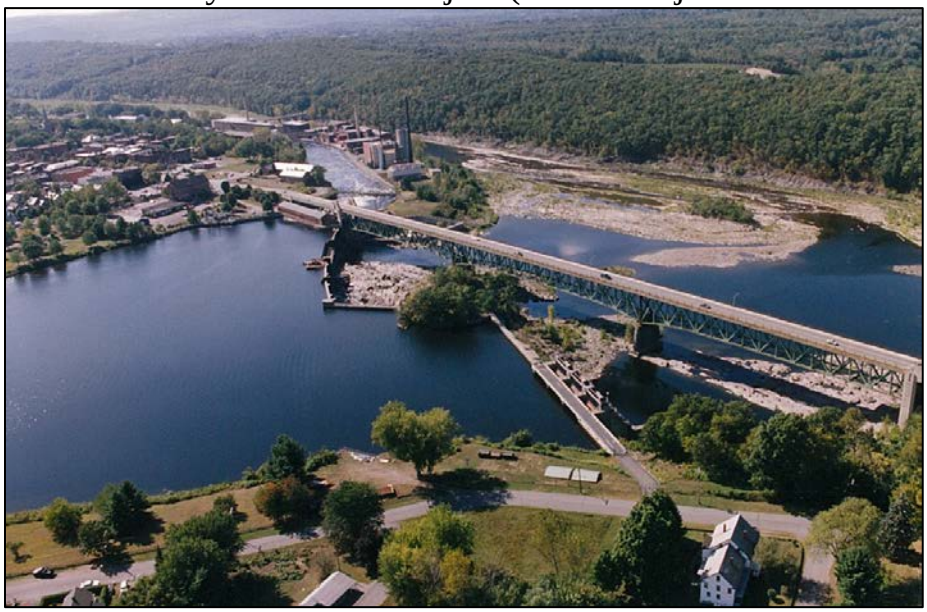
Before the Federal Energy Regulatory Commission

Amended Final Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)



FirstLight

VOLUME I OF V (PUBLIC)

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DECEMBER 2020

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INITIAL STATEMENT PER 18 CFR § 4.51

Before the Federal Energy Regulatory Commission
Application for New License Major Water Power Project - Existing Dam

1. FirstLight MA Hydro LLC (hereinafter referred to as FirstLight or Applicant) applies to the Federal Energy Regulatory Commission (Commission or FERC) for a new license for the existing Turners Falls Hydroelectric Project (Turners Falls Project), FERC Project Number 1889, as described in the attached Exhibits. The current license for the Turners Falls Project was issued on May 5, 1980 and expired on April 30, 2018. FirstLight is currently operating the Turners Falls Project under annual licenses.

2. The location of the Turners Falls Project is:

The structures associated with the Turners Falls Project are located in the towns of Montague and Gill MA, on the Connecticut River. The Turners Falls bypass (Connecticut River) flanks the towns of Greenfield and Montague, MA. The Turners Falls Impoundment borders several towns including Gill, Montague, Northfield, and Erving, MA, with upper portions extending into Vernon, VT and Hinsdale, NH.

3. The exact name, address, and telephone number of the Applicant are:

FirstLight Power Services LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247

The exact name, address, and telephone number of each person authorized to act as agent for the Applicant in this application are:

Mr. Justin Trudell
Vice President, Operations
FirstLight MA Hydro LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247
Email: justin.trudell@firstlightpower.com

Mr. Michael A. Swiger, Esq.
Ms. Julia S. Wood, Esq
Van Ness Feldman LLP
1050 Thomas Jefferson Street, NW
Seventh Floor
Washington, DC 20007
Tel: 202-298-1800
Email: mas@vnf.com
jsw@vnf.com

4. The Applicant is a domestic corporation and is not claiming preference under section 7(a) of the Federal Power Act, 16 U.S.C. 796.

5. (i) There are no statutory or regulatory requirements of NH or VT that affect the project as proposed to continue to be operated with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, or with respect to the right to engage in the business of developing, transmitting, and distributing power or in any other business necessary to accomplish the purposes of the license under the Federal Power Act. The statutory or regulatory requirements of the Commonwealth of Massachusetts are:

- The Applicant must apply for a Water Quality Certification from the Massachusetts Department of Environmental Protection under Section 401 (a)(1) of the Clean Water Act.

(ii) The steps which the Applicant has taken or plans to take to comply with the regulations cited above are:

- The Applicant will submit a request for Water Quality Certification from the Massachusetts Department of Environmental Protection.

- FirstLight possesses the necessary riparian property rights to use the waters of the Connecticut River for power purposes.

6. FirstLight owns all of the existing Turners Falls Project facilities; there are no Federally owned or operated facilities associated with this application.

ADDITIONAL INFORMATION REQUIRED BY 18 C.F.R. § 5.18(A)

1. Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate or maintain the project:

FirstLight has or intends to obtain and will maintain the proprietary rights necessary to operate and maintain the Turners Falls Project under the new license.

2. Identify (providing names and mailing addresses):

(i) Every county in which any part of the project and any Federal facilities that would be used by the project would be located;

Franklin County government in Massachusetts was abolished in 1997, although the county continues to exist as a geographical and political entity. County-wide comprehensive planning responsibilities are undertaken by the Franklin Regional Council of Governments (FRCOG). The FRCOG's offices are located at:

The Franklin Regional Council of Governments
12 Olive Street, Suite 2
Greenfield, MA 01301-3318

Upper portions of the Turners Falls Impoundment extend into the following Vermont and New Hampshire counties:

Windham County
P.O. Box 784
Brattleboro, VT 05302

Cheshire County
Administration
33 West Street
Keene, NH 03431

(ii) Every city, town, or similar local political subdivision:

i. In which any part of the Project, and any Federal facility that would be used by the project, would be located; or

Town of Erving
12 East Main Street
Erving, MA 01344

Town of Gill
325 Main Street
Gill, MA 01354

Town of Greenfield
14 Court Street
Greenfield, MA 01301

Town of Montague
1 Avenue A
Montague, MA 01376

Town of Northfield
69 Main Street
Northfield, MA 01360

Town of Vernon
567 Governor Hunt Road
Vernon, VT 05354

Town of Hinsdale
Town Hall
11 Main Street
Hinsdale, NH 03451

ii. **That has a population of 5,000 or more people and is located within 15 miles of the project dam.**

The following cities and towns each have a population of 5,000 or more people (2010 census data) and are located within 15 miles of the Turners Falls Dam:

Town of Amherst (population: 37,819)
Town Clerk
Town Hall
4 Boltwood Avenue
Amherst, MA 01002

Town of Athol
(population: 8,265)
Town Clerk
584 Main Street, Suite 10
Athol, MA 01331

Town of Brattleboro (population: 7,414)
Town Clerk
230 Main Street, Suite 108
Brattleboro, VT 05301

Town of Deerfield (population: 5,125)
Town Clerk
8 Conway Street
South Deerfield, MA 01373

Town of Greenfield (population: 17,456)
Town Clerk
14 Court Street
Greenfield, MA 01301

Town of Hadley (population: 5,250)
Town Clerk
100 Middle Street
Hadley, MA 01035

Town of Montague (population: 8,437)
Town Clerk
One Avenue A
Turners Falls, MA 01376

Town of Orange (population: 7,839)
Town Clerk
6 Prospect Street
Orange, MA 01364

(iii) Every irrigation district, drainage district or similar special purpose political subdivision (A) in which any part of the project is located, and any Federal facility that is or is proposed to be used by the project is located, or (B) that owns, operates, maintains, or uses any project facility or any Federal facility that is or is proposed to be used by the project:

There is no irrigation district, drainage district, or similar special purpose political subdivision in which any part of the Turners Falls Project is located or that owns, operates, maintains, or uses any project facility.

(iv) Every other political subdivision in the general area of the Project that there is reason to believe would likely be interested in, or affected by, the application.

There is no other political subdivision in the general area of the Turners Falls Project that there is reason to believe would be likely to be interested in, or affected by, this notification.

(v) All Indian tribes that may be affected by the Project.

Federally recognized tribes in Massachusetts include:

Wampanoag Tribe of Gay Head (Aquinnah)
Lee Ander Wander
Chief of Staff
20 Black Brook Road
Aquinnah, MA 02535-1546
cos@wampanoagtribe-nsn.gov

Mashpee Wampanoag Tribe
483 Great Neck Road
South Mashpee, MA 02649
trish.keliinui@mwtribe-nsn.gov

There are no federally recognized tribes in New Hampshire or Vermont.

There are no state recognized tribes New Hampshire. There is one state recognized tribe in Massachusetts and four in Vermont as shown below. Other tribes that may potentially be interested in the relicensing are listed below:

Massachusetts Recognized Tribes

Nipmuc Nation
25 Main Street
South Grafton, MA 01560
info@nipmucnation.org

Vermont Recognized Tribes

Elnu Abenaki Tribe
Chief Roger Longtoe Sheehan
Tribal Headquarters
5243 VT Route 30
Jamaica, VT 05343
gitceedadann@yahoo.com

Nulhegan Abenaki Tribe
Chief Don Stevens
156 Bacon Drive
Shelburne, VT 05482
chiefdonstevens@comcast.net

Koasek of the Koas of the Abenaki Nation
Chief Shirly Hook
188 Allen Bent Road
W. Braintree
Roxbury, VT 05669
shirly480@gmail.com

Missisquoi Abenaki Tribe
Chief Richard Menard
P.O. Box 133
Swanton, VT 05488
richard.menard@abenakination.com

Other Potentially Interested Tribes

Abenaki Nation New Hampshire
262 Lancaster Road
Whitefield, NH 03598
Kcicasco@aol.com

Ms. Bonney Hartley
Stockbridge-Munsee Community
400 Broadway #718
Troy, NY 12181
bonney.hartley@mohican-nsn.gov

Narragansett Indian Tribe
Chief Sachem: Anthony Dean Stanton
Narragansett Indian Longhouse
4425-A South County Trail
Charlestown, RI 02813
adstanton@nitribe.org

Nolumbeka Project
91 Main Street
P.O. Box 285
Greenfield, MA 01302
nolumbekaproject@gmail.com

Koasek Traditional Band
P.O. Box 147
Post Mills, VT 05058
n.pero@aol.com

3.

(i) The Applicant has made a good faith effort to give notification by certified mail of the filing of the application to:

(A) Every property owner of record of any interest in the property within the bounds of the Project, or in the case of the Project without a specific boundary, each such owner of property which would underlie or be adjacent to any Project works, including any impoundments; and

(B) The entities identified in paragraph (2) above, as well as any other federal, state, municipal or other local government agencies that there is reason to believe would likely be interested in or affected by the application.

Because this is an application for a new license under section 15 of the Federal Power Act, the Applicant is not required to provide notice by certified mail of the Application to landowners.

VERIFICATION STATEMENT REQUIRED BY 18 C.F.R. § 5.18(A)

This application is executed in the

STATE OF: New Hampshire

COUNTY OF: Strafford

By: Justin Trudell, being duly sworn, deposes and says that the contents of this application are true to the best of his knowledge or belief. The undersigned applicant has signed this application this 28th day of November 2020.

Justin Trudell
Vice President, Operations
FirstLight MA Hydro LLC
111 South Bedford Street, Suite 103
Burlington, MA 01803
Tel: 781-653-4247
Email: justin.trudell@firstlightpower.com

Subscribed and sworn before me, a Notary Public of the State of New Hampshire, this 28th day of November 2020.

Notary Republic

ELI I. TILLINGHAST, Notary Public
My Commission Expires March 25, 2025

ACRONYMS AND ABBREVIATIONS

2D	two dimensional
3D	three dimensional
A	ampere
AC	alternating current
ACHP	Advisory Council of Historic Preservation
ADA	Americans with Disabilities Act
AFLA	Amended Final License Application
AMC	Appalachian Mountain Club
APE	Area of Potential Effects
ARLAC	Ashuelot River Local Advisory Committee
ATUs	Accumulated Thermal Units
AWIA	America's Water Infrastructure Act
AWWA	American Whitewater Association
BA	Biological Assessment
BSTEM	Bank Stability and Toe Erosion Model
CAFRC	Conte Anadromous Fish Research Center
CEII	Critical Energy Infrastructure Information
CEQ	Council of Environmental Quality
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFU	colony forming units
CJS	Cormack Jolly Seber live recapture model
CL&P	Connecticut Light & Power
cm	centimeter
cmbgs	centimeters below ground surface
CPRs	Critical Protective Rates
CPUE	catch per unit effort
CRASC	Connecticut River Atlantic Salmon Commission
CRJC	Connecticut River Joint Commissions
CRSEC	Connecticut River Streambank Erosion Committee
CRUISE	Connecticut River Unimpacted Streamflow Estimation
CRWC	Connecticut River Watershed Council
CT	Connecticut
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDEP	Connecticut Department of Environmental Protection
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
°C	degrees Celsius
DLA	Draft License Application
DO	dissolved oxygen
DRTU	Deerfield River Chapter of Trout Unlimited
DSSMR	Dam Safety Surveillance and Monitoring Report
EA	Environmental Assessment
EAP	Emergency Action Plan
EAV	emergent aquatic vegetation
ECP	Erosion Control Plan
EFH	essential fish habitat

EIS	Environmental Impact Statement
ESA	Endangered Species Act
FCD	Franklin Conservation District
FCRP	Friends of the Connecticut River Paddlers
FEMA	Federal Emergency Management Agency
FERC or Commission	Federal Energy Regulatory Commission
FGS	Field Geology Services
FirstLight	FirstLight MA Hydro LLC
FIS	Flood Insurance Study
FLA	Final License Application
FPA	Federal Power Act
fps	feet per second
FRCOG	Franklin Regional Council of Governments
FRR	Full River Reconnaissance
FSF	Four Star Farms
ft	foot or feet
ft^2	square feet
°F	degrees Fahrenheit
GPD	gallons per day
GRH	Great River Hydro
GWSA	2008 Global Warming Solutions Act
HAER	Historic American Buildings Survey
HEC	USACE Hydrologic Engineering Center
HEC-RAS	Hydrologic Engineering Center River Analysis System
HEC-ResSim	Hydrologic Engineering Center Reservoir System Simulation
HELCO	Hartford Electric Light Co.
HG&E	Holyoke Gas and Electric
HPMP	Historic Properties Management Plan
hr	hour
HSI	habitat suitability index
IFIM	Instream Flow Incremental Methodology
ILP	Integrated Licensing Process
ISO-NE	ISO New England
ISR	Initial Study Report
kcfs	kilo cubic feet per second
kV	kilovolt
kW	kilowatt
kWH	kilowatt-hour
l	liter
LCCLC	Landowners and Concerned Citizens for License Compliance
m	meter
MA	Massachusetts
MACRIS	Massachusetts Cultural Resources Information System
MADFW	Massachusetts Division of Fish and Wildlife
MAEOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
MAFBF	Massachusetts Farm Bureau Federation, Inc.
MassGIS	Massachusetts Geographic Information System
MAWMA	Massachusetts Water Management Act
MBI	Midwest Biodiversity Institute
MADEP	Massachusetts Department of Environmental Protection
MADFG	Massachusetts Division of Fisheries and Game

mg	milligram
MGD	million gallons per day
MHC	Massachusetts Historical Commission
mi	mile
mi^2	square miles
ml	milliliter
MOA	Memorandum of Agreement
msl	mean sea level
MVA	Mega volt ampere
MW	megawatt
MWH	megawatt-hour
NCC	Town of Northfield Conservation Commission
NEE	New England Environmental
NE FLOW	New England Flow
NEFU	New England Farmers Union
NEMBA	New England Mountain Biking Association
NEPA	National Environmental Policy Act
NEPOOL	New England Power Pool
NET	New England National Scenic Trail
NGVD29	National Geodetic Vertical Datum of 1929
NH	New Hampshire
NHDES	New Hampshire Department of Environmental Services
NHDHR	New Hampshire Division of Historical Resources
NHDOT	New Hampshire Department of Transportation
NHESP	Natural Heritage and Endangered Species Program
NHFGD	New Hampshire Fish and Game Department
NHPA	National Historic Preservation Act
NID	National Inventory of Dams
NIT	Narragansett Indian Tribe
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NMTTC	Northfield Mountain Tour and Trail Center
NOI	Notice of Intent
Northfield Mountain Project	Northfield Mountain Pumped Storage Project
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRF	Naturally Routed Flow
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NUSCO	Northeast Utilities Service Company
NWI	National Wetland Inventory
NWRC	National Wetlands Research Center
NY-ISO	New York ISO
NYRO	FERC New York Regional Office
NYSDEC	New York Department of Environmental Conservation
O&M	operation and maintenance
PAD	Pre-Application Document
PCBs	polychlorinated biphenyls
PHABSIM	Physical Habitat Simulation
PIT	passive integrated transponder
PLC	programmable logic controller

PM&E	Protection, Mitigation & Enhancement
PSP	Proposed Study Plan
PTB	Puritan Tiger Beetle
PVPC	Pioneer Valley Planning Commission
QA/QC	quality control/quality assurance
RANS	Reynolds Averaged Navier-Stokes equations
REA	Ready for Environmental Analysis
RM	River mile
RMP	Recreation Management Plan
RRA	River Residents Association
RSA 483	New Hampshire Rivers Management and Protection Act
RSP	Revised Study Plan
RTE	Rare, Threatened, and Endangered
S&A	Simons and Associates
SAV	submerged aquatic vegetation
SCORP	State Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SDR	Supporting Design Report
SHPO	State Historic Preservation Officer
SMP	Surveillance and Monitoring Plan
SNS	Shortnose Sturgeon
SPDL	Study Plan Determination Letter
SSC	suspended sediment concentration
SSSRT	Shortnose Sturgeon Status Review Team
STPs	shovel test pits
TBD	to-be-determined
TCP	Native American Traditional Cultural Properties
TDS	total dissolved solids
TFI	Turners Falls Impoundment
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TN	total nitrogen
TNC	The Nature Conservancy
TP	total phosphorus
TSS	total suspended solids
TU	test unit
Turners Falls Project	Turners Falls Hydroelectric Project
UMass	University of Massachusetts at Amherst
USACE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USR	Updated Study Report
µS	microsiemens
VRC	Vermont River Conservancy
VT	Vermont
VTANR	Vermont Agency of Natural Resources
VTDEC	Vermont Department of Environmental Conservation
VTDHP	Vermont Division of Historic Preservation

VTFWD	Vermont Fish and Wildlife Department
VY	Vermont Yankee Nuclear Facility
WMA	Wildlife Management Area
WMCC	Western Massachusetts Climbing Coalition
WMECO	Western Massachusetts Electric Company
WQC	Water Quality Certificate
WSEL	water surface elevation
WSP	Water Surface Profile
WUA	weighted useable area
YOY	young-of-year

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT A-PROJECT DESCRIPTION

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EXHIBIT A – PROJECT DESCRIPTION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51(b) describes the required content of this Exhibit.

Exhibit A is a description of the project. This exhibit need not include information on project works maintained and operated by the U.S. Army Corps of Engineers, the Bureau of Reclamation, or any other department or agency of the United States, except for any project works that are proposed to be altered or modified. If the project includes more than one dam with associated facilities, each dam and the associated component parts must be described together as a discrete development. The description for each development must contain:

1. *The physical composition, dimensions, and general configuration of any dams, spillways, penstocks, powerhouses, tailraces, or other structures, whether existing or proposed, to be included as part of the project;*

2. *The normal maximum surface area and normal maximum surface elevation (mean sea level), gross storage capacity, and usable storage capacity of any impoundments to be included as part of the project;*

3. *The number, type, and rated capacity of any turbines or generators, whether existing or proposed, to be included as part of the project;*

4. *The number, length, voltage, and interconnections of any primary transmission lines, whether existing or proposed, to be included as part of the project (see 16 U.S.C. 796(11));*

5. *The specifications of any additional mechanical, electrical, and transmission equipment appurtenant to the project; and*

6. *All lands of the United States that are enclosed within the project boundary described under paragraph (h) of this section (Exhibit G), identified and tabulated by legal subdivisions of a public land survey of the affected area or, in the absence of a public land survey, by the best available legal description. The tabulation must show the total acreage of the lands of the United States within the project boundary.*

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1 TURNERS FALLS HYDROELECTRIC PROJECT

The Turners Falls Hydroelectric Project (Turners Falls Project or Project) is owned and operated by FirstLight MA Hydro LLC (hereinafter referred to as FirstLight). The Turners Falls Project is located on the Connecticut River in the Commonwealth of Massachusetts (MA), and the states of New Hampshire (NH) and Vermont (VT) (Figure 1.0-1). The greater portion of the Turners Falls Project, including developed facilities and most of the lands within the Project boundary, is located in Franklin County, MA; specifically, in the towns of Erving, Gill, Greenfield, Montague and Northfield. The Turners Falls Project Boundary is shown in Figure 1.0-1 and Figure 1.0-2 (closer view near the dam); it overlaps with the Northfield Mountain Pumped Storage Project (Northfield Mountain Project) Boundary along nearly the entire perimeter of the Turners Falls Impoundment (TFI). The northern reaches of the collective Project boundary extend into the town of Hinsdale, in Cheshire County, NH, and the town of Vernon, in Windham County, VT. The Turners Falls Dam is located at approximately river mile 122 (above Long Island Sound) on the Connecticut River, at coordinates 42°36'38.77" north and 72°33'05.76" west, in the towns of Gill and Montague, MA.

The Turners Falls Dam creates the TFI, which is approximately 20 miles long, and extends upstream to the base of Great River Hydro's Vernon Hydroelectric Project and Dam (FERC No. 1904). Most of the TFI lies in MA, however, approximately 5.7 miles of the northern portion of the impoundment is located in NH and VT. The TFI also serves as the lower reservoir for the Northfield Mountain Project, FERC Project No. 2485.

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. At the southwest end of the Turners Falls Dam is the gatehouse. 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. Associated with this power canal are the two hydroelectric generating facilities owned by FirstLight: Station No. 1 and Cabot Station. Station No. 1 is located approximately one-third of the way down the power canal. Water is conveyed from the power canal, to a small branch canal feeding the Station No. 1 turbines, before discharging into the bypassed reach of the Connecticut River. 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 canal that discharge into the bypass reach, when operating. Located between the Turners Falls Dam and the Station No. 1 tailrace is the Turners Falls Hydro, LLC project (FERC No. 2622), which is owned and operated by Eagle Creek Renewable Energy. Also, Milton Hilton, LLC, an unlicensed hydroelectric facility owned by a private developer, is located between the Turners Falls Hydro, LLC project and Station No. 1.

At the Turners Falls Dam, the total drainage area is approximately 7,163 square miles (mi^2), or about 64% of the Connecticut River Basin drainage area (11,250 mi^2). The Connecticut River is the largest and longest river in New England, and is tidal up to Windsor Locks, CT, which is located approximately 60 miles upstream from Long Island Sound.

The Turners Falls Project consists of: a) two individual concrete gravity dams, referred to as the Gill Dam and Montague Dam connected by a natural rock island known as Great Island, b) an approximate 20-mile long TFI serving as the lower reservoir for the Northfield Mountain Project, c) a gatehouse, d) a power canal, e) two hydroelectric projects located on the power canal including Station No. 1 and Cabot Station, f) three fish passage facilities and g) a downstream fish passage facility located at the downstream terminus of the power canal. Each of these features are described in detail below.

1.1 Turners Falls Dam

The Turners Falls Dam consists of two individual concrete gravity dams, referred to as the Gill Dam and Montague Dam connected by a natural rock island known as Great Island. The 630-foot-long Montague Dam is founded on bedrock and connects Great Island to the west bank of the Connecticut River. It includes four bascule[1] type gates, each 120 feet wide by 13.25 feet high and a fixed crest section which is normally not overflowed. All four bascule gates are operated by hydraulic cylinders. The bascule gate closest to the gatehouse (bascule gate no. 1) is typically used to provide any required flow releases to the bypass reach by means of "pond-following". Pond-following means that the gate can be set to discharge a certain magnitude of flow and the gate position automatically adjusts to release the same flow based on changes in the TFI elevation. The average height above bedrock is 35 feet and the dam crest elevation is 172.26 feet (NGVD29[2]). When fully upright, the top of the bascule gates are at elevation 185.5 feet.

The Gill Dam is approximately 55 feet high and 493 feet long extending from the Gill shoreline (east bank) to Great Island. It includes three 40 foot wide by 39 foot high tainter spillway gates. The tainter gates discharge water from the base of the gates. Each tainter[3] gate is operated by a motor/gearbox driving a torsion shaft connected to two lifting chains. When closed, the elevation atop the tainter gate is at elevation 185.5 feet.

1.2 Lower Reservoir or Turners Falls Impoundment

The TFI, formed by the Turners Falls Dam, extends upstream approximately 20 miles to the base of Great River Hydro's Vernon Dam in Vernon, VT. The first dam was built in 1798 as an extension to a lock and dam system that started in Holyoke, MA. Other dams have been constructed or rebuilt between 1798 and the present day dam. In 1970, to provide storage capacity for the Northfield Mountain Project, the Gill Dam was rebuilt with three taintor gates and the existing wooden flashboards on top of the Montague Dam were replaced with four bascule-type spillway gates raising the TFI 5.4 feet to elevation 185.0 feet as measured at the Turners Falls Dam providing an additional 12,600 acre-feet of storage. The lower and upper limits of the TFI, per the FERC license, range from a minimum elevation of 176.0 feet to a maximum elevation of 185.0 feet as measured at the Turners Falls Dam. This range decreases from downstream to upstream. The TFI has a surface area of approximately 2,110 acres and a gross storage volume of approximately 20,300 acre-feet at elevation 185.0 feet (as measured at the Turners Falls Dam).

The TFI, between Turners Falls Dam and Vernon Dam, has a water surface profile that varies depending on the magnitude of flow in the Connecticut River, the water level at the Turners Falls Dam and the storage used for the Northfield Mountain Project. The profile slope steepens as the magnitude of flow increases. At pinch-points or hydraulic controls such as at the French King Gorge, located downstream of the Northfield Mountain Project tailrace, the water level upstream of the hydraulic control is higher than below and will exceed 185.5 ft in accordance with the river backwater curve and inflow amount.

1.3 Gatehouse

The power canal gatehouse is located on the Montague side of the Connecticut River. The gatehouse dimensions are 33 feet wide by 214 feet long. It forms the abutment for connecting the Montague Dam

[1] A bascule gate is a hinged crest gate. Each bascule gate is controlled by a pair of hydraulic cylinders, mounted in the concrete gravity dam.
[2] Unless otherwise noted in this License Application, reported elevations are based on the National Geodetic Vertical Datum (NGVD) of 1929.
[3] A tainter gate is a spillway gate whose face is a section of a cylinder; it rotates about a horizontal axis on the downstream end of the gate and can be closed under its own weight.

spillway with the shoreline and is equipped with headgates controlling flow from the TFI to the power canal. The structure is of masonry and reinforced concrete foundations with a brick walled superstructure. The gatehouse houses 15 operable gates controlling flow to the power canal. Six (6) of the gates are 10'-8" high by 9' wide wooden gates and nine (9) of the gates are 12'-7" high by 9'-6" wide wooden gates. The gatehouse fishway passes through the gatehouse at the east bank.

The local controls and operating equipment for the dam's bascule gates are in the gatehouse. They are normally operated remotely from the control room located at Northfield Mountain. The tainter gates are operated locally at the Gill Dam. The magnitude of flow passing through the gatehouse is a function of the gate(s) opening and the hydraulic head or the differential in the TFI elevation and the power canal elevation.

1.4 Power Canal

The power canal is approximately 2.1 miles long. The first 3,900-ft reach of the canal downstream of the gatehouse is rectangular with canal walls varying from masonry to concrete to cut-rock faces. The bottom width ranges from 170 ft at the gatehouse to 123 ft at the end of this 3,900-ft reach. The next 3,300-ft reach has been excavated to a trapezoidal shape with 1.5H:1V slopes on both sides; the canal walls are generally similar to the preceding segment. The remaining segment (about 4,300 ft upstream of the Cabot Station) is essentially a pond covering about 50 acres, which was excavated to provide fill for the canal dikes. The width of the pond is approximately 783 ft at its widest point. The bottom of the pond was not originally excavated. It was a field having an average surface elevation of 159 ft at the upstream end, with a few trees that were removed. The average depth of the pond was about 14 ft when the canal level was raised in 1915.

The last 600 ft of the canal, extending from the "pond" to the Cabot Station, was excavated from rock and has earth and concrete walls. It is generally trapezoidal in shape and riprap was added to the earth portions of the channel slopes for slope protection.

Under a normal power canal elevation of 173.5 feet, the power canal depth varies from 17 feet deep just below the gatehouse to 30 feet deep above Cabot Station. The canal has a design capacity of approximately 18,000 cubic feet per second (cfs). There are several entities having indentured rights to the first flows from the canal; Table 1.4-1 lists the water users, approximate hydraulic capacity, and FERC project number (where applicable).

Table 1.4-1: Entities Having Rights to Withdraw Water from Power Canal

Facility Name	Owner	Approximate Hydraulic Capacity (cfs)	FERC Project No.
*Milton Hilton, LLC	Private Developer	113 cfs	N/A
*Turners Falls Hydro, LLC	Eagle Creek Renewable Energy	289 cfs	2622
Station No. 1	FirstLight MA Hydro LLC	2,210 cfs	1889
Cabot Station	FirstLight MA Hydro LLC	13,728 cfs	1889
United States Geological Survey, Silvio Conte	United States Geological Survey	Variable[4]	N/A

[4] Per Exhibit B of the May 25, 1988 conveyance agreement, the allowable withdrawal rate (in cfs) and number of days of withdrawal vary based on the month. They can range from a maximum of 200 cfs for 13 days in October to a minimum of 2 cfs for 28 days in February.

Facility Name	Owner	Approximate Hydraulic Capacity (cfs)	FERC Project No.
Anadromous Fish Laboratory			

*Milton Hilton, LLC[5] and Turners Falls Hydro, LLC[6] have indentured water rights. FirstLight currently has an agreement with each of these entities which provides that the entity will come on line when the naturally routed flow (NRF)[7] in the Connecticut River increases to 15,000 cfs (close to the combined capacity of Cabot and Station No. 1). The Turners Falls Hydro and Milton Hilton Hydro project tailraces enter the bypass reach approximately 0.3 miles and 0.5 miles downstream of the Turners Falls Dam, respectively. Both tailraces are upstream of the Station No. 1 tailrace.

The United States Geological Survey (USGS), which withdraws water for the Silvio Conte Anadromous Fish Laboratory, also has a water use agreement with FirstLight; however, its water use is minimal.

The power canal can be drained via the Keith Drainage Tunnel near the upper end of the power canal (between the gatehouse and Station No. 1 branch canal). The Keith Drainage Tunnel is constructed of concrete, is approximately 7 feet in diameter and 200 feet long. There is also a non-project works Lower Drainage Tunnel near Cabot Station (located just upstream of where the power canal widens above Cabot Station). The Lower Drainage Tunnel is constructed of concrete, is approximately 5 feet in diameter and 955 feet long. The Lower Drainage tunnel is abandoned and has never been used to FirstLight's knowledge. Both tunnels discharge into the Connecticut River.

1.5 Station No. 1

From the power canal there is an approximate 700 foot long by 100 foot wide branch canal. Under the normal power canal elevation of 173.5 feet, the depth of the branch canal ranges from 23 feet deep at the intersection of the power canal and branch canal to 16 feet deep in front of the Station No. 1 intake. At the end of the branch canal is the entrance to Station No. 1, consisting of eight bays, each 15 feet wide for a total intake width of 120 feet. Trashracks are angled across the entire entrance, totaling 120 feet wide by 20.5 feet high. The bar rack thickness is 0.375 inches and the bars are 3 inches on center, thus the clear spacing between bars is 2.625 inches.

After passing the trashrack, the intakes narrow down to four individual 13'-1.5" diameter steel penstocks, approximately 100 feet long, feeding the original seven horizontal Francis turbines housed in the powerhouse. The steel penstocks are lined with reinforced gunite. Only five of the turbines are operational. The powerhouse consists of brick masonry on concrete foundations. The powerhouse has five generators, all alternating current (AC) horizontal type, 60 cycle, and 2300 volt. The powerhouse dimensions are approximately 64 feet wide by 134 feet long.

[5] A water use agreement between then Esleeck Manufacturing Company (a predecessor to Milton Hilton, LLC) and then Turners Falls Power and Electric Company (a predecessor to FirstLight) was signed in August 1928. Note that in August 2017, the Southworth Paper Company which owned PaperLogic (now Milton Hilton, LLC) ceased operation. Milton Hilton, LLC, has taken ownership of the facility. On March 27, 2020, the hydroelectric facility went back into operation.

[6] A water exchange agreement between then Keith Paper Company (a predecessor to Eagle Creek Renewable Energy) and then Western Massachusetts Electric Company (a predecessor to FirstLight) was signed in September 1951.

[7] The naturally routed flow equals the sum of Vernon discharges plus flows recorded at USGS Gages on the Ashuelot and Millers Rivers.

Penstock 1 feeds Unit 1, penstock 2 feeds Units 2 and 3, penstock 3 feeds Units 4 and 5, and penstock 4 feeds Units 6 and 7. Note that penstock 2 bifurcates into pipes leading to Unit 2 and Unit 3, penstock 3 bifurcates into pipes leading to Unit 4 and 5, and penstock 4 originally bifurcated into pipes leading to Units 6 and 7, but the branch pipe to Unit 6 was removed and a bulkhead was installed; Units 4 and 6 are no longer in service. Unit 4 was originally a water-powered rotary exciter. A static exciter was installed to replace it in the same floor space in the powerhouse. Unit 6 was decommissioned in-place based on its poor condition. FirstLight has no plans to restore these two units into service.

The steel branch pipes leading to Units 2 and 4 are approximately 23 feet long. The pipe leading to Unit 2 starts at 8 feet in diameter as it branches off the main penstock then reduces to 7 feet in diameter at the turbine. The branch pipe leading to Unit 2 is lined with epoxy reinforced with fiberglass. The pipe leading to Unit 4 starts at 6 feet in diameter as it branches off the main penstock then reduces to 5 feet in diameter at the turbine. The main penstocks at Units 1, 3, 5, and 7 increase to 14 ft diameter at the upstream turbine, which is situated inside the penstocks. Station No. 1 operates under a gross head of 43.7 feet and has an approximate total electrical nameplate capacity and hydraulic capacity of 5,693 kilowatts (kW) and 2,210 cfs, respectively.

The Station No. 1 steel draft tubes are approximately 21 feet long and 6.5 feet in diameter (the diameter does vary).

Table 1.5-1 includes information on Station No. 1's generators and turbines. FirstLight cannot throttle the units at Station No. 1, meaning the units only operate at maximum hydraulic capacity.

Table 1.5-1: Generator and Turbine Characteristics of Station No. 1

	Generators		Turbines			
Unit No.	Electrical Capacity (kW)	Amps	Runner Size	Hydraulic Capacity (cfs)	Horsepower (hp)	Speed (rpm)
1	1,500	376	2-48" horizontal double runners	560	2100	200
2*	365	—	1-33" horizontal runner	140	590	257
3	1,276	314	2-42" horizontal double runners	500	1900	200
4	Unit 4 was originally a water-powered rotary exciter. A static exciter was installed to replace it in the same floor space in the powerhouse.					
5	1,276	252	2-39" horizontal double runner	490	1635	200
6	Note at Unit 6 was decommissioned in-place based on its poor condition					
7	1,276	251	2-42" horizontal double runner	520	1955	200
Total	**5,693**			**2,210**		

*Unit 2 is directly connected to a 1600 amp, 257 rpm, 115 volt exciter.

Transmission facilities at Station No. 1 include generator leads and the 2.4 kV bus. Station No. 1 has one bank consisting of a single, three phase, 4.8/6.0 MVA, 13800-2400 volts, oil immersed, self-cooled transformer. Table 1.5-2 includes information on the generator leads. Station No. 1 does not have a primary transmission line.

Table 1.5-2: Generator Leads at Station No. 1

Leads	Length (feet)	Voltage	Conductors per phase
Unit 1 to bus	50	2.4 KV	1
Unit 2 to bus	45	2.4 KV	1
Unit 3 to bus	40	2.4 KV	1
Unit 5 to bus	45	2.4 KV	1
Unit 7 to bus	70	2.4 KV	1
Bus to substation	110	2.4 KV	4
To set up transformer	20	2.4 KV	1

None of these items above is a transmission voltage item.

The three single phase pole mounted station service transformers are rated 50KVA, 13800-480 WYE/277 V.

1.6 Cabot Station

Cabot Station is located at the downstream terminus of the power canal. The trashrack opening is 217 feet wide by 31 feet high, resulting in a gross area of 6,727 ft^2. The trashracks are angled and include upper and lower racks. The top 11 feet of the upper racks have clear bar spacing of 0.94 inches (15/16-inch), and the bottom 7 feet of the upper racks have clear bar spacing of 3.56 inches (3 9/16 inch). The entire 13 feet of the lower racks have clear bar spacing of 3.56 inches. After passing through the trashracks, flow is conveyed through one of six 13'-6" diameter concrete penstocks to turbines housed in the powerhouse. Each penstock has three headgates followed by a 13'-6" high x 9'-4" wide section that join into one scroll. The total length of penstock from headgate to centerline of turbine is approximately 70 feet long. The powerhouse footprint is approximately 79.5 feet wide by 235 feet long. It is a brick and steel structure set on a concrete substructure on a rock foundation. It houses six identical vertical, Francis type, single runner turbines. At a 60 foot head, each unit is rated at 13,867 horsepower. The wicket gates for each unit are operated by two servomotors. Each concrete draft tube is approximately 41 feet long and has a diameter of approximately 13.5 feet (the diameter varies between 12.5 feet and 14.5 feet).

Transmission facilities at Cabot Station consist of (i) generator leads and two 13.8 kV buses for three units each for a total of six units, (ii) one 13.8 kV transmission line, about 200 feet long and extending across the power canal to the Montague substation which is owned by Eversource[8], and (iii) one 13.6/115 kV oil immersed air cooled transformer and appurtenant facilities. Table 1.6-1 includes information on the generator leads.

The six generators are 13.8 kV. Each unit has its own static excitation system rated at 160 volts DC, 781 amps.

[8] FirstLight has been granted a Generation Equipment Easement Area in the Montague Substation per the following documents; 1) A corrective deed from Connecticut Light and Power et al to Northeast Generation Company dated March 3, 2000, and recorded in the Franklin County Registry of Deeds at Book 3868, Page 101 and 2) A curative deed from FirstLight Hydro Generating Company, f/k/a NE Hydro Generating Company, f/k/a Northeast Generation Company to FirstLight MA Hydro LLC dated December 9, 2019 and recorded in the Franklin County Registry of Deeds at Book 7469, Page 44.

