

Revised Draft Biological Assessment
for the
Federal Relicensing of the
Northfield Mountain Pumped Storage Project (No. 2485)
and the
Turners Falls Hydroelectric Project (No. 1889)

Prepared for:



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Submitted to:



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LIST OF ABBREVIATIONS

AFLA	Amended Final License Application
AMC	Appalachian Mountain Club
AW	American Whitewater
BA	Biological Assessment
BO	Biological Opinion
°C	degree Celsius
CAW	Crab Apple Whitewater, Inc.
CFR	Code of Federal Regulations
cfs	cubic feet per second
CSO	combined sewer overflows
CT	Connecticut
CTDEEP	Connecticut Department of Energy and Environmental Protection
DO	dissolved oxygen
Draft BA	Draft Biological Assessment
ESA	Endangered Species Act
FERC or Commission	Federal Energy Regulatory Commission
F/F Agreement	Flows and Fish Passage Settlement Agreement
FirstLight	FirstLight Hydro MA LLC and Northfield Mountain LLC
FLA	Final License Application
ft	feet
FRCOG	Franklin Regional Council of Governments
hr	hour
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HEC-ResSim	Hydrologic Engineering Center's Reservoir System Simulation
HG&E	Holyoke Gas and Electric
ILP	Integrated Licensing Process
IPaC	USFWS Information for Planning and Consultation tool
ISO-NE	ISO-New England
kW	kilowatt
MA	Massachusetts
MDCR	Massachusetts Department of Conservation and Recreation
MDEP	Massachusetts Department of Environmental Protection
MDFW	Massachusetts Division of Fisheries and Wildlife
NHESP	Massachusetts Natural Heritage and Endangered Species Program
MW	megawatt
NE FLOW	New England FLOW
NMFS	National Marine Fisheries Service
NGVD29	National Geodetic Vertical Datum of 1929
Northfield Mountain Project	Northfield Mountain Pumped Storage Project (FERC No. 2485)
NPS	National Park Service
NRF	Naturally Routed Flow
PAD	Pre-Application Document

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PCB	polychlorinated biphenyls
PM&E	Protection, Mitigation, and Enhancement
PSP	Proposed Study Plan
Project(s)	Collectively the Turners Falls Hydroelectric Project (FERC No. 1889) and the Northfield Mountain Pumped Storage Project (FERC No. 2485)
Recreation Agreement	Recreation Settlement Agreement
ROR	Run of River
RTK-GPS	Real-Time Kinematic Global Positioning System
SD1	Scoping Document 1
SD2	Scoping Document 2
SPDL	Study Plan Determination Letter
TFI	Turners Falls Impoundment
TNC	The Nature Conservancy
Turners Falls Project	Turners Falls Hydroelectric Project (FERC No. 1889)
USACE	United States Army Corps of Engineers
USFWS	United States Fish Wildlife Service
USGS	United States Geological Survey
VY	Vermont Yankee
WQC	Water Quality Certification
WSE	Water Surface Elevation
ZO	Zoar Outdoor

EXECUTIVE SUMMARY

FirstLight MA Hydro LLC is the owner of the Turners Falls Hydroelectric Project (Turners Falls Project, FERC No. 1889). Northfield Mountain LLC is the owner of the Northfield Mountain Pumped Storage Project (Northfield Mountain Project, FERC No. 2485). Collectively referred to as FirstLight, the owners are seeking to relicense the hydroelectric projects with the Federal Energy Regulatory Commission (FERC). The Turners Falls Project and Northfield Mountain Project are collectively referred to as the Project(s). As part of relicensing, FirstLight filed Amended Final License Applications (AFLA) in December 2020, which included proposals for continued operation of the Projects. FirstLight also included Draft Biological Assessment with the AFLA. Since the AFLA filings, settlement discussions occurred resulting in a Flows and Fish Passage Settlement Agreement (F/F Agreement) that was filed with FERC on March 31, 2023.¹ The F/F Agreement resolved issues pertaining to Project operations (minimum flows, ramping rates, stabilized flows, recreational boating flows, water levels, etc.) and fish passage. The F/F Agreement was signed by FirstLight, United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW), The Nature Conservancy (TNC), American Whitewater (AW), Appalachian Mountain Club (AMC), New England Flow (NE FLOW), Crab Apple Whitewater, Inc. (CAW), and Zoar Outdoor (ZO). The F/F Agreement included draft license articles for FERC's consideration.

Also, since filing the AFLA, a Recreation Settlement Agreement (Recreation Agreement) was filed with FERC on June 12, 2023.² The Recreation Agreement resolved issues pertaining to recreation, including establishing conservation easements, creating new public access sites to the Connecticut River, campsites, parks, portages, trails and other measures. The Recreation Agreement was signed by FirstLight, National Park Service (NPS), Massachusetts Department of Conservation and Recreation (MDCR), Franklin Regional Council of Governments (FRCOG), the Towns of Erving, Gill, Montague and Northfield Massachusetts, Access Fund, AW, AMC, CAW, NE FLOW, Western Massachusetts Climbing Coalition and ZO. The Recreation Agreement included draft license articles and a Recreation Management Plan for FERC's consideration.

This Draft Biological Assessment (BA) was prepared by FirstLight to support FERC's submission of a request for Endangered Species Act (ESA) Section 7 consultation with the USFWS to consider the effect of two proposed actions: the relicensing of the Turners Falls Project and the relicensing of the Northfield Mountain Project. Since F/F and Recreation Agreements were reached on both Projects, the effects of the measures included in these agreements are evaluated in this draft BA.

Six federally-listed species that could be present in the Project-affected areas were initially identified for inclusion in this Draft BA, including Puritan Tiger Beetle (*Ellipsoptera puritana*), Shortnose Sturgeon (*Acipenser brevirostrum*), Dwarf Wedgemussel (*Alasmidonta heterodon*), Northeastern Bulrush (*Scirpus ancistrochaetus*), Small Whorled Pogonia (*Isotria medeoloides*), and Northern Long-Eared Bat (*Myotis septentrionalis*). Of these species, only the Puritan Tiger Beetle was included for detailed analysis in this Draft BA. The effects on Shortnose Sturgeon were included in a separate Draft BA to be submitted to the NMFS and the other species would not be affected by the Project's proposals. Information available for the other species indicated a lack of presence in the Action Area or a preliminary determination that the Proposed Action would not be likely to adversely affect those species.

The only known remaining population of Puritan Tiger Beetle in Massachusetts resides at Rainbow Beach near Northampton, which is 33 miles below the Northfield Mountain Project tailrace and 25 miles below the Cabot Station tailrace, which is the primary hydropower discharge for the Turners Falls Project. Other populations of Puritan Tiger Beetle reside further downstream in the tidal portions of the river in Connecticut, and at beaches/bluffs along the shoreline of the Chesapeake Bay in Maryland. The population

¹ FERC Accession No. 20230331-5600.

² FERC Accession No. 20230612-5219.

at Rainbow Beach has been subjected to several threats, including the historical construction of dams and associated changes in hydrology, recreational use of the beach, land use practices nearby and along the Connecticut River corridor, encroachment of native and non-native vegetation, and interactions with other species, including other species of tiger beetle.

FirstLight has gathered the best available scientific data and has analyzed the effects of water levels on habitat for long-term (i.e. annual and multi-year cohort) and short-term (i.e. seasonal, daily, and hourly) timescales. To perform the analysis, FirstLight characterized the frequency, timing, and magnitude of inundation at Rainbow Beach, along with changes in water level, as relevant to the habitat utilized by various life stages and activities of the Puritan Tiger Beetle. The analysis was robust, with 28 years of hourly flow data routed to Rainbow Beach through a HEC-RAS hydraulic model.

Based on the presented analyses, FirstLight concludes that the operations proposed for the new licenses may affect Puritan Tiger Beetles because operational flows affect water levels at Rainbow Beach. However, proposed operations are not likely to adversely affect or jeopardize the continued existence of the Puritan Tiger Beetle. In general, the exposure of any life stage or activity of Puritan Tiger Beetle to Project flow regimes under the baseline condition has been very limited. This is due primarily to the linear distance between the Turners Falls Project and Rainbow Beach, which results in considerable flow and water level attenuation, and the effects have been limited to low-elevation areas along the beach where a small percentage of documented larvae have been recorded. The proposed restrictions to flow changes at the Project primarily result in limited daily water level changes at Rainbow Beach, which would reduce the potential for Puritan Tiger Beetle to be affected by Project-induced water level changes over the term of the next license.

1 INTRODUCTION

1.1 Background

FirstLight MA Hydro LLC owns and operates the Turners Falls Hydroelectric Project (Turners Falls Project, FERC No. 1889) located on the Connecticut River near Montague, MA. Northfield Mountain LLC owns and operates the Northfield Mountain Pumped Storage Project (Northfield Mountain Project, FERC No. 2485) located in Northfield, MA. The Turners Falls Project and Northfield Mountain Project are collectively referred to as the Project(s). The Northfield Mountain Project uses water from the Turners Falls Impoundment (TFI), which is created by the Turners Falls Dam, as part of its pumped-storage operations. Hereinafter the two owners are collectively referred to as FirstLight.

FirstLight, in accordance with Sections (§§) 5.17 and 5.18 of Title 18 of the Code of Federal Regulations (CFR), filed with the Federal Energy Regulatory Commission (FERC, the Commission) separate license applications for the two Projects, although a combined Exhibit E – Environmental Analysis was developed. The current license for the Turners Falls Project was issued on May 5, 1980, and expired on April 30, 2018. The license for the Northfield Mountain Project was issued on May 14, 1968, and expired on April 30, 2018. Both Projects currently operate under annual licenses. FirstLight filed Amended Final License Applications (AFLAs) on each Project with FERC on December 6, 2020, which included a Draft Biological Assessment (BA) on Puritan Tiger Beetle. Since the AFLA filings, settlement discussions occurred resulting in a Flows and Fish Passage Settlement Agreement (F/F Agreement) that was filed with FERC on March 31, 2023 ([Appendix A](#)).³ The F/F Agreement resolved issues pertaining to Project operations (minimum flows, ramping rates, stabilized flows, recreational boating flows, water levels, etc.) and fish passage. The F/F Agreement was signed by FirstLight, United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW), The Nature Conservancy (TNC), American Whitewater (AW), Appalachian Mountain Club (AMC), New England Flow (NE FLOW), Crab Apple Whitewater, Inc. (CAW), and Zoar Outdoor (ZO). The F/F Agreement included draft license articles for FERC’s consideration.

Also, since filing the AFLA, a Recreation Settlement Agreement (Recreation Agreement) was filed with FERC on June 12, 2023 ([Appendix B](#)).⁴ The Recreation Agreement resolved issues pertaining to recreation, including establishing conservation easements, creating new public access sites to the Connecticut River, campsites, parks, portages, trails and other measures. The Recreation Agreement was signed by FirstLight, National Park Service (NPS), Massachusetts Department of Conservation and Recreation (MDCR), Franklin Regional Council of Governments (FRCOG), the Towns of Erving, Gill, Montague and Northfield Massachusetts, Access Fund, AW, AMC, CAW, NE FLOW, Western Massachusetts Climbing Coalition and ZO. The Recreation Agreement included draft license articles and a Recreation Management Plan for FERC’s consideration.

1.2 Federally Listed Species Considered in this Biological Assessment

This Draft BA addresses the effects associated with the relicensing of the Projects on federally listed endangered and threatened species within the jurisdiction of the USFWS. During relicensing proceedings and resource agency consultation for the Projects, along with recent (September 13, 2023) evaluations using USFWS’s Information for Planning and Consultation (IPaC) tool, six federally-listed species and one candidate species that could be present in the Project-affected areas were identified, including:

- Puritan Tiger Beetle (*Ellipsoptera puritana*) – Threatened
- Shortnose Sturgeon (*Acipenser brevirostrum*) – Endangered

³ FERC Accession No. 20230331-5600.

⁴ FERC Accession No. 20230612-5219.

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- Dwarf Wedgemussel (*Alasmidonta heterodon*) – Endangered
- Northeastern Bulrush (*Scirpus ancistrochaetus*) – Endangered
- Small Whorled Pogonia (*Isotria medeoloides*) – Threatened
- Northern Long-Eared Bat (*Myotis septentrionalis*) – Endangered
- Monarch Butterfly (*Danaus plexippus*) - Candidate

FirstLight has conducted several studies to gather information necessary to understand the locations and extent of protected resources, along with potential effects of Project operations, land management practices, and recreational use on protected resources. The species above were considered for inclusion in this Draft BA as follows.

Puritan Tiger Beetle

The Puritan Tiger Beetle was listed as a threatened species by the USFWS in 1990 due to its limited distribution, coupled with threats from habitat loss and degradation, along with its vulnerability to natural and human threats ([USFWS 1993a](#)). It is a predatory invertebrate, with adults that forage and breed on sandy beaches, depositing eggs on adjacent cliff/bluff faces or upper portions of beach areas. Larvae burrow into sparsely vegetated or non-vegetated areas of the cliff/bluff faces and upper beach areas and take approximately two years to complete their life cycle through three larval instar stages. The Puritan Tiger Beetle is known to inhabit areas that are downstream of the Turners Falls Project, where Project effects could have potential impacts, and the effects are discussed in this Draft BA.

Shortnose Sturgeon

Shortnose Sturgeon is an endangered fish species known to be present downstream of the Turners Falls Project. This species is addressed in a separate Draft BA, to be submitted to the NMFS.

Dwarf Wedgemussel

The Dwarf Wedgemussel was listed as an endangered species by the USFWS in 1990. The largest of the Dwarf Wedgemussel populations in the Connecticut River watershed, which numbers in the tens of thousands, can be found in two stretches of the Upper Connecticut River, identified by USFWS in its 2007 5-Year Review to be located in Coos, Grafton, Sullivan, and Cheshire counties, New Hampshire and Essex, Orange, Windsor, and Windham counties, Vermont. The Dwarf Wedgemussel is an oval-shaped bivalve with a smooth, thin shell. It lives in rivers and creeks of varying sizes, settling on sand and gravel bottoms. It can be found in water depths ranging from a few inches to over 20 feet. This species is generally found in a firm substrate.

In 2011, a freshwater mussel survey was conducted in a 20-mile reach of the TFI, and a 3.5-mile reach from Turners Falls Dam to the confluence with the Deerfield River (2.7 of the 3.5 miles is in the bypass reach), as well as 2.1 miles of the power canal ([FirstLight 2012](#)). The objective of the survey was to assess the distribution, abundance and habitat of freshwater mussels. The TFI and bypass reach surveys were conducted during low flow in August and the power canal survey was conducted during the September canal drawdown. Five freshwater mussel species were found, including the Eastern Elliptio, Alewife Floater, Eastern Lampmussel, Eastern Floater, and Triangle Floater, but no Dwarf Wedgemussel were found.

In 2014, FirstLight conducted a quantitative survey and habitat assessment of freshwater mussels in the Connecticut River from Cabot Station downstream to the Route 116 Bridge in Sunderland (Study No. 3.3.16 *Habitat Assessment Surveys and Modeling of Suitable Habitat for State-Listed Mussels Species in the Connecticut River below Cabot*). The objectives of the survey were to delineate populations of state-listed mussels and suitable habitat; characterize the distribution, abundance, demographics, and habitat use of these populations; and to identify potential habitat for listed species based on their habitat preferences. The

Dwarf Wedgemussel was included in the study as one of the target species, but none were documented. Further, none were documented during additional semi-quantitative (i.e., timed qualitative) surveys and habitat measurements that were conducted at 26 sites in the study area. The most recent report of Dwarf Wedgemussel in this reach was from ~1978 (shell only).

Extensive mussel surveys have also been completed further downstream by HG&E, including areas in the Holyoke Dam impoundment, which is the next river segment downstream of where FirstLight completed surveys in 2014. A single Dwarf Wedgemussel had been documented below Hadley Falls (the location of Holyoke Dam) in 1999. HG&E completed surveys every four years (2005, 2009, and 2013) in the impoundment, along with areas downstream of the dam. Though Dwarf Wedgemussel were a target species for these surveys, none were documented ([HG&E 2014](#)).

In general, extensive surveys that have been completed within the Project areas of the Turners Falls and Northfield Mountain Projects, along with areas further downstream to Holyoke Dam, have not documented any Dwarf Wedgemussel. Therefore, the Dwarf Wedgemussel is not present in Project-affected areas and the Proposed Action is not likely to adversely affect this species. This species is not discussed further in this Draft BA.

Northeastern Bulrush

The Northeastern Bulrush is a leafy bulrush in the sedge family currently known only from populations scattered from New Hampshire and Massachusetts, south to West Virginia. In New England, the species is primarily found along the Connecticut River valley in New Hampshire and Vermont, and north-central Massachusetts. The species is described from a variety of wetlands along its extensive range. In the northern extent of its range, the bulrush is found most commonly on the edge of shallow beaver ponds, usually in full sun or similar habitats where water levels may vary.

Based on the 1993 recovery plan for the species at the time of publishing, 33 populations of the species were known to occur ([USFWS, 1993b](#)). Of the total number of known populations four occurred within north-central Massachusetts and Southern Vermont/New Hampshire. In these states the bulrush was known to occur in Franklin County, Massachusetts (one population), Cheshire County, New Hampshire (one population), and Windham County, Vermont (two known populations) ([USFWS, 1993b](#)). USFWS occurrence data does not identify specific locations that have been documented within these counties.

FirstLight has conducted several studies that identify the distribution of botanical resources within the Turners Falls and Northfield Mountain Project areas, along with identification of Project effects. Assessments of botanical resources included vegetation inventories in the following areas:

- Upland areas along the TFI including areas within the Project Boundary and areas up to 200 feet from shore where the Project Boundary is along the shoreline;
- Upland areas adjacent to the bypass reach, defined as extending from the Turners Falls Dam to the Cabot Station tailrace;
- The Connecticut River from the Cabot Station tailrace to the Route 116 Bridge in Sunderland; and
- Approximately 2,011 acres of land of Northfield Mountain, of which approximately 405-407 acres is the Upper Reservoir.

Despite extensive survey efforts, and identification of 390 plant species in the study areas in 2014 and 2015, no Northeastern Bulrush, or any other federally listed botanical species, were found. Therefore, the Northeastern Bulrush is not present in Project-affected areas and the Proposed Action is not likely to adversely affect this species. This species is not discussed further in this Draft BA.

Small Whorled Pogonia

The Small Whorled Pogonia is a member of the Orchid family with colonies in a relatedly broad but sparse distribution in the Atlantic seaboard states from Maine to Georgia, with other occurrences in several other eastern and midwestern states. According to the Revised Recovery Plan ([USFWS 1992](#)), the Small Whorled Pogonia occurs on upland sites in mixed-deciduous or mixed-deciduous/coniferous forests that are in second- or third-growth successional stages. According to the IPaC search, the species may be present in the Hadley area, which is outside of the direct Project areas. Despite extensive survey efforts that included upland habitats within the Project areas completed by FirstLight during relicensing, no Small Whorled Pogonia were found. Therefore, because this species does not exist in the Project areas, it would not be affected by any construction or maintenance activities. The only Project effects in the Hadley area are limited to water level changes along the Connecticut River shorelines, where this upland species would not be present. Because the locations of the habitat for Small Whorled Pogonia would not overlap with any locations where there are Project-related effects, the Proposed Action is not likely to adversely affect this species. Therefore, this species is not discussed further in this Draft BA.

Northern Long-Eared Bat

The Northern Long-Eared Bat overwinters in caves or old mines with high humidity and stable temperatures. During the summer the bats will roost in large diameter trees, preferring those with exfoliating bark. Reproduction begins in late summer or fall, with delayed implantation resulting in pupping in the following spring. The Project area includes old growth hemlock, shagbark hickory, silver maple, and several other species which are large in diameter and possess bark characteristics which could provide potential summer roosting habitat for the Northern Long-Eared Bat.

On April 2, 2015 the Northern Long-Eared Bat was listed as federally threatened. The primary reason for the listing of this species is the dramatic population decline which has resulted from the spread of white-nose syndrome. The USFWS has the authority to write special rules and exemptions for threatened species under section 4(d) of the federal Endangered Species Act. These rules are referred to as 4(d) rules. On January 14, 2016, USFWS issued a Final 4(d) Rule for the Northern Long-Eared Bat, imposing several specific conservation measures. On April 27, 2016, USFWS announced its determination that it would not designate critical habitat for the Northern Long-Eared Bat, having determined that summer habitat is not limited or in short supply and summer habitat loss is not a range-wide threat to the species. On November 29, 2022, the Northern Long-Eared Bat was reclassified as Endangered due to the continued effects of white-nose syndrome. Based on the final rule and after a timeline extension, the reclassification became effective on March 31, 2023.

No hibernacula or occupied maternity roost trees have been known to be present within or near the Project area, and none have been identified by the agencies. The nearest documented hibernacula are located approximately 16-17 miles west-northwest of the Connecticut River near Montague, MA whereas the nearest maternity roost trees that have been documented are over 100 miles away on Cape Cod ([MNHESP 2021](#)).

Project operations (i.e., water level and flow management) are not anticipated to have any effects on the Northern Long-Eared Bat or its habitat; effects would be limited to actions that involve tree removal, which is sometimes necessary for maintenance or safety on Project lands (e.g., hazard trees). To limit potential effects on Northern Long-Eared Bat, and other bats, the F/F Agreement included the following draft license article⁵ for both Projects (the text below is specific to the Turners Falls Project, but is exactly the same for the Northfield Mountain Project):

⁵ From the F/F Agreement see [Appendix A](#), Page A-23, Turners Falls, Draft License Article A410. Bat Protection Measures and Appendix B, Page B-4, Northfield Mountain, Draft License Article B310. Bat Protection Measures.

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

The proposed restrictions have been recently identified by FERC as a measure that would result in a “not likely to adversely affect” finding (FERC 2020), and the April through October restriction period was described by USFWS in their comments on the January 9, 2020 draft. These efforts by FirstLight are anticipated to result in few, if any, encounters with Northern Long-Eared Bats on Project-affected areas. Therefore, the Proposed Action, in conjunction with the measures outlined above, is not likely to adversely affect this species and Northern Long-Eared Bat is not discussed further in the Draft BA.

Monarch Butterfly

After overwintering, Monarch Butterflies migrate to the temperate climates in the spring and summer, typically reaching Massachusetts in mid to late June. They lay their eggs on their obligate milkweed host plant, and hatched larvae feed on the host plants, develop through multiple instars, and then pupate into adult butterflies. Multiple generations of monarchs can be produced during a breeding season, with most adults living two to five weeks, but overwintering adults will live longer, approximately six to nine months. The overwintering adults leave the area in the early fall and emigrate to their overwintering areas in Mexico. As Monarch Butterfly is a candidate species, consultation with USFWS under Section 7 of the ESA is not required and is not discussed further in the Draft BA.

1.3 Consultation History

FirstLight is relicensing the Projects using the Integrated Licensing Process (ILP), throughout which there have been intensive and documented consultation efforts between FirstLight and resource agencies, including USFWS. On October 31, 2012, FirstLight filed its Pre-Application Document (PAD) and Notice of Intent with the FERC. The PAD included FirstLight’s preliminary list of proposed studies. FERC conducted a public scoping process during which various resource issues were identified. On December 21, 2012, FERC issued Scoping Document 1 (SD1) and preliminarily identified resource issues and concerns. On January 30 and 31, 2013, FERC held scoping meetings for the two Projects. FERC issued Scoping Document 2 (SD2) on April 15, 2013.

FirstLight filed its Proposed Study Plan (PSP) on April 15, 2013, and, per the Commission regulations, held a PSP meeting at the Northfield Visitors Center on May 14, 2013. Thereafter, FirstLight held ten resource-specific study plan meetings to allow for more detailed discussions on the studies. On June 28, 2013, FirstLight filed with the Commission an Updated PSP to reflect further changes to the PSP based on comments received at the meetings. On or before July 15, 2013, stakeholders filed written comments on the Updated PSP. FirstLight filed a Revised Study Plan (RSP) on August 14, 2013, with FERC addressing stakeholder comments.

On August 27, 2013, Entergy Corp. announced that the Vermont Yankee Nuclear Power Plant (VY), located on the downstream end of the Vernon Impoundment on the Connecticut River and upstream of the two Projects, would be closing no later than December 29, 2014. With the closure of VY, certain environmental baseline conditions were anticipated to change during the relicensing study period. On September 13, 2013, FERC issued its first Study Plan Determination Letter (SPDL) in which many of the studies were approved or approved with FERC modification. However, due to the impending closure of VY, FERC did not act on 19 proposed or requested studies pertaining to aquatic resources. The SPDL for these 19 studies was deferred until after FERC held a technical meeting with stakeholders on November 25, 2013, regarding any necessary adjustments to the proposed and requested study designs and/or schedules due to the impending VY closure. FERC issued its second SPDL on the remaining 19 studies on February 21, 2014, approving the RSP with certain modifications. Studies were completed over several subsequent years. The Draft

License Application was filed with FERC on December 2, 2015, the Final License Application was filed with FERC on April 29, 2016, and an AFLA was filed with FERC on December 6, 2020.

For the purposes of this Draft BA, a preliminary outline was provided to the USFWS via email on December 12, 2019 and was discussed with them via teleconference on December 16, 2019. On January 9, 2020, FirstLight sent the USFWS a preliminary Draft BA for review and comment. On June 2, 2020, FirstLight and USFWS had a conference call to discuss the Draft BA. On August 27, 2020, FirstLight received written comments from the USFWS on the Draft BA. Responses to the USFWS comments are included in [Appendix C](#) and revised the analyses in this Draft BA were incorporated, as appropriate.

As noted above, since the AFLA filings, FirstLight filed the F/F Agreement relative to Project operations and fish passage. FirstLight revised the Draft BA to reflect the operations in the F/F Agreement and provided a draft to the USFWS on September 28, 2023. On February 12, 2024, FirstLight received comments from the USFWS. FirstLight then made minor revisions to the Draft BA based on the USFWS comments. The consultation record is included in Appendix C, including written comments received and FirstLight's responses.

1.4 Critical Habitat Addressed in this Biological Assessment

No designated critical habitat areas are in the Project-affected areas.

2 PROJECT LAYOUT AND CURRENT OPERATIONS

2.1 Existing Facilities

The Northfield Mountain Project boundary includes the perimeter of the TFI down to the Turners Falls Dam and the area around the Northfield Mountain Project. The Turners Falls Project boundary also includes the perimeter of the TFI (overlapping with the Northfield Mountain Project boundary) and an area below the Turners Falls Dam down to Cabot Station. [Figure 2.1-1](#) shows the overlapping Project boundary, and the separate Turners Falls and Northfield Mountain Project boundaries. The combined existing Project Boundary for the Turners Falls Project and Northfield Mountain Project contains 7,246 acres of land and 2,238 acres of flowed land.

2.1.1 Turners Falls Project

The Turners Falls Project includes the Turners Falls Dam, which creates the TFI on the Connecticut River ([Figure 2.1.1-1](#)). The Turners Falls Dam consists of two individual concrete gravity dams, referred to as the Gill Dam and Montague Dam, which are connected by a natural rock island known as Great Island. The 630-foot-long Montague Dam connects Great Island to the west bank of the Connecticut River and includes four bascule type gates, each 120-foot-wide by 13.25-foot-high and a fixed crest section which is normally not overflowed. The Gill Dam is approximately 55-foot-high and 493-foot-long extending from the Gill shoreline (east bank) to Great Island and includes three Tainter spillway gates, each 40-foot-wide by 39-foot-high.

Adjacent to the Montague Dam is the 214-foot-long gatehouse equipped with 15 operating gates controlling flow from the TFI 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, described below, passes through the gatehouse at the east bank.

The power canal is approximately 2.1 miles long and has a design capacity of approximately 18,000 cubic feet per second (cfs). There are several water withdrawals from the power canal. The major ones are FirstLight's Station No. 1 and Cabot Station—these two hydroelectric projects are part of the Turners Falls Project. Station No. 1 is located closer to the beginning of the power canal and Cabot Station is located at the downstream terminus of the power canal. The generation and hydraulic capacity of Station No. 1 is 5,683 kW and 2,210 cfs, respectively. The generation and hydraulic capacity of Cabot Station is 62.016 MW and 13,728 cfs, respectively. With the two generating stations combined, the total hydraulic capacity of the Turners Falls Project is 15,938 cfs.

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, including the Turners Falls Hydro, LLC project and Milton Hilton, LLC project. The Turners Falls Hydro project (FERC No. 2622) is owned and operated by Eagle Creek Renewable Energy and received a new FERC license on February 25, 2021. It discharges into the bypass reach approximately 0.3 miles downstream of the Turners Falls Dam, which is upstream of the Station No. 1 tailrace. The Milton Hilton, LLC project is an unlicensed project owned and operated by a private developer. It discharges into the bypass reach approximately 0.5 miles downstream of the Turners Falls Hydro project tailrace, which is upstream of the Station No. 1 tailrace.

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. The Cabot fishway, located near the Cabot tailrace, moves migrating fish from the Connecticut River into the power canal. The Spillway fishway, located at the Turners Falls Dam, moves migrating fish from the Connecticut River into a gallery leading to the Gatehouse fishway; however, some fish do drop out into the power canal. The Gatehouse fishway, located at the Gatehouse, moves fish from the power canal to above the Turners Falls Dam. A downstream fish passage facility is 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.

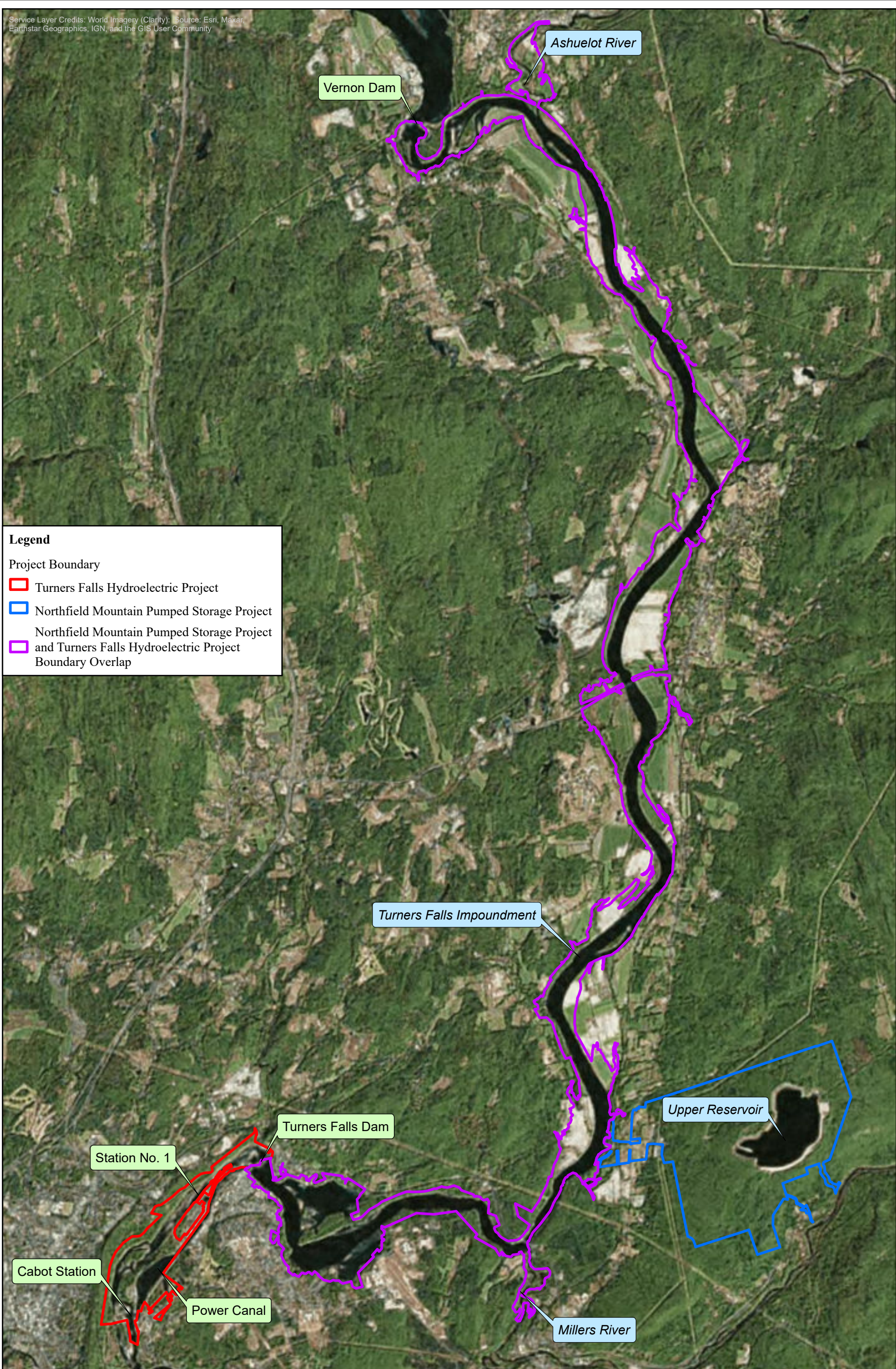
The TFI extends approximately 20 miles upstream to just below the Vernon Hydroelectric Project (FERC No. 1904), which is owned and operated by Great River Hydro. To provide storage capacity for the Northfield Mountain Project, the TFI elevation may vary, per the FERC license, from a minimum elevation of 176.0 feet⁶ (National Geodetic Vertical Datum of 1929 (NGVD29)) to a maximum elevation of 185.0 feet constituting a 9-foot fluctuation as measured at the Turners Falls Dam. The usable storage capacity in this 9-foot fluctuation, as measured at the Turners Falls Dam, is approximately 16,150 acre-feet.

2.1.2 Northfield Mountain Project

The Northfield Mountain Project consists of an Upper Reservoir and dam/dikes, an intake, pressure shaft, underground powerhouse and tailrace ([Figure 2.1.2-1](#)). The crest elevation of the Upper Reservoir's Main Dam is at elevation 1010 feet. In addition to the Main Dam there are several dam/dikes that form the Upper Reservoir. The Upper Reservoir elevation may vary, per the FERC license, from a minimum elevation of 938 feet to a maximum elevation of 1,000.5 feet constituting a 62.5-foot drawdown. FERC has allowed temporary variances to increase the maximum and minimum elevation to 1,004.5 feet and 920 feet, respectively, during certain periods to meet electric grid system needs.

The intake channel directs water from the Upper Reservoir into the pressure conduit intake and eventually to the underground powerhouse. The electrical capacity of the four (4) reversible pump-turbines is 291.7 MW for a total station nameplate capacity of 1,166.80 MW. When operating at maximum pumping mode, the approximate hydraulic capacity is 15,200 cfs. Alternatively, when operating at maximum generation mode, the approximate hydraulic capacity is 20,000 cfs.

⁶ The Project datum is the National Geodetic Vertical Datum of 1929 (NGVD29). All elevations in the license application for the Turners Falls Project and Northfield Mountain Project are based on the NGVD29 datum unless otherwise noted



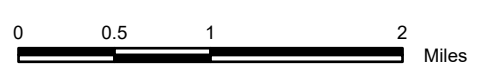
Legend

Project Boundary

- Turners Falls Hydroelectric Project
- Northfield Mountain Pumped Storage Project
- Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project Boundary Overlap

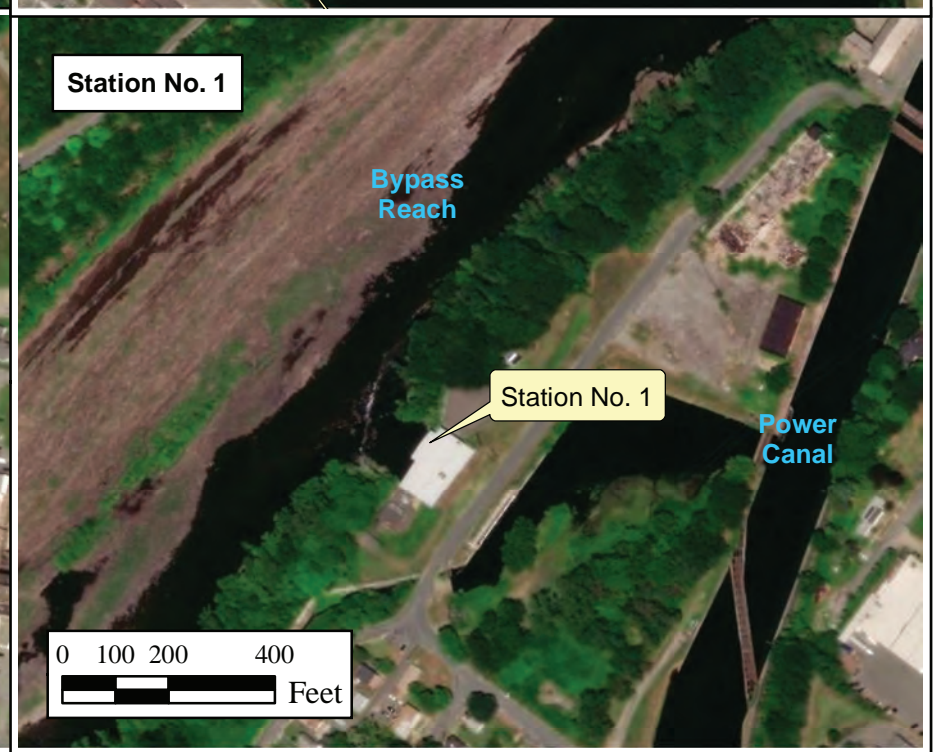
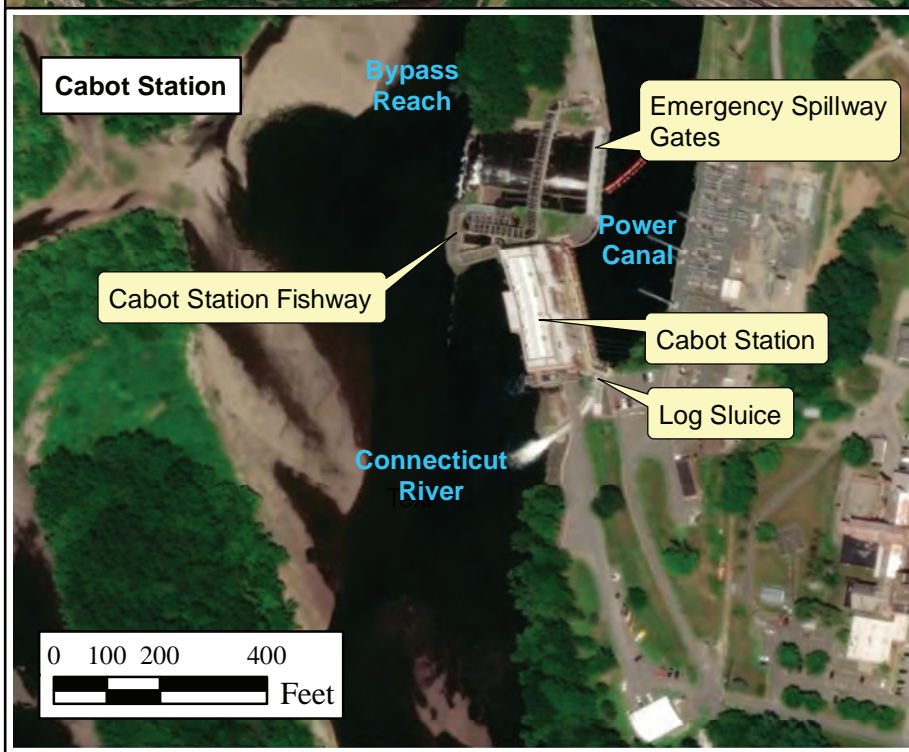
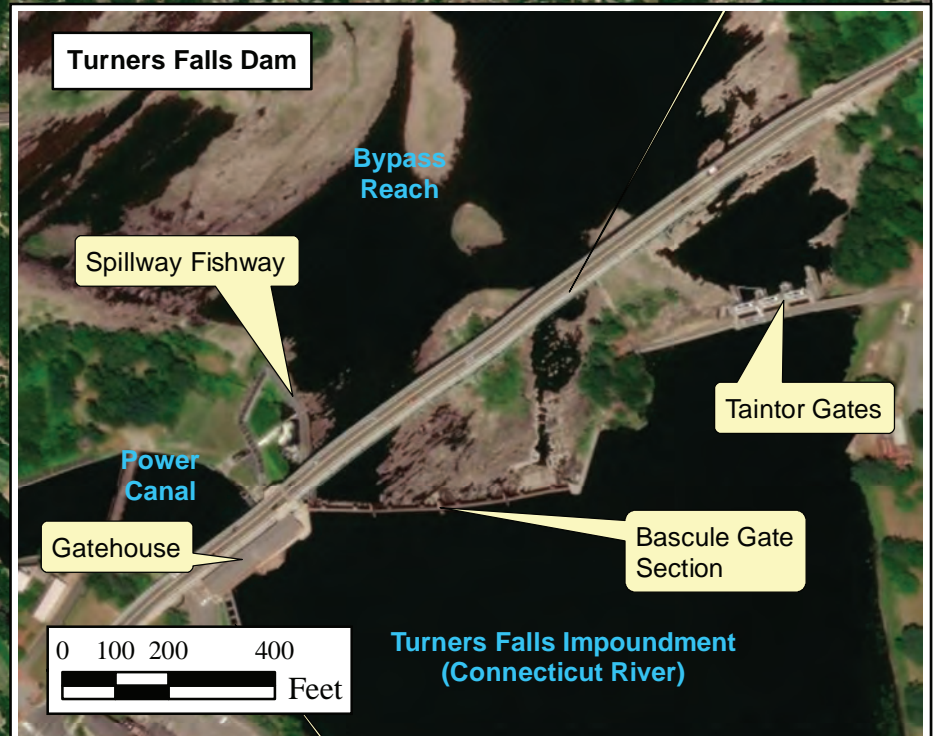
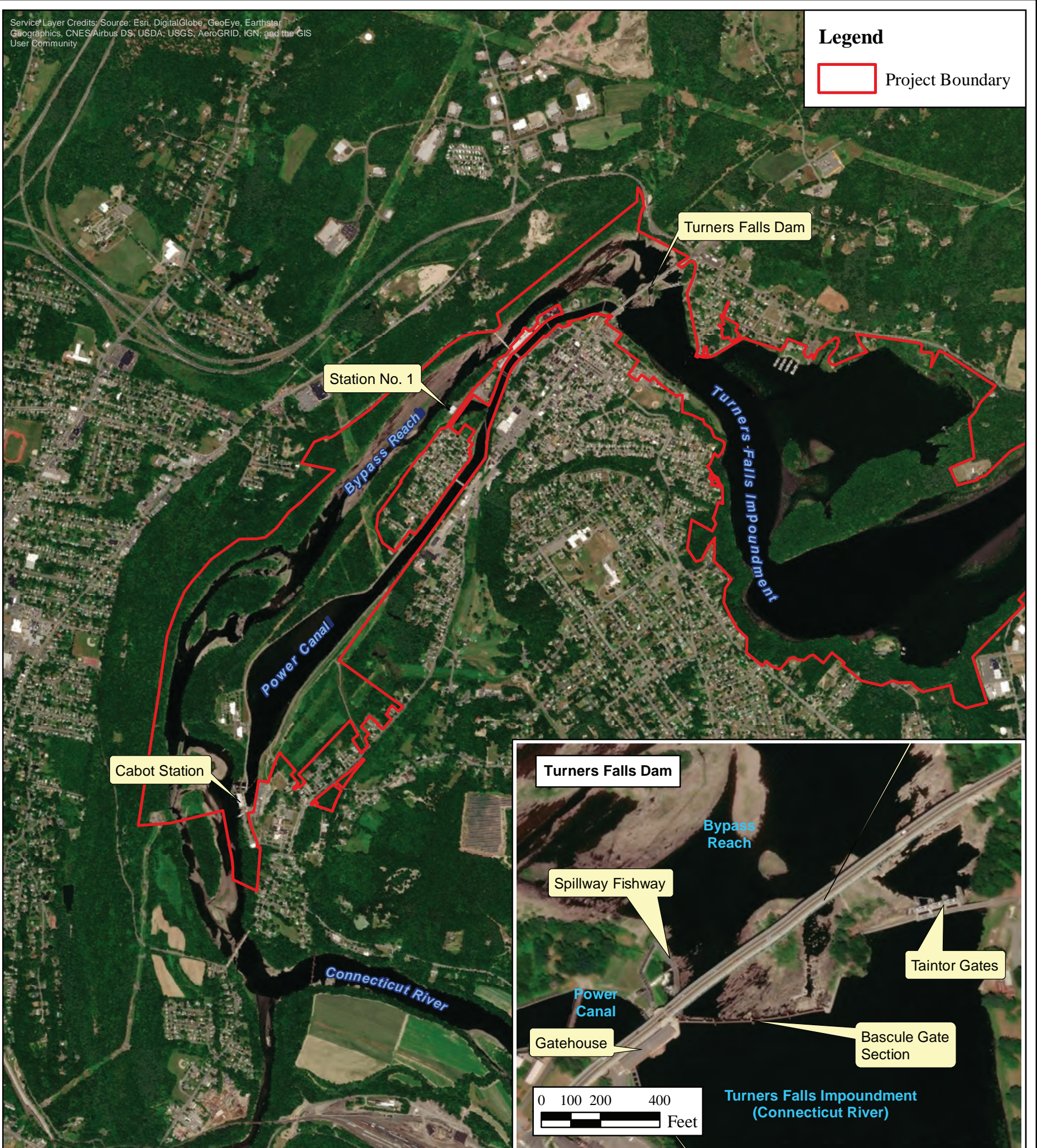
Northfield Mountain Pumped Storage Project (No. 2485)
and
Turners Falls Hydroelectric Project (No. 1889)

