Water Quality Certification with Conditions

FirstLight Hydroelectric Project
FERC License Nos. 1889 (Turners Falls)
2485 (Northfield Mountain)

Applicants: FirstLight MA Hydro, LLC
Northfield Mountain, LLC

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I. Introduction

A. MassDEP's Authority

The Massachusetts Clean Waters Act (State Act), M.G.L. c.21, §§ 26-53, delegates to the Massachusetts Department of Environmental Protection (MassDEP) the responsibility for protecting public health and enhancing the quality and value of water resources within the Commonwealth. Section 27 of the State Act directs MassDEP to take all action necessary or appropriate to secure to the Commonwealth the benefits of 33 U.S.C. 1251, *et seq*., (the Federal Clean Water Act). The main objectives of the Federal Clean Water Act are to restore and maintain the chemical, physical and biological integrity of the Nation's waters. To meet these objectives, MassDEP adopted the Massachusetts Surface Water Quality Standards (SWQS). 314 CMR 4.00, *et seq.* The SWQS classify each body of water; designate the most sensitive uses to be enhanced, maintained and protected for each class; prescribe minimum water quality criteria required to sustain the designated uses; and contain regulations necessary to protect and maintain the existing and designated uses and maintain existing water quality including, where appropriate, the prohibition of discharges into waters of the Commonwealth.

B. FirstLight's Water Quality Certification Application

FirstLight MA Hydro LLC (FirstLight) is the owner and operator of the Turners Falls Hydroelectric Project (Turners Falls Project, Federal Energy Regulatory Commission (FERC) No. 1889). Northfield Mountain LLC is the owner and operator of the Northfield Mountain Pumped Storage Project (Northfield Mountain Project, FERC No. 2485). The Turners Falls and Northfield Mountain projects are collectively referred to herein as the Project or Projects. FirstLight Hydro LLC and Northfield Mountain LLC are collectively referred to herein as FirstLight or Licensee. The Projects are located within the municipalities of Turners Falls, Montague, and Northfield, Massachusetts, on the Connecticut River.

FirstLight has applied to the Federal Energy Regulatory Commission (FERC or Commission) for new licenses under the Federal Power Act, 16 U.S.C. §§ 791-825r, after the prior licenses expired by their terms on April 30, 2018. Since then, FERC has issued annual licenses for the Projects under the terms and conditions of the current license until a new license is issued.

On February 22, 2024, FERC issued its Ready for Environmental Analysis (REA) notice. MassDEP held a pre-meeting with FirstLight on March 26, 2024 and established a webpage to help keep the public informed: 401 WQC for the FirstLight Hydroelectric Re-Licensing Project | Mass.gov. On April 22, 2024, FirstLight filed with MassDEP its 401 Water Quality Certification Application (WQC Application). FirstLight filed a single WQC Application for both Projects (with separate BRP WW28 application forms). MassDEP has until April 22, 2025, to grant, deny, or waive the certification.

On April 29, 2024, FirstLight published notice of two public hearings and a written comment period on the WQC Application in several local and regional newspapers and by other means, including requesting local municipalities to publish the notice on their websites. MassDEP established a written public comment period from April 29, 2024 until June 3, 2024 and held two virtual public hearings on May 29, 2024. MassDEP satisfied all public notice procedures established pursuant to Federal Clean Water Act section 401(a)(1). MassDEP has considered all public comments for this WQC.

C. The Connecticut River

The Connecticut River is the longest river in New England. It originates 2,625 feet above sea level in the Fourth Connecticut Lake, Pittsburgh, NH, and accumulates water from several major tributaries as it flows south at a slope of about 6 feet per mile. The waterway serves as the boundary between New Hampshire and Vermont, then runs through Massachusetts and Connecticut. It empties into Long Island Sound, over 400 miles from its source.

The Connecticut River watershed is of major importance to the Northeast region. It provides essential habitats and a migratory corridor for numerous species of fish, wildlife, and native plants; recreational opportunities to over 2 million people; and a major source of water for irrigation, power production, industrial water supply and waste assimilation. The river supports twelve diadromous fish species including species listed under the Federal Endangered Species Act (ESA) (five Distinct Population Segments of Atlantic Sturgeon and Shortnose Sturgeon).[1] Each of these species serves unique and important ecological functions by connecting the marine environment to freshwater and terrestrial ecosystems. Industrial development, dams, and overfishing have heavily affected these species over the past 250 years, leading to historical declines in their stocks.[2]

Unfortunately, these uses are often in competition with one another. The environment of the 11,250 square-mile drainage basin is variable, exemplifying both highly developed, urbanized areas and rural forested reaches. For most of the mainstem and many of its tributaries, the natural stream gradient is interrupted by artificial impoundments that provide over 3 million acre-feet of storage capacity. These reservoirs are a direct result of the more than 1,000 dams located on the mainstem and tributaries. There are 16 dams, most of which are utility owned, impounding nearly 200 miles of the mainstem river.

Additionally, the Connecticut River was a natural highway for commerce in New England prior to the development of the railroad. Several canals were built between 1791 and 1828 to facilitate transportation around natural falls. The combined operation of electrical generating facilities and maintenance of the canal systems has greatly influenced the flow regime, water quality, aquatic habitat, and movement of anadromous, catadromous, and riverine fish in the Connecticut River.

The Turners Falls Project is the second dam on the river proceeding upstream from the sea. The first dam is the Holyoke Hydroelectric Project (FERC No. 2004). There are nine dams on the Connecticut River upstream of Turners Falls, all FERC-licensed hydroelectric projects. Turners Falls has an authorized installed capacity of 64.21 megawatts (MW) and generates approximately 332,351 megawatt-hours (MWh) annually.

For many years, the state and federal governments have cooperated in efforts to restore anadromous Atlantic Salmon, American Shad, Blueback Herring and other species to the Connecticut River. These species require safe and efficient passage past the Projects during their upstream spawning migrations.

[1] The American Fisheries Society's convention is to capitalize both parts of common names of fish.
[2] US Department of Commerce, National Marine Fisheries Service, Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Prescription for Fishways; FirstLight, LLC, Turners Falls Hydroelectric Project (P- 1889-085) and Northfield Mountain Pumped Storage Project (P-2485-071) (May 20, 2024) (**hereafter "NMFS" or "DOC", FERC Accession No. 20240521-5074**)

Juveniles of these species require downstream passage measures to guide them safely past the Projects' turbine intakes on their seaward migrations. The Turners Falls Project currently includes facilities aimed at providing upstream and downstream passage for these species. However, modifications to these facilities are needed to increase their capacity and efficiency, and adequate bypass flows are needed to provide a safe zone-of-passage through the bypass reach to the dam and spillway fishway.

After considering the administrative record and all applicable law, MassDEP issues this WQC with conditions.

II. Federal Law, State Water Quality Standards Law, and Impairments

A. Federal Law

Congress enacted § 401 of the Federal Clean Water Act, 33 U.S.C. § 1341, to provide states and authorized tribes with an important tool to help protect water quality of federally regulated waters within their borders in collaboration with federal agencies. Under § 401, a federal agency may not issue a license or permit to conduct any activity that may result in any discharge into waters of the United States, unless the state where the discharge would originate either issues a WQC finding compliance with existing water quality requirements or waives the certification requirement. Section 401(d) allows the certifying authority to include conditions to assure that the applicant will comply with enumerated Federal Clean Water Act provisions and "other appropriate requirements of State law."[3] The 2023 Clean Water Act Section 401 Water Quality Certification Rule applicable to FirstLight's WQC Application directs MassDEP to evaluate whether the activity will comply with applicable water quality requirements. 40 C.F.R. § 121.3(a). The Rule defines "water quality requirements" as "any limitation, standard, or other requirement under sections 301, 302, 303, 306, and 307 of the Clean Water Act, any Federal and state or Tribal laws or regulations implementing those sections, and any other water quality- related requirement of state or Tribal law." 40 CFR 121.1(j).

B. State Water Quality Related Laws

The Massachusetts Clean Waters Act creates "a comprehensive program for protection of the surface and groundwaters of the Commonwealth." *Friends & Fishers of the Edgartown Great Pond, Inc. v. Department of Envtl. Protection*, 446 Mass. 830, 837 (2006). It confers on MassDEP "the duty and responsibility . . . to enhance the quality and value of water resources and to establish a program for prevention, control, and abatement of water pollution." M.G.L. c. 21, § 27. Like the Federal Act, the State Act creates a comprehensive permitting program to ensure water quality standards are met. *See* M.G.L. c. 21, §§ 43 and 44.

More specifically, the State Act confers on MassDEP the authority to:

- Establish standards of minimum water quality which shall be applicable to the various waters or portions of waters of the Commonwealth. *See id*. at § 27(5).

[3] MassDEP considers the Massachusetts Division of Fisheries and Wildlife's ("MassWildlife") enabling authorities which provide for the protection and management of the inland fish and wildlife resources of the Commonwealth, including, but not limited to, the Massachusetts Endangered Species Act, M.G.L. c. 131A, § 1 et seq., (MESA) and Cold Water Fish Resources regulations at 321 CMR 5.00 as "appropriate requirements of state law" for purposes of § 401 certification.

- Prescribe effluent limitations, permit programs and procedures applicable to the management and disposal of pollutants, including, where appropriate, prohibition of discharges. *See id*. at § 27(6).
- Require dischargers to establish monitoring, sampling, record keeping and reporting procedures and to submit to MassDEP data it reasonably needs to carry out the purposes of the State Act. *See id.* at § 27(7).
- Take all action necessary or appropriate to secure to the Commonwealth the benefits of the Federal Act. *See id*. at § 27(3).

Pursuant to M.G.L. c. 21, § 27(5), MassDEP has adopted the Massachusetts Surface Water Quality Standards (SWQS) at 314 CMR 4.00. The Standards establish "designated uses" for different classes of surface waters in the Commonwealth (*e.g.*, fish habitat, recreation) and enumerate the criteria necessary to protect both existing and designated uses. *See* 314 CMR 4.05. *See also* 33 U.S.C. § 1313(c)(2)(A) (2006). For MassDEP to issue a § 401 certification for an activity, water quality must be maintained or restored to protect the existing and designated uses of the pertinent waterbody. *See* 314 CMR 4.03(3)(b). The applicant for a WQC is responsible for providing MassDEP sufficient information to demonstrate compliance with the SWQS and other appropriate requirements of state law.

The Wetlands Protection Act, M.G.L. c 131, §40, and implementing regulations at 310 CMR 10.00 establish standards for activities conducted in wetland resource areas to protect the quality of public and private water supplies, prevent water pollution, and protect the habitat of aquatic life and wildlife. 310 CMR 10.01(2).

M.G.L. c. 131A, the Massachusetts Endangered Species Act ("MESA"), was enacted to protect rare species and their habitats by prohibiting the "Take" of any plant or animal species listed as Endangered, Threatened, or Special Concern. MESA and its implementing regulations at 321 CMR 10.00, administered by the Natural Heritage and Endangered Species Program (NHESP) of the Division of Fisheries and Wildlife (MassWildlife or MDFW), establish a comprehensive approach to the protection of the Commonwealth's Endangered, Threatened, and Special Concern species and their habitats by establishing procedures for the listing and protection of rare plants and animals, and outlining project review filing requirements for projects or activities that are located within a Priority Habitat of Rare Species. MassWildlife regulations at 321 CMR 5.00 protect the Commonwealth's cold water fish resources.

C. Water Quality Impairments at Issue

The SWQS categorize the segments of the Connecticut River just upstream and downstream of the dam as Class B warm waters. *See* 314 CMR 4.06(6)(b): Figure A; Table 7. Class B waters are designated as habitat for fish, other aquatic life, and wildlife, including their reproduction, migration, growth, and other critical functions, and for primary and secondary contact recreation. They can be suitable as a source of public water supply after appropriate treatment. Class B waters are also suitable for irrigation and other agricultural uses, and for compatible industrial cooling and process uses. Class B waters must consistently exhibit good aesthetic quality. The minimum criteria applicable to Class B waters are listed within 314 CMR 4.05(3)(b). Additional minimum criteria applicable to all surface waters are listed within 314 CMR 4.05(5). The Antidegradation provisions of 314 CMR 4.04 require protection of all existing and designated uses of water bodies, and maintenance

of the level of water quality needed to protect those uses.

The Projects are located within MassDEP water quality Assessment Units MA34122, MA34-01, 34-02, 34-03. *See* 314 CMR 4.06(1) and 314 CMR 4.06(6)(b), Figure 7 and Table 7. As required by the Federal Clean Water Act, MassDEP compiles and submits to EPA every two years a detailed report on the status of its waterbodies, called the Integrated List of Waters. The report includes updated use attainment and impairment decisions for each water body or segment and is subject to public review and comment.

Water quality in the Connecticut River has been affected by the construction and operation of hydroelectric facilities and their impoundments for more than 100 years. The entire Massachusetts part of the river upstream of the Turners Falls Dam is listed as impaired in the Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle. The table below summarizes the applicable impairments.

Table 1 - Impairments

Assessment Unit ID	Description	Length (miles)	Causes of Impairment	Source**
MA34122	Gill (cove of Connecticut River upstream of Turners Falls Dams)	160 acres	(Curly-leaf Pondweed*) (Eurasian Water Milfoil*) (Fanwort*) (Water Chestnut*)	Introduction of Non-Native Organisms (Accidental or Intentional)
			Escherichia Coli (E.coli)	Unknown
MA34-01	New Hampshire/Massachusetts state line to Route 10 Bridge in Northfield	3.5	(Alteration in Stream-side or Littoral Vegetative Covers*)	Streambank Modifications/ Destabilization
			(Flow Regime Modification*)	Impacts from Hydrostructure Flow Regulation/ Modification
			PCBs in Fish Tissue	Unknown
MA34-02	Route 10 Bridge, Northfield to Turners Falls Dams (NATID: MA00848 and MA00849) Gill/ Montague (excluding the delineated segment; Barton Cove MA34019)	11.4	(Alteration in Stream-side or Littoral Vegetative Covers*)	Streambank Modifications/ Destabilization
			(Flow Regime Modification*)	Impacts from Hydrostructure Flow Regulation/ Modification
			(Water Chestnut*)	Introduction of Non-Native Organisms (Accidental or Intentional)
			PCBs in Fish Tissue	Unknown
MA34-03	Turners Falls Dams (NATID: MA00848 and MA00849), Gill/Montague to confluence with	3.7	(Dewatering*)	Impacts from Hydrostructure Flow Regulation/ Modification
			(Flow Regime Modification*)	Impacts from Hydrostructure Flow Regulation/ Modification
			Escherichia Coli (E. Coli)	Combined Sewer Overflows

	Deerfield River, Greenfield/Montague		PCBs in Fish Tissue	Unknown
			Total Suspended Solids (TSS)	Unknown

*TMDL not required (Non-pollutant)
**The sources were obtained from Water Quality Data Viewer - MassDEP
Source: download (mass.gov), Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle, May 2023, page 167-168.

III. The Project and Facilities

A. Turners Falls Project

Most of the Turners Falls Project, including developed facilities and most of the lands within the FERC Project boundary are located within the municipalities of Erving, Gill, Greenfield, Montague and Northfield. The Turners Falls Dam impounds the upstream segment that is called the Turners Falls Impoundment (TFI). It is an approximately 20-mile-long section of the Connecticut River extending upstream from the dam to the base of Great River Hydro's Vernon Hydroelectric Project and Dam (FERC No. 1904) in Vermont. Most of the TFI lies in MA, however, approximately 5.7 miles of the northern portion of the TFI lies in NH and VT. The TFI is the river segment where the Northfield Mountain Project withdraws and then subsequently discharges water during pumping and generating cycles. These cycles significantly impact the flow and elevation of the TFI. The dam and TFI are depicted in Figure 1 below.

Figure 1

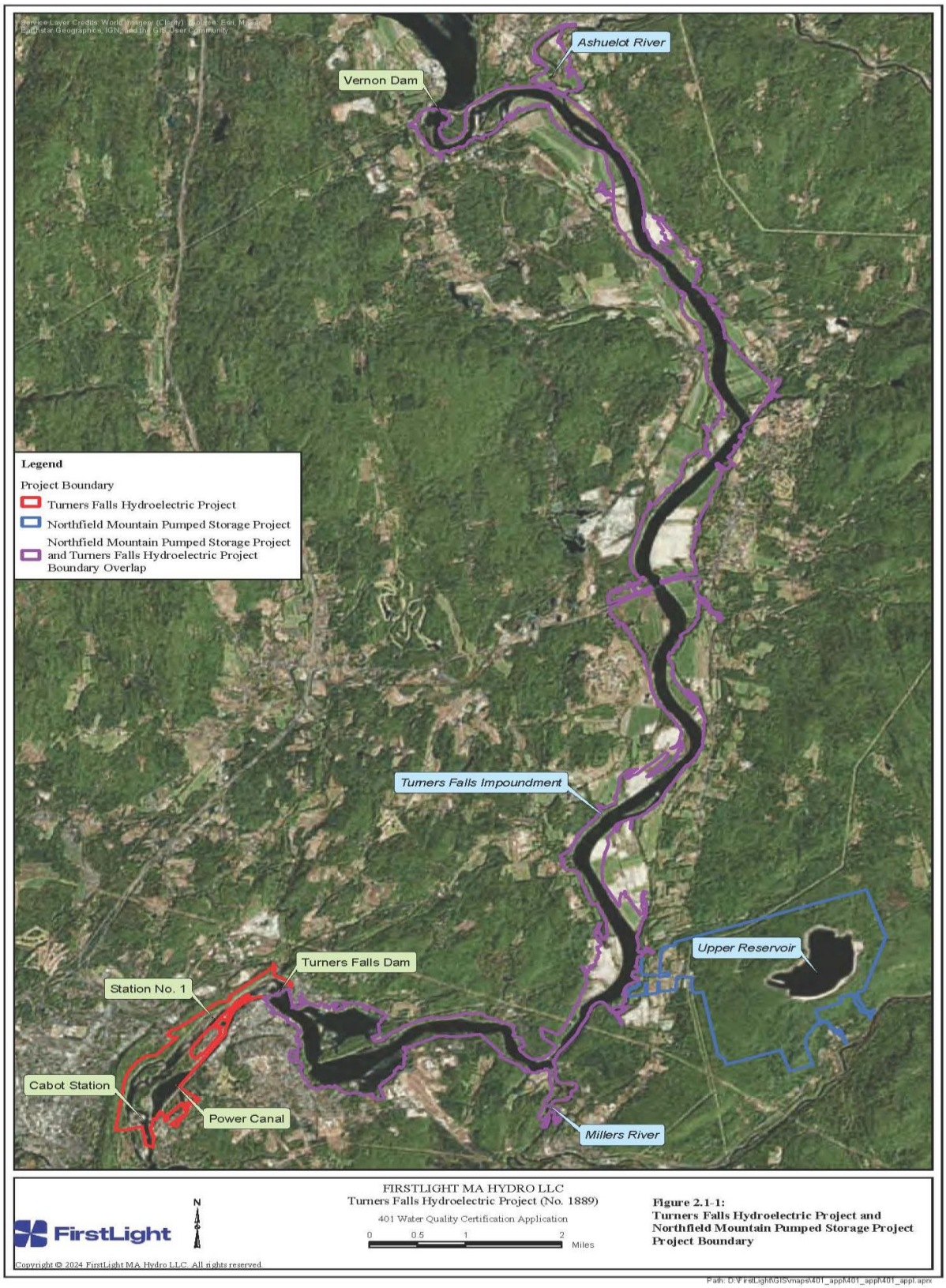
Service Layer Credits: World Imagery (Clarity), DeLorme, Esri, METI/NASA, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Ashuelot River
Vernon Dam
Legend
Project Boundary
Turners Falls Hydroelectric Project
Northfield Mountain Pumped Storage Project
Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project Boundary Overlap
Turners Falls Impoundment
Upper Reservoir
Turners Falls Dam
Station No. 1
Cabot Station
Power Canal
Millers River
FIRSTLIGHT MA HYDRO LLC
Turners Falls Hydroelectric Project (No. 1889)
401 Water Quality Certification Application
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Figure 2.1-1:
Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project Project Boundary
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The Turners Falls Dam is located at approximately river mile 122 (above Long Island Sound) on the Connecticut River in the towns of Gill and Montague. Key features of the Project are shown in Figure 2 below.

Figure 2

The Turners Falls Dam is located on a "Z turn" in the river, and is oriented on a northeast-southwest axis, with the impounded area on the east side of the dam and extending north. It is depicted above as the Gatehouse, Montague Spillway, and Gill Spillway.

Below the dam, originating at the gatehouse, is the Turners Falls power canal. Paralleling this power canal is a bypassed section of the Connecticut River, referred to as the bypass reach (approximately 2.6 miles long). Associated with the power canal are the two hydroelectric generating facilities owned by FirstLight: Station No. 1 and Cabot Station. Station No. 1 is located approximately one-quarter of the way down the power canal, which is about 2.5 miles long. Water is conveyed from the power canal to a small branch canal feeding the Station No. 1 turbines, before discharging into the bypass reach. Station No. 1 discharges to the bypass reach approximately 0.7 miles downstream from the dam. Cabot Station is located at the downstream terminus of the power canal, where it rejoins the main stem of the Connecticut River. Station No. 1 and Cabot Station discharge into the Connecticut River approximately 0.9 miles and 2.5 miles downstream of the Turners Falls Dam, respectively.

In addition to Station No. 1 and Cabot Station, there are two other hydropower facilities on the power canal that discharge into the bypass reach, when operating. Located between the Turners Falls Dam and Station No. 1 tailrace is Turners Falls Hydro, LLC project (FERC No. 2622), which is owned and operated by Eagle Creek Renewable Energy. Also, Milton Hilton, LLC, a FERC non-jurisdictional

hydroelectric facility owned by a private developer, is located between the Turners Falls Hydro, LLC project and Station No. 1.

The Turners Falls Project is equipped with three upstream fish passage facilities, including (in downstream to upstream order): the Cabot ladder; the Spillway ladder; and the Gatehouse ladder. Fish enter the Cabot ladder below Cabot Station, enter the power canal, and then move 2.1 miles upstream in the canal to the Gatehouse ladder and eventually into the TFI. Those fish bypassing the Cabot ladder move upstream via the bypass reach where they will ultimately encounter the Turners Falls Dam. Fish arriving here are passed upstream via the Spillway ladder into a gallery leading to the Gatehouse ladder and eventually into the TFI.

The downstream fish passage facilities are located at Cabot Station at the downstream terminus of the power canal. Fish moving downstream pass through the gatehouse (which has no racks) and into the power canal. Downstream fish passage facilities at Cabot Station consist of: reduced bar-spacing in the upper 11 feet of the intake racks; a broad-crested weir with an elliptical floor and side walls developed specifically to enhance fish passage at the log sluice; the log sluice itself, which has been resurfaced to provide a passage route; above-water lighting; and a sampling facility.

The operating requirements under the current FERC license include:

- The TFI operating band is from elevation 176.0 feet NGVD29[4] to 185.0 feet, as measured at the Turners Falls Dam.

- Maintain a continuous minimum flow of 1,433 cubic feet per second (cfs) or inflow, whichever is less, below the Turners Falls Project.

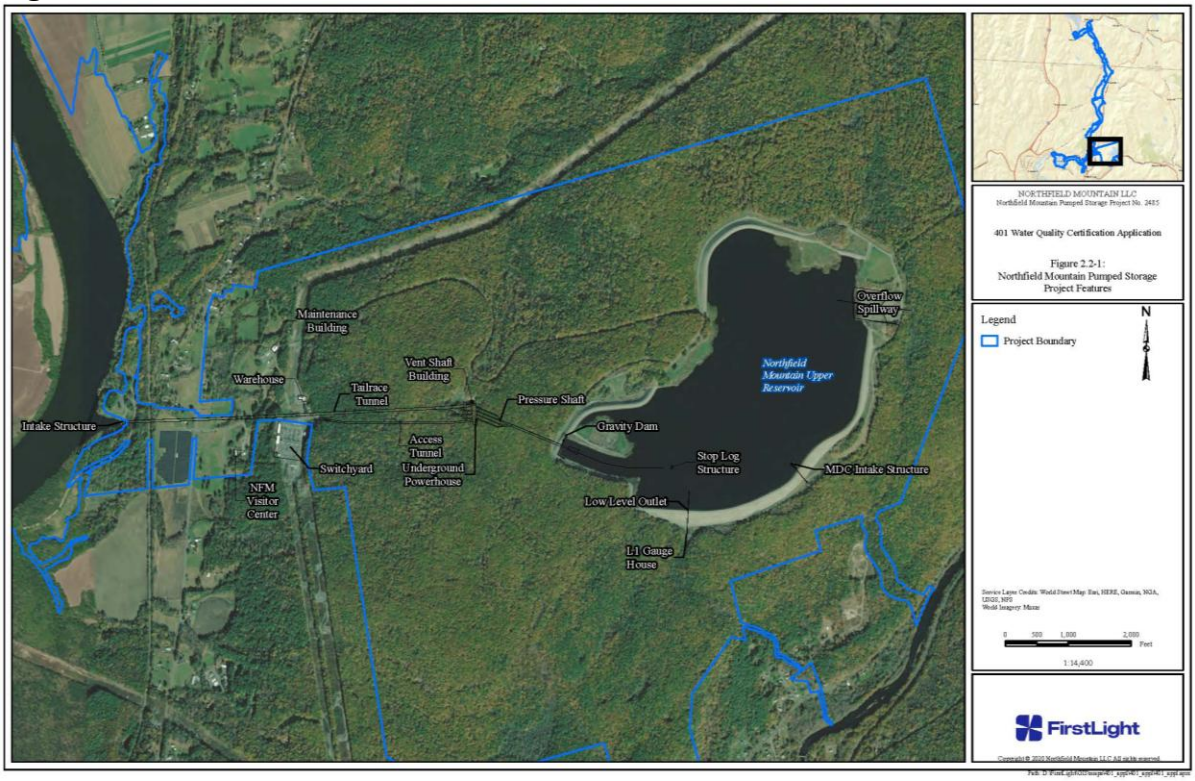
- Maintain a continuous minimum flow of 200 cfs in the bypass reach starting on May 1 of each year and increasing to 400 cfs when fish passage starts by releasing flow through a bascule gate at the dam. The 400 cfs continuous minimum flow is provided through July 15, unless the upstream fish passage season has concluded early, then reduced to 120 cfs to provide a zone of passage for Shortnose Sturgeon. The 120 cfs continuous minimum flow is maintained in the bypass reach from the date the fishways are closed (or by July 16) until the river temperature drops below 7°C, which typically occurs around November 15.

B. Northfield Mountain Project

The Northfield Mountain Project is a pumped-storage facility using the TFI as its lower reservoir. The Northfield Mountain Project is shown in Figure 3 below:

[4] All elevations in this document are based on the National Geodetic Vertical Datum of 1929 (NGVD29).

Figure 3



The pumped storage facility is an open-loop system located approximately 5.2 miles upstream of Turners Falls Dam, on the east side of the TFI. The Project's Upper Reservoir is a human-made structure situated atop Northfield Mountain, to the east of the Connecticut River. During pumping operations, water is pumped from the TFI to the Upper Reservoir. When generating, water is passed from the Upper Reservoir through an underground pressure shaft to a powerhouse cavern and then a tailrace tunnel delivers the water back to the TFI.

The powerhouse contains four reversible pump/turbines operating at gross heads ranging from 753 to 824.5 feet. Each of the four units has an electrical capacity of 291.7 MW, for a total station nameplate capacity of 1,166.80 MW. When operating in a generation mode, the maximum hydraulic capacity (4 turbines) is approximately 20,000 cfs (5,000 cfs/turbine).

The Upper Reservoir has a gross storage capacity of 17,050 acre-feet. Under the current FERC license, the Upper Reservoir may operate between 1000.5 feet and 938 feet, equating to a usable storage capacity of approximately 12,318 acre-feet. This is equivalent to approximately 8,729 megawatt hours (MWh) of stored energy. The Upper Reservoir was constructed to accommodate water up to an elevation of 1004.5 feet as approved by FERC in 1976. In addition, the reservoir retains usable storage capacity down to elevation 920 feet. The usable storage volume between elevation 1004.5 feet and 920 feet is approximately 15,327 acre-feet, which is equivalent to approximately 10,779 MWh of stored energy.

IV. The FERC Process Settlement Agreements and Agency Recommendations, Comments, and Prescriptions

On October 30, 2012, FirstLight initiated the FERC relicensing process with issuance of its Notice of Intent (NOI) and Pre-Application Document (PAD). The FERC Integrated Licensing Process including implementation of several studies then transpired over the next several years.
On December 2, 2015, FirstLight filed a Draft License Application and on April 29, 2016, it filed a single Final License Application for both Projects, two years prior to license expiration. On December 2, 2020, FirstLight filed separate Amended Final License Applications (AFLAs) for each Project, which included a combined Exhibit E (Environmental Report) for both Projects. Exhibit E of the AFLAs included FirstLight's relicensing proposal relative to Project Operations, Fish Passage, and Recreation. The proposal also included the following plans: Recreation Management Plan, Historic Properties Management Plan, Bald Eagle Protection Plan and Invasive Plant Species Management Plan.

A. Settlement Agreements

As part of the FERC process, FirstLight engaged several stakeholders and entered into two settlement agreements that were ultimately filed with FERC, one being the Flows and Fish Passage Settlement Agreement (FFP Agreement) and the other the Recreation Settlement Agreement (Recreation Agreement). MassDEP decided not to participate in the settlement discussions.

Signatories to the FFP Agreement included FirstLight, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Services (NMFS), Massachusetts Division of Fish and Wildlife (MassWildlife), The Nature Conservancy, American Whitewater, Appalachian Mountain Club, Crabapple Whitewater, Inc., New England Flow, and Zoar Outdoor. The FFP Agreement addressed issues pertaining to a) fish passage, b) flows for fishery, ecological conservation, and recreation purposes, and c) protected, threatened, and endangered species.

Importantly, one of the above signatories, MassWildlife, is the state agency responsible for the protection and management of the inland fish and wildlife resources of the Commonwealth. MassWildlife's mission also includes conserving and protecting endangered, threatened, and species of special concern pursuant to the Massachusetts Endangered Species Act (MESA; M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00).

The Recreation Agreement contained a Recreation Management Plan (RMP) as an appendix for both the Northfield and Turners Falls projects including proposed recreation protection, mitigation, and enhancement measures. Signatories to the Recreation Agreement included FirstLight, The National Park Service, Massachusetts Department of Conservation and Recreation (DCR), Towns of Erving, Gill, Montague and Northfield, American Whitewater, Appalachian Mountain Club, Crabapple Whitewater, New England Flow, Zoar Outdoor, Access Fund, Franklin Regional Council of Governments, and the Western Massachusetts Climbers Coalition.

As part of the Recreation Settlement Agreement, FirstLight has agreed to place lands it owns that are not used for specific project activities (*e.g.*, power production, project recreation facilities) along the TFI shoreline, into conservation easement/restriction status to maintain riparian buffers. FirstLight

will also permanently conserve its lands within Bennett Meadow, and the approximately 1.3- mile-long portion of the New England National Scenic Trail in the Northfield Mountain Project Boundary via a permanent trail easement. Collectively, the conservation easements/restrictions equate to 761.4 acres. In addition, as part of this WQC, MassDEP has established a condition to require implementation of a Riparian Management Plan.