Table 1.6-1: Generator Leads at Cabot Station

Leads	Length (feet)	Voltage	Conductors per phase
Unit 1 to bus	80	13.8 KV	1
Unit 2 to bus	80	13.8 KV	1
Unit 3 to bus	100	13.8 KV	1
Unit 4 to bus	125	13.8 KV	1
Unit 5 to bus	250	13.8 KV	1
Unit 6 to bus	250	13.8 KV	1
Bus to roof	60	13.8 KV	4
Overhead cable to step up transformer	200	13.8 KV	2

Cabot Station has a total station nameplate capacity of 62.016 megawatts (MW) or 10.336 MW/unit. The station has a total hydraulic capacity of approximately 13,728 cfs or 2,288 cfs/unit.

At the downstream terminus of the power canal and adjacent to the Cabot Powerhouse are eight wooden 16'-8" high by 13'-7" wide spillway gates, which permit the discharge of approximately 12,000 cfs. These gates are used to rapidly draw down the power canal in the event of a Cabot Station load rejection or canal dike breach or to sluice ice and debris. In addition, there is a 16'-2" wide by 13'-1" high log sluice gate located at the downstream end of the forebay.

1.7 Fish Passage Facilities

1.7.1 Upstream Fish Passage Facilities

The Turners Falls Project is equipped with three upstream fish passage facilities, including (in order from downstream to upstream): the Cabot fishway, the Spillway fishway, and the gatehouse fishway. These fish passage facilities were based on a design recommended by the United States Fish and Wildlife Service (USFWS). Fish ladders of similar design pass Pacific salmon species and American Shad on the Columbia River. At the time of installation, it was believed that these same designs could be applied to pass Atlantic salmon and American Shad, the original target species. American Shad is the primary species currently using these fish passage facilities.

The Cabot fishway is a modified "ice harbor" design. It consists of 66 pools, with each pool situated approximately one foot higher than the previous pool. Fish enter the Cabot fishway below Cabot Station. Fish pass through the Cabot fishway into the power canal; from there, they swim 2.1 miles upstream to the gatehouse fishway. The dimensions of the Cabot fishway are 16 feet wide by 10 feet high by approximately 850 feet long. The hydraulic capacity of the Cabot fishway is approximately 33 cfs. The Cabot attraction flow is 400 cfs per the design specifications. A programmable logic computer (PLC) maintains a one foot differential at the ladder entrance. As the river level changes, the attraction gates will open to maintain the one foot differential. There are two attraction gates, each capable of 350 cfs.

Those fish bypassing the Cabot fishway move upstream via the bypassed reach where they will ultimately encounter the Turners Falls Dam. Fish arriving here are passed upstream via the Spillway fishway into a gallery leading to the gatehouse fishway where they rejoin fish that have passed to this point via the Cabot Ladder. The Spillway fishway is also of modified ice harbor design, with 42 pools. The dimensions of the Spillway fishway are 10 feet wide by 10 feet high by approximately 500 feet long. The hydraulic capacity of the Spillway fishway is approximately 18 cfs. The attraction flow is 64-400 cfs per the design specifications. A PLC maintains a one foot differential at the ladder entrance. As the river level changes,

the attraction gates will open to maintain the one foot differential. There are two attraction gates, each capable of 350 cfs.

Fish reaching the upstream end of the power canal after passing the Cabot fishway can enter the gallery via two entrances: a 70 foot long flume extending into the canal on the river side of the canal, and a 5 foot wide opening on the town side of the canal. The fish then pass upstream of the gatehouse via the gatehouse fishway. The gatehouse fishway is a vertical slot fishway which delivers fish into the TFI to continue their journey up the Connecticut River. The dimensions of the gatehouse fishway are 16 feet wide by 17.5 feet high at the entrance (21.5 feet high at the gatehouse) by approximately 225 feet long. The gatehouse attraction flow is 400 cfs per the design specifications but will vary with changing TFI elevation, power canal elevation and with varying flows in the entrance for the gatehouse ladder. The vertical slot fishway flow, per modeling, is on average approximately 250 cfs, but could be as low as 210 cfs and as high as 270 cfs.

The Connecticut River Atlantic Salmon Commission (CRASC[9]) establishes an annual schedule for the operation of upstream fish passage facilities at the Connecticut River dams. The schedules are based on the projected movement of migratory fish and may be adjusted in season to address actual observations. Table 1.7.1-1 lists the 2020 schedule for upstream fish passage operations at the Turners Falls Project.

Table 1.7.1-1: Upstream Fish Passage Schedule for Cabot, Gatehouse, and Spillway Fishways

Project	Species	Life Stage	Dates of Operation	Hours of Operation
Turners Falls	Salmon	adult	Apr 7-Jul 15	24 hours/day
	Salmon	adult	Sep 15-Nov 15	24 hours/day
	shad & herring	adult	Apr 4[1]-Jul 15	24 hours/day
	[1]Actual dates of operation are based on passage of fish at the previous fishway (excluding Holyoke). Turners Falls fishways shall be operational as soon as 50 shad have been counted passing the Holyoke Fish Lift.			

Source: CRASC letter to FirstLight, 3/2/2020

Downstream Fish Passage Facilities

The downstream fish passage facilities are located at Cabot Station at the downstream terminus of the power canal. Assuming no spill is occurring at Turners Falls Dam, 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[10] 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. Although the log sluice gate is approximately 16 feet wide, there is an 8 foot wide weir that is inserted in the sluice opening during downstream fish passage season. The sluiceway is 6 feet high and 180 feet long. With the weir in place, the amount of flow conveyed downstream varies based on the power canal elevation, but typically ranges from 110 to 253 cfs. During fish passage season, the gate is set 3.5 feet open if/when the weir is removed, which results in a flow of approximately 130 cfs.

The log sluice gate can be lowered to an elevation of 163.6 ft (i.e., open 11.5 feet). With the weir removed, and the gate fully open, the log sluice can pass approximately 1,600 cfs.

[9] CRASC membership consists of the USFWS, NMFS, and state fishery agencies from CT, MA, NH, and VT.
[10] A uniform acceleration weir.

As described for upstream passage, the CRASC also establishes an annual schedule for the operation of downstream fish passage facilities at the Connecticut River dams. Table 1.7.1-2 lists the 2020 schedule for downstream fish passage operations at the Project.

Table 1.7.1-2: Downstream Fish Passage Schedule

Project	Downstream Fish Passage Exit	Species	Life Stage	Dates of Operation	Hours of Operation
Turners Falls	Log sluice and trash sluice	salmon	smolt	Not required	
		salmon	adult	Oct 15-Dec 31[1]	24 hours/day
		shad	adult	Apr 7[2]-Jul 31	24 hours/day
		shad	juvenile	Aug 1-Nov 15	24 hours/day
		eels	adult	Sep 1-Nov 15	24 hours/day
		[1]Downstream passage operation for adults will only be required if 50 or more adults are documented as passing upstream of a dam/facility. [2]Downstream passage measures should be operational for American Shad at the same time as upstream passage is initiated			

Source: CRASC letter to FirstLight, 3/2/2020

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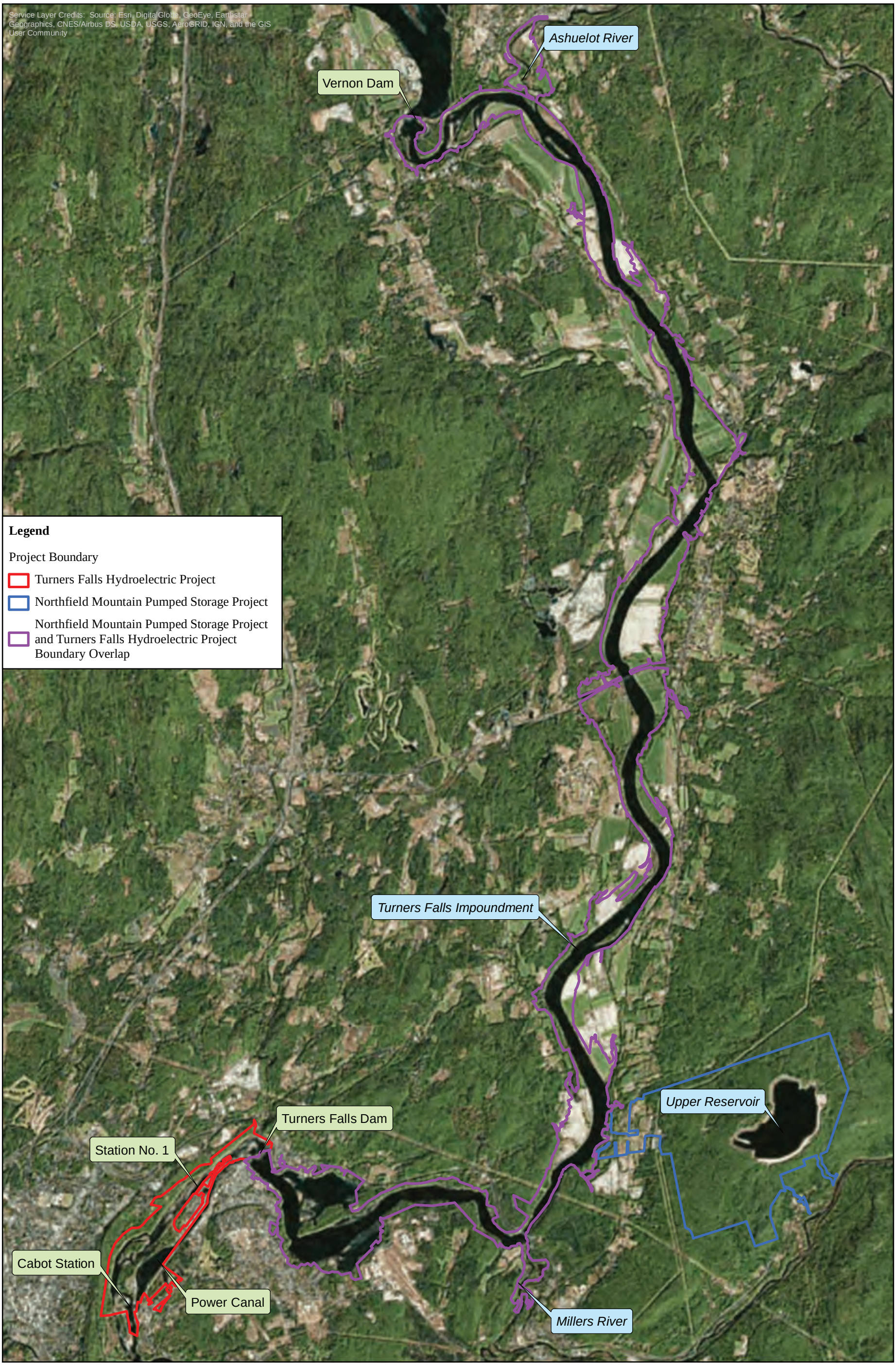

FIRSTLIGHT MA HYDRO LLC
Turners Falls Hydroelectric Project (No. 1889)
Amended Final License Application Exhibit A

N

0 0.5 1 2 Miles

Figure 1.0-1
Turners Falls Hydroelectric Project Boundary Map

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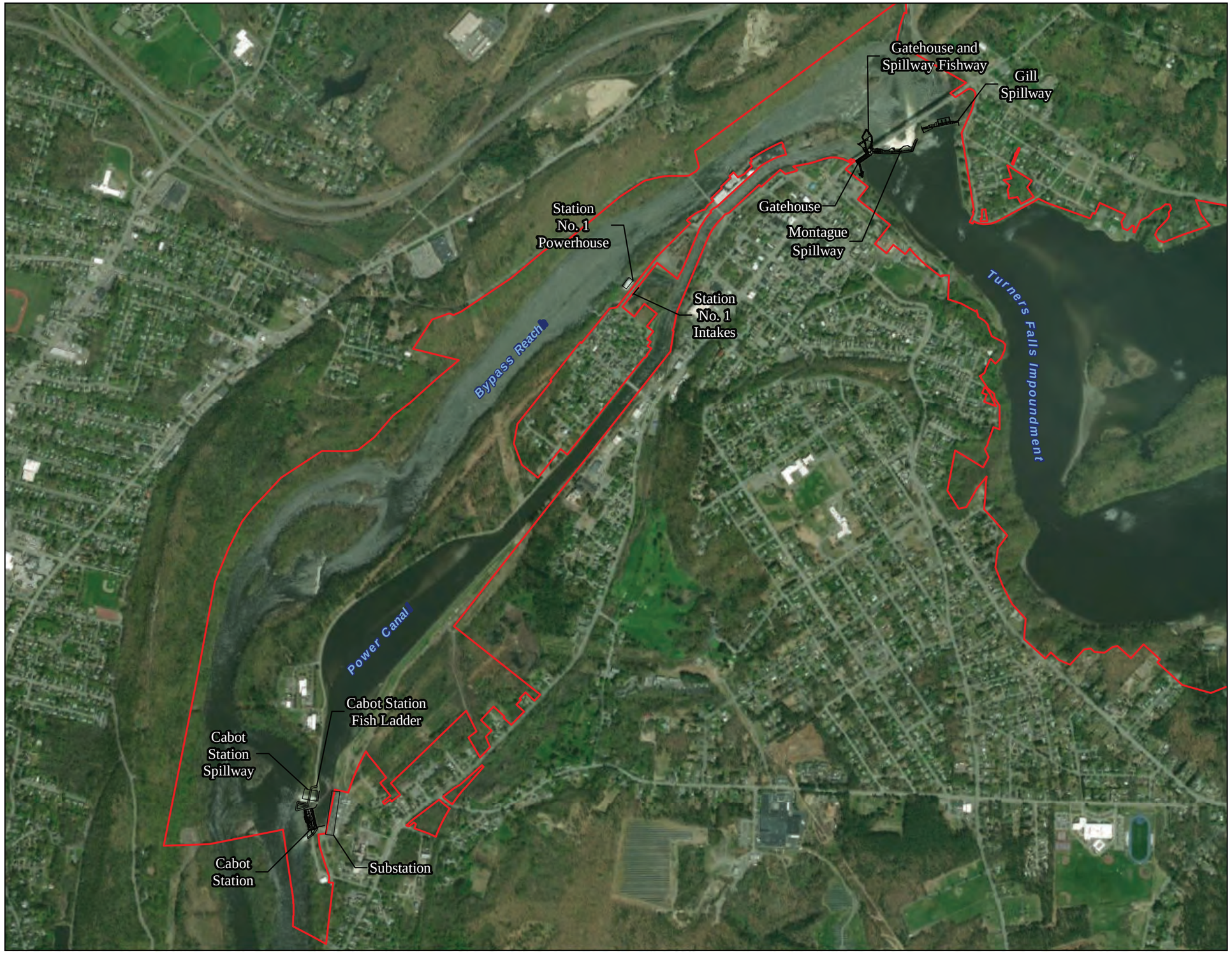

FIRSTLIGHT MA HYDRO LLC
Turners Falls Hydroelectric Project No. 1889

Amended Final License Application
Exhibit A

Figure 1.0-2
Turners Falls Hydroelectric Project
Features

Legend

Project Boundary

N

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS,

0 600 1,200 2,400 Feet

1 inch = 1,200 feet

FirstLight

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2 ADDITIONAL EQUIPMENT

The Project also includes various turbine governors, generator exciters, batteries, control panels and circuit breakers.

FirstLight is proposing to a) construct infrastructure necessary to pass FirstLight's proposed bypass flows in the winter, b) upgrade Station No. 1, c) construct new fish passage facilities and d) construct new recreation facilities as described below.

2.1 Infrastructure Needed to Pass Winter Bypass Flows

FirstLight proposes to provide a bypass flow of 300 cfs, or inflow, whichever is less, as measured just below the Turners Falls Dam, from December 1 to March 31. There are two water conveyance structures at the Turners Falls Dam, including bascule gates and tainter gates. The tainter gates are designed to discharge flows greater than approximately 5,000 cfs. Of the four bascule gates, bascule gate no. 1 is pond following, meaning the crest of the bascule gate can be adjusted to pass a desired flow at a given TFI water level. FirstLight proposes to use this bascule gate to pass the winter flow; however, some modification to the gate is needed. Specifically, FirstLight proposes to add heaters to the gate to prevent ice build-up.

2.2 Station No. 1 Upgrades

FirstLight is proposing changes to the Turners Falls Project, specifically, changes to Station No. 1. Station No. 1 is currently an unstaffed facility. To bring units on, an operator must visit the site. In addition, the five (5) units cannot be throttled over a range of flows, meaning each unit only discharges its maximum capacity. FirstLight is proposing to pass a portion of its proposed bypass flows via Turners Falls Dam spill and Station No. 1 discharge. By automating Station No. 1, it will allow FirstLight to a) remotely operate the units and b) operate the units over a wider range of flows (not just the maximum capacity). FirstLight proposes the following:

- For each unit, upgrading the brakes, controls, governors, grounding transformer, protective relaying, excitation system and turbine rehabilitations.
- Automation including auto synchronizing equipment and sensors to interface to the programmable logic controller (PLC).

2.3 Minimum Flow Turbine Generator at Turners Falls Dam

At this time, FirstLight is not proposing to install a minimum flow turbine-generator at the Turners Falls Dam to generate with its proposed bypass flows. However, over the term of the next license, FirstLight will continually evaluate the economic feasibility of adding a minimum flow turbine-generator or any other potential energy source.

2.4 Proposed Upstream and Downstream Fish Passage Facilities

FirstLight proposes to construct various upstream and downstream fish passage facilities. Table 2.4-1 lists the proposed fish passage protection, mitigation and enhancement (PM&E) measures.

Table 2.4-1 FirstLight's Proposed PM&E Measures for Upstream and Downstream Fish Passage at the Turners Falls Project

Upstream or Downstream Passage	Proposed PM&E Measure
Upstream Passage	Install Permanent Ultrasound Array in the Cabot Tailrace to deflect American Shad to the Bypass Reach
	Construct a new Spillway Lift with Palisade Entrance at the Turners Falls Dam.
	Construct an Eelway near the Turners Falls Dam.
	Retire Cabot Fish Ladder.
	Retire Entrance Portions of gatehouse ladder in the canal.
Downstream Passage	Construct a Plunge Pool below Bascule Gate No. 1 located at the Turners Falls Dam. This work would likely be conducted at the same time as the Spillway Lift construction
	Construct a Bar Rack at the entrance to the Station No. 1 Forebay.

For all of the fish passage structures described below, FirstLight has included some level of detail; however, FirstLight recognizes that further consultation with the USFWS, National Marine Fisheries Service (NMFS) and Massachusetts Division of Fish and Wildlife (MADFW) will occur. Thus, some of the high level design details described below could change following agency consultation.

Permanent Ultrasound Array. FirstLight proposes to install a permanent ultrasound array at the outer edge of the Cabot Station tailrace to deter upstream migrating adult American Shad from entering the tailrace area, but instead move them up the bypass reach to a new fish lift at the Turners Falls Dam (the Spillway Lift). FirstLight will install the permanent ultrasound array after the Spillway Lift is constructed. Once the ultrasound array is functioning FirstLight proposes to close the Cabot fish ladder to prevent American Shad from entering the power canal, where they may experience long delays or are never able to reach the TFI.

Construct new Spillway Lift and Plunge Pool. FirstLight proposes to construct a new Spillway Lift (with palisade entrance) and plunge pool below bascule gate no. 1 of the Turners Falls Dam. The Spillway Lift will include a single hopper that will lift fish approximately 39 feet to an exit trough that connects into the top of the existing Spillway Fish Ladder for fish to exit into the headpond through the existing gatehouse fish ladder. The lift will also utilize the existing entrance structure of the Spillway Fish Ladder for the entrance to the lift. A V-trap and brail system will be used instead of a crowder channel to capture fish in the hopper.

The plunge pool will include two concrete walls to create an approximately 110-foot-wide by 65-foot-long box below bascule gate no. 1 – one wall parallel to flow between bascule gate no. 1 and bascule gate no. 2, and one wall perpendicular to the flow from the end of the first wall to the fish lift entrance. Flow will pass from the pool either through a palisade structure adjacent to the fish lift entrance or by spilling over the downstream wall of the box. The flow from the palisade structure will also be used for attraction flow to the Spillway Lift.

Since the Spillway Lift and plunge pool are in the same location these two projects would be constructed simultaneously.

Construct Eelway. Once all upstream and downstream fish passage structures at the Turners Falls Project are complete, FirstLight proposes to install an eelway near the Turners Falls Dam. Based on siting surveys and two temporary eelramp installations, over 90% of the elvers move upstream at the Spillway Ladder. FirstLight proposes to install an eelway at this location. The eelway will include a single tray lined with

substrate for the eels to ascend on, piping providing flow through the substrate and attraction flow, and a collection tank at the tray exit.

Construct a Bar Rack at Entrance to Station No. 1 Forebay. FirstLight proposes to install a bar rack, with ¾-inch clear spacing, at the location where flow from the main power canal is diverted into the Station No. 1 forebay. The rack will be approximately 58 feet wide across the entrance of the forebay and 21 feet tall. Approximately 4 feet of rock would be excavated from the bottom of the canal to provide sufficient area to prevent impingement. A new concrete base will be constructed below the rack for a foundation and to support diagonal bracing behind the rack. A new trash rake and conveyor for trash removal will also be installed for regular cleaning of debris from the rack.

Conceptual level drawings of the above structures, with the exception of the eelway and ultrasound array, are included in the Turners Falls Project Exhibit F (Spillway Lift, Plunge Pool, Station No. 1 Rack).

Retire Cabot Fish Ladder. Once the Spillway Fish Lift is functioning to pass fish and the ultrasound array is operational, FirstLight proposes to retire the Cabot Fish Ladder because all fish passage would be moved to the Spillway Lift. FirstLight does not believe continuing to introduce fish into the power canal where they encounter extensive delays or never reach the TFI is productive.

Retire Entrance Portion of Gatehouse Fish Ladder. The portion of the gatehouse ladder that includes the entrances on the right and left side of the canal walls will not be needed; however, the ladder will be used to move fish from the Spillway Lift into the TFI.

2.5 Proposed Recreation Facilities

FirstLight proposes to construct or enhance two recreation facilities as described below.

Formal Access Trail and Put-In just below Turners Falls Dam. Stakeholders have requested a put-in just below the Turners Falls Dam to kayak/canoe/raft the bypass reach. There is an existing informal pathway leading to the base of the Turners Falls Dam just downstream of the existing Spillway Ladder. The proposed access would be provided via the existing bridge (aka the "IP Bridge") spanning the power canal. Once over the canal, a formal 12-ft wide path would lead recreationists to the base of the dam. The path would include a sign (Project name and FERC No.) just after exiting the IP bridge, and directional signs along the formalized path.

FirstLight also proposes to establish a weblink that would report the forecasted Turners Falls Dam discharge each day during the daylight hours from July 1 to October 15 to benefit whitewater boaters. FirstLight is not proposing to post the Turners Falls Dam discharge from April 1 to June 30 because it is a period when the federally endangered SNS could be utilizing the bypass reach for spawning and incubation which could be disturbed by whitewater boaters.

Formal Access Trail and Stairs for Take-out at Poplar Street. There is an existing take-out at Poplar Street; however, it is extremely steep. FirstLight has limited options due to steep topography and land ownership. FirstLight proposes to use the existing gravel parking lot leading to 20-foot wide timber stairs with a boat slide railing leading to a 5-foot long, 20-foot wide concrete landing/abutment. A 32-foot long gangway would be anchored to the concrete abutment and lead to a floating dock in the Connecticut River to accommodate fluctuations in the river elevation. The site would include a sign (Project name and FERC No.) at the top of the timber stairs.

A separate Recreation Management Plan is included in Exhibit E of the Amended Final License Application.

3 LANDS OF THE UNITED STATES

There are approximately 20 acres of federal lands within the current Turners Falls Project boundary associated with the USGS's Silvio Conte Anadromous Fish Laboratory. However, the proposed Turners Falls Project boundary would not include any federal lands, because the lands are not needed for project purposes.

Amended Final Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT B-PROJECT OPERATION AND RESOURCE UTILIZATION

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EXHIBIT B – PROJECT OPERATION AND RESOURCE UTILIZATION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (c) describes the required content of this Exhibit.

Exhibit B is a statement of project operation and resource utilization. If the project includes more than one dam with associated facilities, the information must be provided separately for each such discrete development. The exhibit must contain:

(1) A statement whether operation of the powerplant will be manual or automatic, an estimate of the annual plant factor, and a statement of how the project will be operated during adverse, mean, and high-water years;

(2) An estimate of the dependable capacity and average annual energy production in kilowatt hours (or a mechanical equivalent), supported by the following data:

(i) The minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the powerplant intake or point of diversion, with a specification of any adjustments made for evaporation, leakage, minimum flow releases (including duration of releases), or other reductions in available flow; monthly flow duration curves indicating the period of record and the gauging stations used in deriving the curves; and a specification of the period of critical streamflow used to determine the dependable capacity;

(ii) An area-capacity curve showing the gross storage capacity and usable storage capacity of the impoundment, with a rule curve showing the proposed operation of the impoundment and how the usable storage capacity is to be utilized;

(iii) The estimated hydraulic capacity of the powerplant (minimum and maximum flow through the powerplant) in cubic feet per second;

(iv) A tailwater rating curve; and

(v) A curve showing powerplant capability versus head and specifying maximum, normal, and minimum heads;

(3) A statement, with load curves and tabular data, if necessary, of the manner in which the power generated at the project is to be utilized, including the amount of power to be used on-site, if any, the amount of power to be sold, and the identity of any proposed purchasers; and

(4) A statement of the applicant's plans, if any, for future development of the project or of any other existing or proposed water power project on the stream or other body of water, indicating the approximate location and estimated installed capacity of the proposed developments.

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1 PROJECT OPERATION AND RESOURCE UTILIZATION

1.1 Project Operation

The Turners Falls Hydroelectric Project (Turners Falls Project) consists of two facilities- Cabot Station and Station No. 1. Cabot Station is used at all river flows. During low flow periods [between the hydraulic capacity of 1 Cabot unit (2,288 cfs) and all 6 Cabot units (13,728 cfs)], Cabot Station operates to meet peak demand. During high flows in excess of 13,728 cfs, it operates as a base load plant. Station No. 1 is a base load plant and typically operates when inflows to the Turners Falls Impoundment (TFI) are less than the hydraulic capacity of a single Cabot Unit (~2,288 cfs) or when inflows exceed the hydraulic capacity of Cabot Station. The current license requirements relative to Turners Falls Project operations are described below.

The Turners Falls Hydro, LLC project and Milton Hilton, LLC project are also located on the canal. Milton Hilton, LLC[1] and Turners Falls Hydro, LLC[2] have indentured water rights. FirstLight currently has an agreement with each of these entities which provides that the entity will come on line when the naturally routed flow (NRF)[3] in the Connecticut River increases to 15,000 cfs (close to the combined capacity of Cabot and Station No. 1).

Turners Falls Impoundment Fluctuation

Under the FERC license, the Turners Falls Impoundment (TFI) elevation limits extend from a minimum elevation of 176.0 feet to a maximum elevation of 185.0 feet, as measured at the Turners Falls Dam.

Minimum Flow below Project

Under the current FERC license for the Turners Falls Project, FirstLight MA Hydro LLC (hereinafter referred to as FirstLight) is required to release a continuous minimum flow of 1,433 cfs or inflow, whichever is less below the Turners Falls Project. FirstLight typically maintains the minimum flow requirement through discharges at Cabot Station and/or Station No. 1.

Minimum Flow in Bypass

Per the FERC license, a continuous minimum flow of 200 cfs is maintained in the bypass reach starting on May 1 and increases to 400 cfs when fish passage starts by releasing flow through a bascule gate. The 400 cfs continuous minimum flow is provided through July 15, unless the upstream fish passage season has concluded early in which case the 400 cfs flow is 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.

1.2 Annual Plant Factor

The average annual plant factor is determined using the following equation:

Average Annual Generation/Nameplate Capacity x 8,760 hrs per year = Avg. Annual Plant Factor

[1]A water use agreement between then Esleeck Manufacturing Company (a predecessor to Milton Hilton, LLC) and then Turners Falls Power and Electric Company (a predecessor to FirstLight) was signed in August 1928.
[2]A water exchange agreement between then Keith Paper Company (a predecessor to Eagle Creek Renewable Energy) and then Western Massachusetts Electric Company (a predecessor to FirstLight) was signed in September 1951.
[3]The naturally routed flow equals the sum of Vernon discharges plus flows recorded at USGS Gages on the Ashuelot and Millers Rivers.

The Turners Falls Project has an average annual generation of approximately 332,351 MWh per year for the period 2011-2019, and an annual plant factor of approximately 56% (332,351/593,043) based on its current combined nameplate capacities of Cabot Station and Station No. 1 of 62.016 MW and 5.693 MW, respectively (total of 67.709 MW).

1.3 Operation During Adverse, Mean, and High Water Years

Because the Turners Falls Project and Northfield Mountain Pumped Storage Project (Northfield Mountain Project) share the TFI, the operations described pertain to both facilities. As noted above, the water level of the TFI can vary from a minimum elevation of 176.0 feet to a maximum operating elevation of 185.0 feet as measured at the Turners Falls Dam. Below is a summary of how the Turners Falls Project and Northfield Mountain Project operate over a range of flow conditions.

Turners Falls Project and Northfield Mountain Project Operations when Naturally Routed Flows (NRF) are < 1,433 cfs (Minimum Flow)

When NRFs[4] are very low, i.e., less than 1,433 cfs (current minimum flow, river flows exceed 1,433 cfs approximately 96% of the time), FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively referred to herein as FirstLight) generally maintains the TFI elevation between 180.5 and 182.0 feet to create sufficient hydraulic head to pass flow through the gatehouse.

At flows less than 1,433 cfs, bypass flows are provided first, and the balance of flow is passed through Station No. 1.

Bypass flows are provided at Turners Falls Dam as required for fishery needs during certain periods of the year. If bypass flows are required, they are provided by bascule gate no. 1 closest to the gatehouse.

At these low flows (less than 1,433 cfs), the Northfield Mountain Project may operate during peak demand hours and pump back during low demand periods. The number of turbines operating, and the magnitude of generation flow will vary depending on demand.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 1,433 cfs and 13,728 cfs (Cabot Capacity)

Under moderate flow conditions, i.e., NRFs are between 1,433 cfs and 13,728 cfs (river flow exceeds 13,728 cfs approximately 31% of the time), the TFI elevation is typically managed around elevation 180.5 feet, but fluctuates under these inflow conditions due to the upstream Vernon Hydroelectric Project[5] peak demand operations, Cabot peak demand operations, and the pumping/generating cycle at the Northfield Mountain Project. The TFI level also varies based on the volume of water in the Northfield Mountain Upper Reservoir in order to maintain a balance. Sufficient water volume must be available in the TFI to fill the Northfield Upper Reservoir, and sufficient storage volume must be available in the TFI to accept Northfield Mountain generation. Under most circumstances, the TFI elevation fluctuates between 180.5 and 184.0 feet under these inflow conditions. The target elevation in the power canal at the Cabot Station forebay remains at 173.5 feet.

When NRFs are between 1,433 cfs and 13,728 cfs (the approximate hydraulic capacity of Cabot Station), FirstLight will operate various units at Cabot Station and Station No. 1 based on several factors such as water and unit availability and unit efficiency. Depending on the inflow and electrical demand, Cabot Station may be operated as a peak demand facility, with the number of peaks per day varying with electrical demand. If demand is high, such as in the summer and winter, Cabot Station may peak twice a day to meet demand, in the morning and late afternoon. Outside of these hours, Cabot Station's generation is typically curtailed to base load needs, by reducing the flow through the gatehouse. Excess inflow to Turners Falls

[4] Naturally Routed Flows = Vernon discharge+ Ashuelot River flow + Millers River flow (both rivers have USGS gages).
[5] The Vernon Hydroelectric Project is owned and operated by Great River Hydro.

Dam is stored within the TFI. If inflow is consistently in the 13,728 cfs range, Cabot Station will operate continuously at full capacity.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 13,728 cfs and 15,938 cfs (full capacity of Station No. 1 and Cabot)

Under these flow conditions, operations are similar to above; however, Cabot Station is typically operated at full hydraulic capacity, while the remaining flow is passed through Station No. 1. On an annual basis, river flow exceeds 15,938 cfs approximately 21% of the time.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 15,938 cfs and 30,000 cfs

Under normal to somewhat high flows, as the NRF to the TFI exceeds the hydraulic capacity of Cabot Station and Station No. 1, both facilities operate at full capacity. Per the agreement with the United States Army Corps of Engineers (USACE) as required by Article 32 of the Turners Falls Project license, and Article 43 of the Northfield Mountain Project license, the maximum TFI elevation during inflows of this magnitude is 186.5 feet, which would occur under the flood of record, although under lesser flood flows, FirstLight typically opens the bascule gates at the Turners Falls Dam, as needed, to maintain the TFI elevation closer to 180-182 feet. On an annual basis, river flow exceeds 30,000 cfs approximately 9% of the time.

FirstLight continually evaluates the volume of water in the TFI storage versus the volume of water in the Upper Reservoir to ensure there is sufficient volume in the TFI to fill the Upper Reservoir, if needed.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 30,000 cfs and 65,000 cfs

When flows are in this high range, Turners Falls Project and Northfield Mountain Project operations are generally the same as above, with one exception: the USACE requires that FirstLight draw the TFI elevation down as far as possible, but not below elevation 176.0 feet. In drawing the TFI down, discharges cannot be increased by more than 10,000 cfs per hour above the NRF. The TFI elevation is maintained down until the NRF drops below 30,000 cfs or the actual discharge exceeds 65,000 cfs. When the actual discharge past Turners Falls Dam rises to 65,000 cfs (river flow exceeds 65,000 cfs approximately 1% of the time), the discharge is maintained at 65,000 cfs until the TFI elevation has fallen to 176.0 feet or the TFI begins to rise, at which point a constant TFI elevation is maintained.

Turners Falls Project and Northfield Mountain Project Operations when NRFs are between 65,000 cfs and 126,000 cfs

Per the USACE agreement, when the NRF exceeds 65,000 cfs, but is expected to be less than 126,000 cfs (this flow is very rarely exceeded), the outflow at the Turners Falls Project should be regulated according to the operating schedule of the Northfield Mountain Project. If the Northfield Mountain Project is operating, it is required to keep the combined useable volume of the Upper Reservoir and TFI constant. If the Northfield Mountain Project is not operating, it is required to keep the TFI elevation constant until the spillway gates are wide open.

Turners Falls Project and Northfield Mountain Project Operations when NRFs exceed 126,000 cfs

When the NRF is expected to be greater than 126,000 cfs, the operating rules continue to require the following: if the Northfield Mountain Project has not been operating in the previous hour, it is required to maintain a constant TFI elevation. If the Northfield Mountain Project has been operating in the previous hour, it is required to maintain a constant combined useable storage volume.

1.4 HEC-ResSim Operations Model

FirstLight developed an operations model to better understand how operational changes at the three[6] upstream Great River Hydro (GRH) hydroelectric projects and FirstLight's Turners Falls Project and Northfield Mountain Project affect the timing of river flows and energy generation. The model considers each Project's engineering data and operational constraints, such as current FERC licensed water level fluctuations and minimum flow requirements. The model outputs include hourly flow, reservoir elevation and generation from the GRH and FirstLight hydroelectric facilities.

The model calibration procedure involved adjusting several model parameters and constraints to reasonably match historic (2002-2003) Project data (flow, reservoir elevation, generation). The calibrated model was subsequently updated to reflect today's equipment; this model is termed the baseline model representing existing conditions. The hourly baseline model was subsequently run for a longer-term period of record from 1962-2003[7]. The hourly baseline model output (flow, reservoir elevation, generation) was ultimately used as a tool to compare baseline conditions with FirstLight's proposed operations.

Some sections of this license application, including Exhibit D and Exhibit E, use model output from simulating baseline and FirstLight's proposed operations.

2 DEPENDABLE CAPACITY AND AVERAGE ANNUAL GENERATION

2.1 Estimate of Dependable Capacity and Average Annual Generation

The net dependable capacity of the Turners Falls Project is 67.709 MW (62.016 MW at Cabot and 5.693 MW at Station No. 1).

Average annual generation of the Turners Falls Project for the period 2011-2019 was 332,351 MWh. The monthly and annual generation at the Turners Falls Project for the period 2011-2019 are provided in Table 2.1-1.

2.2 Streamflow

FirstLight estimates the total instantaneous inflow to the TFI – referred to as the NRF-- as the sum of the Vernon Hydroelectric Project discharge and inflow from two larger tributaries equipped with United States Geological Survey (USGS) gages – the Ashuelot and Millers Rivers. The drainage areas at the Vernon Dam and Turners Falls Dam are 6,266 square miles (mi^2) and 7,163 mi^2, respectively, a difference of 897 mi^2. Thus, 87% of the inflow to the TFI is controlled by the Vernon Hydroelectric Project. Information on the Ashuelot and Millers Rivers is shown in Table 2.2-1.

[6] Great River Hydro is in the process of relicensing three projects in series on the Connecticut River located immediately upstream of the Turners Falls Project and having the same license expiration date of April 30, 2018. They include, in upstream to downstream order: Wilder Hydroelectric Project (FERC No. 1892), Bellows Falls Hydroelectric Project (FERC No. 1855) and the Vernon Hydroelectric Project (FERC No. 1904). GRH (then TransCanada), requested FERC to extend the license term by one year. On July 22, 2015 FERC granted the one-year extension such that the new expiration date was April 30, 2019. On May 9, 2019, the FERC authorized continued operation of the three GRH projects and thus they are now operating under annual licenses.

[7] Model inflows were obtained from the Connecticut River Unimpacted Streamflow Estimation (CRUISE) model that was developed by the USGS. The period of record of the CRUISE model ended in 2003. FirstLight had hoped to extend the period of record to 2012 or later but based on extensive correspondence with the USACE and the Nature Conservancy, it was not possible to extend the period of record past 2003.

Table 2.2-1: USGS Gages on Tributaries to the Turners Falls Impoundment

Gage No.	Gage Name	Period of Record	Drainage Area	Regulation
01161000	Ashuelot River at Hinsdale, NH	1907-current	420 mi^2	Regulated by Corps Storage Reservoir- Surry Dam since 1941.
01166500	Millers River at Erving, MA	1915-current	372 mi^2	Regulated by Corps Storage Reservoirs- Tully Dam and Birch Hill Dams since 1949 and 1941, respectively.

The total drainage area of these two gages is 792 mi^2, which represents 88% (792/897) of the incremental additional drainage area below Vernon Dam contributing to the TFI. The remaining 105 mi^2 represents other drainage to the TFI (1.5% of the total drainage area).