**Figure 2.1-1:
Project Boundary Map**



Legend

 Project Boundary



Northfield Mountain Pumped Storage Project (No. 2485)

and

Turners Falls Hydroelectric Project (No. 1889)

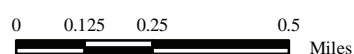
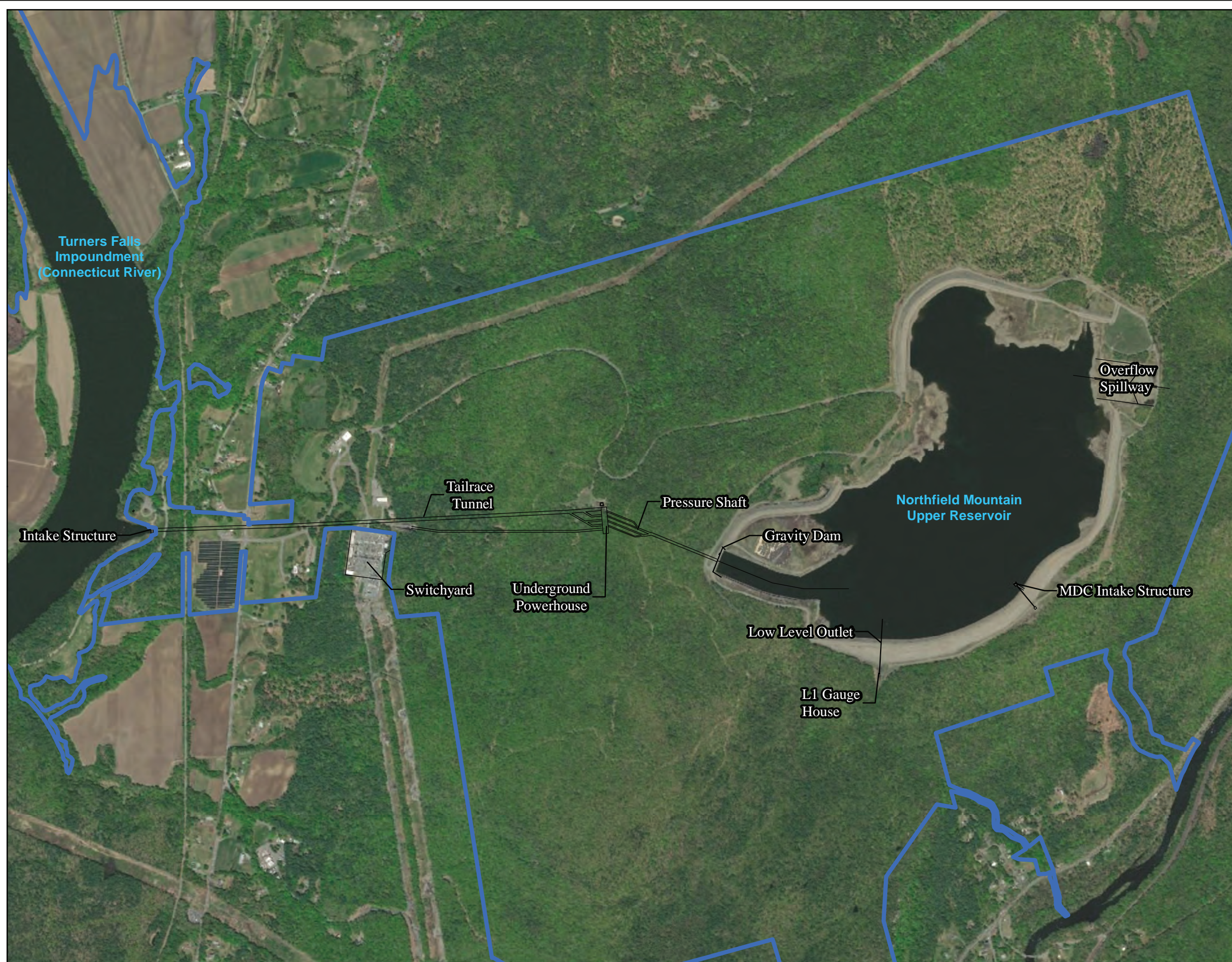


Figure 2.1.1-1
Turners Falls Project Features



Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)

Figure 2.1.2-1
Northfield Mountain Project Features

Legend

Project Boundary

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 600 1,200 2,400 Feet

1 inch = 1,200 feet



2.2 Current Operations

2.2.1 Turners Falls Project

As noted above, the Turners Falls Project consists of two hydroelectric facilities- Cabot Station and Station No. 1. During periods when inflow is within the hydraulic range of Cabot Station, it is operated as a peaking plant; during periods of high inflow, in excess of 13,728 cfs (its approximate maximum hydraulic capacity), it operates as a base load plant. Station No. 1 is a base load plant with a hydraulic capacity of 2,210 cfs and typically operates when inflows to the 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. Station No. 1 is manually operated, while Cabot is remotely operated. The current license requirements relative to Turners Falls Project operations are described below.

As noted above, the Turners Falls Hydro project and Milton Hilton, LLC project are also located on the canal. Milton Hilton, LLC⁷ and Turners Falls Hydro⁸ 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)⁹ in the Connecticut River increases to 15,000 cfs (close to the combined capacity of Cabot and Station No. 1).

Under the current FERC license for the Turners Falls Project, FirstLight is required to release a continuous minimum flow of 1,433 cfs¹⁰ or inflow, whichever is less below the Project. FirstLight typically maintains the minimum flow requirement through discharges at Cabot and/or Station No. 1.

Per the FERC license, a continuous minimum flow of 200 cfs is maintained in the bypass reach starting on May 1, increasing to 400 cfs when fish passage starts by releasing flow through a bascule gate at the Turners Falls Dam. 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 allow Shortnose Sturgeon egress through the bypass reach. 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.

The TFI elevation is currently licensed to fluctuate between 176.0 feet and 185.0 feet, as measured at the Turners Falls Dam. Though TFI water levels are managed at the Turners Falls Dam, generation and pumping from Northfield Mountain, and varying inflows all affect the TFI water levels.

2.2.2 Northfield Mountain Project

The Northfield Mountain Project is a pumped storage hydroelectric facility. Water is pumped from the TFI to the Upper Reservoir which has 12,318 acre-feet of useable storage available for pumped storage operations. Typically, pumping occurs during periods when energy prices are low, while generation occurs during periods when energy prices are high. Under the current FERC license, the Northfield Mountain Upper Reservoir elevation may fluctuate between 1,000.5 feet and 938 feet.

⁷ 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.

⁸ 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.

⁹ The naturally routed flow equals the sum of Vernon discharges plus flows recorded at USGS Gages on the Ashuelot and Millers Rivers.

¹⁰ This equates to 0.20 cfs per square mile of drainage area at the Turners Falls Dam.

3 PROPOSED ACTION

The F/F Agreement includes several protection, mitigation and enhancement measures (PM&E) designed to benefit various environmental and recreational resources. These include modifications relative to Project operations to benefit Puritan Tiger Beetle. Where applicable in the sections below we have included the Draft License Articles from the F/F Agreement (verbatim) relative to Project operations or construction of fish passage facilities.

Note that the F/F Agreement Draft License Articles were written as standalone articles, thus any footnotes have been added to the end of the license article; not to the bottom of the page. In addition, only those Draft License Articles pertaining to the construction of fish passage are included below. Many other fish passage related Draft License Articles are included in the F/F Agreement. License articles starting with an A or B pertain to the Turners Falls Project and Northfield Mountain Project, respectively.

Also included below are proposed recreation improvements, as outlined in the Recreation Agreement. Specifically, Appendix A of the Recreation Agreement includes the Recreation Management Plan listing the various recreation features. Any new or updated recreation features are described herein for completeness; however, because the Puritan Tiger Beetles are located over 25 miles below Cabot Station, and the recreation improvements are located near the Projects, the recreation measures will not impact Puritan Tiger Beetles.

3.1 Proposed Project Facilities

3.1.1 Proposed Generation Facilities

FirstLight is not proposing any changes to existing developmental (i.e., generation) facilities at the Northfield Mountain Project.

Station No. 1 Upgrades

Article A100. Station No. 1 Upgrades

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

3.1.2 Proposed Non-Generation Facilities- Fish Passage

Turners Falls Project

Article A300. Fish Passage Facilities and Consultation¹¹

The Licensee shall implement the following fish passage measures on the schedule specified. When due dates cited in this and other articles are in “years after license issuance,” this shall mean on the appropriate date in the specified calendar year after license issuance, regardless of the quarter in which the license is issued. For example, “Year 1 after license issuance” begins on the first January 1 following license issuance.

Upstream Fish Passage

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

¹¹ The consultation part of the License Article is not included herein.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

- (b) rehabilitate the Gatehouse Trapping facility (sampling facility) to be operational no later than April 1 of Year 9 after license issuance.
- (c) retire, either by removal or retaining in place, the Cabot Ladder and the power canal portions of the Gatehouse Ladder within 2 years after the Spillway Lift becomes operational.
- (d) install and operate interim upstream eel passage in the vicinity of the existing Spillway Ladder within 1 year of license issuance and continue operating it until permanent upstream eel passage facilities are operational. The Licensee shall consult MDFW, NMFS, and USFWS on the location and design of the interim eelway(s).
- (e) conduct up to 2 years of eelway siting studies after the Spillway Lift becomes operational, using a similar methodology to relicensing Study 3.3.4 for both years. Based on the siting survey results, design, construct, operate, and maintain up to two permanent upstream eel passage facilities at the Turners Falls Project no later than 3 years after completing the final siting survey. The Licensee shall consult MDFW, NMFS, and USFWS on the location of the two permanent upstream eel passage facilities. The final eelway siting will take into account the ability to maintain the eelway(s) in light of spillage conditions at the Turners Falls Project. The Licensee will not be required to place any eelways at the foot of any active spillway structures.

Downstream Fish Passage

- (f) Within 4 years¹ of license issuance, replace the existing Cabot Station trashrack structure with a new full depth trashrack with 1-inch clear spacing. The new trashracks will have multiple openings for fish passage, including openings on the top and bottom of the water column. The Licensee will attempt to maximize the hydraulic capacity of these openings within the constraints of the conveyance mechanisms. The Licensee will base detailed design alternatives on the following conceptual design; however, the Parties will remain flexible on design alternatives as necessary to meet fish passage goals.

The new trashrack will have multiple surface entrances including a.) between Cabot Units 2 and 3; b.) between Cabot Units 4 and 5; and c.) at the right wall of the intake (looking downstream) at Cabot Unit 6. The openings will be 3-feet-wide by 2-feet-tall and will connect to the existing trash trough located behind the racks. Each opening at the top of the trashrack will have an approximate hydraulic capacity of 24 cfs, and the existing trash trough will convey a total hydraulic capacity of approximately 72 cfs from these openings. The new trashrack will have an additional entrance near the bottom at the left wall of the intake (looking downstream) at Unit 1. This entrance will be approximately 3-feet-wide by 3-feet-tall and will connect to a vertical pipe to safely convey fish to the existing trash trough or log sluice. This entrance will be sized to provide a velocity that attracts fish to the bypass relative to the turbine intakes (approximately 5 feet-per-second). In addition to the entrances integral to the new trashrack structure, fish will be conveyed via a new uniform acceleration weir (UAW) and log sluice. The log sluice will be resurfaced to limit turbulence and injury to migrants. A steel panel (or equivalent) will be provided below the UAW to exclude migrants from being delayed in the space below the UAW. Total flow from all downstream passage components at Cabot Station will be 5% (685 cfs) of maximum hydraulic station capacity (13,728 cfs). The conveyance at each bypass entrance will be determined during the design phase.

- (g) Within 4 years¹ of license issuance, construct a ¾-inch clear-spaced bar rack at the entrance to the Station No. 1 branch canal.

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

than August 1 of Year 4 after license issuance; and if it is issued after Q2 then these two facilities will be operational no later than April 1 of Year 5 after license issuance.

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

Northfield Mountain Project

Article B200. Fish Intake Protection and Consultation¹²

Intake Protection

The Licensee shall install a barrier net in front of the Northfield Mountain tailrace/intake, having 3/8-inch mesh on the top and 3/4-inch mesh on the bottom. The barrier net design shall be based on the conceptual design in the Amended Final License Application filed with the Commission in December 2020, as modified through consultation with MDFW, NMFS, and USFWS, from June 1 to November 15 to protect out-migrating American Shad and adult American Eel, to be operational no later than June 1 of Year 7 after license issuance.

3.1.3 Proposed Non-Generation Facilities- Recreation

Any new recreation features or upgrades to existing recreation features are described below.

Turners Falls Project

Construct Pocket Park: FirstLight will construct one pocket park (viewing location, picnic table) at the Pauchaug-Schell Bridge Greenway and include signage for historical and cultural interpretation.

Construct Mallory Brook Campsite: FirstLight will provide paddle access camping at a new campsite at Mallory Brook (if for some reason that location proves to be problematic, another site will be chosen).

Construct Formal Access Trail and Put-In at Cabot Camp: FirstLight will construct a 10-foot-wide formal path leading from the Cabot Camp parking area to an access point on the Millers River just upstream of the confluence with the Connecticut River.

Construct Car-Top Access at East End of Unity Park and Reconfigure Parking Lot: FirstLight will add a new car-top access and put-in at the eastern end of Unity Park, provide a means of storing and locking vessels, and will reconfigure the Unity Park parking lot to improve vehicle and pedestrian safety.

Construct River Access and Two Put-Ins Just Below Turners Falls Dam: The new access will start via the existing bridge (aka the "IP Bridge") spanning the power canal just below the Gatehouse. Once over the power canal, a 12-foot-wide path will lead recreationists to an elevated bench and opening above the river channel. From this elevated bench there will be two routes to access the river. One route will continue with a 12-foot wide path leading further upstream to a put-in closer to the dam and upstream of Peskeomskut Island. This route will be designed to accommodate whitewater rafters. The second route will lead further downstream to a put-in below Peskeomskut Island. The second route currently consists of an uneven path with jagged rocks creating unstable footing. The proposed second route will require clearing and grubbing to create an approximate 12-foot-wide level path with better footing before turning right to the put-in. This route will be designed to accommodate pass-through boaters (canoes and kayaks) that want to avoid Peskeomskut Island.

Construct Viewing Platform and Picnic Area just Below Turners Falls Dam: A viewing platform and picnic area will be constructed below the Turners Falls Dam with the best feasible view of Great Falls (the Turners Falls Dam). The exact location of the viewing platform and picnic area are yet to be determined, with one

¹² The consultation part of the License Article is not included herein.

option being forming a platform atop the existing Spillway Ladder as it is elevated and provides a good view of the Turners Falls Dam.

Construct River Access Trail at Station No. 1: Although there is currently informal access to the Station No. 1 tailrace, FirstLight will provide formal access for fishing and non-motorized boats. It will include an approximately 10-footwide path leading from Power Street to a put-in just upstream of the Station No. 1 tailrace.

Install Stairs at the Cabot Woods Fishing Access: Historically, there were stairs along the steep topography leading from the picnic area in Cabot Woods to the river's edge; however, they are no longer in place. FirstLight will install and maintain new stairs at the same location as the previous stairs, which leads to just below Rock Dam.

Construct Portage Trail Around Rock Dam: The "Rock Dam" is a natural rock feature with a sizeable vertical drop located in the bypass reach of the Connecticut River near the Cabot Woods Fishing Area. With boating opportunities expected to increase under the new flow regime, some boaters may opt to avoid Rock Dam and portage around it for safety reasons. Alternatively, some boaters may view the vertical drop at Rock Dam as a "play" area and may want to "run" the drop more than once. For these reasons, FirstLight will construct a portage trail around Rock Dam.

Improve Poplar Street River Access: There is existing cartop access at Poplar Street; however, it is extremely steep. Due to steep topography and land ownership restrictions, FirstLight will 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 will be anchored to the concrete abutment and lead to a floating dock in the Connecticut River to accommodate fluctuations in the river elevation.

Install Interpretive Cultural Signage at Key Locations: FirstLight will install interpretive signage at Cabot Woods (Rock Dam), and Peskeompskut/Great Falls (Turners Falls Dam).

Northfield Mountain Project

Enhance Existing Bennett Meadow Trails: FirstLight will enhance existing riverfront trails south of Route 10 off the parking lot at Bennett Meadow and include historical and cultural interpretive signage.

Construct Riverview Improvements (Docks): The proposed barrier net will be in place during a portion of the summer recreation season. The current layout of the barrier net encloses the existing Boat Tour Dock. Given this, FirstLight proposes to relocate the dock further upstream of its current location. Moving the dock will entail extending the existing road further north and allowing boaters or users of the area the ability to drop a boat closer to the dock or operate a wheelchair down the access road.

Construct New Mountain Biking Trails at Northfield Mountain: FirstLight will construct approximately five (5) miles of new trails for mountain biking.

Construct Barton Cove Campsite: FirstLight will provide paddle access camping at a new campsite in the Barton Cove area in Gill.

Establish Rose Ledges as a Project Recreation Facility: Rose Ledges is a rock climbing area on the eastern side of Northfield Mountain. FirstLight will make Rose Ledges a new Project Recreation Facility to allow rock climbing as it is already in the Northfield Mountain Project Boundary.

3.2 Proposed Project Boundary

FirstLight is proposing changes to each Project Boundary as summarized below.

Turners Falls Project and Northfield Mountain Project Overlapping Project Boundary Changes

- The removal of a 0.2 acre parcel of land at 39 Riverview Drive in Gill, MA. These lands are owned by FirstLight but are not needed for Project operations or any other Project purpose. None of the lands FirstLight proposes to exclude from the Project boundaries contains historic properties eligible or potentially eligible for the National Register of Historic Places.

Northfield Mountain Project Boundary Changes

- The removal of an 8.1 acre parcel of land referred to as Fuller Farm located near 169 Millers Falls Road in Northfield, MA. These lands are not needed for Project operations or any other Project purpose.
- The addition of 135.5 acres¹³ of land south of the Northfield Switching Station located in the Towns of Northfield and Erving in Massachusetts. Some of these lands are currently owned by Eversource and are necessary to include recreation trails associated with the Northfield Mountain Trail and Tour Center that are not currently enclosed in the Project Boundary.
- The removal of 52.3 acres of land on the south side of Northfield Mountain located in the Town of Erving, MA. These lands are not needed for Project operations and are being taken out to establish a conservation easement on Farley Ledges as part of an off-license agreement.

Turners Falls Project Boundary Changes

- 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. These lands are not needed for Project operations or any other Project purpose.
- The addition of an 0.8 acre parcel of land owned by FirstLight at 21 Poplar Street (end of the street) in Montague, MA. These lands are needed for recreational purposes (take-out or put-in).

3.3 Proposed Project Safety

FirstLight anticipates that, as part of the relicensing process, FERC staff will evaluate the continued safety of the proposed Project facilities under the new license. FirstLight anticipates FERC will continue to inspect the Project during the new license term to assure continued adherence to FERC-approved plans and specifications, any special license articles pertaining to construction, operation and maintenance, and accepted engineering practices and procedures.

3.4 Proposed Project Operations

FirstLight proposes several operational changes as summarized in Section 3.5.

3.5 Proposed Environmental Measures

Turners Falls Project

Article A110. Minimum Flows below Turners Falls Dam

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

¹³ Of the 135.5 acres, 12.5 acres is owned by FirstLight, while the remaining 122 acres is owned by Eversource.

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Date	Minimum Flows below Turners Falls Dam
01/01-03/31 ¹	<ul style="list-style-type: none"> • If the Naturally Routed Flow (NRF- definition provided later in this article) is \leq 400 cubic feet per second (cfs), the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is $>$ 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.
04/01-05/31	<ul style="list-style-type: none"> • If the NRF is \leq 6,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 6,500, the Minimum Flow below Turners Falls Dam shall be 4,290 cfs.
06/01-06/15 ^{2,3}	<ul style="list-style-type: none"> • If the NRF is \leq 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,990 cfs.
06/16-06/30 ³	<ul style="list-style-type: none"> • If the NRF is \leq 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,280 cfs.
07/01-11/15 ¹	<ul style="list-style-type: none"> • If the NRF is \leq 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs or the NRF, whichever is less. • If the NRF is $>$ 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs.
11/16-12/31 ¹	<ul style="list-style-type: none"> • If the NRF is \leq 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is $>$ 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.

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

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

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

Definition of Naturally Routed Flow

From December 1 through June 30, the NRF is defined as the hourly sum of the discharges from 12 hours previous as reported by the: Vernon Hydroelectric Project (FERC No. 1904), Ashuelot River (USGS, Gauge No. 01161000), and Millers River USGS gauge (USGS Gauge No. 01166500).

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

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

Article A120. Total Minimum Bypass Flows below Station No. 1

Upon license issuance, the Licensee shall maintain the Total Minimum Bypass Flows below Station No. 1 as follows:

Date	Total Minimum Bypass Flows below Station No. 1 ¹
01/01-03/31	<ul style="list-style-type: none"> • If the NRF is \leq 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is $>$ 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 1,500 cfs, or the NRF, whichever is less.
04/01-05/31	<ul style="list-style-type: none"> • If the NRF is \leq 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is $>$ 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 6,500 cfs.
06/01-06/15 ^{2,4}	<ul style="list-style-type: none"> • If the NRF is \leq 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is $>$ 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 4,500 cfs.
06/16-06/30 ⁴	<ul style="list-style-type: none"> • If the NRF is \leq 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is $>$ 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 3,500 cfs.
07/01-08/31 ³	<ul style="list-style-type: none"> • If the NRF is \leq 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is $>$ 500 cfs and \leq 1,800 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is $>$ 1,800 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,800 cfs, or 90% of the NRF, whichever is less.

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Date	Total Minimum Bypass Flows below Station No. 1 ¹
09/01-11/15 ³	<ul style="list-style-type: none"> • If the NRF is ≤ 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is > 500 cfs and $\leq 1,500$ cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF, or 90% of the NRF. • If the NRF is $> 1,500$ cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.
11/16-12/31 ³	<ul style="list-style-type: none"> • If the NRF is < 400 cfs, then the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is > 400 cfs and $\leq 1,500$ cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is $> 1,500$ cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.

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

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

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

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

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

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

Article A130. Minimum Flows below Cabot Station

Upon license issuance, the Licensee shall maintain Minimum Flows below Cabot Station, or the NRF, whichever is less, as follows.

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

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

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

Article A140. Cabot Station Ramping Rates

Upon license issuance until 3 years after license issuance, the Licensee shall ramp Cabot Station as follows.

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

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

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

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

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

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

Article A150. Variable Releases from Turners Falls Dam and Variable Flow below Station No. 1

For recreation and ecological conservation purposes, upon license issuance, the Licensee shall provide variable releases from the Turners Falls Dam and a variable flow below Station No. 1 as shown below.

Variable Releases from Turners Falls Dam

Magnitude of Variable Release from Turners Falls Dam	¹ 4,000 cfs, or the NRF, whichever is less
Dates when Variable Releases may occur	² July 1 through October 31
³ Total No. of 2-day events	5 events for a total of 10 Variable Releases, but could potentially be 11 Variable Releases subject to footnote 3
Days of Variable Release for 2 day-events	Saturday and Sunday- must be two consecutive days
Hours of Variable Release	10:00 am to 2:00 pm, 4 hrs/day, Saturday and Sunday
Magnitude of Variable Release from Turners Falls Dam from Saturday at 2:00 pm to Sunday at 10:00 am.	See footnote 4
⁵ Up-Ramping Rates at Start of Variable Release	See footnote 5
⁶ Down-Ramping Rates at End of Variable Release	See footnote 6

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

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

³The Licensee conducts annual canal drawdowns for maintenance purposes resulting in the NRF being passed at the Turners Falls Dam. If the canal drawdown occurs between July 1 and October 31 and the NRF is being passed either on Saturday from 10:00 am- 2:00 pm or Sunday from 10:00 am-2:00 pm, the total number of releases at the Turners Falls Dam shall remain at 10 releases. However, if the canal

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drawdown does not occur between July 1 and October 31 on Saturday from 10:00 am-2:00 pm or Sunday from 10:00 am-2:00 pm, the Licensee shall provide an additional consecutive day of variable release such that one of the 2-day events is a 3-day consecutive event resulting in a total of 11 releases. The additional day shall either be Friday from 10:00 am-2:00 pm before the scheduled weekend variable release or Monday from 10:00 am-2:00 pm after the scheduled weekend variable release. If there ends up being one 3-day event, the magnitude of release from Friday at 2:00 pm to Saturday at 10:00 am (or Sunday at 2:00 pm to Monday at 10:00 am), shall be computed as noted in footnote 4.

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

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

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

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

Variable Flow below Station No. 1

Magnitude of Variable Flow below Station No. 1	¹ 2,500 cfs, or the NRF, whichever is less
Dates when Variable Flow may occur	² July 1 through October 31
Total No. of 2-day events	7 events for a total of 14 Variable Flows
Days of Variable Flow	Saturday and Sunday- must be two consecutive days
Hours of Variable Flow	10:00 am to 2:00 pm, 4 hrs/day
Magnitude of Variable Flow below Station No. 1 from Saturday at 2:00 pm to Sunday at 10:00 am.	See Footnote 3

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

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

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

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

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

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

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

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

Article A160. Flow Stabilization below Cabot Station and Allowable Deviations for Flexible Operations

Three years after license issuance, the Licensee shall maintain $\pm 10\%$ of the NRF below Cabot Station as follows.

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

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

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

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

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

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

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

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

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

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

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

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

Article A170. Flood Flow Operations

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

Article A180. Cabot Station Emergency Gate Use

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

Article A190. Turners Falls Impoundment Water Level Management

Upon license issuance, the Licensee shall operate the Turners Falls Impoundment, as measured at the Turners Falls Dam, as follows:

- (a) Maintain water levels between elevation 176.0 feet and 185.0 feet National Geodetic Vertical Datum of 1929 (NGVD29).
- (b) Limit the rate of rise of the Turners Falls Impoundment water level to be less than 0.9 feet/hour from May 15 to August 15 from 8:00 am to 2:00 pm. However, if the NRF is greater than the sum of the hydraulic capacity of Cabot Station and Station No. 1 and the Minimum Flow below Turners Falls Dam in effect at the time, the Turners Falls Impoundment rate of rise requirement will not apply.
- (c) The rate of rise of the Turners Falls Impoundment may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the rate of rise of the Turners Falls Impoundment is so modified, the Licensee shall notify the Commission, MDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The rate of rise of the Turners Falls Impoundment may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain

Pumped Storage Project (FERC No. 2485), MDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.

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

Northfield Mountain Project

Article B100. Project Operations

Upon license issuance, the Licensee shall:

- (a) Operate the Northfield Mountain Pumped Storage Project in accordance with its existing agreement with the United States Army Corps of Engineers (USACE). This agreement, memorialized in the Reservoir and River Flow Management Procedures (1976), as it may be amended from time to time, governs how the Project will operate during flood conditions and coordinate its operations with the Licensee of the Turners Falls Hydroelectric Project (FERC No. 1889).
- (b) Operate the Northfield Mountain Pumped Storage Project upper reservoir between elevation 1004.5 and 920.0 feet National Geodetic Vertical Datum of 1929 (NGVD29).

4 ACTION AREA

4.1 Geographic Area of Project Effects

Project elements of the Proposed Action include construction, maintenance, and operations. Each are defined below, and their geographic area of effect is identified based on features in [Figure 4.1-1](#).

4.1.1 Construction

Construction will be limited to the PM&E measures proposed at the Projects. All proposed construction will be confined to specific areas within the Project boundaries ([Figure 4.1-1](#)).

4.1.2 Maintenance

Maintenance of Project facilities and lands will be limited to areas within the Project boundaries ([Figure 4.1-1](#)).

4.1.3 Operations

Project hydropower operations affect the Connecticut River corridor for approximately 57 river miles from Vernon Dam to Holyoke Dam ([Figure 4.1-1](#); [Table 4.1.3-1](#)). The TFI water levels are affected by pumping and generation at the Northfield Mountain Project, along with operations at the Turners Falls Project. River flows from upstream, along with pumping and generation from the Northfield Mountain Project, can determine the amount of flow passed through the Turners Falls Project. Outflows through the Turners Falls Project affect flows and water levels in the Connecticut River from Turners Falls Dam to Holyoke Dam, but only when the river flows are below the combined hydraulic capacity of the Turners Falls Project and Total Minimum Flow from Turners Falls Dam. In particular, flows higher than 15,938 cfs, plus the Total Minimum Flow from Turners Falls Dam at the time, exceed the hydraulic capacity of the Project and result in additional flow over the dam and to the Connecticut River downriver of the Project.




Table 4.1.3-1: River Miles of Major Project Features

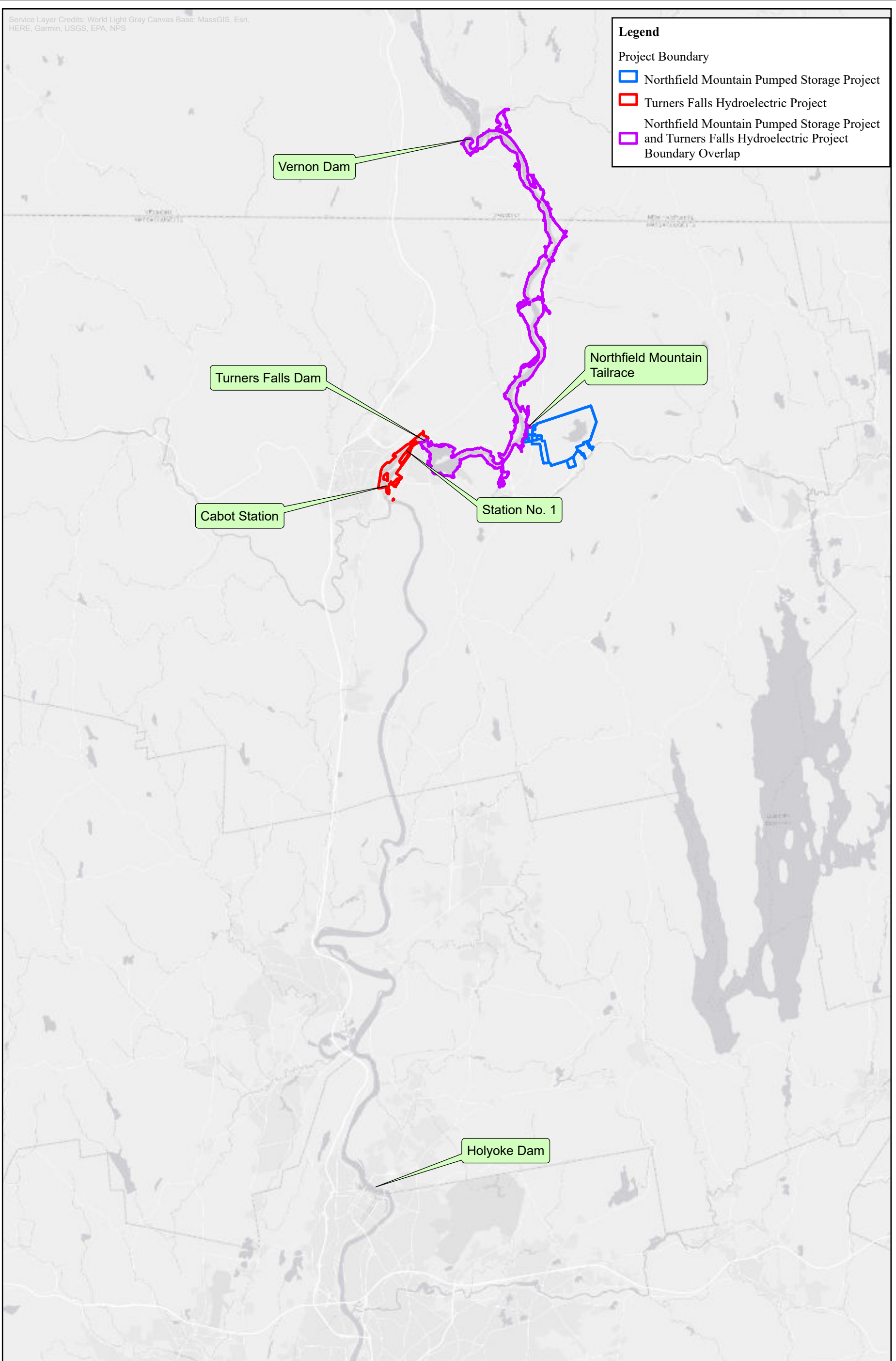
Location	River Mile
Vernon Dam*	142.1
Northfield Mountain Tailrace	127.3
Turners Falls Dam	122.2
Station No. 1	121.1
Cabot Station	119.3
Lower End of Turners Falls Project Boundary	119.0
Holyoke Dam*	85.5

**Vernon Dam and Holyoke Dam are not Project features but are included because they are considered the upstream and downstream extents, respectively, of the operational project element for the Northfield Mountain and Turners Falls Projects.*

Legend

Project Boundary

-  Northfield Mountain Pumped Storage Project
-  Turners Falls Hydroelectric Project
-  Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project Boundary Overlap



Northfield Mountain Pumped Storage Project (No. 2485)
and
Turners Falls Hydroelectric Project (No. 1889)

**Figure 4.1-1:
Geographic Area of Project Effects Map**



4.2 Affected Environment

The Puritan Tiger Beetle is an invertebrate predator, which was historically found on beaches in Connecticut, New Hampshire, Massachusetts, and along the shores of the Chesapeake Bay in Maryland. The distribution of the Puritan Tiger Beetle is now limited to areas along the Chesapeake Bay in Maryland, and along the Connecticut River in New England ([USFWS 1993a](#)). In New England, there remains one metapopulation consisting of four sites near Cromwell, CT and one single site in Massachusetts, located in Northampton. As such, the only Puritan Tiger Beetle habitat that would be affected by Project operations is that utilized by the population in Massachusetts.

The Massachusetts population occurs along a ~2,100-foot-long sparsely vegetated sandy beach, known as Rainbow Beach, located within the Rainbow Beach Conservation Area. This area is co-owned and managed by the Commonwealth of Massachusetts and the City of Northampton. Rainbow Beach is located approximately 25 miles downstream of Cabot Station at the Turners Falls Project ([Figure 4.2-1](#)). Rainbow Beach is the only confirmed Puritan Tiger Beetle habitat within the affected area that maintains a population. Puritan Tiger Beetles have historically been recorded at other sites near Rainbow Beach in small numbers but have not been found maintaining populations or meta-populations. For example, both adults and larvae have been observed on the steep, eroding banks a short distance upstream from Rainbow Beach. This area has been termed “North Bank”. Researchers believe that this habitat could be a population sink, based on the bank/habitat characteristics, rather than a source to the Rainbow Beach population (C. Davis, *pers. comm.*).¹⁴ Additionally, on the opposite bank from Rainbow Beach is a small area with steep-banked eroding shoreline where larvae have been observed (C. Davis, *pers. comm.*); some adults could fly there from Rainbow Beach to lay eggs, and it is possible that larvae there could return to Rainbow Beach as adults if they survive. However, the contribution to the Rainbow Beach population has not been quantified and would be minimal. In 2014, a survey was completed by FirstLight, assisted by Chris Davis, to find and characterize additional Puritan Tiger Beetle habitat along the river near Rainbow Beach. In addition to Rainbow Beach, six areas were investigated where Puritan Tiger Beetle presence was historically recorded, and/or if the locations contained habitat characteristics that could be suitable for Puritan Tiger Beetle ([FirstLight 2016a](#)). None of these other locations were determined to provide suitable habitat for Puritan Tiger Beetle populations. Therefore, Rainbow Beach is considered to be the only location in the action area with a Puritan Tiger Beetle population, and is the only location analyzed in this Draft BA.

The habitat at Rainbow Beach is unique in that it harbors the only known existing population of Puritan Tiger Beetle within a non-tidal riverine shoreline habitat. The habitat structure and those selected for various activities by the Puritan Tiger Beetle are therefore quite different than those observed at other beaches, including the nearest known population in Cromwell, Connecticut, approximately 58 river miles downstream of Rainbow Beach (e.g., [Gwiazdowski 2020](#)). The beach at Cromwell is narrow, tidal, is subjected to tidal fluctuations twice per day on the order of 2-3 feet, and contains an area of dense, damp sand within the intertidal zone. This intertidal zone is used by Puritan Tiger Beetles for oviposition and larval development, apparently due to the combination of suitable moisture, temperature, and sediment grain size ([Gwiazdowski 2020](#)). In contrast, the habitat at Rainbow Beach consists of a narrow area near the water-land interface that is wetted by waves and boat wakes on short-term time scales (i.e., minute/hourly). The location of the water-land interface at Rainbow Beach can also vary seasonally, daily, and sub-daily depending on the baseflow in the river, flows from the Turners Falls Project, and water levels at Holyoke Dam. Despite these factors, water levels at Rainbow Beach fluctuate considerably less on a daily and hourly basis than the tidal Connecticut River during the adult active period (see [Figure C-1](#) and [Figure C-2](#) of [Appendix C](#)). Rainbow Beach is much larger and broader than the beach in Cromwell and contains broad areas of soft sand that dries out during low flow periods. This type of area is not suitable for

¹⁴ Chris Davis has been the lead researcher on the Puritan Tiger Beetle recovery efforts at Rainbow Beach from 1997 through the present, which has included translocation of larvae, habitat management, and surveys of adult (mark/recapture) and larval populations through a USFWS contract.

egg deposition and egg/larval survival (e.g., [Gwiazdowski 2020](#)). Because of the different habitat structure on Rainbow Beach, Puritan Tiger Beetles exhibit different behavioral patterns for finding and using suitable habitat. Adult Puritan Tiger Beetles traverse the broad areas of Rainbow Beach to forage and mate near the water-land interface during the day before moving back up to the higher elevations on the beach to oviposit. Gwiazdowski ([2020](#)) did not positively identify oviposition near the water-land interface on Rainbow Beach, though some oviposition was found higher on the beach. Puritan Tiger Beetle have been observed ovipositing and larvae have been documented along a narrow strip of land with areas of silt deposition at some of the highest elevations on Rainbow Beach (C. Davis, *pers. comm.*; [Davis 2020](#)). These areas contain sparse vegetation and have a combination of adequate moisture, temperature, and sediment grain size for oviposition ([Davis 2020](#)). Davis ([2020](#)) performed larval counts at Rainbow Beach during fall 2020 and documented most larvae in the northern portions of the beach at relatively high elevations within sparsely vegetated areas. Though the survey area included a 10-meter swath of potential larval habitat, larvae were found primarily within 3-4 meters of the vegetation line at the highest elevations along the beach, consistent with previous findings ([Davis 2020](#)).

Researchers associated with Gwiazdowski ([2021; 2022a](#)) and Davis ([2021](#)) collected information of larval occurrence at Rainbow Beach along transects that had been surveyed originally by FirstLight in 2014. To ensure relevant elevation data associated with larval observations, topography at these transects was surveyed again by FirstLight in 2021.¹⁵ When the data were aggregated across study years and surveys, larvae were found between elevations 101.91 and 108.8 feet, with relatively few at low elevations ([Figure 4.2-2](#)). For example, 97.5% were located at or above 103.2 feet and 90% were located at or above 103.9 feet.

¹⁵ The sands of Rainbow Beach are known to shift, which affects beach topography over time.

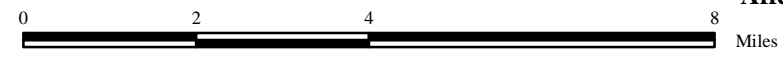


- Legend**
- Project Boundary
 - █ Northfield Mountain Pumped Storage Project
 - █ Turners Falls Hydroelectric Project
 - █ Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project Boundary Overlap



Northfield Mountain Pumped Storage Project (No. 2485)
and
Turners Falls Hydroelectric Project (No. 1889)

Figure 4.2-1
Affected Environment - Rainbow Beach



PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

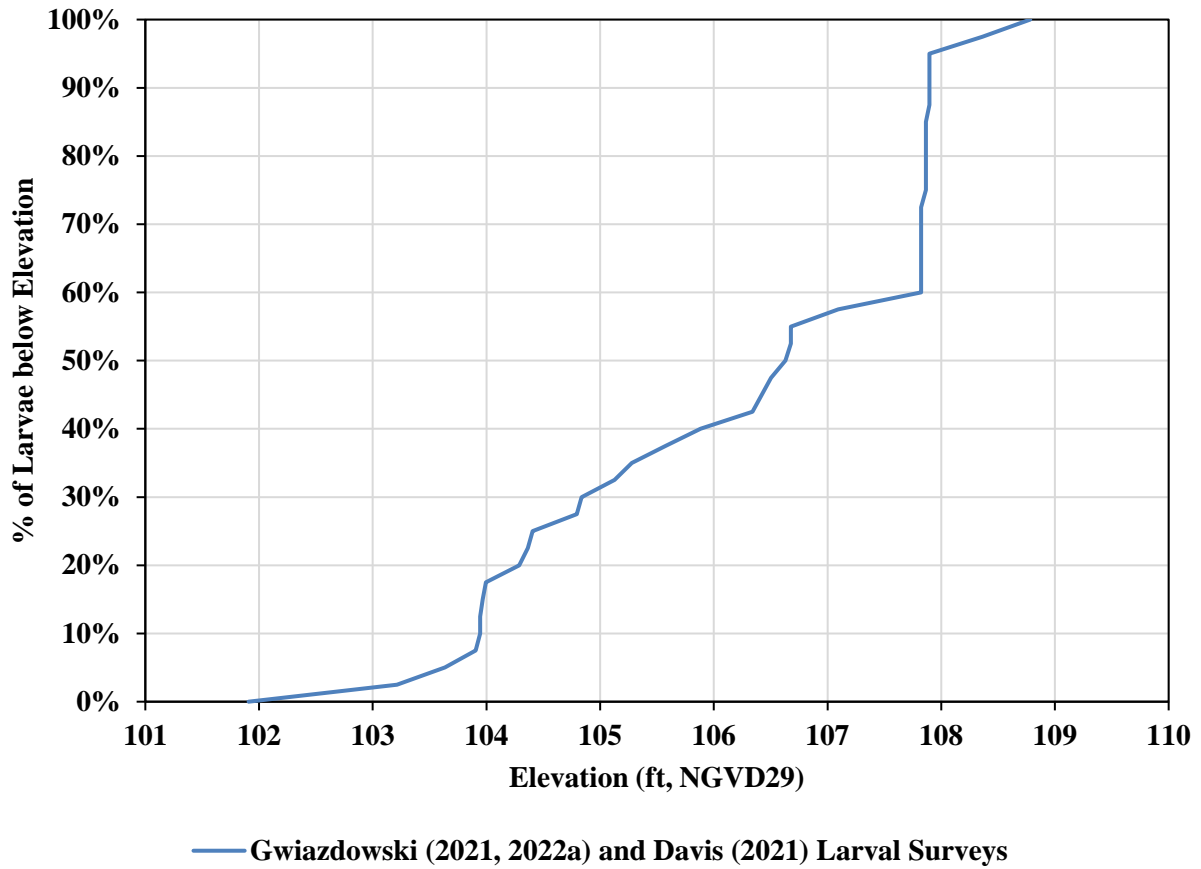


Figure 4.2-2: Elevation Distribution of Documented Puritan Tiger Beetle Larvae at Rainbow Beach

4.2.1 Ongoing Activities

Public Use and Recreation

According to USFWS (2019), the Rainbow Beach population is subjected to unregulated recreational use, primarily in the summer. There are some State regulations for Wildlife Management Areas that prohibit certain activities, such as camping and fires, but the regulations have not been enforced at the site and measures to protect the habitat and individual beetles have not been implemented (USFWS 2019). Years with hot, long summers exhibit the greatest amount of recreational use on the beach, with up to 3,094 recreational users documented in 2005 (HG&E 2008). Approximately 1,539 of those recreationalists were observed using the beach (HG&E 2008).