The FirstLight WQC Application includes and is based upon all the terms that were agreed upon in the above settlement agreements, except as discussed otherwise below.

B. Prior Federal and State Participation

Section 10(j)(1) of the Federal Power Act, 16 U.S.C. 791a-828c (FPA), requires the Commission, when issuing a license, to include conditions based on recommendations by federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act, 16 U.S.C. 661-666(e), to "adequately and equitably protect, mitigate damages to, and enhance fish and wildlife (including related spawning grounds and habitat)" affected by the project.

Section 10(a)(1) of the FPA requires the project adopted by the Commission to be, in its judgment, "best adapted to a comprehensive plan for ... beneficial public uses, including … purposes referred to in section 4(e) ..." 16 U.S.C §803(a)(1). This includes consideration of adequate protection, mitigation and enhancement of fish and wildlife, including related spawning grounds and habitat. 16 U.S.C §803(a). Section 10(a)(2) requires that, in making this determination, the Commission consider the recommendations of federal agencies exercising jurisdiction over resources of the state in which the project is located (16 U.S.C §803(a)(2)). Here, the primary interest at the Project is safe, timely, and effective fish passage for the benefit of American Shad and American Eel, as well as habitat considerations for migration, spawning, and rearing for American Shad, American Eel, and Shortnose Sturgeon.

On May 16, 2024, the U.S. Department of the Interior, Office of Environmental Policy and Compliance, filed "Comments, Recommendations, Terms and Conditions, and Prescriptions" (**hereafter "USFWS" or "DOI";** FERC Accession No. 20240516-5099) with FERC pursuant to sections 10(a), 10(j), and 18 of the Federal Power Act that were prepared by the Department's National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS) and U.S. Geological Survey (USGS) in accordance with provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e); the National Environmental Policy Act, as amended (42 U.S.C. 4321-4347); the Federal Power Act (FPA), as amended (16 U.S.C. 791a-828c), and the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531, *et seq*.). The DOI developed its prescription for fishways through a review process that included consultation among fisheries biologists from the USFWS, the National Marine Fisheries Service (NMFS), and MassWildlife.

Importantly, the DOI Comments, Recommendations, Terms and Conditions, and Prescriptions endorsed and incorporated the terms of the FFP Agreement and the Recreation Agreement. The USFWS, an agency within the DOI, was a signatory to the FFP Agreement.

On May 20, 2024, the National Marine Fisheries Service (via the U.S. Department of Commerce) filed with FERC its Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary

Prescription for Fishways (**hereafter "NMFS" or "DOC";** FERC Accession No. 20240521-5074). The NMFS "developed this preliminary prescription for fishways, as well as the recommended conditions, through a review process that included consultation with the U.S. Fish and Wildlife Service, Massachusetts Division of Fisheries and Wildlife, non-governmental organizations, and the Licensee. These mandatory conditions and recommendations are intended to be consistent with the [FFP Agreement]." NMFS, p. 5.

NMFS stated that the purpose of the Section 18 preliminary fishway prescription is to identify "the engineered facilities, and operations and maintenance of such facilities, necessary to achieve safe, timely, and effective fish passage conditions and flows for our trust resources." NMFS, p. 9. The NMFS added: "At this filing, our prescriptions for fishways are preliminary. We developed these prescriptions using the best available scientific information. We include specific prescriptive measures that allow amendments through adaptive management to develop final design plans or to correct observed deficiencies." NMFS, p. 5. NMFS endorsed and incorporated the terms of the FFP Agreement, to which it was a signatory, into its Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Prescription for Fishways.

Also on May 20, 2023, MassWildlife filed its Comments, Recommendations, Terms and Conditions with FERC.[5] MassWildlife was a signatory to the FFP Agreement pursuant to Section 10(j) and 10(a). As discussed below, MassWildlife had additional comments and recommendations concerning invasive species management, canal drawdown species protection plan, bat protection measures, state-listed species permits, and bald eagle protection plan.

C. FirstLight's WQC Application

Importantly, the DOI, USFW and NMFS have consistently endorsed and adopted all the terms of the FFP Agreement[6], the terms of which FirstLight included in its WQC Application. Thus, the WQC Application is the most up-to-date document with respect to proposed terms and conditions for evaluating issues pertaining to the WQC, as it includes all terms of the FFP Agreement.

V. MassDEP's WQC Findings

A. Introduction

Rivers are dynamic systems, always changing shape and moving things from their headwaters downstream like giant conveyor belts. As part of this dynamic system and pursuant to the Federal Clean Water Act and the SWQS, the quality of water in rivers must be sufficient to support their designated and existing uses. 314 CMR 4.04. Here, the relevant designated and existing uses include aquatic life and its habitat, water related recreation (*e.g.*, boating, swimming) and consistently good aesthetic value. 314 CMR 4.01, 4.04, 4.05(3)(b).

Dams typically adversely affect these uses and riverine processes. Dams that divert water for power and other uses remove water needed for healthy in-stream ecosystems. Peaking power operations can cause dramatic changes in reservoir water levels. This can leave stretches below dams at low water levels or

[5] FERC Accession No. 20240520-5190.
[6] The USFW and NMFS were signatories to the FFP Agreement.

completely de-watered. There may also be problems if dams suddenly release water or reduce flows causing river levels below the dam to rise or fall suddenly. This is sometimes done to answer the needs of power generation – as is the case with Northfield Project – generally, water is stored in the reservoir during periods of low power demand and then released later to generate electricity when demand is high. These irregular releases destroy natural seasonal flow variations that trigger natural growth and reproduction cycles in many species.

The Northfield Project significantly affects the entire length of the TFI. FirstLight pumps water from the 20-mile section of the Connecticut River that is upstream of the Turners Falls dam—the TFI—uphill to the Northfield Reservoir. FirstLight then chooses when to pump water back downhill to the TFI through turbines that generate electricity. Both the uphill and downhill pumping operations cause unnatural changes in the river surface elevation on riverbanks[7] and flow; some report that the river flows backwards at times during pumping and generating modes.[8]

Further, slow-moving or still-water reservoirs can heat up, resulting in abnormal temperature fluctuations which can affect sensitive species. The slowing of river flow allows for the collection of nutrients in the warmer waters, creating habitat for algal blooms and decreased oxygen levels. Other dams decrease temperatures by releasing cooled, oxygen-deprived water from the reservoir bottom.

Dams can trap sediment, burying rock riverbeds where fish spawn. Gravel, logs, and other important food and habitat features can also become trapped behind dams. This negatively affects the creation and maintenance of more complex habitat (*e.g.*, riffles, pools) downstream.

Dams prevent or hinder fish migration. This limits their ability to access spawning habitat, seek out food resources, and escape predation. Fish passage structures can enable a percentage of fish to pass around a dam, but their effectiveness decreases depending on the species of fish and the number of dams fish must traverse.

B. Project Operations, Turners Falls Project

1. Flow Below the Dam, Station No. 1, and Cabot Station

The WQC Application, which is based on the FFP Agreement, proposes substantial changes to flows below the Turners Fall Dam, Station No. 1, and Cabot Station, resulting in significantly increased and stabilized (reduced peaking) flows that will generally improve conditions to support aquatic life and other designated and existing uses, both in the vicinity of the dam and for many miles downstream of the dam. The relevant river segments are depicted in Figure 4 below.

[7] The elevation fluctuations have contributed to erosion that has led to impairments for stream side littoral vegetation.
[8] Typically, pumped storage operations have a closed loop system instead of an open loop system like the Northfield system, which relies upon a 20 mile segment of the Connecticut River for withdrawal and discharge.

Figure 4

As shown above, the Turners Falls Dam is identified by the references to: Gill Spillway, Gatehouse, and Montage Spillway. The bypass reach is 2.6 miles long, beginning just below the dam and extending down to where it flows below the Cabot Station Spillway and Cabot Station. There is one tributary, Falls River, that enters the bypass reach approximately 0.17 miles below the Turners Falls Dam. Station No. 1 discharges into the bypass reach approximately 0.7 miles below the Turners Falls Dam, as indicated by the reference to Station No. 1 Powerhouse. The proposed changes in flows are summarized in Table 2 below:

Table 2

Current License			**FFP Agreement & WQC Application**		
Period	**Flow (cfs)**	**Location**	**Period**	**Flow[A] (cfs)**	**Location**
5/1-7/15	200/400	Turners Falls Dam (TFD)	4/1-5/31	6,500	4,290 cfs from TFD; remainder from Station No. 1
7/16-11/15	120	TFD	6/1-6/15	4,500	2,990 cfs from TFD; remainder from Station No. 1
11/16-4/30	0	TFD	6/16-6/30	3,500	2,280 cfs from TFD; remainder from Station No. 1

Current License			FFP Agreement & WQC Application		
Period	**Flow (cfs)**	**Location**	**Period**	**Flow[A] (cfs)**	**Location**
			7/1-11/15	1,800	500 cfs from TFD; remainder from Station No. 1
			11/16-3/31	1,500	400 cfs from TFD; remainder from Station No. 1

In sum, flow changes include the following:

- Significant increase in bypass flows and flows below Cabot Station to provide fish passage through the bypass, protect aquatic resources, and increase spawning habitat for the federally endangered Shortnose Sturgeon and American Shad.

- Cabot Station ramping rate restrictions to protect Shortnose Sturgeon spawning and incubation, state listed odonates, and downstream flora and fauna.

- Maintaining stable flow regime below Cabot Station to protect state-endangered Cobblestone Tiger Beetle, federal and state endangered Puritan Tiger Beetle and Shortnose Sturgeon, and state-listed odonates.

- Variable releases from Station No. 1 and Turners Falls Dam for recreational boating and ecological conservation purposes. The releases are also intended to introduce natural flow variability to the bypass reach, with the number of releases, schedule of releases, and quantity of flows released generally crafted to align with the patterns of naturally occurring flow events within the Connecticut River. The variable releases will not adversely affect, and are expected to benefit, the aquatic and riparian resources within the Turners Falls bypass reach.[9]

- Significant improvements in aquatic life habitat from Cabot Station to the Holyoke Dam (FERC No. 2004), approximately 10 miles downstream from increased, more stabilized flows, reduction in peaking, and passage of naturally routed flows. The higher bypass flows, higher minimum flows, and seasonal naturally routed flows below Cabot Station will provide more persistent habitat relative to current conditions. These flow changes will mimic naturalized flows, which results in a more natural gradient of habitat availability and increase habitat persistence.

The USFW summarized the results of FirstLight's instream flow study to assess impacts of current operations on aquatic resources within the Turners Falls Project-affected area, including the bypass reach.[10] In general, there will be substantial increases in habitat as measured by the percent of maximum Weighted Usable Area (WUA)[11] in the bypass reach, including the area just below the dam. For

[9] USFW, Comments and Recommendations, pp. 4-10.
[10] USFW, Comments and Recommendations, pp. 6-10.
[11] WUA is a microhabitat metric that measures the wetted area of a stream based on its suitability for aquatic organisms or recreational activities. It's calculated by multiplying the total surface area with a certain combination of hydraulic conditions

example, for migratory fish, in some areas flows will provide an average of 84 percent of maximum WUA for spawning sea lamprey; 73 percent of maximum WUA for spawning shad; 88 percent of maximum WUA for juvenile shad; 96 percent of maximum WUA for spawning sturgeon; 100 percent of maximum WUA for sturgeon eggs and larvae; and 73 percent of maximum WUA for sturgeon fry.

For resident riverine species (nonmigratory), the percent of maximum WUA provided varied by species, life stage, and location. Generally, the high flows provided in the spring lowered the suitability of spawning habitat, likely due to excessive velocities, primarily in some of the area just below the dam. The exception is for Walleye (*Sander vitreus*), where flows provide greater than 95 percent of maximum WUA. For juvenile fish, high spring flows lower habitat suitability for juvenile Fallfish (*Semotilus corporalis*); juvenile and adult Longnose Dace (*Rhinichthys cataractae*), Walleye, and Tessellated Darter (*Etheostoma olmstedi*). However, as flows decrease from May through June, habitat suitability generally increases.

The relative benefit of the proposed flows over those currently required include: over 16 times more flow in the spring; from 11 to 25 times the flow in the early summer; 18 times the flow in the summer and early fall; and 15 times the flow over the winter. These flows provide greater than 70 percent of maximum WUA for all life stages of the federally endangered Shortnose Sturgeon as well as spawning habitat for anadromous Sea Lamprey and American Shad in the spring and juvenile shad in the summer and fall. Additionally, it provides from 53 to 81 percent of maximum WUA for resident riverine fish species from summer through early spring.

The USFW and NMFS supported all flows in the FFP Agreement, including bypass flows, minimum flows below Cabot Station, Cabot Station ramping rates, variable releases from the dam and below Station No. 1, and thus and included them as Section 10(j) recommendations for any new license issued to FirstLight.[12]

For the Cabot Station Emergency Gate use, the USFWS deferred any conclusions to the NMFS, as the lead federal agency on issues related to Shortnose Sturgeon, noting that: "[a]brupt increases in velocity, extended periods of velocities exceeding those preferred by sturgeon, and sediments mobilized upstream of the spawning area all have the potential to impact spawning behavior and early life stages."[13] In response, the NMFS stated: "Upon license issuance, the Licensee will use the Cabot Station Emergency Gates under the following conditions: a) a Cabot load rejection that could cause overtopping of the canal, b) dam safety issues such as potential canal overtopping or partial breach, and c) to discharge up to approximately 500 cfs from April 1 to June 15 for debris management. If the Licensee desires to discharge higher flows during April 1 to June 15, the Licensee shall coordinate with NMFS to minimize potential impacts to Shortnose Sturgeon in the area below Cabot Station." This is identical to the WQC Application's proposed Article A180, Cabot Station Emergency Gate Use.

The USFWS commented that the flow related measures will require vigilant monitoring and management of project operations to ensure compliance. [14] The WQC Application's proposed Article

by the composite probability of use for that combination. *See* Payne, Thomas R., The Concept of Weighted Usable Area as Relative to Suitability Index (2003).

[12] USFW, Comments and Recommendations, pp. 6-12; NMFS, pp. 33-53.

[13] USFW, Comments and Recommendations, pp. 11-12.

[14] USFW, Comments and Recommendation, p. 13.

A200 calls for the Licensee to develop a Project Operation, Monitoring, and Reporting Plan, in consultation with the USFWS and other agencies, that includes a description of how the Licensee will comply with operational requirements, including bypass reach, below-Cabot Station flow protocols, and TFI water level management. WQC Application proposed Article A200 also requires documenting and categorizing allowable deviations from operational requirements.

MassDEP concurs with the USFW and NMFS recommendations, comments, and preliminary prescriptions for flows below the Turners Falls Dam, which are based on the FFP Agreement. The WQC Application is consistent with these recommendations, comments, and preliminary prescriptions. MassDEP finds that such flows will comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards at 314 CMR 4.00, and other water quality-related requirements of state law, subject to Special Condition Nos. 1-12 (with changes noted below to proposed license articles at Special Condition 10 (proposed Article A190) and Special Condition 12 (proposed Article A210)).

(a) Flow Limitations Immediately Below the Dam Are Necessary

The FFP Agreement, as incorporated in the WQC Application, would increase the typical flows from immediately below the dam down to Station 1 (Reach 1) from July 1 to November 15 from approximately 140 cfs to 500 cfs. The current flows of 140 cfs have occurred for decades.

There was an interest from some commenters to increase flows to approximately 1,500 to 2,500 cfs in that section between July 1 and November 15, which would be closer to the agreed upon flows starting just 0.6 miles downstream at Station No. 1. The commenters contend such increased flows are necessary to increase available habitat for common fluvial fish species, provide more recreational opportunities (*i.e.*, whitewater boating), and enhance aesthetics.

MassWildlife, however, sought the compromise of 500 cfs to protect two sensitive native plant species: Tufted Hairgrass *Deschampsia cespitosa* ssp. glauca (MESA Endangered) and Tradescant's Aster, *Symphyotrichum trandescantii* (MESA Threatened). The MESA and regulations establish procedures for the listing of plant and animal species as endangered, threatened, or special concern and protect these species and their habitat. M.G.L. c. 131A; 321 CMR 10.00. MassWildlife's Natural Heritage and Endangered Species Program, within the Massachusetts Department of Fish and Game, is responsible for this highly specialized area and MassDEP routinely relies on the expertise of its staff. *See* Appendix A, State-Listed Plants of Focus in the Bypass Reach for Turner's Falls Relicensing, Massachusetts Division of Fisheries and Wildlife.

Tufted Hairgrass is a native, long-lived grass found on river-scoured bedrock, cobble and gravel shores along a small portion of the Connecticut River in Massachusetts. The largest extant native occurrence is located within the bypass reach of the Turners Falls Dam. The majority of these plants are found in the plunge "pool" just downstream of the dam, although there are a few smaller occurrences between the pool and the end of the bypass reach (Reach 3). There was a recent single small occurrence of the plant identified in the TFI, representing the only known location of this species located outside of the bypass reach in Massachusetts. Historically, a population was reported in the Merrimack River but it has not been observed in the last 25 years.

The current New England range of Tufted Hairgrass includes the Connecticut River in Connecticut,

Massachusetts, Vermont, and New Hampshire, as well as the bigger rivers in northern Maine (Penobscot, Kennebec, etc.). These areas are heavily scoured by powerful spring flows and ice but are then not inundated during the growing season except during occasional, temporary large-scale storm events. Flowers are wind pollinated and seed dropped on bare or nearly bear soils and rock. Tufted Hairgrass requires significant periods of dry, exposed conditions during the growing season to flower, distribute pollen by wind, and set seed. It is classified as facultative wet (found in an area considered a wetland) where it is associated with large rivers with high, scouring flows in spring and rocky and gravelly shorelines, river shore cliffs and outcrops.

Tradescant's Aster is a New England native wetland/riparian, facultative wet species; also considered endemic. It occurs at two locations in Massachusetts, within the bypass reach of the Turners Falls Dam and within the impoundment of the Holyoke Dam. Numbers are relatively equal between these areas. Relative to Tufted Hairgrass, Tradescant's Aster co-occur from the lowest Tufted Hairgrass elevation but extend further up the banks (*i.e.*, to a higher elevation than Tufted Hairgrass) until it is outcompeted/shaded out by upper elevation plants. It is currently found in the Connecticut River basin in Massachusetts, Vermont, and New Hampshire. There are disjunct populations in Maine. Habitat in these locations includes gravelly and sandy areas of certain lakeshores and streams. Tradescant's Aster is small-insect pollinated.

MassWildlife assessed the potential impacts on the two plant species in 2018 and again in 2024. Tufted Hairgrass habitat can be viewed as a horizontal band of habitat in the bypass reach that is characterized by high scour in spring/fall and likely ice scour in winter. The horizontal extent is limited by suitable substrate that give Tufted Hairgrass and Tradescant's Aster an advantage, as both are capable of rooting in very limited soil (*i.e.*, rock crevices/cracks) and withstanding persistent high flows outside the growing season. The vertical lower extent of habitat is limited by persistent inundation. The vertical upper extent is limited by the extent of high scour from flows and ice. In this area of the bypass reach (Reach 1), almost all the rocks have limited elevation. So, the increase in water surface elevation from increased flows will decrease the amount of habitat available. On the shores of the "pool," the rocks make up the bank, but the vertical limit of habitat for these two plants is limited by the depth of scour from ice/seasonal flows and substrate.

Overall, MassWildlife's field observations and analyses confirmed that both Tufted Hairgrass and Tradescant's Aster are clustered in lower elevations and that increased flows rapidly lead to extensive inundation of both plants in the plunge pool area. A MassWildlife botanist found that approximately 40% of Tradescant's Asters and their habitat at this site were inundated at 500 cfs and 90% at 1500 cfs. For Tufted Hairgrass, 30% were inundated at 500 cfs and nearly 100% by 1,500 cfs. This is consistent with the 2018 qualitative observations, and is contrary to First Lights' October 2017 report, which assumed that plants were evenly distributed by elevation and that impacts increased incrementally as flows increase.

Generally, MassWildlife concluded that inundation of these plants outside of seasonal norms will impact reproduction (from the formation of the flowers through pollination and seed dispersal). In normal river systems, a single year or even several years of rainy summers would impact reproductive success. But reproductive failure from extremely rainy or highwater years would not occur with a high frequency, and populations are able to rebound from such variations and thrive during normal and dry years. Changing the agreed flows of 500 cfs to upward of 1400 cfs or even 2500-4500 cfs for

whitewater boaters, as advocated by some, would functionally introduce high spring floods year-round into this otherwise dry section of the upper bypass reach. MassWildlife believed that this persistent inundation would lead to a catastrophic loss of these populations and, potentially, permanent extirpation of Tufted Hairgrass from Massachusetts. Such a result would be inconsistent with the spirit, intent, and requirements of MESA and its implementing regulations.

Sub-populations further downstream in the bypass reach will likely be heavily impacted under the proposed minimum summer/fall flows below Station 1 (1,500-1,800 cfs, FFP Agreement). However, in consideration of other species, recreational, and tribal interests, MassWildlife elected not to push for further reductions in the Turners Falls Dam spill flow during settlement discussions. Instead, MassWildlife agreed to flows of 500 cfs below Turners Falls Dam during the summer months despite the still significant impacts (>30-40% loss) that are likely to occur to the primary plunge pool sub-population.

If flows in the bypass reach were to be re-balanced by decreasing Station No. 1 flows and increasing spill flows from Turners Falls Dam to 1,500-1,800 cfs, the inundation would result in the loss of >95% of Tufted Hairgrass populations – and most of Tradescant's Aster populations – in the bypass reach. For Tufted Hairgrass specifically, this would mean a >95% loss to the only known population of this sub-species in Massachusetts. While there is a small occurrence of Tufted Hairgrass in the TFI, it does not meaningfully contribute to the conservation of Tufted Hairgrass, primarily because the habitat is not sufficiently supportive; in addition, MassWildlife does not anticipate long-term persistence of this subpopulation under the anticipated increase in impoundment variability needed to help FirstLight naturalize flows downstream of Cabot Station. Although this will likely impact this and other rare plants in the impoundment, MassWildlife agreed to this increased operational flexibility with the understanding that protection of rare plants in the plunge pool area of the upper bypass reach would be prioritized over habitat for common native fishes and generalized macroinvertebrates, which are poised to see very substantial and broad benefits under the FFP Agreement, despite the 500 cfs flow limitation in Reach 1.

Under the agreement, generalist species will experience dramatic year-round expansion of habitat quantity and quality throughout the bypass reach, including Reach 1 where minimum flows in the summer are slated to increase by a factor of 4. MassWildlife noted that these generalist species will also see dramatic improvements to habitat quality and persistence in the >25 miles downstream of Cabot Station as a result of the flow stabilization measures required under the Agreement.

MassWildlife's position is consistent with the SWQS. The SWQS designate the most sensitive uses for which the waters of the Commonwealth are to be enhanced, maintained and protected; prescribe the minimum water quality criteria required to sustain the designated uses; and require the achievement of designated uses and the maintenance of existing water quality. 314 CMR 4.01(3). As to hydrologic conditions in the context of a license for a hydroelectric power facility, the SWQS state: "When the Department issues a 401 Water Quality Certification of an activity subject to licensing by the Federal Energy Regulatory Commission, flows shall be maintained or restored to protect existing and designated uses. 314 CMR 4.03(3)(b). The SWQS establish classes and uses of Commonwealth waters, with "[e]ach class identified by the most sensitive, and therefore governing, water uses to be achieved and protected." 314 CMR 4.05(1).

Antidegradation provisions in the SWQS include the protection of existing uses, such as the level of water quality necessary to protect and maintain these uses. 314 CMR 4.04(1). Existing Uses are defined as the designated uses and any other uses actually attained in a water body on or after November 28, 1975. 314 CMR 4.02 (Existing Use).

Where waters have multiple designated uses, criteria are established to support the most sensitive use. 40 CFR 131.11(a)(1). Aquatic life is typically the governing use because it is usually the most sensitive use. *See* 314 CMR 4.05(1). Aquatic life is defined in the SWQS as "[A] native, naturally diverse, community of aquatic flora and fauna including, but not limited to, wildlife and threatened and endangered species." 314 CMR 4.02 (Aquatic Life). Thus, the SWQS protection of the Aquatic Life use explicitly applies to aquatic plants ("flora") and to threatened and endangered plant species.

EPA's Water Quality Standards Handbook ("Handbook") provides relevant guidance on the interpretation of state water quality standards. It addresses the perceived equivalency of fish populations and recreation, clarifying that "[e]ven though the shorthand expression 'fishable/swimmable' is often used, the actual objective of the Act is to 'restore and maintain the chemical, physical, and biological integrity of our Nation's waters' (section 101(a)). The term 'aquatic life' would more accurately reflect the protection of the aquatic community that was intended in section 101(a)(2) of the Act." Handbook, Section. 4.4.2.

An aquatic community should be protected even in the absence of a fish population or recreation: "An existing aquatic community composed entirely of invertebrates and plants, such as may be found in a pristine alpine tributary stream, should still be protected whether or not such a stream supports a fishery." While a small and marginal population may be considered an artifact and need not be protected, "[n]on-aberrational resident species must be protected, even if not prevalent in number or importance." Handbook, Section 4.4.2. Even if not explicitly cited in a state's regulations, the Handbook notes that "[w]here a population consist of a threatened or endangered species, it may require protection under the Endangered Species Act." Handbook, Section 4.4.2.

MassDEP concurs with the analysis of MassWildlife that flows limited to 500 cfs immediately below Turners Falls Dam (Reach 1) during the summer months are necessary to meet the requirements of the SWQS. The plant species present below Turners Falls Dam, are unquestionably classified as aquatic/wetland species and included in the definition of Aquatic Life Use, which specifically includes aquatic flora as well as fauna and specifically refers to threatened and endangered species. 314 CMR 4.02 (Aquatic Life). The Aquatic Life Use in this Class B water is protected as a designated use. 314 CMR 4.05(3)(b). These two plant species are currently present below the Turners Falls Dam, and therefore are also protected as an existing use. 314 CMR 4.02 (Existing Use); 314 CMR 4.04(1). There is ample evidence in the record that the populations of these two plant species are stable and found in habitat to which they are suited; they are not aberrational or artifact populations. Even if the species are present only because of the dam, they remain protected as an Existing Use under the SWQS.

The limitation of flows to 500 cfs in the summer months was agreed to by MassWildlife as a signatory to the FFP Agreement and included in its Comments, Recommendations, Terms and Conditions, despite the still significant impacts (>30-40% loss) that are likely to occur to the primary plunge pool sub-population. This constitutes a reasonable effort to accommodate other uses. MassDEP accepts the judgment of MassWildlife as to the adequacy of this flow to protect the two plant species. The

definition of Aquatic Life in the SWQS specifically references threatened and endangered species; therefore, MassDEP views protection afforded these species under MESA, implemented by MassWildlife, to be an appropriate water quality related requirement of state law properly included in this Certification.

The Aquatic Life Use is typically the most sensitive use, and in most cases takes precedence over other uses. 314 CMR 4.05(1); Water Quality Standards Handbook, § 4.4.2. The flows established to protect the rare plant species may have an effect on recreational canoeing below the dam, but studies have confirmed that this section is navigable by boat (canoe, kayak, etc.) at 500 cfs. The segment is not listed as impaired for secondary contact recreation, which includes boating.

Finally, there is no evidence to support a conclusion that habitat for the two rare fish species identified by one commenter, the Burbot and the Long-nosed Sucker, is an existing use; these species are not currently present, nor would they return to the area if flows were increased. Tufted Hairgrass and Tradescant's Aster are currently present, stable populations, qualifying as an existing aquatic life use that takes precedence over habitat for fish species not currently present and therefore not an existing use.[15]

Accordingly, as discussed above, MassDEP adopts as conditions of this Certification, the flow requirements for below the dam in the bypass reach that were agreed to in the FFP Agreement and incorporated into the WQC Application, finding they are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law.

2. Flow Notification Website

The WQC Application includes proposed Article A210, titled Flow Notification Website. The proposed article is intended to provide greater transparency regarding flows related to the Turners Falls Project to facilitate access and support for designated uses, including boating, fishing, and swimming. It would require the Licensee to provide a website with: (1) real-time data on an hourly basis for TFI water elevations (as measured at the dam), Turners Falls Dam total discharge, and Station No. 1 discharge; (2) the anticipated Turners Falls Dam total discharge and the anticipated Station No. 1 discharge for a 12-hour window into the future, on an hourly basis; and (3) the starting and ending time/date of the annual power canal drawdown, one month prior to the drawdown.

MassDEP supports these measures, but is amending the proposed Article A210, Special Condition 12 in this WQC, to require additional quarterly reporting for compliance assessment purposes, as specified in Special Condition 12. Accordingly, MassDEP adopts as Special Condition 12 of this Certification, the flow notification website provisions that were agreed to in the FFP Agreement and incorporated into the WQC Application along with the changes noted above, finding they are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law.

[15] Flows for Shortnose Sturgeon are discussed below in the Turners Falls Project Fish Passage section.

3. Turners Falls Impoundment Water Level Management

The WQC Application includes proposed Article A190, titled Turners Falls Impoundment Water Level Management, to govern TFI water levels. The proposal includes the water elevation ranges of 176-185 feet NGVD 29[16], as measured at the Turners Falls Dam; limits on the rate of rise to be less than 0.9 feet/hour from May 15 to August 15 from 8:00 am to 2:00 pm to protect state listed odonates known to occur in the TFI during the emergence and eclosure period, with certain qualifications; and allowable Naturally Routed Flow (NRF) deviations from +/-10% to +/- 20%.

FirstLight is presently allowed by its license to fluctuate water levels in the TFI in the range of 176-185 feet. However, FirstLight has never been issued a WQC, so the impacts from such fluctuations have never been evaluated for compliance with the SWQS. As discussed below, FirstLight has not provided MassDEP with the information it needs to determine whether the full range of 176-185 without limits would comply with the SWQS.

In response to MassDEP's August 15, 2024, information request 4, FirstLight provided two operations curves. One reflects current operations and the other proposed future operations. They are respectively titled: Turners Falls Impoundment – 10, 50, 90% Exceedance Elevations and Mean Elevation under Baseline (existing) Conditions ("Existing Exceedance Curves") and Turners Falls Impoundment - 10, 20, 90% Exceedance Elevations and Mean Elevation under the FFP Settlement Agreement ("Future Exceedance Curves"). They are provided at Appendix B.

The facility has generally always operated between elevations of approximately 178.8-183.4, with slight variations at the top and bottom for the 10/90% parameters.[17] *See* Appendix B.[18] FirstLight's erosion related model for the proposed operating conditions shows the TFI elevation at 179 feet or above approximately 96% of the time.[19] That equates to going below 179 approximately 4% of the time (4% of 365 = 14.6 days). For existing operations, FirstLight operates at or above 178.8 feet approximately 98% of time.[20]

FirstLight's proposed modelled scenarios that include the FFP Agreement generally do not appear to vary substantially from the preceding discussion. They project the annual operating range of approximately 179-184.2, with slight variations at the top and bottom for the 10/90% parameters. *See* Appendix B.