GRH reports the Vernon Hydroelectric Project discharge to FirstLight, including flow through the Vernon turbines (total station hydraulic capacity of 17,130 cfs) plus any spill via the gates. There is a gage in the Vernon Powerhouse that is used to measure the discharge; however, the gage can be influenced by backwater conditions[8]. Spill at Vernon Dam is estimated via rating curves for the various gates.

Article 304[9] of the Vernon Hydroelectric Project FERC license requires GRH to coordinate project operations with FirstLight. On May 28, 2003, GRH (then US Gen New England, Inc.) and FirstLight (then Northeast Generating Company) reached a hydro operating agreement relative to the coordinated operations between the Vernon Project and Turners Falls and Northfield Mountain Project. That agreement includes the following steps GRH must take relative to reporting the Vernon Project's generation schedule.

1. By 8:00 am each day, GRH is to fax FirstLight its estimate of the total discharge (cfs-hours) expected the next day at its Vernon Project.
2. When GRH receives the hourly dispatch schedule for the next day from the Independent System Operator-New England (ISO-NE), GRH will fax its Vernon Project schedule to FirstLight. GRH generally receives the ISO-NE report between 12:00 pm and 2:00 pm.
3. If any subsequent dispatch schedules are received during the day showing changes in the project hourly flow schedules, the updated schedule for the Vernon Project will be sent by fax to Northfield.

The agreement also calls for GRH to transmit to FirstLight the instantaneous total discharge and tailwater elevation at the Vernon Project. The current agreement is problematic for FirstLight as it receives inaccurate next day total Vernon Project discharge volumes, and multiple, or sometimes no, real-time updates of the Vernon Project discharges. In Exhibit E of the license application, FirstLight describes what additional information it needs to better manage the Turners Falls and Northfield Mountain Projects under its proposed operating conditions.

[8] Prior to the raising of the Turners Falls Dam the USGS had a gage located immediately below Vernon Station (Gage No. 011565000, Connecticut River at Vernon, VT). The gage was active from 1936 to 1973. However, with the raising of the Turners Falls Dam and TFI water levels, the gage was retired because it is influenced, at times, by backwater conditions. FirstLight still obtains flow estimates recognizing that there are times when the gage is backwatered.

[9] Article 304 of the Vernon Project license was added to the license in 1992 (59 FERC ¶62,267) and generally requires the Licensee to develop and file with the Commission a coordination agreement with the licensee of certain downstream facilities in the event that the regional central dispatch system was ever discontinued. The dispatching of these hydropower projects under that system was discontinued several years ago in connection with the restructuring of the New England power markets.

FirstLight sums the reported Vernon Project discharge and the Ashuelot and Miller Rivers flows and then adjusts it based on the travel time required to reach the Turners Falls Dam. FirstLight refers to the adjusted flow on its log sheets as the NRF. Note that the electronically available data is only available for the period 2000-2014. Thus, to estimate the inflow to Turners Falls Dam over a longer period of record a different method was used to estimate inflow as described below.

The Connecticut River flow at the Turners Falls Dam was estimated using two USGS gages as listed in Table 2.2-2.

Table 2.2-2: USGS Gages to Estimate Inflow to Turners Falls Dam

Gage No.	Gage Name	Period of Record	Drainage Area	Regulation
01170500	Connecticut River at Montague City, MA	1904-current	7,860 mi^2	Regulated seasonally by dams on the CT River (and other major tributaries): First and Second CT Lakes, Moore Reservoir and Comerford Reservoir.
0117000	Deerfield River at West Deerfield, MA	1940-current	557 mi^2	Regulated seasonally by dams on the Deerfield River: Somerset and Harriman Reservoirs.

The Montague USGS gage is located approximately 4,500 feet downstream of Cabot Station. It represents the total flow on the Connecticut River including flow from the Deerfield River. The Deerfield River USGS gage is located further upstream from its confluence with the Connecticut River. As noted above, the drainage area of the Connecticut River at the Turners Falls Dam is 7,163 mi^2. The additional drainage area at the Montague USGS gage compared to the Turners Falls Dam is 697 mi^2, of which the bulk of the increase is attributable to the Deerfield River (557 mi^2 as measured at the USGS gage and 665 mi^2 as measured at its confluence with the Connecticut River). The Deerfield River gage flow was prorated by a factor of 1.25 (697/557) to represent the additional flow from the 697 mi^2 drainage area. This prorated flow was then subtracted from the corresponding flow measured at the Montague USGS Gage to estimate the flow at Turners Falls Dam. The following equation was applied to estimate the flow at Turners Falls Dam:

$Q_{\text{Turners Falls Dam}} = Q_{\text{Montague USGS Gage}} - 1.25(Q_{\text{Deerfield USGS Gage}})$, where

$Q_{\text{Turners Falls Dam}}$=	calculated approximate inflow to Turners Falls Dam (cfs)
$Q_{\text{Montague USGS Gage}}$=	flow recorded at the Montague USGS Gage (cfs)
1.25 =	ratio of the drainage areas (697/557)
$Q_{\text{DeerfieldUSGS Gage}}$=	flow recorded at the Deerfield USGS gage (cfs)

The annual and monthly mean and median flows, and flow per square mile of drainage area at the Turners Falls Dam were calculated for the period 1940-2016 as shown in Table 2.2-3.

Table 2.2-3: Estimated Connecticut River at Turners Falls Dam Drainage Area= 7,163 mi^2, Period of Record Oct 1940-Dec 2016 (cfs)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean	10,231	9,491	18,068	34,656	20,413	10,993	6,650	5,770	5,543	8,645	11,503	12,018	12,821
Mean/ mi^2	1.30	1.21	2.30	4.41	2.60	1.40	0.85	0.73	0.71	1.10	1.46	1.53	1.63
Median	8,013	7,641	13,163	30.336	17,304	9,001	4,976	4,156	4,084	5,974	9,654	9,575	8,478
Median/ mi^2	1.02	0.97	1.67	3.86	2.20	1.15	0.63	0.53	0.52	0.76	1.23	1.22	1.08

Figures 2.2-1 through 2.2-5 show the monthly and annual flow duration curves representing calculated Turners Falls Dam average daily flows, respectively.

2.3 Area Capacity Curve

The TFI stage versus storage curve is shown in Table 2.3-1 and plotted in Figure 2.3-1. The TFI licensed operating range is between 185 feet and 176 feet, a nine (9) foot fluctuation providing a total usable storage of approximately 16,150 acre-ft. The TFI has a surface area of approximately 2,110 acres at elevation 185 ft.

2.4 Hydraulic Capacity

The Turners Falls Project includes two facilities – Station No. 1 and Cabot Station located on the power canal. Unit hydraulic capacities of Station No. 1 are shown in Table 2.4-1. At Station No. 1, five (5) turbines are operational. The total hydraulic capacity of Station No. 1 is 2,210 cfs. Unit 4 was a former water exciter, which has been replaced by a static exciter. Unit 6 is a decommissioned in-place turbine.

Table 2.4-1 Station No. 1 Hydraulic Capacity

Unit No.	Hydraulic Capacity (cfs)
1	560
2*	140
3	500
4	--
5	490
6	--
7	520
Total	2,210

*Unit No. 2 is directly connected to a 1600-amp, 257 rpm, 115-volt exciter.

Cabot Station has six identical turbines for a total hydraulic capacity of 13,728 cfs or approximately 2,288 cfs/turbine. The minimum efficient hydraulic capacity of a single unit is approximately 2,100 cfs.

2.5 Tailwater Rating Curve

Station No. 1 discharges into the Turners Falls bypass reach further upstream than Cabot Station. The Station No. 1 tailwater rating curve is shown in Figure 2.5-1.

Cabot Station discharges into the end of the Turners Falls bypass reach. The Cabot Station tailwater rating curve is shown in Figure 2.5-2.

2.6 Powerplant Capability versus Head Curve

Head (feet) versus generation capacity (MW) curves for Station No. 1 and Cabot Station are shown in Figure 2.6-1 and 2.6-2, respectively.

3 UTILIZATION OF PROJECT POWER

The primary purpose of the Turners Falls Project is to supply energy, capacity, reserve and other ancillary services to the ISO-NE, a regional transmission organization that coordinates the movement of wholesale electricity.

4 PLANS FOR FUTURE DEVELOPMENT

There are currently no plans for future hydroelectric development of the Turners Falls Project.

Table 2.1-1. Turners Falls Hydroelectric Project- Summary of Monthly and Annual Generation (MWH) for 2011-2019

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2011	26,269	19,431	39,341	39,448	45,213	34,294	14,704	18,156	25,336	38,674	35,033	44,346	380,245
2012	34,633	25,227	40,104	30,139	42,125	29,565	11,983	8,349	9,577	24,229	24,868	33,528	314,327
2013	27,118	26,881	33,500	44,208	33,628	40,650	40,622	18,168	21,957	13,963	25,577	30,104	356,376
2014	35,353	22,059	23,709	38,911	45,584	28,200	32,620	23,501	9,183	21,757	25,366	41,609	347,852
2015	31,460	18,202	19,659	40,446	24,351	37,338	26,262	13,123	9,259	14,894	23,086	36,794	294,874
2016	32,173	32,591	45,165	41,800	23,851	10,795	10,183	9,584	3,963	9,453	18,843	29,663	268,064
2017	31,766	23,963	39,618	39,172	44,768	36,714	28,247	13,811	10,449	15,658	33,638	25,758	343,562
2018	35,750	31,605	37,210	42,762	26,791	8,721	16,612	28,370	13,488	30,673	41,376	40,147	353,505
2019	36,628	37,103	35,155	35,288	44,353	25,551	18,324	7,726	6,250	21,709	30,053	28,927	327,067
Average	31,815	26,340	34,829	39,130	36,740	27,981	22,173	15,643	12,162	21,223	28,649	34,542	332,351

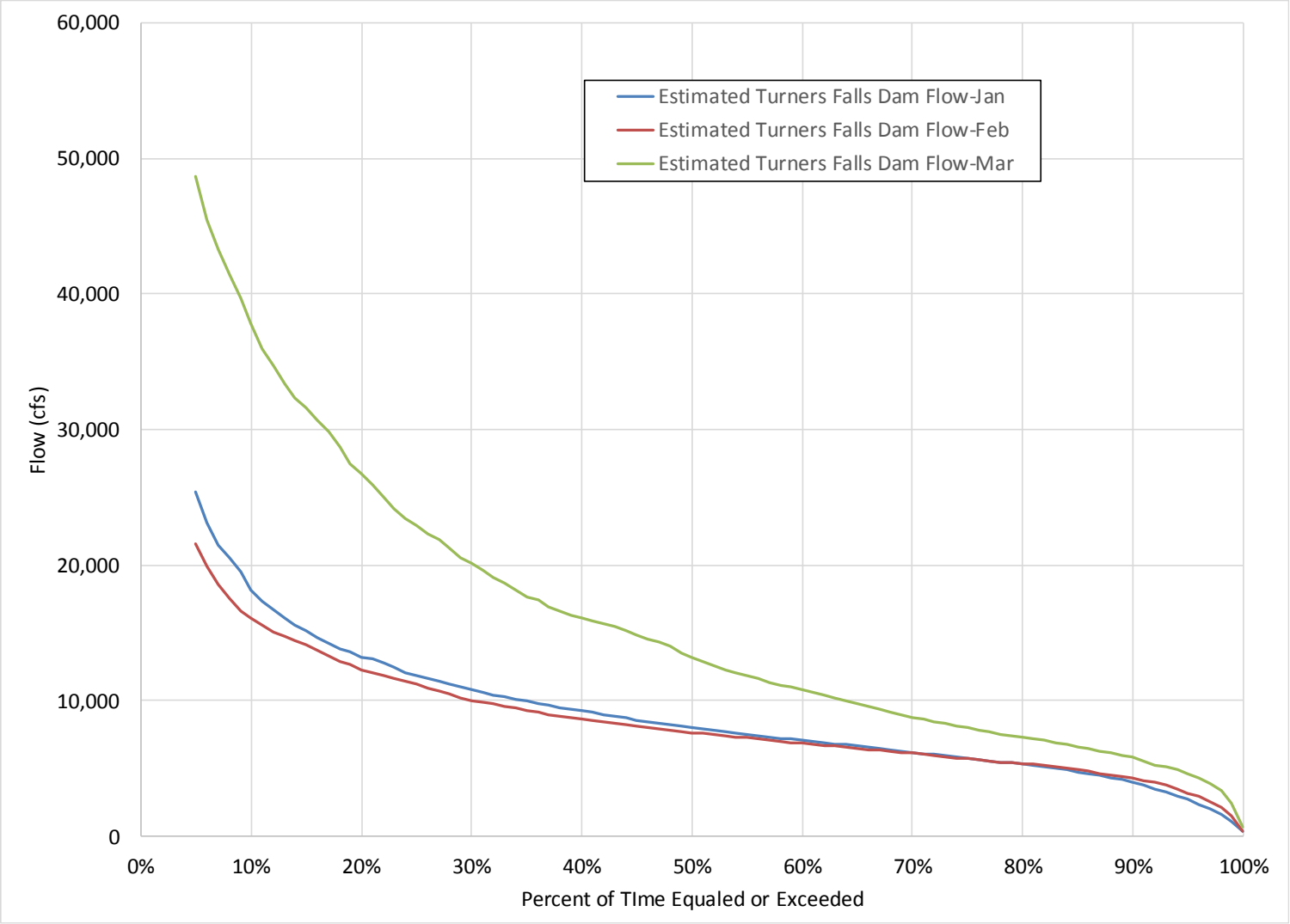

Figure 2.2-1. Connecticut River at Turners Falls Dam, Jan-Mar Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

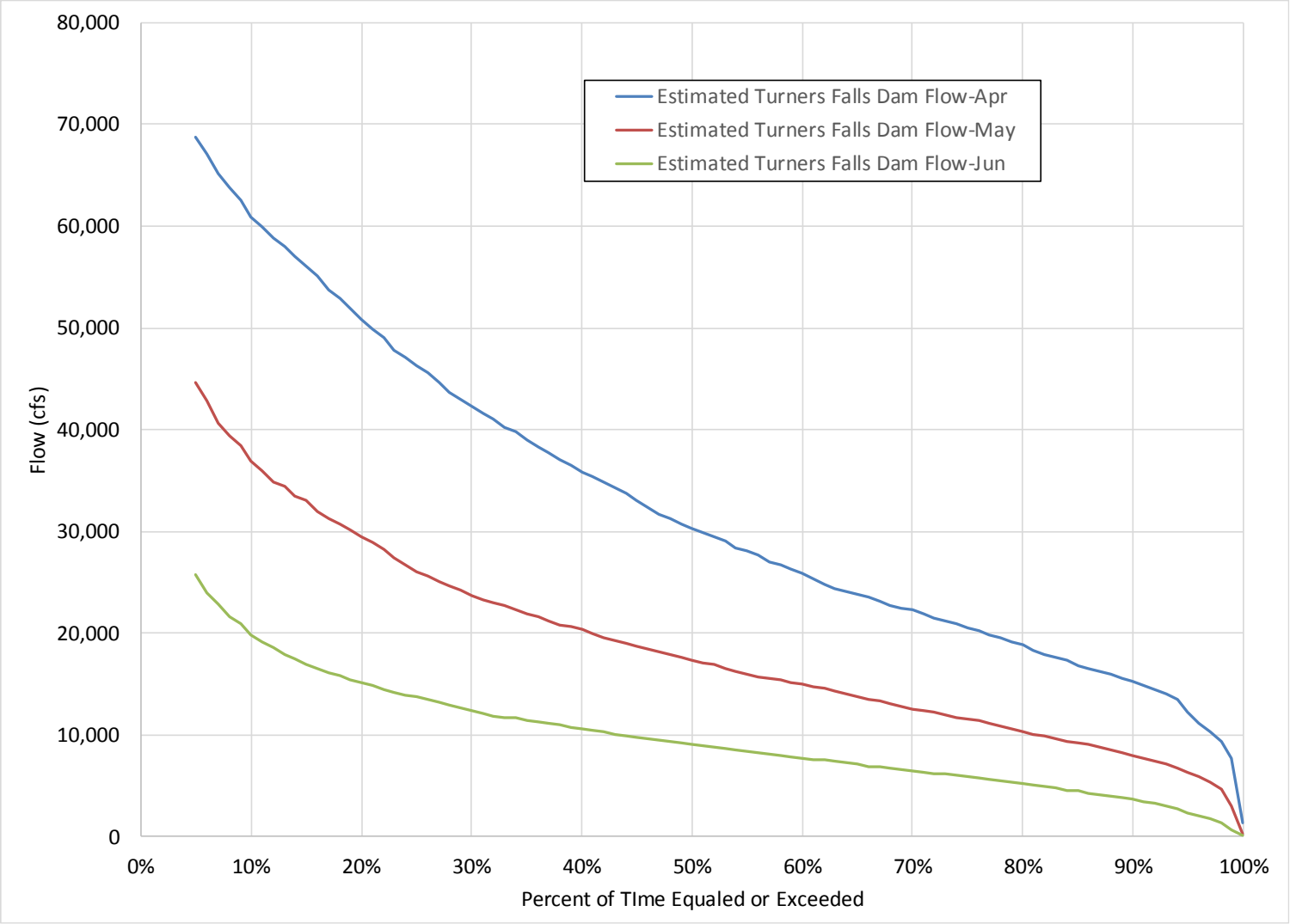

Figure 2.2-2. Connecticut River at Turners Falls Dam, Apr-Jun Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

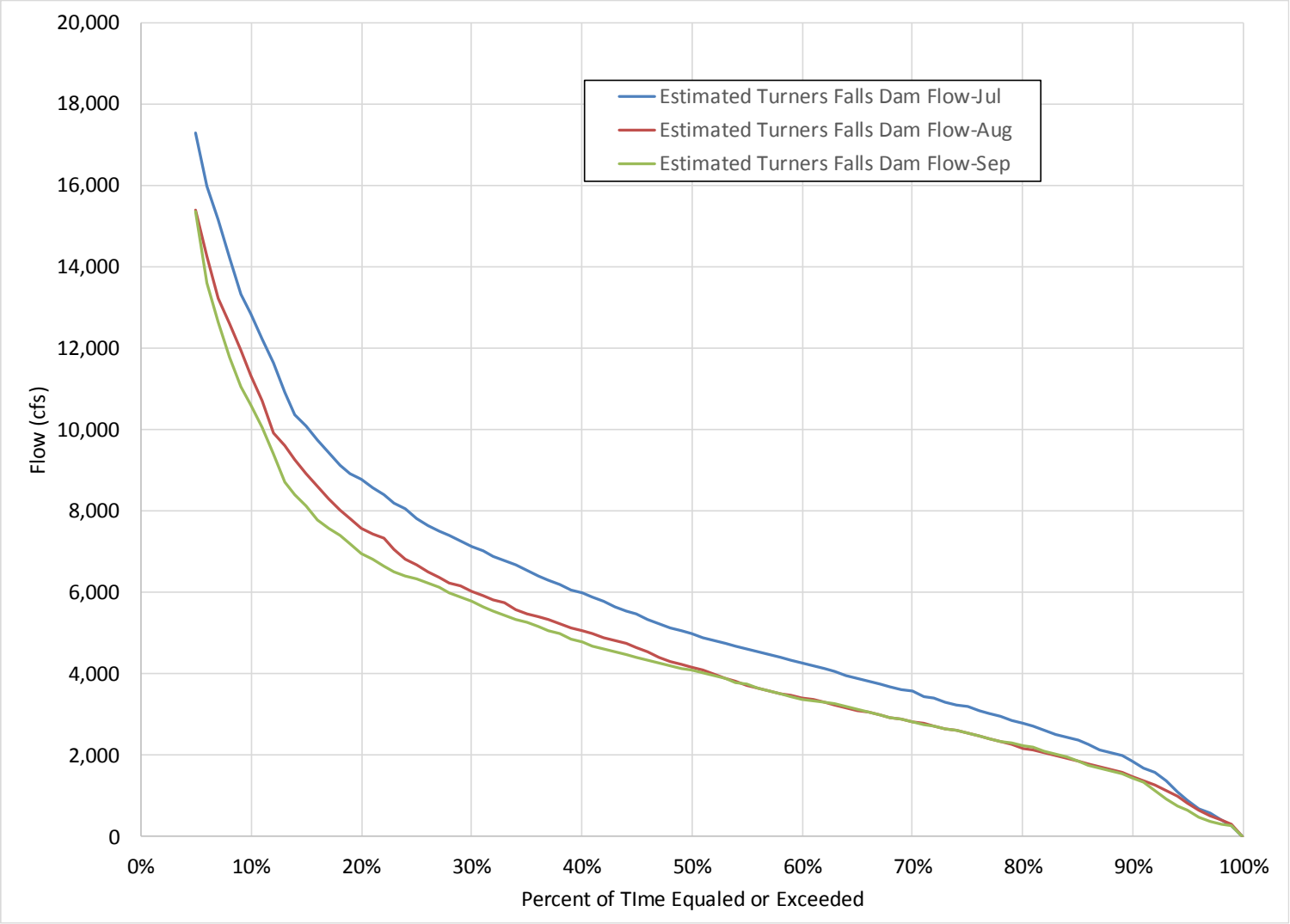

Figure 2.2-3. Connecticut River at Turners Falls Dam, Jul-Sep Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

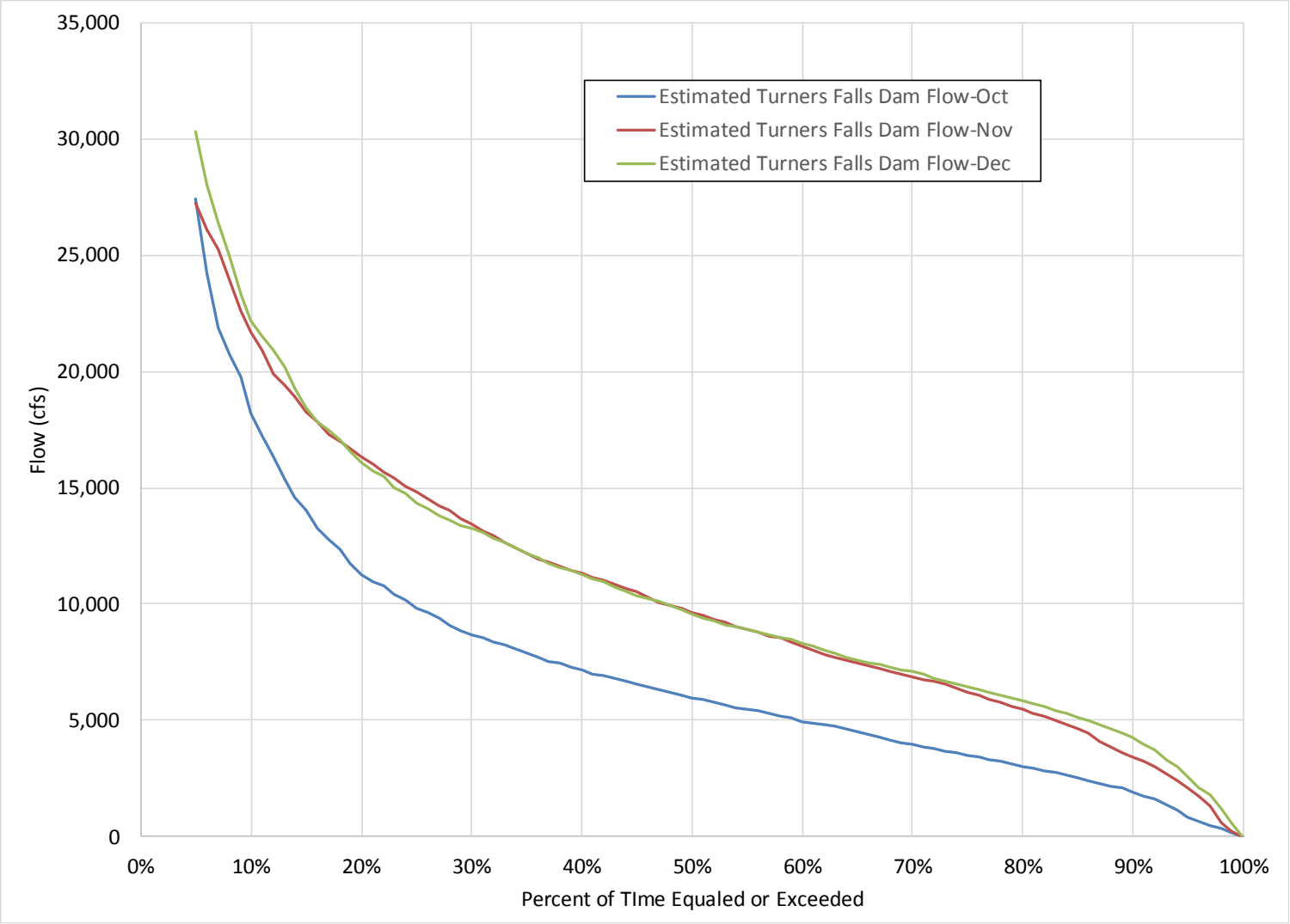

Figure 2.2-4. Connecticut River at Turners Falls Dam, Oct-Dec Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

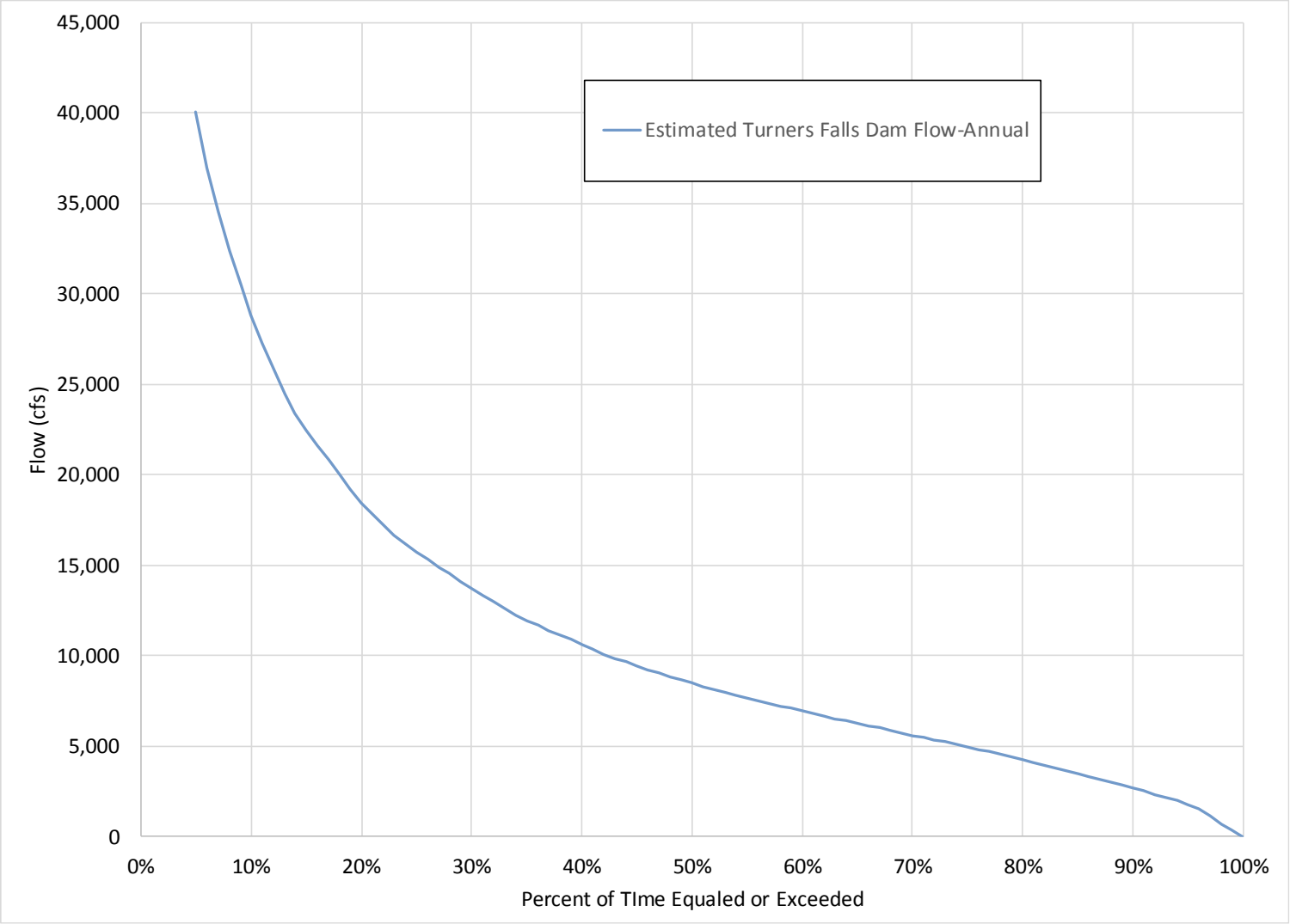

Figure 2.2-5. Connecticut River at Turners Falls Dam, Annual Flow Duration Curve, Oct 1940-Dec 2016, Drainage Area= 7,163 mi^2

Table 2.3-1: Turners Falls Impoundment Stage versus Storage Curve

Turners Falls Impoundment Elev (ft)	**Storage** (acre-ft)
172.26	0
176	4,150
177	5,600
178	7,500
179	9,200
180	11,100
181	13,000
182	14,750
183	16,600
184	18,450
185	20,300
186	22,100
186.5	23,000