Abbott (2003) found that areas selected by foraging and breeding adult Puritan Tiger Beetles on Rainbow Beach overlapped with areas commonly used for human recreation and determined that the Puritan Tiger Beetles are likely being disrupted by human disturbances, which could be limiting successful reproduction. The beetles were using areas near the water's edge for foraging and mating, and recreational use of the beach was also concentrated along the shoreline where motorboats and personal watercraft were anchored (Abbott 2003). The types of recreation observed by Abbott (2003) at Rainbow Beach included sunbathing, grilling food, swimming walking and running along the shorelines, playing horseshoes, playing catch with footballs and discs, playing volleyball, including with erected nets and posts, off-road vehicle use (observations of tracks), pets (including unleashed dogs). Adult Puritan Tiger Beetle will flush and relocate to other areas of the beach when humans or dogs come within a close distance of them, and these disturbances could limit foraging and mating activities on Rainbow Beach (Abbott 2003).

Abbott (2003) reported the greatest number of boats and people at Rainbow Beach in the afternoon hours when compared to midday and morning. In the afternoon on weekends, an average of 103.5 people and 26.7 boats were observed on six visits between June 28 and August 14, 2003. This is in comparison to 20.4 people and 4.4 boats in the afternoon on weekdays (n=14) during the same period. More recent documentation of extensive recreation similar to that observed by Abbott (2003) at Rainbow Beach is shown in screenshots of drone footage from July 4, 2016 (Figures 4.2.1-1 and 4.2.1-2). This degree and type of recreation is not limited to federal holidays, given photographic footage obtained from social media that spans the months of May through September from recent years (Attachment 1 to Appendix C). Similar to Abbot (2003), much of the recreation documented in these photographs is concentrated near the shoreline, and includes boats pulled into the sand/water interface area of the beach, and large numbers of people using the beach.

Abbott (2003) also observed boat wakes that appeared to disturb adult Puritan Tiger Beetle, noting that weekend use of the river can be so high that boat wakes on Rainbow Beach can be almost continuous at times. There is currently a no-wake zone in place near Rainbow Beach, but it is unclear how often this restriction is followed. Based on the drone footage from which Figures 4.2.1-1 and 4.2.1-2 were derived, and from the photographs provided in Attachment 1 Attachment 1 to Appendix C, boat wakes are frequent on Rainbow Beach when people are boating in the river at and around the beach.

The impacts of extensive amounts of reported recreation use on Rainbow Beach during the COVID-19 pandemic have not been studied but could have long-term impacts on the Puritan Tiger Beetle population. During interviews with reporters, local law enforcement officials have stated that there could be 1,000 people or more using Rainbow Beach on Saturdays and Sundays in 2020, with recent increases in observed boating and recreation caused by the COVID-19 pandemic.¹⁶ These numbers are an order of magnitude higher than those observed by Abbott (2003). Gwiazdowski (2020) also documented high recreational use of the beach that interfered with surveys. Specifically, visitor activity precluded establishing transects at Rainbow Beach on Sunday July 26, 2020. The site was revisited by Gwiazdowski (2020) on

¹⁶ <https://www.masslive.com/police-fire/2020/08/theres-way-too-many-people-with-more-boat-traffic-than-ever-massachusetts-environmental-police-and-local-officers-team-up-to-patrol-connecticut-river.html>

Wednesday/Thursday July 29/30, 2020, during which the author described much of Quadrat 3 at Transect 2 having human and dog footprints that obscured the sand surface, along with children playing in the transect, and obscuring all sand in Quadrats 1 and 2. In the morning prior to this disturbance of sand, Gwiazdowski (2020) had documented oviposition in Quadrat 2. As such, the disturbance caused by human recreation directly overlapped with critical activities being performed by Puritan Tiger Beetle.

Nearby Land Use

The land around Rainbow Beach is primarily forested, but there is also existing cropland along the river upstream from the beach, with agricultural crops that were observed growing very close to the bank. The effects that this land use may have on Puritan Tiger Beetle has not been studied, but could potentially include effects from chemicals, fertilizers, and sediments in storm runoff.

Habitat Changes/Shifts

Habitat changes that occur through time that could affect the population and distribution of Puritan Tiger Beetle through time include changes in vegetation types, and also shifts in the position of Rainbow Beach itself due to erosion and deposition of sand along the Connecticut River channel.

The transitional area between the exposed sand and the riparian forest at Rainbow Beach is dominated by Rough Cocklebur (*Xanthium strumarium*), Sandbar Willow (*Salix exigua*), Dogbane (*Apocynum cannabinum*), Black Willow (*Salix nigra*), Eastern Cottonwood (*Populus deltoides*), and Silver Maple (*Acer saccharinum*). Rough Cocklebur and Sandbar Willow are major contributors to vegetation succession at Rainbow Beach, which may eventually reduce suitable Puritan Tiger Beetle habitat. In addition, exotic, invasive species such as Purple Loosestrife (*Lythrum salicaria*) and Japanese Knotweed (*Polygonum cuspidatum*) are present on the site. Both of these species are known to grow and spread rapidly and out-compete native species. Massachusetts Natural Heritage Endangered Species Program (NHESP) began vegetation treatment of native and non-native species during the summer of 2019 in larval areas in the northern and southern sections of the beach.

Rainbow Beach substrate consists primarily of sand and fine material, which has a dynamic nature that can result in substantial changes to the topography and physical characteristics over time. Differences in survey elevations collected by FirstLight along transects collected in 2014 and 2021 prompted further review of historical imagery data to determine the extent of changes that occur at Rainbow Beach over longer timeframes. Based on historical orthoimagery, the Connecticut River at Rainbow Beach, along with Rainbow Beach itself, has been shifting eastward (Figure 4.2.1-3). This means that substrates have been deposited along the primary portions of Rainbow Beach, resulting in vegetation colonization in areas that were previously part of open, sandy beach at low river flows. This vegetation colonization has not only included shrub and herb layers, but also trees. Alternatively, substrates on the opposite side of Rainbow Beach have been eroding away, resulting in an eastward shift of the riverbank, which is steep along that shoreline.

The magnitude of deposition of substrates that has occurred at Rainbow Beach over time suggests that this process has been driven largely by high flow events that could inundate and deposit sediments at high elevations along the beach. Most of the larvae have been documented in these higher elevation locations along the beach; therefore, high flow events can have direct effects on habitats where larvae are residing, and the location and composition of habitats in the future. Though the overall effects in the short and long term are not known, this shifting of Rainbow Beach could be an important component of habitat maintenance for Puritan Tiger Beetle, given that this species is known to be negatively affected by encroaching vegetation and associates positively to habitats containing dense sand and silt.

Population Augmentation

Population augmentation of Puritan Tiger Beetles at Rainbow Beach was first performed between the years 2000 and 2006, during which 3rd instar larvae were transported to the site from the Connecticut sites ([USFWS 2019](#)). Initially, the population increased after these translocations occurred, until 2009, after which the population began to decline again for unknown reasons ([USFWS 2019](#)). More recently, the USFWS funded a project to develop and update a rearing facility, for propagation of Puritan Tiger Beetles ([USFWS 2019](#)); as a result of this program, 90 larvae were released at Rainbow Beach in 2016, 726 were released in 2017, and 23 were released in 2018. The numbers of adults observed at Rainbow Beach, along with preliminary evidence of large numbers of 2nd and 3rd instar burrows, suggests that reintroduction efforts using larval beetles has been successful ([USFWS 2019](#)).

Water Level Management at Holyoke Dam

Licensed hydropower operations at the Holyoke Project (FERC Project No. 2004) include a modified run-of-river (ROR) protocol, whereby water levels in the Holyoke Impoundment, which includes Rainbow Beach, are managed. Holyoke Gas and Electric (HG&E) maintains the Holyoke Project Impoundment elevation between 99.47 feet and 100.67 feet, NGVD29. Further details are provided in [Section 5.4.3](#).

4.2.2 Project-Related Conservation Measures for Puritan Tiger Beetle

The F/F Agreement includes a license article designed to limit flow variability below Cabot Station. Article A160. Flow Stabilization below Cabot Station and Allowable Deviations for Flexible Operations requires FirstLight to provide +/-10% of the NRF below Cabot Station from April 1 to November 30, with some hours allocated for flexible operations. The flow stabilization requirements at Cabot Station from July 1 through August 31 of each year were developed specifically to mitigate the potential effects of peaking on adult foraging and breeding Puritan Tiger Beetles. This summer period typically has relatively low river flows when peaking at Cabot Station could have the greatest impact on water level changes downstream due to a greater differential between base flows and the maximum generating capacity of the Turners Falls Project. The restriction was developed to limit water level increases (while accounting for travel time and attenuation from Cabot Station discharges) at Rainbow Beach at times when adult Puritan Tiger Beetle would typically be foraging and mating during the daylight hours.

Though not developed specifically for Puritan Tiger Beetle, other proposed operations could provide benefits to the adult life stage of the Puritan Tiger Beetle, including:

- Higher summer minimum flows (see Articles A110, A120 and A130) than currently licensed in the Bypass Reach, which would reduce downstream fluctuations caused by operations at Cabot Station
- Ramping restrictions at Cabot Station (see Article A140), which would also reduce downstream fluctuations caused by operations at Cabot Station

Another measure that was not developed for, but is applicable to, the Puritan Tiger Beetle is the current agreement (Pursuant to Article 43 of the current Northfield Mountain Project license) with the Department of the Army (i.e., USACE) for providing coordinated operation of the Turners Falls Project and Northfield Mountain Project during flood conditions on the Connecticut River in accordance with rules and regulations prescribed by the USACE. In general, the agreement allows FirstLight to operate the Northfield Mountain Project within its FERC license requirements without causing river flows downstream of Turners Falls Dam to significantly exceed those that would have occurred absent the Northfield Mountain Project. This agreement is being maintained as part of FirstLight's proposed operations in the new license (see Article A170 and B100). The agreement with the USACE would prevent unnatural flow and inundation patterns during flood events that could have been caused by the Northfield Mountain Project if no agreement were in place.



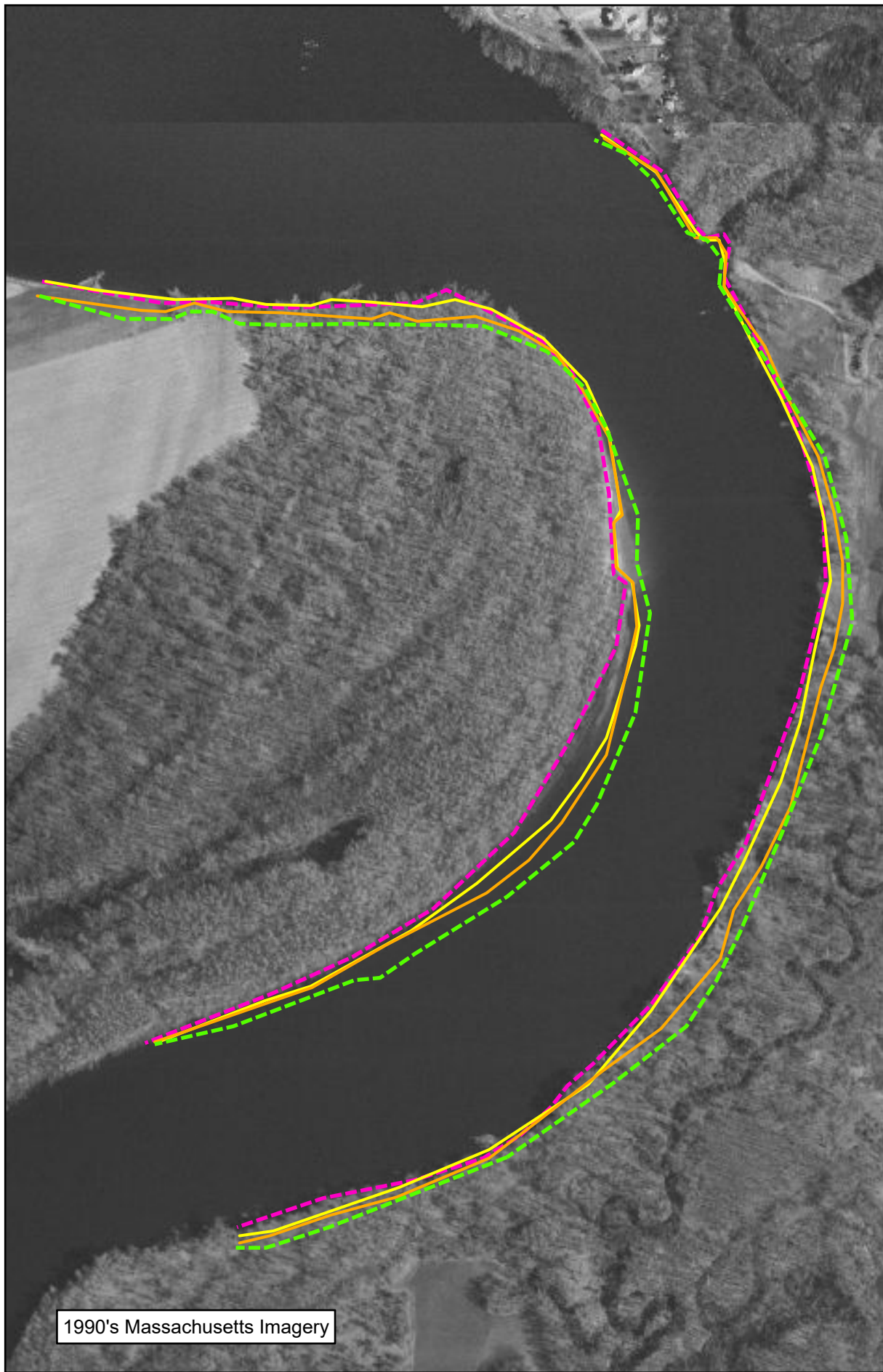
Figure 4.2.1-1: Rainbow Beach from a Drone

(Source: YouTube, <https://www.youtube.com/watch?v=2v2bSRT2H4k>)

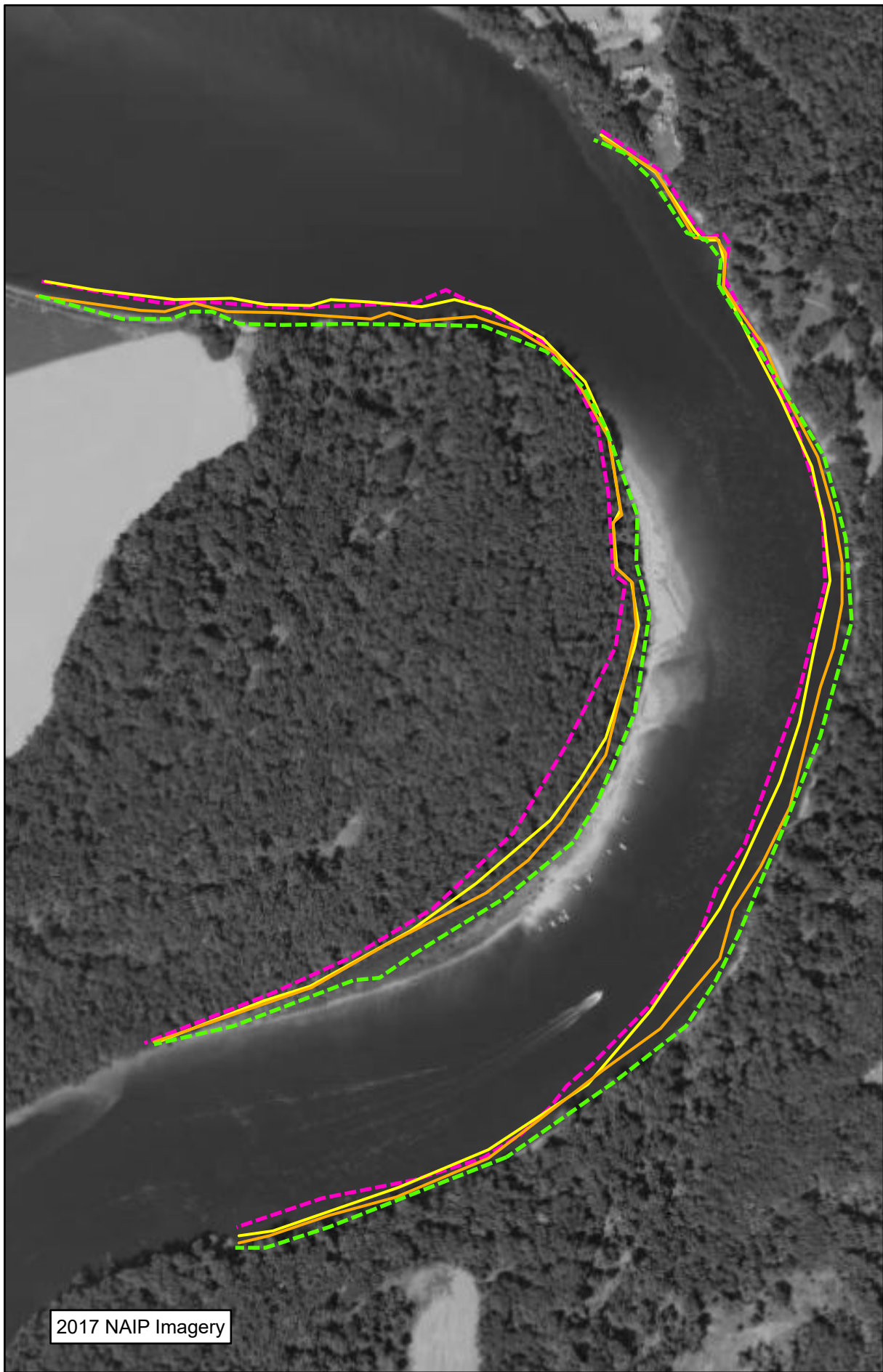


Figure 4.2.1-2: Rainbow Beach from a Drone

(Source: YouTube, <https://www.youtube.com/watch?v=2v2bSRT2H4k>)



1990's Massachusetts Imagery



2017 NAIP Imagery



FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Figure 4.2.1-3:
 Topography and habitat changes
 at Rainbow Beach, 1990s through 2019

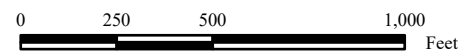
Legend

Vegetation Line

- 1990s
- 2004
- 2008/2009
- 2019



Service Layer Credits: World Esri National Geographic Basemap:
 National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS,
 NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
 NAIP Imagery 2017:
 Massachusetts 1990s Black and White Ortho Imagery: MassGIS



1:6,000



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5 SPECIES INFORMATION

The Puritan Tiger Beetle exhibits a two-year life cycle. For approximately 22 months out of the two years, the Puritan Tiger Beetle is in a larval stage, after which individuals emerge as adults that feed, breed, and then die ([Abbott 2003](#); [USFWS 1993a](#)). Their habitat consists of sandbars that depend on the dynamic interaction of moving water and shifting sands; this includes regular high flows and winter ice scour that maintains existing bars, builds new bars, and controls vegetation growth, along with lower summer flows for foraging, reproduction, and larval development ([USFWS 1993a](#); [Kennedy et al. 2018](#)). The details of each life stage is included below.

5.1 Larval Life Stage

Puritan Tiger Beetle larvae require sandy habitat, which allows for digging of deep vertical channels. In contrast to the Common Tiger Beetle (*Cicindela repanda*), Puritan Tiger Beetle larval burrows are short and angled. Puritan Tiger Beetle larval habitat is generally 10-20% vegetative cover with an interspersion of open sandy areas. Davis ([2020](#)) documented larvae at Rainbow Beach in areas where silt had deposited from high flow events on the Connecticut River, which tend to be at higher elevations on the beach. There are also broad, lower-elevation areas of the beach that contain soft sand that becomes very hot and dry when exposed, which would not be suitable for burrowing and larval survival. Some areas closer to the water's edge may be temporarily suitable for larvae due to lower temperatures and moisture there, though these areas would be frequently inundated by river flows, regardless of Project operation.

According to Connecticut Department of Energy and Environmental Protection (CTDEEP), approximately a week after being deposited in the sand by adult females, the eggs hatch into larvae about one-third of an inch long ([CTDEEP 1999](#)). The larvae then dig a burrow into the sand, and reside near the surface of the burrow, blocking the entrance with their large heads, and wait for prey, which they capture with sickle-like mandibles ([CTDEEP 1999](#)). After 2 to 4 weeks, the larvae molt into a slightly larger second-instar stage, which dig burrows that are 1.5 to 2 feet deep ([CTDEEP 1999](#)). They will then remain active until they close their burrows for the winter. In approximately mid-May of the following spring, they become active and open their burrows to feed through mid-June. They then close their burrows until early September when they molt to the third-instar larval stage. These larvae remain active until they close their burrows and overwinter for a second winter. At Rainbow Beach, active larvae have been documented until late fall or early winter, with Gwiazdowski ([2020](#)) and Gwiazdowski ([2022a](#)) documenting active larvae at Rainbow Beach in late November and early December.

Larval Puritan Tiger Beetle capture prey from their burrow openings ([USFWS 1993a](#)). Though submersion of Puritan Tiger Beetles has not been tested, studies on other species have shown that the larval stages of Tiger Beetles can close their burrows and withstand submersion for longer than adults ([Brust and Hoback 2009](#)). Of six larvae Tiger Beetle species tested, all survived submersion for more than 56 hrs (2.3 days) and the longest period of survival post submersion was 136.6 hrs (5.7 days) ([Brust and Hoback 2009](#)). Brust et al. ([2005](#)) found that survival of riverine shoreline populations of a different species of tiger beetles was relatively high for four days of immersion, but further submersion resulted in much fewer surviving. It should be noted that the tests for riverine populations were limited to hypoxic water, and none were tested for survival in aerated water ([Brust et al. 2005](#)). In riverine habitats where there is dissolved oxygen present in the water, especially during times of high river flow and submersion, larvae could remain in burrows and extract dissolved oxygen from the water and survive for longer periods ([Brust et al. 2005](#)). It is therefore likely that the larvae of Puritan Tiger Beetles along the Connecticut River in Massachusetts would be able to survive relatively long periods of inundation because dissolved oxygen concentrations in the river, especially during inundation periods, would be relatively high ([FirstLight 2016b](#)).

Inundation of larval Puritan Tiger Beetles also routinely occurs within populations that exist along tidal beaches. Though the tidal effects have not been studied for the Puritan Tiger Beetle larvae, a similar species, the Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*), is known to benefit from tidal

fluctuations (USFWS 1994). Periodic inundation is important to larvae of this species by providing both moisture that prevents desiccation and abundant prey that allows for greater growth rates (USFWS 1994). It is generally unknown as to whether the effects of Project-induced water level fluctuations at Rainbow Beach are resulting in net-positive or net-negative effects. Potential positive effects could include replenishment of moisture and food sources, whereas potential negative effects could include disturbance to behavior or too-frequent inundation of low-elevation larvae. However, it is not possible to accurately quantify these contrasting effects.

5.2 Adult Life Stage

Adults emerge from larval burrows and are present at Rainbow Beach from the third week of June until the end of August, with numbers typically peaking during the latter half of July (C. Davis, *pers. comm.*). Based on a survey performed by Babione (2003), emergence occurs at night. After they emerge, adults typically live for a month or less (Abbott 2003), during which they forage for arthropods and mate on open sandy beaches adjacent to larval sites. They cannot withstand as much submersion time as larvae, with reported submersion survival of other species of adult tiger beetles ranging from 9-22 hours, though some findings indicate that adults could survive up to 72 hours of submersion (Brust and Hoback 2009; Brust et al. 2005). Adult Puritan Tiger Beetles are most active on warm sunny days from the time they emerge through August (Abbott 2003), and actively feed in the wrack along the shoreline (USFWS 1993). Adults are not typically active near the water-land interface during the night at Rainbow Beach. They have been observed moving to the higher elevations of the beach in the later part of the day (C. Davis, *pers. comm.*). Puritan Tiger Beetle adults are known to select specific sites for oviposition, with the composition and texture of sand being an important factor for effective oviposition, egg survival, and subsequent larval development (Omland 2002; Gwiazdowski 2020). At Rainbow Beach, this area is a narrow strip along the upper elevations of the beach, near the vegetation line. The sand here is denser than many other areas of the beach and is being selected for oviposition by the adult beetles (C. Davis, *pers. comm.*). Recent surveys documented habitat suitable for oviposition in areas where silt was deposited after high flow events on the Connecticut River (Davis 2020). Gwiazdowski (2020; 2022b) performed surveys to identify locations of oviposition in 2020 and 2021, but did not positively identify oviposition in the quadrat closest to the water-land interface in 2020, and in 2021 the oviposition holes documented would not have been distinguishable from those made by *C. repanda*.¹⁷ The primary adult Puritan Tiger Beetle activity at night is oviposition, which has been observed in the larval habitat area in the evenings as temperatures cool down, typically from 5:00pm through 11:00pm (C. Davis, *pers. comm.*). However, surveys from Gwiazdowski (2020) of a different Puritan Tiger Beetle population near Cromwell, CT documented oviposition occurring from the late afternoon, through the night, and into the morning hours. Though the sample size was small, Gwiazdowski (2020) also observed oviposition holes at Rainbow Beach between approximately 7:00am and 10:00am, which could have been made in the morning hours.

5.3 Population Status

5.3.1 Rangewide

Puritan Tiger Beetles occur in two distinct regions: along the Chesapeake Bay in Maryland and along the Connecticut River in New England (USFWS 2019). The Chesapeake Bay population consists of two metapopulations, one of which is located on the western shore of the bay in Calvert County and the other is located along the Sassafras River portion of the eastern shore of the bay (USFWS 2019). The New England population consists of one metapopulation along the Connecticut River in tidal waters of Connecticut, and at a single location further upstream in Massachusetts at Rainbow Beach.

¹⁷ Though some oviposition holes were identified at Rainbow Beach by Gwiazdowski (2022), there were also active *C. repanda* adults observed during the survey and there is no way to distinguish between *C. repanda* and *E. puritana* oviposition holes.

5.3.1.1 Chesapeake Bay Population

Puritan Tiger Beetles along the Chesapeake Bay occupy naturally eroding cliffs and are most abundant at sites where the bluffs are long and high with sandy soil and little to no vegetation (USFWS 2019). Erosion of the bluffs is considered to be an important process for maintaining larval habitat (USFWS 2019). The Calvert County metapopulation consists of eleven extant subpopulations and tends to be largest with total population estimates between 4,000 and 8,000 beetles depending on the year (USFWS 2019). Though there has been high variability in counts between years, there is no apparent population trend (USFWS 2019). The largest subpopulations are at Warrior Rest and Calvert Cliffs State Park, both of which are protected from development and are largely undeveloped (USFWS 2019). The Sassafras River/Eastern Chesapeake Bay metapopulation consists of eleven documented subpopulations of varying sizes, with a total population size between 2,000 and 6,000 individuals per year (USFWS 2019). Despite large fluctuations, this population has exhibited an increasing trend (USFWS 2019).

Because several of the subpopulations within both the Calvert County and Sassafras River metapopulations follow similar patterns through time, it is likely that they are primarily influenced by large-scale weather patterns that exhibit similar effects on the habitat or the beetles across a relatively large area (USFWS 2019).

5.3.1.2 New England Population

Metapopulations of Puritan Tiger Beetle in New England once ranged as far upstream as Claremont, New Hampshire, though most historical locations were located between Hadley, MA and Cromwell-Portland, CT (USFWS 2019). The only extant locations are near Cromwell-Portland, CT and Hadley/South Hadley, MA at Rainbow Beach. Puritan Tiger Beetle have not been observed at any of the other historical sites on the Connecticut River since the early 1900's to 1930's (USFWS 1993a; USFWS 2019). The Connecticut metapopulation is relatively large and consists of four primary subpopulations. The total beetle counts of the metapopulation reached 1,631 individuals in 2012, but have been lower in recent years, averaging approximately 500 individuals. The Cromwell North subpopulation has represented much of the total population since the mid 2000's. This was not always the case; the Cromwell South subpopulation consistently represented a substantial proportion of the population prior to the mid-2000's, though counts there have been extremely low in recent years (USFWS 2019). USFWS (2019) did not identify this as an issue or state any reasons for the decline of this subpopulation, possibly because the overall size of the Connecticut metapopulation has been stable, though the decline of the Cromwell South population could be due to increased vegetation growth at this area (C. Davis, *pers. comm.*).

By comparison, the Massachusetts population at Rainbow Beach consists of a single location and is much smaller than all other populations. Though small numbers of Puritan Tiger Beetles have been observed in the surrounding areas, Rainbow Beach is the only known location supporting the population. Additional details are provided in [Section 5.3.2](#), as the entire population is within the action area.

5.3.2 Action Area

The Puritan Tiger Beetle population, with its two-year life cycle, contains two cohorts with adults that emerge in even and odd years. Counts of Puritan Tiger Beetles at Rainbow Beach have typically been lower than 20 individuals in most years, with the exception of years that were influenced by population augmentation methods, when counts have exceeded 80 individuals (USFWS 2019, [Figure 5.3.2-1](#)). The most recent peak count data published after USFWS (2019) was 101, 143, and 202 adults in 2019, 2020, and 2021, respectively (unpublished data, C. Davis, *pers. comm.*). The peak daily counts represent approximately 38% of the total adult count for that year (C. Davis, *pers. comm.*). The recent increases in Puritan Tiger Beetle counts were associated with augmentation efforts at Rainbow Beach.

The habitat at Rainbow Beach has been subjected to several threats. Heavy recreational use at Rainbow Beach has been well-documented, along with the encroachment of non-native vegetation. These threats pose both direct threats to the physical habitat, and recreational usage has been shown to further affect

Puritan Tiger Beetle by disturbing their feeding and breeding ([Abbott 2003](#)). Another species of tiger beetle, *Cicindela repanda*, also inhabits Rainbow Beach, and in greater numbers than the Puritan Tiger Beetle; this species has the potential to affect populations of Puritan Tiger Beetle via interspecies competition ([Knisley \(n.d.\)](#); [USFWS 2019](#)), though there is some separation in timing of activity periods between Puritan Tiger Beetle and *C. repanda* that may limit the degree to which interspecies competition occurs at Rainbow Beach (C. Davis, *pers. comm.*). It should be noted that Gwiazdowski ([2022b](#)) documented active *C. repanda* adults at the same time that oviposition surveys were being performed for *E. puritana*.

Changes in flow regimes from upstream have been theorized to be affecting the habitat, and potentially beetle behavior, because much of Rainbow Beach is relatively shallow-sloping and is sensitive to changes in water level. To explore this further, FirstLight has plotted the distribution of flows encountered by 2-year Puritan Tiger Beetle cohorts, along with the peak counts observed as adults ([Figure 5.3.2-2](#)). There was no apparent correlation between the flow distributions (i.e., high, medium, low flow distributions) encountered by Puritan Tiger Beetle cohorts and their peak counts.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

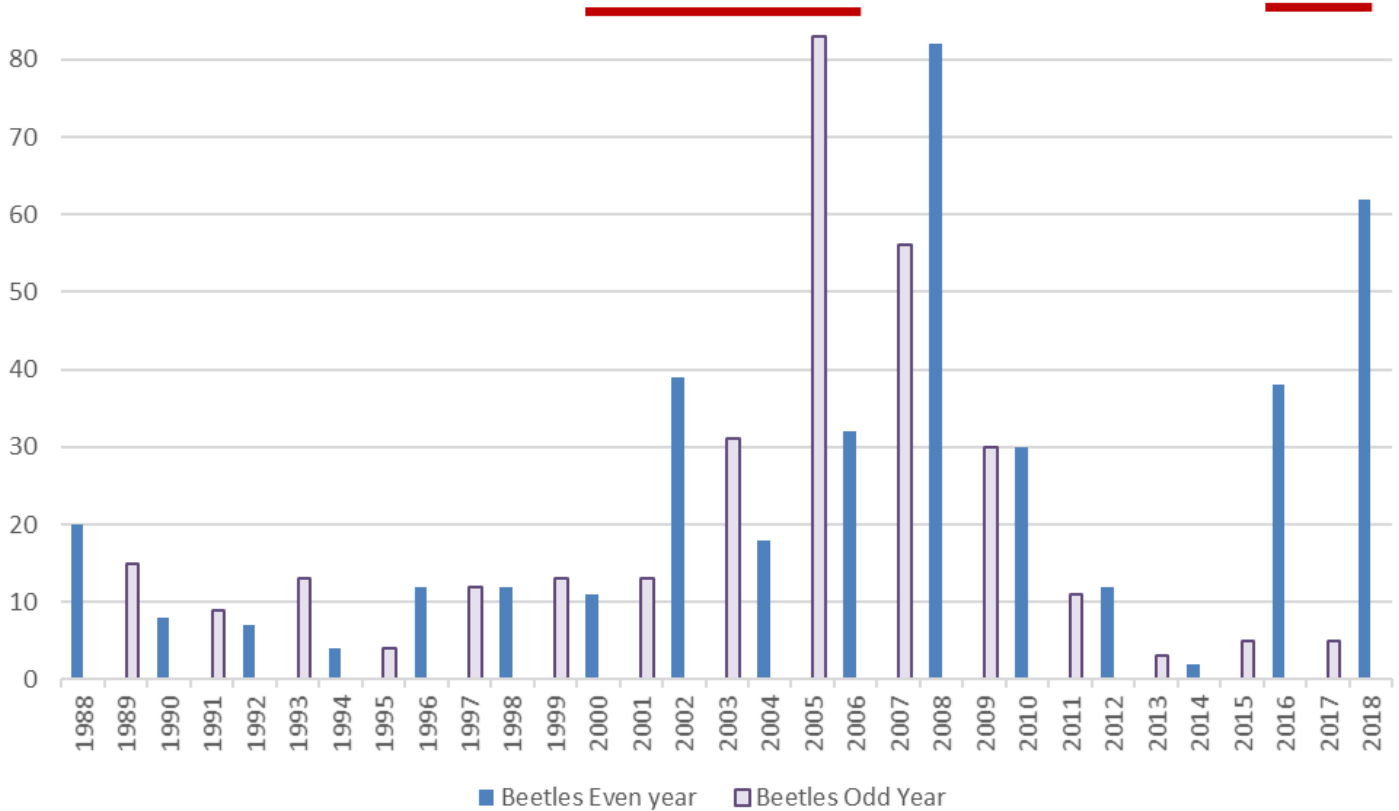


Figure 5.3.2-1: Plot from USFWS (2019) showing peak Puritan Tiger Beetle counts at Rainbow Beach, Massachusetts, including the years where lab-reared larvae were introduced to the site to augment the population, 1988-2018.

Note: Red horizontal bars at the top of the plot indicate periods when the population was augmented, and the effects of augmentation could also last for several years if augmentation resulted in successful breeding of translocated individuals and if survival of their progeny occurred.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

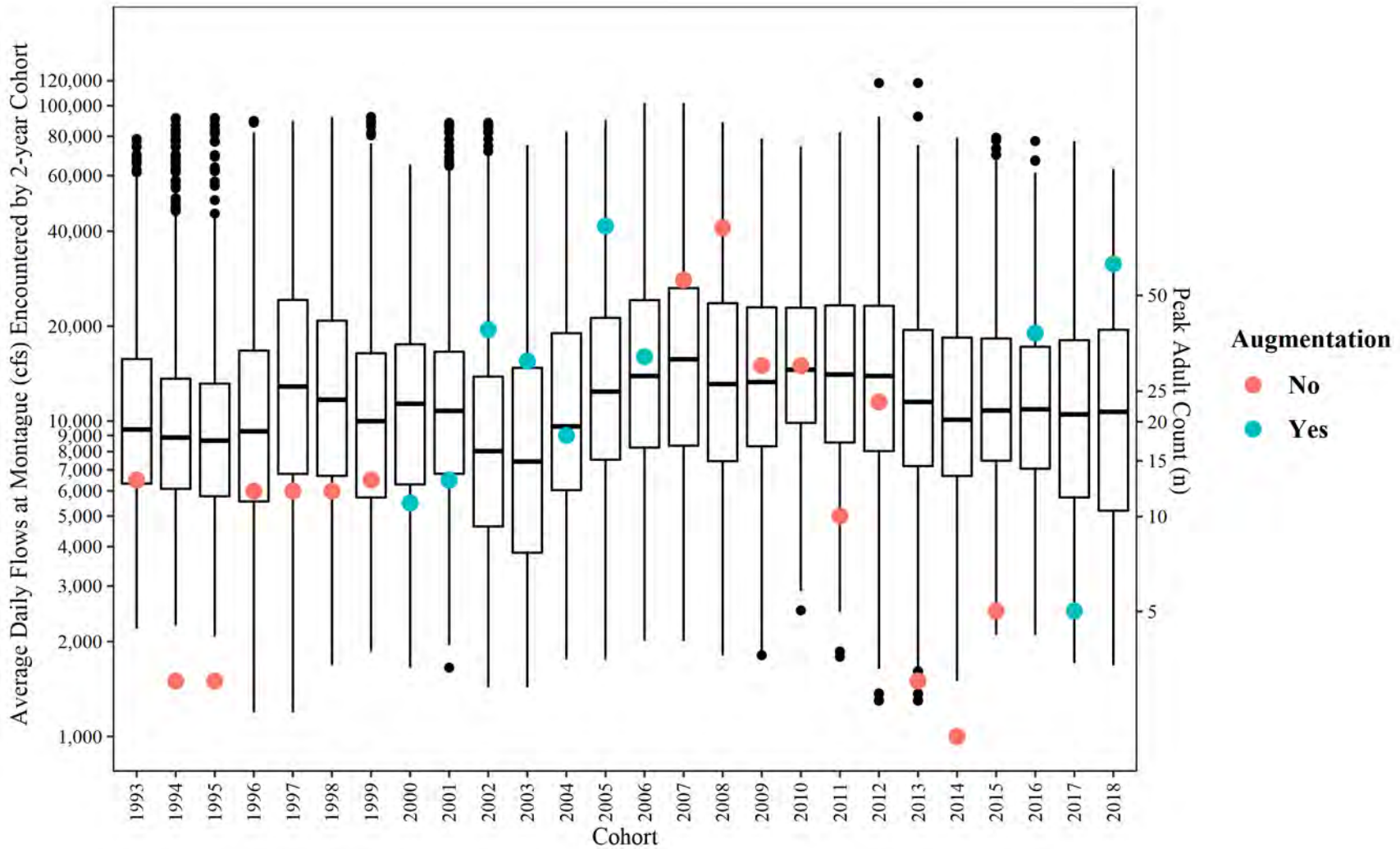


Figure 5.3.2-2: Average Daily Flows in the Connecticut River at Montague Encountered by Puritan Tiger Beetle Cohorts and Adult Counts of those Cohorts, 1993 through 2018.

Note: Years when the population was augmented are noted in the plot. The distribution of average daily flows that is included for each cohort includes two years of flow data at Montague, MA, ranging from July 1 two years prior to the adult count, to the end of June of the year of the adult count (i.e., for the 1994 cohort, flow data ranged from July 1, 1992 through June 30, 1994). The boxplots can be interpreted as follows: Bold line = Median; Top and bottom of box are 75% and 25% percentile flows, respectively; Whiskers represent reasonable extreme flows that are uncommon; Points are outlier flows.

5.4 Cumulative Effects

FirstLight considered past, present, and reasonably-foreseeable activities that could have cumulative effects on the Puritan Tiger Beetle on Rainbow Beach in conjunction with the Project proposals. For the purposes of this Draft BA, the future is defined as the duration of the new licenses for the Northfield Mountain and Turners Falls Projects.

5.4.1 Alterations to Hydrology

The underlying hydrology at Rainbow Beach has been altered by the development and operation of storage reservoirs further upstream in the watershed. The flow in the Connecticut River at the Northfield Mountain and Turners Falls Projects is influenced by these upstream storage reservoirs, which alter river hydrology by decreasing high flows in the spring and increasing low flows in the summer. Hydrology is also affected by USACE flood control dams on tributaries to the Connecticut River upstream of Turners Falls Dam, specifically:

- Union Village: Ompompanoosuc River;
- Dewey Mills and North Hartland: Ottauquechee River;
- Stoughton Pond and North Springfield: Black River;
- Ball Mountain and Townshend: West River;
- Surry Mountain and Otter Brook: Ashuelot River; and
- Tully Lake and Birch Hill; Millers River.

Main-stem dams on the Connecticut River that include sizable storage include:

- Second Connecticut Lake Dam;
- First Connecticut Lake Dam;
- Murphy Dam (Lake Francis);
- Moore Dam; and
- Comerford Dam.

Changes in operation of these reservoirs have the potential to change the frequency, timing, and magnitude of flows that enter the Project areas, which could then result in larger-scale changes in flow patterns of the water passing through the Turners Falls Project that will then flow to Rainbow Beach. Additionally, two storage reservoirs similarly affect the hydrology in the Deerfield River¹⁸, which enters the Connecticut River below the Turners Falls Project but upstream of Rainbow Beach. Changes in how these storage reservoirs operate could occur in the future through federal relicensing or alterations to flood control practices. Substantial alterations to hydrologic patterns could affect Puritan Tiger Beetle habitat at Rainbow Beach by changing the frequency, timing, and magnitude of flows and inundation of habitat. The topography of Rainbow Beach is known to change over time, given its sandy characteristics along a river bend, and changes in the underlying hydrology and associated sediment loading and deposition could affect the topography and substrate suitability of the beach. In general, the overall effects that these actions would have on the Puritan Tiger Beetle or its habitat are unknown but would require separate consultation pursuant to Section 7 of the Endangered Species Act. USFWS (1993a) identified these historical changes in hydrology as an impact on the underlying processes that create and maintain Puritan Tiger Beetle habitat.