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[16] NGVD 29 stands for National Geodetic Vertical Datum of 1929. It is a system that has been used by surveyors and engineers for most of the 20th Century. All references to surface water elevation in this WQC are measured according to NGVD 29 and the reference to NGVD will not be repeated in this document.

[17] Table 3.3.2-1 of FirstLight's Pre-Application Document identifies the *minimum elevation* as 179, stating: "Although the FERC license allows FirstLight to draw the Turner Falls Impoundment to elevation 176.0 feet msl, which occurs during certain operating scenarios, FirstLight generally maintains the impoundment higher than 176.0 feet msl to maintain sufficient head at the gatehouse."

[18] FirstLight Pre-Application Document, p. 3-24 and p. 4-80, Figure 4.3.1.3-7: Turners Falls Impoundment- Annual Elevation Duration Curves, Hourly 2000-2009; Relicensing Study Report 3.3.9, page iii, noting that the median elevation as measured at the dam for 2000 to 2010 was 181.3 msl.

[19] Supplemental BSTEM Modeling Report Reflecting Operating Conditions in the Flows and Fish Passage Settlement Agreement (March 2024), p. 2-15, pdf page 21 (Modeled Hourly WSEL and Energy Grade Line Slope at Transect BC-1R in Barton Cove. FERC Accession 20240322-5086

[20] Relicensing Study 3.1.2, Operations Impact on Existing Erosion and Potential Bank Instability Study Report (October 2016), p. 5-16, pdf page 367. FERC Accession 20161014-5107.

FirstLight confirmed this in its response to comments on the FFP Agreement that it filed with FERC.[21] It stated that it is "speculation that expanded use of the upper reservoir would worsen dewatering problems . . . ." MassDEP interprets this to mean that the facility is proposing to operate consistent with what it has modeled and the lowest TFI elevation will be 178.8, with very infrequent outliers. In another response to comments filed by FirstLight, it stated that water levels in Barton Cove "will be virtually the same as baseline conditions . . . ."[22]

Despite this, FirstLight indicated in its comments that it would need to operate in the full range of 176-179 without limitations. However, FirstLight failed to provide sufficient information for MassDEP to determine that operating in this range without limitations would comply with the SWQS, for the reasons discussed below.

The photos at Appendix C depict the typical lowest drawdown to approximately 179 feet. Even the typical lowest drawdown to approximately 179 feet exposes land under water. In contrast, the photos at Appendix D depict what appears to be an outlier drawdown between 176 and 179 feet, where more land under water is exposed.[23] It is noteworthy that the photos at Appendix D were taken approximately 6 miles upstream from the Turners Falls Dam near Saco Lane in Gill, where the impacts of drawdowns should be less than impacts at points closer to the dam, such as Barton Cove.

Commenter Andrew Fisk, PhD, as Northeast Regional Director for American Rivers, reported that on June 12-13, 2021, FirstLight conducted another outlier drawdown to 177.5 feet, which "stranded boats at the [Franklin County Boat Club] located at Barton Cove, impacting a designated and existing use of recreation. While pumping to this level below 179 feet has not occurred often in the term of the current license, it is quite likely to occur more frequently over the coming license term."[24] This drawdown drew prompt attention from the local media because of the significant departure from prior elevations and concerns about impacts on the designated and existing uses for aquatic life and recreation.[25] *See* Appendix E, photos.

The Town of Montague, where Turners Falls is located, commented in a public comment dated May 29, 2024, noting: "the Town's concern regarding continuation of an operating elevation range of 176 to 185 feet in the TFI, this range accommodates what would be extremely low water levels, which have not been shown necessary to support past utility operations and which the applicant itself has previously indicated are not foreseeably necessary in the future. The Town would argue that 179' is a sufficient low-end elevation threshold to operate under the normal range of operating conditions, with clearly

[21] FERC Accession # 20230612-5216: 20230612 FirstLight Response to FFP Settlement Comments.
[22] FERC Accession #20240708-513520240708 FirstLight Response to Recommendations and Comments. FirstLight's reliance in the comments upon Study 3.6.6, Assessment of Effects of Project Operation on Recreation and Land Use, is misplaced. That is a 2016 study that was based upon existing operations and pre-dated the FFP Agreement. It therefore does not consider future operational impacts, particularly for how FirstLight might operate in the future for the range of 176-179.
[23] The photos at Appendix D depict a rare drawdown below 179 that occurred on September 9, 2023, possibly to approximately 177.5.
[24] The comment letter is dated June 3, 2024.
[25] Low water levels for parts of Connecticut River in Franklin County, WWLP (June 15, 2021)—the following link includes the related story and several photographs of impacts from the low water levels: https://www.wwlp.com/news/local-news/franklin-county/low-water-levels-for-parts-of-connecticut-riverin-franklin-county/

defined protocols to govern emergency conditions that might require lower levels. Absent this standard and procedure, the utility is empowered to take action that may be detrimental to the TFI's water quality without good cause."

The Connecticut River Conservancy commented on June 3, 2024, that MassDEP "should require that 100% of the time during daylight hours, the river height must be above 179 ft to ensure safety and navigability for boats at Barton Cove." The Franklin Regional Council of Governments also commented on June 3, 2024, generally asserting that the TFI range should be confined to 179-184 feet and specifying other limitations it desired.

FirstLight failed to provide sufficient information for MassDEP to determine that operating in the range of 176-179 without sufficient limitations would comply with the SWQS. For example, it failed to assess or model impacts regarding aquatic life, boating, and swimming in the full range of 176-179 feet throughout the entire 20-mile long TFI. FirstLight's operations models focused on the range of approximately 179-184.2 feet, and *not* the full extent to which they anticipate using the entire range of 176-179 feet in the future.

The SWQS include three different provisions at issue here. First, the SWQS prevent degradation of surface waters, otherwise known as anti-degradation. 314 CMR 4.04. The quality (which includes quantity) of water must be sufficient to support designated and existing uses. Here, the relevant designated and existing uses include aquatic life and its habitat, water related recreation (*e.g.*, boating, swimming) and consistently good aesthetic value. 314 CMR 4.01, 4.04, 4.05(3)(b).

Designated and existing uses that could be <u>un</u>supported by unlimited impoundment levels in the full range of 176-179 feet include: boating, swimming, aquatic habitat in the littoral zone (*e.g.*, benthic infauna, amphibians, turtles (during winter and non-winter periods)).[26] Fish and other aquatic life that rely upon the area for benthic infauna or amphibians as a food source could also be adversely affected. FirstLight failed to provided sufficient information to determine that allowing unlimited impoundment levels in the full range of 176-179 feet would comply with the anti-degradation rule.

Second, when MassDEP issues a WQC "of an activity subject to licensing by [FERC], flows shall be *maintained or restored* to protect existing and designated uses." 314 CMR 4.03(3)(b) (emphasis added). Using the full range of 176-179 without limitations would decrease flows in the TFI, leaving expanses of land under water exposed, and would not protect existing and designated uses such as aquatic life and its habitat and water-related recreation. FirstLight failed to present any evidence to the contrary.

Third, under 314 CMR 4.05(b), all surface waters shall be "*free* . . . from *alterations* that adversely affect the physical or chemical nature of the bottom, interfere with the propagation of fish or shellfish, or adversely affect populations of non-mobile or sessile benthic organisms." The alterations caused by unlimited fluctuations between 176-179 would likely adversely affect the physical or chemical nature of

[26] The "littoral zone" is often considered the most fertile and diverse part of the river ecosystem. This zone provides food and shelter for a variety of aquatic organisms, including fish, amphibians, invertebrates, insects, and water birds. Healthy littoral zones are often characterized by emergent plants and submerged plants. A large and productive littoral zone is considered an important characteristic of a healthy lake or river.
https://en.wikipedia.org/wiki/Littoral_zone#:~:text=The%20littoral%20zone%2C%20also%20called,is%20close%20to%20the%20shore.

the bottom, interfere with the propagation of fish or shellfish, and adversely affect populations of nonmobile or sessile benthic organisms. FirstLight failed to present any evidence to the contrary.

Given the above, MassDEP has amended proposed Article A190, now Special Condition 10, and included it as a condition to provide reasonable constraints and prevent unlimited fluctuations down to 176 feet. MassDEP finds that these limitations are necessary for compliance with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition 10, providing reasonable constraints and preventing unlimited fluctuations down to 176 feet.[27]

C. Project Operations, Northfield Mountain Project

FirstLight has proposed to operate the Northfield Mountain Project in accordance with proposed License Article B100, titled Project Operations, which was agreed to as part of the FFP Agreement. The proposed article provides that the Northfield Mountain Project would be run in accordance with its existing agreement with the United States Army Corps of Engineers (USACE), which governs how the Project will operate during flood conditions and coordinate its operations with the Licensee of the Turners Falls Project.

It also provides that FirstLight would operate the Northfield Mountain Pumped Storage Project upper reservoir between elevation 1004.5 and 920.0 feet. This is a proposed increase of 3,000 acre-feet, from the current range between 1000.5 and 938 feet. The upper reservoir was constructed to accommodate water up to an elevation of 1004.5 feet as approved by FERC in 1976. In addition, the reservoir retains usable storage capacity down to elevation 920 feet. The usable storage volume between elevation 1004.5 feet and 920 feet is approximately 15,327 acre-feet, which is equivalent to approximately 10,779 MWh of stored energy.

In response to MassDEP's August 15, 2024, information request number 4, FirstLight stated that it proposed this change for several reasons: to provide flexibility, which could support additional or sustained activation of energy reserves in New England to address any fuel supply-related or other contingencies that may arise. The increased flexibility will improve FirstLight's ability to respond to other unforeseen system emergencies, which FirstLight contends will become more important with increased grid reliance on renewable energy sources.

FirstLight stated that the only aspect of water intake/discharge that may change with the ability to use the full extent of the upper reservoir storage capability at Northfield is the total number of hours of pumping and generation between cycles. In its typical operations, the Northfield Mountain pumped storage facility does not regularly cycle the full Upper Reservoir up and down on a daily basis. For context, filling the upper reservoir from empty to its expanded capacity would take approximately 14-15 hours, and fully emptying again would require over 9 hours of generation. By increasing the storage volume in the upper reservoir, FirstLight can better manage and smooth out pumping operations to meet the electrical grid needs. This expansion provides FirstLight with more time to forecast and schedule pumping and reduces the frequency of refills with less volatility in the TFI.

[27] The mean was derived from the Future Exceedance Curves.

MassDEP has determined that this change, in combination with the TFI impoundment elevation restrictions discussed above, will have no significant impact on water quality, fish, plants, wildlife, endangered species, and erosion. Since 2001, FirstLight has obtained six temporary amendments from FERC to utilize additional upper reservoir storage that the Northfield Mountain Project was designed to provide during ISO-NE declared emergencies. In FERC's 2017 temporary amendment, FERC's Environmental Review assessed the environmental, recreational, and cultural resources in the Northfield Mountain area and concluded that the additional operating flexibility sought by the temporary amendment was not expected to have any significant impact on those resources.

Specifically, the Environmental Review evaluated upper reservoir elevations, Turners Falls Impoundment elevations, and flows below Cabot Station. It concluded that the timing, rate, magnitude, and frequency of water elevation fluctuations in the upper reservoir and Turners Falls Impoundment were not materially different under the proposed temporary amendment compared to baseline conditions. The Environmental Review similarly concluded that the timing, rate, magnitude, and frequency of the flow regime on the Connecticut River below Turners Falls Dam and below Cabot Station also would not be materially different under the proposed temporary amendment compared to baseline conditions. Given these minor differences, the Environmental Review found that there was no significant impact on water quality, fish, plants, wildlife, endangered species, and erosion. Additionally, FirstLight conducted monitoring during the 2014, 2015, and 2017 temporary amendment periods, and found no significant impacts.

The FERC ruling, however, was limited to the temporary nature of the amendment. It stated: "However, as we concluded in the 2015 Amendment Order, it continues to be difficult to determine based on the available information to what extent unrestricted modifications to project operations occurring over a succession of winters during the relicensing proceeding, could affect existing erosion, bank stability, or water quality."

In response to MassDEP's August 15, 2024, information request 4, FirstLight provided the two operations curves discussed above and submitted at Appendix B: Existing Exceedance Curves and Future Exceedance Curves. *See* Appendix B. As discussed above, the Future Exceedance Curves demonstrate that forecasted operations will not vary significantly from the current operations model.

Given the above, and the necessity of including the limitations on TFI surface elevations in Special Condition 10 and the Erosion Mitigation, Stabilization, and Monitoring plan required by Special Condition 25, MassDEP finds that the terms of Special Condition 13, proposed Article B100, are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards at 314 CMR 4.00, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 13, proposed Article B100.

D. Fish Passage, Turners Falls Project

Proposed fish passage enhancements include but are not limited to the following[28]:

- FirstLight will install a new fish lift at the Turners Falls Dam, where the significantly higher

[28] USFW, Comments and Recommendation, pp. 4-5.

bypass flows will attract migratory fish to the new fish lift entrance.

- FirstLight will also install temporary American eel passage structures while studying their placement and effectiveness before eventually installing permanent structures.

- FirstLight has proposed several measures for downstream passage including a barrier net around the Northfield Mountain Project intake/tailrace to prevent fish entrainment; a plunge pool below a portion of the Turners Falls Dam (Bascule Gate 1) to decrease injury and mortality of fish passing downstream over the spillway; an exclusion bar rack at Station No. 1; and upgrades to the Cabot Station downstream fish passage structure and facility to decrease entrainment.

- FirstLight will develop and implement studies to test the effectiveness of newly modified/constructed fish passage facilities based upon the identified performance standards.

- FirstLight will employ adaptive management measures to be used as necessary at newly installed or modified passage facilities.

The schedule for installation of certain fish passage measures is summarized in Table 3 below adjacent to what was proposed in the Amended Final License Application (AFLA) for comparative purposes:

Table 3.

Project	Measure	Operational Year	
		AFLA	**FFP Agreement & WQC Application**
Turners Falls	Cabot Tailrace Ultrasound Array	6	AMM[A]
	Replace Spillway Ladder with new Lift	6	9
	Provide Interim Upstream Eel Passage	2	1
	Permanent Upstream Eel Passage Facility	10	13
	Retire Cabot Fish Ladder	5	11
	Retire Entrance Portions of Gatehouse Ladder in canal	5	11
	Construct a Plunge Pool below Bascule Gate No. 1 located at the Turners Falls Dam	6	9
	Construct a Bar Rack at the entrance to the Station No. 1 Forebay	8	4[B]
	Rehabilitate Gatehouse Trapping Facility	-	9
	Improve Cabot Station Downstream Fish Passage System	-	4[B]
NMPS	Install Barrier Net at Lower Reservoir Intake/Tailrace	5	7

[A] – Adaptive management measure, if needed.
[B] – Depending on what quarter the license is issued, this measure may occur in Year 5.

Some commenters have asserted that installation of certain fish passage measures will not occur until passage of an unnecessarily long time. As shown in the table above, the first measures to be employed – construction of a bar rack at Station No. 1 and improvements to the Cabot Station downstream fish passage system – will not be in operation until 4 and possibly 5 years after issuance of the license. The Northfield barrier net is not scheduled to be operational until 7 years after license issuance. In addition, other commenters oppose installation of downstream passage measures before upstream, arguing for the converse or at least simultaneous installation.

The DOI preliminarily approved the implementation schedule.[29] The timing of implementation was based upon extensive studies to determine a methodology that would lead to the highest fish passage and survival rates. The decision to prioritize the implementation of downstream passage enhancements at Cabot Station was based on shad population modeling. Prioritizing downstream passage ahead of upstream passage will help to ensure that the large numbers of adult shad that will be passed upstream of Turners Falls after the new Spillway Lift becomes operational will have safe, timely, and effective downstream passage through the Projects.[30]

The upstream and downstream fish passages present difficulties for *concurrent* installation, primarily because of the complexity of the dam operations. In sum, some areas may only feasibly be worked on at a certain time due to the need for dewatering and diverting the water to other areas, precluding work in those other areas where the water is diverted.[31]

Further, after installation of the downstream passage several effectiveness studies will have to be conducted to ensure performance measures are being met, which may also result in implementation of adaptive management measures to increase or ensure effectiveness. This process will also consume additional time before the downstream passage can be fully installed. As the DOI stated, however, this is a necessary staging and sequence of implementation.

One commenter, the Connecticut River Conservancy, included the Affidavit of Edwin T. Zapel. Mr. Zapel is a Senior Hydraulic Engineer for Northwest Hydraulic Consultants based in Seattle, Washington. MassDEP has considered Mr. Zapel's affidavit and consulted with MassDEP's subject matter experts in this field. Mr. Zapel and others contend that USFWS, NMFS, MassWildlife, and the other signatories to the FFP Agreement wrongly prioritized installation of downstream fish passage before upstream passage, as discussed above. He also contends that the downstream and upstream fish passages should be installed simultaneously and that sequencing of the two projects is not necessary.

Last, Mr. Zapel contends that sequencing downstream passage before upstream does not make sense for the American Shad. He asserts that the shad's proclivity for rapid colonization, significant fecundity, and the lack of natal homing favor prioritization of the upstream passage. He believes that prioritizing downstream passage is not supported by the biology and behavior of the shad population.

Mr. Zapel did not discuss what background he has with the American Shad, in contrast with his experience with Pacific Salmon in the northwest where he is based, a quite different species that dies

[29] DOI, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 30.
[30] DOI, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 30.
[31] DOI, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 31.

after spawning. Mr. Zapel is a civil engineer, not a fish biologist.

In contrast to the Pacific Salmon, the *repeat* spawning portion of the population in iteroparous species like American Shad is very important. Shad will mature and return upstream to spawn for the first time at 4 or 5 years old (if they survive) and they will return again to spawn, perhaps several times over the following years. The number of eggs produced is related to body size, and repeat spawners are significantly larger than virgin females, making a significantly greater contribution to the total number of eggs produced. This is a compelling rationale to provide enhanced protection for post spawned American Shad during their downstream migration so that they survive the return to the ocean and have a chance to become repeat spawners.

The FFP Agreement and the WQC Application recognize this rationale and prioritize downstream passage construction over upstream passage to protect all adult American Shad that are introduced to waters above the Turners Falls Dam. Biologists from NMFS, USFWS, and MassWildlife were concerned with constructing improved upstream fish passage and allowing more shad to travel upstream only to then be forced to navigate an inadequate downstream fish passage system and incur unnecessary mortality.

Mr. Zapel argues that work on upstream passage and downstream passage could occur simultaneously rather than the staged approach taken in the Settlement Agreement. From a theoretical engineering standpoint this is possible, assuming all the resources are available to simultaneously design, permit, and construct several complex projects. However, when the parties, including the federal and state fish biologists, agreed to the timeline it represented a balance of many interests and tradeoffs, other than a focus solely on engineering capacity, that achieved substantial benefits for fish passage and habitat in other areas discussed previously. It was a compromise that those federal and state experts deemed worthwhile.

Mr. Zapel is also apparently unaware of project details for this specific site and facility that present complexities that will generally require more time. For example, he compares design and installation of the downstream fish passage to the installation of a trashrack project in Seattle at the City Light's Diablo Dam project. For the Turners Falls Project, the downstream passage must be designed with finer spaced rack to pass enough water to satisfy the hydroelectric units without excessive head loss. It must also be constructed and installed for relatively easy cleaning, and it must have low water approach velocities so that fish are not impinged on the rack. Last, it must be designed with multiple openings with appropriate size and flow to successfully pass the target species. For this component alone, the environmental permitting will add at least 1 year.

While it would be ideal to install both the upstream and downstream passages simultaneously, that is not compelled by the status of the American Shad population. The Connecticut River American Shad population is robust and self-sustaining, which provides some latitude in the construction timing. While it is true that passage at the Turners Falls Dam has been a bottleneck in the system relative to the other hydro projects, getting the passage designs and locations correctly installed and operational so that safe and effective passage is assured is more important than an expedited schedule of implementation. As long as the design, construction, and effectiveness testing process move forward diligently at a reasonable pace such that the design considerations are well thought out (including options for timely adaptation if performance criteria are not met), a process that takes several years to a decade is not

unreasonable.

For all the above reasons, MassDEP concurs with the USFWS and NMFS comments, recommendations, and preliminary prescriptions for the prioritization and implementation schedule for the Turners Falls Project fish passage measures. MassDEP therefore finds that the terms of Special Conditions 14-19, proposed Article A300-A350, are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition Nos. 14-19, proposed Article A300-350.

1. Shortnose Sturgeon

Some commenters inquired about the Connecticut River Conservancy using environmental DNA (eDNA) techniques to survey for Shortnose Sturgeon presence upstream of the Turners Falls Dam, all the way to the Bellows Falls dam in Vermont. They questioned how this might impact the WQC.

Construction of the Turners Falls Dam was completed in 1798 and built on a natural falls-rapids. Turners Falls is considered to be the historic upstream boundary of Shortnose Sturgeon in the Connecticut River.

Shortnose Sturgeon are a federally listed endangered species as well as state listed in Massachusetts and New Hampshire. The eDNA study area encompassed approximately 45 to 50 additional miles north of the established existing Shortnose Sturgeon habitat areas below the Turners Falls Dam. The study was done in June and July of 2024 at four sampling locations, three in between the Turners Falls and Vernon dams, and one in between the Vernon and Bellows Falls dams. According to Connecticut River Conservancy, the data indicated positive "hits" for Shortnose Sturgeon eDNA (a positive "hit" is indicative of Shortnose Sturgeon DNA in the water sample taken at that location) and thus the presence of Shortnose Sturgeon in the river upstream of the sampling location. There have also been anecdotal sitings and one verified siting of Shortnose Sturgeon north of the Turners Falls Dam as far back as 2017.

MassDEP consulted with MassWildlife and NMFS. After consultations with the Natural Heritage and Endangered Species Program, MassWildlife opined that FirstLight's proposed operations would support Shortnose Sturgeon habit and fish passage. MassDEP concurs with MassWildlife's assessment. All the evidence to date suggests a very small number of adult Shortnose Sturgeon above the Turners Falls Dam. The historical pictures and descriptions are of adult fish only, and the eDNA data are consistent with very low numbers of individuals being present. There is no evidence of spawning above the Turners Falls Dam. There is not enough information to support any determinations of whether there is a self-sustaining population(s) in the upper Connecticut or if any spawning occurs. The only known successful spawning area is below the Turners Falls Dam, at the lower end of the bypass reach, just upstream of Cabot station. [32] There is also evidence of spawning just below the Holyoke Dam and in Connecticut. Targeted sampling by the USGS Conte Lab and other eDNA studies upstream of the Turners Falls Dam have not resulted in the detection of any Shortnose Sturgeon between Turners Falls

[32] DOC, Preliminary Prescription, p. 20.

and Bellows Falls.[33]

Although none have been observed, it is possible that any Shortnose Sturgeon above the Turners Falls Dam have passed through the Turners Falls fishways during their 40 years of operation- particularly during the last 20 years when the fishways have been left open 24 hours a day. This situation would allow Shortnose Sturgeon to pass undetected at night, during periods of low visibility (turbidity), or while the cameras used to record passage were not functioning due to power outages or mechanical failure. It is also possible that someone caught one or more Shortnose Sturgeon at the known area of concentration below the Sunderland bridge and released them in the river above Turners Falls. [34]

Regardless of how they arrived, any Shortnose Sturgeon above the Turners Falls Dam are protected by both state and federal endangered species acts. MassWildlife determined that while the FirstLight facility could possibly affect Shortnose Sturgeon above the dam, the overall Connecticut River population of Shortnose Sturgeon would continue unaffected.

The proposed flow measures below the Turners Falls Dam are specific operational measures for the purpose of protecting Shortnose Sturgeon and American Shad. The required minimum and stabilized flows will increase considerably the amount of Shortnose Sturgeon and American Shad spawning habitat and rearing/development of Shortnose Sturgeon eggs and larvae that is available below the Projects. The minimum flows also increase the amount of contiguous suitable habitat that would persist under a range of generation conditions. [35]

These agreed upon minimum flow requirements are essential to support the survival and recovery of the species in the Connecticut River, are consistent with the requirements of Sections 7(a)(1) and 7(a)(2) of the ESA, and address Recovery Criteria 3.1.1 and 3.1.2 in NMFS Recovery Plan for Shortnose Sturgeon (NMFS 1998).[36]

Despite the above improvements for minimum flows below the dam throughout the bypass reach, particularly below Station No. 1, some commenters have expressed concern about Shortnose Sturgeon sitings just below the dam in the bypass reach. Their concern arises out of a recent siting of what was believed to be a Shortnose Sturgeon stranded in a pool after high flow conditions abated. These commenters believe that flows should be increased to avoid this problem. MassWildlife, however, has opined that fish strandings in isolated pools below the dam occur from natural or unnatural high flow events where fish swim upstream and then as flows decrease, whether naturally or unnaturally, they are stranded in isolated pools until the next high flow event.

MassDEP understands that the National Marine Fisheries Service is reevaluating the proposed fish passage protections required in relicensing in light of the above, but it is highly likely that the proposed measures will be found to be, or will be designed during the design phases to be protective for Shortnose Sturgeon for these reasons:

[33] DOC, Preliminary Prescription, p. 20.
[34] DOC, Preliminary Prescription, p. 20.
[35] DOC, Preliminary Prescription, p. 35-36.
[36] DOC, Preliminary Prescription, p. 35-36.

- Turners Falls Dam: The plunge pool proposed for downstream passage protection of fish that go over the dam will provide protection for Shortnose Sturgeon. This passage measure has not yet been designed and Shortnose Sturgeon concerns must be included.

- Cabot Station: The downstream passage system proposed (2-inch clear space, full depth, with openings at the bottom) is exactly what was designed and installed at the Holyoke dam to protect and pass adult and juvenile Shortnose Sturgeon. The rack has not yet been designed and Shortnose Sturgeon concerns must be included.

- Station No. 1: The ¾ clear space rack proposed at the power canal wall/Station No. 1 forebay is effectively a fish exclusion rack that will likely keep any Shortnose Sturgeon out of Station No. 1. This rack, however, must be modified if necessary.

- Northfield Mountain Pumped Storage: The barrier net proposed for fish passage protection will have a mesh size small enough to provide protection for Shortnose Sturgeon. Again, however, the net and related structural equipment have not yet been designed and Shortnose Sturgeon concerns can and must be included.

If correctly designed and operated, the upstream and downstream fish passage systems at Turners Falls could be a substantial gain for the Connecticut River Shortnose Sturgeon population, opening miles of previously blocked habitat.

E. Fish Passage, Northfield Mountain

1. Northfield Barrier Net Operational Year

Some commenters have asserted that the Northfield barrier net should become operational earlier than year 7, as presently scheduled. DOI approved the schedule for installation of the net, stating it will allow for implementation to occur between installation of downstream and upstream fish passage measures at Turners Falls.[37] The DOI explained that this will allow for protection from entrainment in advance of the much larger numbers of shad that will be passed upstream once the new upstream passage is operational.

FirstLight submitted a Gantt chart to MassDEP showing a schedule for design, permitting, agency consultation, construction, and installation, of the net, which will consume 5 years. Consequently, FirstLight maintains the net cannot be operational until year 7, as agreed to in the FFP Agreement.

MassDEP concludes for several reasons that there is an insufficient basis for FirstLight to wait until year 7 for the barrier net to be operational. First, because the barrier net is physically separate from and not related to the upstream and downstream fish passage facilities, it is not necessary to install the net between the times for installation of the downstream and upstream fish passage measures at Turner Falls, contrary to DOI's statement above. Second, FirstLight had previously proposed in its Amended

[37] U.S. Department of the Interior, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 33.

Final License Application for the net to be operational by year 5, countering their more recent assertions that earlier installation is not feasible.

Third, MassDEP is persuaded by the Affidavit of Edwin T. Zapel, which the Connecticut River Conservancy included with its comments in this proceeding. Mr. Zapel stated that the net could be designed within one year and implemented within the following two years. His position was based upon his experience in an apparently more complex situation involving a hydropower facility in Washington state. In that case, barrier nets were installed much deeper, to more than 200 feet, and in a reservoir that experiences wider fluctuations in water levels, one of the most problematic design issues. The nets were designed within about two years of license issuance and installed the following year. Fourth, as discussed below, there is evidence of Shortnose Sturgeon in between the Vernon Dam in Vermont and the Turners Falls Dam, possibly in proximity to the Northfield intake structure where the barrier net is designed to prevent entrainment.

For all the above reasons, MassDEP has determined that the barrier net shall be operational by June 1 of year 5 following licensure. Thus, it is necessary to amend Proposed Articles B200-220, which are reflected as Special Conditions 20-22, with respect to the operational year and effectiveness testing to be implemented. MassDEP finds Special Conditions 20-22 are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Conditions 20-22.

2. Northfield Barrier Net Annual Operational Period

Some commenters asserted that the barrier net should be installed earlier in the year than June 1 to maximize the net's protections against entrainment. There are, however, a number of reasons why installation of the barrier net no later than June 1 of each year is appropriate. First, high spring flows with substantial debris will make it difficult and unsafe to install the net earlier. Even if there is a narrow window of low flow to install it, subsequent high flow events before June 1 present an undue risk of damage to the net. Also, the DOI explained that peak spawning does not generally occur until mid-May to mid-June. Thus, adult shad will not be outmigrating until approximately June, "which aligns with the specified operational period for the barrier net."[38]

The DOI noted that "that Condition 10 of this prescription allows for modifying operational periods, based on new information and after consultation with FirstLight. Should migration timing shift due to changing air and water temperatures, or results of effectiveness studies scheduled to take place in Years 10 and 11 indicate barrier net deployment should occur earlier than June 1, the [DOI] would consult with FirstLight and determine whether the new information necessitates modifying the operational period for the NMPS barrier net." The applicable language from DOI's Condition 10 was also included in Proposed Article 230, which is Special Condition 23 below. It states: "Future Refinement of the timing may be made by the MADFW, NMFS, and USFWS based on new information and after consultation with the Licensee."

[38] U.S. Department of the Interior, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 35.

3. Barrier Net Effectiveness

Several commenters also questioned the effectiveness of the barrier net. The DOI explained that it considers the barrier net to be the most effective means of preventing entrainment, pointing to studies of barrier nets: "A barrier net has been in place at the Ludington Pumped Storage Project (LPSP; FERC No. 2680) since 1989. As part of the subsequent license proceeding for LPSP, a phased study was undertaken to identify entrainment abatement and engineering alternatives and assess the feasibility of identified entrainment abatement technologies and engineering alternatives (FERC Accession 20151202- 5217). That study report provides a comprehensive review of barrier net installations throughout the country and a summary of their effectiveness. At all evaluated sites, barrier nets met specified entrainment reduction standards (which varied by site). Based on the findings, the barrier net was carried forward to the detailed feasibility assessment (FERC Accession 20151202-5217)."[39]

The DOI also noted that the barrier net will be required to achieve certain performance standards. These studies will help to ensure effectiveness of the net and reduction in entrainment of juvenile and adult alosines and adult eels.