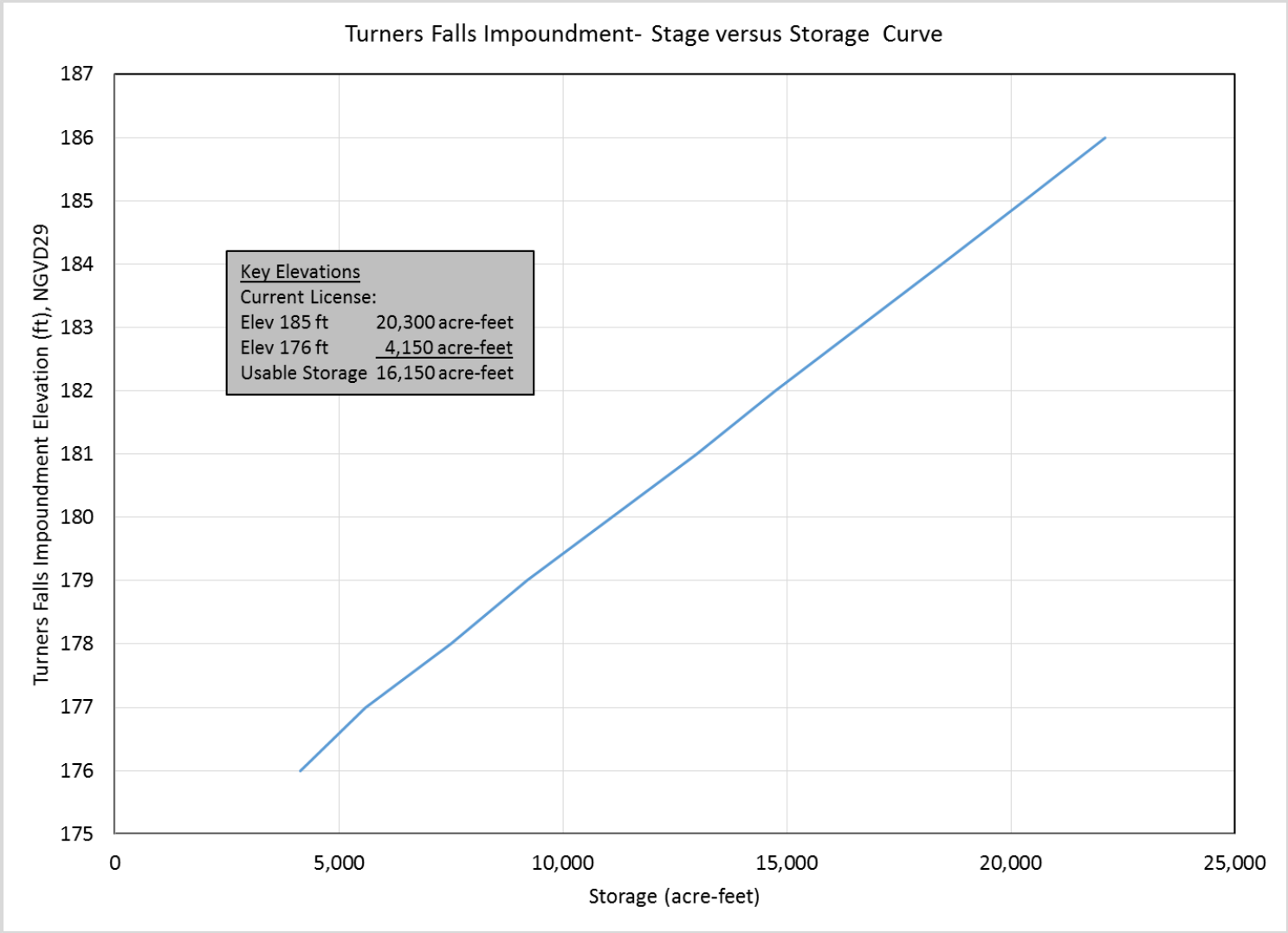

Figure 2.3-1: Turners Falls Impoundment Stage versus Storage Curve

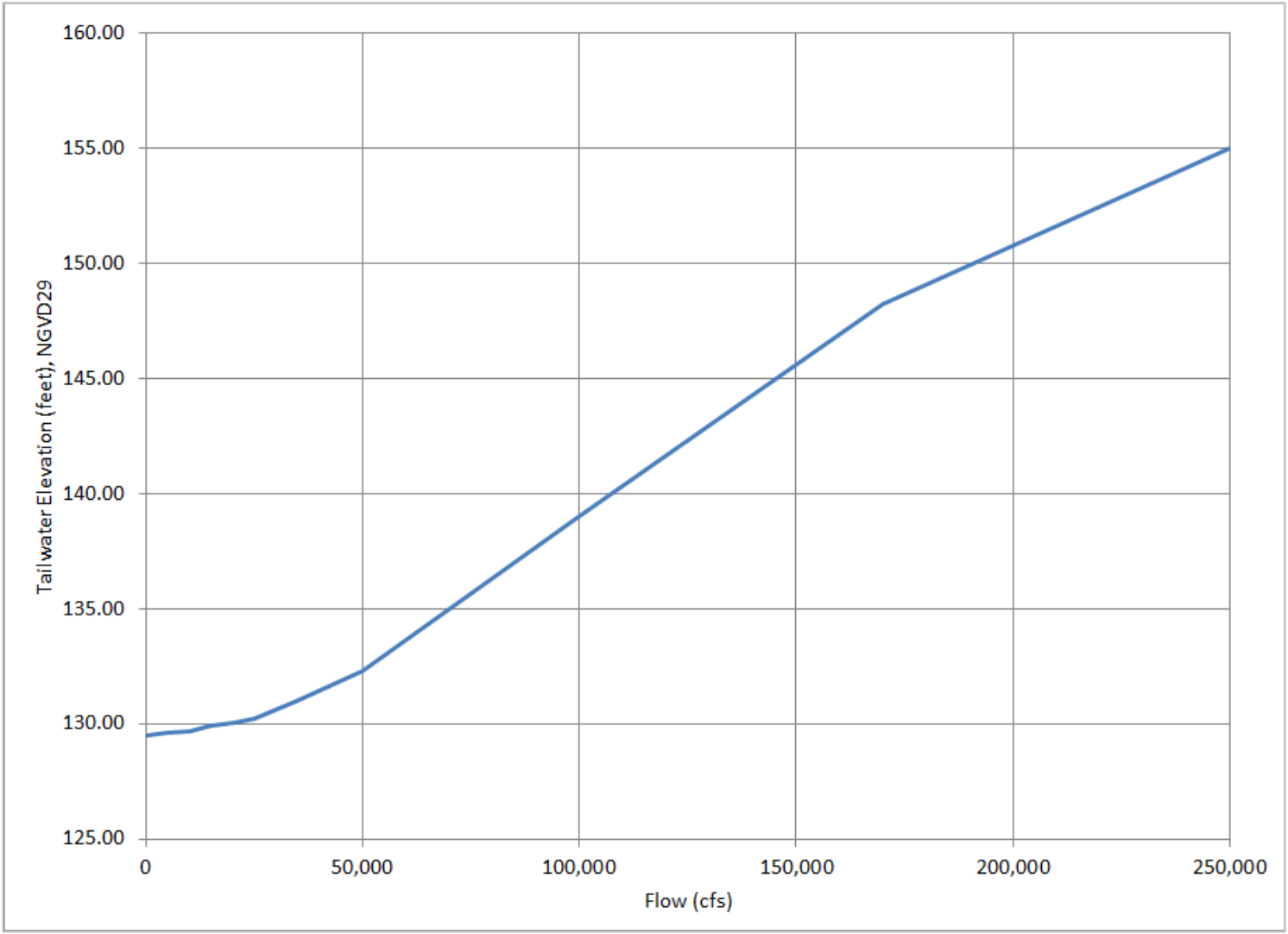

Figure 2.5-1: Station No. 1 Tailwater Rating Curve

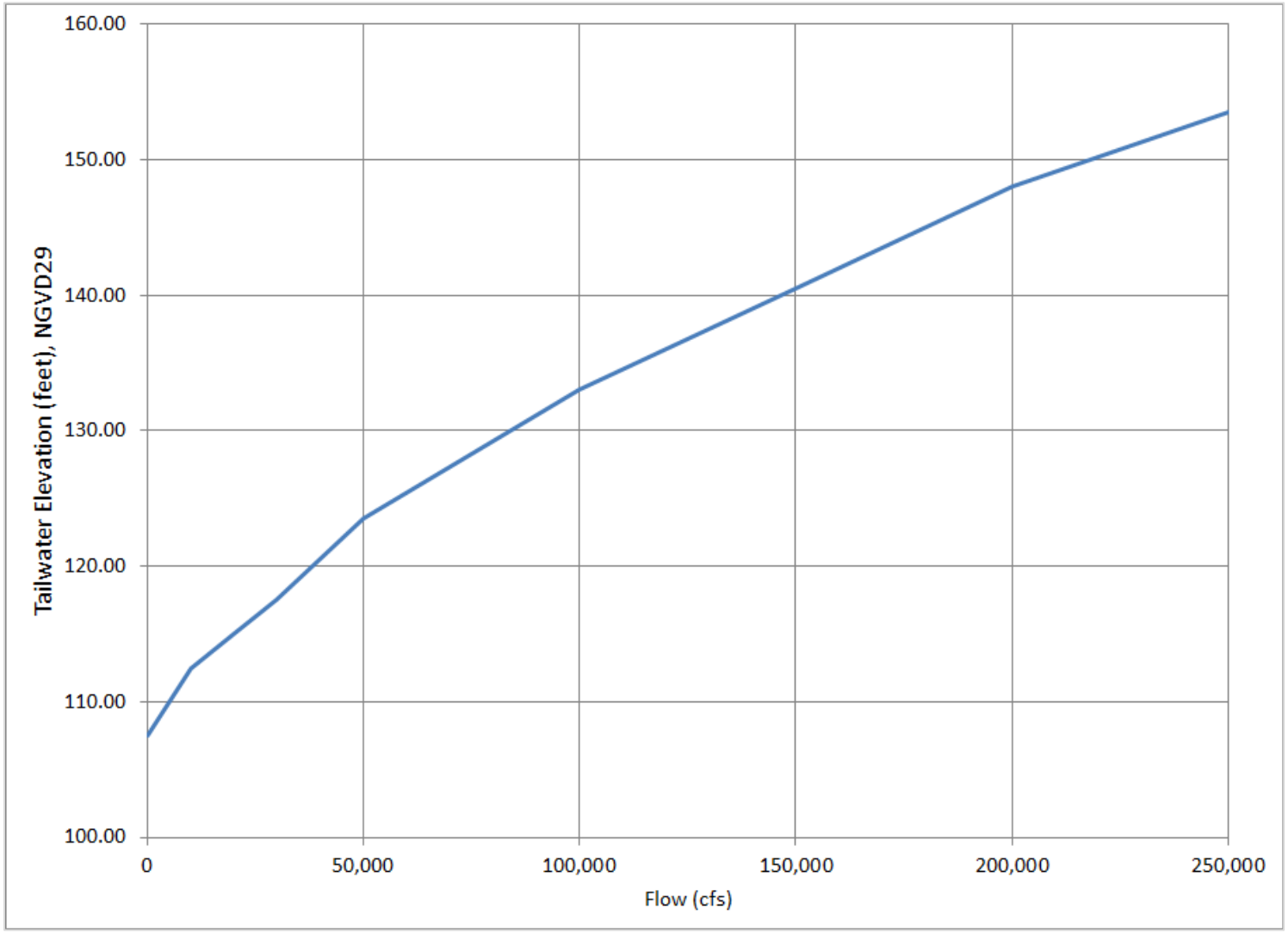

Figure 2.5-2: Cabot Station Tailwater Rating Curve

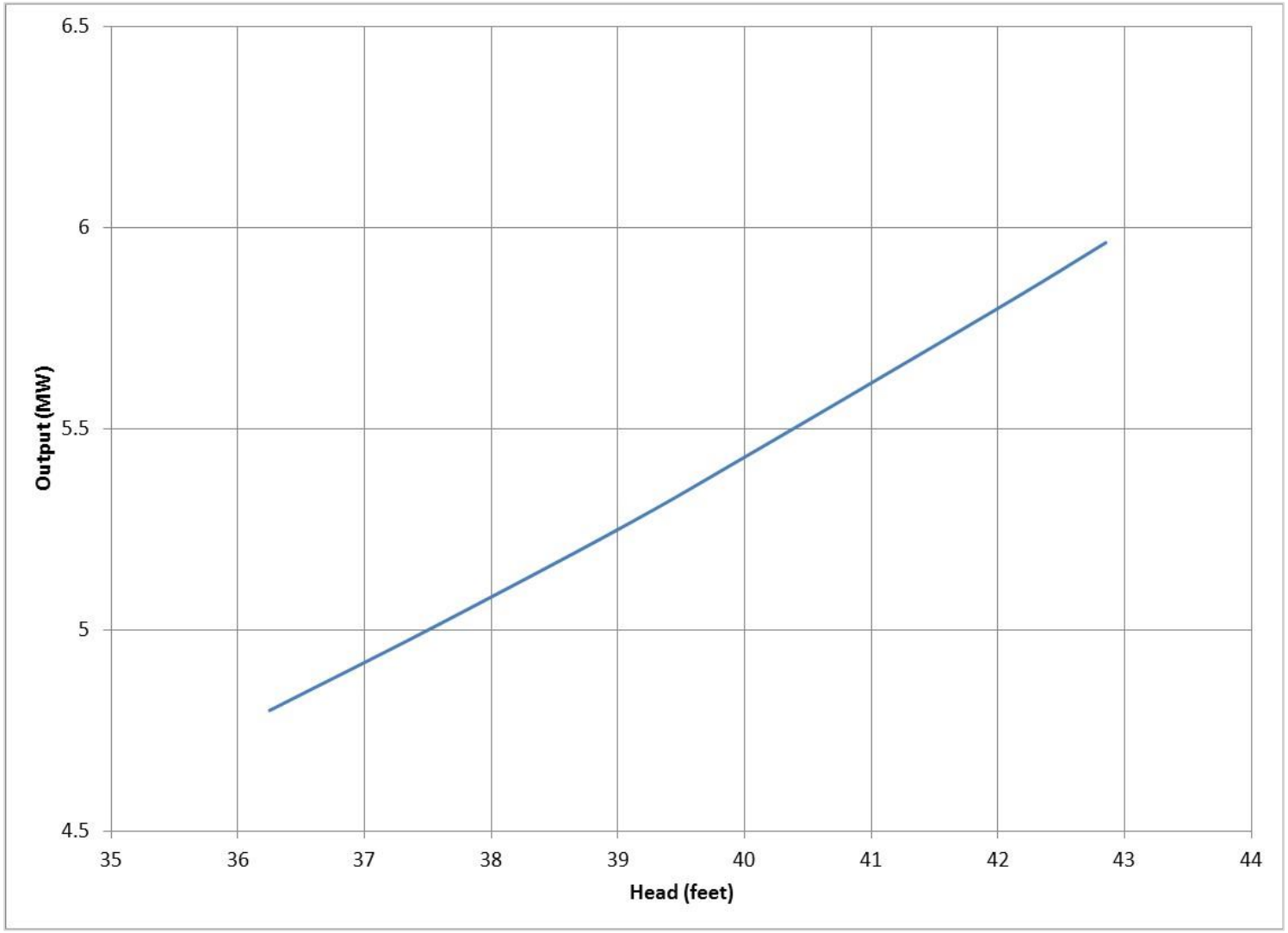

Figure 2.6-1. Station No. 1 - Plant Capability (MW) versus Head (ft) Curve

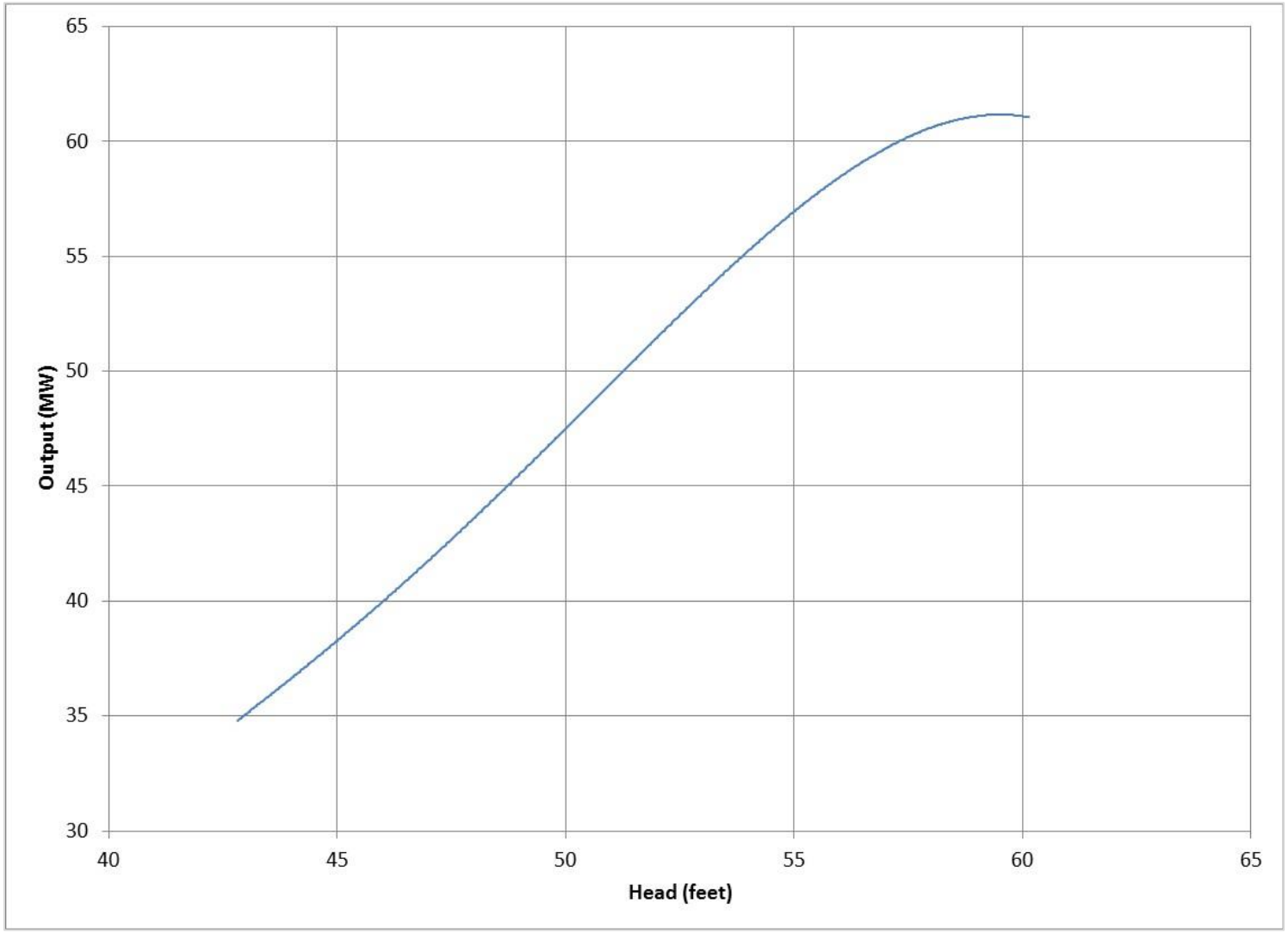

Figure 2.6-2. Cabot Station - Plant Capability (MW) versus Head (ft) Curve

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT C-CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

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EXHIBIT C – CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (d) describes the required content of this Exhibit.

(d) Exhibit C is a construction history and proposed construction schedule for the project. The construction history and schedules must contain:

(1) If the application is for an initial license, a tabulated chronology of construction for the existing projects structures and facilities described under paragraph (b) of this section (Exhibit A), specifying for each structure or facility, to the extent possible, the actual or approximate dates (approximate dates must be identified as such) of:

(i) Commencement and completion of construction or installation;

(ii) Commencement of commercial operation; and

(iii) Any additions or modifications other than routine maintenance; and

(2) If any new development is proposed, a proposed schedule describing the necessary work and specifying the intervals following issuance of a license when the work would be commenced and completed.

1 PROJECT HISTORY

FirstLight MA Hydro LLC (hereinafter referred to as FirstLight) is licensed by the Federal Energy Regulatory Commission (FERC) to operate the Turners Falls Hydroelectric Project (Turners Falls Project or Project).

Turners Falls Project

The Turners Falls Project is located on the Connecticut River in the Commonwealth of Massachusetts (MA), and the states of New Hampshire (NH) and Vermont (VT). The greater portion of the Turners Falls Project, including developed facilities and most of the lands within the Turner Falls Project boundary, are located in Franklin County, MA; specifically, in the towns of Erving, Gill, Greenfield, Montague and Northfield. The northern reaches of the Project boundary, which includes the Turners Falls Impoundment (TFI), extend into the town of Hinsdale, in Cheshire County, NH, and the town of Vernon, in Windham County, VT. The Turners Falls Dam is located at approximately river mile 122 (above Long Island Sound) on the Connecticut River, at coordinates 42°36'38.77" north and 72°33'05.76" west, in the towns of Gill and Montague, MA.

The Turners Falls Project consists of: a) two individual concrete gravity dams, referred to as the Gill Dam and Montague Dam connected by a natural rock island known as Great Island, b) an approximate 20-mile long TFI serving as the lower reservoir for the Northfield Mountain Project, c) a gatehouse, d) a power canal, e) two hydroelectric projects located on the power canal including Station No. 1 and Cabot Station, f) three fish passage facilities and g) a downstream fish passage facility located at the downstream terminus of the power canal.

The first Turners Falls Dam and canal was built in 1798 as an extension to a lock and dam system that started in Holyoke, MA. Other dams have been constructed or rebuilt between 1798 and the present day dam. Improvements to the dam and enlargement of the canal, as well as the construction of the Cabot Station and Station No. 1 powerhouses commenced in the early 1900s. Station No. 1 commenced operation in 1905, while the Cabot Station powerhouse commenced operation in 1916. In 1944, the Federal Power Commission, predecessor to the Federal Energy Regulatory Commission (FERC), issued to Western Massachusetts Electric Company a 50-year license for the Turners Falls Project designated as FERC No. 1889. The Turners Falls Project began operation with six vertical Francis turbines at Cabot Station with a capacity of 51 MW and six horizontal Francis turbines at Station No. 1 with a capacity of 6 MW.

To accommodate for the Northfield Mountain Pumped Storage Project, the Turners Falls license was amended by FERC in the same 1968 Order as the original license for the Northfield Mountain Pumped Storage Project. This amendment approved the reconstruction of the Turners Falls Dam (raising of the dam) and power canal gatehouse. The completion of these improvements resulted in an increase in the permitted headpond level to elevation 185.0 ft NGVD29. A new license for the Turners Falls Project was issued by FERC in 1980.

The Turners Falls Project is maintained through regularly scheduled maintenance inspections and replacement of equipment reaching the end of its service life. In addition to the routine maintenance, various components of the Turners Falls Project have been refurbished. An overview of the history of Project improvements is summarized in Table 1.0-1.

Table 1.0-1. Turners Falls Project Milestones

Date	Station	Description
1905	Station No.1	Station No.1 - Generation Units began operation
1916	Cabot Station	Cabot Station - Generation Units began operation 2/26/1916
1973	Station No.1	Powerhouse deactivated
1982	Station No.1	Units 1,2&3 refurbished; Powerhouse reactivated
1987	Station No.1	Units 5&7 overhauled
1987	Cabot Station	30-ton Gantry Crane refurbished
1990	Cabot Station	Control update to allow remote operation
1995	Cabot Station	Control update to allow automated operation for Gatehouse and Canal
2002	Cabot Unit 1-6	Generator step-up transformer upgraded
2002	Cabot Unit 1&2	Turbine runner replacement and generator rewind
2003	Cabot Unit 3&4	Turbine runner replacement and generator rewind
2004	Cabot Unit 5&6	Turbine runner replacement and generator rewind
2006	Cabot Station	Trashrack frames and supporting structure replaced

2 SCHEDULE FOR PROPOSED PROJECT DEVELOPMENT

Station No. 1 Upgrades

FirstLight is proposing changes to the Turners Falls Project, specifically, changes to Station No. 1. Station No. 1 is currently an unstaffed facility. To bring units on, an operator must visit the site. In addition, the five (5) units cannot be throttled over a range of flows, meaning each unit only discharges its maximum capacity. FirstLight is proposing to pass a portion of its proposed bypass flows via Turners Falls Dam spill and Station No. 1 discharge. By automating Station No. 1, it will allow FirstLight to a) remotely operate the units and b) operate the units over a wider range of flows (not just the maximum capacity). FirstLight proposes the following:

- For each unit, upgrading the brakes, controls, governors, grounding transformer, protective relaying, excitation system and turbine rehabilitations.
- Automation including auto synchronizing equipment and sensors to interface to the programmable logic controller (PLC).

Units 4 and 6 are no longer in service. Unit 4 was originally a water-powered rotary exciter. A static exciter was installed to replace it in the same floor space in the powerhouse. Unit 6 was decommissioned in-place based on its poor condition. FirstLight has no plans to restore these two units into service.

FirstLight anticipates completing this work within three (3) years of license issuance as shown in Table 2.0-1.

Table 2.0-1 FirstLight's Proposed Modification at Station No. 1 Schedule

Proposed Modification	Task	Estimated No. of Years after License Issuance Modification becomes Operational		
		1	2	3
Modify Station No. 1 (within 3 years of license issuance)	Engineering/Design			
	Permitting (assumed not needed)			
	Construction			
	Operational			

Minimum Flow Turbine-Generator

At this time, FirstLight is not proposing to install a minimum flow turbine-generator at the Turners Falls Dam to generate with proposed bypass flows. FirstLight conducted a feasibility study of adding a hydropower facility at the dam to generate with its proposed bypass flows. However, the cost of constructing the facility, coupled with the current low value of energy and capacity in New England, made such a facility economically infeasible. However, over the term of the next license, FirstLight will continually evaluate the economic feasibility of adding a minimum flow turbine-generator or any other potential energy source.

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Amended Final License Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT D – STATEMENT OF COST AND FINANCING

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EXHIBIT D – STATEMENT OF COSTS AND FINANCING

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (e) describes the required content of this Exhibit.

(e) Exhibit D is a statement of costs and financing. The statement must contain:

(1) If the application is for an initial license, a tabulated statement providing the actual or approximate original cost (approximate costs must be identified as such) of:

(i) Any land or water right necessary to the existing project; and

(ii) Each existing structure and facility described under paragraph (b) of this section (Exhibit A).

(2) If the applicant is a licensee applying for a new license, and is not a municipality or a state, an estimate of the amount which would be payable if the project were to be taken over pursuant to section 14 of the Federal Power Act upon expiration of the license in effect [see 16 U.S.C. 807], including:

(i) Fair value;

(ii) Net investment; and

(iii) Severance damages.

(3) If the application includes proposals for any new development, a statement of estimated costs, including:

(i) The cost of any land or water rights necessary to the new development; and

(ii) The cost of the new development work, with a specification of:

(A) Total cost of each major item;

(B) Indirect construction costs such as costs of construction equipment, camps, and commissaries;

(C) Interest during construction; and

(D) Overhead, construction, legal expenses, taxes, administrative and general expenses, and contingencies.

(4) A statement of the estimated average annual cost of the total project as proposed specifying any projected changes in the costs (life-cycle costs) over the estimated financing or licensing period if the applicant takes such changes into account, including:

(i) Cost of capital (equity and debt);

(ii) Local, state, and Federal taxes;

(iii) Depreciation and amortization;

(iv) Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies; and

(v) The estimated capital cost and estimated annual operation and maintenance expense of each proposed environmental measure.

(5) A statement of the estimated annual value of project power, based on a showing of the contract price for sale of power or the estimated average annual cost of obtaining an equivalent amount of power (capacity and energy) from the lowest cost alternative source, specifying any projected changes in the cost of power from that source over the estimated financing or licensing period if the applicant takes such changes into account.

(6) A statement specifying the sources and extent of financing and annual revenues available to the applicant to meet the costs identified in paragraphs (e) (3) and (4) of this section.

(7) An estimate of the cost to develop the license application;

(8) The on-peak and off-peak values of project power, and the basis for estimating the values, for projects which are proposed to operate in a mode other than run-of-river; and

(9) The estimated average annual increase or decrease in project generation, and the estimated average annual increase or decrease of the value of project power, due to a change in project operations (i.e., minimum bypass flows; limits on reservoir fluctuations).

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1 COST OF ORIGINAL DEVELOPMENT

This application is for a new license, not an initial license; the Turners Falls Hydroelectric Project (Turners Falls Project) was most recently licensed in 1980. Accordingly, the Commission's regulations do not require FirstLight MA Hydro LLC (hereinafter referred to as FirstLight) to include a statement of costs of lands, water rights, structures or facilities. 18 C.F.R. § 4.51(e)(1).

2 ESTIMATED AMOUNT PAYABLE IN THE EVENT OF PROJECT TAKEOVER

To date, no agency or interested party has recommended a Federal takeover of the Turners Falls Project pursuant to Section 14 of the Federal Power Act (FPA). If such a takeover were to occur, FirstLight would have to be reimbursed for the net investment, not to exceed the fair value of the property taken, plus severance damages, if any, to property of the licensee valuable, serviceable, and dependent for its usefulness on the continuance of the license, but not taken. (Section 14, FPA).

2.1 Fair Value

The term "fair value" is not defined in the FPA Section 14. FirstLight believes the best approximation of fair value is the cost to construct and operate a comparable power generating facility. Because of the high capital costs involved with constructing new facilities and the increase in fuel costs, the fair value would be considerably higher than the net investment (see Section 2.2). If a takeover were proposed, FirstLight would calculate fair value based on then-current conditions.

2.2 Net Investment

The FPA defines "net investment" as the original cost, plus additions, minus the sum of the following items (to the extent that such items have been accumulated during the period of the license from earnings in excess of a fair return on such investment): (a) unappropriated surplus; (b) aggregate credit balances of current depreciated accounts; and (c) aggregate appropriations of surplus or income held in amortization, sinking fund, or similar reserves.

The Turners Falls Project net investment is approximately $37,439,000.

2.3 Severance Damages

Severance damages are determined either by the cost of replacing (retiring) equipment that is "dependent for its usefulness upon the continuance of the License" but not taken (Section 14, FPA). Should the Turners Falls Project be taken over by a different entity, it could be operated such that it could harm Northfield Mountain Project operations. FirstLight currently strives to keep the storage in the TFI and in the Northfield Mountain Project's Upper Reservoir in balance such there is always storage in the TFI to fill the Upper Reservoir and vice versa. If a different entity operated the Turners Falls Project and depleted the TFI storage, it could harm the Northfield Mountain Project's ability to pump water.

3 ESTIMATED CAPITAL COST OF PROPOSED PROJECT

At this time, FirstLight is not proposing to add capacity or install a minimum flow turbine-generator at the Turners Falls Dam to generate with proposed bypass flows. However, over the term of the next license FirstLight will continually evaluate the economic feasibility of adding a minimum flow turbine-generator or any other potential energy source.

4 ESTIMATED AVERAGE ANNUAL COST OF PROJECT

The average annual cost of the Turners Falls Project includes capital costs, taxes, depreciation, as well as operations and maintenance (O&M) costs. The average annual costs also includes any costs associated with the proposed Protection, Mitigation and Enhancement (PM&E) measures.

4.1 Capital Costs

The current estimated average annual capital costs for the Turners Falls Project is approximately $2,000,000/year or $100,000,000 over a 50-year license term. These costs include life cycle costs such as runner replacements, generator rewinds, and oil circuit breaker replacements and routine replacement of vehicles and tools. Additional capital costs related to the implementation of PM&E measures will add to the current annual capital expense. Those costs are detailed in Section 4.5.

Other Capital Costs

On October 23, 2018, the America's Water Infrastructure Act (AWIA) of 2018 was enacted. The Act added Section 36 to the FPA, requiring FERC to consider, and give equal weight to, project-related investments by the Licensee under the new license and project-relative investments by the Licensee over the term of the existing license when setting the term under the new license.

Section 36(b)(2) requires FERC to consider investments by the Licensee over the term of the existing license (including any terms under annual licenses) that "(A) resulted in redevelopment, new construction, new capacity, efficiency, modernization, rehabilitation or replacement of major equipment, safety improvements, or environmental, recreation, or other protection, mitigation, or enhancement measures conducted over the term of the existing license; and (B) were not expressly considered by the Commission as contributing to the length of the existing license term in any order establishing or extending the existing license term."

There have been considerable investments into efficiency and modernization of the six turbines at Cabot Station as documented in Exhibit C. The major modernization work, completed between 2001 and 2005, included turbine runner replacements and generator rewinds for all six turbines. The total cost of these improvements was approximately $25,200,000.

4.2 Taxes

The actual annual property taxes for the fiscal year ending December 31, 2019 for the Turners Falls Project was $4,527,000. FirstLight estimates paying approximately $100,000 in state franchise taxes annually. A summary of the local and state franchise taxes for the fiscal year ending December 31, 2019 are shown in Table 4.2-1. Federal income taxes for the Turners Falls Project are incorporated into costs of the Licensee's consolidated business and are not separated out for the Turners Falls Project.

Table 4.2-1: State and Local Taxes Associated with the Turners Falls Project (FY 2019 dollars)

Tax	Turners Falls Project
Local (property)	$4,527,000
State	$100,000
Total	**$4,627,000**

4.3 Depreciation and Amortization

The estimated annual depreciation and amortization costs associated with the Turners Falls Project are approximately $4,300,000.

4.4 Operation and Maintenance Expenses

Annual O&M expenses include interim replacements, insurance, and administrative and general costs associated with the operation of the Turners Falls Project, as well as compliance with environmental measures. The O&M costs for the Turners Falls Project are approximately $4,300,000/year.

Additional O&M expenses related to the implementation of PM&E measures will add to the annual O&M expenses. Those costs are detailed in Section 4.5.

4.5 Costs of Proposed Protection, Mitigation and Enhancement Measures

FirstLight proposes several PM&E measures for inclusion in the new license for the Turners Falls Project. The PM&E measures have extensive associated capital cost, periodic capital cost, and annual O&M cost over the proposed 50-year license term. Table 4.5-1 summarizes the PM&E measures and includes the following:

- The total capital costs, including engineering, permitting and construction, for each PM&E measure.
- The periodic costs, including the cost of replacing and/or repairing equipment associated with each PM&E measure.
- The annual O&M costs associated with each PM&E measure.

Table 4.5-1: Costs Associated with Proposed PM&E Measures at the Turners Falls Hydroelectric Project

PM&E Measure	Total Capital Cost over 50 years (2019 dollars)	Total Periodic Capital Cost over 50 years (2019 dollars)	Total O&M Cost over 50 years (2019 dollars)	Average[1] Annual Cost over 50 years (2019 dollars)
[2]**Fish Passage Measures**				
Construct a new Spillway Lift with Palisade Entrance at the Turners Falls Dam	$12,187,000	$1,692,300	$15,884,000 $361,000/year for 44 years	$595,000
Construct an Eelway near the Turners Falls Dam	$547,000	$282,000	$308,000 $7,700/year for 40 years	$23,000
Install Permanent Ultrasound Array in the Cabot Tailrace	$2,490,000	$500,000	$3,010,000 $70,000/year for 43 years	$120,000
Construct a Plunge Pool below Bascule Gate No. 1	$4,493,000	$483,800	$3,344,000 $76,000/year for 44 years	$166,000
Construct a Bar Rack at the entrance to Station No. 1	$3,921,000	$524,800	$215,000 $5,000/year for 43 years	$93,000
Recreation				
Construct a formal access trail to a put-in below the Turners Falls Dam	$183,000	-	$329,000 $7,000/year for 47 years	$10,000
Create a formal trail and steps for a take-out at Poplar Street	$286,000	-	$329,000 $7,000/year for 47 years	$12,000
Project Upgrades				
[3]Station No. 1 Upgrades	$1,200,000	$1,200,000	$94,000 $2,000/yr for 47 years	$50,000
Infrastructure needed to pass winter bypass flows (heaters on bascule gate no. 1)	$400,000	-	$587,500 $12,500/year for 47 years	$20,000
Total	**$25,707,000**	**$4,682,900**	**$24,100,500**	**$1,089,000**

[1]Rounded to the nearest $1,000. Average Annual Cost= (Total Capital Costs + Total Periodic Costs + Total O&M Costs)/50 years.

[2]Each fish passage measure assumes 3 years of effectiveness testing that is incorporated into the Capital Cost.

[3]Station No. 1 upgrades include a) for each unit, upgrading the brakes, controls, governors, grounding transformer, protective relaying, excitation system and turbine rehabilitations and b) automation including auto synchronizing equipment and sensors to interface to the programmable logic controller.

The average annual cost of the PM&E measures over 50 years equates to $1,089,000/year.

5 ESTIMATED ANNUAL VALUE OF PROJECT POWER

If all of the Turners Falls Project generation were sold into the market, it would be priced at the Day Ahead and Real Time Locational Marginal Prices that clear for each generator. For 2019, the Turners Falls Project had a realized energy value of $35.75/MWh (this is a realized value calculated as revenue divided by generation). The economic analysis of the Turners Falls Project also recognizes that the New England Power Pool (NEPOOL) market values the capacity, reserve and ancillary/regulation services provided by generation facilities.

Capacity is required by NEPOOL to ensure the reliability of the electric system and the price is established by NEPOOL through the forward capacity auction process. For 2019, the calendar average forward capacity auction clearing price was $8.07/KW-month, second all-time high, while the capacity revenue received by the Turners Falls Project was approximately $6,500,000. With known Forward Capacity Auction clearing prices, capacity revenue will drop precipitously to approximately $1,640,000 in 2024 as shown in Table 5.0-1.

Table 5.0-1: Annual Capacity Revenue of the Turners Falls Project

Year	Average Price ($kW-month)	Expected Revenue
2020	$6.02	$4,927,450
2021	$4.91	$4,007,323
2022	$4.15	$3,377,080
2023	$2.75	$2,244,539
2024[1]	$2.00	$1,636,800

[1]Capacity prices are cleared through May 2024; remainder of 2024 period assumes a $2.00/kW-month clearing price with unchanged qualified capacity of 68.2 MW.

In addition to energy and capacity the Turners Falls Project produces ancillary and real-time reserve services necessary for effective system control. For 2019, the ancillary services revenue has been calculated as approximately (-$326,000) and the revenue from local forward and real-time reserves is approximately $64,000.

Table 5.0-2 below shows the total valuation of the power based on the product components identified above. This is based on 327,067 MWh of generation in 2019. The annual market value of the energy, capacity and reserve and ancillary services is approximately $18,090,000 per year, which equates to $55.31 per MWh.

Table 5.0-2: Annual Revenue of the Turners Falls Project (2019)

Revenue Source	Value
Energy ($35.75/MWh for Year 2019 for 327,067 MWh)	$11,693,000
Capacity	$6,500,000
Renewable Energy Credits	$159,000
Locational Forward Reserve Market and Real-Time Reserves	$64,000
Ancillary*	($326,000)
Total Value	$18,090,000

NOTE: Numbers may not be exact due to rounding.
* Ancillary includes Utility charges for electric production.

6 SOURCES AND EXTENT OF FINANCING

The Turners Falls Project finances capital projects using cash flow from operations and as necessary additional debt obligations. It is part of a portfolio of 13 hydro assets which together service existing debt obligations. Interest expenses to service these obligations are approximately $29,500,000 annually. Based on the value of Turners Falls Project power, it should have adequate financial resources to meet the costs of operating the facility for the term of the new license.

7 ESTIMATED COST TO DEVELOP LICENSE APPLICATION

The cost to develop the information necessary to complete the license application through March 2020 is approximately $32,150,000 (which includes both the Turners Falls Project and the Northfield Mountain Project). This estimate includes all study costs, Integrated Licensing Process (ILP) costs, and personnel and administrative costs associated with processing.

8 ON-PEAK AND OFF-PEAK VALUES OF POWER

The Turners Falls Project operates within NEPOOL, whose geographic area includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

The Market has provided the historical 2019 On-Peak and Off-Peak prices for the Turners Falls Project generation node:

On-Peak Price	$33.79/MWh
Off-Peak Price	$27.63/MWh

9 ESTIMATED AVERAGE ANNUAL INCREASE OR DECREASE IN PROJECT GENERATION

FirstLight is proposing the following operational measures outlined in more detail in Exhibit E (which is a combined Exhibit E for the Turners Falls Project and Northfield Mountain Project).

Operational Regime

(a) The Licensee shall operate the Turners Falls Hydroelectric Project in accordance with the following operational flow regime until the third (3rd) anniversary of the effective date of the new license.

Date	Total Bypass Flow[2]	Turners Falls Dam	[3]Station No. 1
01/01-03/31	1,500 cfs or the Naturally Routed Flow (NRF), whichever is less	300 cfs	1,200 cfs[4]
04/01-05-31[1]	6,500 cfs or the NRF, whichever is less	4,290 cfs	2,210 cfs[4]
06/01-06/15[1]	4,500 cfs or the NRF, whichever is less	2,990 cfs	1,510 cfs[4]
06/16-06/30[1]	3,500 cfs or the NRF, whichever is less	2,280 cfs	1,220 cfs[4]
07/01-08/31	1,800 cfs or the NRF, whichever is less	670 cfs	1,130 cfs[4]
09/01-11/30	1,500 cfs or the NRF, whichever is less	500 cfs	1,000 cfs[4]
12/01-12/31	1,500 cfs or the NRF, whichever is less	300 cfs	1,200 cfs[4]

[1]The flow split during these periods is approximately 67% from the Turners Falls Dam and 33% from Station No. 1. If FirstLight conducts further testing, in consultation with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS) and Massachusetts Department of Fish and Wildlife (MADFW), and

Date	Total Bypass Flow[2]	Turners Falls Dam	[3]Station No. 1
determines that migratory fish are not delayed by passing a greater percentage of the bypass flow via Station No. 1, it may increase the percentage through Station No. 1 upon written concurrence of those agencies. [2]If the NRF is less than 6,500 cfs (04/01-05/31), 4,500 cfs (06/01-06/15) or 3,500 cfs (06/16-06/30) the flow split will still be set at approximately 67% of the NRF from the Turners Falls Dam and 33% of the NRF from Station No. 1. If the NRF is less than 1,800 cfs (7/1-8/31), 1,500 cfs (9/1-11/30), or 1,500 cfs (12/1-3/31), the Licensee shall maintain the Turners Falls Dam discharges at 670 cfs, 500, cfs, and 300 cfs, respectively. [3]To maintain the flow split, Station No. 1 must be automated, which will not occur until Year 3 of the license. FirstLight proposes to maintain the flow split such that the Turners Falls Dam discharge will be as shown above, or higher flows will be spilled, in cases where the additional flow cannot be passed through Station No. 1. [4]The Turners Falls Hydro (TFH) project (FERC No. 2622) and Milton Hilton, LLC project (unlicensed) are located on the power canal and discharge into the bypass reach upstream of Station No. 1. The hydraulic capacity of the TFH project and Milton Hilton, LLC project is 289 and 113 cfs, respectively. If the TFH project is operating, FirstLight will reduce its Station No. 1 discharge by 289 cfs. If the Milton Hilton, LLC project is operating, FirstLight will reduce its Station No. 1 discharge by 113 cfs.			

(b) Maintain a continuous minimum flow below Cabot Station of 6,800 cfs from 6/1-6/15 and 5,800 cfs from 6/16-6/30 or the NRF, whichever is less.

The bypass flows and minimum flow below Cabot may be modified temporarily: (1) during and to the extent required by operating emergencies beyond the control of the Licensee; and (2) upon mutual agreement among the Licensees for Projects Nos. 1889 and 2485 and the USFWS, NMFS, MADEP and MADFW.

(c) The NRF represents the inflow to the Turners Falls Dam. The NRF is defined as the sum of the Vernon Hydroelectric Project (FERC No. 1904) total discharge, Ashuelot River United States Geological Survey (USGS) gage flow and Millers River USGS gage flow.

(d) The Licensee shall operate the Turners Falls Hydroelectric Project in accordance with the conditions in paragraph (a) and (b) and the following operational flow regime beginning on the third (3rd) anniversary of the effective date of the new license.

Date	Total Bypass Flow[2,3]	Maximum Flow below Cabot Station to Protect Puritan Tiger Beetles	Cabot Down-Ramping Rate to Protect Shortnose Sturgeon	Cabot Up-Ramping Rate to Protect Shortnose Sturgeon (4/1-5/31) and Odonates (6/1-8/15)
01/01-03/31	1,500 cfs or the NRF, whichever is less			
[1]04/01-05/31	6,500 cfs or the NRF, whichever is less		Down to 2,300 cfs/hour	Up to 2,300 cfs/hour
[1]06/01-06/15	4,500 cfs or the NRF, whichever is less			Up to 2,300 cfs/hr from 8:00 am to 2:00 pm

Date	Total Bypass Flow[2,3]	Maximum Flow below Cabot Station to Protect Puritan Tiger Beetles	Cabot Down-Ramping Rate to Protect Shortnose Sturgeon	Cabot Up-Ramping Rate to Protect Shortnose Sturgeon (4/1-5/31) and Odonates (6/1-8/15)
[1]06/16-06/30	3,500 cfs or the NRF, whichever is less			Up to 2,300 cfs/hr from 8:00 am to 2:00 pm
07/01-08/15	1,800 cfs or the NRF, whichever is less	Add no more than 4,600 cfs additional flow from Cabot Station from 1 am to 2 pm		Up to 2,300 cfs/hr from 8:00 am to 2:00 pm
08/16-08/31	1,500 cfs or the NRF, whichever is less	Add no more than 4,600 cfs additional flow from Cabot Station from 1 am to 2 pm		
09/01-11/30	1,500 cfs or the NRF, whichever is less			
12/01-12/31	1,500 cfs or the NRF, whichever is less			

[1]The flow split during these periods is approximately 67% from the Turners Falls Dam and 33% from Station No. 1. If FirstLight conducts further testing, in consultation with the NMFS, USFWS and MADFW, and determines that migratory fish are not delayed by passing a greater percentage of the bypass flow via Station No. 1, it may increase the percentage through Station No. 1 upon written concurrence of those agencies.

[2]If the NRF is less than 6,500 cfs (04/01-05/31), 4,500 cfs (06/01-06/15) or 3,500 cfs (06/16-06/30) the flow split will still be set as approximately 67% of the NRF from the Turners Falls Dam and 33% of the NRF from Station No. 1. If the NRF is less than 1,800 cfs (7/1-8/31), 1,500 cfs (9/1-11/30), or 1,500 cfs (12/1-3/31), the Licensee shall maintain the Turners Falls Dam discharges at 670 cfs, 500, cfs, and 300 cfs, respectively.

[3]The Turners Falls Hydro (TFH) project (FERC No. 2622) and Milton Hilton, LLC project (unlicensed) are located on the power canal and discharge into the bypass reach upstream of Station No. 1. The hydraulic capacity of the TFH project and Milton Hilton, LLC project is 289 and 113 cfs, respectively. If the TFH project is operating, FirstLight will reduce its Station No. 1 discharge by 289 cfs. If the Milton Hilton, LLC project is operating, FirstLight will reduce its Station No. 1 discharge by 113 cfs.

FirstLight has included two timing elements in its Proposed Action to address the new operational paradigm. First, FirstLight is proposing a three (3) year transition period in which it will institute new minimum flows in paragraph (a) and (b), as a license condition, and also put processes in place with GRH and ISO-NE to assure success in meeting its obligations for Cabot Station up and down ramping as well as Cabot Station peak demand flow restrictions. In addition, Station No. 1 upgrades will be completed during this period. In Year 4 of the new license, FirstLight will be responsible, as a license condition, for the full suite of flow enhancements shown in paragraphs (a), (b) and (d) (i.e. Cabot Station up and down ramping, Cabot Station peak demand flow restrictions).