¹⁸ Storage reservoirs in the Deerfield River include Somerset and Harriman.

Additionally, changes in daily operations of FERC-regulated hydropower dams in the Connecticut River upstream of the Turners Falls and Northfield Mountain Projects could affect daily flow fluctuations on the Connecticut River at Rainbow Beach by changing daily and hourly inflows arriving at the Projects. The FERC-regulated projects on the main-stem of the Connecticut River listed upstream to downstream include:

- Canaan;
- Gilman;
- Moore;
- Comerford;
- McIndoes;
- Dodge Falls;
- Wilder;
- Bellows Falls; and
- Vernon.

Great River Hydro's Wilder, Bellows Falls and Vernon Projects, which are currently undergoing licensing, filed its AFLA with FERC on December 7, 2020. Per the AFLA, Great River Hydro, with support from relevant state and federal resources agencies, and regional and national non-governmental organizations, proposed modified project operations at all three facilities aimed at reducing the frequency, amplitude and rate of change in project-related discharge and water surface fluctuations. The proposed operation focuses on creating more stable discharges from all three projects year-round, except for a select number of hours where the Licensee is permitted to operate in "flex mode", which allows the Licensee to be responsive to current wholesale energy, forward capacity, reserve, and other ancillary services markets managed by the New England Independent System Operator (ISO-NE).

In fact, when the Vernon Project operates in a "flex mode", FirstLight will be dampening peaking releases through its calculation of the NRF (see Article A110, Definition of Naturally Routed Flow).

Though these effects appear to be relatively minor in comparison to greater hydrologic changes in the watershed, alterations to those operations could also have some daily or sub-daily effects on Puritan Tiger Beetle habitat inundation. It is anticipated that the operations proposals of Great River Hydro, along with the operations of FirstLight's Proposed Action, will cumulatively reduce the frequency and magnitude of daily and sub-daily changes in river flow that could affect Puritan Tiger Beetle habitat inundation.

5.4.2 Historical Construction of Dams

The historical construction of several dams on the Connecticut River likely inundated locations containing historic Puritan Tiger Beetle habitats. Currently, there are very few areas with suitable habitat for Puritan Tiger Beetle on the Connecticut River. These dams have also altered sedimentation processes in the river, which could have been historically important to the development of beach and sandbar areas that may have supported populations of Puritan Tiger Beetles either permanently or ephemerally. The status of Puritan Tiger Beetle at Rainbow Beach prior to the development of Holyoke Dam is not known. However, the habitat on and around Rainbow Beach may have been quite different prior to the development of Holyoke Dam and the associated impoundment. Currently, Rainbow Beach is within the Holyoke Impoundment, the operation of which can affect habitat inundation on the beach as described in the following section.

5.4.3 Water Level Management at Holyoke Dam

The Holyoke Project owned by HG&E was issued a new license by FERC on August 20, 1999 and the MDEP issued a final Water Quality Certification (WQC) in 2001. The Project currently consists of a 30-

foot-high, 985-foot-long dam topped by five 3.5-foot-high inflatable rubber dam sections that were installed in 2001. There are two hydropower units at the Holyoke Dam with a total hydraulic capacity of 8,270 cfs. Holyoke Dam also feeds the Holyoke Canal System with multiple hydropower units and a total capacity of about 6,000 cfs resulting in a total flow used for hydropower generation of about 14,250 cfs. As part of the license, the Holyoke Impoundment was required to be operated in a run-of-river mode with a variation of +/- 0.2 feet from the normal impoundment level of 100.37 feet. On March 12, 2004, HG&E filed a Settlement Agreement with the FERC that proposed resolutions of a series of issues raised upon rehearing of the August 20, 1999 project license. In an order issued April 19, 2005 (2005 Order), the FERC approved the Settlement Agreement and revised a number of license articles accordingly. The 2005 Order also incorporated the 2001 WQC and a January 27, 2005, Biological Opinion (BO) issued by the NMFS. In 2006, FERC issued an order accepting Holyoke's proposed plan on how ROR project operations would be achieved, monitored and recorded. In addition, this Order also approved Holyoke's proposal to test modifications of ROR provisions (by increasing the amount of Water Surface Elevation (WSE) fluctuation at the Holyoke Dam) to more effectively limit water level fluctuation on the Puritan Tiger Beetle at Rainbow Beach. In 2008, Holyoke submitted a report to FERC containing the results of modified ROR study that showed that the modified ROR procedures are beneficial to the Puritan Tiger Beetle (by limiting the daily WSE fluctuations) at Rainbow Beach and also results in a smoothing effect of flows downstream of Holyoke. Then, after additional studies and agency consultation, FERC issued on May 18, 2016, an order amending the comprehensive Operations and Flow Plan with a WSE range at the Holyoke Dam of between 99.2 and a normal maximum of 100.6 feet. Based on discussions with HG&E, the WSE fluctuation is generally between 99.47 and 100.67 feet. In studies performed by HG&E, the lower limit was shown to reduce impoundment elevations and water level fluctuations at Rainbow Beach, which would be beneficial to the Puritan Tiger Beetle when inflows are less than 11,000 cfs ([HG&E 2012](#); [HG&E 2015](#)).

The range of water levels licensed at Holyoke Dam can affect inundation of Puritan Tiger Beetle habitat to a greater degree than operations of the Turners Falls and Northfield Mountain Projects, as shown in analyses presented in [Section 6](#) of this Draft BA. FirstLight did not have access to long-term water level data from the Holyoke Project¹⁹ in its analyses to fully understand how it is operated in relation to incoming flows from the Projects; however, water level data collected in 2012 and associated modeling of water levels at Rainbow Beach suggest that the Holyoke Project is typically operated in between the high and low impoundment conditions ([Appendix D](#)). The license for the Holyoke Project expires in 2039, which would occur within the duration of the proposed licenses at the Turners Falls and Northfield Projects. Changes to licensed water level operations at Holyoke Dam would have the potential for impacts (positive or negative) for Puritan Tiger Beetles and would require separate consultation pursuant to Section 7 of the Endangered Species Act.

5.4.4 Recreational Usage of the Rainbow Beach Conservation Area

The presence of Rainbow Beach Conservation Area provides protection for the Puritan Tiger Beetle habitat by preventing development and restricting use of the land along Rainbow Beach. However, management of the conservation area by the Commonwealth of Massachusetts and the City of Northampton also has the potential to affect the population of Puritan Tiger Beetles at Rainbow Beach. Heavy recreation use is likely negatively impacting the population of Puritan Tiger Beetles at Rainbow Beach (see [Section 4.2.1](#)). Restrictions for recreational use, and enforcement practices, are likely to change with time. Recreation on Rainbow Beach is heavy during the summer months, especially during hot, dry summer periods ([HG&E 2008](#)). For example, in summer 2005, which was long and hot, HG&E ([2008](#)) documented that 3,094 recreationalists had used Rainbow Beach, 1,539 of which were estimated to be on the beach, 555 in the water, and 1,000 on boats. As identified in [Section 4.2.1](#), current levels of recreation may be higher than historically documented.

¹⁹ FirstLight requested water level data from HG&E several times but no data were provided.

Greater restriction and enforcement of measures that could protect Puritan Tiger Beetles would offer the greatest benefit to the population, whereas further relaxed restrictions and limited enforcement could result in negative impacts to the population. Additionally, management actions to control vegetation on and along Rainbow Beach are important for maintenance of Puritan Tiger Beetle habitat; previous vegetation treatments at Rainbow Beach were found to be inadequate to maintain larval habitats, and in the case of some early vegetation management efforts (2001-2004), resulted in increased plant growth due to disturbance of the substrate ([USFWS 2019](#)). Further experimental vegetation control efforts are currently underway, and if they are successful, could provide a benefit to Puritan Tiger Beetle, as they have shown to be for a population on the Sassafraz River in Maryland. Alternatively, limiting the extent of effective methods and/or ending vegetation control efforts in the future could negatively impact Puritan Tiger Beetle.

5.4.5 Contaminants and Water Quality

Industries along the Connecticut River include or have included in the past, hydroelectric and other energy generating facilities, an armory, firearms factory, industrial mills and various other industrial pursuits. The effect of general pollution on Puritan Tiger Beetle along the Connecticut River is unknown.

Pulp mill, silvicultural, agricultural, and sewer discharges, as well as a combination of non-point source discharges containing elevated temperatures or high biochemical oxygen demand, can reduce DO concentrations, which could affect submerged Puritan Tiger Beetle larvae that rely on pulling DO from the water during submersion periods. Recent water quality studies performed by FirstLight suggest that DO is generally good in the Connecticut River, but low DO may have been an issue historically. Point source discharge (i.e., municipal wastewater, paper mill effluent, industrial or power plant cooling water or waste water) and compounds associated with discharges (e.g., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of the Puritan Tiger Beetle population.

The New England Interstate Water Pollution Control Commission issued a report in early 1998 on water quality threats. This report indicated that the Connecticut River had several major water quality issues. These included: toxins, such as polychlorinated biphenyls (PCBs); combined sewer overflows (CSOs) which can cause poor water quality conditions in urban areas after storm events; and non-point source pollution.

5.4.6 Global Climate Change

Global climate change is predicted to have several effects to the Connecticut River watershed, including increasing the frequency of flood events each year, earlier spring snowmelt, increases in winter/spring precipitation, and less snowfall and accumulation of snowpack ([Kennedy et al. 2018](#)). Changes to regional climate over the span of the Project licenses could therefore result in alterations to the processes that underlie maintenance of the habitat structure and inundation patterns at Rainbow Beach (e.g. sedimentation processes and seasonal hydrology).

5.4.7 Native and Non-Native Species Interactions

Competition and predation on adults by *C. repanda* was identified by Knisley ([n.d.](#)) to be a natural mortality factor for Puritan Tiger Beetle. *C. repanda* is a native species of tiger beetle known to be present on Rainbow Beach in considerably high abundance compared to the Puritan Tiger Beetle ([USFWS 2019](#)). As such, *C. repanda* could be limiting, and may affect the future of the Puritan Tiger Beetle population at Rainbow Beach through interspecies interactions.

There are also predators to Puritan Tiger Beetles, including vertebrate and invertebrate insectivores that may feed on adults, along with parasitic wasps that lay eggs on tiger beetle larvae, after which the wasp larvae parasitize the tiger beetle larvae ([Knisley n.d.; USFWS 1993a](#)). Changes in populations of these species, expansions of these species due to climate change or anthropogenic effects, or introductions of

non-native species that may occur over the term of the proposed Project licenses, could all impact Puritan Tiger Beetle populations.

6 EFFECTS ANALYSIS

The effects analysis of this Draft BA compares the proposed action ([Section 3](#)) to the environmental baseline condition. Environmental baselines include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this Draft BA includes the effects of several activities that may affect the survival and recovery of the endangered species in the action area. Because the Turners Falls Project and Northfield Mountain Project are existing, FERC-licensed facilities, ongoing effects of the Projects as currently licensed on listed species are part of the environmental baseline.

For the purpose of the analyses in the sections below, the environmental baseline for Project operations is considered to be current licensed operations and is hereafter referred to as the baseline condition. The proposed condition analyzed includes operational changes associated with FirstLight's relicensing proposal.

Evaluating Project effects on Puritan Tiger Beetle relies on several approaches combined to accurately depict conditions in a complex and changing riparian environment. These approaches include:

- Establishing the locations and elevations of Puritan Tiger Beetle occupancy at Rainbow Beach using survey data ([Section 6.1.2](#))
- Determining the flow, water level, and habitat occupancy relationships at Rainbow Beach using relationships between constant-flow hydraulic models ([Section 6.1.3.1](#))
- Characterizing flow and water level attenuation between the Turners Falls Project and Rainbow Beach by developing synthetic hydrographs ([Section 6.1.3.2](#))
- Evaluating the frequency and magnitude of exposure to operational effects by analyzing water level timeseries data (hourly) developed using unsteady-state²⁰ hydraulic modeling, where input flows were based on flow data from the Connecticut River ([Section 6.1.4](#)). This analysis takes into account the attenuation and lag of flows from Montague to Rainbow Beach
- Comparing Baseline and Proposed conditions by analyzing water level timeseries data developed using unsteady-state hydraulic modeling, where flow inputs were based on modeled operational conditions ([Section 6.1.5](#))

Two models were used for this assessment as described below.

Hydraulic Model

FirstLight developed a hydraulic model²¹ of the Connecticut River from the Montague USGS gage to Holyoke Dam. The model was calibrated to observed water surface elevations in this reach and was used to predict water elevations at Rainbow Beach under existing and proposed operations. Background on the hydraulic modeling is included in the report: Relicensing Study 3.2.2 – Hydraulic Modeling of Turners Falls Impoundment, Bypass Reach, and below Cabot Station. Unsteady-state hydraulic models were ultimately used to evaluate how baseline and proposed operations could impact water levels at Rainbow Beach.

²⁰ Unsteady-state means the flow changes from hour to hour, similar to a time-varying hydrograph.

²¹ The hydraulic model used is the Hydroelectric Engineering Center's River Analysis System (HEC-RAS) software.

Given that observed water level data were not available at Holyoke Dam for timeseries modeling, both high and low Holyoke Impoundment conditions were evaluated separately for various modeling analyses; however, it should be noted that, based on a small amount of water level data available at Holyoke Dam from 2012, modeled water levels at Rainbow Beach are typically in between water levels modeled for high and low operating ranges when actual historic Holyoke Impoundment data are used ([Appendix D](#)).

Operations Model

FirstLight developed an operations model²² of the Connecticut River that included Great River Hydro's Wilder, Bellows Falls, and Vernon Hydroelectric Projects, FirstLight's Northfield Mountain Pumped-Storage Project and Turners Falls Hydroelectric Project, and HG&E's Holyoke Hydroelectric Project. The model was developed on an hourly time step for the period 1962-2003. The operations model is a tool to simulate different operating conditions (bypass flows, peaking restrictions, ramping restrictions, water level restrictions, etc.). The operations model was used to simulate baseline conditions and the proposed conditions as outlined in [Section 3](#). The key output from the operations model that was used for the Puritan Tiger Beetle assessment is the flow at Montague. The flow at Montague under baseline and proposed conditions was used as "input" to the hydraulic model. Background on the operations modeling is included in the report: Relicensing Study 3.8.1 – Evaluate the Impact of Current and Proposed Future Modes of Operation on Flow, Water Elevation, and Hydropower Generation.

²² The operations model used is the Hydroelectric Engineering Center's Reservoir System Simulation (HEC-ResSim) software.

6.1 Exposure to Project Elements

6.1.1 Project Elements

The Projects have operated under the current licenses since May 5, 1980 and May 14, 1968 for the Turners Falls Project and Northfield Mountain Project, respectively. Proposed construction and routine maintenance would be confined to the direct Project areas, many miles from the Puritan Tiger Beetle habitat at Rainbow Beach ([Table 6.1.1-1](#)). Therefore, the only Project element that could affect the Puritan Tiger Beetle is Project operations, which can affect water levels downstream to Holyoke Dam.

Table 6.1.1-1: River Miles of Major Project Features relative to Rainbow Beach and Puritan Tiger Beetle Habitat

Location	River Mile	Relative River Mile from Rainbow Beach
Vernon Dam*	142.1	47.8
Northfield Mountain Tailrace	127.3	33.0
Turners Falls Dam	122.2	27.9
Station No. 1	121.1	26.8
Cabot Station	119.3	25.0
Lower End of Turners Falls Project Boundary	119.0	24.7
Montague USGS Gage**	118.5	24.2
Rainbow Beach (Puritan Tiger Beetle Habitat)	94.3	0.0
Holyoke Dam*	85.5	-8.8

*Vernon Dam and Holyoke Dam are not Project features but are included because they are considered the upstream and downstream extents, respectively, of the operational project element for the Northfield Mountain and Turners Falls Projects.

** The Montague USGS Gage is also not a project feature and is located on the Connecticut River just downstream of the confluence with the Deerfield River.

6.1.2 Locations of Larval Puritan Tiger Beetle Relative to Water Levels

The topography of Rainbow Beach was surveyed by FirstLight in November 2014 and October 2021 using a Real-Time Kinematic Global Positioning System (RTK-GPS), which provided survey-grade accuracy of both location and elevation. Gwiazdowski ([2020](#); [2022a](#)) established larval survey transects along the topographic transects from 2014.

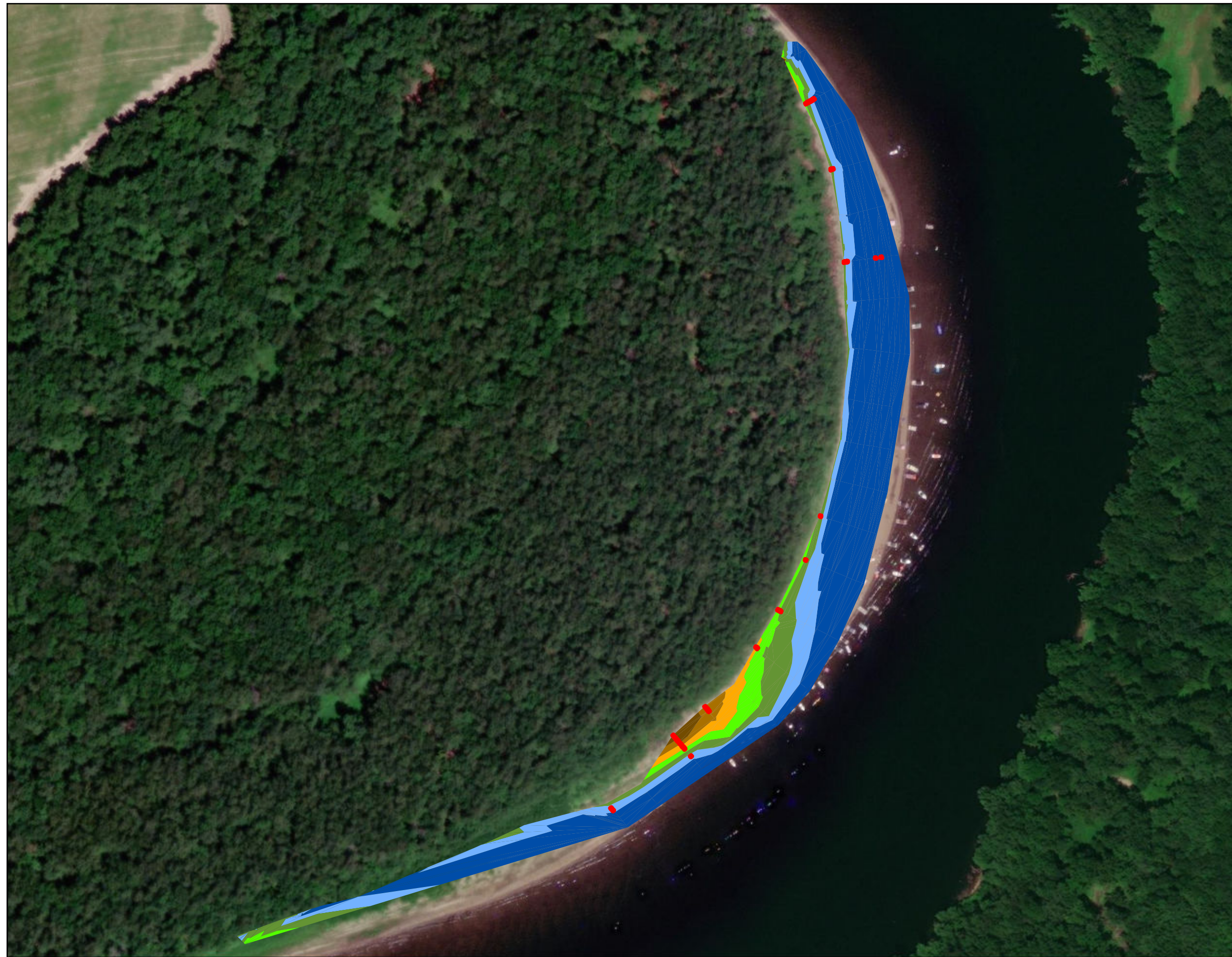
The topographic survey data were used to develop a terrain model based on the 2021 data, which were closer in time to larval distribution assessments that were performed in 2020 and 2021 ([Figure 6.1.2-1](#)). In general, *E. puritana* at Rainbow Beach tend to be clustered in some of the northernmost and southernmost areas along the beach, and also in the higher elevation locations near the vegetation line (e.g., [Gwiazdowski 2022](#)). The locations of larval Puritan Tiger Beetle in relation to elevation at Rainbow Beach was determined based on observed larvae along the surveyed transects.²³ The surveys for Gwiazdowski ([2020](#); [2022a](#)) typically reached elevations as low as 102-102.5 feet, but occasionally reached elevations nearly down to 100 feet ([Table 6.1.2-1](#)). Additionally, the survey performed by Davis ([2021](#)) extended to the water's edge when the water surface elevation was directly measured at 100.5 feet. Larvae were documented between elevations 101.9 and 108.8 feet, with relatively few located at the lowest elevations and most located between 103 and 108 feet ([Figure 6.1.2-2](#)). Many larvae were also clustered at an elevation of nearly 108 feet. Water levels that would reach the observed larval locations depend on both the flow in the Connecticut River and the operations of the Project and are evaluated further in [Section 6.1.3](#).

Adult Puritan Tiger Beetle can be found anywhere on the beach from the edge of dense vegetation to the water's edge, though they tend to prefer the cooler, damper locations at the highest and lowest elevations along the beach for their various activities (e.g., foraging/mating near the water's edge, oviposition at higher elevations). Because the location of the water-land interface is dependent on flow in the river at Rainbow Beach, along with the water level at Holyoke Dam, the actual foraging/mating locations of Puritan Tiger Beetle would be variable with time.

²³ Survey methodologies by Gwiazdowski (2020), Davis (2021), and Gwiazdowski (2021) included 1-m quadrats of presence/abundance of larvae along the surveyed transects.

Table 6.1.2-1: Lowest Elevations Sampled for Larval Puritan Tiger Beetle, by Survey Date for Gwiazdowski (2020; 2022a)

Survey Date	Lowest Elevation Quadrat (ft, NGVD29)
7/30/2020	100.4
9/24/2020	100.4
10/14/2020	100.3
11/9/2020	102.6
7/28/2021	102.5
8/9/2021	102.3
8/11/2021	101.6
9/17/2021	102.1
9/29/2021	102.1
10/13/2021	102.0
10/29/2021	102.0
11/17/2021	102.9
12/1/2021	102.3



FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Figure 6.1.2-1:
 Rainbow Beach Topography

Legend

■ Puritan Beetle Observations (Larval)

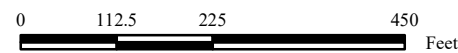
Elevation (ft, NGVD29)

- >108'
- 107' to 108'
- 106' to 107'
- 105' to 106'
- 104' to 105'
- 103' to 104'
- 100.2' to 103'

Aerial Imagery Flown:
 August 1, 2020
 Elevation Data Collected:
 October 1, 2021



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
 Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



1 inch = 225 feet



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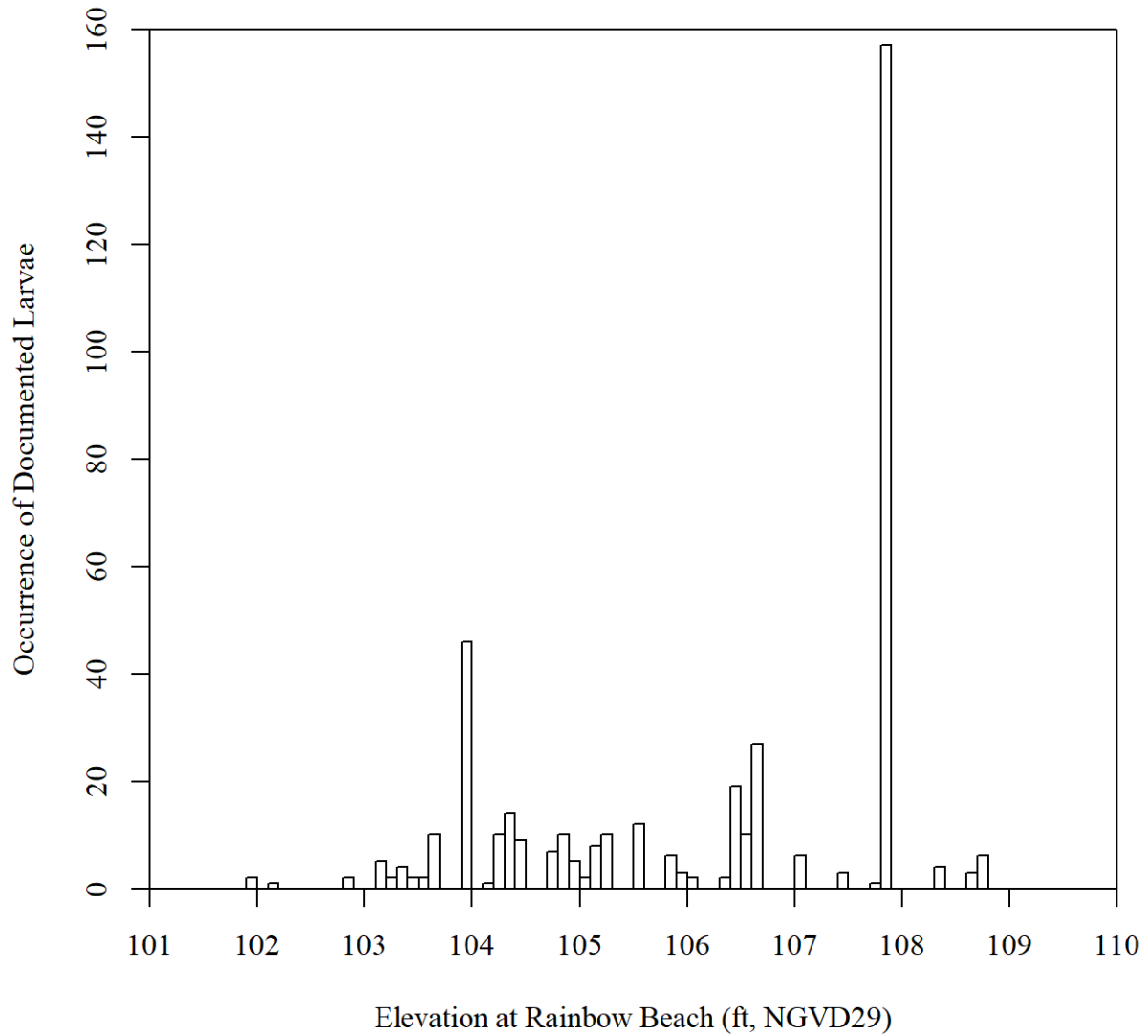


Figure 6.1.2-2: Elevations of Larval Puritan Tiger Beetle Observed at Rainbow Beach, 2020-2021
Note: Data were combined from Gwiazdowski (2021), Davis (2021), and Gwiazdowski (2022a).

6.1.3 Effects of Flows on Water Levels at Rainbow Beach

6.1.3.1 Flow and Water Level Relationships at Rainbow Beach

Water levels at Rainbow Beach in the Connecticut River were calculated using hydraulic modeling of constant flow rates, and the relationship was developed by interpolating between the modeled flow rates. During high Holyoke Impoundment conditions, water levels at Rainbow Beach are also higher at comparable flows, though sensitivity to Holyoke Impoundment conditions decreases with increasing flow rates (Figure 6.1.3.1-1).

Relating these steady-state flow conditions to the elevations at which Puritan Tiger Beetle larvae were documented, nearly 20,000 cfs of steady flow would inundate approximately 5% of the larval observations if Holyoke Dam was being operated at its high operating level, whereas the same flow would inundate only 3% of the larval observations given a low operating level at Holyoke Dam (Figure 6.1.3.1-2). With the two generating stations combined, the total hydraulic capacity of the Turners Falls Project is 15,938 cfs; with additional flows from the bypass reach and tributaries, the Project would be expected to result in lower levels of inundation than a steady state flow of 20,000 cfs most of the time, though more detailed analyses are necessary to consider hydraulics associated with Project flow changes.

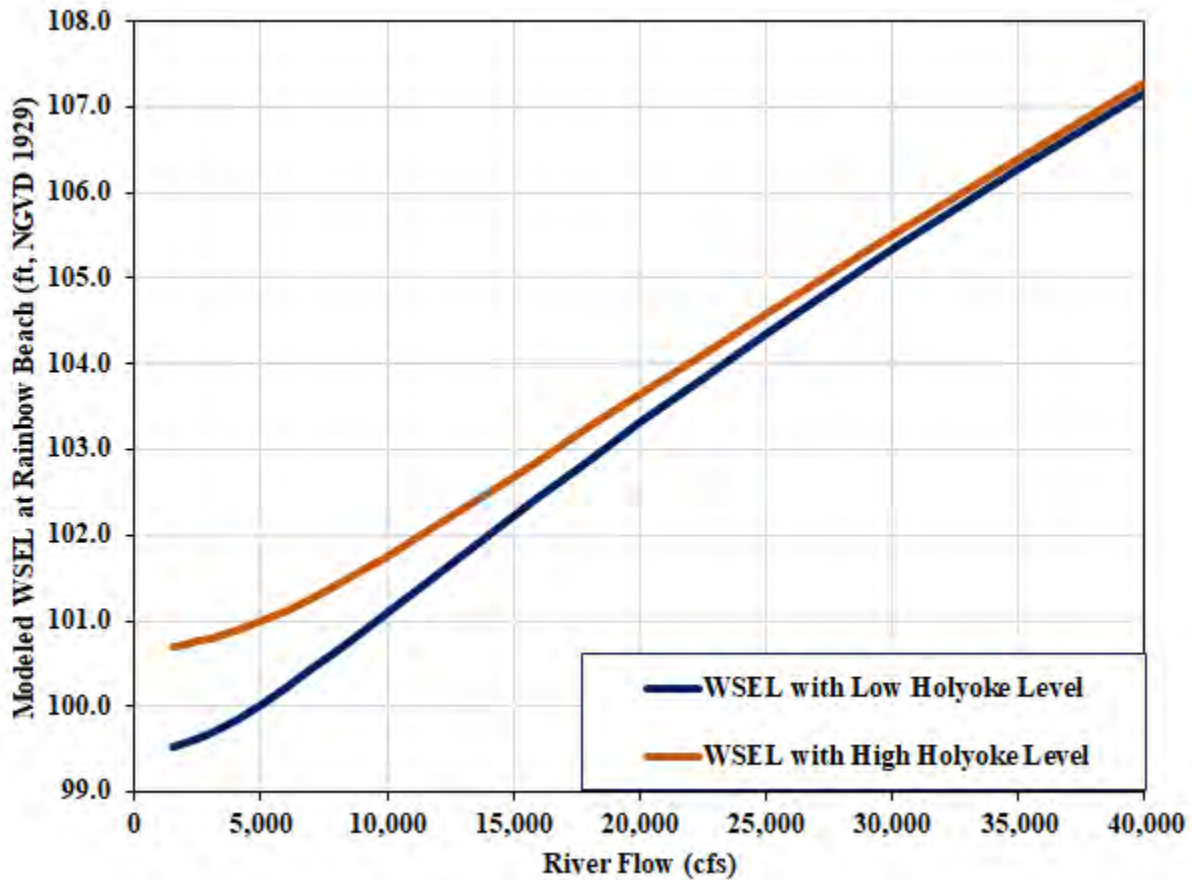


Figure 6.1.3.1-1: Modeled Water Surface Elevations at Rainbow Beach based on River Flow and the Range of Licensed Water Levels at Holyoke Dam

Note: These modeled elevations are for steady-state conditions.

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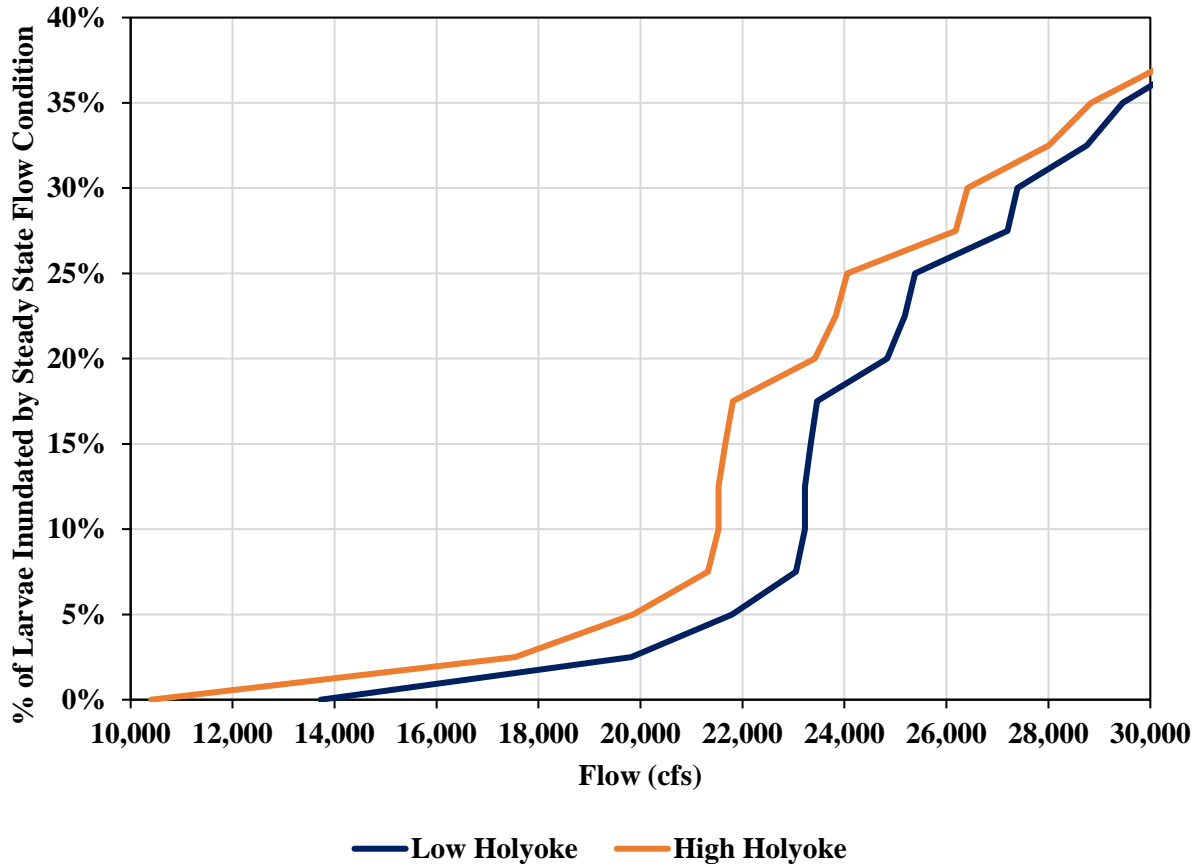


Figure 6.1.3.1-2: Steady-State Flow Inundation of Observed Puritan Tiger Beetle Larvae based on River Flow and the Range of Licensed Water Levels at Holyoke Dam

Note: Puritan Tiger Beetle elevation data were combined from Gwiazdowski (2020), Davis (2021), and Gwiazdowski (2021).

6.1.3.2 Characterization of Attenuation and Lag Time of Project Flows

Though the results presented above were useful for developing the flow and water level relationships at Rainbow Beach, the amount of flow released from the Turners Falls Project does not result in the same amount of flow reaching Rainbow Beach due to substantial attenuation that occurs over the approximately 25 miles of river that separate Rainbow Beach from the Turners Falls Project. Further, there is a considerable time lag between when flows leave the Turners Falls Project and when they reach Rainbow Beach. As part of the other studies, FirstLight installed water level loggers near Rainbow Beach and at Holyoke Dam that measured the water surface elevations every 15 minutes. [Figure 6.1.3.2-1](#) shows an example of observed flow at the Montague USGS Gage and the associated water levels at Rainbow Beach and Holyoke Dam from July 7-10, 2017. The largest peaking event depicted (July 7, 2017), when flow at Montague increased from around 5,000 cfs to over 16,000 cfs, reaching an ultimate peak of 18,100 cfs before decreasing around midnight on July 8, 2017, represents a relatively full capacity peaking event at Cabot Station ([Figure 6.1.3.2-1](#)). In this case, water levels at Holyoke Dam were also allowed to increase, and the associated inundation at Rainbow Beach reached the 2.5th percentile range for the known occurrences of Puritan Tiger Beetle larvae as documented by the 2020/2021 surveys. Other peaking events during that period resulted in lower levels of inundation, though still in the range of inundating a very small percentage of larval Puritan Tiger Beetles and associated habitat.

FirstLight developed several synthetic hydrographs representing Cabot peaking, which were then analyzed in the unsteady-state hydraulic model to determine the travel time and attenuation relationship from Cabot to Rainbow Beach. Summaries and timeseries figures of the synthetic hydrograph modeling results are included in [Appendix E](#) and [Appendix F](#), respectively. The modeling indicates that peak releases from Cabot generally take over six hours to reach Rainbow Beach and the timing and magnitude of attenuation is related to the length and magnitude of Cabot peak flow releases, along with underlying conditions such as base flows in the Connecticut River and water levels at Holyoke Dam.

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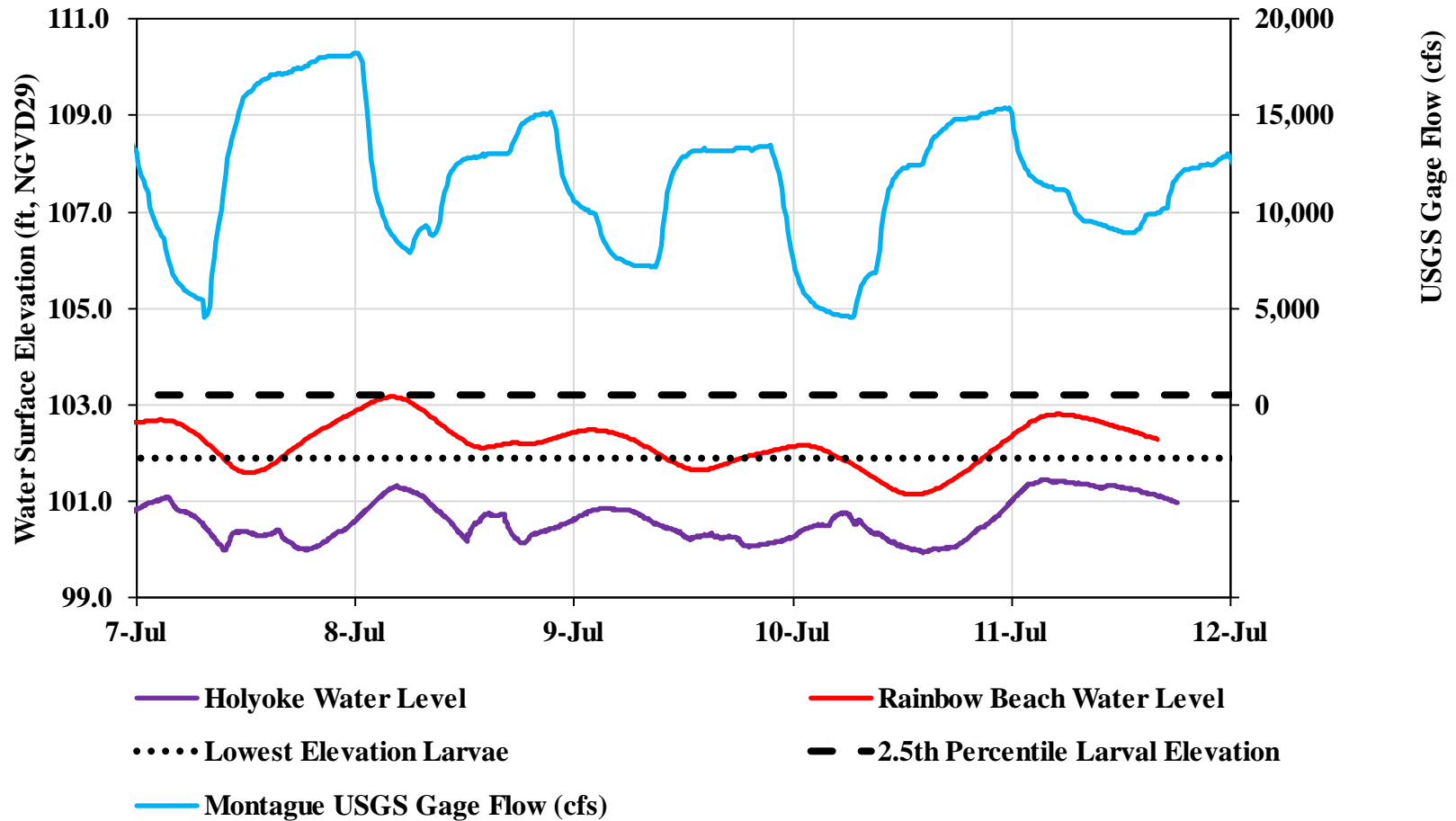


Figure 6.1.3.2-1: Example of Peaking Flow Changes from Cabot Station and Resulting Water Level Changes at Rainbow Beach, 2017 Data

Note: Water level data at Rainbow Beach were modeled using a HEC-RAS model based on actual water level data collected near Holyoke and Rainbow Beach.

6.1.4 Frequency, Duration, and Magnitude of Exposure

Given the variable effects of river flows, Project peaking flows, and Holyoke Impoundment water levels, as described in the sections above, unsteady-state hydraulic modeling was necessary to characterize the frequency, duration, and magnitude of exposure under the baseline environmental flow condition for each life stage and activity period of the Puritan Tiger Beetle. This modeling was performed using 28 years of hourly timeseries flow data (1991-2018) in the Connecticut River at the Montague USGS gage, routed to Rainbow Beach using HEC-RAS. The models produced flow and water level timeseries at Rainbow Beach for those 28 years given low and high Holyoke Impoundment conditions.

To characterize frequency, duration, and magnitude of exposure, when applicable, universal continuous under threshold habitat duration curves (UCUT curves) were developed from the timeseries.²⁴ The UCUT curves allow for a visualization of the frequency and duration of inundation to specific water levels at Rainbow Beach. The UCUT concept was applied to characterize both inundation level (e.g., water level reaches or exceeds a threshold) and habitat limitation (inundation of a percentage of documented larvae). Examples depicting inundation events associated with this timeseries and UCUT curves are provided in [Appendix G](#).

6.1.4.1 Inundation Frequency and Duration at Rainbow Beach

Throughout the year, larval habitats are subjected to natural high flow inundation events. Three primary periods were evaluated that pertained to the life stages when Puritan Tiger Beetle have limited mobility within larval habitats. These included:

- Larval Inactivity Period: December 16 through May 14, during which larvae would be inactive, with their burrows closed.
- Larval Activity Period: May 15 through December 15, during which larvae can have their burrows opened and be actively feeding. This period is conservative given that many larvae will close their burrows prior to the end of the larval activity period based on surveys performed by Gwiazdowski (2021) and (2022a).
- Adult Activity Period: June 16 through September 7, during which adults would be performing various activities. Activities pertaining to larval habitats include emergence and oviposition. Though there is some evidence that emergence and oviposition occur during specific times of the day, the sample sizes of observations of these activities are low. Therefore, for the purposes of this analysis, inundation was evaluated at all times of the day.

Within the 1991-2018 timeseries, inundation events experienced by Puritan Tiger Beetles that began during the inactive period could be relatively long, given the greater prevalence of moderate to high flows that tend to occur during this period ([Figure 6.1.4.1-1](#)). Habitats in the lower portion of the observed larval areas (e.g., 102-104 feet) were inundated relatively frequently, with the longest inundation events lasting from 50-130 days depending on exact elevation and Holyoke impoundment levels ([Figure 6.1.4.1-2](#)). Inundation of the entirety of observed larval areas (e.g., water levels reaching approximately 109 feet) occurred infrequently and with events that lasted between 1-20 days ([Figure 6.1.4.1-2](#))²⁵.