Other commenters point out that the barrier net is only effective with respect to fish and does not prevent entrainment of fish eggs and larvae. They believe that FirstLight should install what is known as an aquatic filter barrier (AFB). The DOI explained why this alternative is not feasible for this project: "To date, this technology has only been deployed at cooling water intake structures. The LPSP study assessed AFB technology and determined it should be carried forward to the detailed feasibility assessment; however, it was not considered for further evaluation, given the required size (estimated at 15-miles-long), anticipated bio-fouling and debris issues, visual and recreational impacts, and permitting issues (FERC Accession 20151202-5217). Many of these issues are potential concerns at Northfield also. Based on the stated design flow for an AFB of 0.02 fps (FERC Accession 20151202-5217), a conservative average Connecticut River depth of 20 feet, and a maximum NMPS discharge of 20,000 cfs, the calculated length of AFB required would be 9.5 miles long."[40]

The DOI elaborated on the problem of the barrier net not being able to prevent the entrainment of eggs and larvae. The DOI stated that "in order to compensate for the unavoidable loss" of eggs and larvae FirstLight will fund compensatory management efforts intended to offset the loss of adult equivalents."[41] The FFP Settlement Agreement requires an off-license Ichthyoplankton Mitigation Fund to offset the potential loss of ichthyoplankton (shad eggs and larvae) through entrainment at the Northfield Mountain Project. The agreement requires that FirstLight will make the payments to the USFWS or its designee, which will select and carry out the projects and activities. FirstLight's total contributions will be $1,296,281 over the 50-year license term.

MassDEP concurs that the barrier net is the most effective technology to date, if properly installed and implemented with sufficient adaptive management measures (AMMs). For all the above reasons, except

[39] U.S. Department of the Interior, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 33.
[40] U.S. Department of the Interior, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 33-34.
[41] U.S. Department of the Interior, Preliminary Prescription for Fishways Pursuant to Section 18 of the Federal Power Act, p. 35.

as otherwise noted above concerning the operation year for the barrier net, MassDEP concurs with USFWS and NMFS comments, recommendations, and preliminary prescriptions for the prioritization and implementation schedule for the Northfield Mount Project fish passage measures. MassDEP therefore finds that the terms of Special Conditions 20-24, proposed Article B200-B240, are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition Nos. 20-24, proposed Article B200-B240.

F. Turners Falls Impoundment Erosion and Impairments

Since the Northfield pumped storage facility began operating in the early 1970s erosion and its causes in the TFI have been studied extensively, beginning in 1979.[42] This is likely because the facility licensee is generally only responsible for addressing erosion caused by project operations, and not erosion caused by natural phenomena, such as flood and high flows, run-off, and wind-driven wave action.[43]

As discussed previously, in 1998, MassDEP identified Impairments at Assessment Units MA34-01 and -02, for Alteration in Stream-side or Littoral Vegetative Covers/Flow Regime Modification. The causes for both impairments are associated with project operations and described as "Streambank Modifications/Destabilization."

Several commenters have expressed concern with erosion in the TFI, requesting that FirstLight be required to implement stabilization, mitigation, and monitoring measures for the term of the FERC license.

Erosion is typically a natural riverine process that redistributes sediment and nutrients throughout the ecosystem and associated flow path. As part of that process, erosion can create various landforms including riverine valleys and fertile floodplains. Naturally occurring erosion does not always result in the degradation of water quality and can be attributed to natural and necessary geomorphological processes.

Natural erosion, however, can be accelerated by anthropogenic influences such as land use, hydropower operations, and various other activities that disrupt stability and equilibrium. Distinguishing between natural and anthropogenically influenced erosion is critical to understanding the responsibility of FirstLight for erosion within the TFI.

Erosion, if substantial, has the ability to contribute to impairments of existing and designated uses by:

- Increasing turbidity and suspended solids;
- Impairing streamside vegetation and associated habitat;

[42] *See e.g.*, U.S. Army Corps of Engineers (USACE). 1979. Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by Simons, D.B., Andrew, J.W., Li, R.M., and Alawady, M.A. Waltham, MA: USACE.

[43] Bangor Hydro Electric Company 83 FERC ¶ 61,037, at 61,090 (1998); Duke Power Company, 33 FERC ¶ 61,321 (1985). In addition, the baseline for analysis must be based upon the dam being present, i.e., instead of including a baseline that assumes the dam does not exist. *See e.g., American Rivers v. FERC*, 201 F.3d 1186 (9th Cir. 2000).

- Degrading the physical composition of the bottom of the waterbody; and
- Preventing recreational use of the waterbody, docks, and boat launches due to sedimentation.

In general, hydropower operations contribute to erosion by raising and lowering the water surface elevation more frequently and significantly than natural fluctuations. The ACOE concluded that repeated raising and lowering of water elevation (pool fluctuations) in the TFI can cause an increase in instability on the order of 18% of the sheer stress exerted on the bank by the flowing water.[44] The ACOE also added, however, that an impounded section of a river may theoretically reduce erosion that might otherwise occur during natural, unimpounded conditions. The natural river (*i.e.*, non-dammed sections of the Connecticut River) is approximately 1.34 times more susceptible to major bank erosion. In contrast, another evaluation of erosion in the TFI determined that the ACOE's conclusion that pool fluctuations are responsible for 18% of the erosive forces underreported the amount that pool fluctuations in the TFI affect erosion.[45]

Overall, water surface fluctuations can be the second highest cause of erosion following naturally caused sheer stress (velocity) from river flows, with smaller contributions from boat waves, gravitational forces, seepage, natural stage variations, wind-induced waves, ice, flood variations, and freeze-thaw.[46] The USACE concluded that the "impacts of hydropower development on bank stability in [the TFI] have been and continue to be more severe than for the other pools. The increase in pool level, the larger pool fluctuations and flow reversals caused by the present hydropower operation all contribute to the documented bank instabilities." [47] Pool fluctuations on the order of 5 feet are at least twice as destructive to banks as pool fluctuations of about 1-3 feet experienced in the other hydropower pools." [48]

Linking water surface fluctuations to erosional processes has been demonstrated in numerous studies. The potential contribution to existing erosion rates in some locations was an increase of 28 to 30% following hydropower operation simulations.[49] Additionally, other research shows that the level or range of fluctuations contribute to how long it takes for the impoundment to stabilize following dam construction as assessed through various geomorphological processes.[50]

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[44] U.S. Army Corps of Engineers (USACE). 1979. Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by Simons, D.B., Andrew, J.W., Li, R.M., and Alawady, M.A. Waltham, MA: USACE.
[45]Field, John, PhD, "Detailed Analysis of the 2008 Full River Reconnaissance of the Turners Falls Pool on the Connecticut River, Prepared for Landowners and Concerned Citizens for License Compliance Turners Falls Pool," Field Geology Services (Farmington, ME, 2011).
[46] U.S. Army Corps of Engineers (USACE). 1979. Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by Simons, D.B., Andrew, J.W., Li, R.M., and Alawady, M.A. Waltham, MA: USACE.
[47] U.S. Army Corps of Engineers (USACE). 1979. Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by Simons, D.B., Andrew, J.W., Li, R.M., and Alawady, M.A. Waltham, MA: USACE.
[48] U.S. Army Corps of Engineers (USACE). 1979. Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by Simons, D.B., Andrew, J.W., Li, R.M., and Alawady, M.A. Waltham, MA: USACE.
[49] Saint-Laurent, D., Touileb, B. N., Saucet, J. P., Whalen, A., Gagnon, B., & Nzakimuena, T. (2001). Effects of simulated water level management on shore erosion rates. Case study: Baskatong Reservoir, Québec, Canada. Canadian Journal of Civil Engineering.
[50] Kaczmarek, H., Mazaeva, O. A., Kozyreva, E. A., Babicheva, V. A., Tyszkowski, S., Rybchenko, E. A., Brykata, D., Barrtczak, A., & Słowiński, M. (2016). Impact of large water level fluctuations on geomorphological processes and their interactions in the shore zone of a dam reservoir. Journal of Great Lakes Research, 42(5), 926-941.

Examining the historical context of erosion within the TFI can provide necessary reference information when assessing the various causes of erosion. In a report titled *Riverbank Erosion on the Connecticut River at Gill, Massachusetts: its Causes and its Timing*[51], J.B. Reid compares the TFI from the 1800s to present day to develop an understanding of how specific locations have changed over time. Reid acknowledged the limitations of his methodology and comparing historical datasets but concluded that erosion had been occurring in numerous locations within the TFI long before the current Turner's Falls Dam elevation was raised in 1970 and Northfield Mountain Pumped Storage operations commenced.

The WQC Application and related FERC-relicensing studies also contribute to understanding hydropower-induced erosion. FirstLight conducted multiple iterations of the Bank Stability and Toe Erosion Model (BSTEM) to assess the project's existing contribution to erosion under the existing license[52] and the proposed contribution to erosion associated with the operations proposed for relicensing.[53]

Based on the modelled results, FirstLight assessed the causes of erosion and divided the results into dominant causes and contributing causes. The possible causes of erosion included high flows, moderate flows, boat waves, and project operations. For a cause to be considered dominant at a site, the cause had to be responsible for at least 50% of bank erosion. For a cause to be considered a contributing cause of erosion at a site, the cause had to contribute more than 5% but less than 50% of the erosion. The simulated results showed that high flows were the dominant cause of erosion for approximately 37.1 miles of the shoreline (86% of the entire TFI), while boat waves were the dominant cause for the remaining 5.9 miles (14% of the entire TFI). Boats were a contributing cause of erosion for 8.0 miles of shoreline (19% of the entire TFI), while moderate flows were a contributing cause for 4.4 miles (10% of the entire TFI) and project operations were a contributing cause for 7.7 miles (18% of the entire TFI). These percentages reflect the entire TFI, some of which is located north of Massachusetts in New Hampshire and Vermont. The sections and lengths of river where project operations are projected to contribute to erosion within Massachusetts is 21,600 linear feet of bank between Barton Cove and French King Gorge and 4,700 linear feet of bank on river right upstream of the Northfield Project's tailrace.

MassDEP's review of the WQC Application also considered the various peer reviews[54] of FirstLight's erosion findings and the BSTEM methodology. These peer reviews discussed limitations of: the BSTEM methodology, the experiment and study design, documentation of the model inputs; and the results and interpretation of the results, all raising questions about the accuracy of the BSTEM results and interpretations.

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[51] Reid, J.B. (1990). Riverbank Erosion on the Connecticut River at Gill, Massachusetts: its Causes and its Timing. Hampshire College, Unpublished report.

[52] FirstLight. (2016). FirstLight Relicensing Study 3.1.2: Northfield Mountain / Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability Study Report.

[53] FirstLight. (2024). Supplemental BSTEM Modeling Report Reflecting Operating Conditions in the Flows and Fish Passage Settlement Agreement.

[54] Dethier, Evan. (2024). Review of Erosion in the Turners Falls Impoundment. https://www.mass.gov/doc/firstlight-power-401-wqc-public-comments-crc-attachments/download. p. 267 – 319; Inter-FLuve. (2024). Technical Memorandum: Review of the BSTEM Modeling and Reporting. https://www.mass.gov/doc/massdeps-consultant-review-of-firstlights-supplemental-bstem-modeling-report/download; Princeton Hydro (2016). Peer Review of Relicensing Study 3.1.2 Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Instability Study Report

In light of all the above, it is clear that project operations will continue to contribute to erosion in the TFI. It is very difficult, however, to quantify the extent of that contribution. It is therefore necessary to establish erosion-related measures in the WQC to address the existing impairments and to ensure compliance with the SWQS. The measures are intended to balance the limitations and difficulties of precisely determining erosion causation in the TFI with the need to address existing erosion and impairments and monitor for and address any future erosion. The SWQS require that the existing and designated uses and the necessary water quality be maintained and protected and that they be free from solids, color, and turbidity that would be aesthetically objectionable, impair any use, or impair the benthic biota or degrade the chemical composition of the bottom. *See* 314 CMR 4.04.

The measures are also intended to build upon the substantial erosion related mitigation, stabilization, and restoration work that has been done to date. Bank stabilization work throughout the TFI began in the early 1970s, shortly after the construction of the Northfield Mountain Project. Over 5 miles of bank were stabilized, using rip-rap or rip-rap with vegetation and grading and planting. An additional 2,000 feet of experimental stabilization was also constructed by the United States Army Corps of Engineers (USACE) in the 1970s.

In 1999, FirstLight's predecessor developed the Erosion Control Plan (ECP), identifying 20 severely eroded shoreline sites requiring stabilization. Based on the ECP, FirstLight (or its predecessors) stabilized nearly 5 miles of banks throughout the TFI, most of which were in Massachusetts.

In 2013, FirstLight conducted relicensing Study 3.1.1, 2013 Full River Reconnaissance (2013 FRR) to identify and define riverbank features and characteristics as well as the types, stages, indicators, and extent of erosion throughout the TFI. The 2013 FRR culminated in the identification of 10 TFI bank segments, approximately 855 linear feet, where stabilization or preventative maintenance projects were needed. FirstLight completed the proposed stabilization/preventative maintenance work on the 10 bank segments identified during the study.

For almost three decades, the Franklin Regional Council of Governments (FRCOG) and its predecessor (the Franklin County Commission) and its Connecticut River Streambank Erosion Committee developed and implemented bioengineering bank stabilization projects pursuant to the ECP. FRCOG secured over $900,000 in federal funds and MassDEP funds from the Federal Clean Water Act, § 319 grants, to stabilize over 3,000 feet of shoreline.[55]

In total, approximately 10.5 miles of riverbank have been stabilized in the TFI by either FirstLight, its predecessor, or other groups. This equals approximately 32% of all TFI banks in Massachusetts.

For all the above reasons, MassDEP finds it necessary to impose the erosion-related measures in Special Condition 25 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 25.

[55] Grant funds include those from the EPA Targeted Watershed Grant WS-97122001-0; and three from MassDEP's Section 319 grant program 96-03/319, 00-04/319 and 03-07/319.

G. Water Quality Monitoring

As discussed above, dams and hydropower facilities typically alter river flow and elevations (as is the case with the FirstLight Projects), potentially causing an array of adverse impacts on water quality, including alterations of water temperature, chemistry, and aquatic life. In fact, as discussed above, the TFI has a number of impairments related to water quality and aquatic life, including non-native aquatic plants (Curly-leaf Pondweed, Eurasion Water Milfoil, Fanwort, and Water Chestnut); flow regime modification; alteration in stream-side littoral vegetation, dewatering, and total suspended solids.

Although it is possible that in a particular point in time the chemistry and health of a river may appear satisfactory, adverse impacts can develop over time, particularly from climate change. It is therefore important to require long-term monitoring for the life of the license to better understand the data and any long-term trends. This facilitates being able to respond in a timely manner rather than waiting until a potential problem fully develops.

For all the above reasons, MassDEP finds it necessary to include Special Condition 26 for the projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 26, which specifies water quality monitoring requirements for the life of the license.

H. Invasive Plant Species Management Plan

FirstLight has proposed identical Invasive Plant Species Management Plans (IPSMPs) for the Turners Falls and Northfield Projects. The stated purpose of the plans is to prevent the introduction and/or spread of invasive species within the project boundaries through implementation of best management practices and supporting the education of those performing construction, maintenance, and/or operational activities within the project boundaries (WQC Application, Appendices B and C).

On May 20, 2024, MassWildlife filed comments with FERC regarding the IPSMPs ("MassWildlife Comments").[56] MassWildlife summarized the results of FirstLight's invasive plant study with respect to the TFI: Surveys documented five invasive submerged aquatic vegetation (SAV) species within the TFI including fanwort (*Cabomba caroliniana*), Eurasian milfoil (*Myriophyllum spicatum*), variable leaf milfoil (*Myriophyllum heterophyllum*), curly-leaved pondweed (*Potamageton crispus*), and water chestnut (*Trapa natans*). These invasive SAV beds are most common within the lower portion of the TFI, particularly Barton Cove. As noted in the study report relied upon by MassWildlife, the presence of these species may ultimately degrade available habitat for fish and wildlife.[57]

Both MassWildlife and USFWS concurred in their assessments of the IPSMPs. They generally support the protection measures in Section 3 of the IPSMPs of the plans as they relate to preventing future establishment or spreading of invasive plant species when performing routine maintenance, construction, or major maintenance activities but recommended adding the following additional measure to the IPSMPs: "Based on post-activity vegetation surveys, if invasive species have been found

[56] DFW COMMENTS, RECOMMENDATIONS, TERMS AND CONDITIONS, Application Ready for Environmental Analysis, Turners Falls Hydroelectric Project, FERC No. 1889-085; Northfield Mountain Pumped Storage Project, FERC Number 2485-071, p. 5.
[57] MassWildlife Comments, p. 5.

to outcompete desirable vegetation during reestablishment, the Licensee will treat infestations, as necessary, to eliminate or reduce the invasive infestation(s)."[58]

MassWildlife also summarized the invasive plant studies as showing 41 of the 107 SAV beds had some level of invasive species infestation, with the majority occurring immediately upstream of the Turners Falls Dam (*i.e.*, Barton Cove). Since issuance of MassDEP's 2018/2020 Integrated List of Waters, water chestnut has become established in the lower portion of the Turners Falls power canal.[59]

Water chestnut forms dense mats that displace native species and interfere with recreational activities. The dense mats of vegetation shade out native aquatic plants that provide food and shelter to native fish, waterfowl, and insects; and decomposition of these dense mats reduces dissolved oxygen levels and may kill fish. Because it is an annual plant, it can be effectively controlled if seed formation is prevented, through manual, mechanical, or chemical methods.[60]

Given the above, particularly that the invasive plants presently persist in these areas and the seed bank could be viable for up to 12 years, and the absence of applicable measures in the IPSMP, MassWildlife and USFWS recommended, pursuant to Section 10(j), that FirstLight undertake annual water chestnut removal within the lower TFI (Barton Cove) and canal.

Both MassWildlife and USFWS concurred that the highly invasive Hydrilla (*Hydrilla verticilata*) presents a significant concern for future infestation, particularly in backwater or low velocity areas, such as those used for boat launches. MassWildlife found, consistent with the USFWS, that without vigilant monitoring, hydrilla could quickly become established in Barton Cove and other low velocity areas within the TFI. Controlling or eradicating established beds could be difficult, given the number of sensitive plant and invertebrate species that inhabit the TFI. "Therefore it is imperative that FirstLight include an early detection and rapid response program (EDRR) as part of its IPSMP."[61]

MassWildlife and USFW requested that FERC include in any new license issued for the projects the above recommendations, including an EDRR, pursuant to Section 10(j). MassDEP concurs with this request.

For all the above reasons, MassDEP finds it necessary to include Special Condition 27 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 27, which requires implementation of the Invasive Species Management Plan.

I. Riparian Management Plan

A riparian zone for a river is the area of land that runs along and parallel to the riverbank. Healthy riparian zones are often vegetated with native trees and plants that are allowed to grow undisturbed.

Land adjacent to rivers and streams can protect the natural integrity of these waterbodies. The presence

[58] MassWildlife Comments, p. 6; USFW, p. 18.
[59] MassWildlife Comments, p. 6; USFW, p. 18.
[60] MassWildlife Comments, p. 6; USFW, p. 18.
[61] MassWildlife Comments, p. 7; USFW, pp. 18-19.

of natural vegetation within the riparian zone is critical to sustaining rivers as ecosystems. The riparian zone can prevent degradation of water quality by filtering sediments, toxic substances (such as heavy metals), and nutrients (such as phosphorus and nitrogen) from stormwater, nonpoint pollution sources, and the river itself. Sediments are trapped by vegetation before reaching the river. Nutrients and toxic substances may be detained in plant root systems or broken down by soil bacteria.

Riparian zones can also trap and remove disease-causing bacteria that otherwise would reach rivers. Natural vegetation within the riparian zone also maintains water quality for fish and wildlife. Mature vegetation within riparian zones provides shade to moderate water temperatures and slow algal growth.[62]

Riparian zones are critical to maintaining thriving fisheries. Maintaining vegetation along rivers promotes fish cover, increases food and oxygen availability, decreases sedimentation, and provides spawning habitat. Maintenance of water temperatures and depths is critical to many important fish species.[63]

Riparian zones are important wildlife habitat, providing food, shelter, breeding, migratory, and overwintering areas. Even some predominantly upland species use and may be seasonally dependent on riparian zones. Riparian zones promote biological diversity by providing habitats for an unusually wide variety of upland and wetland species, including bald eagles, osprey, and kingfishers. Large dead trees provide nesting sites for bird species that typically use the same nest from year to year. Sandy areas along rivers may serve as nesting sites for turtles and water snakes.

Riparian zones provide food for species such as wood turtles which feed and nest in uplands but use rivers as resting and overwintering areas. Riparian zones also provide corridors for the migration of wildlife for feeding or breeding. Loss of this connective function, from activities that create barriers to wildlife movement within riparian zones, results in habitat fragmentation and causes declines in wildlife populations. Wildlife must also be able to move across riparian zones, between uplands and the river.[64]

Reptiles, especially turtles, often require areas along rivers to lay their eggs. Since amphibians and reptiles are less mobile than mammals and birds, maintaining integrity of their habitat is critical.[65]

For all the above reasons, MassDEP finds it necessary to include Special Condition 28 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 28 requiring a Riparian Management Plan.

J. Recreation

MassDEP finds that the Recreation Settlement Agreement is necessary to sustain and improve access for certain designated and existing uses in the Surface Water Quality Standards, including secondary

[62] 310 CMR 10.58, Riverfront Area.
[63] 310 CMR 10.58, Riverfront Area.
[64] 310 CMR 10.58, Riverfront Area.
[65] 310 CMR 10.58, Riverfront Area.

contact uses such as boating, fishing, swimming, and wading. To that end, MassDEP finds it necessary to include Special Condition 29 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 29 requiring implementation of the Recreation Management Plan dated May 2023.

K. Sediment Management Plan

The Northfield Project's withdrawal of water from the Connecticut River involves redistribution of sediment to the Northfield Reservoir where it accumulates. Careful management of that sediment and monitoring the Northfield tail race (as required in Special Condition No. 26) are necessary to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition 26 for monitoring and Special Condition No. 30 for management.

L. Consideration of Climate Change

NMFS found that the measures within its preliminary prescriptions provide American Shad and American Eel safe and timely access to climate resilient habitat upstream of the Project. It stated: "Beyond the general information on model predictions for the Northeast U.S. and the Connecticut River watershed, fine scale predictions on how climate change will impact the Turners Falls and Northfield Mountain Pumped Storage Project area are not available. As there is significant uncertainty in the rate and timing of change as well as the effect of any changes experienced in the project area due to climate change, it is difficult to predict the impact of these changes on any particular species."[66]

NMFS concluded that "it is possible that changing seasonal temperature regimes could result in changes to the timing of seasonal migrations for all diadromous fish in the Connecticut River watershed. Ensuring access to a diversity of suitable habitat, including climate resilient habitats, is essential for the continued survival and recovery potential of diadromous species. Safe, timely, and effective passage at the Turners Falls Project will support our restoration goals by promoting access to a greater expanse and diversity of spawning, rearing, and nursery habitat that is expected to support population resiliency in light of changing conditions." [67]

Careful management of the fish passage measures will be necessary to accommodate these potential impacts of climate change. To that end, MassDEP finds it necessary to include Special Condition 31 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 31.

M. Canal Drawdown Aquatic Organism Protection

Careful management of FirstLight's annual power canal drawdown for maintenance is necessary to mitigate impacts to aquatic life. To that end, MassDEP finds it necessary to include Special Condition 32 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water

[66] DOC, Preliminary Prescription, pp. 13.
[67] DOC, Preliminary Prescription, pp. 14.

Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 32.

N. Bald Eagle Protection Plan

The WQC Application included proposed articles applicable to both Projects requiring compliance with the submitted Bald Eagle Protection Plan. FirstLight included FFP Agreement provisions A400 (for Turners Falls) and B200 (for Northfield) for the Licensee to implement the Bald Eagle Protection Plan (BEPPs) in the WQC Application for both Projects. MassWildlife and USFWS supported this proposal and requested that FERC include it in any new license issued for the project pursuant to Section 10(j).[68] MassDEP concurs with the position and recommendation of MassWildlife and USFWS. Therefore, MassDEP imposes Special Condition 33 to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law.

O. Bat Protection Measures

The northern long-eared bat (NLEB; *Myotis septentrionalis*) was listed as federally threatened under the Endangered Species Act by the USFWS on April 2, 2015 (USFWS 2015). The species was reclassified as endangered on November 29, 2022, with the rule becoming effective March 31, 2023 (USFWS 2022a). NLEBs typically roost singly or in maternity colonies underneath bark or in cavities or crevices of live trees and snags (USFWS 2022b).

In the WQC Application FirstLight proposes to minimize project-related impacts to NLEB by cutting trees equal to or greater than 3 inches in diameter at breast height within the Northfield Mountain Pumped Storage and Turners Falls Project boundaries only between November 1 and March 31, unless they pose an immediate threat to human life or property (hazard trees). Both MassWildlife and USFWS support this measure and requested that FERC include it in any new license issued for the project pursuant to Section 10(j). MassDEP concurs with their support and recommendations. Therefore, MassDEP imposes Special Condition 34 to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law.

VI. Certification Provisions

MassDEP's authority to issue this certification is conferred by M.G.L. c. 21, § 27(3). Based on a review of the WQC Application, the information included in the administrative record, the information provided by FirstLight, and information provided by the public during the comment period, and other publicly available information on file with MassDEP, MassDEP has reasonable assurance that, through the imposition of the conditions described below, the activity will comply with the applicable provisions of sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, Massachusetts Surface Water Quality Standards at 314 CMR 4.00 and other water quality-related requirements of state law, as set forth herein. Therefore, MassDEP hereby grants certification for the Projects subject to the conditions

[68] USFW, Comments and Recommendation, p. 13; DFW COMMENTS, RECOMMENDATIONS, TERMS AND CONDITIONS, Application Ready for Environmental Analysis, Turners Falls Hydroelectric Project, FERC No. 1889-085; Northfield Mountain Pumped Storage Project, FERC Number 2485-071, p. 9.

set forth below. This certification shall take effect on the date that FERC issues a new license for the FirstLight Projects (FERC Nos. 1889, 2485).

In accordance with Section 401 of the Federal Clean Water Act, and pursuant to M.G.L. c. 21, §§ 27, 42 and 44, FirstLight shall comply with the following conditions which MassDEP finds are necessary to assure compliance with the applicable provisions of the Federal Clean Water Act Sections 208(e), 301, 302, 303, 306, and 307 and other water quality-related requirements of State law:

Standard Conditions

1. Prior to or at the time of filing with the Commission, the Licensee shall serve all representatives of MassDEP and MassWildlife on the service list a copy of any request the Licensee may file for amendment of the license, amendment or appeal of any fish, wildlife, or other aquatic life related license conditions, or extension of time requests for project construction or implementation of license article provisions.

2. This certification does not grant or affirm any property rights, license, or privilege in any water or any right of use in any water.

3. The Licensee shall conduct all activities in conformance with all applicable provisions of federal, state and local laws and regulations.

4. All construction, maintenance and repair activities, including disposal of debris and removal of sediments in impounded areas, shall be conducted in a manner so as not to impair water quality and in compliance with any required approvals.

5. To the extent allowed by federal and state law, MassDEP reserves the right to request modifications of this certification based on a written agreement with FERC or if a court of competent jurisdiction or appropriate state appeals forum stays, vacates or remands this certification. The Licensee retains any rights to participate in any proceeding or filing at FERC or MassDEP relating to modification of the certification.

6. The Licensee shall allow any employee, agent, consultant, contractor or authorized representative of MassDEP or MassWildlife to (i) enter the facilities, (ii) inspect, at reasonable times, any facilities, equipment, practices, or operations regulated or required under the certification, (iii) have access to and copy, at reasonable times, any records that must be kept under the conditions of the certification, and (iv) sample or monitor at reasonable times for the purpose of assessing compliance with the terms and conditions of this certification. Any such person must comply with all applicable safety and security standards and requirements established by the Licensee, and any federal and state occupational health or safety regulations for entering the facilities.

7. If any event arising from causes beyond the reasonable control of the Licensee or of any entity controlled by the Licensee, including its engineers, consultants, contractors and subcontractors, that delays or prevents the timely performance of any obligation under this certification notwithstanding the Licensee's reasonable efforts to fulfill the obligation (a "force majeure

event)" occurs, then the time for performance shall be extended for an appropriate period of time. The requirement that the Licensee exercise "reasonable efforts" includes using reasonable efforts to anticipate any potential force majeure event and all reasonable efforts to address the effects of any such event (a) as it is occurring, and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. The Licensee shall bear the burden of demonstrating that a force majeure event has occurred or will occur, and that the delay was beyond the reasonable control and without the fault of the Licensee. Any extension of time must be confirmed by MassDEP in writing to be valid and enforceable. Such an extension of time must be in writing to have effect.

8. The Licensee shall operate the Projects in accordance with the conditions contained in the FERC license. Any modifications made during the licensing process that would have a significant or material effect on the conclusions or conditions contained in this WQC, as determined by MassDEP, shall be submitted to MassDEP for review and approval prior to licensing.

9. As set forth more specifically in this WQC, the Licensee shall operate the Project in a manner that maintains the existing and designated uses of the Connecticut River, as outlined in the SWQS at 314 CMR 4.00, and an integrated and diverse biological community within the Connecticut River, and as required by the FERC license.

10. The Licensee shall conduct all activities in conformance with the applicable performance standards for work in wetland resource areas as established by the Massachusetts Wetlands Protection Act, including the Rivers Protection Act, M.G.L. c. 131, § 40, and the implementing regulations at 310 CMR 10.00.

11. The Licensee shall comply with all applicable provisions of the Public Waterfront Act, M.G.L. c. 91, and the implementing regulations at 310 CMR 9.00.

12. The Licensee shall comply with all applicable provisions of the Water Management Act, M.G.L. c. 21G, and the implementing regulations at 310 CMR 36.00. The Licensee's non-consumptive water use is included in the Non-consumptive Water Use Statement filed with MassDEP by Northeast Generation Co. in March, 2000, and transferred to FirstLight Hydro on May 8, 2007. Should the Licensee's non-consumptive water use increase, a Non-consumptive Water Use Statement for the increased water use shall be filed for review and approval by MassDEP.

13. To meet the requirements of Massachusetts laws, each of the conditions cited in this WQC shall not be made less stringent unless new data or other information is presented and MassDEP determines modification of this WQC is appropriate in consideration of the relevant water quality considerations, to the extent authorized by law.

14. To the extent authorized by law, MassDEP reserves the right to modify this WQC if there is a change in Massachusetts law or regulation upon which this WQC is based.

15. To the extent authorized by law, MassDEP reserves the right to add and alter the terms and conditions of this WQC during the life of the Projects as necessary to carry out its statutory responsibilities.

16. MassDEP may request, at any time during which this WQC is in effect, that FERC reopen the license to make modifications MassDEP deems necessary to maintain compliance with the Massachusetts Surface Water Quality Standards, 314 CMR 4.00, or other appropriate requirements of state law.

17. MassDEP may take enforcement action for noncompliance with this 401 Water Quality Certification pursuant to M.G.L. c. 21, §§ 42 and 44, M.G.L. c. 21A, § 16, and 310 CMR 5.00, to the extent authorized by applicable law.