In addition, and in an attempt to meet its obligations for delivering reliable power and capacity, FirstLight is also proposing exceptions where it can deviate from its Cabot Station up and down ramping and peak demand flow requirements for a finite period of time as described in (e) below if required to meet either its

flood operations (or similar public safety obligation) or ISO-NE obligations, as well as due to unforeseen river conditions from the Vernon Project.

(e) If compliance with the prescribed operating limits (defined as Maximum Flow below Cabot Station, Cabot Down-Ramping Rate and Cabot Up-Ramping Rate which are shown as the last three columns in the table in paragraph (d)) 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 agreement with a governmental entity, or any tariff, capacity rating requirement, ramping criterion, or other requirement of the ISO-NE or its successors (ISO-NE), Licensee may deviate from the prescribed operating limitations to the least degree necessary in order to avoid such violation or breach. In addition, Licensee may deviate from the operating limits for the following reasons:

- To perform demonstrations of the resources' operating capabilities under ISO-NE rules and procedures. Licensee will use best efforts to be allowed by ISO-NE to perform these demonstrations at times that will not cause it to deviate from the operating limits.
- To manage the Turners Falls Impoundment within license limits following unexpected, significant increases or decreases in the NRF.
- To support the needs of ISO-NE grid operations by operating when called upon by the ISO-NE.
- If compliance with the prescribed operating limitations would cause a public safety hazard or prevent timely rescue.

With the exception of public safety, the Licensee agrees that under no conditions shall the four exceptions identified above occur in more than 10% of the hours each year that the limitations apply, without the written concurrence of the USFWS, NMFS, MADFW and MADEP.

The Licensee shall document on an hourly basis for each day any deviations from the Maximum Flow below Cabot Station, Cabot Down-Ramping Rate and Cabot Up-Ramping Rate restrictions. Each day, any deviations would be summed and at the end of each month between April 1 and August 31, the Licensee shall document the total number of deviations and provide the information to USFWS, NMFS, MADFW and MADEP on a monthly basis.

(f) Cabot Emergency Gate Use. The Licensee shall use the Cabot Emergency Gates under the following conditions: a) in case of a Cabot load rejection[1], b) in the case of dam safety issues such as potential canal overtopping or partial breach, and c) to discharge approximately 500 cfs between April 1 and June 15 for debris management. The Licensee shall avoid discharging higher flows through the gates from April 1 to June 15 whenever possible; however, if necessary, the Licensee shall coordinate with NMFS to minimize potential impact to SNS in the area below Cabot Station.

(g) Flood Flow Operations. The Licensee shall operate the Turners Falls Hydroelectric Project in accordance with its existing agreement with the United States Army Corp of Engineers (USACOE). 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 shall operate during flood

[1] A load rejection is when the Cabot Stations units are suddenly shut off. If this were to occur, the canal could potentially be overtopped. To prevent overtopping, the Cabot Emergency Gates open so that incoming flow down the power canal can be discharged via the Cabot Emergency Gates. Load rejections could occur at any time.

conditions and coordinate its operations with the Licensee of the Northfield Mountain Pumped Storage Project (FERC No. 2485).

Turners Falls Impoundment Water Level Management

(a) The Licensee shall operate the TFI, as measured at the Turners Falls Dam, between elevation 176.0 feet and 185.0 feet NGVD29.

(b) The Licensee shall limit the rate of rise of the TFI water level, as measured at the Turners Falls Dam, to be less than 0.9 feet/hour from May 15 to August 15 between the hours of 8:00 am and 2:00 pm for the protection of odonates.

(c) The rate of rise of the TFI may be modified temporarily: (1) during and to the extent required by operating emergencies beyond the control of the Licensee; and (2) upon mutual agreement among the Licensees for Projects Nos. 1889 and 2485 and the USFWS, NMFS and MADFW.

Whitewater Boating Flows

(a) The Licensee shall provide whitewater boating releases in accordance with the schedule below, or the NRF, whichever is less, from the Turners Falls Dam. The Licensee shall maintain the following whitewater release schedule. FirstLight will provide an annual schedule of releases on its website, for the period July-October by May 31 of each year.

Date	Turners Falls Dam Magnitude of Discharge	Turners Falls Dam Release Duration
1 Saturday in July	2,500 cfs or the NRF, whichever is less	4 hours
1 Saturday in August	2,500 cfs or the NRF, whichever is less	4 hours
3 Saturdays in September	3,500 cfs or the NRF, whichever is less	4 hours
1 Saturday in October	3,500 cfs or the NRF, whichever is less	4 hours
2 Saturdays in October	5,000 cfs or the NRF, whichever is less	4 hours

(b) The whitewater boating flows may be modified temporarily: (1) during and to the extent required by operating emergencies beyond the control of the Licensee; and (2) upon mutual agreement among the Licensees for Projects Nos. 1889 and 2485 and the USFWS, NMFS and MADFW.

Operating Priorities

In the event of a conflict among the operational requirements of this license, the Licensee shall maintain the priority listing below with 1 being highest priority. Flood flows operations will always take priority over any resource specific restriction. After flood flow operations, the priorities are bypass flows followed by operating improvements for SNS, PTB, odonates and finally whitewater flows.

Restriction	Resource Protected	Priority (1- highest, 6- lowest)							
		4/1-4/30	5/1-5/15	5/16-5/31	6/1-6/30	7/1-7/31	8/1-8/15	8/16-8/31	9/1-3/31
Flood Flow Operations	Public safety	1	1	1	1	1	1	1	1
Bypass Flows, or-inflow, 24 hrs/day	Aquatic Species	2	2	2	2	2	2	2	2
Up/Down Ramping 2,300 cfs, 24 hrs/day		3	3	3					

Restriction	Resource Protected	Priority (1- highest, 6- lowest)							
		4/1-4/30	5/1-5/15	5/16-5/31	6/1-6/30	7/1-7/31	8/1-8/15	8/16-8/31	9/1-3/31
Minimum flow below Cabot Station, or-inflow, 24 hrs/day	Shortnose Sturgeon				3				
Add no more than 2 additional Cabot Units from 1 am to 2 pm	Puritan Tiger Beetle					3	3	3	
Up Ramping 1 Cabot Unit/hr, 8 am to 2 pm	Odonates			4	4	4	4	4	
TFI elevation rate of rise <0.9 ft/hr as measured at the Turners Falls Dam, 8 am to 2 pm				5	5	5	5	5	
Whitewater Flows, or-inflow, Weekend, 4 hrs/day, flows ranging from 2,500 to 5,000 cfs	Public					6	6	6	6 (Sep, Oct only)

As discussed in Exhibit B, FirstLight developed an hourly time step operations model of the Connecticut River Basin for the period 1962-2003 to determine the impact on generation, flows and reservoir elevations due to alternative modes of operations. The operations model simulated two scenarios- baseline conditions (representing current operations) and FirstLight's proposed conditions as outlined above. Shown in Table 9.0-1 is a summary of the average (1962-2003) annual generation under baseline conditions, FirstLight's proposed conditions and the delta in generation between baseline and proposed operations.

Table 9.0-1: Average (1962-2003) Annual Generation Impact of FirstLight's Proposed Operations

Turners Falls Hydroelectric Project- Average Annual *Baseline Generation* from Operations Model (MWh/year)	**Turners Falls Hydroelectric Project- Average Annual *Proposed Operations Generation* from Operations Model (MWh/year)**	**Turners Falls Hydroelectric Project- Average Annual *Loss in Generation* due to Proposed Operations (MWh/year)**
296,754	263,242	-33,512 (-11.3%)

Operating the Turners Falls Project per the conditions described above results in an average annual generation loss of approximately 33,512 MWh/year, an overall 11.3% generation loss compared to baseline conditions. As noted above, for 2019, the Turners Falls Project had a realized energy value of $35.75/MWh (this is a realized value calculated as revenue divided by generation). Thus, a loss of 33,512 MWh/year equates to a loss $1,198,000/year or $59,900,00 over a 50-year license term.

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Amended Final License Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT G- PROJECT BOUNDARY MAPS

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EXHIBIT G – PROJECT BOUNDARY MAPS

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.41(h) describes the required content of this Exhibit.

Exhibit G is a map of the project that must conform to the specifications of § 4.39. In addition to the other components of Exhibit G, the applicant must provide the project boundary data in a georeferenced electronic format - such as ArcView shape files, GeoMedia files, MapInfo files, or any similar format. The electronic boundary data must be potentially accurate to ± 40 ft, in order to comply with the National Map Accuracy Standards for maps at a 1:24,000 scale (the scale of the USGS quadrangle maps). The electronic exhibit G data must include a text file describing the map projection used (i.e., UTM, State Plane, Decimal Degrees, etc.), the map datum (i.e., North American 27, North American 83, etc.) and the units of measurement (i.e., feet, meters, miles, etc.). Three sets of the maps must be submitted on CD or other appropriate electronic media. If more than one sheet is used, for the paper maps, the sheets must be numbered consecutively, and each sheet must bear a small insert sketch showing the entire project and indicating that portion of the project depicted on that sheet. Each sheet must contain a minimum of three known reference points. The latitude and longitude coordinates, or state plane coordinates, of each reference point must be shown. If at any time after the application is filed there is any change in the project boundary, the applicant must submit, within 90 days following the completion of project construction, a final Exhibit G showing the extent of such changes. The map must show:

(1) Location of the project and principal features. The map must show the location of the project as a whole with reference to the affected stream or other body of water and, if possible, to a nearby town or any other permanent monuments or objects, such as roads, transmissions lines or other structures, that can be noted on the map and recognized in the field. The map must also show the relative locations and physical interrelationships of the principal project works and other features described under paragraph (b) of this section (Exhibit A).

(2) Project Boundary. The map must show a project boundary enclosing all project works and other features described under paragraph (b) of this section (Exhibit A) that are to be licensed. If accurate survey information is not available at the time the application is filed, the applicant must so state, and a tentative boundary may be submitted. The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources (see paragraph (f) of this section (Exhibit E)). Existing residential, commercial, or other structures may be included within the boundary only to the extent that underlying lands are needed for project purposes (e.g., for flowage, public recreation, shoreline control, or protection of environmental resources). If the boundary is on land covered by a public survey, ties must be shown on the map at sufficient points to permit accurate platting of the position of the boundary relative to the lines of the public land survey, the best available legal description of the position of the boundary must be provided, including distances and directions from fixed monuments or physical features.

The boundary must be described as follows:

(i) Impoundments.
(A) The boundary around a project impoundment must be described by one of the following:
(1) Contour lines, including the contour elevation (preferred method);
(2) Specified courses and distances (meets and bounds);
(3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
(4) Any combination of the above methods.

(B) The boundary must be located no more than 200 feet (horizontal measurement) from the exterior margin of the reservoir, defined by the normal maximum surface elevation, except where deviations may be necessary in describing the boundary according to the above methods or where additional lands are necessary for project purposes, such as public recreation, shoreline control, or protection of environmental resources.

(ii) Continuous features. The boundary around linear (continuous) project features such as access roads, transmission lines, and conduits may be described by specified distances from center lines or offset lines of survey. The width of such corridors must not exceed 200 feet unless good cause is shown for a greater width. Several sections of a continuous feature may be shown on a single sheet with information showing the sequence of contiguous sections.

(iii) Noncontinuous features.
(A) The boundary around noncontinuous project works such as dams, spillways, and powerhouses must be described by one of the following:

(1) Contour lines;
(2) Specified courses and distances;
(3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
(4) Any combination of the above methods.

(B) The boundary must enclose only those lands that are necessary for safe and efficient operation and maintenance of the project or for other specified project purposes, such as public recreation or protection of environmental resources.

(3) Federal lands. Any public lands and reservations of the United States (Federal lands) [see 16 U.S.C. 796 (1) and (2)] that are within the project boundary, such as lands administered by the U.S. Forest Service, Bureau of Land Management, or National Park Service, or Indian tribal lands, and the boundaries of those Federal lands, must be identified as such on the map by:

(i) Legal subdivisions of a public land survey of the affected area (a protration of identified township and section lines is sufficient for this purpose); and
(ii) The Federal agency, identified by symbol or legend, that maintains or manages each identified subdivision of the public land survey within the project boundary; or
(iii) In the absence of a public land survey, the location of the Federal lands according to the distances and directions from fixed monuments or physical features. When a Federal survey monument or a Federal bench mark will be destroyed or rendered unusable by the construction of project works, at least two permanent, marked witness monuments or bench marks must be established at accessible points. The maps show the location (and elevation, for bench marks) of the survey monument or bench mark which will be destroyed or rendered unusable, as well as of the witness monuments or bench marks. Connecting courses and distances from the witness monuments or bench marks to the original must also be shown.
(iv) The project location must include the most current information pertaining to affected federal lands as described under § 4.81(b)(5).

(4) Non-Federal lands. For those lands within the project boundary not identified under paragraph (h)(3) of this section, the map must identify by legal subdivision:

(i) Lands owned in fee by the applicant and lands that the applicant plans to acquire in fee; and
(ii) Lands over which the applicant has acquired or plans to acquire rights to occupancy and use other than fee title, including rights acquired or to be acquired by easement or lease

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1 DETAILED MAPS

Exhibit G provides maps showing the Project boundary enclosing the Turners Falls Hydroelectric Project (Turners Falls Project) as described in Exhibit A. The Turners Falls Project boundary includes lands around the Turners Falls Dam, gatehouse, power canal, Station No. 1 and Cabot Station as well as the Turners Falls Impoundment (TFI). The Northfield Mountain Pumped Storage Project boundary overlaps with the Turners Falls Project Boundary around the TFI. The maps conform to the requirements of Section 4.41(h) of the Commission's regulations. Maps of the Turners Falls Project Area showing principal features and the boundary are included.

2 PROJECT BOUNDARY

The Turners Falls Project boundary is shown on the attached Exhibit G maps. FirstLight MA Hydro LLC (hereinafter referred to as FirstLight) is proposing three changes to the existing Project boundary:

- The removal of a 0.2 acre parcel of land at 39 Riverview Drive in Gill, MA[1] (Sheet 2 of 13, Exhibit G-2). FirstLight has no ownership rights on this residential parcel and land rights are not needed for Project operations or any other Project purpose. None of the lands FirstLight proposes to exclude from the Project boundary contains historic properties eligible or potentially eligible for the National Register of Historic Places.

- The addition of an 0.8 acre parcel of land owned by FirstLight at 21 Poplar Street (end of the street) in Montague, MA (Sheet 1 of 13, Exhibit G-1). These lands are needed for recreational purposes (take-out or put-in).

- The removal of a 20.1 acre parcel of land currently occupied by the United States Geological Survey's (USGS) Silvio Conte Anadromous Fish Laboratory located at One Migratory Way, P.O Box 796, in Turners Falls, MA 01376. The Conte Lab lands are located just north of Cabot Station (Sheet 1 of 13, Exhibit G-1). These lands are not needed for Project operations or any other Project purpose.

  The Commission's regulations provide that the boundary of a project "*must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources" and that "[e]xisting residential, commercial, or other structures may be included within the boundary only to the extent that underlying lands are needed for project purposes*." 18 C.F.R. § 4.41(h)(2). The lands occupied by Conte Lab do not meet these criteria.

  FirstLight's predecessor, the Western Massachusetts Electric Company, sought Commission approval to convey the land currently occupied by Conte Lab to the U.S. Fish and Wildlife Service (USFWS) for construction of a "Northeast Anadromous Fish Research Laboratory" in 1987. When the Commission approved the conveyance in 1988,[2] the purpose of USFWS's Fishery Resources Program responsible for constructing the lab was to *"[p]romote and enhance conservation of the Nation's freshwater, anadromous, and intercoastal fishery resources for maximum long-term public benefit*."[3] The land and lab were subsequently transferred from USFWS to USGS. Today Conte Lab has been charged with "*meeting the need for information about anadromous fish biology and ecology" by performing "research directed towards restoration and protection of anadromous*

[1] Note that this parcel has an overlapping Project boundary with the Northfield Mountain Project.
[2] *W. Mass. Elec. Co.*, 43 FERC ¶ 62,004 (1988).
[3] *See* Application for Approval of Change in Land Rights, Attachment 5 at 3, Project No. 1889-009 (filed Aug. 31, 1987).

fishes" and has in recent years "expanded its mission to include work on any riverine migratory species."[4]

Thus, Conte Lab is a laboratory structure that performs both regional and national research for public and private entities. Although FirstLight has contracted Conte Lab to conduct research, its presence within the boundary is not necessary for operation and maintenance of the Turners Falls Project. Conte Lab does not serve any Project purpose and is not necessary to fulfill any license requirements. Rather, it is a non-Project use of lands that should not be included in the Project boundary. The underlying lands similarly are not necessary for Project purposes.

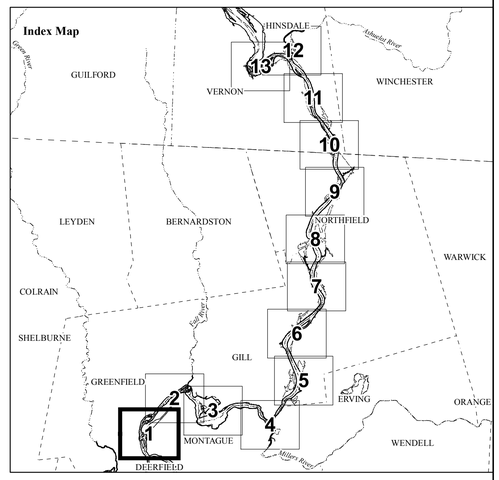
3 FEDERAL LANDS

There are no federal lands located in the Project Boundary. In the Exhibit G drawings (Sheet 1 of 13, Exhibit G-1), the USGS's Silvio Conte Anadromous Fish Laboratory is proposed to be removed from the Project Boundary. Its address is One Migratory Way, P.O. Box 796, Turners Falls, MA 01376.

4 NON-FEDERAL LANDS

The attached Exhibit G maps identify lands that FirstLight owns in fee, and lands over which FirstLight has acquired or intends to acquire rights to occupancy and use other than fee title, including by easement or lease.

[4] USGS, Conte Anadromous Fish Branch, http://www.lsc.usgs.gov/?q=conte-anadromous-fish-branch.



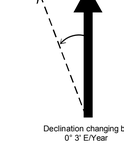
Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929



I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 1 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-1 1 inch = 400 feet 1:4,800

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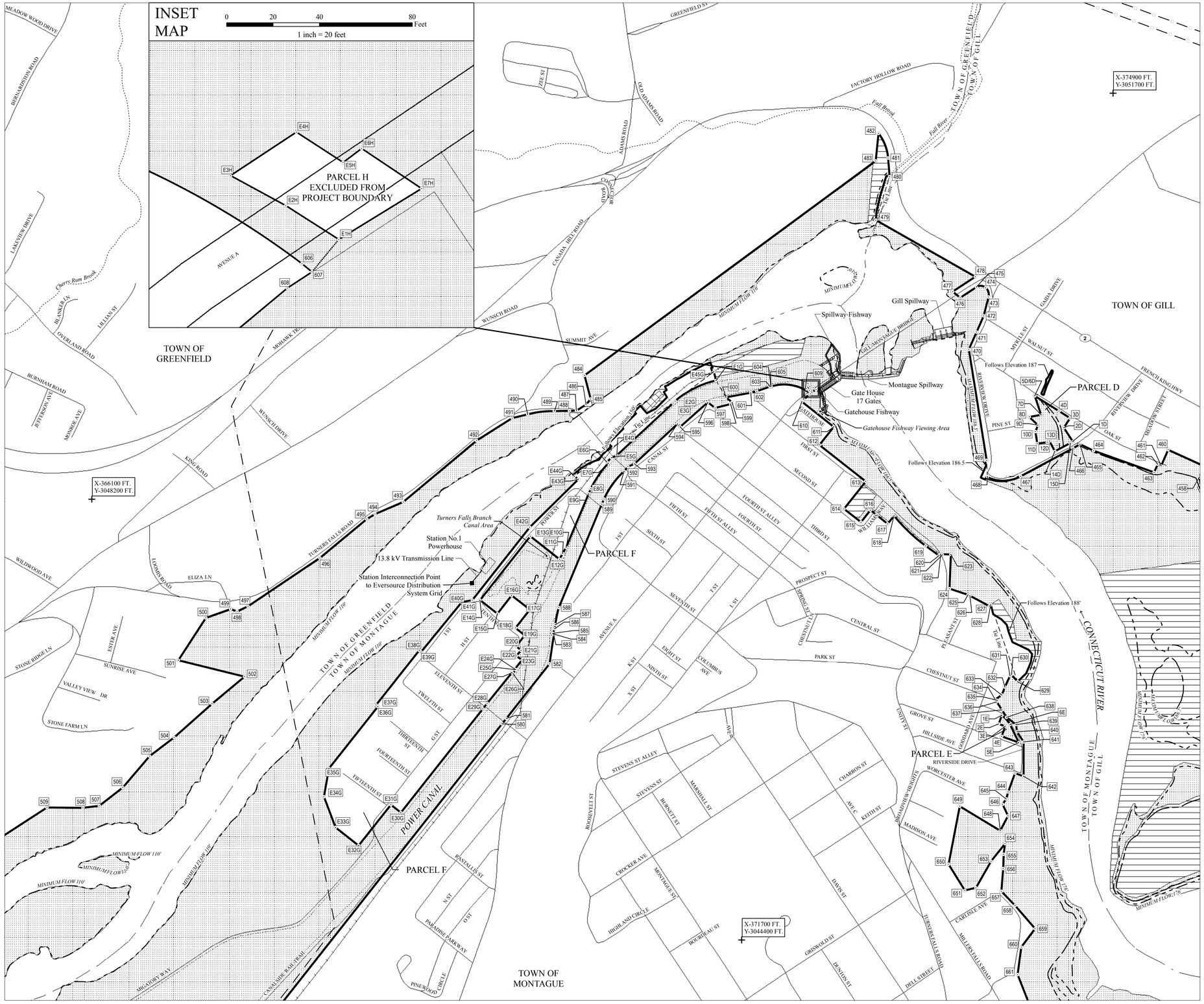

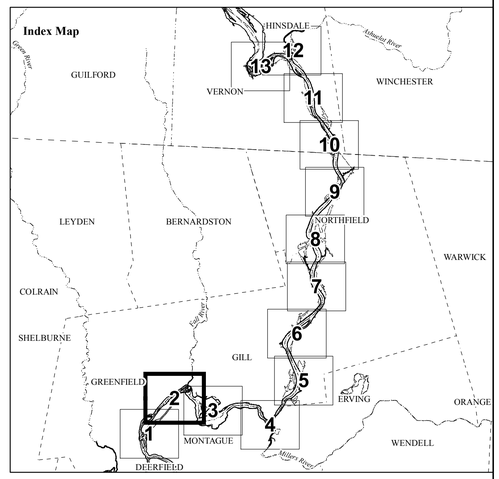

Legend

- Project Boundary
- 164 — Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°12' W

Declination changing by 0° 3' E/Year

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STATE OF NEW HAMPSHIRE — No. 626 — ARTHUR F. SCIACCHITANO, JR. — LICENSED LAND SURVEYOR

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 2 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-2 — 1 inch = 400 feet — 1:4,800

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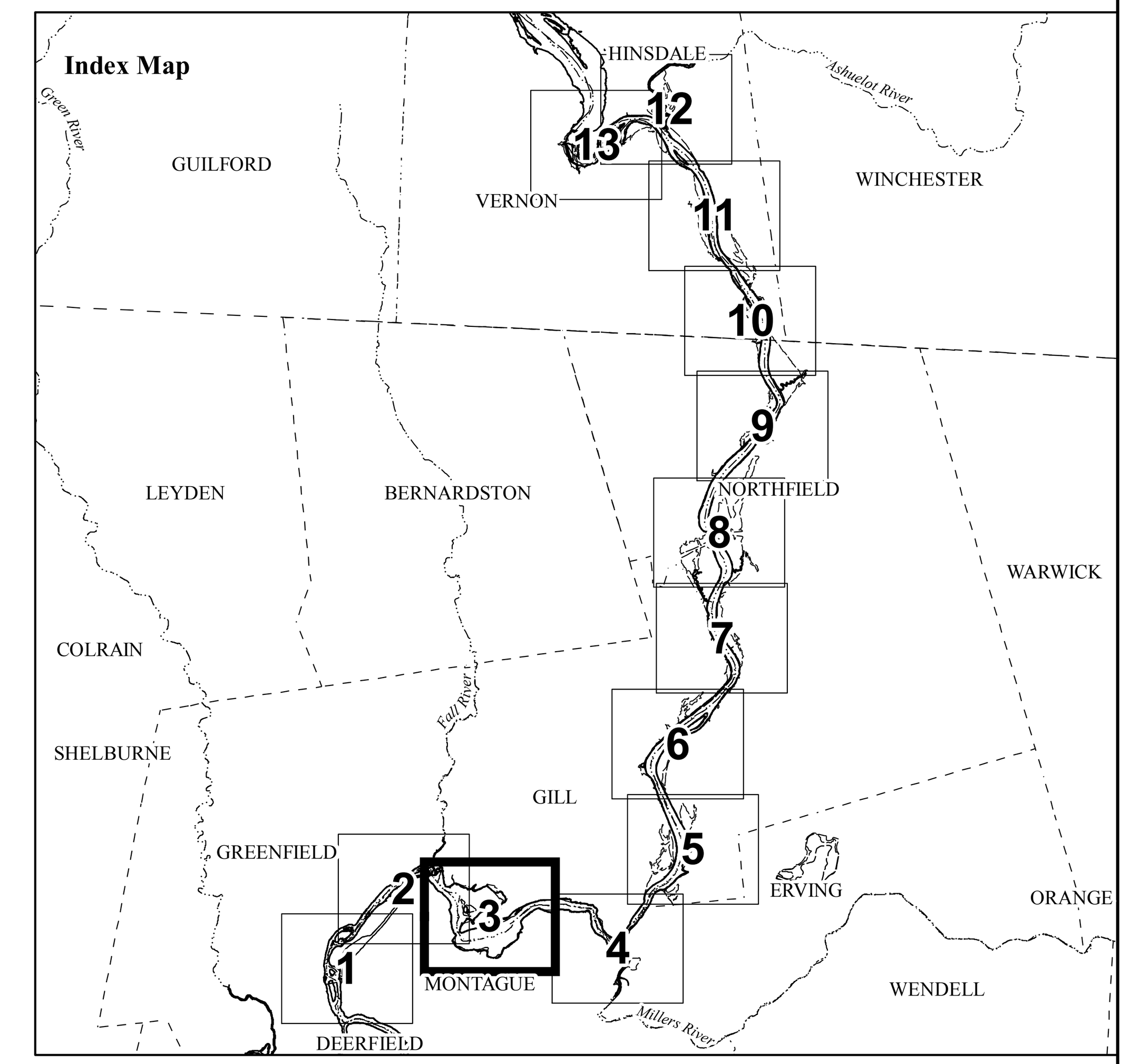

Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
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Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
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MN 14°12' W

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STATE OF NEW HAMPSHIRE
ARTHUR F. SICILIANO, JR.
No. 626
LICENSED LAND SURVEYOR

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 3 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-3 | 1 inch = 400 feet | 1:4,800

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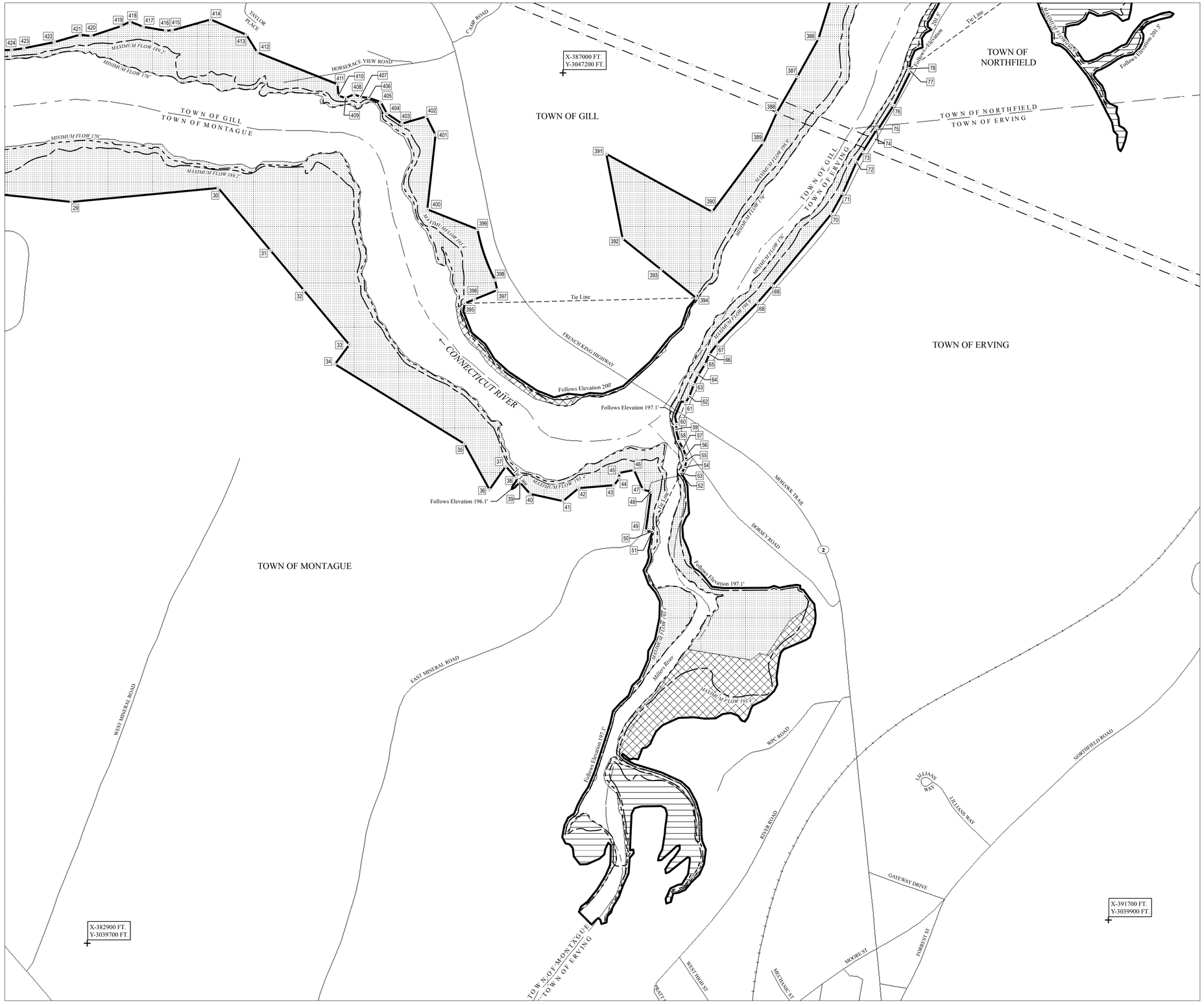
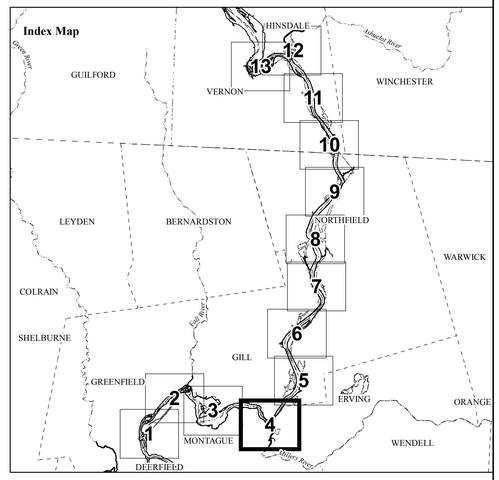


Index Map



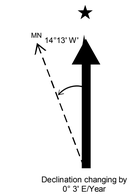
Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

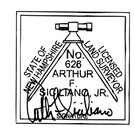
Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929



I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.



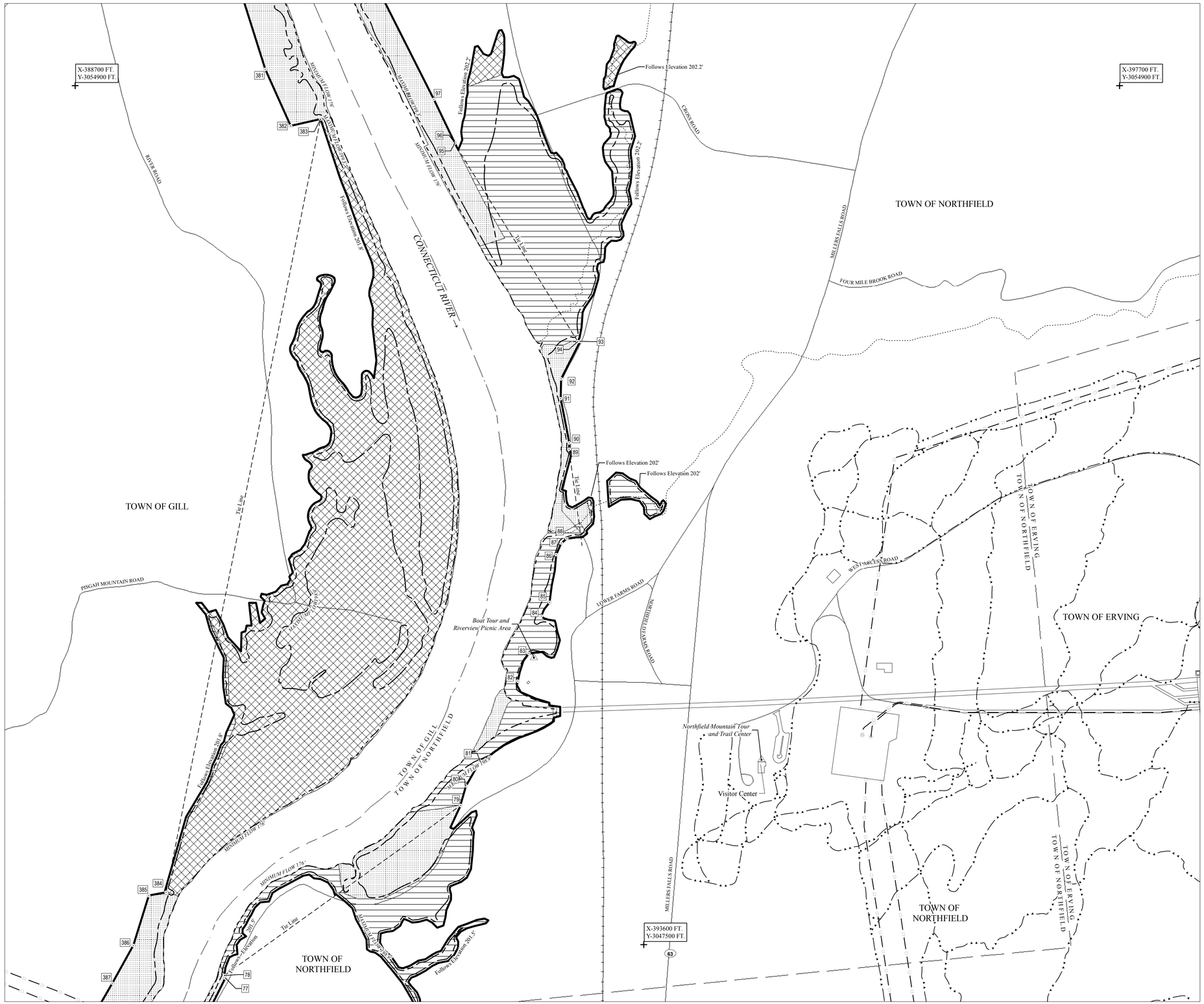
FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

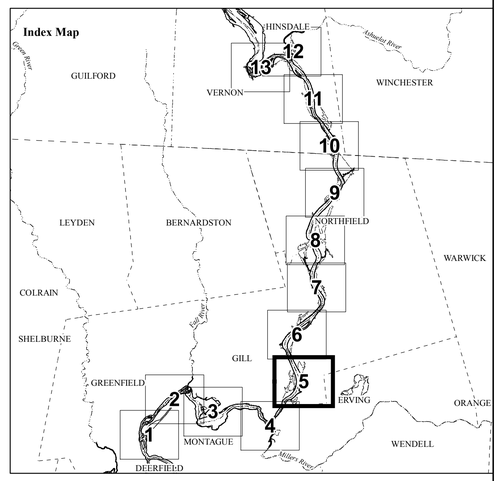
SHEET 4 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-4 1 inch = 400 feet 1:4,800

Path: W:\gis\maps\exhibit_g\if_amended\if_exhibit_g.mxd





Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

MN 14°14' W

Declination changing by 0° 3' E/Year

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE — LICENSED LAND SURVEYOR — No. 626 — ARTHUR F. SCIACCHITANO, JR. — SURVEYED

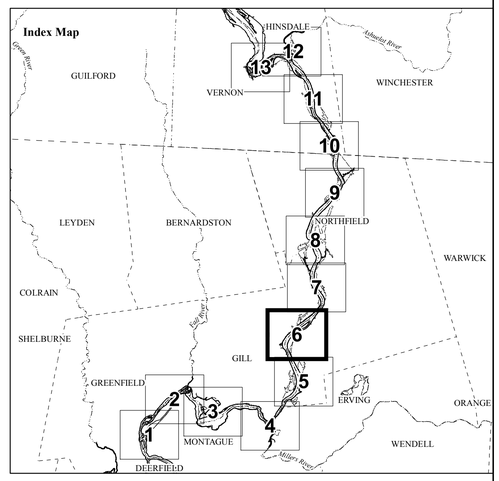
FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 5 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-5 — 1 inch = 400 feet — 1:4,800

Path: W:\gis\maps\exhibit_g\tf_amended\tf_exhibit_g.mxd



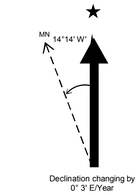
Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929



I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

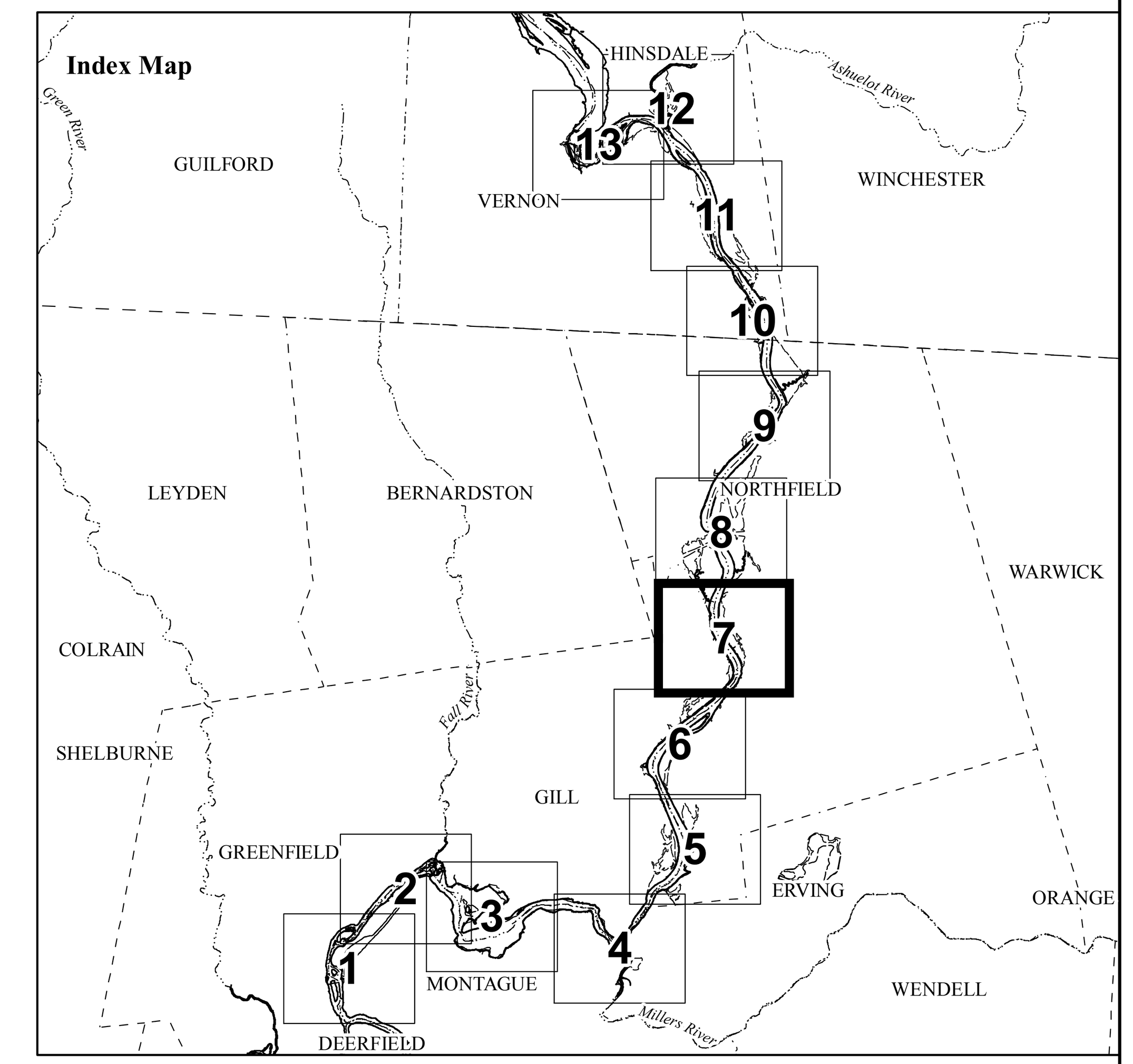
FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 6 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-6 1 inch = 400 feet 1:4,800

Path: W:\gis\maps\exhibit_g\f_amended\f_exhibit_g.mxd



Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

MN 14°15' W

Declination changing by 0° 3' E/Year

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE LICENSED LAND SURVEYOR No. 626 ARTHUR F. SICILIANO, JR.

