Not required	
<b>Wilder</b>	Log Sluice	salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
<b>Bellows Falls</b>	Angled Fish Guide Wall and Log Sluice	salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
<b>Vernon</b>	Fish Bypass at Unit 10	salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 10 <sup>2</sup> - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
	Louver and Fish Pipe at Unit 4	eels	adult	September 1 – November 15	24 hrs/day
		salmon	smolt	Not required	
		salmon	adult	October 10 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 10 <sup>2</sup> - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
		eels	adult	September 1 – November 15	24 hrs/day
<b>Northfield</b>	Barrier Net	salmon	smolt	Not required	
<b>Turners Falls</b>	Log Sluice and Trash Sluice	salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 7 - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
		eels	adult	September 1 – November 15	24 hrs/day

Table continued on page 2...

- 1 - Downstream passage operation, for adults will only be required if 50 or more adults are documented as passing upstream of a dam/facility.
- 2 - Downstream passage measures should be operational for American shad at the same time as upstream passage is initiated, based on Turners Falls upstream passage operations.
- 3 - Fish passage operations/schedule may be adjusted by NOAA Fisheries, USFWS, and/or MADFW.

**Connecticut River Atlantic Salmon Commission  
2018  
Connecticut River Schedule of Downstream Fish Passage Operations**

Location (Project)	Downstream Fish Passage Exit	Species	Life Stage	Dates of Operation	Hours of Operation
Holyoke	Canal Louver and new (2016) low level Bypass	salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 1 – July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
		eels	adult	September 1 – December 1	24 hrs/day
		sturgeon	adult	April 1 – November 15 <sup>3</sup>	24 hrs/day
		sturgeon	juvenile	April 1- November 15 <sup>3</sup>	24 hrs/day
		Bascule Gate	eels	adult	September 1 – December 1
		salmon	smolt	Not required	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 1 - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
		eels	adult	September 1 – December 1	24 hrs/day

1 - Downstream passage operation, for adults will only be required if 50 or more adults are documented as passing upstream of a dam/facility.

2 – Downstream passage measures should be operational for American shad at the same time as upstream passage is initiated, based on Turners Falls upstream passage operations.

3 – Fish passage operations/schedule may be adjusted by NOAA Fisheries, USFWS, and/or MADFW.

## APPENDIX C - 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 **Great River Hydro, 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.*

Company Name: **Great River Hydro, LLC**

Authorized Representative:

Name: Erin A. O'Dea

Title: Vice President - Legal

Authorized Signature: \_\_\_\_\_



Date: May 3, 2019