Special Conditions

The following conditions correspond to, but are not necessarily identical to, the referenced proposed articles from the WQC Application.[69]

Turners Falls Project Operations

1. Station No. 1 Upgrades (Proposed Article A100)
Within 3 years of license issuance, the Licensee shall automate Station No. 1 such that it is capable of being operated remotely and over a range of flows. The Licensee shall submit design plans to the Commission for automating Station No. 1. Upon Commission approval, the Licensee shall automate Station No. 1, including any changes required by the Commission.

2. Minimum Flows below Turners Falls Dam (Proposed Article A110)
Upon license issuance, the Licensee shall discharge from the Turners Falls Dam or from the gate located on the power canal ("canal gate") just below the Turners Falls Dam the following seasonal minimum flows.

Date	Minimum Flows below Turners Falls Dam
01/01-03/31[1]	• If the Naturally Routed Flow (NRF- definition provided later in this article) is ≤ 400 cubic feet per second (cfs), the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is > 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.
04/01-05/31	• If the NRF is ≤ 6,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is > 6,500, the Minimum Flow below Turners Falls Dam shall be 4,290 cfs.

[69] Changes to the proposed articles include: (1) replacement of "will" with "shall"; (2) modifications to proposed Article A210, discussed at page 24; (3) modifications to proposed Article A190, discussed at page 28; (4) modifications to proposed Articles B200-220, discussed at page 36; and (5) modifications to proposed Articles A320, A330, and B220 concerning the enforcement authority of MassWildlife, NMFS, and USFWS.

06/01-06/15[2,3]	• If the NRF is ≤ 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is > 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,990 cfs.
06/16-06/30[3]	• If the NRF is ≤ 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is > 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,280 cfs.
07/01-11/15[1]	• If the NRF is ≤ 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs or the NRF, whichever is less. • If the NRF is > 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs.
11/16-12/31[1]	• If the NRF is ≤ 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is > 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.

[1]From November 16 through March 31, the 400 cfs minimum flow below Turners Falls Dam shall be provided from the canal gate, having a design maximum capacity of 400 cfs. The Licensee shall open the canal gate to its maximum opening and implement ice mitigation measures, if necessary, to maintain the maximum opening. The Licensee shall monitor canal gate operations to determine if supplemental measures, such as cable-heating the gate, are needed to maintain flows at or as close to 400 cfs as possible.

[2]One of the upstream fish passage adaptive management measures (AMMs) described in Article A330 calls for increasing the Total Minimum Bypass Flow below Station No. 1 (see Article A120) from June 1 to June 15 from 4,500 cfs to 6,500 cfs. If this AMM is enacted, and if the NRF is ≤ 6,500 cfs, the Minimum Flow below the Turners Falls Dam shall be 67% of the NRF, subject to the conditions in Article A330. If this AMM is enacted, and if the NRF is > 6,500 cfs, the Minimum Flow below the Turners Falls Dam shall be 4,290 cfs, subject to the conditions in Article A330.

[3]The magnitude of the Minimum Flow below Turners Falls Dam from June 1 to June 30 may be modified in the future pending fish passage effectiveness studies (see Article A330). If the Licensee conducts fish passage effectiveness studies, in consultation with the Massachusetts Division of Fisheries and Wildlife (MDFW), National Marine Fisheries Service (NMFS), and United States Fish and Wildlife Service (USFWS) and determines that migratory fish are not delayed by passing a greater percentage of the Total Minimum Bypass below Station No. 1 (see Article A120) via Station No. 1 discharges, the Licensee may file for a license amendment to increase the Station No. 1 discharge upon written concurrence of MDFW, NMFS, and USFWS. Prior to filing for a license amendment with the Commission, the Licensee shall consult MassDEP and address any of its comments in the license amendment filing.

Definition of Naturally Routed Flow

From December 1 through June 30, the NRF is defined as the hourly sum of the discharges from 12 hours previous as reported by the: Vernon Hydroelectric Project (FERC No. 1904), Ashuelot River

United States Geological Survey gauge (USGS, Gauge No. 01161000), and Millers River USGS gauge (Gauge No. 01166500).

From July 1 through November 30, the NRF is defined as the hourly sum of the discharges averaged from 1 to 12 hours previous as reported by the: Vernon Hydroelectric Project, Ashuelot River USGS gauge, and Millers River USGS gauge. Upon license issuance until 3 years thereafter, the Licensee shall operate the Turners Falls Project based on the NRF computational method from July 1 through November 30 to determine if the Turners Falls Project can be operated in this manner. If the Turners Falls Project cannot be operated in this manner, the Licensee shall consult MDFW, NMFS, and USFWS on alternative means of computing the NRF that are feasible for Turners Falls Project operation and sufficiently dampen upstream hydroelectric project flexible operations.

The Minimum Flow below Turners Falls Dam may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Minimum Flow below Turners Falls Dam is so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The Minimum Flow below Turners Falls Dam may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MassDEP, MDFW, NMFS and USFWS, and upon 5 days' notice to the Commission.

3. Total Minimum Bypass Flows below Station No. 1 (Proposed Article A120)
Upon license issuance, the Licensee shall maintain the Total Minimum Bypass Flows below Station No. 1 as follows:

Date	**Total Minimum Bypass Flows below Station No. 1[1]**
01/01-03/31	• If the NRF is ≤ 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is > 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 1,500 cfs, or the NRF, whichever is less.
04/01-05/31	• If the NRF is ≤ 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is > 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 6,500 cfs.
06/01-06/15[2,4]	• If the NRF is ≤ 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF.
Date	**Total Minimum Bypass Flows below Station No. 1[1]**
	• If the NRF is > 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 4,500 cfs.
06/16-06/30[4]	• If the NRF is ≤ 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is > 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 3,500 cfs.

07/01-08/31[3]	• If the NRF is ≤ 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is > 500 cfs and ≤ 1,800 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is > 1,800 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,800 cfs, or 90% of the NRF, whichever is less.
09/01-11/15[3]	• If the NRF is ≤ 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is > 500 cfs and ≤ 1,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF, or 90% of the NRF. • If the NRF is > 1,500 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.
11/16-12/31[3]	• If the NRF is < 400 cfs, then the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is > 400 cfs and ≤ 1,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is > 1,500 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.

[1]From license issuance until 3 years thereafter, Station No. 1 shall not be automated. During those 3 years, if Station No. 1 is the only source, other than the Fall River, Turners Falls Hydro, LLC, or Milton Hilton, LLC to provide the additional flow needed to meet the Total Minimum Bypass Flow below Station No. 1, the Licensee shall maintain the Station No. 1 discharge such that the Turners Falls Dam Minimum Flow will be as shown in Article A110, or higher flows, in cases where the additional flow cannot be passed through Station No. 1.

[2]One of the upstream fish passage adaptive management measures (AMMs) described in Article A330 calls for increasing the Total Minimum Bypass Flow below Station No. 1 from June 1 to June 15 from 4,500 cfs to 6,500 cfs. If this AMM is enacted, and if the NRF is ≤ 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF, subject to the conditions in Article A330. If this AMM is enacted, and the NRF > 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 is 6,500 cfs, subject to the conditions in Article A330.

[3]From July 1 to August 31, when the NRF is greater than 1,800 cfs, the Total Minimum Bypass Flow below Station No.1 shall be 1,800 or 90% of the NRF, whichever is less. From September 1 to December 31, when the NRF is greater than 1,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 1,500 cfs or 90% of the NRF, whichever is less. From July 1 to December 31, if the Total Minimum Bypass Flow below Station No. 1 shall be reduced by 10%, it shall not be taken from the Turners Falls Dam Minimum Flow (Article 110).

[4]The amount of flow needed from Station No. 1 from June 1 to June 30 may be modified in the future pending fish passage effectiveness studies. If the Licensee conducts fish passage effectiveness studies, in consultation with the MDFW, NMFS, and USFWS and determines that migratory fish are not delayed by passing a greater percentage of the Total Minimum Bypass Flow below Station No. 1 via Station No. 1 discharge, the Licensee may file for a license amendment to increase the magnitude of Station No. 1 discharge upon written concurrence of MDFW, NMFS, and USFWS. Prior to filing for a

license amendment with the Commission, the Licensee shall consult MassDEP, American Whitewater (AW), Appalachian Mountain Club (AMC), Crabapple Whitewater, Inc. (CAW), New England Flow (NE FLOW), and Zoar Outdoor (ZO) and address any comments of those entities in the license amendment filing.

If the Station No. 1 units are used to maintain the Total Minimum Bypass Flow below Station No. 1, and if some or all of the Station No. 1 units become inoperable, the balance of the flow needed to maintain the Total Bypass flow below Station No. 1 shall be provided from either the Turners Falls Dam Minimum Flow (dam or canal gate), Fall River, Turners Falls Hydro, LLC or Milton Hilton, LLC.

The Total Minimum Bypass Flow below Station No. 1 may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Total Minimum Bypass Flow below Station No. 1 is so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The total bypass flow below Station No. 1 may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MassDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.

4. Minimum Flows below Cabot Station (Proposed Article A130)
Upon license issuance, the Licensee shall maintain Minimum Flows below Cabot Station, or the NRF, whichever is less, as follows.

Date	Minimum Flow below Cabot Station
01/01-03/31	3,800 cfs or the NRF, whichever is less
04/01-05/31	8,800 cfs from midnight to 7:00 pm or the NRF, whichever is less and 6,500 cfs from 7:00 pm to midnight or the NRF, whichever is less.
06/01-06/15	6,800 cfs or the NRF, whichever is less
06/16-06/30	5,800 cfs or the NRF, whichever is less
07/01-08/31[1]	1,800 cfs or 90% of the NRF, whichever is less
09/01-11/15[1]	1,500 cfs or 90% of the NRF, whichever is less
11/16-11/30[1]	1,500 cfs or 90% of the NRF, whichever is less
12/01-12/31	3,800 cfs or NRF, whichever is less

[1]From July 1 to November 30, the Minimum Flow below Cabot Station is 1,800 (07/01-08/31) and 1,500 cfs (09/01-11/30) or 90% of the NRF, whichever is less. If the Minimum Flow below Cabot Station is reduced by 10% during these periods, it shall not be taken from the Turners Falls Dam Minimum Flow (Article A110).

The Minimum Flow below Cabot Station may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Minimum Flow below Cabot Station is so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The Minimum Flow below Cabot Station may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485),

MassDEP, MDFW, NMFS and USFWS, and upon 5 days' notice to the Commission.

5. Cabot Station Ramping Rates (Proposed Article A140)
Upon license issuance until 3 years after license issuance, the Licensee shall ramp Cabot Station as follows.

Date	Cabot Station Ramping Rates[1]
04/01-06/30	Up and Down Ramping at a rate of 2,300 cfs/hour
07/01-08/15	Up Ramping at a rate of 2,300 cfs/hour from 8:00 am to 2:00 pm

Three years after license issuance, the Licensee shall ramp Cabot Station as follows.

Date	Cabot Station Ramping Rate[1]
04/01-06/30	Up and Down Ramping at a rate of 2,300 cfs/hour

[1]If the NRF is greater than the sum of the hydraulic capacity of Cabot Station and Station No. 1 and the Minimum Flow below Turners Falls Dam in effect at the time, the Cabot Station up-ramping rates will not apply.

The Cabot Station Ramping Rates above shall take precedence over the Flow Stabilization below Cabot Station (Article A160).

The Cabot Station Ramping Rates may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Cabot Station Ramping Rates are so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The Cabot Station Ramping Rate may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MassDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.

6. Variable Releases from Turners Falls Dam and Variable Flow below Station No. 1 (Proposed Article A150)
For recreation and ecological conservation purposes, upon license issuance, the Licensee shall provide variable releases from the Turners Falls Dam and a variable flow below Station No. 1 as shown below.

Variable Releases from Turners Falls Dam

Magnitude of Variable Release from Turners Falls Dam	[1]4,000 cfs, or the NRF, whichever is less
Dates when Variable Releases may occur	[2]July 1 through October 31
[3]Total No. of 2-day events	5 events for a total of 10 Variable Releases, but could potentially be 11 Variable Releases subject to footnote 3
Days of Variable Release for 2 day-events	Saturday and Sunday- must be two consecutive days

Hours of Variable Release	10:00 am to 2:00 pm, 4 hrs/day, Saturday and Sunday
Magnitude of Variable Release from Turners Falls Dam from Saturday at 2:00 pm to Sunday at 10:00 am.	See footnote 4
[5]Up-Ramping Rates at Start of Variable Release	See footnote 5
[6]Down-Ramping Rates at End of Variable Release	See footnote 6

[1]If the NRF< 2,500 cfs during the scheduled variable release (see footnote 2 below relative to scheduling variable releases), there shall be no variable release and it shall not be rescheduled.

[2]The Licensee shall consult AW, AMC, commercial outfitters, MassDEP, MDFW, National Park Service (NPS), NE FLOW, and USFWS no later than March 1 annually over the license term to develop a mutually agreeable schedule for the variable releases. When developing the schedule, there shall be at least one weekend per month, between July 1 and October 31, when no variable releases are provided.

[3]The Licensee conducts annual canal drawdowns for maintenance purposes resulting in the NRF being passed at the Turners Falls Dam. If the canal drawdown occurs between July 1 and October 31 and the NRF is being passed either on Saturday from 10:00 am- 2:00 pm or Sunday from 10:00 am-2:00 pm, the total number of releases at the Turners Falls Dam shall remain at 10 releases. However, if the canal drawdown does not occur between July 1 and October 31 on Saturday from 10:00 am-2:00 pm or Sunday from 10:00 am-2:00 pm, the Licensee shall provide an additional consecutive day of variable release such that one of the 2-day events is a 3-day consecutive event resulting in a total of 11 releases. The additional day shall either be Friday from 10:00 am-2:00 pm before the scheduled weekend variable release or Monday from 10:00 am-2:00 pm after the scheduled weekend variable release. If there ends up being one 3-day event, the magnitude of release from Friday at 2:00 pm to Saturday at 10:00 am (or Sunday at 2:00 pm to Monday at 10:00 am), shall be computed as noted in footnote 4.

[4]This flow shall be calculated as: [(Variable Flow Release- Minimum Flow below Turners Falls Dam as defined in Article A110)/2]. If there is a 3-day event as noted in footnote 3, the variable flow release from Friday at 2:00 pm to Saturday at 10:00 am (or from Sunday at 2:00 pm to Monday at 10:00 am) shall be based on the same calculation.

[5]At the beginning of the variable release, if the NRF is > 4,000 cfs, the Licensee shall up-ramp from the Minimum Flow below Turners Falls Dam as defined in Article A110 to 4,000 cfs in two hours, not to exceed 2,000 cfs/hr.

At the beginning of the variable release, if the NRF is between 2,500 and 4,000 cfs, the Licensee shall up ramp at 50% of the NRF per hour.

[6]At the end of the variable release, if Turners Falls Dam variable release is between 2,500 and 4,000 cfs, the Licensee shall down ramp at 50% of the variable release per hour.

Variable Flow below Station No. 1

Magnitude of Variable Flow below Station No. 1	[1]2,500 cfs, or the NRF, whichever is less

Dates when Variable Flow may occur	[2]July 1 through October 31
Total No. of 2-day events	7 events for a total of 14 Variable Flows
Days of Variable Flow	Saturday and Sunday- must be two consecutive days
Hours of Variable Flow	10:00 am to 2:00 pm, 4 hrs/day
Magnitude of Variable Flow below Station No. 1 from Saturday at 2:00 pm to Sunday at 10:00 am.	See Footnote 3

[1]If the NRF< 2,500 cfs, during the scheduled flow (see footnote 2 below relative to scheduling the flow), there shall be no 2,500 cfs flow and it shall not be rescheduled.

[2]The Licensee shall consult AW, AMC, commercial outfitters, MassDEP, MDFW, NPS, NE FLOW, and USFWS no later than March 1 annually over the license term to develop a mutually agreeable schedule for the variable flow. When developing the schedule there shall be at least one weekend per month, between July 1 and October 31, when no variable flow is provided.

[3]From July 1 to August 31, the Total Minimum Bypass Flow below Station No. 1 is defined in Article A120. If the NRF is > 1,800 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,800 cfs, or 90% of the NRF, whichever is less. The magnitude of flow below Station No. 1 from Saturday at 2:00 pm to Sunday at 10:00 am from July 1 to August 31 shall be computed as follows:

(2,500 cfs + Total Minimum Flow below Station No. 1 as defined in Article A120)/2.

From September 1 to November 15, the Total Minimum Bypass Flow below Station No. 1 is defined in Article A120. If the NRF is > 1,500 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less. The magnitude of flow below Station No. 1 from Saturday at 2:00 pm to Sunday at 10:00 am from September 1 to November 15 shall be computed as follows:

(2,500 cfs + Total Minimum Flow below Station No. 1 as defined in Article A120)/2.

When implementing the variable releases from the Turners Falls Dam or the 2,500 cfs flow below Station No. 1, the Licensee is still required to maintain the operational requirements in License Articles A110, A120, A130, A140, A160 and A190.

The above variable release from the Turners Falls Dam and variable flow below Station No. 1 may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Turners Falls Dam variable release or variable flow below Station No. 1 are so modified, the Licensee shall notify AW, AMC, commercial outfitters, MassDEP, MDFW, NMFS, NPS, NE FLOW, and USFWS as soon as possible. The Turners Falls Dam variable release or variable flow below Station No. 1 may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), AW, AMC, commercial outfitters, MassDEP, MDFW, NMFS, NPS, NE FLOW and USFWS.

7. Flow Stabilization below Cabot Station and Allowable Deviations for Flexible Operations (Proposed Article A160)

Three years after license issuance, the Licensee shall maintain ±10% of the NRF below Cabot Station as

follows.

Date	Flow Stabilization below Cabot Station[1]
04/01-05/15[2]	Provide ±10% of the NRF below Cabot Station from 7:00 pm to midnight, with allowable deviations up to ±20% of the NRF for up to 22 hours total from 04/01-05/15 (the 22 hours shall be used from 7:00 pm to midnight).
05/16-05/31[2]	Provide ±10% of the NRF below Cabot Station from 7:00 pm to midnight, with allowable deviations up to ±20% of the NRF for up to 18 hours total from 05/16-05/31 (the 18 hours shall be used from 7:00 pm to midnight).
06/01-06/15[2]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 7 hours total from 06/01-06/15.
06/16-06/30[2]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 7 hours total from 06/16-06/30.
07/01-08/15[3]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 55 hours total from 07/01-08/15.
08/16-08/31[3]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 27 hours total from 08/16-08/31.
09/01-10/31[3]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 44 hours total from 09/01-10/31.
11/01-11/30[3]	Provide ±10% of the NRF below Cabot Station with allowable deviations up to ±20% of the NRF for up to 11 hours total from 11/01-11/30.

[1]If the NRF is greater than the sum of the hydraulic capacity of Cabot Station and Station No. 1 and the Minimum Flow below Turners Falls Dam in effect at the time, the Flow Stabilization below Cabot Station shall not apply.

[2]From April 1 to June 30, the NRF flow may be reduced by 10% or up to 20% for select hours. If the NRF is reduced during this period, the flow shall be taken from Cabot Station generation.

[3]From July 1 to November 30, the NRF flow may be reduced by 10% or up to 20% for select hours. If the NRF is reduced during this period, the flow shall not be taken from the Turners Falls Dam Minimum Flow.

Beginning three years after license issuance, the Licensee may deviate from the Flow Stabilization below Cabot Station and Cabot Station Ramping Rates (Article A140) for a certain number of hours in July, August, September, October and November, hereinafter referred to as flexible operations.

The Licensee has restricted discretionary flexible operating capability to respond to elevated energy prices, as defined in paragraph (a) below, from July 1 to November 30, as well as unrestricted capability to respond to emergencies, Independent System Operator-New England (ISO-NE, or its successors) transmission and power system requirements, and other regulatory requirements as defined in paragraph (b) below.

(a) The Licensee may deviate from the Flow Stabilization below Cabot Station and Cabot Station Ramping Rates (Article A140). The number of hours of flexible operations, which may be used at the discretion of the Licensee, are as follows.

Date	**Allowable Deviations from Cabot Station Ramping Rates (Article A140) and Flow Stabilization below Cabot Station**
07/01-07/31	20 hours of flexible operations with no more than 7 flexible events per month
08/01-08/31	26 hours of flexible operations with no more than 7 flexible events per month
09/01-09/30	23 hours of flexible operations with no more than 7 flexible events per month
10/01-10/31	20 hours of flexible operations with no more than 7 flexible events per month
11/01-11/30	28 hours of flexible operations with no more than 7 flexible events per month

(b) If compliance with the Flow Stabilization below Cabot and Cabot Station Ramping Rates (Article A140) would cause the Licensee to violate or breach any law, any applicable license, permit, approval, consent, exemption or authorization from a federal, state, or local governmental authority, any applicable agreement with a governmental entity, the Licensee may deviate from the Flow Stabilization below Cabot and Cabot Station Ramping Rates (Article A140) to the least degree necessary to avoid such violation or breach. The Licensee may also deviate from the Flow Stabilization below Cabot and Cabot Station Ramping Rates for the following reasons:

(1) To implement Flood Flow Operations as defined in Article A170.
(2) To perform demonstrations of the resources' operating capabilities under ISO-NE, or its successors, rules and procedures such as, maintaining the Licensee's capacity accreditation (or its successor) or its fast start reserve eligibility. The Licensee shall seek to perform these demonstrations at times that will not cause it to deviate from the conditions in Articles A110- A160, with recognition that April 1 to June 30 should be avoided, to the maximum extent possible.
(3) To manage the Turners Falls Impoundment to stay within its licensed operating limits in Article A190, with recognition that deviations from April 1 to June 30 should be avoided to the maximum extent possible.
(4) If compliance with Articles A110-A160 would cause a public safety hazard or prevent timely rescue.

*****ISO-NE, or its successors, (or another recognized entity with responsibilities for regional energy and capacity supply) requirements are circumstances when ISO-NE requires the Licensee to be fully available and, if necessary, responsive.

The Flow Stabilization below Cabot Station may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Flow

Stabilization below Cabot Station is so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The Flow Stabilization below Cabot Station may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MassDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.

8. Flood Flow Operations (Proposed Article A170)
Upon license issuance, the Licensee shall operate the Project in accordance with its existing agreement with the United States Army Corps of Engineers (USACE). This agreement, memorialized in the Reservoir and River Flow Management Procedures (1976), as it may be amended from time to time, governs how the Turners Falls Project will operate during flood conditions and coordinate its operations with the Licensee of the Northfield Mountain Pumped Storage Project (FERC No. 2485).

9. Cabot Station Emergency Gate Use (Proposed Article A180)
Upon license issuance, the Licensee shall use the Cabot Station Emergency Gates under the following conditions: a) a Cabot load rejection which could cause overtopping of the canal, b) dam safety issues such as potential canal overtopping or partial breach, and c) to discharge up to approximately 500 cfs from April 1 to June 15 for debris management. The Licensee shall avoid discharging flows higher than 500 cfs through the gates from April 1 to June 15 if practicable; however, if necessary to discharge higher flows, the Licensee shall coordinate with NMFS to minimize potential impacts to Shortnose Sturgeon in the area below Cabot Station.

10. Turners Falls Impoundment Water Level Management (Proposed Article A190, as amended)
Upon license issuance, the Licensee shall operate the Turners Falls Impoundment, as measured at the Turners Falls Dam, as follows:

(a) Maintain water levels between elevation 178.5 feet and 185 feet National Geodetic Vertical Datum of 1929 (NGVD29) except under the following circumstances:

Discretionary Events:

1. The Licensee may operate between elevations 178.5 and 177.5 feet 25 times per year for no more than 12 hours per event and 5 times a year for no more than 24 hours per event.

Nondiscretionary Events – The Licensee may deviate from the operating range of 178.5-185 only to the extent necessary to:

2. meet minimum flow requirements below the Turners Falls Dam, in the bypass reach below Station No. 1, or below Cabot Station, as required by Special Conditions 2-7, when the Naturally Routed Flow (NRF) is insufficient to meet the requirements of Special Conditions 2-7. This nondiscretionary exception shall only apply if it does not immediately follow a discretionary event specified in (a)1 above.

3. comply with Special Condition 8 governing operations during flood conditions, as provided in the Reservoir and River Flow Management Procedures agreement reached with the United States Army Corp of Engineers.

4. perform demonstrations of the Licensee's operating capabilities, as required by ISO New England, or its successors, pursuant to Special Condition 7. The Licensee shall seek to perform these demonstrations at times that will not cause it to drawdown below 178.5 feet nor at times on or between the Memorial Day and Labor Day holiday weekends.

5. avoid a public safety hazard or facilitate a timely rescue.

6. respond to wholesale market requirements, transmission and power system requirements, and other regulatory requirements during an emergency condition as currently defined in the ISO-NE open access transmission tariff or a similar condition as defined in the future by ISO-NE or its successor. After fulfilling any such requirements during an emergency condition, the Licensee will have an exception to the Cabot Flow Stabilization requirement in Special Condition 7 (proposed Article A160) to utilize the NRF for up to 7 days to bring the TFI elevation back above 178.5 feet and refill the Northfield upper reservoir in order to ensure the Northfield Pumped Storage facility is fully able to respond to extended or future emergency conditions, but shall at all times maintain the minimum flow requirements below Cabot Station and in the bypass reach.

7. address equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. The Licensee shall notify MassDEP of such instances within 24 hours of acquiring knowledge of the equipment malfunction or operating emergency necessitating implementation of this exception.

8. operate if the NRF is below 2,000 cfs and such operations do not include a discretionary event.

For the three-year period following issuance of the License, any noncompliance with Special Condition 10(a)1-8 above shall not be an enforceable violation of these requirements if the Licensee was acting in good faith and the noncompliance was not reasonably foreseeable and reasonably within the control of the Licensee. For the term of the License, the Licensee shall submit biannual reports, with supporting data, to MassDEP and FERC summarizing all instances in which TFI levels were outside of the 178.5-185 range with an explanation why the range was exceeded; whether it was an instance of noncompliance with the above Special Condition 10(a)1-8; what measures could be employed in the future to avoid the noncompliance; and when those measures will be implemented. All such measures to avoid noncompliance must be implemented within 6 months of the biannual report identifying the noncompliance. MassDEP will review each biannual report and determine whether it includes instances of noncompliance.

(b) Limit the rate of rise of the Turners Falls Impoundment water level to be less than 0.9 feet/hour from May 15 to August 15 from 8:00 am to 2:00 pm. However, if the NRF is greater than the sum of the hydraulic capacity of Cabot Station and Station No. 1 and the Minimum Flow below Turners Falls Dam in effect at the time, the Turners Falls Impoundment rate of rise requirement shall not apply.

(c) The rate of rise of the Turners Falls Impoundment may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the rate of rise of the Turners Falls Impoundment is so modified, the Licensee shall notify the Commission, MassDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The rate of rise of the Turners Falls Impoundment may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MassDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.

(d) The Licensee may increase the allowable NRF deviation from ±10% to ±20% to better manage Turners Falls Impoundment water levels. The increased flow deviation is limited by the number of hours shown in the first table of Article A160. This allowance for an increased flow deviation is in addition to the exceptions outlined in paragraphs (a) and (b) of Article A160. As such, the increased flow allowable deviations outlined in this paragraph shall not count against any time allotment for exceptions outlined in paragraphs (a) and (b) of Article A160. Similarly, operations meeting the exception criteria outlined in paragraphs (a) and (b) of Article A160 shall not count against any time allotment for allowable deviations outlined in this paragraph. Allowable flow deviations in excess of ±10% of NRF resulting from conflicting operational requirements shall not count against any time allotment for allowable deviations outlined in this paragraph.

11. Project Operation, Monitoring and Reporting Plan (Proposed Article A200)

Within 1 year of license issuance, the Licensee shall file with the Commission, for approval, a Project Operation, Monitoring and Reporting Plan describing how the Licensee will document compliance with the operating conditions. The Plan shall include the following:

(a) ***A description*** of how the Licensee will comply with Minimum Flows below Turners Falls Dam (Article A110), Total Minimum Bypass Flows below Station No. 1 (Article A120), Minimum Flows below Cabot Station (Article A130), Cabot Station Ramping Rates (Article A140), Variable Releases from Turners Falls Dam and Variable Flow below Station No. 1 (Article A150), Flow Stabilization below Cabot Station (Article A160, implementation starting 3 years after license issuance), and Turners Falls Impoundment Water Level Management (Article A190). These are collectively referred to hereinafter as the operating requirements.

(b) ***A provision*** to file with the Commission, after consultation with the MassDEP, MDFW, NFMS, and USFWS, a minimum flow and operation compliance report detailing implementation of the plan, including any allowable deviations that occurred during the reporting period. For the period January 1 to March 31 and July 1 to December 31, the compliance report, including any deviations, shall be filed with the Commission by March 1 of the following year. For the months of April, May and June, the monthly compliance report, including any deviations, shall be filed with the Commission on June 1, July 1 and August 1, respectively. Upon license issuance until 3 years thereafter, the Licensee shall document on an hourly basis for each day any allowable deviations from the Cabot Station Ramping Rates (Article A140) and demonstrate progress towards meeting the Flow Stabilization below Cabot Station (Article A160). Beginning three years after license issuance until license expiration, the Licensee shall document on an hourly basis for each day any allowable deviations from the Cabot Station Ramping Rates restrictions (Article A140) and Flow

Stabilization below Cabot Station restrictions (Article A160). Each day, from April 1 to November 30, the Licensee shall record any allowable deviations in a spreadsheet showing the daily deviations, the reason for the deviation, the number of hours, and scope. The Licensee shall provide the total number of deviations to the MassDEP, MDFW, NFMS, and USFWS per the reporting schedule above.

Allowable deviations shall be tracked as follows:

- Identify Allowable Deviations: The Licensee shall record the NRF, Turners Falls Dam discharge, Station No. 1 discharge, Cabot Station discharge and total Turners Falls Project discharge (below the Cabot Station tailrace) at the top of each hour. Allowable deviations in both the Cabot Station Ramping Rate and Flow Stabilization below Cabot Station requirements shall be recorded. At the top of each hour, the Licensee shall record the change in Cabot Station discharge from the previous hour to determine if any deviation has occurred from the agreed upon Cabot Station Ramping Rate. In addition, the NRF (as detailed in paragraph (b) of the "Operational Regime" section) shall be compared with the recorded total Turners Falls Project discharge in a given hour to identify if a Flow Stabilization below Cabot Station deviation occurred over the past hour. Any deviation of either the Cabot Station Ramping Rate or total Turners Falls Project discharge within the hour shall be counted in one-hour increments.

- Categorize Allowable Deviations: When an allowable deviation is identified it shall be categorized as either Regulatory, as detailed in paragraph (b) of Article A160, NRF Allowance, as detailed in paragraph (d) of the Article A190 or Discretionary, as detailed in paragraph (a) of Article A160.