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 7 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-7 — 1 inch = 400 feet — 1:4,800

Path: W:\gis\maps\exhibit_g\f_amended\tf_exhibit_g.mxd

X-390700 FT.
Y-3079900 FT.

MOUNT HERMON STATION ROAD

OLD VERNON ROAD

Bennet Brook

HUNNEWELL BROOK ROAD

TOWN OF NORTHFIELD

300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321

← CONNECTICUT RIVER

MAXIMUM FLOW 176'

MAXIMUM FLOW 175.8'

MAXIMUM FLOW 205'

MAXIMUM FLOW 205.8'

MAXIMUM FLOW 205.8'

Follows Elevation 205.8'

MAXIMUM FLOW 205.8'

GREAT MEADOW ROAD

MAXIMUM FLOW 205.8'

GREAT MEADOW ROAD BRANCH

Follows Elevation 205.4'

Tie Line

Follows Elevation 205.4'

Tie Line

142 141 136 135 140 139 138 137 134 133

Follows Elevation 205'

Tie Line

SCHOOL ST

PARKER AVE

WARWICK ROAD

MAIN STREET

EAST ST

LORITA LN

OLD FERRY ROAD

Millers Brook

X-399900 FT.
Y-3075400 FT.

F. SUMNER TURNER ROAD

OLD BERNARDSTON ROAD

Follows Elevation 205.2'

GILL CENTER ROAD

ROUTE 10

10

Bennett Meadow Wildlife Management Area

CRABAPPLE CROSS ROAD

Follows Elevation 205.2'

MAXIMUM FLOW 205.2'

Tie Line

Bailey Brook

Follows Elevation 205.2'

MINIMUM FLOW 176'

Tie Line

MINIMUM FLOW 176'

MAXIMUM FLOW 176'

Follows Elevation 205'

LUCKY CLAPP ROAD

Follows Elevation205'

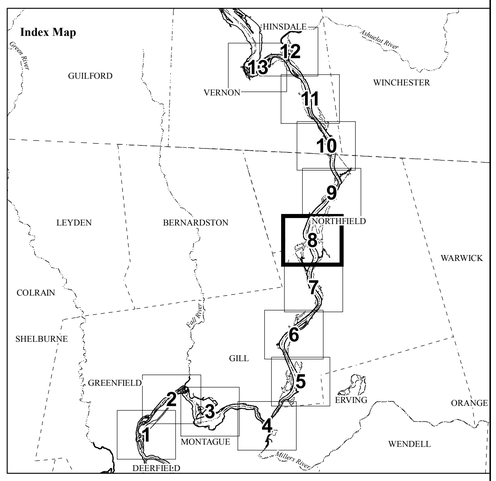
NEW ROAD

CAPTAINS HEIGHTS ATV ROAD

TOWN OF GILL

X-390600 FT.
Y-3072300 FT.

Index Map



Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE
No. 628
ARTHUR F. SCIACCHITANO, JR.
LICENSED LAND SURVEYOR

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 8 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-8 1 inch = 400 feet 1:4,800

Path: W:\gis\maps\exhibit_g\tf_amended\tf_exhibit_g.mxd

X-394100 FT.
Y-3088200 FT.

X-403100 FT.
Y-3088400 FT.

X-399200 FT.
Y-3080800 FT.

TOWN OF NORTHFIELD

CONNECTICUT RIVER

Follows Elevation 207.2'

Follows Elevation 207.2'

Follows Elevation 207.2'

Follows Elevation 206.9'

Follows Elevation 206.7'

Follows Elevation 206.6'

Follows Elevation 206.5'

Follows Elevation 206.1'

Follows Elevation 206'

Tie Line

MAXIMUM FLOW 207'

MAXIMUM FLOW 206'

MAXIMUM FLOW 205'

MAXIMUM FLOW 276'

MINIMUM FLOW 276'

GROUP MEADOW ROAD

WEST NORTHFIELD ROAD

MOUNT HERMON STATION ROAD

WEST ROAD

Mormon Brook

CALDWELL CROSS ROAD

KENDALL ROAD

CALDWELL ROAD

Pauchaug Brook

PAUCHAUG RAMP ROAD

Louisiana Brook

MUSIC HALL DRIVE

EAST HALL DRIVE

WINCHESTER ROAD

BOLTON ROAD

THE WILLOWS

EAST NORTHFIELD ROAD

MOODY ST

NORTH LN

PINE ST

HOWARD ST

ALDRICH ST

GLENWOOD AVE

HIGHLAND AVE

BIRNAM ROAD

ELM AVE

HOLTON ST

NORTHFIELD INN DRIVE

BRIDGE ST

MILL ST

MAIN ST

PECKTICOST ROAD

Mill Brook

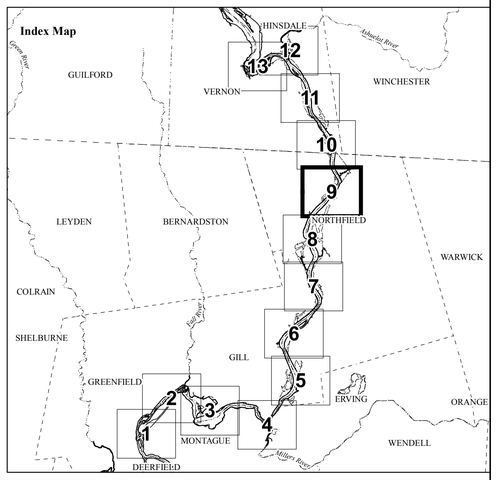
DICKINSON ST

MEADOW ST

SCHOOL ST

63

Index Map



Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE — LICENSED LAND SURVEYOR — NO. 626 — ARTHUR F. SCIACNO, JR.

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 9 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-9 — 1 inch = 400 feet — 1:4,800

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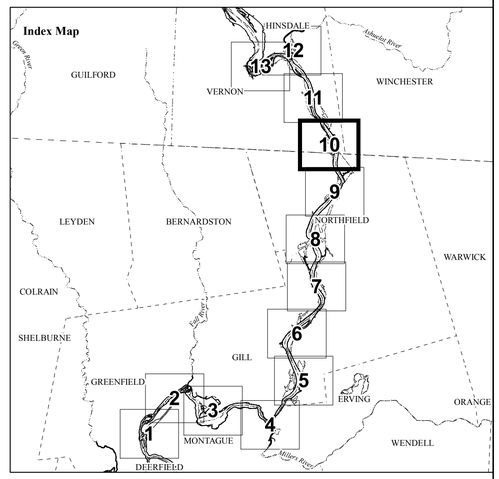

Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds) (164)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF MASSACHUSETTS — NO. 526 — ARTHUR F. SCOTTI NO. JR. — REGISTERED LAND SURVEYOR

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 10 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-10 — 1 inch = 400 feet — 1:4,800

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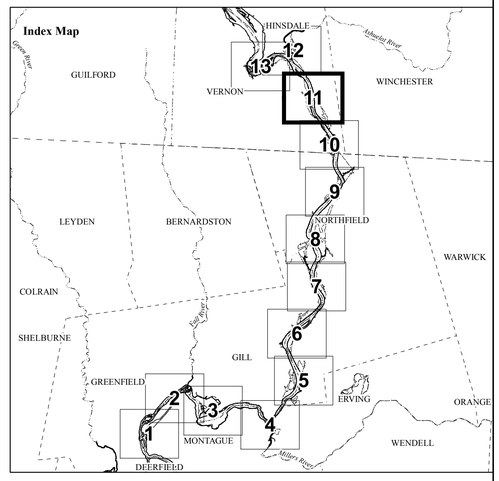

Legend

- Project Boundary
- 164 Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

- Own in Fee
- Flowage Easement
- Right to be Acquired

Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°17' W

Declination changing by 0° 3' E/Year

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STATE OF NEW HAMPSHIRE — LICENSED LAND SURVEYOR — No. 626 — ARTHUR F. SCIACCHITANO, JR. — SURVEYED

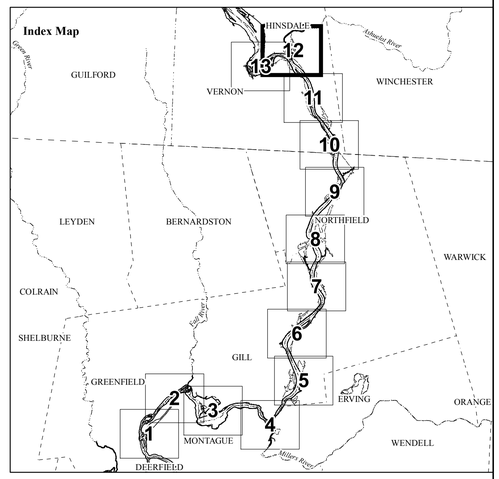
FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 11 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-11 — 1 inch = 400 feet — 1:4,800

Path: W:\gis\maps\exhibit_g\tf_amended\tf_exhibit_g.mxd



Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
- Shoreline
- Major Creek
- Project Trail
- Railroad
- Transmission Lines
- Roads

Licensee Land Rights

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Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF MASSACHUSETTS — NO. 526 — ARTHUR F. SCIOTTI, JR. — REGISTERED LAND SURVEYOR

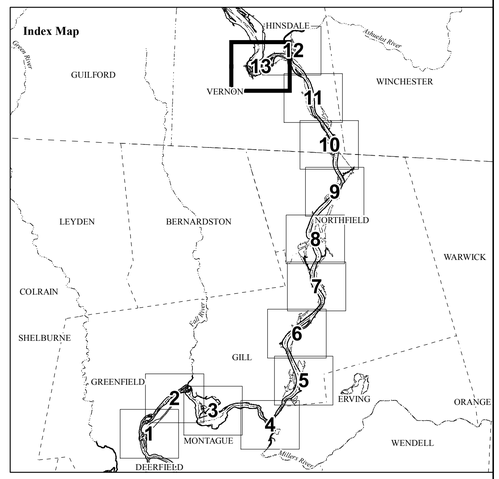
FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 12 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-12 — 1 inch = 400 feet — 1:4,800

Path: W:\gis\maps\exhibit_g\tf_amended\tf_exhibit_g.mxd



Legend

- Project Boundary
- Point No. (see Project Boundary Data table for metes and bounds)
- Project Recreation Site
- Project Recreation Site Proposed to be Non-Project Recreation Site
- Town Boundary
- Reference Point
- Maximum Water Surface Elevation (in feet)
- Minimum Water Surface Elevation (in feet)
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Licensee Land Rights

- Own in Fee
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Coordinate System:
NAD83 State Plane
Massachusetts Mainland Zone (feet)
Horizontal Datum:
NAD 1983
Vertical Datum:
NGVD 1929

MN 14°16' W

Declination changing by 0° 3' E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE TURNERS FALLS HYDROELECTRIC PROJECT (FERC #1889) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE TURNERS FALLS HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

STATE OF NEW HAMPSHIRE — NO. 626 — ARTHUR F. SCIOTTI, JR. — LICENSED LAND SURVEYOR

FirstLight MA Hydro LLC
TURNERS FALLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 1889

SHEET 13 of 13

0 200 400 800 1,200 1,600 Feet

EXHIBIT G-13 — 1 inch = 400 feet — 1:4,800

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PROJECT BOUNDARY DATA

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
1	3042973.69	375761.20			Point of Beginning
			N 42-26-44 E	231.98	
2	3043144.87	375917.76			
			S 47-30-41 E	279.68	
3	3042955.96	376124.00			
			S 42-18-35 W	47.28	
4	3042921.00	376092.18			
			S 47-44-43 E	415.17	
5	3042641.83	376399.47			
			S 73-53-26 E	370.70	
6	3042538.98	376755.61			
			N 68-1-31 E	204.39	
7	3042615.46	376945.15			
			S 73-18-46 E	125.36	
8	3042579.47	377065.23			
			S 87-59-56 E	207.16	
9	3042572.24	377272.26			
			S 40-17-53 E	114.43	
10	3042484.96	377346.27			
			S 53-36-7 E	141.98	
11	3042400.72	377460.55			
			N 78-38-35 E	500.00	
12	3042499.18	377950.75			
			S 11-18-5 E	295.10	
13	3042209.81	378008.58			
			S 58-39-6 E	225.20	
14	3042092.65	378200.91			
			N 78-36-47 E	377.92	
15	3042167.27	378571.39			
			N 14-59-18 W	831.79	
16	3042970.75	378356.26			
			N 47-2-36 E	1268.33	
17	3043835.05	379284.49			
			N 42-29-14 W	128.50	
18	3043929.81	379197.70			
			N 43-33-58 E	449.33	
19	3044255.39	379507.37			
			S 29-43-23 E	160.00	
20	3044116.44	379586.70			
			N 47-2-36 E	224.21	
21	3044269.23	379750.79			
			N 1-54-25 E	418.25	
22	3044687.25	379764.70			
			N 1-54-25 E	135.45	Tie Line, Follows elevation 190.4 ft. in between points 22 and 23
23	3044822.62	379769.20			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 1-54-25 E	165.65	
24	3044988.18	379774.72			
			N 1-54-25 E	399.80	Tie Line, Follows elevation 190.4 ft. in between points 24 and 25
25	3045387.75	379788.01			
			N 1-54-25 E	156.42	
26	3045544.08	379793.22			
			S 67-7-35 E	195.14	
27	3045468.24	379973.01			
			N 68-20-8 E	1953.78	
28	3046189.53	381788.75			
			S 83-58-46 E	980.00	
29	3046086.75	382763.34			
			N 84-32-37 E	1271.53	
30	3046207.67	384029.09			
			S 39-53-54 E	701.88	
31	3045669.21	384479.30			
			S 39-53-58 E	446.94	
32	3045326.34	384765.98			
			S 39-50-12 E	612.30	
33	3044856.18	385158.22			
			S 36-25-42 W	208.05	
34	3044688.78	385034.68			
			S 58-25-15 E	1308.76	
35	3044003.43	386149.63			
			S 28-47-22 E	451.27	
36	3043607.95	386366.96			
			N 34-53-59 E	244.84	
37	3043808.76	386507.04			
			S 41-24-47 E	132.00	
38	3043709.76	386594.36			
			S 41-24-47 E	51.00	Tie Line, Follows elevation 196.1 ft. in between points 38 and 39
39	3043671.52	386628.09			
			S 41-24-47 E	133.07	
40	3043571.72	386716.12			
			S 77-33-5 E	292.58	
41	3043508.65	387001.82			
			N 49-44-55 E	173.68	
42	3043620.88	387134.37			
			N 85-15-17 E	306.12	
43	3043646.20	387439.43			
			N 37-3-58 E	77.25	
44	3043707.84	387485.99			
			N 6-30-17 W	44.46	
45	3043752.02	387480.96			
			N 79-15-45 E	133.13	
46	3043776.82	387611.75			
			S 24-22-40 E	184.00	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
47	3043609.23	387687.70			
			S 74-9-30 E	73.10	
48	3043589.28	387758.02			
			S 7-26-57 W	341.51	
49	3043250.65	387713.75			
			S 86-33-38 E	52.73	
50	3043247.49	387766.39			
			S 86-33-29 E	3.00	
51	3043247.31	387769.38			
			N 25-55-54 E	557.51	Tie Line, Follows elevation 197.1 ft. in between points 51 and 52
52	3043748.68	388013.17			
			N 77-2-32 E	11.20	
53	3043751.19	388024.09			
			N 28-36-0 E	53.40	
54	3043798.08	388049.65			
			N 13-27-0 E	60.55	
55	3043856.97	388063.73			
			N 7-21-0 W	43.40	
56	3043900.01	388058.18			
			N 20-59-0 W	66.41	
57	3043962.02	388034.40			
			N 30-16-50 W	71.06	
58	3044023.38	387998.57			
			N 13-38-40 W	105.12	
59	3044125.53	387973.77			
			N 6-35-10 E	44.81	
60	3044170.05	387978.91			
			N 22-22-56 E	203.04	Tie Line, Follows elevation 197.1 ft. in between points 60 and 61
61	3044357.79	388056.22			
			N 32-15-12 E	62.86	
62	3044410.95	388089.76			
			N 20-2-15 E	108.28	
63	3044512.68	388126.86			
			N 25-33-24 E	92.73	
64	3044596.33	388166.87			
			N 31-37-10 E	107.49	
65	3044687.86	388223.22			
			N 24-2-44 E	94.26	
66	3044773.94	388261.62			
			N 36-5-25 E	109.84	
67	3044862.70	388326.33			
			N 44-29-7 E	500.21	
68	3045219.57	388676.83			
			N 41-18-51 E	196.16	
69	3045366.91	388806.33			
			N 39-23-8 E	798.93	
70	3045984.39	389313.26			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 28-52-29 E	202.37	
71	3046161.60	389410.98			
			N 23-37-10 E	294.77	
72	3046431.68	389529.08			
			N 31-38-50 E	103.98	
73	3046520.20	389583.64			
			N 31-54-35 E	226.68	
74	3046712.62	389703.45			
			N 84-15-22 E	12.08	
75	3046713.83	389715.47			
			N 33-3-0 E	245.06	
76	3046919.24	389849.12			
			N 26-35-0 E	327.70	
77	3047212.29	389995.76			
			N 24-55-45 W	24.44	
78	3047234.46	389985.46			
			N 54-17-5 E	2508.86	Tie Line, Follows elevation 201.5 ft. in between points 78 and 79
79	3048699.03	392022.43			
			N 15-11-51 E	175.00	
80	3048867.91	392068.30			
			N 29-31-32 E	245.39	
81	3049081.43	392189.24			
			N 25-18-0 E	761.65	
82	3049770.02	392514.73			
			N 21-58-38 E	257.60	
83	3050008.91	392611.14			
			N 18-22-52 E	340.33	
84	3050331.88	392718.46			
			N 30-39-0 E	136.22	
85	3050449.06	392787.90			
			N 8-1-56 E	416.26	
86	3050861.24	392846.06			
			N 24-8-13 E	107.18	
87	3050959.04	392889.89			
			N 50-23-57 E	61.96	
88	3050998.54	392937.63			
			N 1-22-18 E	768.44	
89	3051766.76	392956.03			
			N 2-40-21 E	55.57	
90	3051822.27	392958.62			
			N 10-55-38 W	389.60	
91	3052204.80	392884.76			
			N 1-2-22 E	171.10	
92	3052375.87	392887.86			
			N 27-1-22 E	362.20	
93	3052698.53	393052.42			
			S 80-55-1 W	20.60	
94	3052695.28	393032.08			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 31-56-0 W	1946.69	Tie Line, Follows elevation 202.2 ft. in between points 94 and 95
95	3054405.92	391973.10			
			S 26-34-39 E	65.50	
96	3054405.92	391973.10			
			N 25-42-38 W	419.00	
97	3054783.43	391791.33			
			N 26-46-40 W	1313.32	
98	3055955.89	391199.63			
			N 24-41-40 W	124.80	
99	3056069.28	391147.49			
			N 14-7-0 E	3884.37	Tie Line, Follows elevation 203.1 ft. in between points 99 and 100
100	3059836.32	392094.83			
			N 63-5-20 E	167.00	
101	3059911.91	392243.74			
			N 63-5-20 E	81.80	Tie Line, Follows elevation 203.1 ft. in between points 101 and 102
102	3059948.93	392316.69			
			N 63-5-21 E	22.00	
103	3059958.89	392336.30			
			N 67-50-20 E	611.40	
104	3060189.52	392902.53			
			N 77-15-21 E	16.30	
105	3060193.12	392918.43			
			N 77-15-19 E	79.20	Tie Line, Follows elevation 203.1 ft. in between points 105 and 106
106	3060210.59	392995.67			
			N 77-15-19 E	406.69	
107	3060300.31	393392.34			
			N 56-9-1 E	422.17	
108	3060535.47	393742.94			
			N 46-40-1 E	1060.43	
109	3061263.18	394514.26			
			N 30-22-1 E	93.35	
110	3061343.72	394561.45			
			N 30-22-1 E	26.69	Tie Line, Follows elevation 202 ft. in between points 110 and 111
111	3061366.75	394574.94			
			N 30-22-1 E	118.06	
112	3061468.61	394634.62			
			N 29-48-1 E	507.20	
113	3061908.74	394886.68			
			N 35-36-19 E	565.67	
114	3062368.66	395216.01			
			N 35-36-19 E	169.00	Tie Line, Follows elevation 202 ft. in between points 114 and 115
115	3062506.06	395314.40			
			N 35-36-19 E	149.54	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
116	3062627.65	395401.46			
			N 34-8-15 E	734.73	
117	3063235.78	395813.76			
			N 36-49-15 E	391.05	
118	3063548.82	396048.12			
			N 36-50-34 E	72.20	
119	3063606.60	396091.41			
			S 43-10-38 E	79.94	
120	3063548.30	396146.11			
			N 40-45-11 E	121.77	
121	3063640.55	396225.60			
			N 40-45-11 E	260.00	
122	3063837.51	396395.32			
			N 40-45-11 E	347.08	
123	3064100.43	396621.89			
			N 27-8-11 E	612.05	
124	3064645.11	396901.04			
			N 48-30-40 E	119.94	
125	3064724.56	396990.89			
			N 6-34-40 E	105.55	
126	3064829.42	397002.98			
			N 7-18-40 E	699.65	
127	3065523.38	397092.00			
			N 0-46-20 W	175.00	
128	3065698.36	397089.64			
			N 18-40-16 W	5405.25	Tie Line, Follows elevation 204.5 ft. in between points 128 and 129
129	3070819.08	395359.20			
			N 14-23-47 E	83.21	
130	3070899.68	395379.89			
			N 28-33-47 E	127.88	
131	3071011.99	395441.03			
			N 19-5-47 E	116.16	
132	3071121.76	395479.03			
			N 19-39-8 E	4713.71	Tie Line, Follows elevation 205 ft. in between points 132 and 133
133	3075560.88	397064.24			
			N 84-52-57 E	242.50	
134	3075582.52	397305.77			
			N 1-33-57 E	322.37	
135	3075904.76	397314.57			
			S 67-0-34 W	75.38	
136	3075875.32	397245.18			
			N 86-25-33 W	51.80	
137	3075878.55	397193.48			
			N 86-25-33 W	548.20	Tie Line, Follows elevation 205.4 ft. in between points 137 and 138
138	3075912.72	396646.36			
			N 79-36-2 W	74.30	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
139	3075926.13	396573.28			
			N 79-36-2 W	136.80	
140	3075950.82	396438.73			
			N 65-51-29 E	806.11	Tie Line, Follows elevation 205 ft. in between points 140 and 141
141	3076280.52	397174.32			
			S 86-25-34 E	1.40	
142	3076280.44	397175.71			
			N 11-30-46 E	7173.61	Tie Line, Follows elevation 205.8 ft. in between points 142 and 143
143	3083309.67	398607.37			
			N 31-43-29 W	86.99	
144	3083383.67	398561.63			
			N 32-19-12 W	91.15	
145	3083460.69	398512.89			
			N 54-20-10 E	830.44	Tie Line, Follows elevation 206.5 ft. in between points 145 and 146
146	3084182.04	399456.40			
			N 25-14-17 E	186.83	
147	3083944.87	399187.57			
			N 48-12-22 E	232.60	
148	3084099.89	399360.98			
			N 49-16-22 E	125.91	
149	3084351.03	399536.06			
			N 34-1-17 E	202.12	
150	3084518.56	399649.14			
			N 49-3-43 W	129.60	
151	3084603.47	399551.24			
			N 19-38-24 E	161.53	Tie Line, Follows elevation 206.6 ft. in between points 151 and 152
152	3084755.60	399605.53			
			S 48-9-2 E	166.40	
153	3084644.59	399729.48			
			N 32-52-58 E	324.29	
154	3084916.92	399905.54			
			N 22-45-58 E	241.57	
155	3085139.67	399999.02			
			N 49-32-2 W	173.30	
156	3085252.14	399867.17			
			N 21-48-19 E	183.66	Tie Line, Follows elevation 206.7 ft. in between points 156 and 157
157	3085422.66	399935.39			
			S 57-10-48 E	170.80	
158	3085330.09	400078.93			
			N 20-3-12 E	149.91	
159	3085470.91	400130.33			
			N 18-21-12 E	249.84	
160	3085708.04	400208.99			
			N 69-45-40 W	121.13	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
161	3085749.94	400095.34			
			N 37-8-43 E	508.06	Tie Line, Follows elevation 206.8 ft. in between points 161 and 162
162	3086154.91	400402.12			
			S 67-40-40 E	55.20	
163	3086133.95	400453.18			
			N 48-16-34 E	110.01	
164	3086207.17	400535.29			
			N 40-2-34 E	121.70	
165	3086300.33	400613.58			
			N 12-29-48 W	88.00	
166	3086386.25	400594.54			
			N 8-43-49 W	10.60	
167	3086396.73	400592.93			
			N 9-44-3 W	5011.06	Tie Line, Follows elevation 207.2 ft. in between points 167 and 168
168	3091335.59	399745.64			
			S 86-53-0 E	172.25	
169	3091326.23	399917.63			
			N 26-25-28 W	21.78	
170	3091345.73	399907.94			
			N 41-7-0 W	154.89	
171	3091462.42	399806.08			
			N 38-14-40 W	151.57	
172	3091581.46	399712.26			
			N 38-59-50 W	192.95	
173	3091731.41	399590.84			
			N 36-20-1 W	65.79	
174	3091784.41	399551.86			
			N 42-5-30 W	144.43	
175	3091891.58	399455.05			
			S 64-17-57 W	111.99	
176	3091843.02	399354.14			
			N 6-19-28 W	464.02	Tie Line, Follows elevation 207.5 ft. in between points 176 and 177
177	3092304.21	399303.02			
			N 59-39-57 E	67.25	
178	3092338.17	399361.06			
			N 11-27-33 W	181.17	
179	3092515.73	399325.06			
			N 15-2-33 W	94.09	
180	3092606.59	399300.64			
			N 15-16-33 W	186.18	
181	3092786.19	399251.59			
			N 15-1-33 W	136.13	
182	3092917.67	399216.30			
			N 21-54-33 W	197.19	
183	3093100.61	399142.72			
			N 16-28-33 W	202.19	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
184	3093294.50	399085.37			
			N 26-44-33 W	137.33	
185	3093417.14	399023.58			
			N 26-18-3 W	1439.16	Tie Line, Follows elevation 207.7 ft. in between points 185 and 186
186	3094707.30	398385.90			
			N 19-51-20 W	17.53	
187	3094723.79	398379.95			
			N 35-16-23 W	272.04	
188	3094945.88	398222.85			
			N 33-33-23 W	163.02	
189	3095081.73	398132.74			
			N 35-58-23 W	188.03	
190	3095233.90	398022.29			
			N 41-22-23 W	133.02	
191	3095333.72	397934.37			
			S 47-49-19 W	44.00	
192	3095304.17	397901.76			
			N 38-18-13 W	3612.42	Tie Line, Follows elevation 207.9 ft. in between points 192 and 193
193	3098138.92	395662.68			
			N 68-38-0 E	121.00	
194	3098183.00	395775.36			
			N 31-5-25 W	552.96	
195	3098656.53	395489.81			
			N 11-57-25 W	546.86	
196	3099191.51	395376.51			
			S 70-48-36 W	127.50	
197	3099149.60	395256.10			
			N 3-30-19 W	896.79	Tie Line, Follows elevation 208 ft. in between points 197 and 198
198	3100044.71	395201.26			
			N 71-52-36 E	102.79	
199	3100076.69	395298.95			
			N 2-11-25 W	466.88	
200	3100543.23	395281.11			
			N 4-37-25 W	453.88	
201	3100995.63	395244.52			
			N 3-53-25 W	435.86	
202	3101430.49	395214.94			
			N 11-29-24 W	164.92	
203	3101592.10	395182.09			
			N 10-49-24 W	793.00	
204	3102371.00	395033.18			
			N 15-53-24 W	493.00	
205	3102845.16	394898.20			
			S 81-40-36 W	92.50	
206	3102831.77	394806.67			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 46-30-12 W	8971.20	Tie Line, Follows elevation 209.7 ft. in between points 206 and 207
207	3109006.70	388298.86			
			S 65-25-19 W	1466.52	Tie Line, Follows elevation 210.6 ft. in between points 207 and 208
208	3108396.71	386965.23			
			N 30-32-41 W	2.00	
209	3108398.44	386964.22			
			S 2-35-23 W	2510.02	Tie Line, Follows elevation 211.5 ft. in between points 209 and 210
210	3105890.97	386850.82			
			S 9-42-22 E	56.22	
211	3105835.55	386860.30			
			N 61-42-18 E	189.83	
212	3105925.54	387027.44			
			N 64-16-18 E	191.82	
213	3106008.81	387200.25			
			N 52-52-18 E	213.80	
214	3106137.86	387370.70			
			N 43-54-18 E	223.79	
215	3106299.10	387525.89			
			N 43-43-18 E	145.87	
216	3106404.52	387626.71			
			N 6-50-18 E	118.89	
217	3106522.57	387640.86			
			N 24-0-18 E	137.87	
218	3106648.51	387696.95			
			N 44-30-18 E	77.17	
219	3106703.55	387751.04			
			N 67-14-44 E	2754.08	Tie Line, Follows elevation 210.2 ft. in between points 219 and 220
220	3107768.81	390290.74			
			S 53-14-44 E	36.00	
221	3107747.27	390319.58			
			S 31-16-42 E	27.00	
222	3107724.19	390333.60			
			S 27-7-43 E	2006.99	Tie Line, Follows elevation 210.2 ft. in between points 222 and 223
223	3105938.01	391248.77			
			S 23-6-12 E	113.97	
224	3105833.18	391293.49			
			S 40-58-54 E	254.95	
225	3105640.71	391460.69			
			S 43-27-54 E	369.92	
226	3105372.23	391715.16			
			S 48-37-54 E	195.96	
227	3105242.72	391862.22			
			S 43-50-54 E	158.97	
228	3105128.07	391972.35			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 35-52-54 E	179.96	
229	3104982.27	392077.83			
			S 67-52-54 E	226.95	
230	3104896.82	392288.07			
			S 68-27-54 E	489.21	
231	3104717.25	392743.13			
			S 68-27-54 E	29.80	Tie Line, Follows elevation 208.5 ft. in between points 231 and 232
232	3104706.31	392770.85			
			S 68-27-53 E	25.80	
233	3104696.84	392794.85			
			S 60-17-54 E	449.91	
234	3104473.92	393185.64			
			S 29-2-54 E	244.30	
235	3104260.35	393304.26			
			S 14-16-24 E	6758.54	Tie Line, Follows elevation 208.5 ft. in between points 235 and 236
236	3097710.46	394970.60			
			S 34-59-52 E	21.30	
237	3097693.02	394982.81			
			S 37-57-3 E	6.00	
238	3097688.29	394986.50			
			S 37-57-0 E	25.50	Tie Line, Follows elevation 208.5 ft. in between points 238 and 239
239	3097668.18	395002.18			
			S 37-57-0 E	143.01	
240	3097555.41	395090.13			
			S 76-13-0 E	330.39	
241	3097476.70	395411.00			
			S 52-37-0 E	130.15	
242	3097397.68	395514.42			
			S 24-8-0 E	102.52	
243	3097304.12	395556.34			
			S 35-50-0 E	93.11	
244	3097228.64	395610.85			
			S 18-27-0 E	222.26	
245	3097017.80	395681.19			
			S 57-49-0 E	180.21	
246	3096921.82	395833.71			
			S 49-23-0 E	236.28	
247	3096768.01	396013.06			
			S 10-8-0 E	351.42	
248	3096422.07	396074.89			
			S 20-33-0 E	272.32	
249	3096167.08	396170.49			
			S 25-24-0 E	306.36	
250	3095890.34	396301.90			
			S 36-43-0 E	246.29	
251	3095692.92	396449.14			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 38-53-26 E	471.25	
252	3095326.13	396745.01			
			N 78-2-35 E	42.73	
253	3095334.98	396786.81			
			S 32-30-26 E	520.33	
254	3094896.18	397066.44			
			N 17-34-30 E	64.71	
255	3094957.87	397085.98			
			N 42-55-0 E	104.00	
256	3095034.04	397156.80			
			S 13-46-51 E	4781.01	Tie Line, Follows elevation 207.6 ft. in between points 256 and 257
257	3090390.70	398295.71			
			S 15-31-13 W	103.27	
258	3090291.20	398268.08			
			S 1-55-47 E	187.07	
259	3090104.24	398274.38			
			S 3-45-25 E	257.41	
260	3089847.38	398291.25			
			S 3-51-49 W	202.80	
261	3089645.05	398277.58			
			S 8-26-49 W	162.52	
262	3089484.29	398253.71			
			S 0-0-49 W	216.00	
263	3089268.29	398253.66			
			S 11-50-11 E	191.71	
264	3089080.66	398292.99			
			S 23-14-55 E	182.45	
265	3088913.03	398365.01			
			S 88-17-22 E	134.50	
266	3088909.01	398499.44			
			S 24-47-58 E	694.75	Tie Line, Follows elevation 207.2 ft. in between points 266 and 267
267	3088278.34	398790.85			
			N 89-10-22 W	83.00	
268	3088279.54	398707.86			
			S 30-5-22 E	209.61	
269	3088098.18	398812.95			
			S 22-21-22 E	193.82	
270	3087918.93	398886.68			
			S 34-15-22 E	115.00	
271	3087823.88	398951.41			
			S 12-20-51 W	3888.58	Tie Line, Follows elevation 206.8 ft. in between points 271 and 272
272	3084025.27	398119.91			
			N 33-9-14 W	106.00	
273	3084114.02	398061.94			
			N 49-14-14 W	481.76	
274	3084428.57	397697.05			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 79-25-21 W	64.78	
275	3084440.46	397633.37			
			S 55-32-52 W	529.94	
276	3084140.66	397196.39			
			N 35-13-29 W	8.25	
277	3084147.40	397191.63			
			S 54-54-2 W	369.49	
278	3083934.94	396889.34			
			S 20-48-6 W	14.76	
279	3083934.94	396889.34			
			S 20-48-5 W	861.10	
280	3083129.97	396583.55			
			S 54-1-35 E	84.59	
281	3083080.28	396652.01			
			S 1-15-58 E	89.91	
282	3082990.40	396653.99			
			S 7-56-25 W	117.37	
283	3082874.15	396637.78			
			S 29-59-25 W	132.76	
284	3082759.17	396571.42			
			S 46-7-25 W	90.38	
285	3082696.52	396506.28			
			S 15-21-25 W	79.75	
286	3082619.62	396485.16			
			S 32-0-25 W	253.60	
287	3082404.57	396350.75			
			S 52-9-25 W	276.43	
288	3082234.98	396132.45			
			S 16-51-25 W	171.36	
289	3082070.99	396082.77			
			S 25-58-25 W	127.01	
290	3081956.81	396027.14			
			N 85-48-37 W	97.54	Tie Line, Follows elevation 206.1 ft. in between points 290 and 291
291	3081963.94	395929.86			
			N 60-50-35 W	131.86	
292	3082028.18	395814.71			
			S 27-40-1 W	387.49	
293	3081684.99	395634.80			
			S 44-42-25 W	395.39	
294	3081403.98	395356.65			
			S 33-42-25 W	524.79	
295	3080967.42	395065.43			
			S 82-54-13 W	174.08	
296	3080945.91	394892.69			
			S 33-46-17 W	114.53	
297	3080850.71	394829.02			
			S 33-46-18 W	43.43	
298	3080814.60	394804.88			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 33-46-17 W	125.00	Tie Line, Follows elevation 206 ft. in between points 298 and 299
299	3080710.70	394735.40			
			S 33-46-17 W	446.25	
300	3080339.75	394487.34			
			S 19-53-39 W	756.67	
301	3079628.24	394229.87			
			S 17-15-35 W	993.22	
302	3078679.75	393935.19			
			S 18-18-5 W	114.29	
303	3078571.24	393899.31			
			S 18-18-5 W	380.23	
304	3078210.24	393779.91			
			S 22-26-5 W	299.71	
305	3077933.22	393665.54			
			S 5-45-5 W	176.83	
306	3077757.28	393647.82			
			S 14-55-5 W	155.85	
307	3077606.68	393607.70			
			S 7-30-5 W	251.75	
308	3077357.09	393574.84			
			S 1-57-55 W	147.86	
309	3077209.32	393569.77			
			S 1-27-5 W	187.82	
310	3077021.56	393565.01			
			S 12-49-55 E	275.73	
311	3076752.72	393626.25			
			S 24-49-55 E	239.76	
312	3076535.13	393726.94			
			S 22-19-55 E	73.93	
313	3076466.74	393755.03			
			S 48-26-55 E	137.86	
314	3076375.30	393858.20			
			N 41-10-4 E	19.98	
315	3076390.34	393871.35			
			S 13-54-54 E	136.19	
316	3076258.15	393904.11			
			S 49-23-54 E	95.85	
317	3076195.78	393976.88			
			S 71-29-58 E	179.50	
318	3076138.82	394147.10			
			N 49-57-42 E	90.00	
319	3076196.72	394216.01			
			S 40-20-18 E	60.00	
320	3076150.98	394254.84			
			S 24-11-40 E	6.30	
321	3076145.24	394257.43			
			S 1-6-39 W	5723.32	Tie Line, Follows elevation 205.2 ft. in between points 321 and 322