During the active larval period, flows tend to be lower and duration events were typically shorter for the range of elevations at Rainbow Beach ([Figure 6.1.4.1-3](#); [Figure 6.1.4.1-4](#)). Though the lowest elevation

²⁴ The UCUT method was developed as a modification to CUT curves ([Capra et al., 1995](#)). The primary difference between the UCUT and CUT curves, is that the UCUT curves include vertical portions of the curves where specific duration values did not occur in the timeseries.

²⁵ The longest (20-day) complete inundation event in the inactive larval portion of the timeseries occurred between April 16 and May 7, 1996, during which flows remained largely above 50,000 cfs with multiple peaks over 90,000 cfs at Montague.

portions where larvae have been documented (approximately 102 feet) could become inundated for long periods of time (e.g., 60 days or more), this rarely occurred within the timeseries.²⁶ Inundation of larval habitats at higher elevations were less frequent and occurred in shorter duration events. Inundation of the entirety of observed larval areas (e.g., water levels reaching approximately 109 feet) occurred rarely during the active larval period within the timeseries. The longest period of complete inundation within the timeseries during the active larval period was approximately six days.²⁷

Flows and associated durations of inundations at Rainbow Beach during the adult activity period were lowest and shortest, respectively, compared to any of the other seasons evaluated, though inundation of the entirety of Rainbow Beach has occurred during this season as the result of major precipitation events ([Figure 6.1.4.1-5](#); [Figure 6.1.4.1-6](#)).

It is important to note that, in all of these seasons, operation of the Holyoke Impoundment at its highest operating level could substantially increase the frequency and duration of habitats at Rainbow Beach relative to operation at its lowest operating level, though this effect generally decreases with increasing elevation, and does not appear to have much of an effect at elevations beyond 104 feet ([Figure 6.1.4.1-2](#); [Figure 6.1.4.1-4](#); [Figure 6.1.4.1-6](#)).

²⁶ The longest (60+ day) inundation event at 102 feet during the active larval portion of the timeseries occurred during a prolonged period of elevated flows higher than Project capacity in fall of 2005 (beginning October 8 and continuing through the end of the active larval period).

²⁷ The longest (6-day) complete inundation event during the active larval portion of the timeseries occurred during a portion of a prolonged period of elevated flows higher than Project capacity in fall of 2005 (October 15-21).

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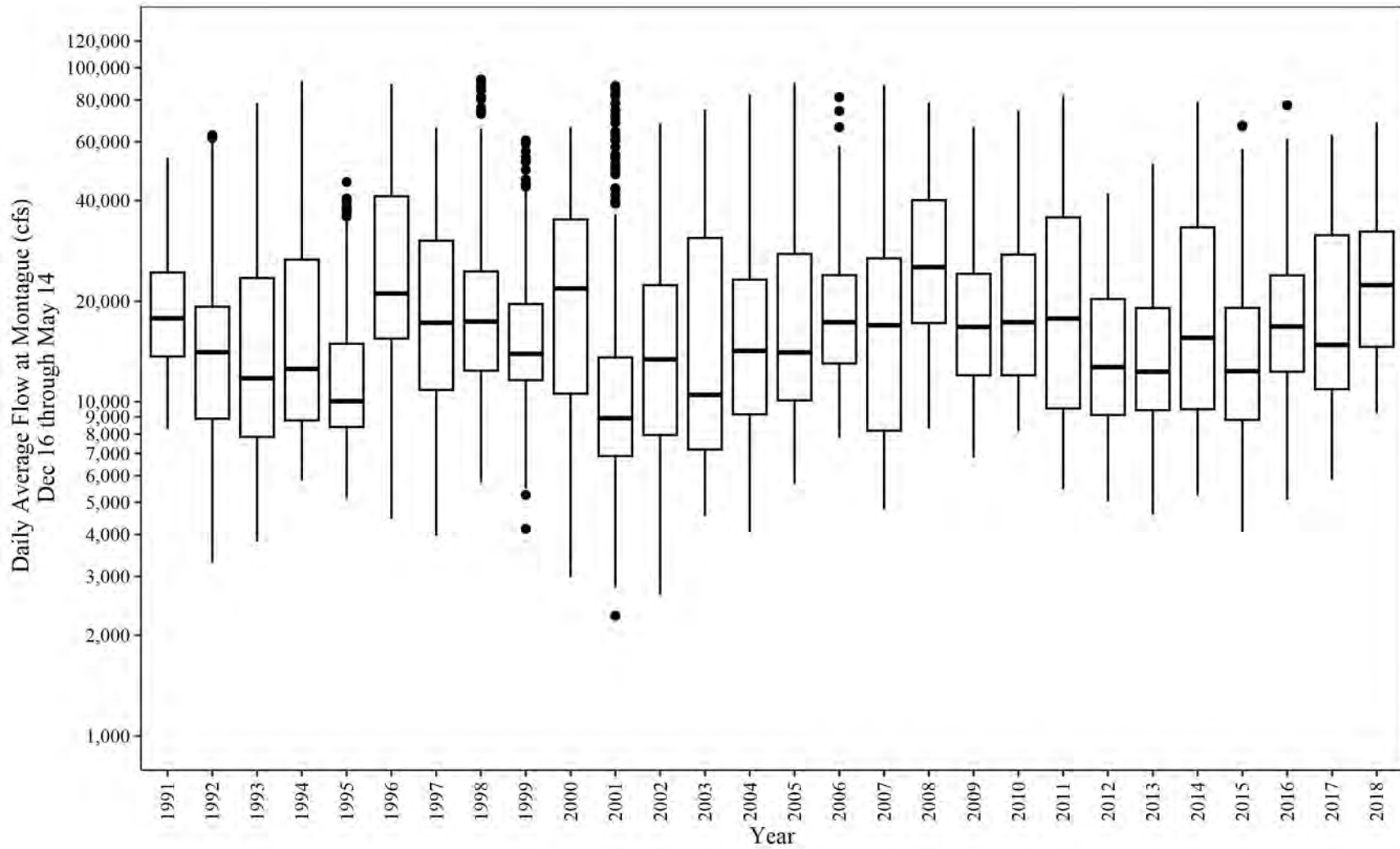


Figure 6.1.4.1-1: Distribution of Average Daily Flows on the Connecticut River at Montague during the Larval Inactivity Period, 1991-2018

Note: The boxplots can be interpreted as follows: Bold line = Median; Top and bottom of box are 75% and 25% percentile flows, respectively; Whiskers represent reasonable extreme flows that are uncommon; Points are outlier flows.

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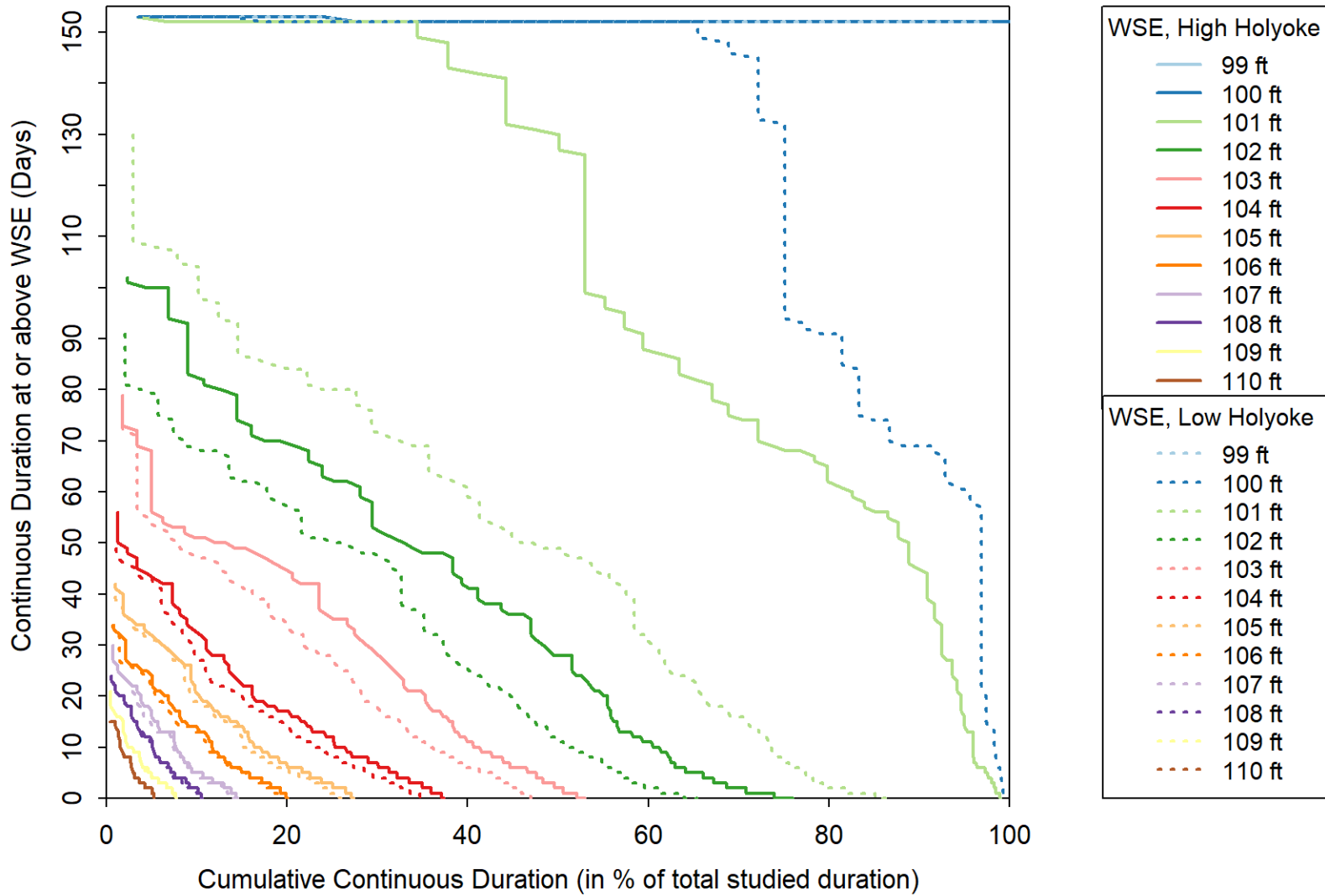


Figure 6.1.4.1-2: Frequency and Duration of Inundation Events at Rainbow Beach during the Larval Inactivity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

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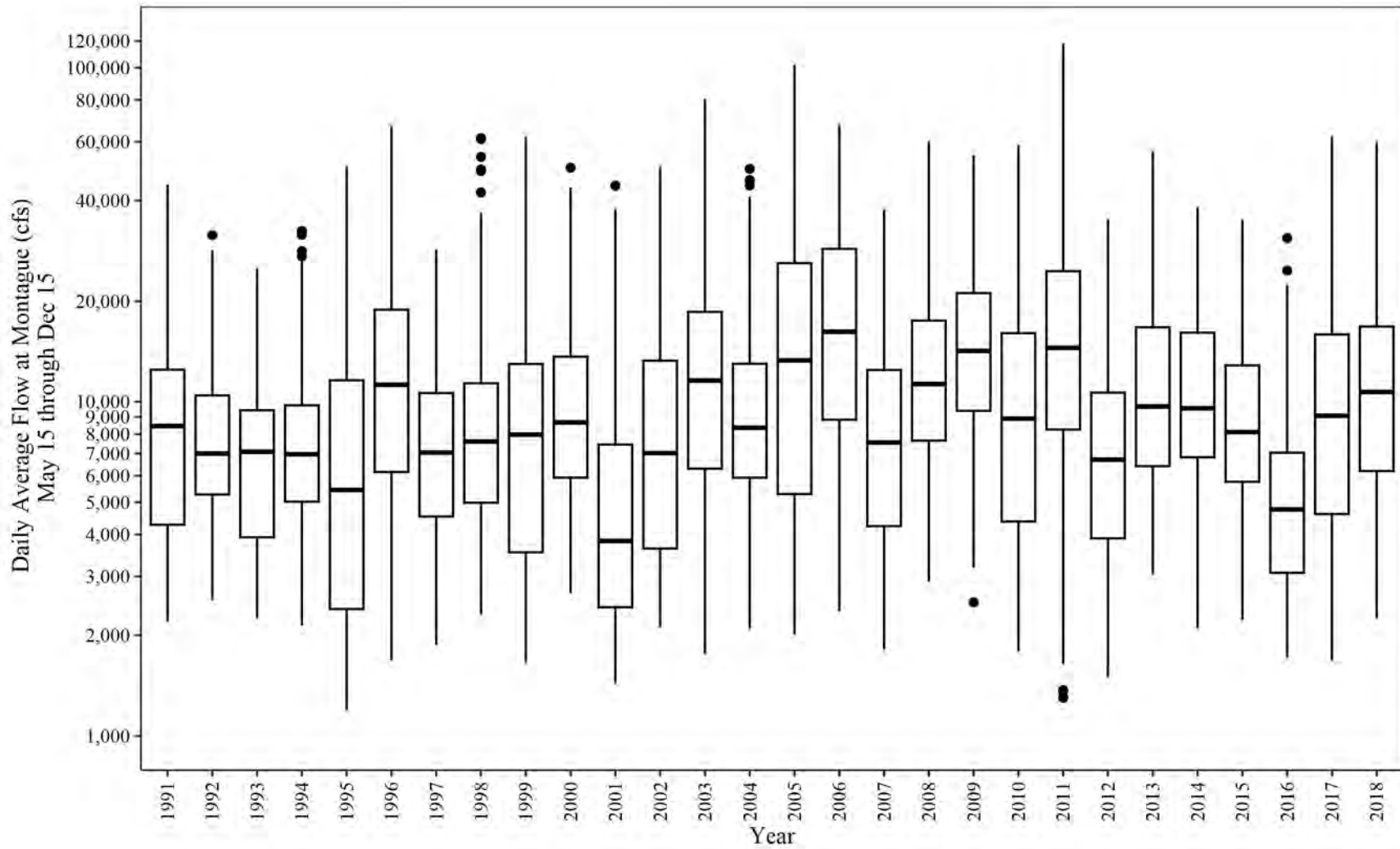


Figure 6.1.4.1-3: Distribution of Average Daily Flows on the Connecticut River at Montague during the Larval Activity Period, 1991-2018

Note: The boxplots can be interpreted as follows: Bold line = Median; Top and bottom of box are 75% and 25% percentile flows, respectively; Whiskers represent reasonable extreme flows that are uncommon; Points are outlier flows.

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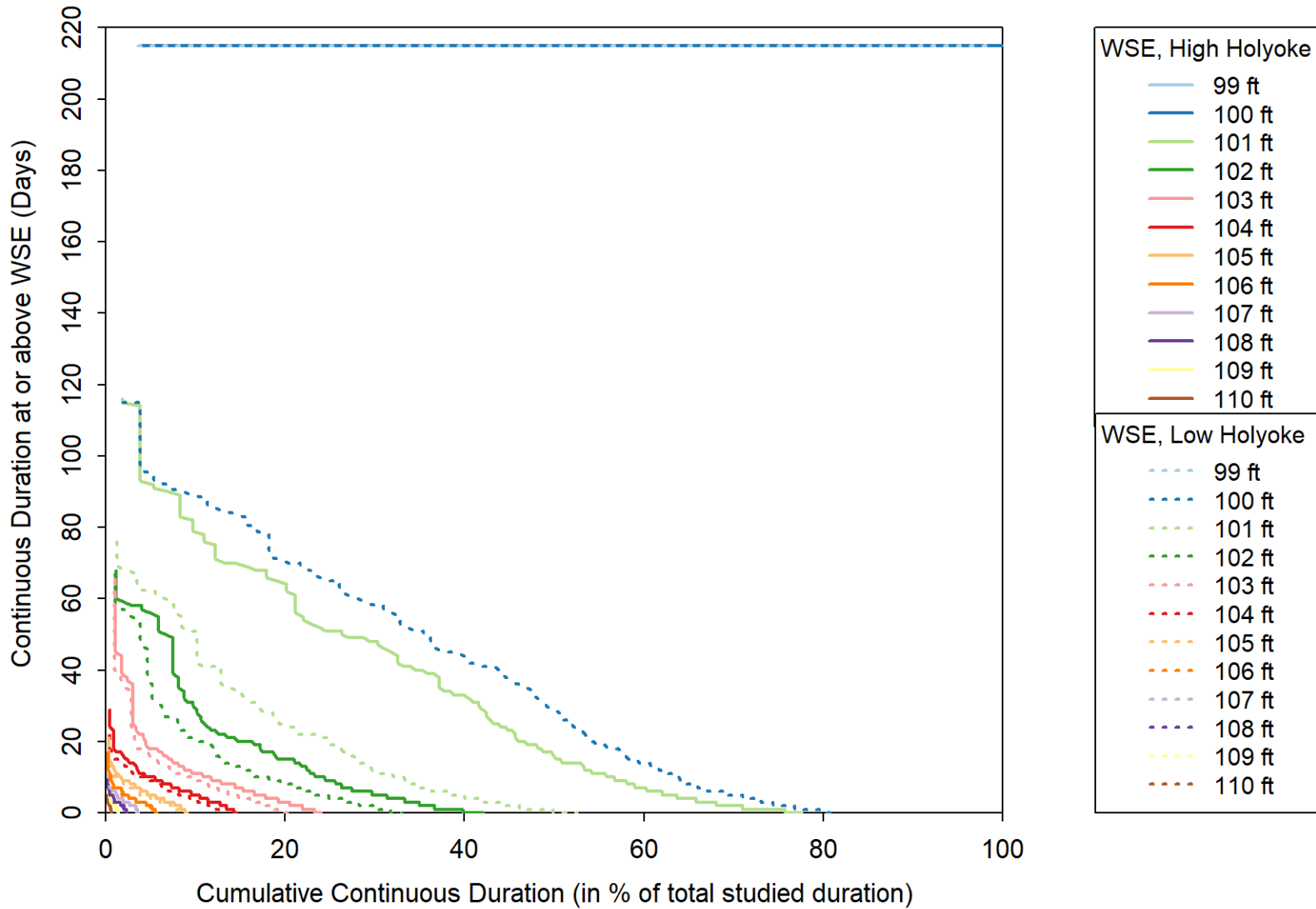


Figure 6.1.4.1-4: Frequency and Duration of Inundation Events at Rainbow Beach during the Larval Activity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

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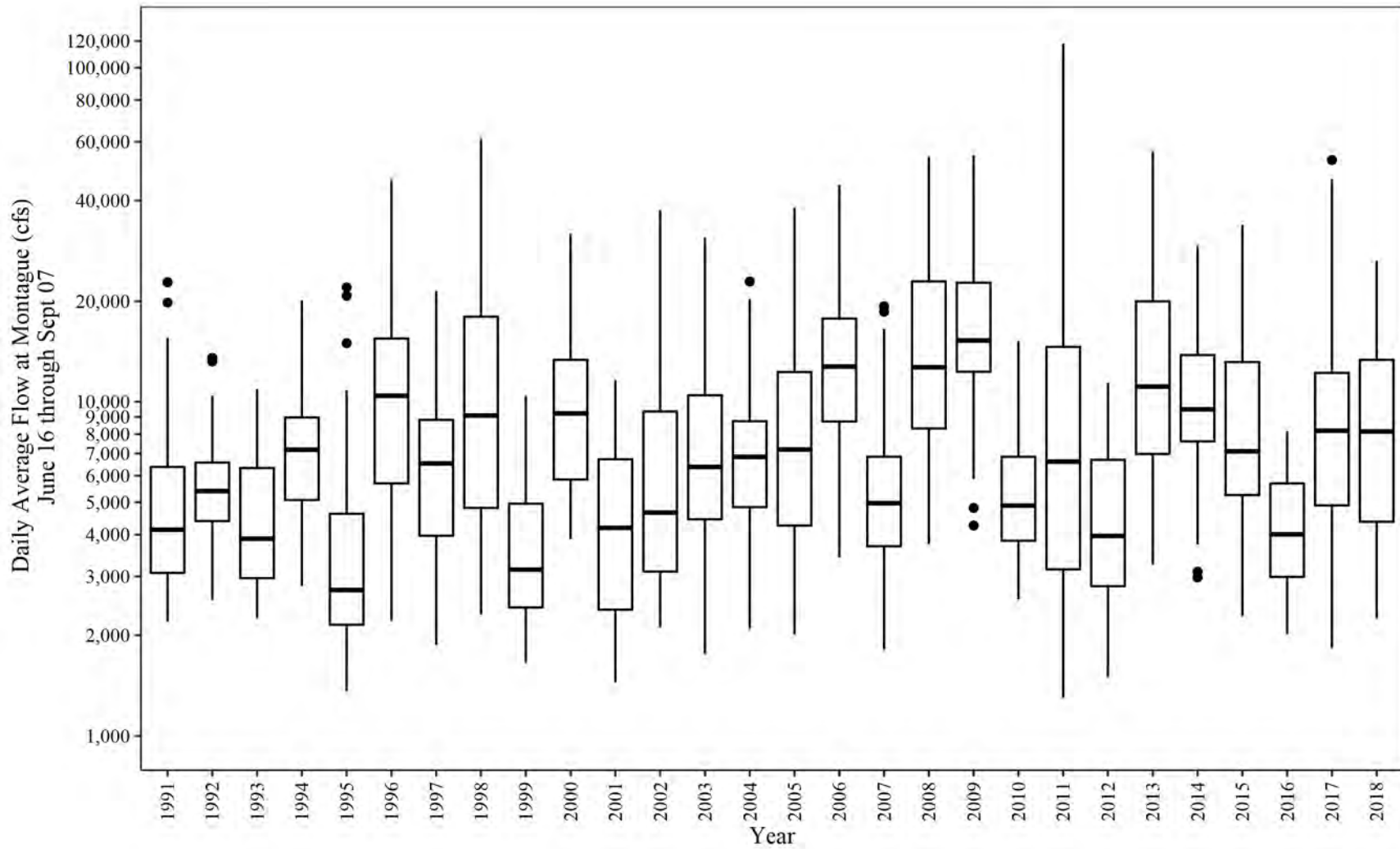


Figure 6.1.4.2-5: Distribution of Average Daily Flows on the Connecticut River at Montague during the Adult Activity Period, 1991-2018

Note: The boxplots can be interpreted as follows: Bold line = Median; Top and bottom of box are 75% and 25% percentile flows, respectively; Whiskers represent reasonable extreme flows that are uncommon; Points are outlier flows.

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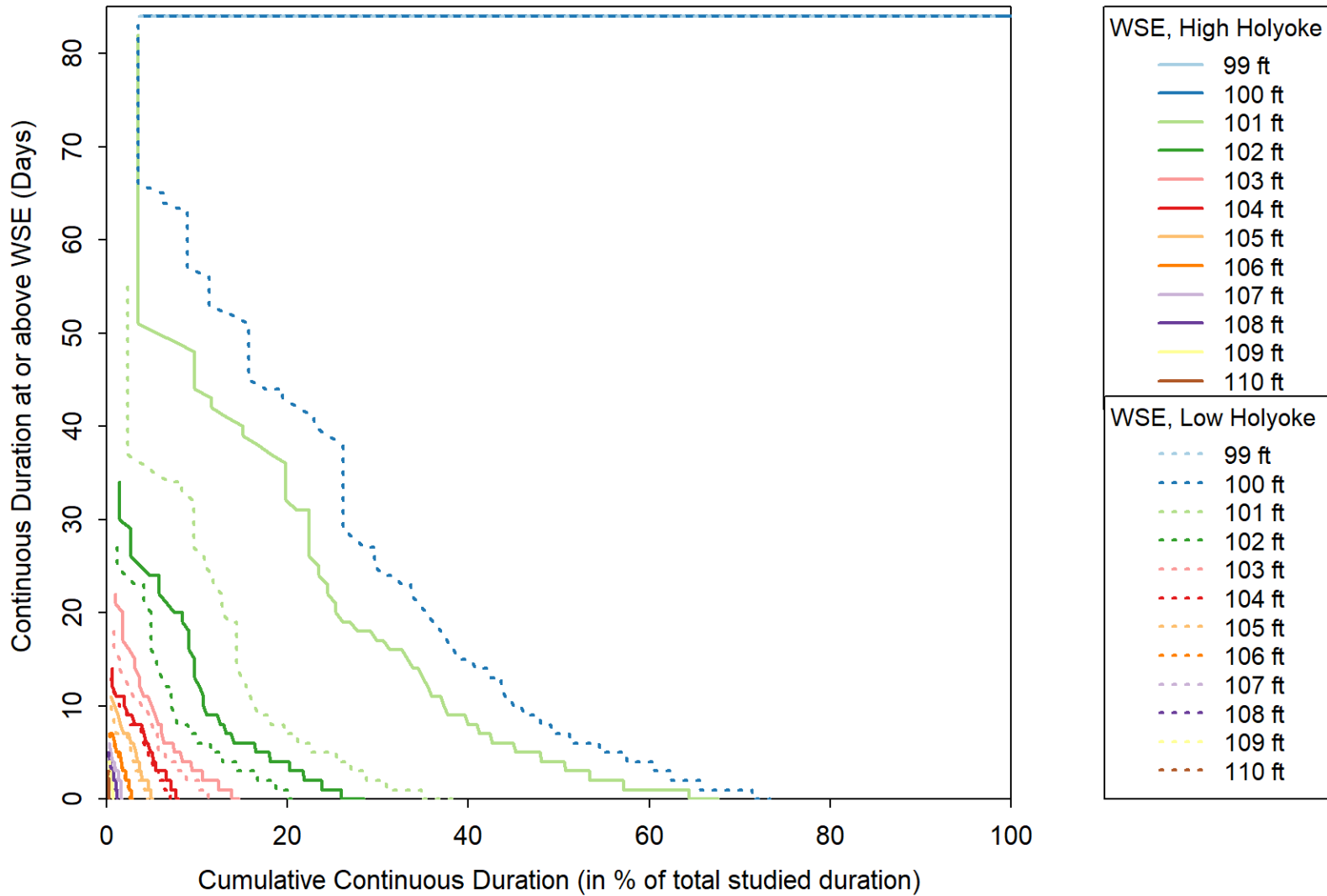


Figure 6.1.4.1-6: Frequency and Duration of Inundation Events at Rainbow Beach during the Adult Activity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

6.1.4.2 Larval Habitat Availability

Based on the results of larval observations studies performed in 2020 and 2021, along with elevation surveys at Rainbow Beach from 2021 at the established larval study transects, larvae are not evenly distributed spatially or vertically. Given the relatively limited degree of movements that larvae are known to undertake, it is likely that a combination of preference for oviposition, along with egg and larval survival, is responsible for the distribution of larvae observed.

To demonstrate the frequency and duration of inundation events pertaining to habitat availability, water levels that would have inundated specific proportions of observed larvae based on the surveys was evaluated using UCUT curves for the same periods described in [Section 6.1.4.1](#).

Consistent with the increased durations of inundation relative to the other seasons evaluated, the flows that occur during the inactive larval period result in relatively long durations of inundation, especially for areas where larvae were located at lower elevations along the beach. For example, inundation of approximately 45 days, 30 days, and 20 days represent the longest durations of inundation for 25%, 50%, and 100% of the larvae during the inactive period ([Figure 6.1.4.2-1](#)). These durations of inundation for the respective proportions of larvae are considered to be the extremes, whereas lower durations and magnitudes of inundation have been more frequent. By comparison, durations and magnitudes of inundation at any habitat level become shorter and less frequent during the active larval period and the adult activity period ([Figure 6.1.4.2-2](#); [Figure 6.1.4.2-3](#)). Generally, inundation of a high percentage of habitat has occurred very rarely and for relatively short durations, with most water levels at Rainbow Beach affective a very small proportion of the larvae documented, their associated habitats, and potential activities performed there (e.g., larval overwintering, larval activity/feeding, adult emergence, adult oviposition).

The immobile life stage of tiger beetles could benefit from occasional inundation that brings food items to their locations and prevents desiccation. Active larvae can also close their burrows and survive through inundation events, especially if dissolved oxygen concentrations are high. The frequency of inundation that becomes problematic for larvae is currently unknown, but it is possible that too-frequent inundation could negatively impact their behavior or result in limited periods when they can forage. As such, the potential effects of Project operations on the lowest-elevation larval habitat areas are not possible to quantify. However, given the high elevations of many Puritan Tiger Beetle larvae located above of the range of flows affected by Project operations, it is unlikely that Project operations have substantially affected the habitat availability for larval Puritan Tiger Beetles.

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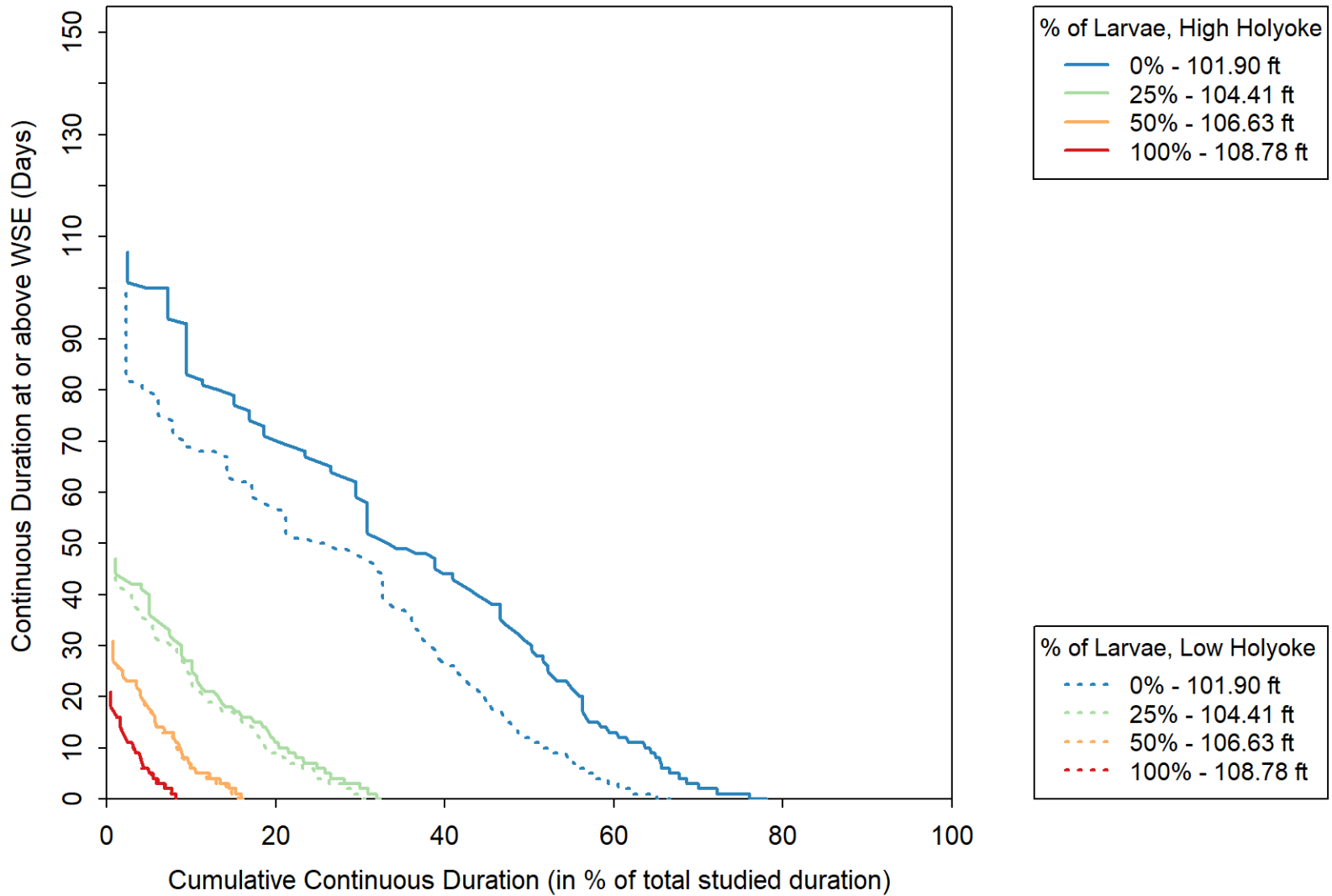


Figure 6.1.4.2-1: Frequency and Duration of Habitat Inundation Events at Rainbow Beach during the Larval Inactivity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

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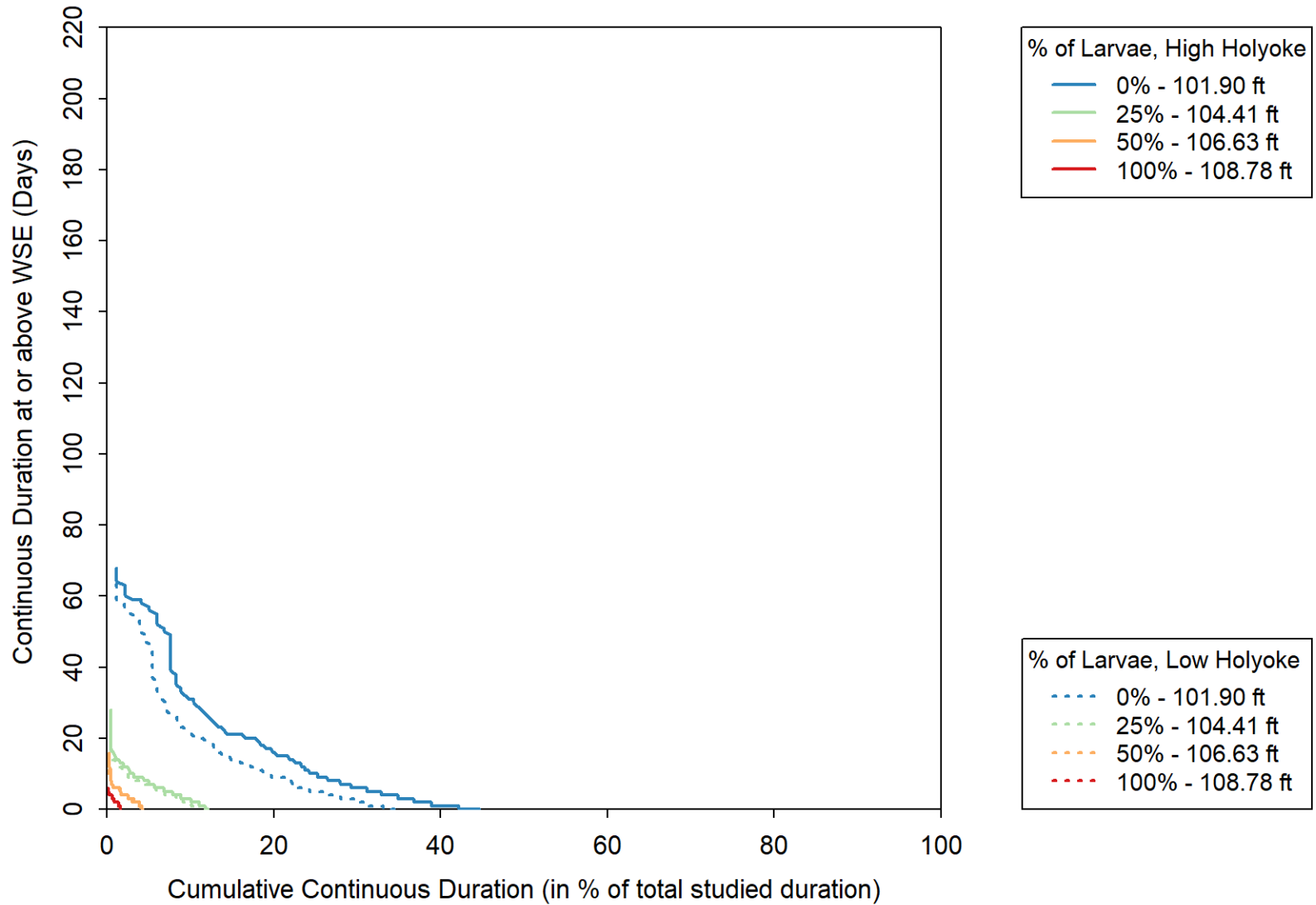


Figure 6.1.4.2-2: Frequency and Duration of Habitat Inundation Events at Rainbow Beach during the Larval Activity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

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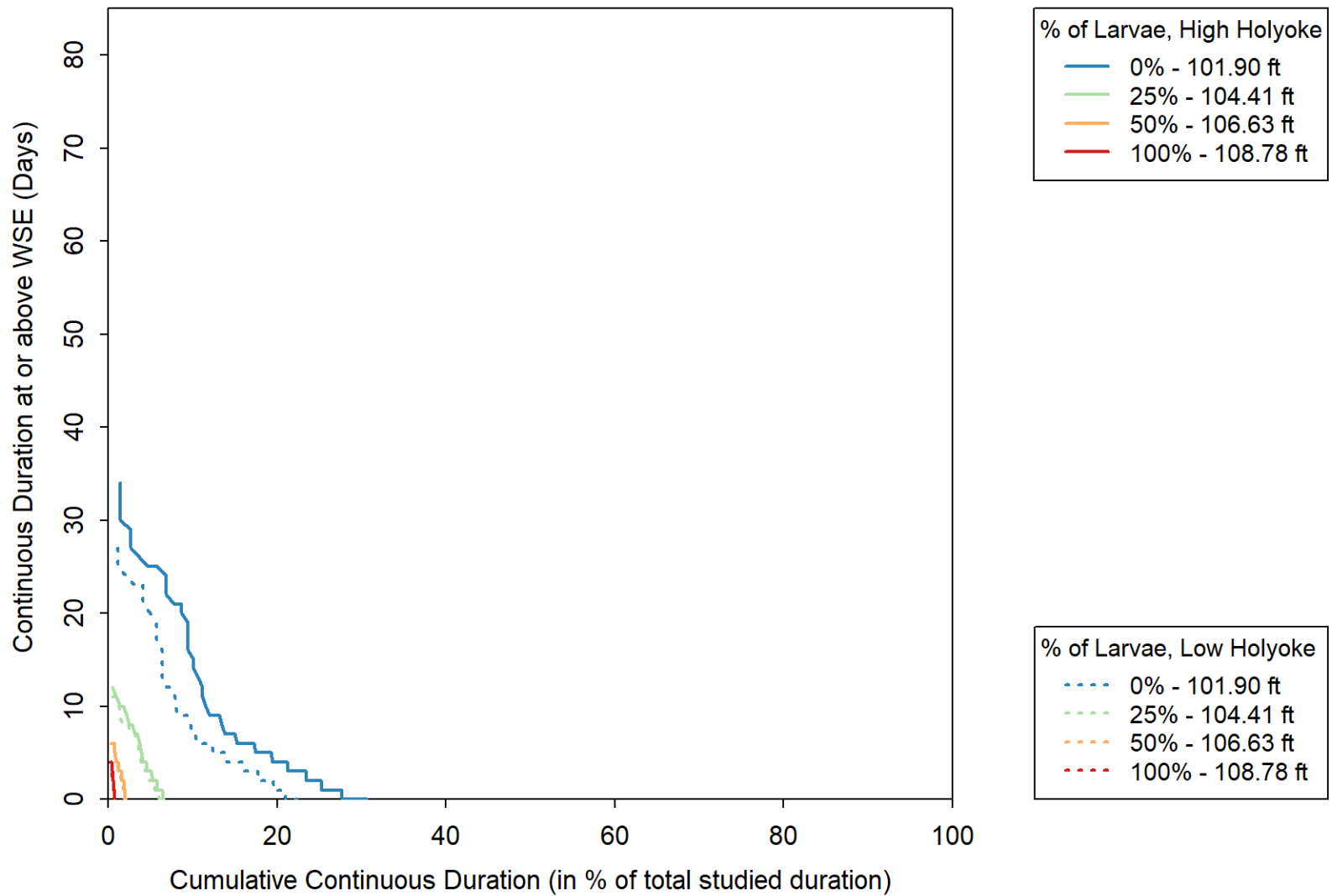


Figure 6.1.4.2-3: Frequency and Duration of Habitat Inundation Events at Rainbow Beach during the Adult Activity Period given High and Low Holyoke Impoundment Operational Conditions, 1991-2018.

6.1.4.3 Adult Habitat Availability and Disturbances

The adult active season at Rainbow Beach was analyzed as June 16th through September 7th. During the adult life stage of the Puritan Tiger Beetle, there are four primary phases that could be affected by Project operations. These include:

- Emergence
- Oviposition
- Mating
- Foraging

Emergence and oviposition are strongly correlated with the location of larval habitats and were evaluated in [Section 6.1.4.2](#). Adult Puritan Tiger Beetle foraging and mating habitat at Rainbow Beach ranges from the water's edge up to the dense vegetation at the top edge of the beach, though they tend to show a preference toward the damp, cooler areas near the water's edge.

On an annual basis, low-flow years typically result in less maximum daily inundation of adult Puritan Tiger Beetle foraging and mating habitat. Normal operations at the Turners Falls Project would result in less inundation when the Holyoke Project is operating at its low impoundment level when compared to its high impoundment level ([Figure 6.1.4.3-1](#)). It has been documented that, if all the habitat becomes inundated during the foraging/mating period, the adults will leave the beach and are not known to return (C. Davis, *pers. comm.*). Years when all of the available habitat becomes inundated at some point (e.g., to the upper extent of larvae observed at 108.78 feet) were associated with high flow events of approximately 50,000 cfs or more. These types of flow events are not able to be controlled by the Project, nor would the Project be capable of providing flows that reach a magnitude to result in abandonment of the beach by Puritan Tiger Beetle.

Foraging and mating activities are primarily confined to the daytime. Based on the modeled timeseries, when the Project is in control of the river, peak daily water levels at Rainbow Beach that could be associated with Project operations primarily occur at night, between 11pm and the early morning hours, for low and high Holyoke Impoundment operational conditions ([Figure 6.1.4.3-2](#); [Figure 6.1.4.3-3](#)). Therefore, most foraging and mating activities would be performed when water levels at Rainbow Beach are receding or have receded from nighttime highs that result from Project peaking. Hourly water level changes at Rainbow Beach during the adult activity season (any time of day) also tend to be very small, primarily between 0.15 feet/hr (1.8 inches/hr) decreases or increases, and often much less ([Figure 6.1.4.3-4](#); [Figure 6.1.4.3-5](#)). This degree of change may not be detected by adult Puritan Tiger Beetles, especially given the presence of other potential influences at the water's edge, such as wind-induced waves and boat wakes.