The Licensee shall develop the Plan after consultation with MassDEP, MDFW, NMFS, and USFWS. The Licensee shall include with the Plan documentation of consultation after it has been prepared and provided to MassDEP, MDFW, NMFS, and USFWS. The Licensee shall provide a minimum of 30 days for MassDEP, MDFW, NMFS, and USFWS to comment and to make recommendations before filing the Plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission may change the Plan. Implementation of the Plan shall not begin until the Licensee is notified by the Commission that the Plan is approved. Upon Commission approval, the Licensee shall implement the Plan, including any changes required by the Commission.

12. Flow Notification and Website (Proposed Article A210, as amended)

Within 1 year of license issuance, the Licensee shall provide the following information year-round on a publicly available website:

(a) On an hourly basis, the Turners Falls Impoundment water elevation, as measured at the Turners Falls Dam, the Turners Falls Dam total discharge, and the Station No. 1 discharge.

(b) On an hourly basis, the anticipated Turners Falls Dam total discharge and the anticipated Station No. 1 discharge for a 12-hour window into the future. Should the Licensee deviate

from passing the 12- hour previous NRF from December 1 to May 31 or the 12-hour average NRF from June 1 to November 30, it shall post the revised flows (in the 12-hour look ahead window) to a website as soon as practicable after they are known. Should the Licensee of the Vernon Hydroelectric Project provide the Licensee with flow data more than 12 hours in advance, the Licensee shall publish the information sooner.

(c) Within one month prior to its annual power canal drawdown, the Licensee shall post on its website the starting and ending time/date of the drawdown, which shall last at least 4 days. Throughout the duration of the canal drawdown, the NRF, as defined in Article A110, shall be maintained below the Turners Falls Dam.

(d) Quarterly reports provided by the end of the second month following each quarter that include data concerning:

- daily impoundment elevation fluctuations;
- average, median, highest, and lowest impoundment levels on a weekly and monthly basis; and
- discharges from the Turners Falls Dam, Station No. 1, and Cabot Station on a daily, weekly, and monthly basis.

(e) Annual summary report by February 1 of each year, which includes the preceding information, and delineates the timing, frequency, magnitude, and duration of TFI levels below 178.5 and above 184.

Northfield Mountain Project Operations

13. Project Operations (Proposed Article B100)

Upon license issuance, the Licensee shall:

(a) Operate the Northfield Mountain Pumped Storage Project in accordance with its existing agreement with the United States Army Corps of Engineers (USACE). This agreement, memorialized in the Reservoir and River Flow Management Procedures (1976), as it may be amended from time to time, governs how the Project will operate during flood conditions and coordinate its operations with the Licensee of the Turners Falls Hydroelectric Project (FERC No. 1889).

(b) Operate the Northfield Mountain Pumped Storage Project upper reservoir between elevation 1004.5 and 920.0 feet National Geodetic Vertical Datum of 1929 (NGVD29).

Turners Falls Project Fish Passage

14. Fish Passage Facilities and Consultation (Proposed Article A300)

The Licensee shall implement the following fish passage measures on the schedule specified. When due dates cited in this and other articles are in "years after license issuance," this shall mean on the appropriate date in the specified calendar year after license issuance, regardless of the quarter in which

the license is issued. For example, "Year 1 after license issuance" begins on the first January 1 following license issuance.

Upstream Fish Passage

(a) construct a Spillway Lift at the Turners Falls Dam to be operational no later than April 1 of Year 9 after license issuance.

(b) rehabilitate the Gatehouse Trapping facility (sampling facility) to be operational no later than April 1 of Year 9 after license issuance.

(c) retire, either by removal or retaining in place, the Cabot Ladder and the power canal portions of the Gatehouse Ladder within 2 years after the Spillway Lift becomes operational.

(d) install and operate interim upstream eel passage in the vicinity of the existing Spillway Ladder within 1 year of license issuance and continue operating it until permanent upstream eel passage facilities are operational. The Licensee shall consult MDFW, NMFS, and USFWS on the location and design of the interim eelway(s).

(e) conduct up to 2 years of eelway siting studies after the Spillway Lift becomes operational, using a similar methodology to relicensing Study 3.3.4 for both years. Based on the siting survey results, design, construct, operate, and maintain up to two permanent upstream eel passage facilities at the Turners Falls Project no later than 3 years after completing the final siting survey. The Licensee shall consult MDFW, NMFS, and USFWS on the location of the two permanent upstream eel passage facilities. The final eelway siting shall take into account the ability to maintain the eelway(s) in light of spillage conditions at the Turners Falls Project. The Licensee shall not be required to place any eelways at the foot of any active spillway structures.

Downstream Fish Passage

(f) Within 4 years[1] of license issuance, replace the existing Cabot Station trashrack structure with a new full depth trashrack with 1-inch clear spacing. The new trashracks shall have multiple openings for fish passage, including openings on the top and bottom of the water column. The Licensee shall attempt to maximize the hydraulic capacity of these openings within the constraints of the conveyance mechanisms. The Licensee shall base detailed design alternatives on the following conceptual design; however, the Parties will remain flexible on design alternatives as necessary to meet fish passage goals.

The new trashrack shall have multiple surface entrances including:

a.) between Cabot Units 2 and 3;
b.) between Cabot Units 4 and 5; and
c.) at the right wall of the intake (looking downstream) at Cabot Unit 6.

The openings shall be 3-feet-wide by 2-feet-tall and shall connect to the existing trash trough located behind the racks. Each opening at the top of the trashrack shall have an approximate hydraulic capacity of 24 cfs, and the existing trash trough shall convey a total hydraulic capacity of approximately 72 cfs

from these openings. The new trashrack shall have an additional entrance near the bottom at the left wall of the intake (looking downstream) at Unit 1. This entrance shall be approximately 3-feet- wide by 3-feet-tall and shall connect to a vertical pipe to safely convey fish to the existing trash trough or log sluice. This entrance shall be sized to provide a velocity that attracts fish to the bypass relative to the turbine intakes (approximately 5 feet-per-second). In addition to the entrances integral to the new trashrack structure, fish shall be conveyed via a new uniform acceleration weir (UAW) and log sluice. The log sluice shall be resurfaced to limit turbulence and injury to migrants. A steel panel (or equivalent) shall be provided below the UAW to exclude migrants from being delayed in the space below the UAW. Total flow from all downstream passage components at Cabot Station shall be 5% (685 cfs) of maximum hydraulic station capacity (13,728 cfs). The conveyance at each bypass entrance shall be determined during the design phase.

(g) Within 4 years[1] of license issuance, construct a ¾-inch clear-spaced bar rack at the entrance to the Station No. 1 branch canal.

[1]Relative to the Cabot Intake Protection and Downstream Passage Conveyance and the Station No. 1 Bar Rack, the times cited shall be from license issuance based on the time needed to complete construction. The actual first year of operation of these two facilities will depend on when the license is issued. If the License is issued in quarter 1 (Q1, Jan 1-Mar 31) then these two facilities shall be operational no later than April 1 of Year 4 after license issuance; if it is issued in Q2 then these two facilities shall be operational no later than August 1 of Year 4 after license issuance; and if it is issued after Q2 then these two facilities shall be operational no later than April 1 of Year 5 after license issuance.

(h) Construct a plunge pool downstream of the Turners Falls Dam Bascule Gate No. 1 as part of the construction of the Spillway Lift, to be operational no later than April 1 of Year 9 after license issuance.

Consultation

For any new fish passage facility, the Licensee shall consult and obtain approval from MDFW, NMFS, and USFWS on the facility design and on operation and maintenance procedures. The Licensee shall consult MDFW, NMFS, and USFWS at the 30%, 60%, 90% and 100% design plan milestones. The Licensee shall file the 100% design plans with the Commission, along with documentation of consultation with MDFW, NMFS, and USFWS. If any fish passage adaptive management measures (AMMs) are implemented as discussed in Articles A320 and A330 and require facility design and operation and maintenance procedures, then the Licensee shall follow the same consultation process as the initial fish passage build-out.

The Commission may change the design plans. Implementation of the design plans shall not begin until the Licensee is notified by the Commission that the design plans are approved. Upon Commission approval, the Licensee shall implement the design plans, including any changes required by the Commission.

15. Schedule of Initial Effectiveness Testing, Consultation Process on Effectiveness Testing Study Plans, and Fish Passage Performance Goals (Proposed Article A310)

Schedule of Initial Effectiveness Testing

The Licensee shall complete construction of each fish passage facility, operate the fish passage facility for one season (shakedown year), and then conduct representative and quantitative fish passage effectiveness testing per the schedule below.

Facility	Operational/Shakedown Date	Initial Effectiveness Study Years and Locations to be Tested
Cabot Rack and Downstream Conveyance	Year 4 after license issuance[1]	Years 6-7, the Cabot Downstream Fish Passage Structure and Station No. 1 Rack shall be tested.
Station No. 1 Bar Rack	Year 4 after license issuance[1]	
Turners Falls Dam Plunge Pool	Year 9 (by April 1st) after license issuance	Years 10-11, the Turners Falls Plunge Pool and Spillway Lift shall be tested.
Spillway Lift	Year 9 (by April 1st) after license issuance	
Rehabilitate Gatehouse Trapping Facility (Sampling Facility)	Year 9 (by April 1st) after license issuance	Not Applicable
Retire Cabot Ladder and Portions of Gatehouse Ladder	No later than Year 11 after license issuance (tied to within 2 years after the Spillway Lift becomes operational).	Not Applicable
Permanent Eel Passage Structure(s)	Year 13 after license issuance	Year 14, the internal efficiency of the permanent eel passage structure(s) shall be tested.

[1]Relative to the Cabot Intake Protection and Downstream Passage Conveyance and the Station No. 1 Bar Rack, the times cited shall be from license issuance based on the time needed to complete construction. The actual first year of operation of these two facilities will depend on when the license is issued. If the license is issued in quarter 1 (Q1, Jan 1-Mar 31) then these two facilities shall be operational no later than April 1 of Year 4 after license issuance; if it is issued in Q2 then these two facilities shall be operational no later than August 1 of Year 4 after license issuance; and if it is issued after Q2 then these two facilities shall be operational no later than April 1 of Year 5 after license issuance.

Consultation Process on Effectiveness Study Plans

For any initial fish passage effectiveness studies and any subsequent fish passage effectiveness studies required after implementing any AMMs described in Article A320 and A330, the Licensee shall provide the effectiveness study plans to MDFW, NMFS, and USFWS and request comments on the study plans within 30 days. The Licensee shall consult MDFW, NMFS, and USFWS and obtain their approval on the study plans before conducting the effectiveness studies. The Licensee shall file the effectiveness study plans with the Commission, along with any consultation records.

Fish Passage Performance Goals
The Licensee shall compare the effectiveness study results to the following fish passage performance goals:

Downstream Passage

- 95% of juvenile American Shad arriving 500 meters upstream of the Turners Falls Dam survive migration past the Turners Falls Project within 24 hours.
- 95% of adult American Shad arriving 1 kilometer upstream of the Turners Falls Dam survive migration past the Turners Falls Project within 24 hours.
- 95% of American Eel arriving 1 kilometer upstream of the Turners Falls Dam survive migration past the Turners Falls Project within 48 hours of a flow event. The definition of what constitutes a flow event shall be determined by the Licensee in consultation with MDFW, NMFS and USFWS during effectiveness study plan development.

The downstream passage at the Turners Falls Project is project wide and shall include all routes of passage (*e.g.*, spill, fish bypass, and turbine passage).

Upstream Passage

- 75% of adult American Shad arriving 500 meters below Cabot Station successfully pass into the Turners Falls Impoundment within 48 hours. The 75% passage efficiency for American Shad shall be based on the first 90% of the American Shad run. The effectiveness testing shall be conducted over the entire adult American Shad run, but the 75% passage efficiency goal shall be based on the first 90% of the run as determined by the Licensee as *a posteriori* analysis of run counts. The Licensee shall determine where and how run counts shall occur in consultation with MDFW, NMFS and USFWS during effectiveness study plan development. The Licensee, MDFW, NMFS and USFWS shall revisit whether the 75% passage efficiency goal is achievable or should be reduced, and whether the 48-hour time-to-pass goal is achievable or should be increased, after implementing the first (Tier 1) and second (Tier 2) round of AMMs as described in Article A330.
- An internal passage efficiency of 95% within the permanent passage structure(s) for American Eel. The 95% internal efficiency assumes it is possible for the Licensee to successfully tag up-migrating eels. The Licensee shall consult MDFW, NMFS, and USFWS on the appropriate size American eel, based on available technology, to test the internal efficiency.

16. Downstream Fish Passage- Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Studies (Proposed Article A320, as amended)

Initial Effectiveness Studies- Years 6 and 7
The Licensee shall conduct initial effectiveness testing in Years 6 and 7 (see Article 310) to evaluate the fish passage survival and time-to-pass of the newly constructed Station No. 1 bar rack and Cabot Rack and Conveyance Structure and compare the findings at individual components (e.g., Cabot Station and Station No. 1) to the performance goals in Article 310. The Licensee shall develop reports by February 1 of Years 7 and 8 for adult American Shad and by April 1 of Years 7 and 8 for juvenile American Shad and adult American Eel summarizing the survival study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and

determine what, if any, adaptive management measures (AMMs) may be implemented from the table below. The Licensee shall target any AMMs to those locations where fish passage performance goals are not achieved. The Licensee shall file a report with the Commission to include the effectiveness testing report and documentation of any AMMs agreed to by the Licensee, MDFW, NMFS, and USFWS, along with any consultation records. If warranted, the Licensee shall consult MDFW, NMFS, and USFWS on when to implement the Round 1 AMMs at Station No. 1 and/or Cabot Station.

Effectiveness Testing of Round 1 AMMs at Station No. 1 and/or Cabot Station and Initial Effectiveness Testing at Turners Falls Dam Plunge Pool- Years 10 and 11

The Licensee shall conduct Round 1 AMM effectiveness testing at Station No. 1 and/or Cabot Station and initial effectiveness testing of the Turners Falls Dam plunge pool in Years 10 and 11. The Licensee shall:

- Compare the effectiveness study results to the performance goals in Article 310.
- Provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 11 and 12 for adult American Shad and by April 1 of Years 11 and 12 for juvenile American Shad and adult American Eel summarizing the survival study findings.
- Consult MDFW, NMFS, and USFWS to determine what, if any AMMs may be implemented from the table below and target AMMs to those locations where passage performance goals are not achieved.
- File the effectiveness study report and documentation of any AMMs with the Commission.

If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement any Round 2 AMMs at Station No. 1 and/or Cabot Station and Round 1 AMMs at the Turners Falls Dam plunge pool.

Effectiveness Testing of Round 2 AMMs at Station No. 1 and/or Cabot Station and Round 1 AMMs at Turners Falls Dam Plunge Pool- Years 14 and 15

The Licensee shall conduct Round 2 AMM effectiveness testing at Station No. 1 and/or Cabot Station and Round 1 AMMs at the Turners Falls Dam plunge pool in Years 14 and 15. The Licensee shall follow the same consultations steps bulleted above; however, the Licensee shall provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 15 and 16 for adult American Shad and by April 1 of Years 15 and 16 for juvenile American Shad and adult American Eel.

If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement any Round 3 AMMs at Station No. 1 and/or Cabot Station and Round 2 AMMs at the Turners Falls Dam plunge pool.

Effectiveness Testing of Round 3 AMMs at Station No. 1 and/or Cabot Station and Round 2 AMMs at Turners Falls Dam Plunge Pool- Years 18 and 19

The Licensee shall conduct Round 3 AMM effectiveness testing at Station No. 1 and/or Cabot Station and Round 2 AMMs at the Turners Falls Dam plunge pool in Years 18 and 19. The Licensee shall follow the same consultations steps bulleted above however, the Licensee shall provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 19 and 20 for adult American Shad and by April 1 of Years 19 and 20 for juvenile American Shad and adult American Eel.

While MassDEP includes the following provision from the proposed articles to acknowledge it, MassDEP does not believe it is necessary to comply with the SWQS: MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding downstream passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, MDFW, NMFS, and USFWS have agreed, consistent with the terms of the settlement agreement, that they will not request or require Cabot Station shutdowns over the life of the license. MassDEP adds that the provision is not inconsistent with meeting the SWQS.

Downstream Adaptive Management Measures

Adaptive Management Measure (if needed)	**Timing**
Turners Falls Dam • Modify the bascule gate setting(s) and resultant spill (rate, location). Station No. 1 • Install a behavioral barrier. Cabot Station • Modify the downstream passage conveyance design to reduce impact velocities and shear stresses (e.g., pump-back system; gradient reduction; piping, lining); • Modify the downstream passage conveyance design to increase water depth; • Modify the area of flow convergences of the trash trough, Uniform Acceleration Weir, eel pipe, and sluiceway;	Initial Effectiveness Testing at Cabot Station and Station No. 1: **Years 6-7**. Initial Effectiveness Testing at Turners Falls Dam Plunge Pool and Round 1 Effectiveness Testing for any AMMs implemented at Cabot Station and/or Station No. 1 (if needed): **Years 10-11**. Round 2 AMM Effectiveness Testing at Cabot Station and/or Station No. 1 (if needed) and Round 1 Effectiveness Testing at Turners Falls Dam Plunge Pool (if needed): **Years 14-15** Round 3 AMM Effectiveness Testing at Cabot Station and/or Station No. 1 (if needed) and Round 2 Effectiveness
Adaptive Management Measure (if needed)	**Timing**
• Modify the area of flow convergence of the sluiceway and the receiving waters in the Connecticut River (*e.g.*, adjustable lip, velocity control, and plunge pool depth)	Testing at Turners Falls Dam Plunge Pool (if needed): **Years 18-19**

17. Upstream Fish Passage Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Testing (Proposed Article A330, as amended)

Initial Effectiveness Testing of Adult American Shad- Years 10 and 11

The Licensee shall conduct initial effectiveness testing in Years 10 and 11 (see Article 310) to evaluate upstream fish passage efficiency and time-to-pass at the Cabot Station tailrace, Rawson Island, Station No. 1 tailrace, and at the Spillway Lift through the Gatehouse Ladder exit and compare the findings to

the performance goals in Article 310. The Licensee shall develop a report by February 1 of Years 11 and 12 for adult American Shad summarizing the effectiveness study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and determine what, if any, Tier 1 adaptive management measures (AMMs) from the table below may be implemented.

The Licensee's implementation of Tier 1 AMMs, if warranted, shall be informed by the initial effectiveness testing results. While the overall passage efficiency goal is 75% in 48 hours, there are four locations (or nodes) of interest, where the Licensee can provide enhancements as part of the AMMs for upstream passage efficiency including Cabot Station, Rawson Island, Station No. 1 and the Spillway Lift. If the individual passage efficiency at all four locations is 90% or higher, or if the overall passage efficiency goals are met, no Tier 1 AMMs will be implemented. If the individual passage efficiency at any of the four locations is less than 90%, the Licensee shall target Tier 1 enhancements to achieve an individual location passage efficiency of 90% or higher. However, if the Licensee, MDFW, NFMS, and USFWS agree that improvements can be made at other nodes that would improve the overall passage efficiency a comparable amount as an enhancement to achieve an individual location/node to at least 90%, then that enhancement can be implemented.

If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement the Tier 1 AMMs.

Tier 1 Adaptive Management Measures Effectiveness Testing of Adult American Shad- Years 13 and 14

The Licensee shall conduct Tier 1 AMM effectiveness testing in Years 13 and 14 and conduct the following:

- The Licensee shall compare the effectiveness study results to the performance goals in Article 310.
- The Licensee shall provide the effectiveness study report to MDFW, NMFS and USFWS by February 1 of Years 14 and 15.
- At the election of the Licensee, the Licensee may provide the effectiveness study report to an Independent Peer Review Panel (IPRP) of experts to evaluate the study results. The IPRP shall consist of one member selected by the Licensee, one member selected collectively by MDFW, NMFS, and USFWS, and one member selected jointly by the Licensee, MDFW, NMFS, and USFWS. After the IPRP's review of the effectiveness study findings, the IPRP shall evaluate the ability to achieve the upstream fish passage performance goals in Article 310 and provide a summary report of its findings to the Licensee, MDFW, NMFS, and USFWS within 3 months of receiving the effectiveness study report.
- If the 75% passage efficiency/48-hour time-to-pass performance goal is not met, the Licensee shall consult MDFW, NMFS, and USFWS to determine whether the 75% passage efficiency goal is achievable or should be reduced, and/or the 48-hour time-to-pass goal is achievable or should be increased. Any modifications to the 75% passage efficiency/48-hour time-to-pass must be agreed to by the Licensee, MDFW, NMFS, and USFWS.
- The Licensee shall consult MDFW, NMFS, and USFWS to determine what, if any, AMMs will be implemented.
- The Licensee shall file the effectiveness study report and documentation of any AMMs with

the Commission.

If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement either the remaining Tier 1 AMMs and/or Tier 2 AMMs.

Tier 1 and/or Tier 2 Adaptive Management Measures Effectiveness Testing of Adult American Shad- Years 18 and 19

The Licensee shall conduct any Tier 1 and/or Tier 2 AMM effectiveness testing in Years 18 and 19 and conduct the following:

- The Licensee shall compare the effectiveness study results to the performance goals in Article 310.
- The Licensee shall provide the effectiveness study report to MDFW, NMFS and USFWS by February 1 of Years 19 and 20.
- The Licensee shall file the effectiveness study report and documentation of any AMMs with the Commission.

If, after the Licensee implements additional Tier 1 AMMs and/or Tier 2 AMMs, the overall passage efficiency is greater than 65% or a lesser number as agreed to by the Licensee, MDFW, NMFS, and USFWS, and the overall time-to-pass is less than 60 hours or a higher number as agreed by the same group, then MDFW, NMFS, and USFWS will not exercise any reserved or other regulatory authority to require additional upstream fish passage measures or operational changes. While MassDEP includes the preceding sentence from the proposed articles to acknowledge it, MassDEP does not believe it is necessary to comply with the SWQS. It is not inconsistent with meeting the SWQS.

While MassDEP includes the following provision from the proposed articles to acknowledge it, MassDEP does not believe it is necessary to comply with the SWQS: MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding upstream passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, MDFW, NMFS, and USFWS have agreed, consistent with the terms of the settlement agreement, that they will not request or require Cabot Station shutdowns or a lift at Cabot Station over the life of the license. MassDEP adds that the provision is not inconsistent with meeting the SWQS.

Effectiveness Testing of Juvenile American Eel- Year 14

The Licensee shall conduct effectiveness testing in Year 14 to evaluate the internal efficiency of the permanent eelway structure(s) and compare the findings to the performance goals in Article 310.

Upstream Adaptive Management Measures- Tier 1 and 2

Adaptive Management Measure (if needed)	**Schedule**
Tier 1	
<u>Cabot Tailrace and Rawson Island Nodes</u> Upon license issuance, the Total Minimum Bypass Flow below Station No. 1 from June 1 to June 15 is 4,500 cfs (see Article A120). This AMM includes increasing the Total Minimum Bypass Flow below Station No. 1 from June 1 to June 15 to	Years of Initial Effectiveness

6,500 cfs until 90% of the American Shad run enter the Spillway Lift, upon which the Total Minimum Bypass Flow below Station No. 1 will revert to 4,500 cfs. If this adaptative management measure is enacted and after two years of effectiveness testing, it improves the fish passage efficiency and time-to-pass goals, this change may be implemented throughout the remainder of the license, subject to other adaptive management measures. However, even after this change, the 6,500 cfs shall revert to 4,500 cfs when 90% of the adult American Shad run enter the Spillway Lift before or within the June 1 to 15 period. The indicator as to when the 90% of the adult American Shad run passes shall be determined using a predictive model to be developed by the Licensee in consultation with MDFW, NMFS, and USFWS. The Licensee shall file with the Commission the predictive model results within 6 months of license issuance and it shall be updated and/or refined with data collected over intervening years. If this change is implemented, from June 1 to June 15, the Minimum Flow below the Turners Falls Dam (Article A110) must be 4,290 cfs or the NRF, whichever is less; and the Total Minimum Bypass Flow below Station No. 1 (Article A120) must be 6,500 cfs or the NRF, whichever is less. <u>Station No. 1 Node</u> Shift the distribution of the Total Minimum Bypass Flow below Station No. 1 (Article A120) to increase the Total Minimum Flow below Turners Falls Dam (Article A110) from April 1 to June 30 until 90% of the adult American Shad run enter the Spillway Lift, upon which it shall revert back to the flow requirements in Articles A110 and A120. The Total Minimum Bypass Flow below Station No. 1 remains the same from April 1 to June 30 as described in Article A120. <u>Spillway Lift</u> Adjust the new plunge pool release and/or bascule gate operation and/or, Adjust the new fish lift attraction water and entrance conditions and/or, Adjust the timing and frequency of lift operations and/or; Adjust the entrance gate.	Testing: **Years 10-11** Time Needed to Implement AMM(s): **Year 0** since all Tier 1 AMMs are operational Years of Post AMM Effectiveness Testing: **Years 13-14**

Adaptive Management Measure (if needed)	Schedule
Tier 2	
Cabot Tailrace Node Install a behavioral barrier near the Cabot Station tailrace to guide fish upstream for passage at the Turners Falls Dam. If this AMM is implemented, then the Total Minimum Bypass Flow below Station No. 1 (Article A120) shall be reduced from 6,500 cfs to 4,500 cfs (Tier 1 AMM) from June 1 to June 15 for the period of testing the Tier 2 measures. At the end of Tier 2 testing (and provided that the 6,500 cfs extension is not needed to significantly improve passage efficiency or time-to-pass at Rawson Island) either the increased flow of 6,500 cfs (June 1 to June 15) shall be implemented or the behavioral barrier but not both unless it is demonstrated that both are needed to make a substantial improvement in passage efficiency or time-to-pass. Rawson Island Node If it is determined that the river channel adjacent to Rawson Island is inhibiting upstream fish passage, then constructing a zone of passage is an AMM. Prior to conducting any work associated with this AMM, the Licensee shall consult MDFW, NMFS, USFWS, recreational boating and Tribal interests and the Massachusetts Natural Heritage and Endangered Species Program (NHESP) on the design of the zone of passage. If the zone of passage is constructed, then the Total Minimum Bypass Flow below Staton No. 1 shall be reduced from 6,500 cfs to 4,500 cfs (Tier 1 AMM) from June 1 to June 15 for the period of testing the Tier 2 measures. At the end of Tier 2 testing (and provided that the 6,500 cfs extension is not needed to significantly improve passage efficiency or time-to- pass at Rawson Island) the 6,500 cfs shall be reduced back to 4,500 cfs. Station No. 1 Node Install a behavioral barrier near the Station No. 1 tailrace to guide fish upstream for passage at the Turners Falls Dam. If this AMM is implemented, then the Turners Falls Dam Spill/Sum of Fall River, Turners Falls Hydro, LLC, Milton Hilton, LLL and Station No. 1 flow split shall be returned to the 67%/33%, respectively, from April 1 to June 30. At the end of Tier 2 testing, either the increased Turners Falls Dam Minimum Flow component of the flow split used in Tier 1 shall be implemented or the behavioral barrier but not both unless it is demonstrated that both are needed to make a substantial improvement in passage efficiency or time to pass. Turners Falls Dam/Fish Lift Node Internal structural modifications to improve hydraulics for fish movement, as necessary.	Time Needed to Implement AMM(s): **Year 15-16** Shakedown: **Year 17** Years of Post AMM Effectiveness Testing: **Years 18-19**

18. Fishway Operating Periods[1] (Proposed Article A340)
The Licensee shall operate the fishways during the following periods:

Upstream eel passage	May 1 to November 15
Upstream anadromous	April 4 to July 15
Downstream passage	April 4 to November 15

[1]Future refinement of the timing on an annual or permanent basis may be made by the MDFW, NMFS, and USFWS based on new information and after consultation with the Licensee.

19. Fish Passage Facilities Operation and Maintenance Plan (Proposed Article A350)
The Licensee shall develop and implement a Fish Passage Facilities Operations and Maintenance Plan (FOMP). The FOMP shall detail how and when the fishways will be operated and describe routine maintenance activities that shall occur both during and outside of the fish passage season. The FOMP shall include a provision to provide annual fishway Operation and Maintenance (O&M) reports that summarize the status of the fish passage facilities, identify needed repairs or equipment replacement, etc. The O&M report shall be submitted to the MDFW, NMFS, and USFWS by January 31 annually. The FOMP shall be developed in consultation with and require approval by the MDFW, NMFS, and USFWS prior to submitting the final FOMP to the FERC for approval.

The FOMP shall be completed no later than 6 months after license issuance for the interim upstream eel passage which shall be placed into service within 1 year of license issuance per Article A300, and for existing fish passage facilities (*i.e.*, Cabot downstream fish bypass; Cabot Ladder; Spillway Ladder; and Gatehouse Ladder). Thereafter, the same FOMP shall be amended by the Licensee within 6 months prior to the following:

- Any fish passage structures are placed into service, as outlined in the schedule in Article A300;
- Any AMM's are placed into service, as outlined in the schedule in Articles A320 and A330; and,
- Any operational or facilities modifications resulting from new information obtained from operation of the fish passage facilities pursuant to the annual O&M reports.

FOMP provisions dealing with facilities that are decommissioned over the term of the license may be dropped from revisions of the FOMP after decommissioning.

<u>Northfield Mountain Project Fish Passage</u>

20. Fish Intake Protection and Consultation (Proposed Condition B200)

Intake Protection
The Licensee shall install a barrier net in front of the Northfield Mountain tailrace/intake, having 3/8-inch mesh on the top and ¾-inch mesh on the bottom. The barrier net design shall be based on the conceptual design in the Amended Final License Application filed with the Commission in December 2020, as modified through consultation with MDFW, NMFS, and USFWS, from June 1 to November 15 to protect out-migrating American Shad and adult American Eel, and shall be operational no later than June 1 of Year 5 after license issuance.

Consultation
The Licensee shall consult and obtain approval from MDFW, NMFS, and USFWS on the barrier net design and on operation and maintenance procedures. The Licensee shall consult MDFW, NMFS, and USFWS at the 30%, 60%, 90% and 100% design plan milestones. The Licensee shall file the 100% design plans with the Commission, along with documentation of consultation with MDFW, NMFS, and USFWS.

The Commission reserves the right to require changes to the design plans. Implementation of the design plans must not begin until the Licensee is notified by the Commission that the design plans are approved. Upon Commission approval, the Licensee shall implement the design plans, including any changes required by the Commission.

21. Initial Intake Protection Effectiveness Testing and Fish Passage Performance Goals (Article B210, as amended)

Initial Effectiveness Testing
The Licensee shall complete construction of the Northfield Mountain barrier net, operate the barrier net for one season (shakedown year), and conduct representative and quantitative effectiveness testing in Years 7 and 8 to evaluate the downstream fish passage survival and time-to-pass compared to the performance goals below.

Consultation Process on Effectiveness Study Plans
For any initial fish passage effectiveness studies and any subsequent fish passage effectiveness studies required after implementing any AMMs described in Article B220, the Licensee shall provide the effectiveness study plans to MDFW, NMFS, and USFWS and request comments on the study plans within 30 days. The Licensee shall consult MDFW, NMFS, and USFWS and obtain their approval on the study plans before conducting the effectiveness study. The Licensee shall file the effectiveness study plans with the Commission, along with any consultation records.