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
322	3070423.04	394146.54			
			S 7-56-50 W	108.60	
323	3070315.49	394131.53			
			S 14-44-2 E	331.99	
324	3069994.42	394215.96			
			S 30-22-36 E	247.36	
325	3069781.02	394341.05			
			S 16-55-10 W	228.96	
326	3069561.97	394274.42			
			S 10-2-51 E	153.20	
327	3069411.12	394301.15			
			S 3-52-37 E	193.08	
328	3069218.48	394314.20			
			S 7-19-45 E	160.70	
329	3069059.10	394334.71			
			S 4-21-38 E	175.89	
330	3068883.72	394348.08			
			S 9-5-49 E	189.48	
331	3068696.62	394378.04			
			S 16-40-58 E	451.01	
332	3068264.60	394507.52			
			S 20-57-0 E	341.58	
333	3067945.61	394629.65			
			S 36-25-0 E	88.02	
334	3067874.78	394681.90			
			S 36-25-0 E	83.55	Tie Line, Follows elevation 204.5 ft. in between points 334 and 335
335	3067807.54	394731.50			
			S 36-25-0 E	32.30	
336	3067781.55	394750.68			
			S 23-17-0 E	186.98	
337	3067609.80	394824.59			
			S 34-23-0 E	103.03	
338	3067524.77	394882.77			
			S 34-15-45 E	1200.03	
339	3066533.00	395558.37			
			S 30-12-34 E	360.62	
340	3066221.36	395739.82			
			S 30-12-34 E	30.20	Tie Line, Follows elevation 203.8 ft. in between points 340 and 341
341	3066195.27	395755.02			
			S 30-12-35 E	23.30	
342	3066175.13	395766.74			
			S 22-49-34 E	340.06	
343	3065861.71	395898.67			
			S 3-0-3 E	1044.49	Tie Line, Follows elevation 203.8 ft. in between points 343 and 344
344	3064818.66	395953.36			
			S 23-31-26 W	57.10	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
345	3064766.30	395930.57			
			S 40-0-26 W	635.34	
346	3064279.66	395522.13			
			S 63-20-39 E	24.29	
347	3064268.76	395543.83			
			S 63-20-39 E	153.71	
348	3064199.80	395681.21			
			S 44-27-52 W	1193.60	Tie Line, Follows elevation 203.8 ft. in between points 348 and 349
349	3063347.94	394845.15			
			N 35-0-34 W	135.54	
350	3063458.96	394767.39			
			S 51-48-26 W	780.93	
351	3062976.10	394153.64			
			S 52-32-24 W	16.00	
352	3062966.37	394140.94			
			S 50-47-3 W	2662.56	Tie Line, Follows elevation 203.3 ft. in between points 352 and 353
353	3061282.97	392078.11			
			S 44-29-15 W	115.58	
354	3061200.52	391997.12			
			S 71-54-11 W	163.06	
355	3061149.87	391842.13			
			S 61-24-15 W	330.13	
356	3060991.85	391552.27			
			S 55-52-15 W	60.13	
357	3060958.12	391502.50			
			S 46-43-52 W	340.28	Tie Line, Follows elevation 203.3 ft. in between points 357 and 358
358	3060724.88	391254.73			
			S 34-9-14 W	57.20	
359	3060677.55	391222.62			
			S 37-14-15 W	280.11	
360	3060454.54	391053.12			
			S 35-21-15 W	130.05	
361	3060348.47	390977.87			
			S 29-3-15 W	150.06	
362	3060217.30	390905.00			
			S 58-23-15 W	146.06	
363	3060140.74	390780.62			
			S 35-3-15 W	190.07	
364	3059985.14	390671.45			
			S 47-21-16 W	43.92	
365	3059955.39	390639.15			
			S 47-21-15 W	66.70	Tie Line, Follows elevation 203.3 ft. in between points 365 and 366
366	3059910.20	390590.09			
			S 47-21-15 W	74.45	
367	3059859.77	390535.33			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			S 46-46-15 W	163.06	
368	3059748.08	390416.52			
			S 49-1-15 W	184.07	
369	3059627.37	390277.56			
			S 40-23-15 W	270.10	
370	3059421.64	390102.55			
			S 43-43-15 W	280.11	
371	3059219.20	389908.96			
			S 23-8-15 W	130.05	
372	3059099.61	389857.86			
			S 46-36-45 E	110.50	
373	3059023.71	389938.16			
			S 27-10-7 W	1806.19	Tie Line, Follows elevation 202.7 ft. in between points 373 and 374
374	3057416.81	389113.46			
			S 86-46-16 W	94.35	
375	3057411.49	389019.26			
			S 86-32-41 W	98.85	
376	3057405.53	388920.59			
			S 28-5-19 E	554.28	
377	3056916.54	389181.57			
			N 89-50-41 E	392.42	
378	3056917.61	389573.98			
			S 44-9-19 E	440.15	
379	3056601.83	389880.60			
			S 14-45-19 E	666.32	
380	3055957.49	390050.31			
			S 17-27-19 E	961.18	
381	3055040.58	390338.63			
			S 24-15-19 E	533.81	
382	3054553.90	390557.92			
			N 77-4-28 E	263.82	
383	3054612.91	390815.05			
			S 11-17-32 W	6793.49	Tie Line, Follows elevation 201.8 ft. in between points 383 and 384
384	3047950.98	389484.88			
			S 79-34-12 W	152.80	
385	3047923.31	389334.61			
			S 17-16-12 W	449.50	
386	3047494.08	389201.17			
			S 28-56-12 W	373.32	
387	3047167.37	389020.55			
			S 29-59-56 W	357.13	
388	3046858.08	388841.99			
			S 23-58-7 W	287.42	
389	3046595.45	388725.24			
			S 36-32-14 W	738.03	
390	3046002.46	388285.87			
			N 61-21-35 W	1040.13	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
391	3046500.99	387373.01			
			S 10-56-24 E	742.50	
392	3045772.00	387513.92			
			S 51-5-4 E	425.66	
393	3045504.61	387845.12			
			S 51-5-4 E	389.64	
394	3045259.86	388148.28			
			S 88-39-33 W	1995.70	Tie Line, Follows elevation 200 ft. in between points 394 and 395
395	3045213.14	386153.15			
			N 67-46-9 E	90.96	
396	3045247.55	386237.35			
			N 67-46-9 E	211.10	
397	3045327.42	386432.76			
			N 12-47-0 W	90.76	
398	3045415.93	386412.67			
			R = 1673	L = 462.56	
399	3045851.94	386262.71			
			N 68-19-10 W	465.01	
400	3046023.72	385830.60			
			N 6-15-35 E	645.08	
401	3046664.95	385900.92			
			N 26-20-57 W	176.20	
402	3046822.84	385822.72			
			S 74-3-25 W	218.92	
403	3046762.71	385612.22			
			N 56-15-33 W	155.89	
404	3046849.29	385482.59			
			N 27-59-33 W	112.65	
405	3046948.76	385429.72			
			N 71-1-33 W	108.46	
406	3046984.02	385327.15			
			N 83-33-33 W	72.40	
407	3046992.15	385255.21			
			N 67-7-33 W	59.42	
408	3047015.24	385200.46			
			S 66-11-27 W	81.39	
409	3046982.38	385126.00			
			N 71-14-33 W	65.66	
410	3047003.50	385063.83			
			N 3-45-33 W	98.27	
411	3047101.56	385057.39			
			N 68-20-33 W	744.71	
412	3047376.39	384365.25			
			N 31-57-33 W	179.96	
413	3047529.07	384270.00			
			N 66-57-33 W	332.20	
414	3047659.08	383964.30			
			S 74-22-27 W	344.14	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
415	3047566.38	383632.88			
			S 86-57-28 W	57.02	
416	3047563.36	383575.94			
			N 80-19-33 W	196.53	
417	3047596.38	383382.21			
			N 67-56-33 W	122.74	
418	3047642.47	383268.45			
			S 62-38-27 W	83.69	
419	3047604.01	383194.13			
			S 71-29-27 W	274.83	
420	3047516.76	382933.52			
			N 83-14-33 W	96.77	
421	3047528.15	382837.42			
			S 74-7-27 W	230.89	
422	3047464.98	382615.34			
			S 78-21-27 W	266.64	
423	3047411.17	382354.19			
			S 82-21-27 W	105.86	
424	3047397.09	382249.27			
			S 89-13-0 W	216.78	
425	3047394.13	382032.51			
			S 89-31-10 W	374.00	
426	3047390.98	381658.53			
			N 83-47-50 W	209.10	
427	3047413.57	381450.66			
			N 87-37-9 W	176.30	
428	3047420.90	381274.51			
			S 72-49-48 W	433.00	
429	3047293.07	380860.81			
			S 68-49-27 W	499.94	
430	3047112.47	380394.64			
			S 70-1-45 W	565.88	
431	3046919.19	379862.80			
			S 53-58-9 W	263.55	
432	3046764.17	379649.67			
			S 62-10-47 W	271.36	
433	3046637.52	379409.68			
			S 63-21-50 W	280.41	
434	3046511.80	379159.03			
			S 48-28-50 W	594.61	
435	3046117.65	378713.84			
			S 71-43-0 W	154.38	
436	3046069.22	378567.25			
			S 5-54-14 E	25.95	
437	3046043.41	378569.92			
			S 77-37-41 W	360.47	
438	3045966.17	378217.83			
			N 22-50-24 W	322.96	
439	3046263.80	378092.46			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			N 67-35-4 E	191.74	
440	3046336.92	378269.71			
			N 71-49-4 E	269.17	
441	3046420.91	378525.44			
			N 6-3-30 W	64.00	
442	3046484.56	378518.69			
			N 4-48-30 W	256.55	
443	3046740.20	378497.18			
			N 4-48-30 W	365.87	
444	3047104.78	378466.51			
			N 45-24-20 E	161.94	
445	3047218.48	378581.82			
			N 29-16-0 E	191.73	
446	3047385.73	378675.55			
			N 46-18-0 E	213.40	
447	3047533.17	378829.83			
			N 42-33-0 E	172.53	
448	3047660.27	378946.50			
			R = 1240	L = 97.29	
449	3047713.69	378865.21			
			N 54-26-22 W	768.14	
450	3048160.40	378240.33			
			R = 1737	L = 286.60	
451	3048307.13	377994.52			
			S 28-51-9 W	292.64	
452	3048050.81	377853.31			
			S 28-51-8 W	27.00	
453	3048027.16	377840.28			
			N 54-36-59 W	935.32	Tie Line, Follows elevation 187.5 ft. in between points 453 and 454
454	3048568.75	377077.72			
			N 79-53-25 W	518.89	
455	3048659.82	376566.89			
			S 20-40-12 E	191.69	
456	3048480.48	376634.56			
			S 37-3-2 E	173.27	
457	3048342.19	376738.96			
			N 87-32-13 W	1097.25	Tie Line, Follows elevation 187.5 ft. in between points 457 and 458
458	3048389.33	375642.73			
			N 30-6-30 E	104.60	
459	3048479.82	375695.20			
			N 65-33-50 W	351.87	
460	3048625.38	375374.85			
			S 23-25-50 W	150.08	
461	3048487.67	375315.18			
			N 65-34-50 W	32.24	
462	3048501.00	375285.82			
			S 24-25-11 W	77.28	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
463	3048430.63	375253.87			
			N 70-13-20 W	553.76	
464	3048618.00	374732.78			
			N 64-18-22 W	130.01	
465	3048674.37	374615.63			
			R = 787	L = 70.19	
466	3048638.57	374555.28			
			S 61-52-44 W	512.00	
467	3048397.25	374103.73			
			R = 318	L = 296.97	
468	3048395.26	373817.26			
			N 2-44-16 W	140.20	Tie Line, Follows shoreline in between 468 and 469
469	3048535.30	373810.56			
			N 9-3-33 W	967.56	
470	3049490.78	373658.20			
			N 23-43-20 E	163.41	
471	3049640.38	373723.94			
			N 23-44-40 E	152.47	
472	3049779.95	373785.33			
			N 14-11-20 E	168.57	
473	3049943.38	373826.65			
			R = 80	L = 88.74	
474	3050023.70	373801.19			
			R = 65	L = 84.03	
475	3050028.61	373723.04			
			S 56-33-44 W	168.10	
476	3049935.98	373582.77			
			N 49-41-8 W	82.96	
477	3049989.65	373519.51			
			N 56-33-44 E	232.60	
478	3050117.82	373713.61			
			N 60-21-28 W	986.58	
479	3050605.75	372856.15			
			N 17-38-21 E	393.49	Follows Fall River Shoreline in between points 479 and 480
480	3050980.74	372975.38			
			N 4-54-48 W	162.28	
481	3051142.42	372961.48			
			R = 400	L = 228.77	
482	3051352.67	372879.51			
			S 5-56-55 W	238.07	
483	3051115.89	372854.84			
			S 53-36-52 W	3116.61	
484	3049267.05	370345.89			
			S 14-41-28 E	210.37	
485	3049063.56	370399.24			
			S 39-27-41 W	63.48	
486	3049014.55	370358.89			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 58-3-0 W	97.83	
487	3048962.78	370275.89			
			S 88-34-37 W	59.59	
488	3048961.30	370216.32			
			S 89-5-52 W	130.07	
489	3048959.25	370086.28			
			R = 800	L = 232.24	
490	3048931.16	369856.57			
			S 76-17-52 W	137.07	
491	3048898.70	369723.40			
			S 57-43-52 W	362.38	
492	3048705.22	369416.99			
			S 50-6-52 W	824.54	
493	3048176.48	368784.32			
			S 66-31-4 W	265.92	
494	3048070.51	368540.42			
			S 58-43-52 W	82.08	
495	3048027.91	368470.27			
			S 50-21-52 W	524.72	
496	3047693.19	368066.18			
			S 56-6-52 W	747.31	
497	3047276.53	367445.81			
			S 64-37-52 W	104.02	
498	3047231.96	367351.82			
			N 69-51-0 W	58.71	
499	3047252.19	367296.70			
			S 70-28-14 W	226.30	
500	3047176.53	367083.43			
			S 33-4-13 W	436.52	
501	3046810.73	366845.24			
			S 76-10-47 E	588.07	
502	3046670.26	367416.28			
			S 50-11-11 W	364.16	
503	3046437.09	367136.56			
			S 48-18-13 W	437.95	
504	3046145.77	366809.56			
			S 52-38-13 W	266.14	
505	3045984.26	366598.03			
			S 40-28-13 W	354.99	
506	3045714.20	366367.63			
			S 52-10-13 W	257.47	
507	3045556.29	366164.28			
			S 83-3-13 W	141.50	
508	3045539.17	366023.82			
			N 89-26-47 W	309.72	Tie Line, Follows elevation 188 ft. in between points 630 and 631
509	3045542.16	365714.12			
			S 56-58-13 W	605.13	
510	3045212.32	365206.79			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 42-35-39 W	310.86	
511	3044983.47	364996.41			
			S 44-20-39 W	185.03	
512	3044851.15	364867.08			
			S 38-17-30 W	233.65	
513	3044667.76	364722.30			
			S 26-39-7 W	374.12	
514	3044333.39	364554.49			
			S 22-2-7 W	444.70	
515	3043921.18	364387.65			
			S 10-36-7 W	458.10	
516	3043470.90	364303.37			
			S 10-36-7 W	662.85	
517	3042819.36	364181.43			
			S 11-12-7 W	495.84	
518	3042332.97	364085.11			
			S 11-12-7 W	1721.49	
519	3040644.28	363750.70			
			N 88-7-20 E	485.62	
520	3040660.20	364236.05			
			N 88-7-14 E	83.93	
521	3040662.96	364319.94			
			S 78-36-14 W	+/-931	
522	3040845.23	365232.60			
			S 8-10-10 E	714.72	
523	3040137.77	365334.17			
			R = 1974	L = 496	
524	3039643.85	365355.88			
			S 62-8-53 E	292.23	
525	3039507.33	365614.25			
			S 61-34-3 E	173.00	
526	3039424.96	365766.38			
			N 6-47-57 E	763.30	
527	3040182.89	365856.74			
			N 83-12-2 W	57.00	
528	3040189.64	365800.14			
			N 6-47-57 E	67.00	
529	3040256.16	365808.07			
			N 18-23-54 W	244.20	
530	3040487.88	365731.00			
			N 16-31-54 W	156.40	
531	3040637.81	365686.49			
			N 6-14-34 W	145.10	
532	3040782.05	365670.71			
			N 80-23-6 E	95.00	
533	3040797.92	365764.38			
			N 11-46-6 E	371.60	
534	3041161.71	365840.16			
			N 11-1-6 E	180.00	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
535	3041338.39	365874.56			
			S 78-10-54 E	170.96	
536	3041303.38	366041.90			
			R = 2845	L = 559.69	
537	3041816.52	366263.09			
			S 32-44-28 E	62.24	
538	3041764.17	366296.75			
			S 38-33-20 E	143.00	
539	3041652.34	366385.88			
			S 38-22-22 E	142.47	
540	3041540.65	366474.32			
			S 38-25-24 E	68.98	
541	3041486.61	366517.19			
			S 51-57-0 W	99.69	
542	3041425.17	366438.69			
			S 38-16-34 E	207.21	
543	3041262.50	366567.04			
			S 51-46-23 W	123.39	
544	3041186.15	366470.11			
			S 38-37-0 E	35.56	
545	3041158.37	366492.31			
			N 51-25-28 E	90.83	
546	3041215.01	366563.32			
			S 37-48-3 E	28.59	
547	3041192.42	366580.84			
			N 51-27-29 E	50.58	
548	3041223.93	366620.40			
			N 51-31-0 E	82.61	
549	3041275.34	366685.06			
			N 38-5-34 W	110.08	
550	3041361.97	366617.15			
			N 38-31-17 W	71.63	
551	3041418.01	366572.54			
			N 45-59-48 E	213.71	
552	3041566.48	366726.26			
			N 46-5-18 E	60.43	
553	3041608.39	366769.79			
			N 46-1-3 E	477.39	
554	3041939.91	367113.29			
			N 46-1-3 E	60.35	
555	3041981.82	367156.72			
			N 46-1-3 E	485.80	
556	3042319.18	367506.27			
			S 26-56-0 E	285.94	
557	3042064.26	367635.78			
			S 52-32-26 W	126.52	
558	3041987.31	367535.36			
			S 30-13-59 E	284.86	
559	3041741.20	367678.79			

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
			N 43-45-56 E	44.85	
560	3041773.59	367709.81			
			N 44-18-26 E	133.23	
561	3041868.93	367802.87			
			N 21-55-6 W	137.60	
562	3041996.58	367751.51			
			N 42-39-41 E	40.24	
563	3042026.17	367778.78			
			N 43-59-14 E	65.00	
564	3042072.94	367823.92			
			N 45-19-23 W	186.44	
565	3042204.02	367691.34			
			N 42-27-8 E	66.01	
566	3042252.73	367735.90			
			N 42-21-38 E	162.85	
567	3042373.06	367845.62			
			S 47-38-40 E	186.69	
568	3042247.29	367983.58			
			S 42-21-21 W	20.00	
569	3042232.51	367970.11			
			S 46-40-14 E	131.79	
570	3042142.08	368065.97			
			N 43-45-56 E	230.06	
571	3042308.22	368225.10			
			N 46-11-38 W	128.00	
572	3042396.82	368132.73			
			N 43-43-10 E	80.49	
573	3042455.00	368188.36			
			N 46-11-39 W	24.00	
574	3042471.61	368171.04			
			N 43-43-10 E	104.83	
575	3042547.37	368243.49			
			S 46-28-51 E	152.15	
576	3042442.61	368353.82			
			N 43-45-56 E	106.56	
577	3042519.56	368427.52			
			N 51-39-38 W	1302.13	
578	3043327.28	367406.20			
			N 51-39-37 W	66.00	
579	3043368.22	367354.43			
			N 38-14-23 E	3684.96	
580	3046262.50	369635.19			
			N 38-14-23 E	59.89	
581	3046309.54	369672.26			
			N 38-14-23 E	600.18	
582	3046780.94	370043.74			
			N 8-27-26 E	254.34	
583	3047032.51	370081.14			
			N 51-44-34 W	13.60	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
584	3047040.93	370070.46			
			N 38-15-40 E	2.40	
585	3047042.82	370071.95			
			N 22-46-26 E	42.90	
586	3047082.37	370088.55			
			N 8-27-26 E	36.00	
587	3047117.98	370093.85			
			R = 1469	L = 151.47	
588	3047266.38	370123.83			
			N 22-39-26 E	965.35	
589	3048157.23	370495.69			
			N 23-3-45 E	47.69	
590	3048201.11	370514.37			
			R = 750	L = 297.92	
591	3048441.33	370687.26			
			N 40-33-17 E	50.70	
592	3048479.85	370720.23			
			N 66-7-26 E	61.87	
593	3048504.89	370776.80			
			N 47-9-26 E	505.00	
594	3048848.29	371147.07			
			S 42-50-34 E	33.60	
595	3048823.65	371169.92			
			N 48-17-26 E	318.60	
596	3049035.63	371407.76			
			S 51-44-34 E	81.10	
597	3048985.42	371471.44			
			N 75-29-26 E	138.10	
598	3049020.02	371605.13			
			N 38-15-26 E	20.00	
599	3049035.72	371617.52			
			N 51-44-36 W	66.89	
600	3049077.14	371564.99			
			N 79-18-39 E	217.60	
601	3049117.50	371778.81			
			R = 391	L = 54.04	
602	3049131.16	371831.06			
			N 71-23-39 E	120.05	
603	3049169.46	371944.83			
			R = 451	L = 8.66	
604	3049172.14	371953.07			
			S 17-20-50 E	1.00	
605	3049171.18	371953.37			
			R = 374	L = 355.25	
606	3049112.61	372290.36			
			S 50-42-56 E	5.57	
607	3049109.08	372294.67			
			S 56-33-46 W	12.76	
608	3049102.05	372284.02			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 50-12-15 W	63.62	
609	3049061.33	372235.14			
			S 38-14-45 W	27.03	
610	3049040.10	372218.40			
			S 51-47-12 E	350.00	
611	3048823.60	372493.40			
			S 38-14-45 W	200.00	
612	3048666.53	372369.60			
			S 51-47-12 E	508.41	
613	3048352.03	372769.06			
			S 38-28-20 W	300.55	
614	3048116.73	372582.08			
			S 51-47-12 E	185.93	
615	3048001.72	372728.17			
			N 38-23-20 E	132.00	
616	3048105.18	372810.14			
			S 51-29-36 E	189.33	
617	3047987.31	372958.30			
			N 38-18-24 E	88.82	
618	3048057.00	373013.35			
			R = 1493	L = 376.99	
619	3047797.77	373285.68			
			S 53-38-47 E	142.46	
620	3047713.33	373400.42			
			R = 29	L = 31.72	
621	3047718.48	373430.08			
			N 64-5-10 W	16.23	
622	3047725.57	373415.48			
			S 88-27-13 E	87.82	
623	3047723.21	373503.27			
			S 2-28-0 W	294.75	
624	3047428.73	373490.59			
			S 71-19-40 E	168.80	
625	3047374.69	373650.50			
			S 63-31-0 E	18.00	
626	3047366.66	373666.61			
			S 62-7-30 E	190.15	
627	3047277.76	373834.70			
			N 43-39-30 E	17.22	
628	3047290.22	373846.58			
			S 19-10-53 E	702.37	Tie Line, Follows elevation 188 ft. in between points 457 and 458
629	3046626.85	374077.36			
			N 41-15-14 W	79.51	
630	3046686.63	374024.93			
			S 54-19-3 W	15.79	
631	3046677.42	374012.11			
			S 24-31-27 W	106.28	
632	3046580.72	373967.99			

Point Number	NAD83 Massachusetts State Plane			Distance (feet)	
	North (ft)	East (ft)	Direction		Description
			S 21-35-0 W	73.22	
633	3046512.64	373941.06			
			S 54-36-40 W	68.97	
634	3046472.70	373884.83			
			S 70-23-9 E	19.51	
635	3046466.15	373903.21			
			S 19-53-21 W	15.00	
636	3046452.04	373898.11			
			S 32-56-42 E	82.46	
637	3046382.84	373942.95			
			S 32-7-5 E	75.83	
638	3046318.62	373983.27			
			S 52-49-0 E	102.13	
639	3046256.90	374064.64			
			S 7-21-59 E	62.44	
640	3046194.97	374072.64			
			S 33-10-59 E	105.13	
641	3046106.99	374130.18			
			S 0-2-17 W	295.74	
642	3045811.25	374129.99			
			N 70-20-15 W	80.00	
643	3045838.17	374054.65			
			S 19-39-45 W	173.53	
644	3045674.76	373996.27			
			S 15-51-52 W	61.44	
645	3045615.66	373979.47			
			S 34-4-40 W	56.15	
646	3045569.15	373948.01			
			S 25-0-24 E	110.00	
647	3045469.46	373994.51			
			S 27-23-36 W	144.00	
648	3045341.61	373928.26			
			N 58-58-50 W	407.95	
649	3045551.83	373578.65			
			S 10-49-13 W	508.90	
650	3045051.98	373483.12			
			S 31-51-47 E	264.25	
651	3044827.56	373622.62			
			N 77-10-55 E	98.54	
652	3044849.42	373718.70			
			N 29-48-25 E	264.08	
653	3045078.56	373849.97			
			N 38-28-55 E	192.53	
654	3045229.28	373969.77			
			S 7-34-25 W	91.21	
655	3045138.86	373957.75			
			S 1-38-25 W	123.67	
656	3045015.24	373954.21			
			S 4-54-25 W	197.44	

Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
657	3044818.53	373937.32			
			S 44-28-5 E	170.34	
658	3044696.97	374056.65			
			S 40-46-5 E	263.46	
659	3044497.44	374228.69			
			S 37-3-58 W	197.94	
660	3044339.49	374109.39			
			S 7-31-59 W	239.82	
661	3044101.74	374077.95			
			S 21-24-0 E	250.35	
662	3043868.66	374169.30			
			S 27-6-30 E	254.33	
663	3043642.27	374285.19			
			S 42-53-0 E	248.18	
664	3043460.42	374454.08			
			S 4-4-0 W	251.88	
665	3043209.18	374436.22			
			S 47-45-42 E	356.10	
666	3042969.80	374699.86			
			N 42-26-9 E	100.03	
667	3043043.63	374767.35			
			S 47-45-42 E	140.00	
668	3042949.52	374871.00			
			S 67-22-13 E	148.36	
669	3042892.44	375007.94			
			N 42-16-47 E	253.36	
670	3043079.89	375178.38			
			N 82-13-22 E	85.95	
671	3043091.52	375263.54			
			S 47-47-7 E	62.82	
672	3043049.32	375310.07			
			S 85-23-51 E	123.83	
673	3043039.38	375433.50			
			N 54-57-28 E	120.08	
674	3043108.33	375531.81			
			N 75-27-28 E	66.00	
675	3043124.90	375595.69			
			S 47-35-0 E	224.19	To point of beginning

Parcel A					
Point Number	NAD83 Massachusetts State Plane		Direction	Distance (feet)	Description
	North (ft)	East (ft)			
1A	366587.39	3038465.16			Point of Beginning
			S 48-0-24 E	62.72	
2A	366634.00	3038423.20			
			N 85-37-15 E	66.18	
3A	366699.99	3038428.25			

Parcel A					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
			S 15-22-13 W	175.45	
4A	366653.49	3038259.07			
			S 72-2-21 W	88.77	
5A	366569.05	3038231.70			
			S 61-36-10 W	149.96	
6A	366437.13	3038160.38			
			N 30-25-54 E	202.11	
7A	366539.50	3038334.65			
			N 51-26-10 W	69.58	
8A	366485.10	3038378.02			
			N 49-34-23 E	134.37	To Point of Beginning

Parcel B					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
1B	367302.45	3041109.27			Point of Beginning
			R = 1951	L = 394.65	
2B	367128.37	3040755.84			
			N 65-27-53 W	99.00	
3B	367038.31	3040796.95			
			N 70-34-53 W	186.00	
4B	366862.89	3040858.79			
			N 22-16-7 E	55.60	
5B	366883.96	3040910.24			
			N 49-7-53 W	33.00	
6B	366859.01	3040931.83			
			S 52-0-7 W	79.99	
7B	366795.97	3040882.59			
			N 69-57-12 W	33.12	
8B	366764.86	3040893.94			
			R = 960	L = 142.98	
9B	366871.84	3040988.61			
			N 52-45-40 E	377.21	
10B	367172.14	3041216.87			
			S 44-13-45 E	51.31	
11B	367207.93	3041180.11			
			S 51-52-30 E	107.81	
12B	367292.74	3041113.55			
			S 66-14-5 E	10.63	To Point of Beginning

Parcel C					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
1C	367703.34	3041642.56			Point of Beginning
			S 46-14-4 E	26.90	
2C	367722.77	3041623.95			
			S 41-34-13 W	340.22	
3C	367500.49	3041373.31			
			R = 1951	L = 269.90	
4C	367335.36	3041160.11			
			N 66-14-7 W	12.19	
5C	367324.20	3041165.02			
			N 51-52-30 W	96.23	
6C	367248.50	3041224.43			
			N 44-13-46 W	40.50	
7C	367220.25	3041253.45			
			N 52-45-39 E	170.39	
8C	367355.90	3041356.56			
			N 59-9-17 E	91.89	
9C	367434.79	3041403.68			
			N 48-20-49 E	359.43	To Point of Beginning

Parcel D					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
1D	374555.10	3048695.69			Point of Beginning
			N 33-18-33 W	143.04	
2D	374476.54	3048815.23			
			N 32-28-46 E	100.00	
3D	374530.24	3048899.59			
			N 57-31-14 W	112.44	
4D	374435.39	3048959.97			
			N 58-3-58 W	247.11	
5D	374225.68	3049090.67			
			N 66-5-23 E	65.77	
6D	374225.68	3049090.67			
			S 18-46-0 E	172.83	
7D	374281.28	3048927.03			
			S 80-18-16 W	104.13	
8D	374178.64	3048909.49			
			S 46-26-18 E	103.45	
9D	374253.60	3048838.20			
			S 22-44-13 W	59.81	
10D	374230.49	3048783.04			
			S 9-1-41 E	105.50	
11D	374247.04	3048678.85			
			N 82-31-6 E	87.46	
12D	374333.76	3048690.24			
			N 61-52-44 E	21.00	

Parcel D					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
13D	374352.28	3048700.14			
			S 28-7-16 E	100.00	
14D	374399.41	3048611.94			
			N 61-52-44 E	150.00	
15D	374531.70	3048682.64			
			N 60-50-56 E	26.79	To Point of Beginning

Parcel E					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
1E	373941.47	3046336.37			Point of Beginning
			S 19-37-36 W	78.64	
2E	373915.05	3046262.30			
			S 70-9-2 E	60.00	
3E	373971.49	3046241.93			
			S 19-37-37 W	92.00	
4E	373940.59	3046155.27			
			S 70-9-3 E	157.40	
5E	374088.63	3046101.83			
			N 25-59-43 W	174.15	
6E	374012.30	3046258.36			
			R = 261	L = 106.10	To Point of Beginning

Parcel F (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E1F	365660.98	3043033.63			Point of Beginning
			S 1-53-16 W	175.00	
E2F	365655.21	3042858.72			
			S 1-53-16 W	507.39	
E3F	365638.51	3042351.61			
			S 1-53-16 W	100.47	
E4F	365635.20	3042251.20			
			S 1-53-15 W	30.00	
E5F	365634.21	3042221.21			
			S 0-39-44 E	101.02	
E6F	365635.38	3042120.20			
			S 4-46-44 E	103.59	
E7F	365644.01	3042016.97			
			S 85-13-17 W	127.09	
E8F	365517.36	3042006.38			
			N 37-42-44 W	100.00	
E9F	365456.19	3042085.49			
			N 61-37-44 W	193.68	

Parcel F (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E10F	365285.78	3042177.52			
			N 64-24-44 W	166.63	
E11F	365135.49	3042249.48			
			N 74-5-44 W	311.79	
E12F	364835.64	3042334.92			
			N 11-18-44 W	111.66	
E13F	364813.73	3042444.41			
			N 31-28-17 E	184.74	
E14F	364910.18	3042601.98			
			N 17-58-44 W	134.74	
E15F	364868.59	3042730.14			
			N 4-29-16 E	202.01	
E16F	364884.39	3042931.53			
			N 43-25-16 E	183.37	
E17F	365010.43	3043064.71			
			N 47-35-16 E	407.88	
E18F	365311.57	3043339.81			
			N 55-24-16 E	283.42	
E19F	365544.87	3043500.73			
			S 57-14-44 E	241.69	
E20F	365748.13	3043369.97			
			S 14-31-37 W	347.46	To Point of Beginning

Parcel G (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E1G	371478.67	3049222.79			Point of Beginning
			R = 840	L = 397.65	
E2G	371126.47	3049046.30			
			S 43-21-2 W	24.80	
E3G	371109.44	3049028.27			
			S 47-9-35 W	661.90	
E4G	370624.12	3048578.20			
			S 66-21-20 W	50.58	
E5G	370577.78	3048557.92			
			S 45-9-12 W	54.88	
E6G	370538.87	3048519.22			
			S 50-58-9 E	15.00	
E7G	370550.53	3048509.77			
			R = 854	L = 266.20	
E8G	370400.82	3048290.97			
			S 24-2-31 W	47.47	
E9G	370381.48	3048247.61			
			S 22-42-37 W	502.52	
E10G	370187.48	3047784.05			
			S 30-18-37 W	60.50	

Parcel G (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E11G	370156.95	3047731.82			
			S 26-53-55 W	56.70	
E12G	370131.29	3047681.26			
			N 51-45-8 W	321.66	
E13G	369878.68	3047880.38			
			S 38-14-52 W	700.50	
E14G	369445.04	3047330.25			
			S 51-45-6 E	190.25	
E15G	369594.45	3047212.47			
			N 37-52-15 E	200.00	
E16G	369717.22	3047370.35			
			S 52-7-44 E	199.10	
E17G	369874.39	3047248.13			
			S 37-52-16 W	200.00	
E18G	369751.62	3047090.25			
			S 50-59-42 E	101.42	
E19G	369830.43	3047026.42			
			S 38-16-29 W	120.04	
E20G	369756.07	3046932.18			
			S 51-43-38 E	54.62	
E21G	369798.95	3046898.35			
			S 38-16-23 W	64.00	
E22G	369759.31	3046848.11			
			S 54-56-53 E	58.69	
E23G	369807.36	3046814.40			
			S 38-4-49 W	100.10	
E24G	369745.62	3046735.61			
			S 51-42-24 E	10.00	
E25G	369753.47	3046729.41			
			S 38-17-39 W	40.00	
E26G	369728.68	3046698.02			
			N 51-42-24 W	10.00	
E27G	369720.83	3046704.22			
			S 38-58-4 W	340.08	
E28G	369506.97	3046439.81			
			S 38-17-39 W	59.89	
E29G	369469.86	3046392.80			
			S 38-17-39 W	1139.99	
E30G	368763.42	3045498.09			
			N 51-41-43 W	109.63	
E31G	368677.39	3045566.04			
			S 38-16-9 W	449.00	
E32G	368399.31	3045213.53			
			N 51-43-51 W	252.90	
E33G	368200.76	3045370.16			
			N 20-49-6 W	283.53	
E34G	368099.99	3045635.17			
			N 10-2-10 E	246.90	

Parcel G (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E35G	368143.01	3045878.30			
			N 38-19-10 E	681.44	
E36G	368565.52	3046412.93			
			N 51-40-50 W	20.00	
E37G	368549.83	3046425.33			
			N 38-19-10 E	599.92	
E38G	368921.80	3046896.01			
			S 51-40-50 E	20.00	
E39G	368937.49	3046883.61			
			N 39-19-9 E	554.01	
E40G	369288.53	3047312.21			
			N 79-9-27 E	91.94	
E41G	369378.82	3047329.50			
			N 38-14-52 E	799.37	
E42G	369873.67	3047957.28			
			N 45-22-17 E	588.17	
E43G	370292.25	3048370.48			
			N 51-38-47 W	43.95	
E44G	370257.78	3048397.75			
			N 53-10-5 E	1502.79	
E45G	371460.59	3049298.64			
			S 13-24-26 E	77.97	To Point of Beginning

Parcel H (Excluded from Project Boundary)					
	NAD83 Massachusetts State Plane				
Point Number	North (ft)	East (ft)	Direction	Distance (feet)	Description
E1H	372306.24	3049123.09			Point of Beginning
			N 57-31-23 W	27.09	
E2H	372283.38	3049137.64			
			N 61-28-54 W	27.09	
E3H	372259.58	3049150.57			
			N 56-33-43 E	34.00	
E4H	372287.95	3049169.31			
			S 57-4-25 E	24.00	
E5H	372308.10	3049156.26			
			N 53-17-5 E	10.00	
E6H	372316.11	3049162.24			
			S 56-8-51 E	31.00	
E7H	372341.86	3049144.97			
			S 58-26-18 W	41.80	To Point of Beginning

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Amended Final Application for New License for Major Water Power Project – Existing Dam

Turners Falls Hydroelectric Project (FERC Project Number 1889)

EXHIBIT H- PLANS AND ABILITY OF APPLICANT TO OPERATE THE PROJECT

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EXHIBIT H – PLAN AND ABILITY OF APPLICANT TO OPERATE THE PROJECT

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 4.51 (e) describes the required content of this Exhibit.