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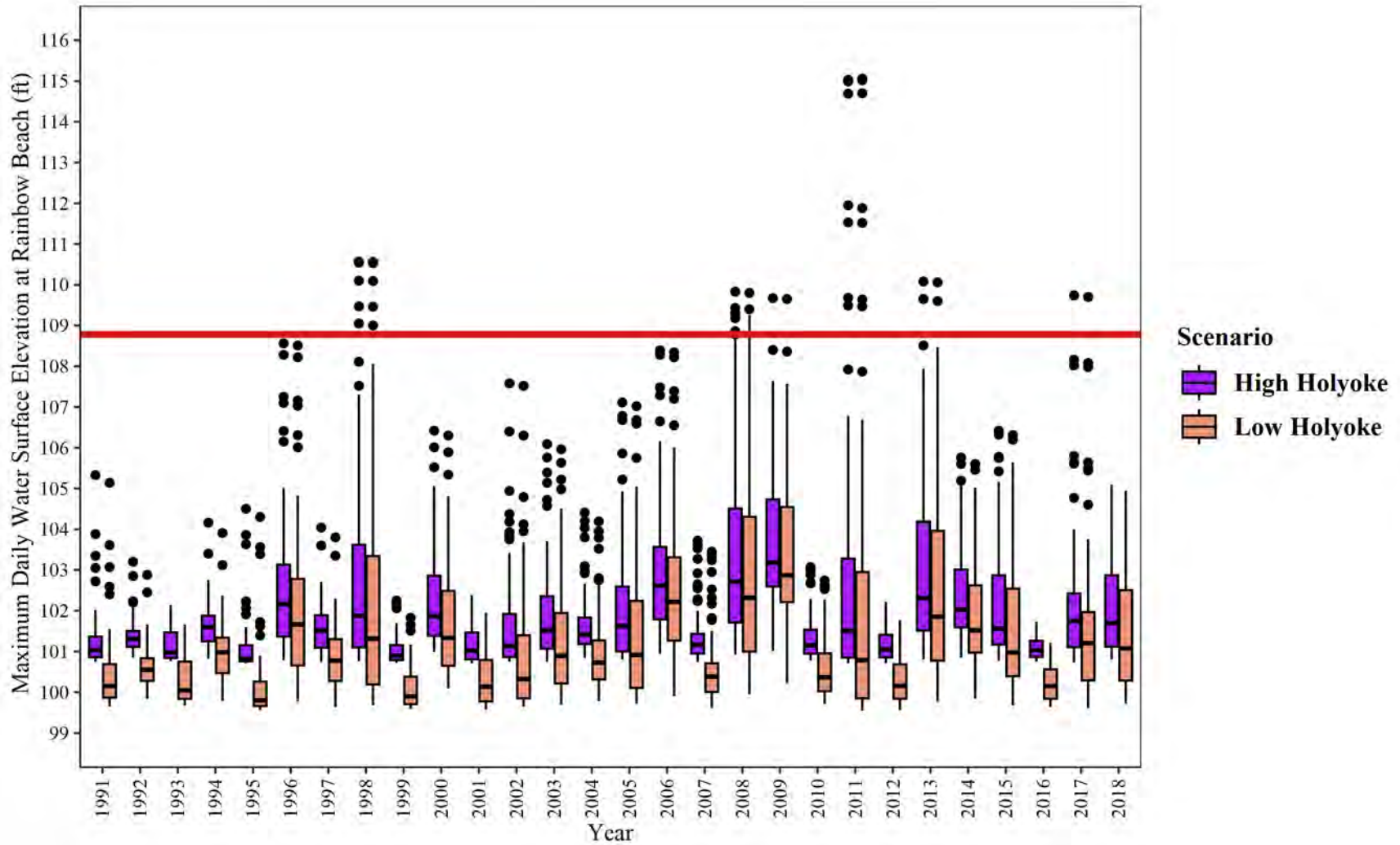


Figure 6.1.4.3-1: Distribution of the Maximum Daily Water Surface Elevations at Rainbow Beach for Foraging/Mating Puritan Tiger Beetle during the Adult Active Season, 1991-2018.

Note: The horizontal red line indicates the highest elevation that larvae were observed on Rainbow Beach, which also approximates the upper extent of adult Puritan Tiger Beetle habitat outside of the dense areas of vegetation. The boxplots can be interpreted as follows: Bold line = Median; Top and bottom of box are 75% and 25% percentile flows, respectively; Whiskers represent reasonable extreme flows that are uncommon; Points are outlier flows.

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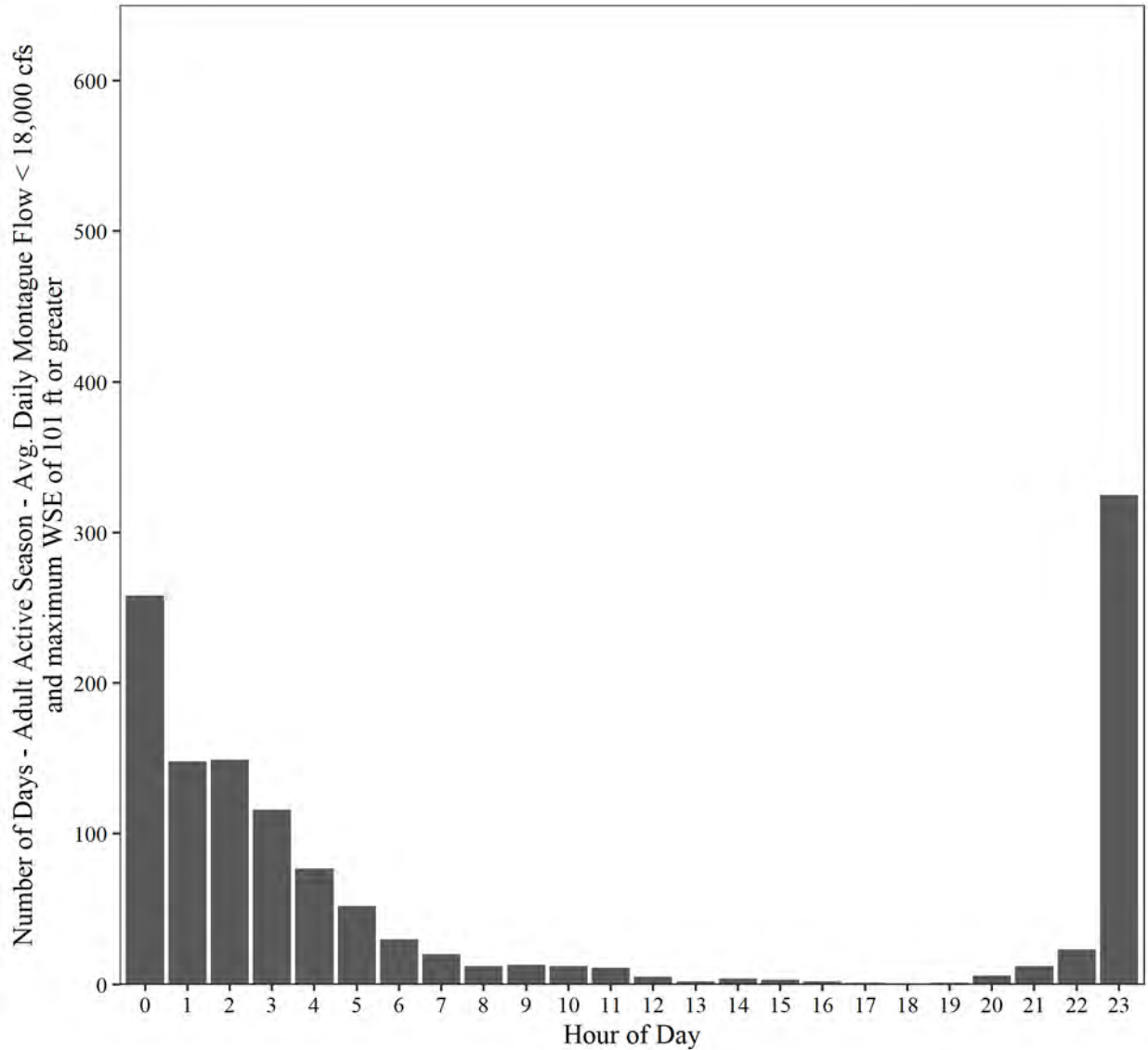


Figure 6.1.4.3-2: Distribution of the Hours of Peak Daily Flows at Rainbow Beach during the Adult Puritan Tiger Beetle Activity Period under Low Holyoke Impoundment Conditions, 1991-2018

Note: Data were filtered to reflect river flows within Project generating capacity plus the design generating capacity from Deerfield River Project No. 2 of 1,450 cfs and other smaller inflows. (Avg. Daily Montague Flow < 18,000 cfs), and during the periods when water levels reached adult Puritan Tiger Beetle habitat (101 feet or greater).

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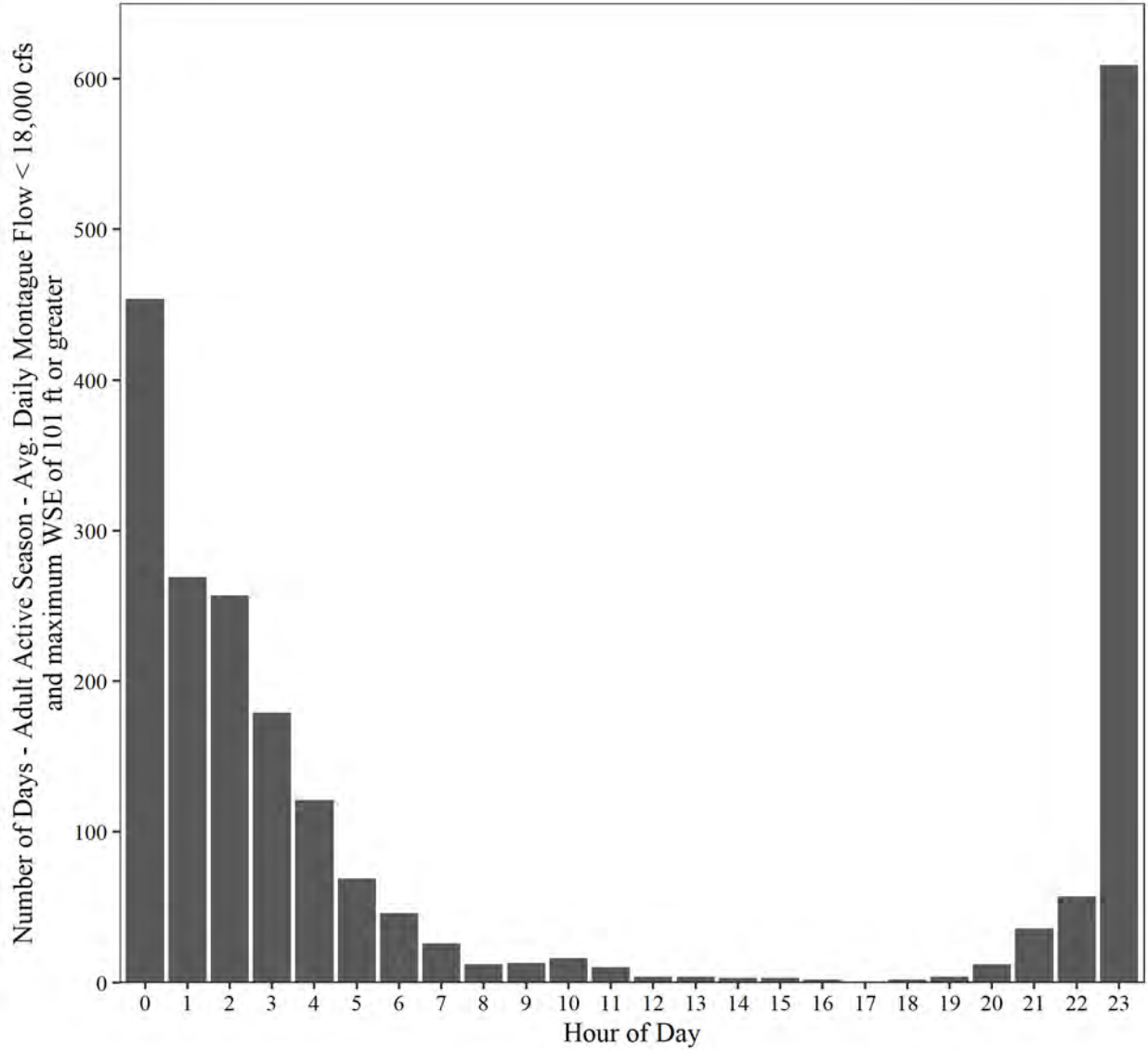


Figure 6.1.4.3-3: Distribution of the Hours of Peak Daily Flows at Rainbow Beach during the Adult Puritan Tiger Beetle Activity Period under High Holyoke Impoundment Conditions, 1991-2018

Note: Data were filtered to reflect river flows within Project generating capacity plus the design generating capacity from Deerfield River Project No. 2 of 1,450 cfs and other smaller inflows. (Avg. Daily Montague Flow < 18,000 cfs), and during the periods when water levels reached adult Puritan Tiger Beetle habitat (101 feet or greater).

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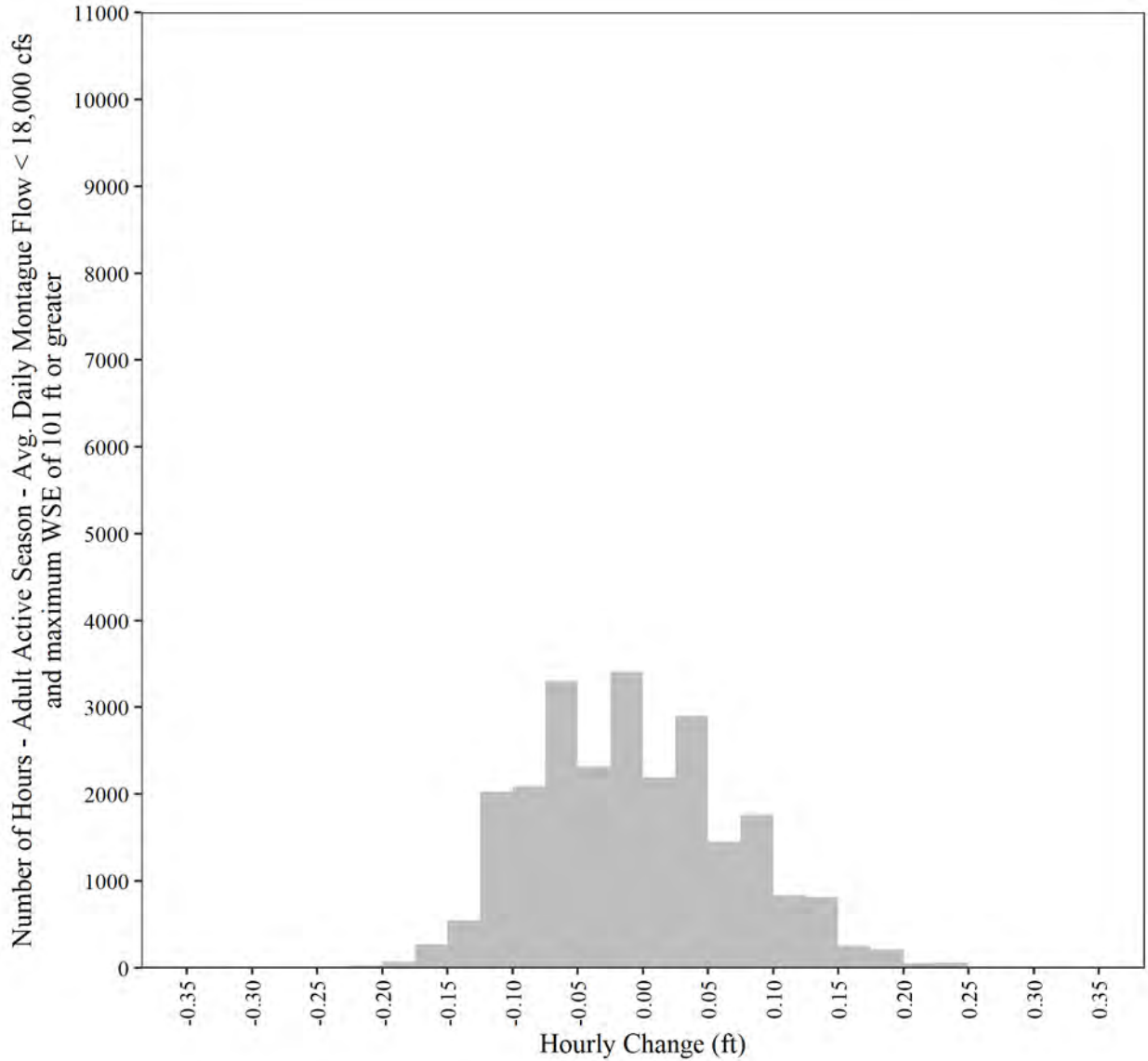


Figure 6.1.4.3-4: Frequency of the Hourly Water Surface Elevation Changes at Rainbow Beach during the Adult Puritan Tiger Beetle Activity Period, Low Holyoke Impoundment Conditions, 1991-2018

Note: Data were filtered to reflect river flows within Project generating capacity plus the design generating capacity from Deerfield River Project No. 2 of 1,450 cfs and other smaller inflows. (Avg. Daily Montague Flow < 18,000 cfs), and during the periods when water levels reached Puritan Tiger Beetle foraging/mating habitat (101 feet or greater).

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

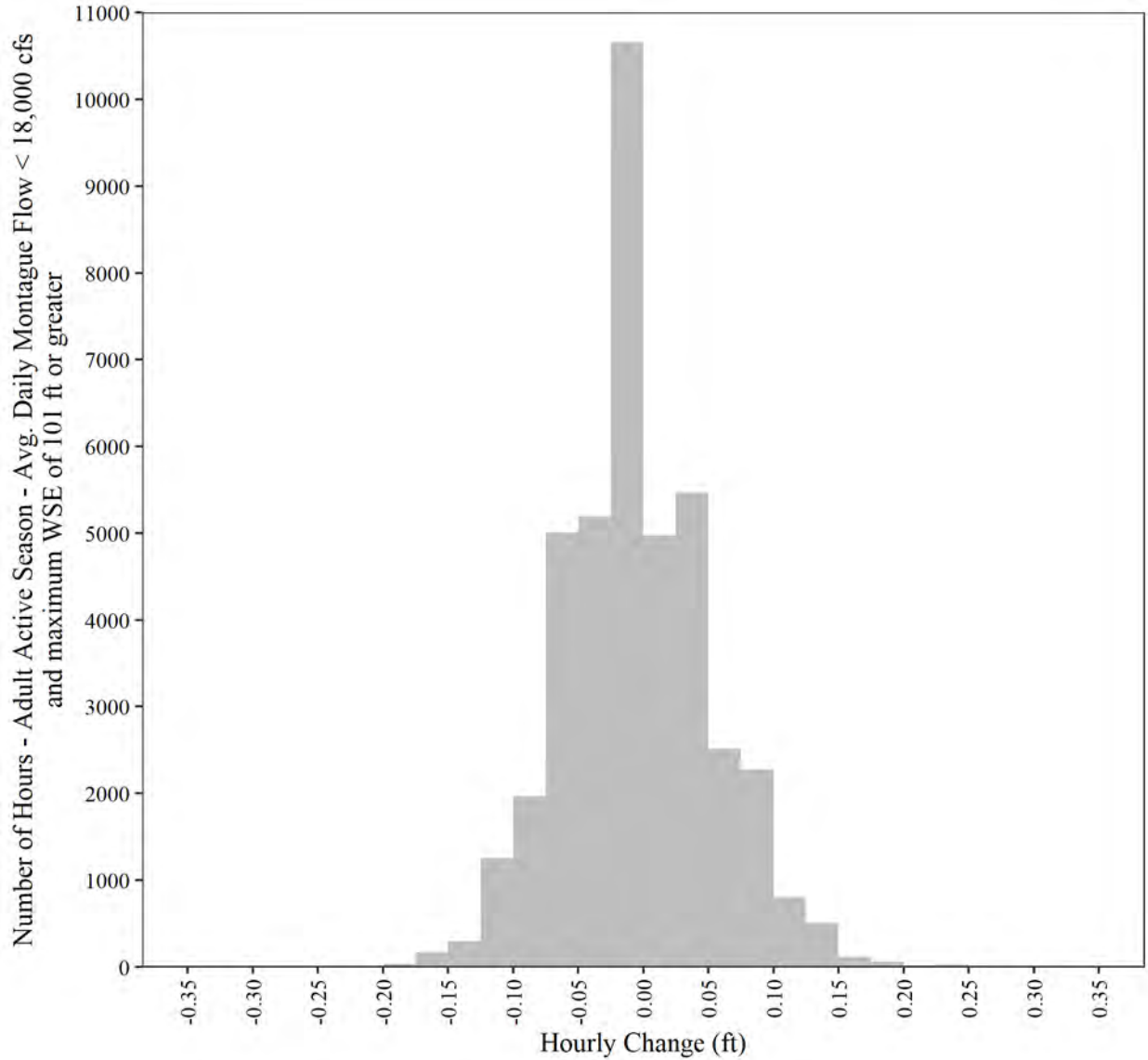


Figure 6.1.4.3-5: Frequency of the Hourly Water Surface Elevation Changes at Rainbow Beach during the Adult Puritan Tiger Beetle Activity Period, High Holyoke Impoundment Conditions, 1991-2018

Note: Data were filtered to reflect river flows within Project generating capacity plus the design generating capacity from Deerfield River Project No. 2 of 1,450 cfs and other smaller inflows. (Avg. Daily Montague Flow < 18,000 cfs), and during the periods when water levels reached Puritan Tiger Beetle foraging/mating habitat (101 feet or greater).

6.1.5 Comparison of Baseline and Proposed Conditions

The operations model described in Section 6 was used to simulate baseline conditions and the proposed conditions outlined in [Section 3](#) on an hourly time step for the period 1962-2003. The key output from the operations model, which served as “input” to the hydraulic model, is the flow at Montague for baseline and proposed conditions. The hydraulic model simulated the timeseries of flows at Montague under baseline and proposed conditions to estimate the water elevations at Rainbow Beach under these two operating conditions.

The proposed condition incorporates all of FirstLight’s proposed operations that are outlined in [Section 3](#) of this Draft BA that were able to be predicted by the model.²⁸ Though the operations model (1962-2003) simulated a different time period than the available Montague Flow data analyzed in [Section 6.1.4](#) (1991-2018), the modeled datasets contained 42 years of data²⁹ that included considerable season and annual variation in river flows.

Based on the modeled data, for higher-elevation locations of Puritan Tiger Beetle habitat, FirstLight’s proposal has no noticeable effect, given that those habitats are too high in elevation to be affected by Project-related flow changes. However, FirstLight’s proposal is anticipated to increase the frequency and duration of inundation for some elevations where Puritan Tiger Beetle larvae are known to reside ([Figure 6.1.5-1](#); [Figure 6.1.5-2](#)). This increase in duration of inundation becomes less pronounced with increases in elevation (and proportions of documented Puritan Tiger Beetle larvae). The reason for this increase in duration of inundation is associated with the limitations to the Project’s peaking range, which results in a slower general pattern of flow increases and decreases and very limited daily water level changes at Rainbow Beach ([Figure 6.1.5-3](#)).

The allowable deviations from flow stabilization below Cabot Station (see Article A160) were not able to be accounted for in the modeled flow dataset. However, these deviations are substantially constrained in both the number of total hours, and the number of times they could occur per month and would therefore result in infrequent and/or low magnitude changes in water levels at Rainbow Beach.

²⁸ Temporary deviations and flexible operations are not able to be predicted by the model.

²⁹ As described in Study 3.8.1, the period of record used for the HEC-ResSim analysis was 1962 to 2003. FirstLight had hoped to extend the period of record to 2012 or later but based on extensive correspondence with the USACE and TNC, it was not possible to obtain the necessary data to extend the period of record past 2003.

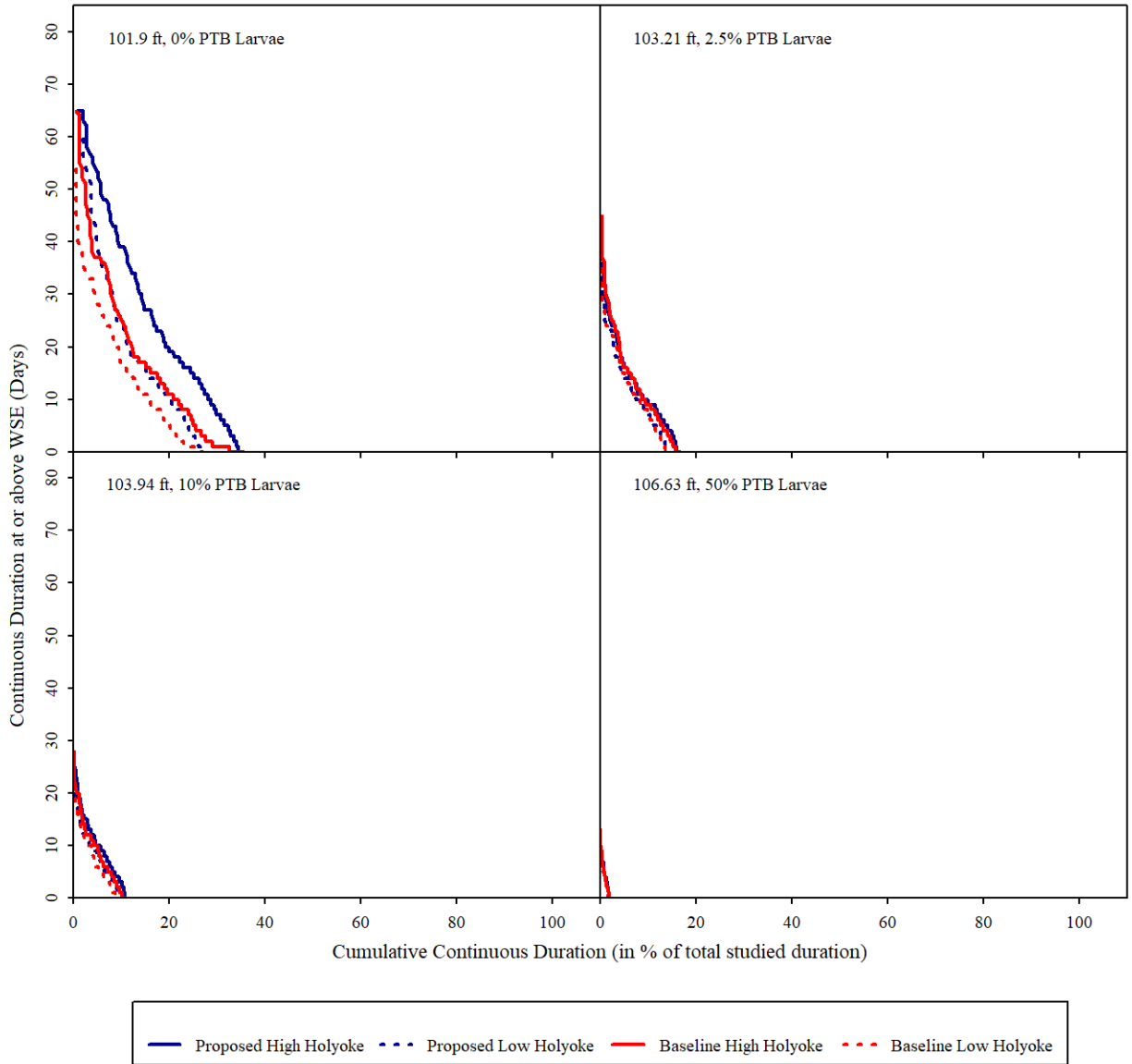


Figure 6.1.5-1: Frequency and Duration of Habitat Inundation Events at Rainbow Beach for Proposed and Baseline Conditions, Larval Activity Period, 1962-2003.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

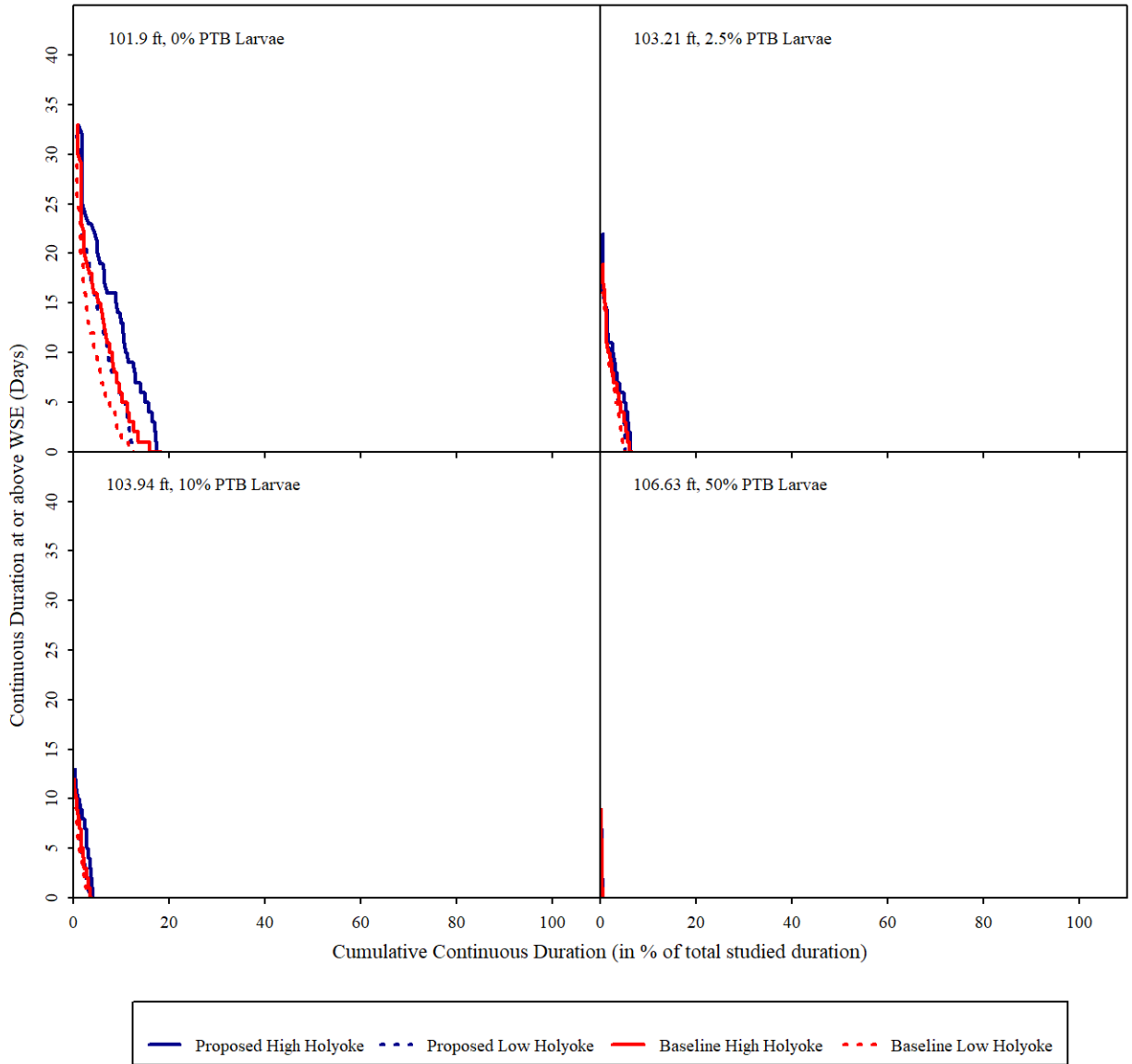


Figure 6.1.5-2: Frequency and Duration of Habitat Inundation Events at Rainbow Beach for Proposed and Baseline Conditions, Adult Activity Period, 1962-2003.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

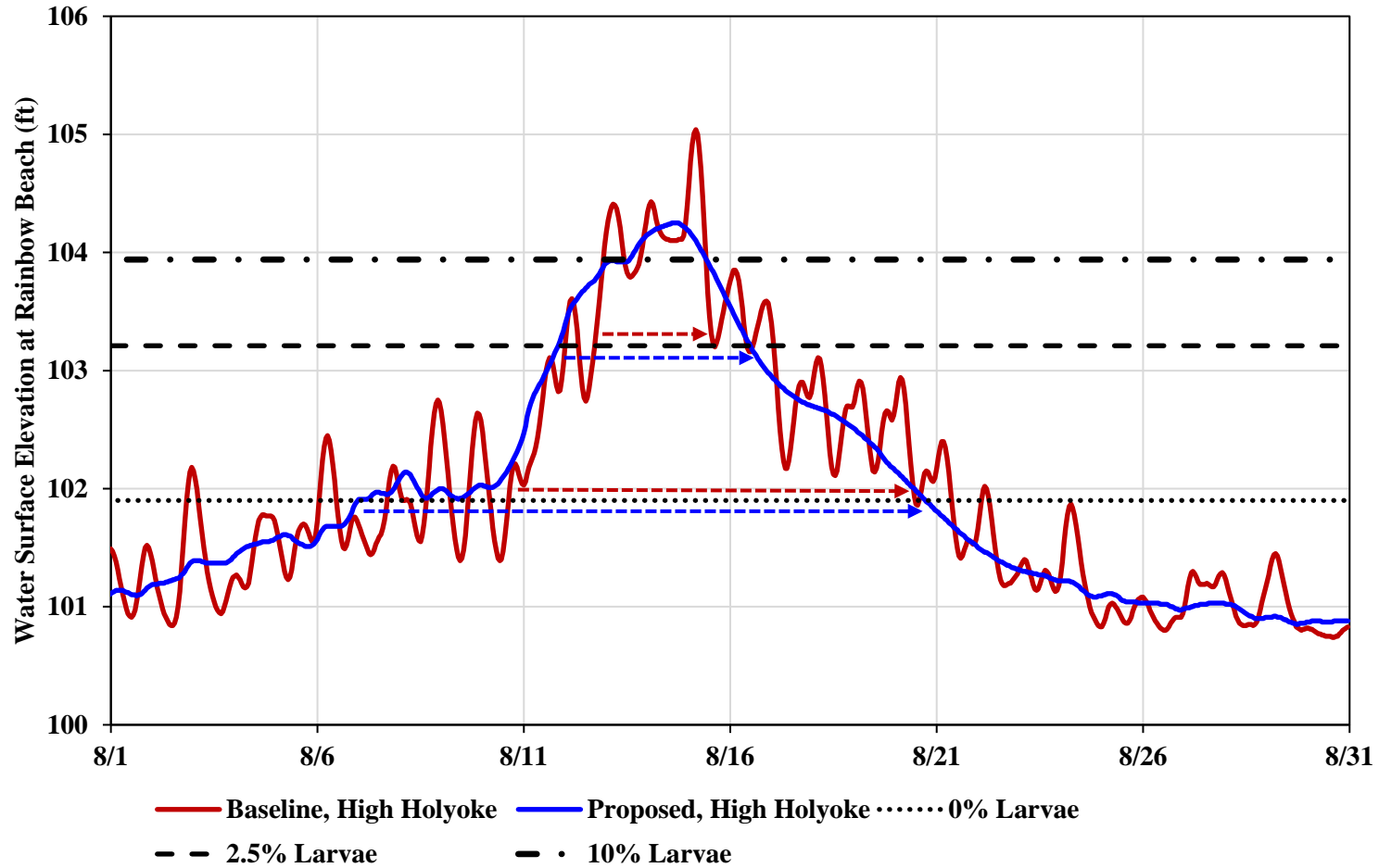


Figure 6.1.5-3: Example Timeseries Plot of Modeled Baseline and Proposed Water Levels at Rainbow Beach

Note: Maximum inundation durations within the time period shown at elevations that would be expected to inundate 0% and 2.5% of documented larvae are demonstrated as arrows that are the same color as the associated timeseries data.

6.2 Anticipated Response to Exposure

In general, the exposure of any life stage or activity of Puritan Tiger Beetle to Project flow regimes under the baseline condition has been very limited. This is due primarily to the linear distance (~25 river miles) between the Turners Falls Project and Rainbow Beach, which results in considerable flow and water level attenuation, and the effects have been limited to low-elevation areas along the beach where a small percentage of documented larvae have been recorded.

The proposed restrictions to flow changes at the Project primarily result in limited daily water level changes at Rainbow Beach, which would reduce the potential for Puritan Tiger Beetle to be affected by Project-induced water level changes over the term of the next license. Potential effects that would be reduced could include both negative (e.g., disturbance to behavior, too-frequent inundation of low-elevation larvae) or positive (e.g., replenished moisture and food sources) interactions between this species and changing water levels. To the extent water level fluctuations at Rainbow Beach are net-negative for this population, the proposed restrictions would limit the potential for those impacts by reducing the frequency and magnitude of water level fluctuations.

FirstLight's proposal would be anticipated to result in increased duration of inundation at specific elevations due to the slower rise and fall of flows and water levels at Rainbow Beach. This could change the distribution of larval Puritan Tiger Beetle slightly at Rainbow Beach, by limiting the availability of habitat in the lowest elevations along the beach more often than the baseline condition. However, a small percentage of larvae are known to occur in these areas, with most larvae documented at higher elevations that are not impacted by Project flow changes.

7 CONCLUSION AND DETERMINATION OF EFFECTS

The potential impacts of construction, maintenance, and operation of new hydropower licenses at the Northfield Mountain Project and Turners Falls Project on Federally protected species have been evaluated. The known distribution, habitats, and life history of those species, and the potential impacts of the proposed conditions for the new licenses, have been considered in this Revised Draft BA.

Based on the presented analyses, FirstLight concludes that the operations proposed for the new licenses may affect Puritan Tiger Beetles because operational flows affect water levels at Rainbow Beach. However, proposed operations are not likely to adversely affect or jeopardize the continued existence of the Puritan Tiger Beetle.

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APPENDIX A: FLOWS AND FISH PASSAGE SETTLEMENT AGREEMENT, MARCH 2023

FLOWS AND FISH PASSAGE SETTLEMENT
AGREEMENT

**FOR THE RELICENSING OF THE TURNERS FALLS
HYDROELECTRIC PROJECT, FERC PROJECT NO. 1889, AND
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT,
FERC PROJECT NO. 2485**

MARCH 2023



**FLOWS AND FISH PASSAGE SETTLEMENT AGREEMENT FOR THE
RELICENSING OF THE TURNERS FALLS HYDROELECTRIC PROJECT, FERC
PROJECT NO. 1889, AND NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT,
FERC PROJECT NO. 2485**

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APPENDICES

- Appendix A - Protection, Mitigation, and Enhancement Measures Recommended to be Included in the New Turners Falls Hydroelectric Project License
- Appendix B - Protection, Mitigation, and Enhancement Measures Recommended to be Included in the New Northfield Mountain Pumped Storage Project License
- Appendix C - Measures Agreed to Among the Parties But Not to Be Included in New Project Licenses
- Appendix D - Authorized Representatives of the Parties

This Relicensing Settlement Agreement for the Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project (“Settlement Agreement”) is made and entered into pursuant to Federal Energy Regulatory Commission (“Commission” or “FERC”) Rule 602, 18 C.F.R. § 385.602, by and among:

FirstLight MA Hydro LLC
Northfield Mountain LLC
National Marine Fisheries Service
U.S. Fish and Wildlife Service
Massachusetts Division of Fisheries and Wildlife
The Nature Conservancy
American Whitewater
Appalachian Mountain Club
Crab Apple Whitewater, Inc.
New England FLOW
Zoar Outdoor

each referred to individually as a “Party” and collectively as “Parties.”

RECITALS

WHEREAS,

- A. FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively, “FirstLight”) are the FERC licensees for the Turners Falls Hydroelectric Project, FERC Project No. 1889 (“Turners Falls Project”), and Northfield Mountain Pumped Storage Project, FERC Project No. 2485 (“Northfield Mountain Project”), respectively. Both the license for the Turners Falls Project and the license for the Northfield Mountain Project (collectively, “Projects”) expired on April 30, 2018. The Projects have been operating on annual licenses pursuant to Section 15 of the Federal Power Act (“FPA”) since that time.
- B. In accordance with the requirements of the FPA and FERC’s regulations, FirstLight filed a Notice of Intent to file an application for new license for each of the Projects on October 31, 2012. Pursuant to FERC’s Integrated Licensing Process, FirstLight then engaged with relicensing participants, FERC, and the public in scoping environmental issues related to the Projects and in developing and implementing a rigorous study plan to assess the Projects’ environmental impacts.
- C. As required by the FPA and FERC’s regulations, FirstLight filed a Final Application for New License (“FLA”) for the Projects with FERC on April 29, 2016. Because certain environmental studies required by FERC had not yet been completed as of the statutory deadline for filing of the FLA, FirstLight filed a separate Amended Final License Application for each Project (“AFLAs”) on December 4, 2020, including FirstLight’s proposed protection, mitigation and enhancement (“PM&E”) measures to be included in the new licenses and the scientific and evidentiary basis for those measures.

- D. In 2017, FirstLight began formal settlement discussions with relicensing participants, in particular, discussions with state and federal fish and wildlife agencies on fish passage and flow issues. Those discussions did not result in agreement on all fish passage and flow issues, but nevertheless informed FirstLight’s PM&E proposals in the AFLAs. FirstLight’s PM&E proposals in the AFLAs also were informed by further non-FERC required environmental studies undertaken in consultation with the state and federal fish and wildlife agencies, which FirstLight filed into the FERC record.
- E. Following submittal of the AFLAs, FirstLight, the state and federal fish and wildlife agencies, and certain conservation organizations resumed discussions on fish passage and flows, which resulted in an Agreement in Principle which FirstLight filed with FERC on March 18, 2022. The same Parties reached an Amended Agreement in Principle on fish passage and flows to address fish passage adaptive management and certain other matters, which FirstLight filed with FERC on October 31, 2022. FirstLight separately engaged with whitewater boating interests and entered into an Agreement in Principle which FirstLight filed with FERC on February 28, 2022. Because of certain inconsistencies between the fish passage and flow agreement and the whitewater boating agreement, the parties to both agreements engaged in mutual discussions to bridge the gaps. Those discussions resulted in updates that have been incorporated into this Settlement Agreement.
- F. While FERC and the Massachusetts Department of Environmental Protection (“MADEP”) have not been directly involved in settlement negotiations, FirstLight and other Parties have kept FERC and MADEP generally apprised with periodic reports of their progress. Additionally, FirstLight and other Parties have at critical junctures requested FERC to continue to defer its Ready for Environmental Analysis (“REA”) notice requesting comments, protests and interventions on FirstLight’s applications for new license in order to give the Parties time to negotiate a final settlement agreement and resolve remaining outstanding issues. MADEP has been supportive of continued settlement discussions in filings with FERC. The Parties appreciate FERC’s agreement to defer its REA notice during this time to allow the Parties to focus on finalizing the Settlement Agreement.
- G. This Settlement Agreement is the end product of the Parties’ work on: (1) fish passage, (2) flows for fishery, ecological conservation and recreation purposes, and (3) protected, threatened and endangered species, and as to the Parties, addresses all outstanding issues for the relicensing of the Projects on those topics (“Topics within the Scope of this Agreement”).
- H. In the course of settlement negotiations, FirstLight developed additional technical materials in support of those discussions. The additional materials will be filed with FERC as relevant and appropriate to the Settlement Agreement.
- I. FERC has stated its intent to do a comprehensive environmental review that includes FirstLight’s Projects as well as the upstream Project Nos. 1855, 1892, and 1904. This Settlement Agreement has been negotiated with the understanding that FirstLight’s

operation of the Projects is in part governed by and dependent upon operations of the upstream projects.

TERMS OF AGREEMENT

NOW THEREFORE, in consideration of the mutual covenants set forth herein, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

1 General Provisions

1.1 Effective Date of Settlement Agreement

Except as provided in Section 1.1.1, this Settlement Agreement shall become effective upon the execution by all Parties of this Settlement Agreement (“Effective Date”).

1.1.1 FirstLight’s Affirmative Acceptance of License

FirstLight’s contractual obligation to the Parties to implement the measures set forth in Appendix C of this Settlement Agreement shall become effective only upon FirstLight’s acceptance, in its sole discretion, of the Final New Project Licenses. Within 45 days of the New Project Licenses becoming Final, FirstLight shall provide Notice to all Parties whether it affirmatively accepts the New Project Licenses and its concomitant obligations under this Settlement Agreement. If FirstLight does not timely provide such Notice, it shall be deemed to have affirmatively accepted the New Project Licenses. If FirstLight rejects the New Project Licenses this Settlement Agreement will terminate pursuant to Section 6.5, and will not be binding on FirstLight or any other Party in any subsequent proceeding at FERC or otherwise.

1.1.2 Effective Date of Parties’ Obligations

The Parties’ obligations under Sections 2 through 8, including the obligation to support this Settlement Agreement in the relicensing and related regulatory proceedings, take effect on the Effective Date.