Fish Passage Performance Goals
The Licensee shall compare the effectiveness study results to the following fish passage performance goals:

- 95% of juvenile American Shad arriving 500 meters upstream of the Northfield Mountain Pumped Storage Project tailrace survive migration past the Northfield Mountain Pumped Storage Project tailrace within 24 hours.
- 95% of adult American Shad arriving 1 kilometer upstream of the Northfield Mountain Pumped Storage Project tailrace survive migration past the Northfield Mountain Pumped Storage Project tailrace within 24 hours.
- 95% of American Eel arriving 1 kilometer upstream of the Northfield Mountain Pumped Storage Project tailrace survive migration past the Northfield Mountain Pumped Storage Project tailrace within 48 hours of a flow event. The definition of what constitutes a flow event shall be determined by the Licensee in consultation with MDFW, NMFS, and USFWS during effectiveness study plan development.

22. Downstream Fish Passage- Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Studies (Proposed Article B220, as amended)

Initial Effectiveness Studies- Years 7 and 8

The Licensee shall conduct initial effectiveness testing in Years 7 and 8 (Article B210) to evaluate the fish passage survival and time-to-pass of the newly constructed barrier net and compare the findings to the performance goals in Article B210. The Licensee shall develop a report by February 1 of Years 8 and 9 for adult American Shad and by April 1 of Years 8 and 9 for juvenile American Shad and adult American Eel summarizing the survival study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and determine what, if any, adaptive managements measures (AMMs) may be implemented from the table below. The Licensee shall file a report with the Commission to include the effectiveness testing report and documentation of any AMMs agreed to by the Licensee, MDFW, NMFS, and USFWS, along with any consultation records. If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement any Round 1 AMMs.

Effectiveness Testing of Round 1 AMMs - Years 10 and 11

The Licensee shall conduct Round 1 AMM effectiveness testing in Years 10 and 11. The Licensee shall:

- Compare the effectiveness study results to the performance goals in Article B210.
- Provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 15 and 16 for adult American Shad and by April 1 of Years 11 and 12 for juvenile American Shad and adult American Eel.
- Consult MDFW, NMFS, and USFWS to determine what, if any AMMs may be implemented from the table below.
- File the effectiveness study report and documentation of any AMMs with the Commission.

If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement any Round 2 AMMs.

Effectiveness Testing of Round 2 AMMs - Years 14 and 15

The Licensee shall conduct Round 2 AMM effectiveness testing in Years 14 and 15. The Licensee shall follow the same consultations steps bulleted above; however, the Licensee shall provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 15 and 16 for adult American Shad and by April 1 of Years 15 and 16 for juvenile American Shad and adult American Eel.

While MassDEP includes the following provision from the proposed articles to acknowledge it, MassDEP does not believe it is necessary to comply with the SWQS: MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, they have agreed, consistent with the settlement agreement, not to request or require pumping restrictions at any time over the life of the license. MassDEP adds that the preceding provision is not inconsistent with the SWQS.

Downstream Adaptive Management Measures

Adaptive Management Measure (if needed)	Timing
Northfield Mountain Intake/Tailrace Alter the arrangement and size of the net panels (*e.g.*, extend depth of the smaller panels). Improve maintenance measures for the net.	Initial Effectiveness Testing of Barrier Net: **Years 7-8**. Round 1 AMM Effectiveness Testing (if needed): **Years 10-11** Round 2 AMM Effectiveness Testing (if needed): **Years 14-15**

23. Fishway Operating Periods[1] (Proposed Article B230)
The Licensee shall operate the barrier net for downstream passage from June 1 to November 15.

[1]Future refinement of the timing may be made by the MDFW, NMFS, and USFWS based on new information and after consultation with the Licensee.

24. Fish Passage Facility Operation and Maintenance Plan for Barrier Net (Proposed Article B240)
The Licensee shall develop and implement a Fish Passage Facilities Operations and Maintenance Plan (FOMP) for the barrier net. The FOMP shall detail how and when the barrier net will be operated and describe routine maintenance activities that will occur both during and outside of the downstream fish passage season. The FOMP will include a provision to provide annual fishway Operation and Maintenance (O&M) reports that summarize the status of the barrier net, identify needed repairs or equipment replacement, etc. The O&M report shall be submitted to the MDFW, NMFS, and USFWS by January 31 annually. The FOMP shall be developed in consultation with and require approval by the MDFW, NMFS, and USFWS prior to submitting the final FOMP to the FERC for approval.

The FOMP shall be completed no later than 6 months prior to the barrier net being placed into service, as outlined in the schedule in Article B200. Thereafter, the same FOMP shall be amended by the Licensee within 6 months prior to the following:

- Any AMM's are placed into service, as outlined in Articles B220; and,
- Any operational or facility modifications resulting from new information obtained from operation of the barrier net pursuant to the annual O&M reports.

25. Erosion Mitigation, Stabilization, and Monitoring
Upon license issuance, the Licensee shall comply with and implement the Erosion, Mitigation, and Monitoring Plan at Appendix F.

26. Water Quality Monitoring
Within 1 year after license issuance, the Licensee will finalize a MassDEP-approved Water Quality Monitoring Plan that is based on a Quality Assurance Project Plan (QAPP) and developed in consultation with MassDEP. The QAPP will outline the procedures and methods for collecting,

analyzing and managing the water quality data. It shall also include details on sampling methods, equipment calibration, data management, and quality control procedures. The QAPP shall be resubmitted every 5 years for re-approval and the Licensee shall submit any significant or substantive changes to the QAPP as an addendum to the approved QAPP. The following are minimum requirements:

The sample locations include:

- Barton Cove, Segment MA34122.
- Turners Falls Impoundment, Segment MA34-01 (Stateline to Route 10 Bridge). The sample location shall be approximately 800 feet north of the Route 10 Bridge (near the eastern end of the old Bernardston Road in Northfield), which is consistent with the existing sampling location in the Massachusetts water quality database (42.6853667, -72.47374624).
- Turners Falls Impoundment, Segment MA34-02 (Route 10 Bridge to Turners Falls Dam). The sample locations shall be within the Northfield Mountain tailrace and behind the Turners Falls Dam.
- Connecticut River below Cabot Station, Segment MA34-03 (Turners Falls Dam to confluence with Deerfield River). The sample location shall be located immediately below Cabot Station.
- The above sampling locations may change during development and review of the QAPP and thereafter, if determined by MassDEP to be necessary.

Continuous monitoring equipment shall be checked as needed to ensure functionality, with the expectation that utilizing the proper equipment and implementing sufficient installation and siting methodologies may reduce necessary equipment and installation checks to 1x/month to ensure functionality.

By March 1 following the previous year's monitoring, the Licensee shall provide MassDEP with a report summarizing the previous summers' findings along with the raw data. A data summary and the raw data files shall be submitted contemporaneously but separately from the report. After 5 years of monitoring, the Licensee may request that required monitoring be performed every two years instead of annually. MassDEP shall decide whether to deny or allow such request.

Time of Year/ Sample Frequency/Chemical Constituents

Location	Time of Year	Sampling Frequency	Chemical Constituents
Barton Cove	June, July, August and September	2x/month *Continuous or 1x/week	Total Phosphorus, and chlorophyll a Dissolved oxygen, and temperature

Location	Time of Year	Sampling Frequency	Chemical Constituents
Turners Falls Impoundment, Segment MA34-01	June, July, August and September	2x/month	Dissolved, oxygen, temperature, total phosphorus, and chlorophyll-a
Turners Falls Impoundment, behind the Turners Falls Dam, Segment MA34-02	June, July, August and September	*Continuous profile at 10-foot increments 2x/month	Dissolved oxygen and temperature Total phosphorus, chlorophyll-a, total suspended solids and turbidity
Turners Falls Impoundment, Northfield Tailrace, Segment MA34-02	June, July, August, September	2x/month	Dissolved oxygen, temperature, total phosphorus, chlorophyll-a, total suspended solids and turbidity
Connecticut River below Cabot Station, Segment MA34-03	June, July, August and September	2x/month	Total suspended solids and turbidity

27. Invasive Species Management Plan
Upon license issuance, the licensee shall comply with and implement the Invasive Plant Species Management Plan that is included at Appendix G.

28. Riparian Management Plan

Within two years of FERC license issuance, the Licensee shall submit a draft riparian management plan (plan) to MassDEP for its review and approval for lands that the Licensee owns in fee along the Connecticut River shoreline other than those used for the Specific Project Purposes of power production and Project recreation facilities.

(a) The goals of maintaining a 75-foot vegetated riparian zone on property owned by Licensee along the Connecticut River, where feasible (as determined by MassDEP), are to:

(i) serve as a vegetative filter to reduce non-point source discharges of oil and grease, sediment, nutrients and fertilizers, pesticides, and other contaminants that may be transported to the Connecticut River in overland runoff;
(ii) protect near shore fish, aquatic life, and wildlife habitat from degradation resulting from adjacent uses and disturbances and from alterations to the riparian zone including docks, riprap, and other structural modifications;

(iii) provide significant wildlife habitats and buffers adequate to avoid disturbance from adjacent uses for species utilizing the river and associated wetlands, including but not limited to rare, threatened, or endangered wildlife species, or other state or federally listed species of concern; and
(iv) provide shade and cover, which cools water and air temperatures; increases food and oxygen availability; serves as an area for shelter, breeding, and migratory and overwintering stops; and promotes amphibious organisms.

(b) The plan shall include all lands owned in fee by the Licensee abutting the Connecticut River other than those used for the Specific Project Purposes identified above. The draft plan shall, without limitation:

(i) specify how a 75 foot riparian zone adequate to protect water quality and designated and existing uses will be implemented, subject to (b)(iv) and (b)(v) below, specifically addressing how long-term conservation of important riparian areas will be assured as needed to achieve this objective;
(ii) allow the revegetation and protection of existing vegetation on all Project Lands within 75 feet of the riverbank and prevent any alteration of such land, except to the extent necessary to enhance revegetation or to the extent of a conflict with deeded rights, the Recreation Settlement Agreement filed with FERC on June 12, 2023, or the FERC "Order Modifying and Approving Non-Project Uses of Project Lands and Waters" dated October 28, 2009 (129 FERC 62,075);
(iii) specifically propose how the entire plan will be implemented;
(iv) specify which parcels are excluded from the riparian management plan because they are used for the Specific Project Purposes identified above;
(v) be subject to existing deeded or contractual rights held by third parties with respect to land owned by the Licensee;
(vi) not require the use of Conservation Restrictions or easements, except where required by the Recreation Settlement Agreement; and
(vii) be consistent with G.L. c. 131 § 40, and 310 CMR 10.58.

(c) The Licensee shall incorporate or otherwise respond to all MassDEP comments on the draft plan and submit a final plan to MassDEP for approval. The Licensee shall implement the plan as approved, including any changes required by MassDEP.

(d) The Licensee shall notify MassDEP and MADCR in writing within 30 days of any sale of its lands within the FERC Project Boundary. The Licensee shall provide all purchasers of such lands with a copy of the Riparian Management Plan prior to the sale.

29. Recreation Management Plan
The Licensee shall implement the Recreation Management Plan dated May 2023.

30. Sediment Management Plan
Within one year of license issuance, the Licensee shall file with MassDEP, for its approval, a revised Sediment Management Plan that presently exists for the Northfield Project and incorporates additional supplemental information related to monitoring, reporting, and planning of sediment management for the Northfield pumped storage facility. The revised plan shall include a requirement that following

Northfield monitoring, a report shall be generated and submitted with the collected data, including an evaluation of sedimentation rates that establish a trajectory of potential dredging events, if needed. Based on those identified scenarios and/or thresholds, protocols shall be developed for the movement/management of removed sediment with proposed locations of potential long-term storage/disposal. Following any dredging event, details on construction and discharge monitoring shall be included in the revised plan.

31. Consideration of Climate Change on Fish Passage

The Licensee shall comply with schedules provided by USFWS with respect to the timing of opening and closing of its migratory fish passage facilities at the Turners Falls Hydroelectric Project and the timing of installing/removing the barrier net at the Northfield Mountain Pumped Storage Project. The USFWS schedules can account for climate-induced changes in migration timing for affected fish, including American Shad and American Eel. On an annual basis, the Licensee shall comply with the USFWS' schedule for opening and closing the fish passage facilities, with particular attention to the USFWS' adjustments to address climate change.

32. Turners Falls Canal Drawdown Aquatic Organism Protection

Within one (1) year of license issuance, the Licensee shall file for Commission approval, a Turners Falls Canal Drawdown Aquatic Organism Protection Plan (Plan), describing measures the Licensee will implement to minimize impacts to aquatic organisms during the annual canal drawdown. The Plan shall be developed in consultation with the USFWS, MassWildlife, and MassDEP. The Plan, along with the consultation record, shall include the following:

a) Procedures for the Canal drawdown including:
   - conducting the annual canal drawdown no earlier than mid-September;
   - drawing down the canal at the rate used in 2014 until the Canal Drawdown Team (discussed below) identifies a permanent rate of canal water level drawdown that sufficiently protects aquatic resources in the canal;
   - installing cones in the canal to identify paths for large machinery to follow while undertaking maintenance work in the canal during the drawdown.

b) Creation of a temporary Canal Drawdown Team (Team) comprised of the Licensee, USFWS, MassWildlife, and MassDEP for the purpose of identifying additional measures beyond those listed in item a) above, if needed, to minimize stranded and/or dewatered organisms during the canal water level drawdown. For the first, second, and third canal drawdowns after license issuance, the Team shall meet twice a year to discuss the proposed procedures for the next canal drawdown, alternative measures to minimize impacts to aquatic organisms, whether to implement the alternatives, and any information needs. After the third canal drawdown, the Team shall update the Plan in item a) above, if needed, and file it, along with consultation record with FERC for approval. Upon FERC's approval, the Licensee shall implement the Plan and the Team may be disbanded.

c) Until and unless the measures implemented pursuant to item (b) conflict, the Licensee shall continue to allow public access to the dewatered portion of the canal for scientific and environmental outreach and education activities, such as volunteer aquatic life rescue efforts during the drawdown, and maintain communication and coordination with the USFWS'

Connecticut River Coordinator.

33. Bald Eagle Protection Plan
The Licensee shall implement the Bald Eagle Protection Plan at Appendix H.

34. Bat Protection Measures
The Licensee shall implement the following measures to protect state or federally listed bat habitat: (1) avoid cutting trees equal to or greater than 3 inches in diameter at breast height within the Northfield Mountain Pumped Storage Project boundary from April 1 through October 31, unless they pose an immediate threat to human life or property (hazard trees); and (2) where non-hazard trees need to be removed, only remove non-hazard trees between November 1 and March 31.

Notice of Appeal Rights

Within 21 days of the issuance of MassDEP's decision to grant, grant with conditions, or deny a water quality certification pursuant to Section 401 of the federal Clean Water Act, the following persons shall have a right to request an adjudicatory hearing concerning MassDEP's decision:

a. the applicant;
b. any person aggrieved by the decision who has submitted written comments during the public comment period;
c. any ten persons of the Commonwealth pursuant to M.G.L. c. 30A, § 10A, where a group member has submitted written comments during the public comment period; or
d. any governmental body or private organization with a mandate to protect the environment, which has submitted written comments during the public comment period.

Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice.

How should the request for an adjudicatory hearing be made?

A request for an adjudicatory hearing concerning DEP's Section 401 water quality certification of the FERC license must be made within 21 days of the issuance of MassDEP's decision to grant, grant with conditions, or deny the water quality certification, in accordance with 310 CMR 1.01. 310 CMR 1.01(6)(b) establishes the required form and content of the request. Failure to meet the requirements of 310 CMR 1.01 may result in dismissal of the request or the requirement to file a more definite statement.

A person filing a request for an adjudicatory hearing must complete and mail a MassDEP Fee Transmittal Form for the request and send it with a valid check to the Commonwealth Master Lockbox, as instructed below, if a fee is required by 310 CMR 4.06. The MassDEP Fee Transmittal Form can be downloaded from:

https://www.mass.gov/doc/adjudicatory-hearing-fee-transmittal-form/download

The written notice requesting an adjudicatory hearing shall be delivered to MassDEP's Case Administrator together with (i) a photocopy of the decision being appealed, (ii) a photocopy of the completed MassDEP Fee Transmittal Form, if required, and (iii) a photocopy of the check used to pay any adjudicatory hearing filing fee due for the appeal under 310 CMR 4.06.

The notice of claim and other items can be sent to OADR by mail (MassDEP Office of Appeals and Dispute Resolution, Case Administrator,100 Cambridge Street, Suite 900, Boston, MA 02114), hand delivery, e-mail (Caseadmin.OADR@mass.gov) or fax ((617) 574-6880) (further information at https://www.mass.gov/how-to/file-an-appeal-with-massdeps-office-of-appeals-and-dispute-resolution).

Please do *not* send the original of the completed MassDEP Fee Transmittal Form and check to the Case Administrator. Instead, please follow the instructions below for delivery of the original of the completed Fee Transmittal Form and check to the Commonwealth Master Lockbox.

A $100 adjudicatory hearing filing fee must be paid, unless (i) a simplified hearing is requested for a reduced fee of $25; (ii) the person requesting an adjudicatory hearing is a city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority effective January 14, 1994, or any municipal housing authority, in which case there is no fee; or (iii) the person requesting the hearing is seeking to have MassDEP waive the adjudicatory hearing filing fee because paying the fee will create an undue financial hardship.

A person who believes that payment of the fee would be an undue financial hardship shall file with the request for adjudicatory hearing a request for waiver of the fee together with an affidavit setting forth the facts the appellant believes constitute the undue financial hardship. For more information on the adjudicatory hearing filing fee and the grounds on which the Department may waive the fee, please see 310 CMR 4.06.

If a fee is required, the completed MassDEP Fee Transmittal Form and a valid check made payable to the Commonwealth of Massachusetts for the amount of the fee due must be mailed to:

Mass. Department of Environmental Protection
Commonwealth Master Lockbox
P.O. Box 4062
Boston, Massachusetts 02211

Failure to pay the adjudicatory hearing filing fee, if required, may be grounds for dismissal of the appeal.

Submissions under this Certification shall be sent to:

MassDEP:

Massachusetts Department of Environmental Protection
Bureau of Water Resources
Division of Wetlands and Waterways
100 Cambridge Street, Suite 900
Boston, MA 02114

Massachusetts Department of Environmental Protection
Bureau of Water Resources
Western Regional Office
436 Dwight Street
Springfield, MA 01103

MassWildlife:

Massachusetts Division of Fisheries and Wildlife Field Headquarters
Assistant Director of Fisheries
1 Rabbit Hill Road
Westborough MA 01581

Massachusetts Division of Fisheries and Wildlife
Assistant Director of Natural Heritage & Endangered Species Attn: Regulatory Review
I Rabbit Hill Road
Westborough MA 01581

USFWS:

United States Fish and Wildlife Service
New England Field Office
Attention: Supervisor
70 Commercial Street, Suite 300
Concord, NH 03301-5087

_____

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection

_____

Date

Appendix A
MassWildlife, State Listed Plans of Focus

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

May 2024, STATE-LISTED PLANTS OF FOCUS IN THE BYPASS REACH FOR TURNER'S FALLS RELICENSING

Tufted Hairgrass, *Deschampsia cespitosa* ssp. *glauca* (MESA Endangered)

- *Fact Sheet:* https://www.mass.gov/doc/tussock-hairgrass/download

- *Occurrence & Habitat in Massachusetts*: *Deschampsia cespitosa* ssp. *glauca* (Tufted Hairgrass) is native, long-lived grass found on river-scoured bedrock, cobble and gravel shores along a small portion of the Connecticut River in Massachusetts. In Massachusetts, the largest extant native occurrence is located within the bypass reach of the Turners Falls Dam (TFD); the majority of these plants are found in the plunge "pool" just downstream of the TFD, although there are a few smaller occurrences between the "pool" and the end of the bypass reach (Reach 3). There has recently been a single small occurrence identified in the upper impoundment, representing the only known location of this species located outside of the bypass reach in Massachusetts. Historically, a population was reported in the Merrimack River but has not been observed in the last 25 years.

  Range Habitat and Description: Habitat described for other members of *D. cespitosa* range from wetlands including wet meadows, upper marsh zones along saltmarshes, to river shorelines. Even within the *glauca* sub-species, high phenotypic trait plasticity is observed. Tufted Hairgrass is noted as being present in portions of the southeastern United States (NC, SC), southern Illinois, and Alaska. The current New England range of Tufted Hairgrass includes the Connecticut River in Connecticut, Massachusetts, Vermont, and New Hampshire, as well as the bigger rivers in northern Maine (Penobscot, Kennebec, etc.).

  However, in Massachusetts Tufted Hairgrass is exclusively observed in limited areas of the bypass reach and a single area of the TFD impoundment of the Connecticut River. These areas are heavily scoured by powerful spring flows and ice but are then not inundated during the growing season except during occasional, temporary large-scale storm events. Flowers are wind pollinated and seed dropped on bare or nearly bear soils and rock. Tufted Hairgrass requires significant periods of dry, exposed conditions during the growing season to flower, distribute pollen by wind, and set seed.

- *Wetland Classifications (*biotics; species level): New England, facultative wet (found in an area considered a wetland) where it is associated with large rivers with high, scouring flows in spring and rocky and gravelly shorelines, river shore cliffs and outcrops. New Hampshire lists it as characteristic of calcareous riverside seeps and acidic riverbank outcrop.

Tradescant's Aster, *Symphyotrichum trandescantii* (MESA Threatened)

- *Fact Sheet*: https://www.mass.gov/files/documents/2016/08/uv/symphyotrichumtradescantii.pdf

- *Occurrence & Habitat in Massachusetts:* The Tradescant's Aster occurs at two locations in Massachusetts: (1) within the bypass reach of the Turners Falls Dam and (2) within the impoundment

of the Holyoke Dam. Numbers are relatively equal between these areas. Relative to Tufted Hairgrass, Tradescant's Aster co-occur from the lowest Tufted Hairgrass elevation but extend further up the banks (i.e., to a higher elevation than TH) until it is outcompeted/shaded out by upper elevation plants.

- *Range Habitat and Description*: A New England native wetland/riparian plant; also considered endemic. Its currently found in the Connecticut River basin in Massachusetts, Vermont, and New Hampshire. There are disjunct populations in Maine, but it is absent from Rhode Island southward. Habitat in these locations includes gravelly and sandy habitats of certain lakeshores and streams. Tradescant's Aster is small-insect pollinated.

- *Wetland Classifications* (biotics; species level): facultative wet (most of the time always found in an area considered a wetland).

Summary of Concerns (2018):

Inundation of these plants outside of seasonal norms will impact reproduction (from the formation of the flowers through pollination and seed dispersal). In normal river systems, a single year or even several years of rainy summers would impact reproductive success. But, reproductive failure from extremely rainy or highwater years would not occur with a high frequency, and populations are able to rebound from such variations and thrive during normal and dry years.

The current flows out of TFD (upper bypass reach) in summer are around 120-140 cfs and have been for decades. Changing these low summer flows to upward of 2000 cfs (2000 cfs requested by CRC; 2500-4500 cfs for whitewater boaters), will functionally introduce high spring floods year-round into this otherwise dry section of the upper bypass reach. We believe persistent inundation would lead to a catastrophic loss of these populations and, potentially, permanent extirpation of Tufted Hairgrass from Massachusetts. This would be inconsistent with the spirit, intent, and requirements of the MA Endangered Species Act and its implementing regulations.

A qualified botanist observed both Tradescant's Aster and Tufted Hairgrass during flow demonstrations on November 12, 16 and 17, 2018. The observer was located on the tiny island in the middle of the "pool" immediately below the TFD (before it turns sharply southward) and observed plants at 120, 500, 1500, 2500 and 4000 cfs. They found that approx. 40% of Tradescant's Asters and their habitat at this site were inundated at 500 cfs and 90% at 1500 cfs. For Tufted Hairgrass, 30% were inundated at 500 cfs and nearly 100% by 1500 cfs. There were no test flows between 500 and 1500 cfs, but the observer felt 100% inundation occurred closer to 500 cfs than 1500 cfs.

Summary of Concerns (Updated 2024)

FirstLight prepared a rare plant impact analysis in 2017 as part of settlement negotiations (see October 2017 Non-Public Report; analyzing all rare plants in the bypass area of study). FirstLight conducted botanical surveys in 2017 and analyzed potential impacts to rare plant populations across different flows. However, FirstLight only collected data on the relative population size, extent and elevational range of

each sub-population[1] (but not the distribution of plants along elevational ranges). For purposes of modeling impacts, FirstLight assumed that rare plants were evenly distributed elevationally within each sub-population (e.g., if 100 plants were observed over 12 vertical inches, FirstLight assumed that plants occurred evenly over that elevational range, so 10 plants per vertical inch). Under this assumption, the analysis suggested that in most cases impacts increased gradually and incrementally with increased flow, with severe impacts not seen until significant flows were reached. Although DFW understood why this assumption was used in the model, based on knowledge of DFW botanists we questioned if the assumption of even distribution across elevations was accurate. DFW also highlighted that, if plants were not evenly distributed along across elevational ranges, FirstLight's impact assessment was likely inaccurate.

In late 2021, FirstLight undertook a thru-paddling study of the bypass reach. DFW used this as an opportunity for DFW botanists to observe Tradescant's Aster and Tufted Hairgrass in the plunge "pool" below TFD during the test flows and ground truth the equal distribution assumption discussed above. DFW botanists confirmed that the earlier assertions of DFW botanists were correct and that plants were not evenly distributed across elevational ranges. Instead, plants typically clustered with larger numbers at lower elevations and just a few at the highest elevations (e.g., if 100 plants were observed, there might be 50 plants at the lowest elevation, 30 plants 1 inch higher and so on up to just a few at the highest elevation).

Further, DFW botanists performed additional surveys for Tufted Hairgrass in Reach 1 during the thru-paddling study and, specifically, in the plunge "pool" area just downstream of TFD where the highest concentrations of Tufted Hairgrass and Tradescant's Aster are found. DFW botanists observed the estimated inundation of Tufted Hairgrass and Tradescant's Aster at the various test flows during the study. We note that test flows from TFD were supposed to range between 500 cfs and 1,100cfs, but FirstLight had trouble calibrating flows and was unwilling to repeat the study given that boatable flows were observed at the highest actual test flow of 545cfs.

DFW field findings and subsequent analyses for Tufted Hairgrass from these observations and prior data collection include:

- Tufted Hairgrass habitat can be viewed as a horizontal band of habitat in the bypass reach that is characterized by high scour in spring/fall and likely ice scour in winter. The horizontal extent is limited by suitable substrate that give Tufted Hairgrass and Tradescant's Aster an advantage, as both are capable of rooting in very limited soil (i.e., rock crevices/cracks) and withstanding persistent high flows outside the growing season. The vertical lower extent of habitat is limited by persistent inundation. The vertical upper extent is limited by the extent of high scour from flows and ice. In this area of the bypass reach, almost all of the rocks are not very tall. So, the increase in water surface elevation from increased flows will only decrease the amount of habitat available as no additional habitat exist as the rocks are quite short. On the shores of the "pool" the rocks make up the bank, but the vertical limit of habitat for these two plants is limited by the depth of scour from ice/seasonal flows and substrate.

[1] For purposes of this document, sub-population is used to refer to a grouping of plants in a geographic area that were identified to intersect with the hydraulic node model developed by FirstLight.

- At a spill of 376 cfs, we anticipate impacts at >23% of total plants (and potentially as high as 40%). There is a transition point somewhere between 276 and 376 cfs where impacts jump from <5% to >23% (at minimum).

- At a spill of 545 cfs, we anticipate impacts at >41% (and potentially as high as 60%). 2018 qualitative observations estimated ~30% impact at 500 cfs, which increases confidence in the 2021 estimate.

- At a spill of 1,500 cfs, we anticipate impacts at >95% (based on 2018 qualitative observations). Notably, we don't have concrete WSELs above 545 cfs. During 2022-23 discussions with CRC and others, we affirmed that it was challenging to consider flows above 545 cfs because we don't have quantitative data sufficient to enable concrete impact assessment, and that the qualitative data we do have suggests that impacts continue to increase rapidly above this flow.

- As no test flows were conducted between 545 and 1500 cfs and we know the plants are not linearly distributed by elevation, we cannot estimate impacts within this range with certainty. However, DFW botanists anticipate that most plants would be inundated quickly above the 545 cfs test flows. If we make the assumption of linear distribution elevationally – which although inaccurate, can enable us to estimate minimum impacts under higher flows - we could see >67% of the population impacted at a spill of 1,000 cfs (as proposed by CRC in June 2022). However, it is important to note again that this is a conservative estimate of potential impacts. All available quantitative and qualitative data indicate that plants occur at highest concentrations at lower elevations, and the 2018 qualitative observations suggest that impacts of >95% occur closer to 500 than 1,500 cfs.

- These are *minimum* estimates; actual impacts may be significantly higher.

Overall, DFW field observations and analyses confirmed that both Tufted Hairgrass and Tradescant's Aster are clustered in lower elevations and that increased flows rapidly lead to extensive inundation of both plants in the plunge "pool" area. This is consistent with the 2018 qualitative observations, and is contrary to FirstLights' October 2017 report, which assumed that plants were evenly distributed elevationally and that impacts increased incrementally as flows increase.

Although DFW did not collect additional field data on the sub-populations located further downstream in the bypass reach, we anticipate that similar trends would be observed there based on the models presented by FirstLight and how plants were distributed elevationally in the upper bypass reach. Sub-populations further downstream in the bypass reach will likely be heavily impacted under the proposed minimum summer/fall flows below Station 1 (1,500-1,800 cfs, Fish and Flows Agreement) than was previously estimated. However, in consideration of other species', recreational and tribal interests, DFW elected not to push for further reductions in TFD spill flow during 2022-23 settlement discussions. Instead, DFW agreed to flows of 500 cfs below TFD during the summer months despite the still significant impacts (>30-40%) that are likely to occur to the primary plunge pool sub-population.

If flows in the bypass reach were to be re-balanced by decreasing Station 1 flows and increasing spill flows from TFD to 1,500-1,800 cfs, we would see inundation and loss of >95% of Tufted Hairgrass populations - and most of Tradescant's Aster populations – in the bypass reach. For Tufted Hairgrass specifically, this would mean a >95% loss to the only known population of this sub-species in Massachusetts. While there is a small occurrence of Tufted Hairgrass in the impoundment, it does not meaningfully contribute to the

conservation of Tufted Hairgrass; in addition, DFW does not anticipate long-term persistence of this sub-population under the anticipated increase in impoundment variability needed to help FirstLight naturalize flows downstream of Cabot Station. Although this will likely impact this and other rare plants in the impoundment, DFW agreed to this increased operational flexibility with the understanding that protection of rare plants in the plunge pool area of the upper bypass reach would be prioritized over habitat for common native fishes and generalized macroinvertebrates, which are poised to see substantial and broad benefits under the proposed Fish and Flows Agreement. Under the Agreement, generalist species will experience dramatic year-round expansion of habitat quantity and quality throughout the bypass reach, including Reach 1 where minimum flows in the summer are slated to increase by a factor of 4. We also note that these generalist species will also see dramatic improvements to habitat quality and persistence in the >25 miles downstream of Cabot Station as a result of the flow stabilization measures required under the Agreement.