(i) Information to be supplied by all applicants. All Applicants for a new license under this part must file the following information with the Commission:

(A) A discussion of the plans and ability of the applicant to operate and maintain the project in a manner most likely to provide efficient and reliable electric service, including efforts and plans to:

(1) Increase capacity or generation at the project;

(2) Coordinate the operation of the project with any upstream or downstream water resource projects; and

(3) Coordinate the operation of the project with the applicant's or other electrical systems to minimize the cost of production.

(B) A discussion of the need of the applicant over the short and long term for the electricity generated by the project, including:

(1) The reasonable costs and reasonable availability of alternative sources of power that would be needed by the applicant or its customers, including wholesale customers, if the applicant is not granted a license for the project;

(2) A discussion of the increase in fuel, capital, and any other costs that would be incurred by the applicant or its customers to purchase or generate power necessary to replace the output of the licensed project, if the applicant is not granted a license for the project;

(3) The effect of each alternative source of power on:

(i) The applicant's customers, including wholesale customers;

(ii) The applicant's operating and load characteristics; and

(iii) The communities served or to be served, including any reallocation of costs associated with the transfer of a license from the existing licensee.

(C) The following data showing need and the reasonable cost and availability of alternative sources of power:

(1) The average annual cost of the power produced by the project, including the basis for that calculation;

(2) The projected resources required by the applicant to meet the applicant's capacity and energy requirements over the short and long term including:

(i) Energy and capacity resources, including the contributions from the applicant's generation, purchases, and load modification measures (such as conservation, if considered as a resource), as separate components of the total resources required;

(ii) A resource analysis, including a statement of system reserve margins to be maintained for energy and capacity;

(iii) If load management measures are not viewed as resources, the effects of such measures on the projected capacity and energy requirements indicated separately;

(iv) For alternative sources of power, including generation of additional power at existing facilities, restarting deactivated units, the purchase of power off-system, the construction or purchase and operation of a new power plant, and load management measures such as conservation: The total annual cost of each alternative source of power to replace project power; the basis for the determination of projected annual cost; and a discussion of the relative merits of each alternative, including the issues of the period of availability and dependability of purchased power, average life of alternatives, relative equivalent availability of generating alternatives, and relative impacts on the applicant's power system reliability and other system

operating characteristics; and the effect on the direct providers (and their immediate customers) of alternate sources of power.

(D) If an applicant uses power for its own industrial facility and related operations, the effect of obtaining or losing electricity from the project on the operation and efficiency of such facility or related operations, its workers, and the related community.

(E) If an applicant is an Indian tribe applying for a license for a project located on the tribal reservation, a statement of the need of such Indian tribe for electricity generated by the project to foster the purposes of the reservation.

(F) A comparison of the impact on the operations and planning of the applicant's transmission system of receiving or not receiving the project license, including:

(1) An analysis of the effects of any resulting redistribution of power flows on line loading (with respect to applicable thermal, voltage, or stability limits), line losses, and necessary new construction of transmission facilities or upgrading of existing facilities, together with the cost impact of these effects;

(2) An analysis of the advantages that the applicant's transmission system would provide in the distribution of the project's power; and

(3) Detailed single-line diagrams, including existing system facilities identified by name and circuit number, that show system transmission elements in relation to the project and other principal interconnected system elements. Power flow and loss data that represent system operating conditions may be appended if applicants believe such data would be useful to show that the operating impacts described would be beneficial.

(G) If the applicant has plans to modify existing project facilities or operations, a statement of the need for, or usefulness of, the modifications, including at least a reconnaissance-level study of the effect and projected costs of the proposed plans and any alternate plans, which in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in Section 10(a)(1) of the Federal Power Act.

(H) If the applicant has no plans to modify existing project facilities or operations, at least a reconnaissance level study to show that the project facilities or operations in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in Section 10(a)(1) of the Federal Power Act.

(I) A statement describing the applicant's financial and personnel resources to meet its obligations under a new license, including specific information to demonstrate that the applicant's personnel are adequate in number and training to operate and maintain the project in accordance with the provisions of the license.

(J) If an applicant proposes to expand the project to encompass additional lands, a statement that the applicant has notified, by certified mail, property owners on the additional lands to be encompassed by the project and governmental agencies and subdivisions likely to be interested in or affected by the proposed expansion.

(K) The applicant's electricity consumption efficiency improvement program, as defined under Section 10(a)(2)(C) of the Federal Power Act, including:

(1) A statement of the applicant's record of encouraging or assisting its customers to conserve electricity and a description of its plans and capabilities for promoting electricity conservation by its customers; and

(2) A statement describing the compliance of the applicant's energy conservation programs with any applicable regulatory requirements.

(L) The names and mailing addresses of every Indian tribe with land on which any part of the proposed project would be located or which the applicant reasonably believes would otherwise be affected by the proposed project.

(ii) Information to be provided by an applicant licensee. An existing licensee that applies for a new license must provide:

(A) The information specified in paragraph (c)(1) of this section.

(B) A statement of measures taken or planned by the licensee to ensure safe management, operation, and maintenance of the project, including:

(1) A description of existing and planned operation of the project during flood conditions;

(2) A discussion of any warning devices used to ensure downstream public safety;

(3) A discussion of any proposed changes to the operation of the project or downstream development that might affect the existing Emergency Action Plan, as described in subpart C of part 12 of this chapter, on file with the Commission;

(4) A description of existing and planned monitoring devices to detect structural movement or stress, seepage, uplift, equipment failure, or water conduit failure, including a description of the maintenance and monitoring programs used or planned in conjunction with the devices; and

(5) A discussion of the project's employee safety and public safety record, including the number of lost-time accidents involving employees and the record of injury or death to the public within the project boundary.

(C) A description of the current operation of the project, including any constraints that might affect the manner in which the project is operated.

(D) A discussion of the history of the project and record of programs to upgrade the operation and maintenance of the project.

(E) A summary of any generation lost at the project over the last five years because of unscheduled outages, including the cause, duration, and corrective action taken.

(F) A discussion of the licensee's record of compliance with the terms and conditions of the existing license, including a list of all incidents of noncompliance, their disposition, and any documentation relating to each incident.

(G) A discussion of any actions taken by the existing licensee related to the project which affects the public.

(H) A summary of the ownership and operating expenses that would be reduced if the project license were transferred from the existing licensee.

(I) A statement of annual fees paid under part I of the Federal Power Act for the use of any Federal or Indian lands included within the project boundary.

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1 INFORMATION TO BE SUPPLIED BY ALL APPLICANTS

The Federal Power Act (FPA) requires applicants for a new license to provide certain information, including information about the applicant's record as the current licensee of the Project. Pursuant to 18 C.F.R. Section 5.18(c), this information is provided in this Exhibit. 18 C.F.R. Section 16.10(a) requires all applicants for a new license to provide certain information such as the need for Project power and the examination of alternative sources; plans to modify an existing Project; an applicant's ability to operate and maintain the Project; and the applicant's electrical efficiency programs. This information is included in Section 1.0 of this Exhibit. Pursuant to 18 C.F.R. Section 16.10(b) 5.18(c)(1)(ii), Section 2.0 contains information to be provided by an applicant who is the existing licensee for a Project and discusses FirstLight MA Hydro LLC's (hereinafter referred to as "FirstLight" or the "Applicant") safe management, operation, and maintenance of the Turners Falls Hydroelectric Project (Turners Falls Project or Project); operational history and programs to upgrade Project operation and maintenance; compliance with the current licenses; and actions related to the Project that affect the public.

1.1 Efficient and Reliable Electric Service

1.1.1 Increase in Capacity or Generation

The Project includes Cabot Station and Station No. 1. The six Cabot Station units underwent modifications in the early-to-mid 2000's. No capacity increase is anticipated for the Cabot Station units.

FirstLight is proposing changes to the Turners Falls Project; specifically changes to Station No. 1. Station No. 1 is currently an unstaffed facility. To bring units on, an operator must visit the site. In addition, the five (5) units cannot be throttled over a range of flows, meaning each unit only discharges its maximum capacity. FirstLight is proposing to pass a portion of its proposed bypass flows via Turners Falls Dam spill and Station No. 1 discharge. By automating Station No. 1, it will allow FirstLight to a) remotely operate the units and b) operate the units over a wider range of flows (not just the maximum capacity). FirstLight proposes the following:

- For each unit, upgrading the brakes, controls, governors, grounding transformer, protective relaying, excitation system and turbine rehabilitations.
- Automation including auto synchronizing equipment and sensors to interface to the programmable logic controller (PLC).

At this time, FirstLight is not proposing to install a minimum flow turbine-generator at the Turners Falls Dam to generate with proposed bypass flows. FirstLight conducted a feasibility study of adding a hydropower facility at the dam to generate with its proposed bypass flows. However, the cost of constructing the facility, coupled with the current low value of energy and capacity in New England, made such a facility economically infeasible. However, over the term of the next license, FirstLight will continually evaluate the economic feasibility of adding a minimum flow turbine-generator or any other potential energy source.

1.1.2 Coordination with any Upstream or Downstream Water Resource Projects

<u>Headwater Benefits- Connecticut River Mainstem Storage Reservoirs</u>

Inflows to the Turners Falls Impoundment (TFI) are largely controlled by operations at several upstream dams on the Connecticut River. More specifically, five upstream dams operate as seasonal storage reservoirs, where water elevations are typically lowered in the fall and winter and refilled with the spring freshet. The seasonal operation and re-regulation of discharges from these dams provide benefits to downstream hydropower facilities by curtailing high flows in the spring and increasing low flows in the summer. These dams and storage volumes, in upstream to downstream order, include the following:

- Second Connecticut Lake 506 million ft^3 (11.6 thousand ac-ft)
- First Connecticut Lake 3.33 billion ft^3 (76.4 thousand ac-ft)
- Lake Francis 4.33 billion ft^3 (99.3 thousand ac-ft)
- Moore Reservoir 4.97 billion ft^3 (114.1 thousand ac-ft)
- Comerford Reservoir 1.28 billion ft^3 (29.4 thousand ac-ft)

Pursuant to a 1993 Headwater Benefit Agreement among predecessor companies and Great River Hydro GRH) (formerly TransCanada), FirstLight pays an annual headwater benefit fee to GRH for the seasonal operation of its storage reservoirs (primarily driven by Moore Reservoir), which provide an incremental increase in generation at Cabot Station and Station No. 1. The Northfield Mountain Project does not receive (or pay for) any headwater benefit from these upstream projects.

Headwater Benefits- United States Army Corps of Engineer Storage Projects in Connecticut River Basin

In 1998, FERC issued its order on Headwater Benefits in the Connecticut River Basin. Because of the energy gains at the Project due to the seasonal operation of the United States Corps of Engineers' Union Village, North Hartland, North Springfield, Ball Mountain, Townsend, Otter Brook, Surry Mountain, Tully and Birch Hill headwater storage projects, FirstLight pays an annual headwater benefit fee.

Headwater Benefits- Mascoma River Basin Storage Reservoirs

Pursuant to a 1990 Agreement among predecessor companies and the New Hampshire Water Resources Council, FirstLight pays headwater benefits for the seasonal operation of storage reservoirs located in the Mascoma River Watershed, which provide an incremental increase in generation at the Project. The Mascoma River empties into the Connecticut River near Lebanon, NH.

Other

In addition to the seasonal storage reservoirs, the next three projects above Turners Falls Dam - namely Vernon, Bellows Falls, and Wilder[1]- currently operate to meet peak demand. The Vernon Project is the next dam upstream of the Turners Falls Dam. Like Turners Falls Dam, the current minimum flow required at Vernon Dam is equivalent to 0.2 cfs per square mile of drainage area or 1,250 cfs. The Vernon Project has a station hydraulic capacity of 17,130 cfs[2] and when operating at full capacity, it exceeds the full hydraulic capacity of the Project of 15,938 cfs (not accounting for incremental inflow from the 897 mi^2 of drainage between the two dams). The magnitude and timing of discharges from the Vernon Project are critical to the operation of the Turners Falls Project.

Article 304[3] of the Vernon Hydroelectric Project FERC license requires GRH to coordinate project operations with FirstLight. On May 28, 2003, GRH (then US Gen New England, Inc.) and FirstLight (then Northeast Generating Company) reached a hydro operating agreement relative to the coordinated operations between the Vernon Project and Turners Falls and Northfield Mountain Project. That agreement includes the following steps GRH must take relative to reporting the Vernon Project's generation schedule.

1. By 8:00 am each day, GRH is to fax FirstLight its estimate of the total discharge (cfs-hours) expected the next day at its Vernon Project.

[1] The Vernon Hydroelectric Project (FERC No. 1904), Bellows Hydroelectric Project (FERC No. 1855) and Wilder Hydroelectric Project (FERC No. 1892) are owned and operated by GRH.
[2] FERC Order Amending License and Revising Annual Charges, Project No. 1904-042, July 28, 2006.
[3] Article 304 of the Vernon Project license was added to the license in 1992 (59 FERC ¶62,267) and generally requires the Licensee to develop and file with the Commission a coordination agreement with the licensee of certain downstream facilities in the event that the regional central dispatch system was ever discontinued. The dispatching of these hydropower projects under that system was discontinued several years ago in connection with the restructuring of the New England power markets.

2. When GRH receives the hourly dispatch schedule for the next day from the Independent System Operator-New England (ISO-NE), GRH will fax its Vernon Project schedule to FirstLight. GRH generally receives the ISO-NE report between 12:00 pm and 2:00 pm.
3. If any subsequent dispatch schedules are received during the day showing changes in the project hourly flow schedules, the updated schedule for the Vernon Project will be sent by fax to Northfield.

The agreement also calls for GRH to transmit to FirstLight the instantaneous total discharge and tailwater elevation at the Vernon Project. The current agreement is problematic for FirstLight as it receives inaccurate next day total Vernon Project discharge volumes, and multiple, or sometimes no, real-time updates of the Vernon Project discharges. In Exhibit E of the license application, FirstLight describes what additional information it needs to better manage the Turners Falls and Northfield Mountain Projects under its proposed operating conditions.

In summary, there is no current requirement for GRH to provide an hourly dispatch schedule the day ahead. If any subsequent dispatch schedules are received during the operating day showing changes in the projected hourly release schedules, the revised schedule for the Vernon Project is faxed or emailed to FirstLight. Not having reliable and timely estimates of the Vernon Project's hourly release schedule the day ahead prevents FirstLight from the most efficient management of the TFI for power production, elevation management, and adherence to Cabot Station operating limitations being proposed in this AFLA.

1.1.3 Coordination of Operations with Electrical Systems

FirstLight coordinates operation of the Project with other electrical systems through its participation in the markets operated by ISO-NE.

1.2 Need for Project Electricity

1.2.1 Cost and Availability of Alternative Sources of Power

FirstLight is not a utility with retail load obligations. If power from the Project were not available for sale into the markets operated by ISO-NE, the services the Project provides to the grid, including meeting peak energy demands, capacity, and ancillary services, all of which are needed to serve wholesale electric consumers, would need to be provided from other existing generation sources or from new generation sources available to the system operator. Since ISO-NE dispatches New England's electric system to minimize production costs, energy to replace the Project's output would come from more expensive generation sources. And, as the Commonwealth's largest carbon free energy generator, the Project helps Massachusetts meet its legislative goals defined in the 2008 Global Warming Solutions Act (GWSA).

Alternate sources of power are likely to come from fossil fuel generation.

1.2.2 Increase in Costs if FirstLight is not Granted a License

Costs to the market of replacing services that the Project provides would include higher cost energy to replace the Project output in the ISO-NE dispatch to meet operating reserve requirements and system ramp needs. Beyond its generation contributions, the Project also provides a source of reactive power to maintain and control system voltage and rotating inertia to provide primary frequency response. Because of the complexity of the New England power system and the confidentiality of costs of alternative resources, quantification of the costs associated with not relicensing the Project is not possible.

1.2.3 Effects of Alternative Sources of Power

Effects on Customers

The primary purpose of the Project is to supply energy, capacity and ancillary services to the ISO-NE, a regional transmission organization that coordinates the movement of wholesale electricity in Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island. Since ISO-NE dispatches the New England electric system to minimize total production costs, it uses lowest cost supply first. Therefore, without the supply provided by Cabot Station and Station No. 1 the costs to New England's electric consumers would increase although the exact amount of the increase is not easily determined.

Effects on the Applicant's Operating and Load Characteristics

The Project provides ISO-NE with the ability to bring units to the electric grid quickly in support of a grid disturbance such as a loss of a major unit or other change of supply occurrence. Unlike many other forms of carbon free generation which are available only when the wind is blowing and the sun is shining, the Project can provide carbon free generation when ISO-NE needs to respond to an unplanned breakdown of another generation resource. Without the ability to call on Cabot Station and Station No. 1 to increase hydroelectric output on short notice, ISO-NE could need to start quick start combustion turbines, burning either natural gas or oil, to replace other generation sources or to maintain reliability when customer demand rises quickly. Additionally, as more solar resources are added to New England's generation mix, ISO-NE will need to use fast ramping resources, like Cabot Station and Station No. 1, to serve load as the sun begins to set each day and solar generation diminishes rapidly.

Effects on Communities Served

If FirstLight were not to receive a new license and the Project was taken over by the Federal Government or decommissioned, there would be a significant loss of tax revenues. In 2019, the Project contributed approximately $4,527,000 in local property tax and $100,000 in state tax. The governmental entities affected by this loss in revenue would ultimately have to seek a reduction in expenses or an increase in other sources of revenue. Also, according to the state's Executive Office of Labor and Workforce Development, FirstLight is one of the top employers in Franklin County. In 2019, of the $4,527,000 paid in local property tax, the majority was paid to the towns of Montague ($4,207,000) and Gill ($300,000). In 2019, FirstLight paid approximately 23% and 11% of the entire tax revenue in Montague and Gill, respectively.

Additionally, loss of the license may result in a less reliable and efficient energy grid with the absence of the Project. Also, it is likely that many of the Project's recreation facilities would no longer be available to the public.

1.3 Need for Project Power, Reasonable Cost and Availability of Alternative Sources of Power

1.3.1 Average Annual Cost of Power

The average annual cost of the power produced by the Project includes capital cost, operating cost, O&M cost associated with Project relicensing, including proposed Protection Mitigation and Enhancement (PM&E) measures. As described in Exhibit D, FirstLight has performed an analysis of the costs of producing Project power.

1.3.2 Projected Resources Required to Meet Capacity and Energy Requirements

The Project provides ISO-NE with energy to meet peak demand, capacity, and ancillary services.

1.3.3 Resource Analysis and System Reserve Margins

The Project is operated to meet peak energy demands and thus is well-suited to meet energy demands as typical operation dictates that it produces power during periods of high demand or periods of high energy ramping needs.

1.3.4 Load Management Measures

Load management is conducted by the ISO-NE, wherein the energy needs on a short-term basis are coordinated.

1.4 Use of Power for Applicant-Owned Industrial Facility

FirstLight does not directly use power generated by the Project to operate its own industrial facilities.

1.5 Need for Power if Applicant is an Indian Tribe

FirstLight is not an Indian tribe applying for a project on a tribal reservation; therefore, this section is not applicable.

1.6 Effect of Operations and Planning of the Applicant's Transmission System of Receiving or not Receiving the License

1.6.1 Effects of Power Flow Redistribution

FirstLight does not own or operate a transmission system. However, if FirstLight were not to receive a new license for the Project, ISO-NE would lose a resource that is valuable to its system.

1.6.2 Advantages of the Applicant's Transmission System

FirstLight does not own or operate a transmission system.

1.6.3 Project Single-Line Diagram

Single-line diagrams for Station No. 1 and Cabot Station which comprise the Turners Falls Project are shown in Figure 1.6.3-1 and 1.6.3-2, respectively. However, the figures are included in a separate Exhibit H because they contain Critical Energy Infrastructure Information (CEII).

1.7 Plans to Modify Existing Project Facilities

FirstLight is proposing to a) construct infrastructure necessary to pass FirstLight's proposed bypass flows in the winter, b) upgrade Station No. 1, c) construct new fish passage facilities and d) construct new recreation facilities as described below.

1.7.1 Infrastructure Needed to Pass Winter Bypass Flows

FirstLight proposes to provide a bypass flow of 300 cfs, or inflow, whichever is less, as measured just below the Turners Falls Dam, from December 1 to March 31. There are two water conveyance structures at the Turners Falls Dam, including bascule gates and tainter gates. The tainter gates are designed to discharge flows greater than approximately 5,000 cfs. Of the four bascule gates, bascule gate no. 1 is pond following, meaning the crest of the bascule gate can be adjusted to pass a desired flow at a given TFI water level. FirstLight proposes to use this bascule gate to pass the winter flow; however, some modification to the gate is needed. Specifically, FirstLight proposes to add heaters to the gate to prevent ice build-up.

1.7.2 Station No. 1 Upgrades

FirstLight is proposing changes to the Turners Falls Project, specifically, changes to Station No. 1. Station No. 1 is currently an unstaffed facility. To bring units on, an operator must visit the site. In addition, the five (5) units cannot be throttled over a range of flows, meaning each unit only discharges its maximum capacity. FirstLight is proposing to pass a portion of its proposed bypass flows via Turners Falls Dam spill and Station No. 1 discharge. By automating Station No. 1, it will allow FirstLight to a) remotely operate the units and b) operate the units over a wider range of flows (not just the maximum capacity). FirstLight proposes the following:

- For each unit, upgrading the brakes, controls, governors, grounding transformer, protective relaying, excitation system and turbine rehabilitations.
- Automation including auto synchronizing equipment and sensors to interface to the programmable logic controller (PLC).

1.7.3 Proposed Upstream and Downstream Fish Passage Facilities

FirstLight proposes to construct various upstream and downstream fish passage facilities as summarized in. Table 1.7.3-1.

Table 1.7.3-1 FirstLight's Proposed PM&E Measures for Upstream and Downstream Fish Passage at the Turners Falls Project

Upstream or Downstream Passage	Proposed PME Measure
Upstream Passage	Install Permanent Ultrasound Array in the Cabot Tailrace to deflect American Shad to the Bypass Reach
	Construct a new Spillway Lift with Palisade Entrance at the Turners Falls Dam
	Construct an Eelway near the Turners Falls Dam
	Retire Cabot Fish Ladder
	Retire Entrance Portions of gatehouse ladder in canal
Downstream Passage	Construct a Plunge Pool below Bascule Gate No. 1 located at the Turners Falls Dam.
	Construct a Bar Rack at the entrance to the Station No. 1 Forebay.

Permanent Ultrasound Array. FirstLight proposes to install a permanent ultrasound array at the outer edge of the Cabot Station tailrace to deter upstream migrating adult American Shad from entering the tailrace area, but instead move them up the bypass reach to a new fish lift at the Turners Falls Dam (the Spillway Lift). FirstLight will install the permanent ultrasound array after the Spillway Lift is constructed. Once the ultrasound array is functioning FirstLight proposes to close the Cabot fish ladder to prevent American Shad from entering the power canal, where they may experience long delays or are never able to reach the TFI.

Construct new Spillway Lift and Plunge Pool. FirstLight proposes to construct a new Spillway Lift (with palisade entrance) and plunge pool below bascule gate no. 1 of the Turners Falls Dam. The Spillway Lift will include a single hopper that will lift fish approximately 39 feet to an exit trough that connects into the top of the existing Spillway Fish Ladder for fish to exit into the headpond through the existing gatehouse fish ladder. The lift will also utilize the existing entrance structure of the Spillway Fish Ladder for the entrance to the lift. A V-trap and brail system will be used instead of a crowder channel to capture fish in the hopper.

The plunge pool will include two concrete walls to create an approximately 110-foot-wide by 65-foot-long box below bascule gate no. 1 – one wall parallel to flow between bascule gate no. 1 and bascule gate no. 2,

and one wall perpendicular to the flow from the end of the first wall to the fish lift entrance. Flow will pass from the pool either through a palisade structure adjacent to the fish lift entrance or by spilling over the downstream wall of the box. The flow from the palisade structure will also be used for attraction flow to the Spillway Lift.

Since the Spillway Lift and plunge pool are in the same location these two projects would be constructed simultaneously.

Construct Eelway. Once all upstream and downstream fish passage structures at the Turners Falls Project are complete, FirstLight proposes to install an eelway near the Turners Falls Dam. Based on siting surveys and two temporary eelramp installations, over 90% of the elvers move upstream at the Spillway Ladder. FirstLight proposes to install an eelway at this location. The eelway will include a single tray lined with substrate for the eels to ascend on, piping providing flow through the substrate and attraction flow, and a collection tank at the tray exit.

Construct a Bar Rack at Entrance to Station No. 1 Forebay. FirstLight proposes to install a bar rack, with ¾-inch clear spacing, at the location where flow from the main power canal is diverted into the Station No. 1 forebay. The rack will be approximately 58 feet wide across the entrance of the forebay and 21 feet tall. Approximately 4 feet of rock would be excavated from the bottom of the canal to provide sufficient area to prevent impingement. A new concrete base will be constructed below the rack for a foundation and to support diagonal bracing behind the rack. A new trash rake and conveyor for trash removal will also be installed for regular cleaning of debris from the rack.

Conceptual level drawings of the above structures, with the exception of the eelway and ultrasound array, are included in the Turners Falls Project Exhibit F (Spillway Lift, Plunge Pool, Station No. 1 Rack).

Retire Cabot Fish Ladder. Once the Spillway Fish Lift is functioning to pass fish and the ultrasound array is operational, FirstLight proposes to retire the Cabot Fish Ladder because all fish passage would be moved to the Spillway Lift. FirstLight does not believe continuing to introduce fish into the power canal where they encounter extensive delays or never reach the TFI is productive.

Retire Entrance Portion of Gatehouse Fish Ladder. The portion of the gatehouse ladder that includes the entrances on the right and left side of the canal walls will not be needed; however, the ladder will be used to move fish from the Spillway Lift into the TFI.

1.7.4 Proposed Recreation Features

FirstLight proposes new recreation features as described below.

Formal Access Trail and Put-In just below Turners Falls Dam. Stakeholders have requested a put-in just below the Turners Falls Dam to kayak/canoe/raft the bypass reach. There is an existing informal pathway leading to the base of the Turners Falls Dam just downstream of the existing Spillway Ladder. The proposed access would be provided via the existing bridge (aka the "IP Bridge") spanning the power canal. Once over the canal, a formal 12-ft wide path would lead recreationists to the base of the dam. The path would include a sign (Project name and FERC No.) just after exiting the IP bridge, and directional signs along the formalized path.

FirstLight also proposes to establish a weblink that would report the forecasted Turners Falls Dam discharge each day during the daylight hours from July 1 to October 15 to benefit whitewater boaters. FirstLight is not proposing to post the Turners Falls Dam discharge from April 1 to June 30 because it is a period when

the federally endangered SNS could be utilizing the bypass reach for spawning and incubation which could be disturbed by whitewater boaters.

Formal Access Trail and Stairs for Take-out at Poplar Street. There is an existing take-out at Poplar Street; however, it is extremely steep. FirstLight has limited options due to steep topography and land ownership. FirstLight proposes to use the existing gravel parking lot leading to 20-foot wide timber stairs with a boat slide railing leading to a 5-foot long, 20-foot wide concrete landing/abutment. A 32-foot long gangway would be anchored to the concrete abutment and lead to a floating dock in the Connecticut River to accommodate fluctuations in the river elevation. The site would include a sign (Project name and FERC No.) at the top of the timber stairs.

Conceptual level drawings of the proposed recreation features are included in the Recreation Management Plans developed for the Turners Falls Project.

1.8 Conformance with a Comprehensive Plan for the Waterway

The Project will be operated under the terms and conditions of a license issued by the Commission, which will be based on the Commission's determination of the license terms and conditions that are best suited to comprehensive development of the waterway. The cumulative environmental impacts of the Project in the context of the Connecticut River Basin are addressed in Exhibit E.

1.9 Financial and Personnel Resources

1.9.1 Financial Resources

FirstLight and its parent company, FirstLight Power Inc., which is a Delaware corporation, have the financial resources to operate the Project during the term of the new license.

1.9.2 Personnel Resources

FirstLight employs approximately 12 full-time employees to operate and maintain the Project with support from personnel at the Northfield Mountain Project. On-site staff are fully qualified to handle all aspects of the operation and maintenance of the Project. The Project is fully equipped to allow staff to perform virtually all routine maintenance functions. All personnel receive training commensurate with their responsibilities in an ongoing effort to improve their ability to operate the Project in the safest and most efficient manner possible.

In addition to FirstLight employees, FirstLight also contracts with local outside entities to provide maintenance support for the Project.

1.10 Project Expansion Notification

FirstLight currently has no plans to expand the Project to encompass additional lands; therefore, notification is not applicable.

1.11 Electricity Consumption Efficiency Improvement Program

1.11.1 Customer Energy Efficiency Program

Not applicable. FirstLight does not have load asset customers except wholesale entities.

1.11.2 Compliance of Energy Conservation Programs with Regulatory Requirements

Not applicable.

1.12 Indian Tribe Names and Mailing Address

There are no federally recognized Indian Tribes with lands occupied by the Project, or which would otherwise be affected by the relicensing. Nevertheless, FirstLight has included the following tribes in the distribution of this license application:

Federally recognized tribes in Massachusetts include:

Wampanoag Tribe of Gay Head (Aquinnah)
Lee Ander Wander
Chief of Staff
20 Black Brook Road
Aquinnah, MA 02535-1546
cos@wampanoagtribe.net

Mashpee Wampanoag Tribe
483 Great Neck Road
South Mashpee, MA 02649
trish.keliinui@mwtribe-nsn.gov

There are no federally recognized tribes in New Hampshire or Vermont.

There are no state recognized tribes in New Hampshire. There is one state recognized tribe in Massachusetts and four in Vermont as shown below. Other tribes that may potentially be interested in the relicensing are listed below:

Massachusetts Recognized Tribes

Nipmuc Nation
25 Main Street
South Grafton, MA 01560
info@nipmucnation.org

Vermont Recognized Tribes

Elnu Abenaki Tribe
Chief Roger Longtoe Sheehan
Tribal Headquarters
5243 VT Route 30
Jamaica, VT 05343
gitceedadann@yahoo.com

Nulhegan Abenaki Tribe
Chief Don Stevens
156 Bacon Drive
Shelburne, VT 05482
chiefdonstevens@comcast.net

Koasek of the Koas of the Abenaki Nation
Chief Shirly Hook
188 Allen Bent Road
W. Braintree
Roxbury, VT 05669
shirly480@gmail.com

Missisquoi Abenaki Tribe
Chief Richard Menard
P.O. Box 133
Swanton, VT 05488
Richard.menard@abenakination.com

Other Potentially Interested Tribes

Abenaki Nation New Hampshire
262 Lancaster Road
Whitefield, NH 03598
Kcicasco@aol.com

Ms. Bonney Hartley
Stockbridge-Munsee Community
400 Broadway #718
Troy, NY 12181
bonney.hartley@mohican-nsn.gov

Narragansett Indian Tribe
Chief Sachem: Anthony Dean Stanton
Narragansett Indian Longhouse
4425-A South County Trail
Charlestown, RI 02813
adstanton@nitribe.org

Nolumbeka Project
91 Main Street
P.O. Box 285
Greenfield, MA 01302
nolumbekaproject@gmail.com

Koasek Traditional Band
P.O. Box 147
Post Mills, VT 05058
n.pero@aol.com

2 INFORMATION TO BE SUPPLIED BY APPLICANTS THAT ARE EXISTING LICENSEES

2.1 Measures Planned to Ensure Safe Management, Operation and Maintenance of the Project

2.1.1 Existing and Planned Operation of the Project during Flooding

This information is detailed in Exhibit B of this Amended Final License Application.

2.1.2 Downstream Warning Devices

FirstLight is in compliance with all Emergency Action Plan (EAP) requirements and has systems in place to notify emergency response teams and homeowners downstream in the unlikely event of a dam breach scenario. The Project is monitored from the Northfield Control Room, which is staffed with full-time operators 24 hours/day 365 days/year.

2.1.3 Operational Changes that Might Affect the Emergency Action Plan

No operational changes are proposed that might affect the existing EAP at the Project. The Project's EAP is reviewed and tested annually and updated as required. There are no known or planned changes to Project operations that would affect the EAP.

2.1.4 Existing and Planned Monitoring Devices

The Project has Surveillance and Monitoring Plans (SMP) filed with FERC. The purpose of the SMP is to describe the existing SMP Program for the Project, relate the instrumentation and monitoring to the Potential Failure Mode Analysis (and any identified Potential Failure Modes), and relate the instrumentation and monitoring to design assumptions for the project structures. A separate Dam Safety Surveillance and Monitoring Report (DSSMR) is prepared annually to present data and interpretation for observations and measurements recorded to date and recommend improvements or changes to the program as appropriate. Since the Project is subject to 5-year inspections under Part 12D of the FERC regulations, updates to the SMP will be prepared and submitted as needed to the FERC. The SMP is reviewed with the FERC engineer during the annual operation inspection of the Project and reviewed by the Independent Consultant during the 5-year inspection.

2.1.5 Employee Safety and Public Safety Record

FirstLight manages the Project consistent with its long-standing commitment to employee safety. This commitment begins with compliance with applicable local, state, and Federal regulations regarding the safe operation of industrial and electrical facilities. As FirstLight operates the Project's generation facilities, this commitment is implemented primarily through a rigorous safety program adopted by FirstLight. Detailed inspection and maintenance programs ensure employee safety relative to operating equipment and facilities. The safety program involves employee training sessions, as well as making safety information available to employees. For the period 2015-2019, there were no lost time incidents at the Project involving FirstLight employees.

FirstLight places a high priority on public safety. It maintains public safety measures (lighting, signage, markers, audible warnings, fencing, etc.) consistent with plans filed with the FERC's New York Regional Office (NYRO). In accordance with 18 CFR 12.10, FirstLight files public safety incident reports with the NYRO.

2.2 Current Operations

Operation of the Project is described in Exhibit B of this Amended Final License Application.

2.3 Project History

A complete Project history is described in Exhibit C of this Amended Final License Application.

2.4 Generation Losses over Previous Five Years

There have been a few unscheduled outages at the Project during the five-year period of time from 2015-2019 (Table 2.4-1). The table includes outages lasting 24 hours or more at Cabot Station and Station No. 1.

2.5 Compliance with Terms and Conditions of Existing License

FirstLight has never been found to be in non-compliance with the terms and conditions of the current license. Over the term of the current license, the Project has been subject to FERC's standard operational and environmental inspections. Any compliance-related issues noted either during the inspections or through self-reports of deviations have been promptly addressed by FirstLight.

2.6 Action Affecting the Public

As a major presence in the region, FirstLight plays a prominent role in ensuring the efficient, productive use of water for hydroelectric generation and recreation. The Project also provides electricity that contributes to the stability of the regional power system. This alone significantly affects the general public by providing a low-cost and renewable energy source to FirstLight's wholesale customers and contributing to the regional emissions reduction, and the balance of regional power supply and demand.

In addition to operating the Project for hydroelectric generation, FirstLight also manages the Project to provide additional benefits to the local community, natural resources, environmental education, recreation and the region at large.

Visitors frequent the Project year-round to enjoy the many recreational opportunities available, including boating, fishing, hiking, hunting, and camping. The Project also supports other day-use and overnight-use activities such as wildlife viewing and picnicking. In addition to the benefits that FirstLight provides to the area's natural resources and the recreating public, the Project contributes to the public benefit through the employment of fulltime and seasonal staff.

2.7 Ownership and Operating Expense Reductions if the Project License was Transferred

If the Project license were transferred to another entity, FirstLight's cost of operating and maintaining the Project (see Exhibit D) would be eliminated.

2.8 Annual Fees for Federal or Indian Lands

FirstLight does not pay annual charges for Federal or Indian tribal reservation lands.

Table 2.4-1: Unscheduled Outages lasting more than 24 hours at the Turners Falls Project 2015-2019

Cabot Station

Start Date	Duration (hrs)	Unit	Description
4/16/2015	24.2	Cabot Unit 5	Ground in Pole
5/25/2016	513.18	Cabot Unit 1	Brush Rigging Support Failure
10/2/2016	53.07	Cabot Unit 6	Multi-function Protective Relay Failure
2/13/2017	76.67	Cabot Unit 5	Failed Generator Pole
10/15/2017	29.85	Cabot Unit 1	Switchyard Transmission Issue
9/26/2018	25.23	Cabot Unit 3	Exciter Breaker Repairs
9/26/2018	25.98	Cabot Unit 5	Exciter Breaker Repairs
8/20/2019	25.17	Cabot Unit 3	Governor Oil System Oil Leak Repairs

Station No. 1

Outage Start	Duration (hrs)	Unit	Description
2/15/2016	50.6	TF Unit 1	Forebay Ice Preventing Generation
2/15/2016	50.63	TF Unit 2	Forebay Ice Preventing Generation
2/15/2016	50.55	TF Unit 3	Forebay Ice Preventing Generation
2/15/2016	47.78	TF Unit 5	Forebay Ice Preventing Generation
2/15/2016	47.63	TF Unit 7	Forebay Ice Preventing Generation
11/4/2018	63.53	TF Unit 1	Loss of Excitation Relay Failure
11/7/2018	1347.82	TF Unit 2	Loss of Excitation Relay Scavenged for Unit 1
4/16/2019	2206.92	TF Unit 2	Barrel Assembly Guide Mechanism Replacement
7/19/2019	329.75	TF Unit 1	Damaged Headgate Gearbox
7/22/2019	47.03	TF Unit 2	Insulator Replacement in Switchyard
7/22/2019	47.03	TF Unit 3	Insulator Replacement in Switchyard
7/22/2019	47.03	TF Unit 5	Insulator Replacement in Switchyard
8/2/2019	2897.5	TF Unit 7	Headgate Gearbox Scavenged for Unit 1

Figure 1.6.3-1: Station No. 1 Single Line Electrical Diagram

This figure constitutes Critical Energy Infrastructure Information (CEII) in accordance with 18 C.F.R. § 388.113(c) and has been removed from the public version of this PAD.

The material is contained in Exhibit H Single Line Diagram (CEII), the non-public version filed with the Commission.

Procedures for obtaining access to CEII may be found at 18 CFR § 388.11.

Figure 1.6.3-2: Cabot Station Single Line Electrical Diagram

This figure constitutes Critical Energy Infrastructure Information (CEII) in accordance with 18 C.F.R. § 388.113(c) and has been removed from the public version of this PAD.

The material is contained in Exhibit H Single Line Diagram (CEII), the non-public version filed with the Commission.

Procedures for obtaining access to CEII may be found at 18 CFR § 388.11.