1.2 Term of Settlement Agreement

The term of this Settlement Agreement shall commence on the Effective Date and shall continue (unless terminated as otherwise provided herein) for the term of the New Project Licenses plus the term(s) of any annual license(s) that may be issued after the foregoing New Project Licenses have expired.

1.3 Definitions

1.3.1 Commission or FERC shall mean the Federal Energy Regulatory Commission.

1.3.2 Consultation shall mean the process under this Settlement Agreement by which FirstLight seeks views through providing drafts of proposals, plans and reports, and seeking and considering comments on such proposals, plans, and reports as appropriate from relevant Parties. Consultation under this Settlement Agreement shall not be construed to satisfy “consultation” under Section 7 of the Endangered Species Act (“ESA”) or other federal laws specifically requiring consultation, unless specifically noted.

1.3.3 Disputing Party or Disputing Parties shall mean the Party providing Notice of the dispute, the Party alleged to have failed to perform an obligation, and any other Party that provides Notice of its intent to participate in the dispute resolution.

1.3.4 Final, with respect to the New Project Licenses under this Settlement Agreement, shall mean such licenses after exhaustion of administrative and judicial remedies for any challenge which any Party or other person brings against the New Project Licenses or against any other regulatory approval integral to issuance of the New Project Licenses.

1.3.5 Fishway Prescription shall mean a prescription issued by the National Marine Fisheries Service (“NMFS”) or the U.S. Fish and Wildlife Service (“USFWS”) under Section 18 of the FPA, whether designated as preliminary, modified or final.

1.3.6 Inconsistent with this Settlement Agreement shall mean: (1) any material modification to, deletion of, or addition to the Proposed License Articles in the New Project Licenses; (2) any material modification to, deletion of, or addition to the Proposed License Articles in any Fishway Prescription, ESA Section 7 Biological Opinion, or Clean Water Act (“CWA”) Section 401 Certification issued in connection with the New Project Licenses; (3) changes to the Projects proposed by FirstLight that are materially inconsistent with the assumptions underlying the Settlement Agreement; or (4) New Project Licenses issued for terms of less than 50 years. The term “material” for purposes of this section means a deviation from the Proposed License Articles that, either individually or collectively with other such deviations, substantially affects a Party’s bargained-for benefits under this Settlement Agreement.

1.3.7 Inconsistent with this Settlement Agreement shall not mean: (1) the inclusion of standard articles from the appropriate L-Form (as defined by 18 C.F.R. § 2.9) in the New Project Licenses; (2) FERC’s reservation of its authority to require changes to implementation schedules, plans, or other requirements of the New Project Licenses; (3) the inclusion in any Fishway Prescription of the issuing agency’s reservation of authority to reopen its prescription, provided that the reservation of authority is consistent with this Settlement Agreement, and provided further that each Party reserves its right to contest the exercise of such reserved authority at such time as the agency may exercise the reserved authority; (4) the inclusion in any ESA Section 7 Biological Opinion of the issuing agency’s

criteria for re-initiation of Section 7 consultation pursuant to 50 C.F.R. § 402.16; or (5) the inclusion in the New Project Licenses, any Fishway Prescription, any ESA Section 7 Biological Opinion, or any CWA Section 401 Certification, of such reasonable minimization and reporting requirements as FERC or the issuing agency determines are necessary to ensure FirstLight's compliance.

1.3.8 Material New Information shall mean significant and relevant new information which was neither in the administrative record for the relicensing nor otherwise known as of the Effective Date to the Party who seeks to use the Material New Information. Each Party agrees in good faith to share any such information with the other Parties in a timely manner.

1.3.9 New Project Licenses shall mean the new licenses, not to include any annual license extending the current licenses, issued by the Commission to FirstLight pursuant to Section 15 of the FPA for the continued operation of Project Nos. 1889 and 2485.

1.3.10 Notice shall mean a written communication which meets the requirements of Section 7.9 and any other requirements for notice specifically provided in any other applicable section of this Settlement Agreement.

1.3.11 Party or Parties shall mean the signatories to this Settlement Agreement.

1.3.12 Projects shall mean the Turners Falls Hydroelectric Project, currently licensed to FirstLight MA Hydro LLC as FERC Project No. 1889, and the Northfield Mountain Pumped Storage Project, currently licensed to Northfield Mountain LLC as FERC Project No. 2485.

1.3.13 Proposed License Articles shall mean the terms and conditions set forth in Appendices A and B of this Settlement Agreement that the Parties request that the Commission include in the New Project Licenses for the continued operation of the Projects.

1.3.14 Regulatory Party (collectively, "Regulatory Parties") shall mean USFWS, NMFS, and the Massachusetts Division of Fisheries and Wildlife ("MDFW").

1.3.15 Settlement Agreement shall mean the entirety of this Settlement Agreement, including the Appendices.

1.4 Acronyms

- 1.4.1** AFLAs – Amended Final License Applications
- 1.4.2** CWA – Clean Water Act
- 1.4.3** ESA – Endangered Species Act
- 1.4.4** FERC – Federal Energy Regulatory Commission
- 1.4.5** FLA – Final License Application
- 1.4.6** FPA – Federal Power Act
- 1.4.7** MADEP – Massachusetts Department of Environmental Protection
- 1.4.8** MDFW – Massachusetts Division of Fisheries and Wildlife
- 1.4.9** NMFS – National Marine Fisheries Service
- 1.4.10** NEPA – National Environmental Policy Act
- 1.4.11** PM&E – protection, mitigation and enhancement measure
- 1.4.12** REA – Ready for Environmental Analysis
- 1.4.13** USFWS – U.S. Fish and Wildlife Service

2 Purpose of Settlement Agreement

2.1 Purpose

The Parties have entered into this Settlement Agreement for the purpose of resolving all issues that have or could have been raised by the Parties in connection with FERC’s orders issuing New Project Licenses relating to Topics within the Scope of this Agreement. While recognizing that several regulatory and statutory processes are not yet completed, it is the Parties’ intention that this Settlement Agreement considers all significant issues related to the authority of Regulatory Parties concerning Topics within the Scope of this Agreement that may arise in the issuance of all regulatory approvals integral to FERC’s issuance of the New Project Licenses, including but not limited to ESA Section 7 Biological Opinions to be issued by USFWS and NMFS, the CWA Section 401 Certifications to be issued by MADEP, and any Environmental Impact Statement or Environmental Assessment issued pursuant to the National Environmental Policy Act (“NEPA”). The Parties recognize that MADEP is the agency responsible for Section 401 Certification and is not a Party to this Settlement Agreement. Pursuant to the Parties’ various rights, authorities, and responsibilities under Sections 10(a), 10(j), and 18 of the FPA, as well as other statutory and regulatory authorities and implied powers, this Settlement Agreement is intended to establish FirstLight’s obligations concerning Topics within the Scope of this Agreement for the protection, mitigation and enhancement of resources affected by the Projects under the New Project Licenses. It also specifies procedures to be used among the Parties to ensure that implementation of the New Project Licenses is not Inconsistent with this Settlement Agreement, and with other legal and regulatory mandates. Except as specifically provided below, each of the Regulatory Parties agrees that FirstLight’s performance of its obligations under this Settlement Agreement will be consistent with and is intended to fulfill FirstLight’s existing statutory and regulatory obligations as to each Regulatory Party relating to the relicensing of the Projects with respect to Topics within the Scope of this Agreement.

2.2 No Precedent for Other Proceedings

This Settlement Agreement is made with the understanding that it constitutes a negotiated resolution of issues relating to Topics within the Scope of this Agreement for the New Project Licenses. Accordingly, this Settlement Agreement shall not be offered against a Party as argument, admission or precedent in any mediation, arbitration, litigation, or other administrative or legal proceeding that does not involve or relate to the New Project Licenses or the operation of the Projects. Further, no Party shall be deemed to have approved, admitted, accepted, or otherwise consented to any operation, management, valuation, or other principle underlying any of the matters covered by this Settlement Agreement, except as expressly provided herein. With respect to any mediation, arbitration, litigation, or other administrative or legal proceeding involving or relating to the New Project Licenses, the Parties' rights and responsibilities shall be as set forth in this Settlement Agreement. This Section shall survive any termination of this Settlement Agreement.

3 Compliance with Legal Responsibilities and Reservations of Rights

3.1 Regulatory Parties

3.1.1 Except as otherwise provided in this Settlement Agreement, by entering into this Settlement Agreement, each Regulatory Party represents that it believes and expects, based on the information known to it at time of signature, that: (1) the Proposed License Articles set forth in Appendices A and B are likely to satisfy the statutory, regulatory, or other legal requirements for the protection, mitigation, and enhancement of natural resources with respect to Topics within the Scope of this Agreement under the New Project Licenses; and (2) the Regulatory Party's statutory, regulatory, or other legal responsibilities with respect to Topics within the Scope of this Agreement are, or can be, met through approval without material modification of this Settlement Agreement and subsequent implementation of the New Project Licenses. This representation applies only to those requirements that the Regulatory Party administers.

3.1.2 Nothing in this Settlement Agreement is intended or shall be construed to be an irrevocable commitment of resources or a pre-decisional determination by a Regulatory Party. After the Effective Date of this Settlement Agreement but prior to the issuance of the New Project Licenses, each Regulatory Party will participate in the relicensing proceeding, including environmental review and consideration of public comments, as required by applicable law. Further, NMFS and USFWS shall consult with FERC under the ESA. Each Regulatory Party shall consider any new information arising in the relicensing proceeding or ESA consultation, as required by applicable law.

3.1.3 The Regulatory Parties agree that, throughout the duration of the term of this Settlement Agreement, they will not exercise any statutory or regulatory authority under currently applicable federal or state law in a manner that is

Inconsistent with this Settlement Agreement, absent Material New Information and except as provided in Section 4.12. Any reservation of authority of USFWS or NMFS pursuant to Section 18 of the FPA and any exercise of such reserved authority shall be consistent with the provisions of this Settlement Agreement, including Section 4.12.

3.2 No Effect on Parties' Other Legal Duties

Nothing in this Settlement Agreement is intended to, or shall be construed to, affect or limit the authority or obligation of any Party to fulfill its constitutional, statutory, and regulatory responsibilities or to comply with any judicial decision or order.

3.3 Future Relicensings

Nothing in this Settlement Agreement is intended or shall be construed to affect or restrict any Party's participation in or comments about the provisions of any future relicensing of the Projects subsequent to the current relicensing.

4 Settlement Agreement Commitments and Implementation

4.1 Parties Bound by Settlement Agreement

Each Party shall be bound by this Settlement Agreement for the term stated in Section 1.2, provided the Final New Project Licenses are not Inconsistent with this Settlement Agreement and the Party has not withdrawn from the Settlement Agreement under Section 6 of this Settlement Agreement.

4.2 Fishway Prescriptions and Section 10(a) and 10(j) Recommendations

4.2.1 Protection, Mitigation and Enhancement Measures to Be Included in Section 18 Fishway Prescriptions and Section 10(a) and 10(j) Recommendations

(1) Preliminary Fishway Prescriptions and any flow or fish passage recommendations under FPA Sections 10(a) and 10(j) of the Parties shall not be Inconsistent with this Settlement Agreement;

(2) Any information, comments, or responses to comments regarding flows and/or fish passage by the Parties in the context of relicensing of the Projects shall not be Inconsistent with this Settlement Agreement;

(3) The Parties shall use reasonable efforts to obtain FERC orders approving this Settlement Agreement and issuing New Project Licenses not Inconsistent with this Settlement Agreement in a timely manner;

(4) The Parties shall support, in all relevant regulatory proceedings in which they

participate, regulatory actions regarding flows and/or fish passage not Inconsistent with this Settlement Agreement; and

(5) A Party may only use Material New Information to submit comments or recommendations under Sections 10(a) or 10(j) Inconsistent with this Settlement Agreement if it believes in good faith that such information significantly undermines the Settlement Agreement, taken as a whole for the affected Party, and significantly affects the adequacy of the Proposed License Articles under Sections 10(a) or 10(j).

4.2.2 Fishway Prescriptions Inconsistent with Settlement Agreement

4.2.2.1 NMFS and USFWS intend that any Fishway Prescriptions submitted to FERC in connection with the issuance of the New Project Licenses will not be Inconsistent with this Settlement Agreement, in particular, Proposed License Articles A300, A310, A320, and A330 for the Turners Falls Project and Articles B200, B210, and B220 for the Northfield Mountain Project.

4.2.2.2 If any Fishway Prescription is Inconsistent with this Settlement Agreement, the Settlement Agreement shall be deemed modified to conform to the inconsistency unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the date the inconsistent Fishway Prescription is filed with FERC.

4.2.2.3 The Disputing Party may exercise any right it may have to request an agency trial-type hearing on issues of material fact under Section 18 of the FPA, and propose alternatives under Section 33 of the FPA, with respect to any Fishway Prescriptions that include an inconsistency with this Settlement Agreement, even if other provisions in the Fishway Prescriptions are not Inconsistent with the Settlement Agreement. The Disputing Party may also seek administrative review at FERC and any other administrative and/or judicial remedies provided by law. The Parties shall follow the dispute resolution process to the extent reasonably practicable while any such appeal of an inconsistent action is pursued.

4.2.2.4 Except as provided in Section 4.5.5.4 for omissions based on jurisdiction or if the Settlement Agreement is terminated pursuant to Section 6.5, if any Fishway Prescriptions are Inconsistent with this Settlement Agreement after a final and non-appealable administrative or judicial decision, this Settlement Agreement shall be deemed modified to conform to that decision.

4.2.2.5 If the Fishway Prescriptions are not Inconsistent with this Settlement Agreement, each Party waives any right it may have to request

an agency trial-type hearing on issues of material fact under Section 18 of the FPA, and to propose alternatives under Section 33 of the FPA. The Parties shall not support any trial-type hearing request by any non-party and will make reasonable efforts to support USFWS and NMFS, as appropriate, if a trial-type hearing is requested by any non-party. If a non-party requests a trial-type hearing, the Parties may intervene in the hearing to support this Settlement Agreement.

4.3 ESA Consultation

4.3.1 Biological Opinions

FERC has designated FirstLight as FERC's non-federal representative for carrying out informal consultation with NMFS and USFWS under Section 7 of the ESA. As part of this informal consultation, FirstLight submitted as part of its AFLAs draft Biological Assessments to assist FERC's preparation of Biological Assessments for purposes of Section 7 consultation with NMFS and USFWS. Within 180 days of the Effective Date, FirstLight will file with FERC revised draft Biological Assessments reflecting the relevant PM&E measures agreed to as part of this Settlement Agreement and asking FERC to consider and adopt them as part of the proposed actions for the Section 7 consultations between FERC and NMFS, and FERC and USFWS. Any Biological Opinions relating to the New Project Licenses shall address and evaluate the provisions that FERC incorporates into its proposed actions. As of the Effective Date, NMFS and USFWS represent that they enter into this Settlement Agreement believing that the information in the record supports the PM&E measures provided herein. However, NMFS and USFWS are not making a pre-decisional determination of the outcome of any Section 7 consultation and expressly reserve the right to issue any Reasonable and Prudent Measures and Terms and Conditions in any Biological Opinions and Incidental Take Statements as necessary to meet their obligations under the ESA.

Further, the Parties acknowledge the ESA consultation will be based on FERC's proposed actions, the species listed under the ESA at the time of the consultation, and the best information available at the time of the consultation. Per the implementing regulations for Section 7 of the ESA, a consultation shall be reinitiated if any of the criteria at 50 C.F.R. § 402.16 are met. The outcome of future consultations on the Projects, during or after the term of the New Project Licenses, will not be limited by the content of this Settlement Agreement. Per 50 C.F.R. § 402.14(i)(2), formal consultations that result in non-jeopardy Biological Opinions must adhere to the "minor change rule."

4.3.2 Biological Opinion and Incidental Take Statement Inconsistent with This Settlement Agreement

4.3.2.1 Consistent with Section 4.3.1, NMFS and USFWS anticipate that the measures contained in this Settlement Agreement will minimize any incidental take occurring as a result of implementation of this Settlement Agreement for species listed as threatened or endangered as of the Effective Date, and that any Reasonable and Prudent Measures and/or Terms and Conditions contained in any Biological Opinions and Incidental Take Statements will not be Inconsistent with this Settlement Agreement.

4.3.2.2 If any Biological Opinion or Incidental Take Statement issued pursuant to Section 7 of the ESA is Inconsistent with this Settlement Agreement, this Settlement Agreement shall be deemed modified to conform to the provisions of the Biological Opinion and Incidental Take Statement, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the Biological Opinion and Incidental Take Statement are filed with FERC.

4.3.2.3 The Disputing Party may, to the extent provided by applicable law, seek administrative and/or judicial review of any Biological Opinion or Incidental Take Statement that is Inconsistent with this Settlement Agreement. The Parties shall follow the dispute resolution process to the extent reasonably practicable while such administrative or judicial review is pursued.

4.3.2.4 Except as provided in Section 4.5.5.4 for omissions based on jurisdiction or if the Settlement Agreement is terminated pursuant to Section 6.5, if any Biological Opinion or Incidental Take Statement is Inconsistent with this Settlement Agreement after a final and non-appealable decision on the administrative or judicial action, this Settlement Agreement shall be deemed modified to conform to the final decision.

4.4 CWA Section 401 Certification

4.4.1 Protection, Mitigation and Enhancement Measures Recommended to Be Included in CWA Section 401 Certifications

Any Party participating in the Section 401 Certification process shall request that MADEP accept and incorporate, without material modifications, as conditions to the Section 401 Certifications, all the PM&E measures stated in Appendices A and B of the Settlement Agreement that are within the MADEP's jurisdiction pursuant to Section 401 of the CWA. The Parties shall further request that

MADEP not include as conditions to the Section 401 Certifications additional conditions that are Inconsistent with this Settlement Agreement.

4.4.2 Section 401 Certifications Inconsistent with This Settlement Agreement

4.4.2.1 If the MADEP denies FirstLight's application for Section 401 Certification for either of the Projects, the Parties agree such denial shall be considered Inconsistent with this Settlement Agreement, unless (1) the denial is without prejudice, and (2) the denial is not based on a determination that the PM&E measures in Appendices A and B of this Settlement Agreement are insufficient for MADEP to issue Section 401 Certifications based on those PM&E measures. If the MADEP issues the Section 401 Certifications and any condition of a Section 401 Certification is Inconsistent with this Settlement Agreement, the Settlement Agreement shall be deemed modified to conform to the Section 401 Certification, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the issuance of the Section 401 Certification.

4.4.2.2 The Disputing Party may, to the extent provided by applicable law, seek administrative and/or judicial review of any Section 401 Certification or denial of Section 401 Certification that is Inconsistent with this Settlement Agreement. The Parties shall follow the dispute resolution process to the extent reasonably practicable while such administrative and/or judicial review is pursued.

4.4.2.3 If any Party or non-party seeks administrative and/or judicial review of a Section 401 Certification, FirstLight or any Party may request that FERC hold the New Project Licenses in abeyance pending a final adjudication of the Section 401 Certification. Any Party objecting to such a request may oppose it, after complying with the dispute resolution procedures of this Settlement Agreement.

4.4.2.4 Except as provided in Section 4.5.5.4 for omission based on jurisdiction or if the Settlement Agreement is terminated pursuant to Section 6.5, if any condition of a Section 401 Certification is Inconsistent with this Settlement Agreement after a final and non-appealable decision on the administrative or judicial action, this Settlement Agreement shall be deemed modified to conform to the final decision.

4.5 New Project Licenses

4.5.1 Support for Issuance of New Project Licenses

The Parties shall support and advocate through appropriate written communications to FERC, USFWS, NMFS, and MADEP on behalf of this Settlement Agreement and the PM&E measures stated in Appendices A and B hereto. The Parties agree not to propose, support, or advocate proposed PM&E measures Inconsistent with this Settlement Agreement, except as specifically permitted herein.

4.5.2 Term of New Project Licenses

The Parties agree that the investment of funds and other commitments associated with the terms of this Settlement Agreement justify the issuance of 50-year licenses and support FirstLight's request for 50-year licenses to FERC.

4.5.3 Comments on the NEPA Document

The Parties shall comment on any PM&E measure recommended by FERC in its draft or final NEPA document which, if approved in the New Project Licenses, would be Inconsistent with this Settlement Agreement. Such comment(s) would aim to urge FERC to adopt the full settlement terms before the issuance of the New Project Licenses.

4.5.4 PM&E Measures Recommended to Be Included in New Project Licenses

The Parties shall request that FERC accept and incorporate, without material modification, as license articles, all the PM&E measures stated in Appendices A and B of this Settlement Agreement. The Parties shall further request that FERC not include in the New Project Licenses PM&E measures that are Inconsistent with this Settlement Agreement.

The Parties shall request that measures and actions agreed to among the Parties as set forth in Appendix C not be incorporated in the New Project Licenses.

4.5.5 New Project Licenses Inconsistent with This Settlement Agreement

4.5.5.1 Consistency of Licenses with Settlement Agreement

If the New Project Licenses issued by FERC are Inconsistent with this Settlement Agreement, the Settlement Agreement shall be deemed modified to conform to the inconsistency, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the date of the FERC order issuing license.

4.5.5.2 Disputing Inconsistencies

The Disputing Party may, in addition, if it is a party to the FERC relicensing proceeding, petition FERC for rehearing and seek judicial review of the New Project Licenses. If any Party, including FirstLight, or non-party seeks rehearing or judicial review of the New Project Licenses, FirstLight may seek a stay or an extension of time of any or all requirements of the New Project Licenses. Any Party objecting to such a request may oppose it, after complying with the dispute resolution procedures of this Settlement Agreement.

4.5.5.3 Modification of Agreement if Inconsistency

Except as provided in Section 4.5.5.4 for omission based on jurisdiction and Section 4.5.5.5 for inclusion based on jurisdiction, or if the Settlement Agreement is terminated pursuant to Section 6.5, if a provision in the Final New Project Licenses is Inconsistent with this Settlement Agreement, this Settlement Agreement shall be deemed modified to conform to the final decision.

4.5.5.4 Omission Based on Jurisdiction

If the New Project Licenses do not contain all the PM&E measures stated in Appendices A and B because FERC expressly determines that it does not have jurisdiction to adopt or enforce the omitted PM&E measures, this Settlement Agreement shall not be deemed modified to conform to such omission, and such omission shall not be used as the basis for dispute among the Parties; provided that any PM&E measure that FERC excludes from Appendices A or B based on a lack of jurisdiction shall be automatically included in Appendix C without material modification (including all funds needed to carry out or implement any such PM&E measure).

4.5.5.5 Inclusion Based on Jurisdiction or Section 401 Certification

If the New Project Licenses include PM&E measures stated in Appendix C of this Settlement Agreement because FERC determines that such measures are required to be included under the FPA and are within FERC's jurisdiction to enforce, or MADEP includes such measures as conditions of a Section 401 Certification, such action shall not be considered Inconsistent with this Settlement Agreement provided there is no material change to the PM&E measure other than its inclusion in the New Project Licenses. However, Parties may not assert in any regulatory forum including FERC that any PM&E measures in Appendix C of this Settlement Agreement should be included in the New Project Licenses.

4.6 Cooperation Among Parties

The Parties shall cooperate in good faith in the implementation of this Settlement Agreement and the New Project Licenses.

4.7 Support for Implementation

Upon notification by FirstLight of the need therefore, the other Parties shall provide written communications (or orally, in the event written communication is impossible to obtain due to reasons outside a Party's control) of support in any administrative approval process that may be required for implementation of this Settlement Agreement or related articles of the New Project Licenses, subject to available Party resources and Regulatory Party authority and policy.

4.8 Defense Against PM&E Measures Inconsistent with This Settlement Agreement

If a Party files a pleading or other document before FERC or another regulatory agency advocating a PM&E measure Inconsistent with this Settlement Agreement which is not based on Material New Information, whether prior to or following issuance of the New Project Licenses, any other Party may defend by: (1) stating its opposition to the PM&E measure Inconsistent with this Settlement Agreement; (2) requesting that FERC or other regulatory agency disapprove the PM&E measure Inconsistent with this Settlement Agreement; and (3) explaining what offsetting PM&E measures should be included in and/or excluded from the New Project Licenses if the PM&E measure Inconsistent with this Settlement Agreement is approved.

4.9 Responsibility for Compliance with New Project Licenses

Upon acceptance of the New Project Licenses, FirstLight is ultimately responsible for compliance with them. By entering into this Settlement Agreement, except as expressly provided herein, none of the other Parties is accepting any new or additional legal liability or responsibility for compliance with the obligations under the New Project Licenses. FirstLight shall not be excused from its duty to comply with the New Project Licenses due to a failure by any other Party, entity, or person to provide funding or carry out a duty, obligation, or responsibility it may have with respect to the Projects pursuant to other laws or agreements. Notwithstanding the foregoing, this Settlement Agreement does not alter or abrogate any duty, obligation, or responsibility that any other Party or person may have to provide such funding pursuant to other laws or agreements, nor does this Settlement Agreement prevent FirstLight or any other Party from seeking to enforce such duty, obligation, or responsibility. Further, FirstLight shall have no obligation to reimburse or otherwise pay any other Party for its assistance, participation, or cooperation in any activities pursuant to this Settlement Agreement of the New Project Licenses unless expressly agreed to by FirstLight or as required by law. In the event of administrative rehearing or judicial review, Parties shall bear their own costs and attorneys' fees.

4.10 Availability of Funds

Implementation of this Settlement Agreement by any Party other than FirstLight is subject to the availability of funds. In addition, implementation of this Settlement Agreement by any federal agency is subject to the requirements of the Anti-Deficiency Act, 31 U.S.C. Section 1341 *et seq.*

4.11 Implementation

4.11.1 Implementation Schedule

FirstLight shall ensure that implementation of the PM&E measures stated in Appendices A and B shall be consistent with any schedule specified in Appendices A and B (as it may be modified by the New Project Licenses). FirstLight and other responsible Parties shall implement the measures stated in Appendix C consistent with the applicable schedules.

4.11.2 Permits

Upon acceptance of the New Project Licenses and FERC approval of the applicable plans, FirstLight shall apply for and use reasonable efforts to obtain in a timely manner and in final form all necessary federal, state, regional, and local permits, licenses, authorizations, certifications, determinations, and other governmental approvals for purposes of implementing this Settlement Agreement and the New Project Licenses (“Permits”). The applications for such Permits shall be consistent with the terms of this Settlement Agreement. Each Party, upon FirstLight’s request, shall use reasonable efforts to support FirstLight’s applications for Permits, and shall not file comments or recommend Permit conditions that are Inconsistent with this Settlement Agreement. However, this agreement to support FirstLight’s applications for Permits, shall not apply to a Regulatory Party issuing the permit, consulting on the issuance of a permit under its legal authority, or not participating in the Permit application proceeding. FirstLight shall pay all fees required by law related to such Permits. The Parties shall work together and cooperate as appropriate during the permitting, environmental review, and implementation of this Settlement Agreement. FirstLight shall not be required by the Settlement Agreement to implement an action required under this Settlement Agreement or the New Project Licenses if a Permit has been denied or contains conditions that are Inconsistent with this Settlement Agreement, or until all applicable Permits required for that action are obtained. If a proceeding challenging any Permit required for the action has been commenced, FirstLight shall be under no obligation under this Settlement Agreement to implement the action or any related action until any such proceeding is terminated. In the event any Permit has been denied, FirstLight determines that the Permit contains conditions that are Inconsistent with this Settlement Agreement, or any Permit is not obtained in a timely manner, the Parties shall confer to evaluate the effect of such event on implementation of this

Settlement Agreement and seek to develop actions to respond to that event. If the Parties do not agree on actions to respond to that event and nonperformance or prolonged delay in performance of one or more PM&E measures due to the event materially reduces the benefit of this Settlement Agreement, a Party may initiate dispute resolution, except that dispute resolution regarding denial of a Permit shall be restricted to the issue of actions to respond to that event. In addition, if the event results in nonperformance or prevents performance of one or more PM&E measures for a prolonged period, the Parties recognize that re-initiation of consultation under the ESA may be required. Nothing contained in this section shall be construed to limit FirstLight's right to apply for a Permit before issuance of the New Project Licenses, provided that any such applications shall not be Inconsistent with this Settlement Agreement.

4.12 Reopener or Amendment of New Project Licenses

4.12.1 Limitation on Reopeners and Modifications

No Party to this Settlement Agreement may seek to modify or otherwise reopen the PM&E measures included in the New Project Licenses in a manner that is Inconsistent with this Settlement Agreement unless that Party, relying on Material New Information, reasonably demonstrates that such proposed modification or reopener fulfills a statutory, regulatory, or court ordered responsibility, or reasonably demonstrates that the New Project Licenses no longer comply with applicable law, or that there is a similarly compelling reason to modify the PM&E measures.

4.12.1.1 Notice of Proposed Reopener

Prior to seeking modification or reopener, a Party shall provide all Parties at least 90-day Notice to consider the Material New Information and that Party's position. A Party shall not be required to comply with this 90-day Notice provision if it reasonably believes an emergency situation exists. If a Party proposes a modification or reopener that another Party believes would be Inconsistent with this Settlement Agreement and objects, then the dispute resolution provisions of Section 5 apply, and the objecting Party must invoke dispute resolution during the 90-day Notice period or waive its objection.

4.12.2 Amendment of New Project Licenses

Nothing in this Settlement Agreement is intended, or shall be construed, to affect or limit the right of FirstLight to seek amendments of the New Project Licenses that are not Inconsistent with this Settlement Agreement.

4.12.2.1 Notice of Proposed License Amendment

Prior to filing any proposed license amendment that relates to a subject covered by this Settlement Agreement, including a temporary amendment, FirstLight shall provide the other Parties at least 90-day Notice of its intention to do so. At the request of any Party, FirstLight shall consult with any/all interested Parties regarding the need for and the purpose of the amendment. If a Party believes the proposed amendment is Inconsistent with this Settlement Agreement and objects, then the dispute resolution provisions in Section 5 apply, and the objecting Party must invoke dispute resolution within this 90-day Notice period or waive its objection. FirstLight shall not be required to comply with this 90-day Notice provision if it reasonably believes an emergency situation exists or if required to meet its responsibilities under applicable law or an order of an agency with jurisdiction over it. In such an emergency or regulatory compliance situation, FirstLight shall give Notice to the Regulatory Parties within 10 business days of recognition of the need for such amendment.

4.12.2.2 Consultation on Amendments

Except as provided in the New Project Licenses or in the case of an emergency, FirstLight shall allow a minimum of 60 days for any Party to comment and to make recommendations before filing any application for a Project license amendment that relates to a subject covered by this Settlement Agreement and where consultation with Regulatory Parties or other Parties is required. If FirstLight does not adopt a recommendation or comment of a Party, it shall include in any filing with FERC copies of the comments/recommendations and an explanation as to why the comment/recommendation was not adopted.

4.12.2.3 Exception for FERC Compliance Directives

The notice and consultation requirements of this Section shall not apply to license amendments in connection with compliance matters under Section 4.13 below.

4.12.2.4 Parties' Option to Intervene in Amendment Proceeding

FirstLight shall not oppose, based on the issue of standing, an intervention request by any Party in a proceeding for a Project license amendment that the Party has concluded would be Inconsistent with this Settlement Agreement. The Parties acknowledge that intervention in the relicensing proceeding docket at FERC does not make the Party an intervenor in any post-licensing proceeding.

4.13 Compliance with FERC Project Safety and Other Directives

FirstLight expressly reserves the right to fully and timely comply with any FERC directive or compliance order, including but not limited to any requirement related to Project safety or security. In no instance will any action by FirstLight that is reasonably necessary or appropriate to comply with any such order or direction from FERC trigger the dispute resolution protocols of this Settlement Agreement or be construed as a breach of the Settlement Agreement or an action Inconsistent with this Settlement Agreement. FirstLight agrees to consult with relevant Parties to the extent practicable prior to taking action. All Parties reserve their rights to defend their interests at FERC.

4.14 Amendment of Settlement Agreement

This Settlement Agreement may be amended at any time through the term of the New Project Licenses plus the term(s) of any annual license(s) that may be issued after the New Project Licenses have expired, with the unanimous agreement of all Parties still in existence, including any successor thereto. The Party seeking amendment shall give each other Party at least 60-day prior written Notice. Such Notice shall state that failure of any Party, with the exception of Regulatory Parties and FirstLight, to respond in writing or by electronic mail to the Notice within the applicable 60-day period shall be deemed to be an approval of such amendment. Any amendment of this Settlement Agreement shall be in writing and executed by the responding Parties. The Parties recognize that any amendment to Appendices A and B of the Settlement Agreement may also require an amendment to the New Project Licenses, the CWA 401 Certifications, and the Biological Opinions.

5 Dispute Resolution

5.1 General Applicability

5.1.1 All disputes among the Parties regarding any Party's performance or compliance with this Settlement Agreement, including resolution of any disputes related to the New Project Licenses, Fishway Prescriptions, Biological Opinions, Section 401 Certifications, or Permits related to the New Project Licenses, shall be subject to the dispute resolution process provided in this Section 5, unless otherwise specifically provided in this Settlement Agreement or required by applicable law. The Parties agree that disputes shall be brought in a prompt and timely manner.

5.1.2 The Disputing Parties shall devote such resources as are needed and as can be reasonably provided to resolve the dispute expeditiously.

5.1.3 The Disputing Parties shall cooperate in good faith to promptly schedule, attend, and participate in the dispute resolution.

5.1.4 Unless otherwise agreed among the Disputing Parties, each Disputing Party shall bear its own costs for its participation in this or any administrative dispute resolution process related to the Settlement Agreement.

5.1.5 Each Disputing Party shall promptly implement any resolution of the dispute.

5.1.6 The dispute resolution process in this Section does not preclude any Party from timely filing and pursuing an action for administrative or judicial relief of any FERC order, compliance matter, or other regulatory action related to the New Project Licenses, provided that any such Party shall pursue dispute resolution pursuant to this process as soon as practicable thereafter or concurrently therewith.

5.1.7 The Party initiating a dispute under this Section may notify FERC when dispute resolution proceedings are initiated relevant to the New Project Licenses. The Parties acknowledge that the initiation of dispute resolution proceedings shall have no effect on filing deadlines or applicable statutes of limitation before FERC.

5.2 Process

5.2.1 Dispute Initiation Notice

A Party claiming a dispute shall give Notice of the dispute. If the dispute includes a claim that a New Project License, or related regulatory approval, is Inconsistent with this Settlement Agreement, the Notice shall be issued within the applicable time periods specified in Section 4. Such Notice shall describe: (A) the matter(s) in dispute, (B) the identity of any other Party alleged to have not performed an obligation provided by the Settlement Agreement, and (C) the specific relief sought. The Parties agree that disputes shall be brought in a prompt and timely manner.

5.2.2 Informal Meetings

The Disputing Parties shall hold at least two informal meetings to resolve the dispute, commencing within 30 days after the Dispute Initiation Notice.

5.2.3 Mediation

If the dispute is not resolved in the informal meetings, the Disputing Parties shall decide whether to use a neutral mediator, such as FERC's Office of Dispute Resolution Services. The decision whether to pursue mediation shall be made within 20 days after conclusion of the informal meetings in Section 5.2.2. The Disputing Parties shall agree on an appropriate allocation of any costs of the mediator employed under this section. Mediation shall not occur if the Disputing

Parties cannot agree on the allocation of costs. The Disputing Parties shall select a mediator within 30 days of the decision to pursue mediation, including the agreement of allocation of costs. The mediation process shall be concluded not later than 60 days after the mediator is selected. The above time periods may be shortened or lengthened upon mutual agreement of the Disputing Parties.

5.2.4 Dispute Resolution Notice

The Disputing Parties shall provide Notice of any resolution of the dispute achieved under Sections 5.2.2 and 5.2.3. The Notice shall: (A) restate the disputed matter, as initially described in the Dispute Initiation Notice; (B) describe the alternatives which the Disputing Parties considered for resolution; and (C) state whether resolution was achieved, in whole or part, and state the specific relief agreed-to as part of the resolution.

5.3 Enforcement of Settlement Agreement After Dispute Resolution

5.3.1 Enforcement Regarding New Project Licenses

A Disputing Party may seek administrative or judicial relief for an unresolved dispute regarding FirstLight's performance of its obligations under the New Project Licenses only after exhaustion of the dispute resolution process under Section 5, unless applicable processes require a filing for relief before dispute resolution can conclude. Any such relief shall be sought and obtained from FERC or other appropriate regulatory or judicial forum. No Party to the Settlement Agreement may seek damages for breach of the Proposed License Articles stated in Appendices A and B, whether before or after acceptance of the New Project Licenses.

5.3.2 Enforcement Regarding Contractual Obligations

A Disputing Party may seek administrative or judicial relief for breach of a contractual obligation established by this Settlement Agreement only after exhaustion of the dispute resolution process in Section 5. Venue for such action shall lie in a court with jurisdiction located in the Commonwealth of Massachusetts. In such action, a Disputing Party may only seek specific performance of the contractual obligation or other equitable relief. No Party shall be liable for damages for such breach of contractual obligations. By executing this Settlement Agreement, no Party waives any equitable or legal defenses that may be available. Nothing in this agreement waives the sovereign immunity of the United States, or the Commonwealth of Massachusetts, or constitutes consent to suit by either sovereign in any manner not otherwise provided for by law.

6 Withdrawal from Settlement Agreement

6.1 Withdrawal of Party from Settlement

A Party may withdraw from this Settlement Agreement only if (1) it objects to a Fishway Prescription, Biological Opinion, CWA 401 Certification, or FERC order issuing a New Project License that is Inconsistent with this Settlement, (2) it has complied with the required dispute resolution procedures stated in Section 5 to attempt to resolve the objection, and (3) the objection is to a CWA 401 Certification or FERC order issuing a New Project License, that Party does not file for appeal of the inconsistency. If the Party files an appeal to resolve the inconsistency, that Party may not withdraw until its appeal is concluded and the inconsistency remains uncured. In addition, FirstLight may withdraw as provided in Section 6.2. A Party that withdraws will provide Notice of withdrawal, including its basis for withdrawal.

6.2 Withdrawal of FirstLight from Settlement Agreement Prior to Acceptance of the New Project Licenses

In addition to the provisions of Section 6.1, prior to the acceptance of the New Project Licenses, FirstLight may withdraw from this Settlement Agreement without first complying with the dispute resolution process stated in Section 5 if a Party withdraws from this Settlement Agreement and FirstLight determines in its sole discretion, after providing the remaining Parties a reasonable opportunity to meet and discuss the matter with FirstLight, that the withdrawal: (1) may adversely affect the likelihood of NMFS or USFWS issuing a Fishway Prescription or Biological Opinion that is consistent with this Settlement Agreement, (2) may adversely affect the likelihood of MADEP issuing a CWA 401 Certification that is consistent with this Settlement Agreement, (3) may adversely affect the likelihood of FERC issuing a license that is consistent with this Settlement Agreement, or (4) substantially diminishes the value of this Settlement Agreement for FirstLight. FirstLight shall give Notice identifying the reason for withdrawal within 30 days of its knowledge of the event creating the right to withdraw.

6.3 Effective Date of Withdrawal

Withdrawal by a Party shall become effective 10 calendar days after Notice is given by the withdrawing Party.

6.4 Continuity After Withdrawal

The withdrawal of a Party, other than FirstLight, does not automatically terminate this Settlement Agreement for the remaining Parties. If a Party withdraws from this Settlement Agreement, the withdrawing Party shall not be bound by any term contained in this Settlement Agreement, except as provided in this section and in Section 2.2. The withdrawing Party shall not use any documents and communications related to the development, execution, and submittal of this Settlement Agreement to FERC as evidence, admission, or argument in any forum or proceeding for any purpose to the

fullest extent allowed by applicable law, including 18 C.F.R. § 385.606. This provision does not apply to any information that was in the public domain prior to the development of this Settlement Agreement or that became part of the public domain at some later time through no unauthorized act or omission by any Party. This provision does not apply to: (1) any information held by a federal agency that is not protected from disclosure pursuant to the Freedom of Information Act or other applicable law; or (2) any information held by a state or local agency that is not protected from disclosure pursuant to M.G.L. ch. 66 §§ 10-10B or other applicable state or federal law. The withdrawing Party shall continue to maintain the confidentiality of all settlement communications to the extent permitted by applicable law.

6.5 Termination of Settlement Agreement

This Settlement Agreement shall terminate as to all Parties and have no further force or effect upon expiration of the New Project Licenses and any annual licenses issued after expiration thereof, upon withdrawal from this Settlement Agreement by FirstLight or upon FirstLight's decision not to affirmatively accept the New Project Licenses, or upon FERC issuing an order approving FirstLight's surrender of one or both of the New Project Licenses. Upon termination, all documents and communications related to the development, execution, and submittal of this Settlement Agreement to FERC shall not be used as evidence, admission, or argument in any forum or proceeding for any purpose to the fullest extent allowed by applicable law, including 18 C.F.R. § 385.606. This provision does not apply to any information that was in the public domain prior to the development of this Settlement Agreement or that became part of the public domain at some later time through no unauthorized act or omission by any Party. This provision does not apply to: (1) any information held by a federal agency that is not protected from disclosure pursuant to the Freedom of Information Act or other applicable law; or (2) any information held by a state or local agency that is not protected from disclosure pursuant to M.G.L. ch. 66 §§ 10-10B or other applicable state or federal law. Notwithstanding the termination of this Settlement Agreement, all Parties shall continue to maintain the confidentiality of all settlement communications to the extent permitted by applicable law, and all Parties remain subject to Section 2.2 of this Settlement Agreement.

7 General Provisions

7.1 Non-Severable Terms of Settlement Agreement

The terms of this Settlement Agreement are not severable one from the other. This Settlement Agreement is made on the understanding that each term is in consideration and support of every other term, and each term is a necessary part of the entire Settlement Agreement. If a court of competent jurisdiction rules that any provision in Sections 1 through 8.2 of this Settlement Agreement is invalid, this Settlement Agreement is deemed modified to conform to such ruling, unless a Party objects. If a Party objects, the other Parties agree to meet and confer regarding the continued viability of this Settlement Agreement.

7.2 No Third-Party Beneficiaries

This Settlement Agreement shall not create any right or interest in the public, or any member thereof, as a third-party beneficiary hereof, and shall not authorize any non-Party to maintain a suit at law or equity pursuant to this Settlement Agreement. The duties, obligations, and responsibilities of the Parties with respect to third parties shall remain as imposed under applicable law.

7.3 Successors and Assigns

This Settlement Agreement shall be binding on and inure to the benefit of the Parties and their successors and approved assigns, unless otherwise specified in this Settlement.

7.3.1 Assignment

Any voluntary assignment by a Party shall not be effective unless approved by FirstLight, which approval shall not be unreasonably withheld. A partial assignment is not permitted. After FirstLight's approval of the assignment, the assignee shall sign the Settlement Agreement and become a Party.

7.3.2 Succession

In the event of succession between public agencies, whether by statute, executive order, or operation of law, the successor agency shall become a Party to and be bound by the terms of this Settlement Agreement, to the extent permitted by law.

7.3.3 Continuation of Certain Obligations

7.3.3.1 Upon completion of a succession or assignment, the initial Party shall no longer be a Party. It shall continue to be bound by Sections 2.2, 6.4, 6.5, 7.2, and 7.3. The initial Party shall not take any action adverse to the Settlement Agreement, or the New Project Licenses to the extent they incorporate the Settlement Agreement.