~end~

Appendix B
Current and Future Exceedance Curves

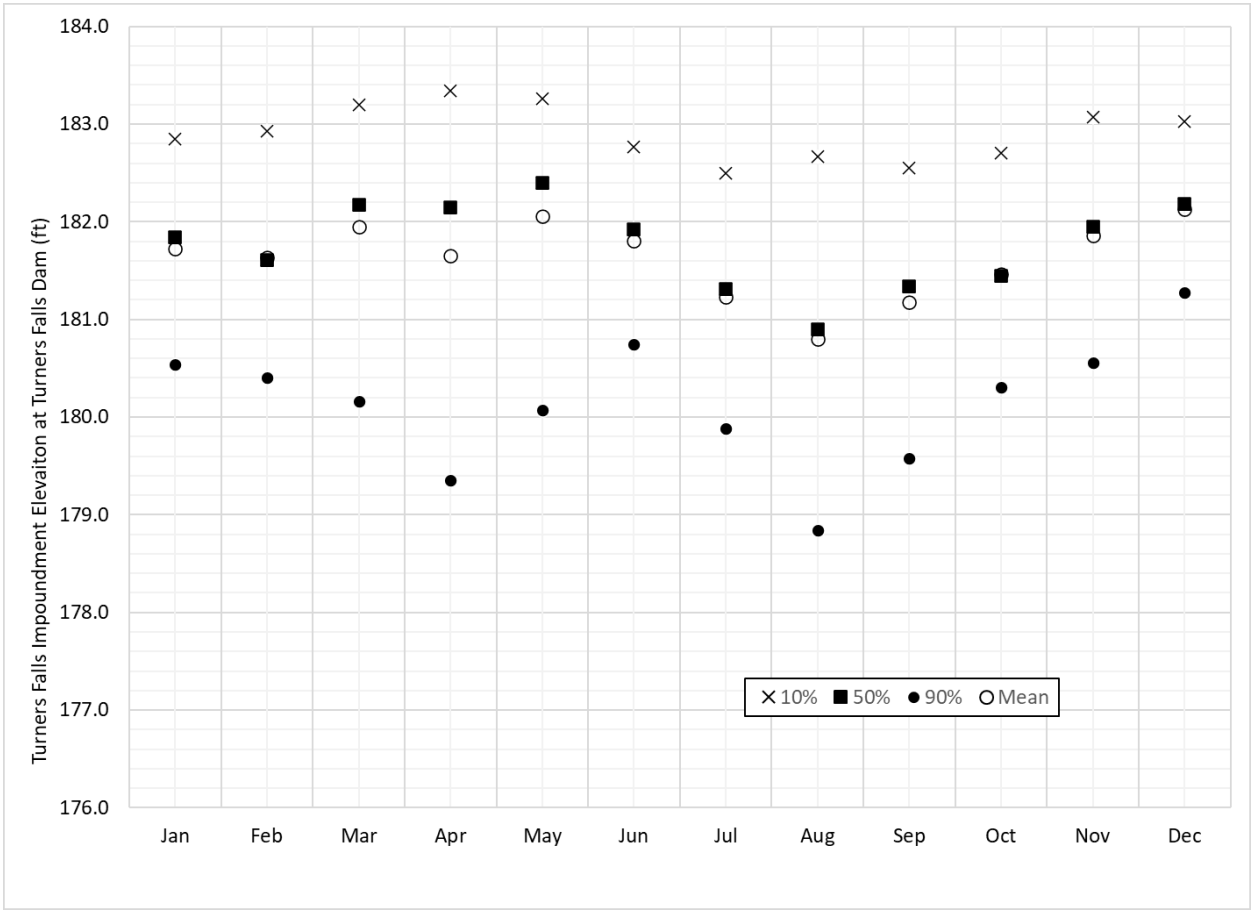

Figure 2. Turners Falls Impoundment- 10, 50, 90% Exceedance Elevations and Mean Elevation under Baseline (Existing) Conditions

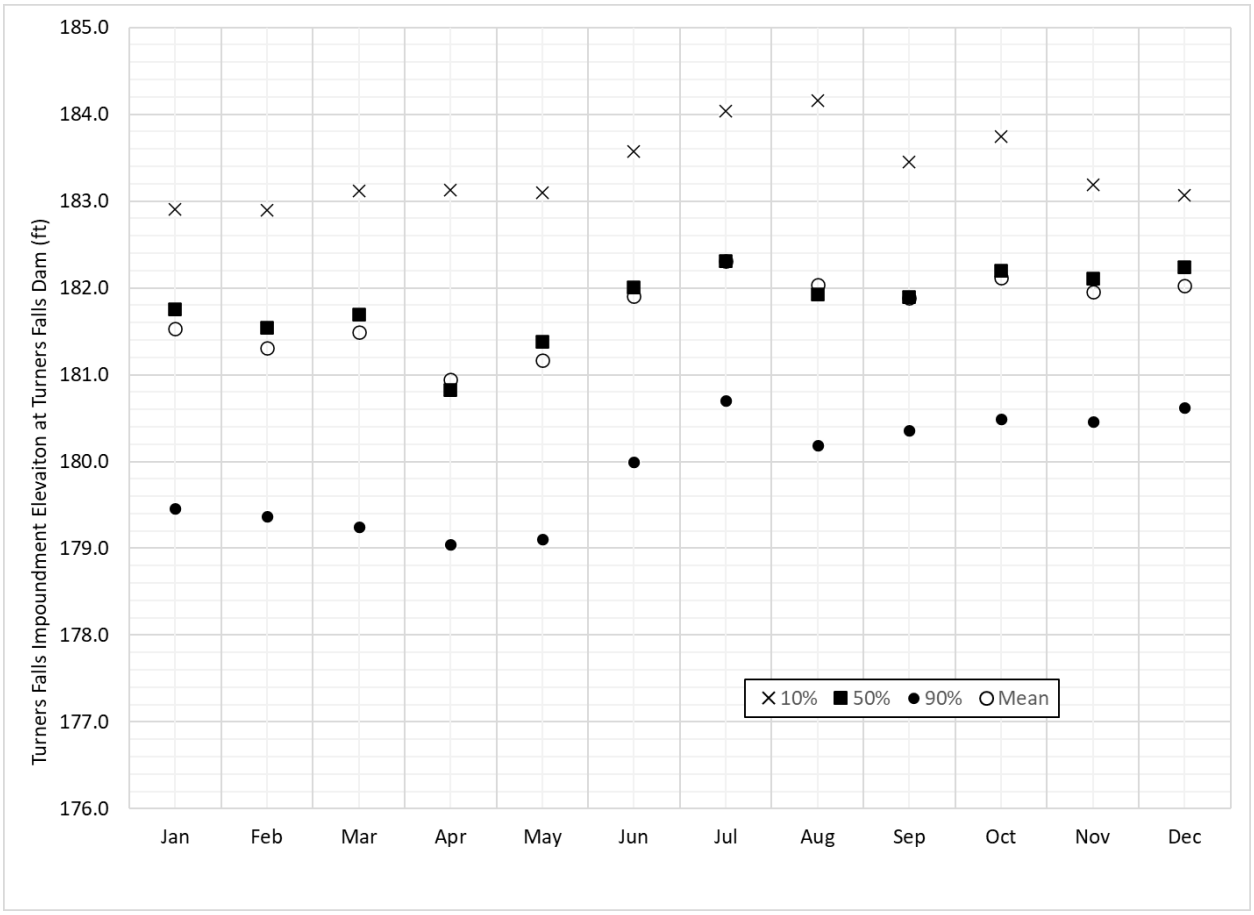

Figure 1. Turners Falls Impoundment- 10, 50, 90% Exceedance Elevations and Mean Elevation under the FFP Settlement Agreement

Appendix C
Drawdown Photos to Approximately 179 Feet

Figure 4.2.5-1 Cabot Camp Access Area

Cabot Camp Access Area –Primary water access site along the Connecticut River. Impoundment elevation at the time of this picture was 179.67 ft.

Figure 4.2.5-2 Cabot Camp Access Area

Cabot Camp Access Area – Trails and water access area at the confluence of the Connecticut River and Millers River. Impoundment elevation at the time of this picture was 179.67 ft.

Figure 4.2.2-1 Pauchaug Boat Launch

Pauchaug Boat Launch – showing narrow channel cut and accumulated sediment on both sides of boat launch. Turners Falls Impoundment elevation at the time of this picture was 180.3 ft.

Appendix D
Drawdown Photos Below 179 Feet

Appendix E
June 14, 2021 Drawdown Photos Below 179 Feet


11:04
Bryan Hobbs
YESTERDAY AT 3:55 PM

"Low Water Levels for parts of Connecticut River in Franklin County."
22 News, WWLP.com (W. Massachusetts), June 14, 2021,
https://www.wwlp.com/news/local-news/franklin-county/low-water-levels-for-parts-of-connecticut-river-in-franklin-county/

Appendix F
Erosion Mitigation, Stabilization, and Monitoring Plan

Erosion Mitigation, Stabilization, and Monitoring Plan

Repair & Stabilize Certain 2013 FRR Sites: Within 6 years of license issuance, the Licensee shall repair and stabilize all previously stabilized sites in the TFI where the 2013 Full River Reconnaissance (2013 FRR) identified erosion and the sites have not already been repaired since 2014. These sites include bank segments 14, 371, 65, and 478 that were delineated during the 2013 FRR, equaling approximately 429 linear feet. *See* Table D-1 below.

Additional New Sites to be Stabilized. In addition to the completed stabilization projects noted above, within 6 years of license issuance, the Licensee shall implement stabilization or preventative maintenance projects at three additional sites within the TFI, which equate to an additional 667 linear feet. These sites were identified during the 2013 FRR as having the most erosion of the banks within Massachusetts that had not already been stabilized. These sites include bank segments 90, 87, and 119 that were delineated during the 2013 FRR, equaling approximately 667 linear feet. *See* Table D-1 below.

Table D-1. Specific Stabilization Sites

Bank Segment[70]	River Station (approx.)	Segment Length (ft.)	Previously Restored Site	Restoration Site Name
New Sites				
90	320+00	62	No	N/A
87	300+50	208	No	N/A
119	400+50	397	No	N/A
	Sub-Total	**667 ft**		
Previously Stabilized Sites				
14	70+00	145	Yes	Montague
371	50+50	37	Yes	Campground Point
65	240+50	147	Yes	River Road
478	570+00	100	Yes	Bennett Meadow
	Sub-Total	**429 ft**		

Erosion Control Monitoring Plan: Within 1 year of license issuance, the Licensee shall consult with MassDEP to develop an Erosion Control Monitoring Plan that sets forth the methods and procedures for documenting shoreline erosion for the term of the license and conducting the surveys and inspections discussed below. The Erosion Control Monitoring Plan shall be implemented beginning in year 2 of the new license with the baseline survey.

Erosion Monitoring Surveys (Years 2, 10, 20, and 30): Within 2 years of license issuance, the Licensee shall conduct an initial Erosion Monitoring Survey of the TFI within Massachusetts to serve as a baseline. This baseline survey and the subsequent 10, 20, and 30 year monitoring surveys must, at a minimum, comply with the Quality Assurance Project Plan (QAPP) that was established for the 2013

[70] Bank segment ID corresponds to the TFI bank segments delineated during the 2013 FRR.

FRR or any subsequent QAPPS. Erosion Monitoring Survey's shall consist of boat-based reconnaissance surveys of the Massachusetts portion of the TFI. During the boat-based survey, a field crew shall delineate bank segments based on common bank features, characteristics, and erosion conditions as defined in the Erosion Monitoring Plan. The field crew shall also collect video of the banks during the survey. The Erosion Monitoring Surveys shall occur in November during leaf-off conditions.[71]

Following the completion of each Erosion Monitoring Survey, the Licensee shall prepare a report summarizing the survey methods and results and submit it to MassDEP for review and approval in the first quarter of the year following the Erosion Monitoring Survey. The report shall also identify new and previously repaired bank segments needing stabilization or preventative maintenance. Once approved, the report shall be filed with FERC.

Boat-Based Inspections (Years 4, 6, 8, 12, 15, 25, 35, 45): Boat-based site inspections of the TFI shall be conducted in Years 4, 6, 8, 12, and 15 in November during leaf-off conditions. After Year 15, the boat-based site inspections shall be conducted in Years 25, 35 and 45. The boat-based inspections shall include visual observation of all TFI bank conditions within the Massachusetts portion of the TFI, maintenance inspections of previously stabilized sites, geo-referenced videotape coverage of the entire TFI shoreline, and development of a summary memo and maps detailing the results of the inspection, including any new erosion that was not part of a previously stabilized site or in Table 1. The level of detail of the video shall be sufficient to observe any visual indicators of potential erosion, including absence of vegetation, exposed tree roots, visible gullies or rills, muddy runoff water, large areas of bare soil, collapsing stream banks, sediment deposits, and a noticeable change in shoreline position. The summary memo, geo-referenced videotape coverage, and maps shall be provided to MassDEP for review and approval in the first quarter of the year following each Boat-based Site Inspection. The summary memo shall include a repair and maintenance plan, as needed, for sites requiring repair or preventative maintenance.

The component of the Erosion Control Monitoring Plan that the Licensee develops with MassDEP for these boat-based site inspections shall comply with the recommendations and protocol developed by Dr. John Field, Field Geology Services (Farmington, ME) in July 2011, in a report titled "Detailed Analysis of the 2008 Full River Reconnaissance of the Turners Falls Pool on the Connecticut River, Prepared for Landowners and Concerned Citizens for License Compliance Turners Falls Pool."[72]

Previously Stabilized Site Repair: Except as noted otherwise below, within 5 years of discovery during the Erosion Monitoring Surveys or the Boat-based Site Inspections, the Licensee shall repair and stabilize all previously stabilized sites requiring maintenance or repair that exhibit 'Some to Extensive' or 'Extensive' erosion based on the definitions contained within the 2013 FRR, in addition to the sites identified in Table 1.

[71] These 10-year surveys shall continue until expiration of the license, and thus shall be conducted in years 40 and 50 if the license lasts that long.

[72] These measures include: (1) having clear definitions and examples for bank features, characteristics, and erosion conditions to ensure consistency between future surveys and to assist the survey crew with clearly identifying bank conditions, (2) identifying the types of erosion, indicators of erosion, and stage of erosion, and (3) including a detailed photo log. The Plan shall also include examples so that the methodology will be easily repeatable from survey to survey to ensure the results are comparable. Establishing a clear foundation from which all future surveys shall be based on will ensure consistency over the license term.

The Licensee shall not be responsible for repairing previously stabilized sites that are damaged by high flow or ice conditions unless prior to the high flow or ice event the site was previously categorized as having "some to extensive" or "extensive erosion" and the site had not been repaired or stabilized. "High flow conditions" shall be defined in the Erosion Control Monitoring Plan as at least 100,000 cfs, measured at the USGS Gage on the Connecticut River at Montague City, MA.

Future New Stabilization Sites: Sites that are newly identified after issuance of the license as exhibiting 'Some to Extensive' or 'Extensive' erosion based on the definitions contained within the 2013 FRR and which were not previously repaired or stabilized by anyone nor identified above in Table 1, shall be repaired and stabilized by the Licensee within 5 years of their discovery during the Erosion Monitoring Surveys or the Boat-based Site Inspections, subject to the following limitations:

Sites that shall not be considered for repair and stabilization are those that exhibit unique conditions that are causing the erosion. These sites are limited to those where erosion is being caused by adjacent bridges and tributary mouths; sites where upland management activities having unique conditions are directly impacting erosion processes; Barton Cove where boat waves contribute significantly to erosion; and islands. Bank segments where upland land management activities are identified as resulting in unique conditions causing erosion are those segments where erosion is present and caused by: (1) agricultural activity or other development that is occurring to the edge of the bank with minimal to no riparian buffer (*i.e.*, a riparian buffer that is less than 15 ft. in width), (2) agricultural activity that is occurring along the bank (*e.g.*, livestock climbing up and down the bank from the field to the river), (3) irrigation infrastructure, (4) boat docks, or (5) other non-project related manmade activity that is directly resulting in erosion. In addition, although not man-made, the presence of sensitive wildlife receptors shall also be considered as part of determining the extent to which the site should be stabilized (*e.g.*, bank swallow, belted kingfisher, and bald eagle nesting).

The Licensee shall be responsible for repairing 5% of the total <u>new</u> bank segments identified in the intervals between each of the Erosion Monitoring Surveys (Years 2, 10, 20, and 30), regardless whether they were identified during the above Boat-based Inspections or the Erosion Monitoring Surveys. New bank segments revealing 'Some to Extensive' or 'Extensive' erosion includes any segment not previously stabilized or in Table 1. Following each Erosion Monitoring Survey, the Licensee shall quantify the total linear feet of new bank segments that were identified either during the Erosion Monitoring Survey or during preceding Boat-based Site Inspections as exhibiting 'Some to Extensive' or 'Extensive' erosion. The Licensee shall determine how many linear feet 5% of the total equates to and identify potential stabilization projects that equate to that length. The Licensee and MassDEP shall consult on what bank segments, representing the 5%, are to be stabilized. The 5% shall account for stabilization work that the Licensee performed on new sites in between each Erosion Monitoring Survey. This 5% shall not include previously repaired sites or sites in Table 1 that may require maintenance. If MassDEP determines that the linear foot equivalent of 5% will not provide a significantly improved stream bank condition, MassDEP may reserve the equivalent linear feet for use in the future.

Barton Cove. FirstLight shall work with the appropriate state and federal agencies to implement within five years of license issuance a no wake zone from the Turners Falls Dam (Station 0+00) to where the TFI narrows upstream of Barton Cove (Station 110+00) to address the impact of boat waves on shoreline erosion.

Appendix G
Invasive Species Management Plan

Invasive Species Management Plan

1 MONITORING MEASURES FOR INVASIVE AQUATIC PLANTS

1.1 Develop Invasive Aquatic Plan Monitoring Plan

Within six months after license issuance, the Licensee shall develop an Invasive Aquatic Plant Monitoring, Treatment, and Control Implementation Plan (Plan) in consultation with the US Fish and Wildlife Service (USFWS), MassDEP, and MassWildlife. The Plan and consultation record shall be filed with FERC and shall elaborate as necessary on the components below and specify how they will be implemented.

1.2 Updated Baseline Invasive Aquatic Plant Survey

In the summer of year 2 after license issuance, the Licensee shall conduct an intensive invasive aquatic plant survey of the Turners Falls Impoundment (TFI) from the Turners Falls Dam to the state border and the bypass reach (from the Turners Falls Dam to Cabot Station). In years 5 and 10 after license issuance and every five years thereafter for the license term the Licensee shall survey the entire TFI (from Turners Falls Dam to state border) and bypass reach to update the first baseline survey.

The survey of the TFI shall be conducted by boat in the late summer (August/September) to facilitate identification of any invasive aquatic plants by means of floristic attributes. The survey methodology shall include semi-quantitatively documenting the invasive aquatic plants found in the TFI to location, size and percent cover by cover class range (i.e., 2-25%; 25-50%; 50-75%; and 75-100%). Estimates of stand width shall be made in three meter intervals (1-3, 3-6, 6-9, and >10 m). Estimates of length shall be made to the nearest foot. Each observation of invasive aquatic plants shall be assigned a cover descriptor category.

The location of the invasive aquatic plants shall be recorded using Geographic Positioning System (GPS) technology for later upload into a GIS map to define baseline or current conditions, and shall include Site ID number, the invasive plant species found (color coded in a legend), and the percent cover. The survey of the bypass reach shall be conducted by canoe and/or foot and shall follow the same methodology as described above.

By February 1 of the year after completing the intensive field survey, the Licensee shall provide a report to the USFWS, MassWildlife, and MassDEP for review and comment (including providing the geospatial data in kml/kmz format). The Licensee shall meet (remotely or in-person) with USFWS, MassWildlife, and MassDEP to discuss study results, identify areas warranting control work, and determine appropriate control approach(es). The Licensee shall update the report (if necessary) and file it with FERC, along with the consultation record, no later than May 1.

1.3 Annual Surveys and Early Detection and Rapid Response Protocol (EDRR)

The purpose of the Annual Surveys and the EDRR protocol is to find and eradicate new invasive plant infestations before they spread and cause harm and to assess the success of control measures and guide where future control measures should occur. Annual surveys are not necessary during the years when the Licensee conducts the baseline survey or the follow-up baseline surveys every 5 years pursuant to § 1.2 above.

Starting the year after completing the updated baseline survey, the Licensee shall undertake annual monitoring and EDRR surveys from the Turners Falls Dam to the Route 10 Bridge. The EDRR component of the annual surveys shall focus on highly aggressive, invasive aquatic species known to occur elsewhere in the watershed.

For EDRR, the Licensee shall consult with USFWS, MassWildlife, and MassDEP to identify project areas most likely to experience infestations first and to determine the most appropriate survey methodology to use, with the default method following the rapid response guidance provided by the Massachusetts Department of Conservation and Recreation.[1] Annual surveys must also assess the success of control measures and guide where future control measures should occur.

Should any new invasive species be detected, the Licensee shall immediately notify the USFWS, MassWildlife, and MassDEP; consult with those agencies on the appropriate rapid response approach(es); and implement rapid response measures identified by the agencies. The Licensee is only responsible for rapid response measures in Barton Cove. These early detection surveys and rapid response measures (as needed) shall continue annually for the duration of the license.

By February 1 of the year after completing the annual surveys, the Licensee shall provide a summary memorandum to the USFWS, MassWildlife, and MassDEP for review and comment (including providing the geospatial data in kml/kmz format if new infestations were detected). The Licensee shall meet (remotely or in-person) with USFWS, MassWildlife, and MassDEP to discuss survey results, any control work undertaken by the Licensee in Barton Cove, any known control work undertaken by others, and any modifications to the early detection survey protocol that may be warranted for the upcoming field season. The Licensee shall also discuss with the agencies the specific control measures that may be approved, including potential chemical treatment. The Licensee shall provide a meeting summary to the agencies no later than May 1 and submit the memorandum, including any responses provided by the agencies, to the FERC no later than July 1.

2 CONTROL MEASURES FOR EXISTING INVASIVE INFESTATIONS

The purpose of undertaking active management and control measures is to eradicate, reduce, or contain (as feasible) invasive SAV beds at select locations for certain species where there is a reasonable expectation of success based on the best available science.

The Licensee shall allocate internal funds for the treatment of aquatic invasive plants including $50,000 in Year 1 and $10,000/year thereafter (subject to annual inflation adjustments in accordance with the U.S. Consumer Price Index as calculated from the date the license is issued) throughout the license term toward treatment[73] of invasive aquatic plants identified as impairments in Barton Cove (MA34122). The Licensee is not responsible for treatment measures outside of Barton Cove. The invasive aquatic plants listed in the impairment include water chestnut, curly-leaf pondweed, Eurasian milfoil and fanwort. MassWildlife has also documented the presence of variable leaf milfoil. During the annual meetings with USFWS, MassDEP, MassWildlife and the Licensee, the parties shall agree on an invasive plant treatment plan for Barton Cove. The Licensee shall manage the funds and implement remediation measures, within the constraints of the available funds, as directed by USFWS, MassDEP and

[73] The amount allocated is for "treatment," as specified. It does not include the Licensee's costs for all other components of this Invasive Species Management Plan.

MassWildlife. The Licensee and its contractors shall comply with all provisions of this Invasive Species Management Plan, unless otherwise agreed to with the parties noted above.

By February 1 of the year following the control work, the Licensee shall provide a summary memorandum, including locations, methods, amount and percent of total removed or treated in Barton Cove, maps, and geospatial data in kml/kmz format) to the USFWS, MassWildlife and MassDEP. The Licensee shall meet (remotely or in-person) with USFWS, MassWildlife, and MassDEP to discuss control work undertaken the previous year, and any recommended modifications to the control approach(es) in Barton Cove for the current year. The control activity memorandum can be combined with the annual early detection report (Section 1.3) and both can be discussed during the same annual agency consultation meeting.

Additional locations and/or invasive species may be added to known locations and target species for future control work based on information obtained through the baseline (Section 1.2) and annual (Section 1.3) surveys, in consultation with the USFWS, MassWildlife, and MassDEP. Annual control activities in Barton Cove may be reduced, eliminated, or suspended, based on monitoring data and agency concurrence.

3 ACTIVITIES TO PREVENT THE SPREAD OF INVASIVE PLANTS

The following activities shall be performed by the Licensee in order to assist in preventing the establishment, and/or spread, of terrestrial and aquatic invasive plant species.

3.1 Activities Associated with Daily Operations and Routine Maintenance

1. The Licensee shall continue to maintain Project grounds in a manner that helps prevent the introduction and spread of invasive plant species within the Project boundary, as provided below.
2. The Licensee shall not actively plant any terrestrial plants listed under the noxious weeds in the United States Department of Agriculture Natural Resources Conservation Service Plants Database, which incorporates plants listed by the Massachusetts Invasive Plant Advisory Group.
3. The Licensee shall monitor areas of disturbance caused by routine operation or maintenance activities within the Project area to ensure that invasive plant species do not out-compete desirable vegetation during the reestablishment phase. Where invasive species have been found to outcompete desirable vegetation during reestablishment, the Licensee shall treat infestations, as necessary, to eliminate or reduce the invasive infestation(s).
4. The Licensee shall instruct its work personnel to visually inspect all the Licensee's exposed boating equipment for attached invasive plant or animal species.
5. The Licensee shall clean and dry its boats and trailers that come in contact with the water following removal from the water. The Licensee shall remove any visible plants or animals before entering the water or leaving the site. Plants and animals are to be discarded in an upland area.
6. The Licensee shall post signage explaining the threats of nonnative aquatic species and steps to prevent the spread at formal and informal recreation sites within the Project area. Recreation sites include boat launches, environmental education facilities, picnic areas, trailheads, etc.
7. The Licensee shall participate in watershed-scale invasive species management groups and disseminate information and recommendations developed by the group to the public widely.

3.2 Activities Associated with Construction or Major Maintenance

3.2.1 Prior to Construction or Major Maintenance Activities

1. The Licensee shall consult with MassWildlife regarding the best management practices (BMP) to be employed and implement activity specific BMPs to help prevent the introduction and/or spread of invasive plant species within the area associated with the activity to be performed.
2. Workers shall clean, drain, and dry boats and trailers that come in contact with the water following removal from the water.
3. Workers shall remove visible plants or animals before entering the water or leaving the site. Plants and animals are to be discarded in an upland area.

3.2.2 During Construction

1. Workers shall be trained to identify invasive plants and informed of the importance of infestation prevention.
2. Construction equipment shall be surveyed and equipment entering the work area shall be cleaned/washed before allowing the equipment to enter an invasive-free area.
3. Invasive plants that could potentially be spread by construction equipment or workers shall be removed. Along access roads, invasive plants shall be identified and controlled to avoid introducing them into invasive-free areas.
4. Gravel and fill shall come from invasive-free sources to avoid introducing invasive vegetation to the construction site, whenever practicable.
5. Certified invasive-free straw, mulch, fiber rolls, and sediment logs shall be used for erosion and sediment control, whenever practicable.

3.2.3 During Seeding and Planting

1. Whenever possible, soil amendments (if any) and mulches shall be obtained from invasive-free sources.
2. The Licensee shall use only native seed mixes for reseeding disturbed areas, whenever possible.
3. Seeding and planting operations and maintenance shall be conducted in a manner to promote vigorous growth of desirable vegetation and discourage invasive species.
4. Bare ground shall be seeded as quickly as possible following disturbance.
5. Seeded sites shall be monitored for infestation by invasive plant species.
6. Identified invasive plant species at monitored sites shall be treated in the first full growing season.
7. Mulch shall be used to limit the amount of unwanted seed sources reaching bare soil, whenever possible.
8. The Licensee shall ensure that all construction contractors are aware of, and comply with, the terms listed above.

3.2.4 Post Construction

1. The Licensee shall monitor any areas of disturbance caused by construction activities on lands owned by the Licensee within the Project boundary as needed to ensure that invasive species have not out-competed desirable vegetation during the reestablishment.
2. Where invasive species have been found to outcompete desirable vegetation during

reestablishment, the Licensee shall treat infestations, as necessary, to eliminate or reduce the invasive infestation(s).

Appendix H
Bald Eagle Protection Plan

Bald Eagle Protection Plan

The purpose of this plan is to guide the Licensee's management and maintenance of lands at the Turners Falls Project and Northfield Mountain Project over the new license term for the protection of bald eagles.

Although bald eagles have been removed from the endangered species list, bald and golden eagles are still protected under multiple federal laws and regulations including the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Bald eagles winter along the Connecticut River in the Project area. Bald eagles are known to perch in riverbank trees and forage over the Connecticut River in the Project vicinity. As part of licensing, several bald eagles, adults and juveniles, have been observed perching or foraging in the Turners Falls Impoundment (TFI) and Northfield Mountain in both 2014 and 2015, and two occupied bald eagle nests were located within the study area. These nests were found downstream on Third Island (below Cabot Station), near Smead Island, Barton Island in Barton Cove, and along the east bank of the TFI across from Stebbins Island in the upper reaches of the TFI. Since the study, the Licensees staff at the Northfield Mountain Visitor Center have provided anecdotal information on two additional eagle nests located within the TFI. One is located in the vicinity of Kidd's Island either on the Island or the eastern shore in the Town of Northfield and one in Turners Falls, on the hillside in the general vicinity of the Turners Falls Airport runway.

Protection Measures
Given the nature and scope of Project operations, no adverse effects on bald eagles are anticipated. In the event that tree removal or construction activities are necessary at the Project, the Licensee shall implement the conservation measures described below to avoid effects to bald eagles.

Prior to any tree clearing within the Project boundary or areas immediately adjacent to the Project boundary by the Licensee or its contractors, the area to be cleared shall be observed for bald eagle nests by the Licensee. If practicable, the Licensee should also survey for nests within 660 feet of the proposed clearing because nests adjacent to clearing may also be indirectly affected. If such nests are discovered, the Licensee shall consult the Massachusetts Division of Fisheries and Wildlife (MDFW) and the United States Fish and Wildlife Service (USFWS) prior to tree-clearing activities and the tree-clearing activities shall be performed in accordance with the applicable regulations and guidance (*i.e.*, the National Bald Eagle Management Guidelines, USFWS 2007, or as amended).

During the nesting season (January 1 through September 30), no tree clearing shall occur within 330 feet of, and no construction activities shall occur within 660 feet of, any known bald eagle nests by the Licensee or its contractors. The National Bald Eagle Management Guidelines advise against conducting external construction and land clearing activities within 660 feet of bald eagle nests during the breeding season.

Additionally, the Guidelines recommend maintaining a year-round buffer between nests and tree clearing of at least 330 feet and a year-round buffer between external construction and nests of either 330 or 660 feet, depending on the construction's size, visibility, and local precedence. For any project-related construction activities, work that requires blasting or other activities that produce extremely loud noises within 1/2 mile of active nests shall be avoided. The Licensee shall consult with the MDFW and USFWS regarding tree clearing or construction activities that cannot meet these conditions.