7.3.3.2 No change in ownership of the Project or transfer of the existing or New Project Licenses by FirstLight shall in any way modify or otherwise affect any other Party's rights or obligations under this Settlement Agreement. Unless prohibited by applicable law, FirstLight shall require in any transaction for a change in ownership of the Projects or transfer of the existing or New Project Licenses, that such new owner shall be bound by, and shall assume all of the rights and obligations of FirstLight under this Settlement Agreement upon completion of the change of ownership and approval by FERC of the license transfer.

7.3.4 Notice

FirstLight transferring pursuant to Section 7.3.3.2 or an assigning Party shall provide Notice to the other Parties at least 30 days prior to the proposed effective date of such transfer or assignment.

7.4 Extension of Time; Inability to Perform

7.4.1 Obligations under New Project Licenses

7.4.1.1 Extension of Time

If FirstLight has good cause, consistent with FERC's standard in 18 C.F.R. § 385.2008, to seek an extension of time to fulfill an obligation under the New Project Licenses, it may file with FERC such a request after consulting with the relevant Parties. The Parties acknowledge that FERC's standard for any such request shall apply. If any Party provides Notice that it disputes the good cause for extension, FirstLight and the Disputing Party shall follow the dispute resolution process in Section 5 of this Settlement Agreement. If the dispute cannot be timely resolved by such process, FirstLight may proceed with its request, if it has not done so already, and any Disputing Party may oppose the request.

7.4.1.2 Inability of FirstLight to Perform

If FirstLight is unable to perform an obligation under the New Project Licenses due to an event or circumstances beyond its reasonable control, FirstLight may file with FERC an appropriate request for relief. The Parties acknowledge that FERC's standard for any such request shall apply. If any Party provides Notice that it disputes the non-performance, FirstLight and the Disputing Party shall follow the dispute resolution process in Section 5 of this Settlement Agreement. If the dispute cannot be timely resolved by such process, FirstLight may proceed with its request to FERC, if it has not done so already, and any Disputing Party may oppose its request.

7.4.2 Contractual Obligations

No Party shall be in breach of a contractual obligation under this Settlement Agreement, as established by Sections 1 through 8.2 and Appendix C of this Settlement Agreement, if it is unable to perform or delays performance due to any Uncontrollable Force reasonably beyond its control, unless otherwise provided by this Settlement Agreement. For this purpose, "Uncontrollable Force" may include, but is not limited to, natural events, labor or civil disruption, action or non-action of a governmental agency, or unforeseen breakdown or failure of the Project works for the period of time necessary to cure.

7.4.3 Notice of Delay or Inability to Perform

The Party whose performance of an obligation under this Settlement Agreement is affected by any delay or inability to perform under Section 7.4 shall provide Notice as soon as reasonably practicable. This Notice shall include: (1) a description of the event causing the delay or anticipated delay; (2) an estimate of the anticipated length of the delay; (3) a description of the measures taken or to be taken to avoid or minimize the delay; and (4) a proposed timetable for the implementation of the measures or performance of the obligation. The affected Party shall make all reasonable efforts to promptly resume performance of the obligation. It shall provide Notice when it resumes performance of the obligation.

7.5 Governing Law

The New Project Licenses and any other terms of this Settlement Agreement over which a federal agency has statutory or regulatory jurisdiction shall be governed, construed, and enforced in accordance with such authorities. This Settlement Agreement shall otherwise be governed and construed under the laws of the Commonwealth of Massachusetts. By executing this Settlement Agreement, no federal agency is consenting to the jurisdiction of a state court unless such jurisdiction otherwise exists. All activities undertaken pursuant to this Settlement Agreement shall be in compliance with all applicable law.

7.6 Elected Officials Not to Benefit

No elected officials shall be entitled to any share or part of this Settlement Agreement or to any benefit that may arise from it.

7.7 No Partnership

Except as otherwise expressly set forth herein, this Settlement Agreement does not and shall not be deemed to make any Party the agent for, partner of, or joint venturer with any other Party.

7.8 Reference to Regulations

Any reference in this Settlement Agreement to any federal or state regulation shall be deemed to be a reference to such regulation, or successor regulation, in existence as of the date of the action at the time in question.

7.9 Notice

Except as otherwise provided in this Section, any Notice required by this Settlement Agreement shall be written. Notice shall be sent to all Parties still in existence and, as applicable, filed with FERC. For the purpose of this Settlement Agreement and unless otherwise specified, a Notice shall be effective upon receipt, but if provided by U.S. Mail, seven (7) business days after the date on which it is mailed. The Parties agree that

if practicable, electronic mail or fax are the preferred methods of providing Notice under this Settlement Agreement. When this Settlement Agreement requires Notice in fewer than seven (7) business days, Notice shall be provided by telephone, fax, or electronic mail and shall be effective when provided. For the purpose of Notice, the list of authorized representatives of the Parties as of the Effective Date is attached as Appendix D. FirstLight shall keep the names and contact information for the Parties to this Settlement Agreement. The Parties shall provide Notice of any change in the authorized representatives designated in Appendix D, and FirstLight shall maintain the current distribution list of such representatives. The Parties agree it is their responsibility to keep FirstLight informed of their current address, telephone, fax, and electronic mail information, and that failure to provide FirstLight with current contact information will result in a waiver of that Party's right to Notice under this Settlement Agreement.

7.10 Section Titles for Convenience Only

The titles for the Sections of this Settlement Agreement are used only for convenience of reference and organization and shall not be used to modify, explain, or interpret any of the provisions of this Settlement Agreement or the intentions of the Parties. This Settlement Agreement has been jointly drafted by the Parties and therefore shall be construed according to its plain meaning and not for or against any Party.

8 Execution of Settlement Agreement

8.1 Signatory Authority

Each signatory to this Settlement Agreement certifies that he or she is authorized to execute this Settlement Agreement and to legally bind the Party he or she represents, and that such Party shall be fully bound by the terms hereof upon such signature without any further act, approval, or authorization by such Party.

8.2 Signing in Counterparts

This Settlement Agreement may be executed in any number of counterparts, and each executed counterpart shall have the same force and effect as an original instrument as if all the signatory Parties to all of the counterparts had signed the same instrument. Any signature page of this Settlement Agreement may be detached from any counterpart of this Settlement Agreement without impairing the legal effect of any signatures thereon, and may be attached to another counterpart of this Settlement Agreement identical in form hereto but having attached to it one or more signature pages.

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have cause this Settlement Agreement to be executed as of the date set forth in this Settlement Agreement.

FirstLight MA Hydro LLC and Northfield Mountain LLC,



Date: 3/24/2023

By: Justin Trudell

U.S. Fish and Wildlife Service,


AUDREY MAYER Digitally signed by AUDREY
MAYER

Date: 2023.03.24 11:40:21 -04'00' Date: _____

By:

National Marine Fisheries Service,

**Michael
Pentony**

 Digitally signed by Michael
Pentony
Date: 2023.03.24 14:47:06
-04'00'

Date: _____

By:

Massachusetts Division of Fisheries and Wildlife,

Mark S. Tisa

Date: 3/24/2023

By: Director Mark S. Tisa, Ph.D., M.B.A.

The Nature Conservancy,



Date: March 22, 2023

By: Deb Markowitz, TNC
Massachusetts State Director

American Whitewater,

Robert H. Aschley

Date: 3/27/23

By:

Appalachian Mountain Club,

Nicole Zussman

Date: March 28, 2023

By: Nicole Zussman, President & CEO of Appalachian Mountain Club

Crab Apple Whitewater, Inc.,

July 1, 2023

Date: 3-27-23

By: Frank J. Moore IV

New England FLOW,

New England FLOW

Date: 3/24/23

By: *Thomas J. Christopher,*
Secretary/Director

Zoar Outdoor,

Janet Cowie

By: JANET Cowie, GM

Date: 3/27/23

**Appendix A. Protection, Mitigation, and Enhancement Measures Recommended
to be Included in the New Turners Falls Hydroelectric Project License**

Appendix A: Draft License Articles- Turners Falls Hydroelectric Project

Article A100. Station No. 1 Upgrades

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

Article A110. Minimum Flows below Turners Falls Dam

Upon license issuance, the Licensee shall discharge from the Turners Falls Dam or from the gate located on the power canal (“canal gate”) just below the Turners Falls Dam the following seasonal minimum flows.

Date	Minimum Flows below Turners Falls Dam
01/01-03/31 ¹	<ul style="list-style-type: none"> • If the Naturally Routed Flow (NRF- definition provided later in this article) is \leq 400 cubic feet per second (cfs), the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is $>$ 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.
04/01-05/31	<ul style="list-style-type: none"> • If the NRF is \leq 6,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 6,500, the Minimum Flow below Turners Falls Dam shall be 4,290 cfs.
06/01-06/15 ^{2,3}	<ul style="list-style-type: none"> • If the NRF is \leq 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 4,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,990 cfs.
06/16-06/30 ³	<ul style="list-style-type: none"> • If the NRF is \leq 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 67% of the NRF. • If the NRF is $>$ 3,500 cfs, the Minimum Flow below Turners Falls Dam shall be 2,280 cfs.
07/01-11/15 ¹	<ul style="list-style-type: none"> • If the NRF is \leq 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs or the NRF, whichever is less. • If the NRF is $>$ 500 cfs, the Minimum Flow below Turners Falls Dam shall be 500 cfs.
11/16-12/31 ¹	<ul style="list-style-type: none"> • If the NRF is \leq 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs or the NRF, whichever is less. • If the NRF is $>$ 400 cfs, the Minimum Flow below Turners Falls Dam shall be 400 cfs.

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

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

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

Definition of Naturally Routed Flow

From December 1 through June 30, the NRF is defined as the hourly sum of the discharges from 12 hours previous as reported by the: Vernon Hydroelectric Project (FERC No. 1904), Ashuelot River United States Geological Survey gauge (USGS, Gauge No. 01161000), and Millers River USGS gauge (Gauge No. 01166500).

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

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

Article A120. Total Minimum Bypass Flows below Station No. 1

Upon license issuance, the Licensee shall maintain the Total Minimum Bypass Flows below Station No. 1 as follows:

Date	Total Minimum Bypass Flows below Station No. 1 ¹
01/01-03/31	<ul style="list-style-type: none"> • If the NRF is ≤ 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is > 400 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 1,500 cfs, or the NRF, whichever is less.
04/01-05/31	<ul style="list-style-type: none"> • If the NRF is ≤ 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is > 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 6,500 cfs.
06/01-06/15 ^{2,4}	<ul style="list-style-type: none"> • If the NRF is ≤ 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is > 4,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 4,500 cfs.
06/16-06/30 ⁴	<ul style="list-style-type: none"> • If the NRF is ≤ 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF. • If the NRF is > 3,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 3,500 cfs.
07/01-08/31 ³	<ul style="list-style-type: none"> • If the NRF is ≤ 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is > 500 cfs and ≤ 1,800 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is > 1,800 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,800 cfs, or 90% of the NRF, whichever is less.
09/01-11/15 ³	<ul style="list-style-type: none"> • If the NRF is ≤ 500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be 500 cfs, or the NRF, whichever is less. • If the NRF is > 500 cfs and ≤ 1,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF, or 90% of the NRF. • If the NRF is > 1,500 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.
11/16-12/31 ³	<ul style="list-style-type: none"> • If the NRF is < 400 cfs, then the Total Minimum Bypass Flow below Station No. 1 shall be 400 cfs, or the NRF, whichever is less. • If the NRF is > 400 cfs and ≤ 1,500 cfs, the Total Minimum Bypass Flow below Station No. 1 shall be the NRF or 90% of the NRF. • If the NRF is > 1,500 cfs, the Total Minimum Bypass below Station No. 1 shall be 1,500 cfs, or 90% of the NRF, whichever is less.

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

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

below Station No. 1 shall be the NRF, subject to the conditions in Article A330. If this AMM is enacted, and the NRF > 6,500 cfs, the Total Minimum Bypass Flow below Station No. 1 is 6,500 cfs, subject to the conditions in Article A330.

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

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

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

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

Article A130. Minimum Flows below Cabot Station

Upon license issuance, the Licensee shall maintain Minimum Flows below Cabot Station, or the NRF, whichever is less, as follows.

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

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

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

Article A140. Cabot Station Ramping Rates

Upon license issuance until 3 years after license issuance, the Licensee shall ramp Cabot Station as follows.

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

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

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

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

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

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

Article A150. Variable Releases from Turners Falls Dam and Variable Flow below Station No. 1

For recreation and ecological conservation purposes, upon license issuance, the Licensee shall provide variable releases from the Turners Falls Dam and a variable flow below Station No. 1 as shown below.

Variable Releases from Turners Falls Dam

Magnitude of Variable Release from Turners Falls Dam	¹ 4,000 cfs, or the NRF, whichever is less
Dates when Variable Releases may occur	² July 1 through October 31
³ Total No. of 2-day events	5 events for a total of 10 Variable Releases, but could potentially be 11 Variable Releases subject to footnote 3
Days of Variable Release for 2 day-events	Saturday and Sunday- must be two consecutive days
Hours of Variable Release	10:00 am to 2:00 pm, 4 hrs/day, Saturday and Sunday
Magnitude of Variable Release from Turners Falls Dam from Saturday at 2:00 pm to Sunday at 10:00 am.	See footnote 4
⁵ Up-Ramping Rates at Start of Variable Release	See footnote 5
⁶ Down-Ramping Rates at End of Variable Release	See footnote 6

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

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

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

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

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

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

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

Variable Flow below Station No. 1

Magnitude of Variable Flow below Station No. 1	¹ 2,500 cfs, or the NRF, whichever is less
Dates when Variable Flow may occur	² July 1 through October 31
Total No. of 2-day events	7 events for a total of 14 Variable Flows
Days of Variable Flow	Saturday and Sunday- must be two consecutive days
Hours of Variable Flow	10:00 am to 2:00 pm, 4 hrs/day
Magnitude of Variable Flow below Station No. 1 from Saturday at 2:00 pm to Sunday at 10:00 am.	See Footnote 3

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

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

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

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

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

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

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

The above variable release from the Turners Falls Dam and variable flow below Station No. 1 may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the Turners Falls Dam variable release or variable flow below Station No. 1 are so modified, the Licensee shall notify AW, AMC, commercial outfitters, MDEP, MDFW, NMFS, NPS, NE

FLOW, and USFWS as soon as possible. The Turners Falls Dam variable release or variable flow below Station No. 1 may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), AW, AMC, commercial outfitters, MDEP, MDFW, NMFS, NPS, NE FLOW and USFWS.

Article A160. Flow Stabilization below Cabot Station and Allowable Deviations for Flexible Operations

Three years after license issuance, the Licensee shall maintain $\pm 10\%$ of the NRF below Cabot Station as follows.

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

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

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

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

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

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

transmission and power system requirements, and other regulatory requirements as defined in paragraph (b) below.

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

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

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

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

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

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

Article A170. Flood Flow Operations

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

Article A180. Cabot Station Emergency Gate Use

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

Article A190. Turners Falls Impoundment Water Level Management

Upon license issuance, the Licensee shall operate the Turners Falls Impoundment, as measured at the Turners Falls Dam, as follows:

- (a) Maintain water levels between elevation 176.0 feet and 185.0 feet National Geodetic Vertical Datum of 1929 (NGVD29).
- (b) Limit the rate of rise of the Turners Falls Impoundment water level to be less than 0.9 feet/hour from May 15 to August 15 from 8:00 am to 2:00 pm. However, if the NRF is greater than the sum of the hydraulic capacity of Cabot Station and Station No. 1 and the Minimum Flow below Turners Falls Dam in effect at the time, the Turners Falls Impoundment rate of rise requirement will not apply.
- (c) The rate of rise of the Turners Falls Impoundment may be temporarily modified if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the rate of rise of the Turners Falls Impoundment is so modified, the Licensee shall notify the Commission, MDEP, MDFW, NMFS, and USFWS as soon as possible, but no later than 10 days after such incident. The rate of rise of the Turners Falls Impoundment may also be temporarily modified for short periods upon mutual agreement with the Licensee for the Northfield Mountain Pumped Storage Project (FERC No. 2485), MDEP, MDFW, NMFS, and USFWS, and upon 5 days' notice to the Commission.
- (d) The Licensee may increase the allowable NRF deviation from $\pm 10\%$ to $\pm 20\%$ to better manage Turners Falls Impoundment water levels. The increased flow deviation is limited by the number of hours shown in the first table of Article A160. This allowance for an increased flow deviation is in addition to the exceptions outlined in paragraphs (a) and (b) of Article A160. As such, the increased flow allowable deviations outlined in this paragraph will not count against any time allotment for exceptions outlined in paragraphs (a) and (b) of Article A160. Similarly, operations meeting the exception criteria outlined in paragraphs (a) and (b) of Article A160 will not count against any time allotment for allowable deviations outlined in this paragraph. Allowable flow deviations in excess of

±10% of NRF resulting from conflicting operational requirements will not count against any time allotment for allowable deviations outlined in this paragraph.

Article A200. Project Operation, Monitoring and Reporting Plan

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

- (a) a description of how the Licensee will comply with Minimum Flows below Turners Falls Dam (Article A110), Total Minimum Bypass Flows below Station No. 1 (Article A120), Minimum Flows below Cabot Station (Article A130), Cabot Station Ramping Rates (Article A140), Variable Releases from Turners Falls Dam and Variable Flow below Station No. 1 (Article A150), Flow Stabilization below Cabot Station (Article A160, implementation starting 3 years after license issuance), and Turners Falls Impoundment Water Level Management (Article A190). These are collectively referred to hereinafter as the operating requirements.
- (b) a provision to file with the Commission, after consultation with the MDEP, MDFW, NFMS, and USFWS, a minimum flow and operation compliance report detailing implementation of the plan, including any allowable deviations that occurred during the reporting period. For the period January 1 to March 31 and July 1 to December 31, the compliance report, including any deviations, will be filed with the Commission by March 1 of the following year. For the months of April, May and June, the monthly compliance report, including any deviations, will be filed with the Commission on June 1, July 1 and August 1, respectively. Upon license issuance until 3 years thereafter, the Licensee shall document on an hourly basis for each day any allowable deviations from the Cabot Station Ramping Rates (Article A140) and demonstrate progress towards meeting the Flow Stabilization below Cabot Station (Article A160). Beginning three years after license issuance until license expiration, the Licensee shall document on an hourly basis for each day any allowable deviations from the Cabot Station Ramping Rates restrictions (Article A140) and Flow Stabilization below Cabot Station restrictions (Article A160). Each day, from April 1 to November 30, the Licensee shall record any allowable deviations in a spreadsheet showing the daily deviations, the reason for the deviation, the number of hours, and scope. The Licensee shall provide the total number of deviations to the MDEP, MDFW, NFMS, and USFWS per the reporting schedule above. Allowable deviations will be tracked as follows:
 - Identify Allowable Deviations: The Licensee shall record the NRF, Turners Falls Dam discharge, Station No. 1 discharge, Cabot Station discharge and total Turners Falls Project discharge (below the Cabot Station tailrace) at the top of each hour. Allowable deviations in both the Cabot Station Ramping Rate and Flow Stabilization below Cabot Station requirements will be recorded. At the top of each hour, the Licensee shall record the change in Cabot Station discharge from the previous hour to determine if any deviation has occurred from the agreed upon Cabot Station Ramping Rate. In addition, the NRF (as detailed in paragraph (b) of the "Operational Regime" section) will be compared with the recorded total Turners Falls Project discharge in a given hour to identify if a Flow Stabilization below Cabot Station deviation occurred over the past hour. Any deviation of either the Cabot Station Ramping Rate or total Turners Falls Project discharge within the hour will be counted in one-hour increments.

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

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

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

Article A210. Flow Notification and Website

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

- (a) On an hourly basis, the Turners Falls Impoundment water elevation, as measured at the Turners Falls Dam, the Turners Falls Dam total discharge, and the Station No. 1 discharge.
- (b) On an hourly basis, the anticipated Turners Falls Dam total discharge and the anticipated Station No. 1 discharge for a 12-hour window into the future. Should the Licensee deviate from passing the 12-hour previous NRF from December 1 to May 31 or the 12-hour average NRF from June 1 to November 30, it will post the revised flows (in the 12-hour look ahead window) to a website as soon as practicable after they are known. Should the Licensee of the Vernon Hydroelectric Project provide the Licensee with flow data more than 12 hours in advance, the Licensee shall publish the information sooner.
- (c) Within one month prior to its annual power canal drawdown, the Licensee shall post on its website the starting and ending time/date of the drawdown, which will last at least 4 days. Throughout the duration of the canal drawdown, the NRF, as defined in Article A110, will be maintained below the Turners Falls Dam.

Article A300. Fish Passage Facilities and Consultation

The Licensee shall implement the following fish passage measures on the schedule specified. When due dates cited in this and other articles are in "years after license issuance," this shall mean on the appropriate date in the specified calendar year after license issuance, regardless of the quarter in which the license is issued. For example, "Year 1 after license issuance" begins on the first January 1 following license issuance.

Upstream Fish Passage

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

- (b) rehabilitate the Gatehouse Trapping facility (sampling facility) to be operational no later than April 1 of Year 9 after license issuance.
- (c) retire, either by removal or retaining in place, the Cabot Ladder and the power canal portions of the Gatehouse Ladder within 2 years after the Spillway Lift becomes operational.
- (d) install and operate interim upstream eel passage in the vicinity of the existing Spillway Ladder within 1 year of license issuance and continue operating it until permanent upstream eel passage facilities are operational. The Licensee shall consult MDFW, NMFS, and USFWS on the location and design of the interim eelway(s).
- (e) conduct up to 2 years of eelway siting studies after the Spillway Lift becomes operational, using a similar methodology to relicensing Study 3.3.4 for both years. Based on the siting survey results, design, construct, operate, and maintain up to two permanent upstream eel passage facilities at the Turners Falls Project no later than 3 years after completing the final siting survey. The Licensee shall consult MDFW, NMFS, and USFWS on the location of the two permanent upstream eel passage facilities. The final eelway siting will take into account the ability to maintain the eelway(s) in light of spillage conditions at the Turners Falls Project. The Licensee will not be required to place any eelways at the foot of any active spillway structures.

Downstream Fish Passage

- (f) Within 4 years¹ of license issuance, replace the existing Cabot Station trashrack structure with a new full depth trashrack with 1-inch clear spacing. The new trashracks will have multiple openings for fish passage, including openings on the top and bottom of the water column. The Licensee will attempt to maximize the hydraulic capacity of these openings within the constraints of the conveyance mechanisms. The Licensee will base detailed design alternatives on the following conceptual design; however, the Parties will remain flexible on design alternatives as necessary to meet fish passage goals.

The new trashrack will have multiple surface entrances including a.) between Cabot Units 2 and 3; b.) between Cabot Units 4 and 5; and c.) at the right wall of the intake (looking downstream) at Cabot Unit 6. The openings will be 3-feet-wide by 2-feet-tall and will connect to the existing trash trough located behind the racks. Each opening at the top of the trashrack will have an approximate hydraulic capacity of 24 cfs, and the existing trash trough will convey a total hydraulic capacity of approximately 72 cfs from these openings. The new trashrack will have an additional entrance near the bottom at the left wall of the intake (looking downstream) at Unit 1. This entrance will be approximately 3-feet-wide by 3-feet-tall and will connect to a vertical pipe to safely convey fish to the existing trash trough or log sluice. This entrance will be sized to provide a velocity that attracts fish to the bypass relative to the turbine intakes (approximately 5 feet-per-second). In addition to the entrances integral to the new trashrack structure, fish will be conveyed via a new uniform acceleration weir (UAW) and log sluice. The log sluice will be resurfaced to limit turbulence and injury to migrants. A steel panel (or equivalent) will be provided below the UAW to exclude migrants from being delayed in the space below the UAW. Total flow from all downstream passage components at Cabot Station will be 5% (685 cfs) of maximum hydraulic station capacity (13,728 cfs). The conveyance at each bypass entrance will be determined during the design phase.

- (g) Within 4 years¹ of license issuance, construct a ¾-inch clear-spaced bar rack at the entrance to the Station No. 1 branch canal.

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

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

Consultation

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

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

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

Schedule of Initial Effectiveness Testing

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

Facility	Operational/Shakedown Date	Initial Effectiveness Study Years and Locations to be Tested
Cabot Rack and Downstream Conveyance	Year 4 after license issuance ¹	Years 6-7, the Cabot Downstream Fish Passage Structure and Station No. 1 Rack will be tested.
Station No. 1 Bar Rack	Year 4 after license issuance ¹	
Turners Falls Dam Plunge Pool	Year 9 (by April 1 st) after license issuance	Years 10-11, the Turners Falls Plunge Pool and Spillway Lift will be tested.
Spillway Lift	Year 9 (by April 1 st) after license issuance	

Facility	Operational/Shakedown Date	Initial Effectiveness Study Years and Locations to be Tested
Rehabilitate Gatehouse Trapping Facility (Sampling Facility)	Year 9 (by April 1 st) after license issuance	Not Applicable
Retire Cabot Ladder and Portions of Gatehouse Ladder	No later than Year 11 after license issuance (tied to within 2 years after the Spillway Lift becomes operational).	Not Applicable
Permanent Eel Passage Structure(s)	Year 13 after license issuance	Year 14, the internal efficiency of the permanent eel passage structure(s) will be tested.

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

Consultation Process on Effectiveness Study Plans

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

Fish Passage Performance Goals

The Licensee shall compare the effectiveness study results to the following fish passage performance goals:

Downstream Passage

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

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

Upstream Passage

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

Article A320. Downstream Fish Passage- Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Studies

Initial Effectiveness Studies- Years 6 and 7

The Licensee shall conduct initial effectiveness testing in Years 6 and 7 (see Article 310) to evaluate the fish passage survival and time-to-pass of the newly constructed Station No. 1 bar rack and Cabot Rack and Conveyance Structure and compare the findings at individual components (e.g., Cabot Station and Station No. 1) to the performance goals in Article 310. The Licensee shall develop reports by February 1 of Years 7 and 8 for adult American Shad and by April 1 of Years 7 and 8 for juvenile American Shad and adult American Eel summarizing the survival study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and determine what, if any, adaptive management measures (AMMs) may be implemented from the table below. The Licensee will target any AMMs to those locations where fish passage performance goals are not achieved. The Licensee shall file a report with the Commission to include the effectiveness testing report and documentation of any AMMs agreed to by the Licensee, MDFW, NMFS, and USFWS, along with any consultation records. If warranted, the Licensee shall consult MDFW, NMFS, and USFWS on when to implement the Round 1 AMMs at Station No. 1 and/or Cabot Station.

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

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

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

- File the effectiveness study report and documentation of any AMMs with the Commission.

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

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

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

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

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

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

MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding downstream passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, MDFW, NMFS, and USFWS have agreed, consistent with the terms of the settlement agreement, that they will not request or require Cabot Station shutdowns over the life of the license.

Downstream Adaptive Management Measures

Adaptive Management Measure (if needed)	Timing
<p><u>Turners Falls Dam</u></p> <ul style="list-style-type: none"> • Modify the bascule gate setting(s) and resultant spill (rate, location). <p><u>Station No. 1</u></p> <ul style="list-style-type: none"> • Install a behavioral barrier. <p><u>Cabot Station</u></p> <ul style="list-style-type: none"> • Modify the downstream passage conveyance design to reduce impact velocities and shear stresses (e.g., pump-back system; gradient reduction; piping, lining); 	<p>Initial Effectiveness Testing at Cabot Station and Station No. 1: Years 6-7.</p> <p>Initial Effectiveness Testing at Turners Falls Dam Plunge Pool and Round 1 Effectiveness Testing for any AMMs implemented at Cabot Station and/or Station No. 1 (if needed): Years 10-11.</p> <p>Round 2 AMM Effectiveness Testing at Cabot Station and/or Station No. 1 (if needed) and Round 1 Effectiveness</p>

Adaptive Management Measure (if needed)	Timing
<ul style="list-style-type: none"> • Modify the downstream passage conveyance design to increase water depth; • Modify the area of flow convergences of the trash trough, Uniform Acceleration Weir, eel pipe, and sluiceway; • Modify the area of flow convergence of the sluiceway and the receiving waters in the Connecticut River (e.g., adjustable lip, velocity control, and plunge pool depth) 	<p>Testing at Turners Falls Dam Plunge Pool (if needed): Years 14-15</p> <p>Round 3 AMM Effectiveness Testing at Cabot Station and/or Station No. 1 (if needed) and Round 2 Effectiveness Testing at Turners Falls Dam Plunge Pool (if needed): Years 18-19</p>

Article A330. Upstream Fish Passage Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Testing

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

The Licensee shall conduct initial effectiveness testing in Years 10 and 11 (see Article 310) to evaluate upstream fish passage efficiency and time-to-pass at the Cabot Station tailrace, Rawson Island, Station No. 1 tailrace, and at the Spillway Lift through the Gatehouse Ladder exit and compare the findings to the performance goals in Article 310. The Licensee shall develop a report by February 1 of Years 11 and 12 for adult American Shad summarizing the effectiveness study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and determine what, if any, Tier 1 adaptive management measures (AMMs) from the table below may be implemented.

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

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

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

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

- The Licensee shall compare the effectiveness study results to the performance goals in Article 310.
- The Licensee shall provide the effectiveness study report to MDFW, NMFS and USFWS by February 1 of Years 14 and 15.

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

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

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

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

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

If, after the Licensee implements additional Tier 1 AMMs and/or Tier 2 AMMs, the overall passage efficiency is greater than 65% or a lesser number as agreed to by the Licensee, MDFW, NMFS, and USFWS, and the overall time-to-pass is less than 60 hours or a higher number as agreed by the same group, then MDFW, NMFS, and USFWS will not exercise any reserved or other regulatory authority to require additional upstream fish passage measures or operational changes.

MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding upstream passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, MDFW, NMFS, and USFWS have agreed, consistent with the terms of the settlement agreement, that they will not request or require Cabot Station shutdowns or a lift at Cabot Station over the life of the license.

Effectiveness Testing of Juvenile American Eel- Year 14

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

Upstream Adaptive Management Measures- Tier 1 and 2

Adaptive Management Measure (if needed)	Schedule
Tier 1	
<p><u>Cabot Tailrace and Rawson Island Nodes</u></p> <ul style="list-style-type: none"> Upon license issuance, the Total Minimum Bypass Flow below Station No. 1 from June 1 to June 15 is 4,500 cfs (see Article A120). This AMM includes increasing the Total Minimum Bypass Flow below Station No. 1 from June 1 to June 15 to 6,500 cfs until 90% of the American Shad run enter the Spillway Lift, upon which the Total Minimum Bypass Flow below Station No. 1 will revert to 4,500 cfs. <p>If this adaptative management measure is enacted and after two years of effectiveness testing, it improves the fish passage efficiency and time-to-pass goals, this change may be implemented throughout the remainder of the license, subject to other adaptive management measures. However, even after this change, the 6,500 cfs will revert to 4,500 cfs when 90% of the adult American Shad run enter the Spillway Lift before or within the June 1 to 15 period. The indicator as to when the 90% of the adult American Shad run passes will be determined using a predictive model to be developed by the Licensee in consultation with MDFW, NMFS, and USFWS. The Licensee shall file with the Commission the predictive model results within 6 months of license issuance and it will be updated and/or refined with data collected over intervening years.</p> <p>If this change is implemented, from June 1 to June 15, the Minimum Flow below the Turners Falls Dam (Article A110) must be 4,290 cfs or the NRF, whichever is less; and the Total Minimum Bypass Flow below Station No. 1 (Article A120) must be 6,500 cfs or the NRF, whichever is less.</p> <p><u>Station No. 1 Node</u></p> <ul style="list-style-type: none"> Shift the distribution of the Total Minimum Bypass Flow below Station No. 1 (Article A120) to increase the Total Minimum Flow below Turners Falls Dam (Article A110) from April 1 to June 30 until 90% of the adult American Shad run enter the Spillway Lift, upon which it will revert back to the flow requirements in Articles A110 and A120. The Total Minimum Bypass Flow below Station No. 1 remains the same from April 1 to June 30 as described in Article A120. <p><u>Spillway Lift</u></p> <ul style="list-style-type: none"> Adjust the new plunge pool release and/or bascule gate operation and/or, Adjust the new fish lift attraction water and entrance conditions and/or, Adjust the timing and frequency of lift operations and/or; Adjust the entrance gate. 	<p>Years of Initial Effectiveness Testing: Years 10-11</p> <p>Time Needed to Implement AMM(s): Year 0 since all Tier 1 AMMs are operational</p> <p>Years of Post AMM Effectiveness Testing: Years 13-14</p>

Adaptive Management Measure (if needed)	Schedule
Tier 2	
<p><u>Cabot Tailrace Node</u></p> <ul style="list-style-type: none"> Install a behavioral barrier near the Cabot Station tailrace to guide fish upstream for passage at the Turners Falls Dam. If this AMM is implemented, then the Total Minimum Bypass Flow below Station No. 1 (Article A120) will be reduced from 6,500 cfs to 4,500 cfs (Tier 1 AMM) from June 1 to June 15 for the period of testing the Tier 2 measures. At the end of Tier 2 testing (and provided that the 6,500 cfs extension is not needed to significantly improve passage efficiency or time-to-pass at Rawson Island) either the increased flow of 6,500 cfs (June 1 to June 15) will be implemented or the behavioral barrier but not both unless it is demonstrated that both are needed to make a substantial improvement in passage efficiency or time-to-pass. <p><u>Rawson Island Node</u></p> <ul style="list-style-type: none"> If it is determined that the river channel adjacent to Rawson Island is inhibiting upstream fish passage, then constructing a zone of passage is an AMM. Prior to conducting any work associated with this AMM, the Licensee shall consult MDFW, NMFS, USFWS, recreational boating and Tribal interests and the Massachusetts Natural Heritage and Endangered Species Program (NHESP) on the design of the zone of passage. If the zone of passage is constructed, then the Total Minimum Bypass Flow below Station No. 1 will be reduced from 6,500 cfs to 4,500 cfs (Tier 1 AMM) from June 1 to June 15 for the period of testing the Tier 2 measures. At the end of Tier 2 testing (and provided that the 6,500 cfs extension is not needed to significantly improve passage efficiency or time-to-pass at Rawson Island) the 6,500 cfs will be reduced back to 4,500 cfs. <p><u>Station No. 1 Node</u></p> <ul style="list-style-type: none"> Install a behavioral barrier near the Station No. 1 tailrace to guide fish upstream for passage at the Turners Falls Dam. If this AMM is implemented, then the Turners Falls Dam Spill/Sum of Fall River, Turners Falls Hydro, LLC, Milton Hilton, LLL and Station No. 1 flow split will be returned to the 67%/33%, respectively, from April 1 to June 30. At the end of Tier 2 testing, either the increased Turners Falls Dam Minimum Flow component of the flow split used in Tier 1 will be implemented or the behavioral barrier but not both unless it is demonstrated that both are needed to make a substantial improvement in passage efficiency or time to pass. <p><u>Turners Falls Dam/Fish Lift Node</u></p> <ul style="list-style-type: none"> Internal structural modifications to improve hydraulics for fish movement, as necessary. 	<p>Time Needed to Implement AMM(s): Year 15-16</p> <p>Shakedown: Year 17</p> <p>Years of Post AMM Effectiveness Testing: Years 18-19</p>

Article A340. Fishway Operating Periods¹

The Licensee shall operate the fishways during the following periods:

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

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

Article A350. Fish Passage Facilities Operation and Maintenance Plan

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

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

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

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

Article A400. Bald Eagle Protection Plan

The Licensee shall implement the Bald Eagle Protection Plan dated January 2023.

Article A410. Bat Protection Measures

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

Turners Falls Hydroelectric Project (FERC Project Number 1889)

Bald Eagle Protection Plan



JANUARY 2023

BACKGROUND

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

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

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

PROTECTION MEASURES

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

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

During the nesting season (January 1 through September 30), no tree clearing will occur within 330 feet of, and no construction activities will occur within 660 feet of, any known bald eagle nests by the Licensee or its contractors. The National Bald Eagle Management Guidelines advise against conducting external construction and land clearing activities within 660 feet of bald eagle nests during the breeding season. Additionally, the Guidelines recommend maintaining a year-round buffer between nests and tree clearing of at least 330 feet and a year-round buffer between external construction and nests of either 330 or 660 feet, depending on the construction's size, visibility, and local precedence. For any project-related construction activities, work that requires blasting or other activities that produce extremely loud noises within 1/2 mile of active nests will be avoided. The Licensee shall consult with the MDFW and USFWS regarding tree clearing or construction activities that cannot meet these conditions.

Appendix B. Protection, Mitigation, and Enhancement Measures Recommended to be Included in the New Northfield Mountain Pumped Storage Project License

Appendix B: Draft License Articles- Northfield Mountain Pumped Storage Project

Article B100. Project Operations

Upon license issuance, the Licensee shall:

- (a) operate the Northfield Mountain Pumped Storage Project in accordance with its existing agreement with the United States Army Corps of Engineers (USACE). This agreement, memorialized in the Reservoir and River Flow Management Procedures (1976), as it may be amended from time to time, governs how the Project will operate during flood conditions and coordinate its operations with the Licensee of the Turners Falls Hydroelectric Project (FERC No. 1889).
- (b) operate the Northfield Mountain Pumped Storage Project upper reservoir between elevation 1004.5 and 920.0 feet National Geodetic Vertical Datum of 1929 (NGVD29).

Article B200. Fish Intake Protection and Consultation

Intake Protection

The Licensee shall install a barrier net in front of the Northfield Mountain tailrace/intake, having 3/8-inch mesh on the top and 3/4-inch mesh on the bottom. The barrier net design shall be based on the conceptual design in the Amended Final License Application filed with the Commission in December 2020, as modified through consultation with MDFW, NMFS, and USFWS, from June 1 to November 15 to protect out-migrating American Shad and adult American Eel, to be operational no later than June 1 of Year 7 after license issuance.

Consultation

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

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

Article B210. Initial Intake Protection Effectiveness Testing and Fish Passage Performance Goals

Initial Effectiveness Testing

The Licensee shall complete construction of the Northfield Mountain barrier net, operate the barrier net for one season (shakedown year), and conduct representative and quantitative effectiveness testing in Years 10 and 11 to evaluate the downstream fish passage survival and time-to-pass compared to the performance goals below.

Consultation Process on Effectiveness Study Plans

For any initial fish passage effectiveness studies and any subsequent fish passage effectiveness studies required after implementing any AMMs described in Article B220, the Licensee shall provide the effectiveness study plans to MDFW, NMFS, and USFWS and request comments on the study plans within

30 days. The Licensee shall consult MDFW, NMFS, and USFWS and obtain their approval on the study plans before conducting the effectiveness study. The Licensee shall file the effectiveness study plans with the Commission, along with any consultation records.

Fish Passage Performance Goals

The Licensee shall compare the effectiveness study results to the following fish passage performance goals:

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

Article B220. Downstream Fish Passage- Initial Effectiveness Studies, Adaptive Management Measures and Subsequent Effectiveness Studies

Initial Effectiveness Studies- Years 10 and 11

The Licensee shall conduct initial effectiveness testing in Years 10 and 11 (Article B210) to evaluate the fish passage survival and time-to-pass of the newly constructed barrier net and compare the findings to the performance goals in Article B210. The Licensee shall develop a report by February 1 of Years 11 and 12 for adult American Shad and by April 1 of Years 11 and 12 for juvenile American Shad and adult American Eel summarizing the survival study findings and provide it to MDFW, NMFS, and USFWS. The Licensee shall consult MDFW, NMFS, and USFWS on the effectiveness study results and determine what, if any, adaptive managements measures (AMMs) may be implemented from the table below. The Licensee shall file a report with the Commission to include the effectiveness testing report and documentation of any AMMs agreed to by the Licensee, MDFW, NMFS, and USFWS, along with any consultation records. If warranted, the Licensee shall consult MDFW, NMFS and USFWS on when to implement any Round 1 AMMs.

Effectiveness Testing of Round 1 AMMs - Years 14 and 15

The Licensee shall conduct Round 1 AMM effectiveness testing in Years 14 and 15. The Licensee shall:

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

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

Effectiveness Testing of Round 2 AMMs - Years 17 and 18

The Licensee shall conduct Round 2 AMM effectiveness testing in Years 17 and 18. The Licensee shall follow the same consultations steps bulleted above; however, the Licensee shall provide the effectiveness study report to MDFW, NMFS, and USFWS by February 1 of Years 18 and 19 for adult American Shad and by April 1 of Years 18 and 19 for juvenile American Shad and adult American Eel.

MDFW, NMFS, and USFWS have agreed, consistent with the terms of the Flows and Fish Passage Settlement Agreement (March 2023), not to exercise any reserved or other regulatory authority regarding passage to request or require any AMMs other than those listed in the table below for the first 25 years of the license. In addition, they have agreed, consistent with the settlement agreement, not to request or require pumping restrictions at any time over the life of the license.

Downstream Adaptive Management Measures

Adaptive Management Measure (if needed)	Timing
<p><u>Northfield Mountain Intake/Tailrace</u></p> <ul style="list-style-type: none"> • Alter the arrangement and size of the net panels (e.g. extend depth of the smaller panels). • Improve maintenance measures for the net. 	<p>Initial Effectiveness Testing of Barrier Net: Years 10-11.</p> <p>Round 1 AMM Effectiveness Testing (if needed): Years 14-15</p> <p>Round 2 AMM Effectiveness Testing (if needed): Years 17-18</p>

Article B230. Fishway Operating Periods¹

The Licensee shall operate the barrier net for downstream passage from June 1 to November 15.

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

Article B240. Fish Passage Facility Operation and Maintenance Plan for Barrier Net

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

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

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

Article B300. Bald Eagle Protection Plan

The Licensee shall implement the Bald Eagle Protection Plan dated January 2023.

Article B310. Bat Protection Measures

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

Northfield Mountain Project (FERC Project Number 2485)

Bald Eagle Protection Plan



JANUARY 2023

BACKGROUND

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

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

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

PROTECTION MEASURES

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

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

During the nesting season (January 1 through September 30), no tree clearing will occur within 330 feet of, and no construction activities will occur within 660 feet of, any known bald eagle nests by the Licensee or its contractors. The National Bald Eagle Management Guidelines advise against conducting external construction and land clearing activities within 660 feet of bald eagle nests during the breeding season. Additionally, the Guidelines recommend maintaining a year-round buffer between nests and tree clearing of at least 330 feet and a year-round buffer between external construction and nests of either 330 or 660 feet, depending on the construction's size, visibility, and local precedence. For any project-related construction activities, work that requires blasting or other activities that produce extremely loud noises within 1/2 mile of active nests will be avoided. The Licensee shall consult with the MDFW and USFWS regarding tree clearing or construction activities that cannot meet these conditions.

**Appendix C. Measures Agreed to Among the Parties But Not to be Included in
New Project License**

ENVIRONMENTAL

Section C101. Ichthyoplankton Mitigation Fund (Northfield Mountain Project)

The Licensee of the Northfield Mountain Pumped Storage Project (FERC No. 2485) shall provide funding for habitat improvement projects and/or alosine management activities to offset the potential loss of ichthyoplankton through entrainment at the Northfield Mountain Pumped Storage Project. The Licensee shall make payments to the United States Fish and Wildlife Service or its designee per the schedule below by February 1 of each identified year.

Year after License Issuance	Amount
1	\$112,800
13	\$35,000
15	\$220,000
20	\$90,000
25	\$110,000
30	\$294,000
35	\$125,000
40	\$132,481
45	\$177,000
Total	\$1,296,281

Section C102. Cobblestone Tiger Beetle Fund (Turners Falls Project)

The Licensee of the Turners Falls Project (FERC No. 1889) shall provide funding for Cobblestone Tiger Beetle (CTB) conservation and management activities to provide a long-term net benefit to CTB in Massachusetts. The Licensee shall make payments to the Massachusetts Division of Fisheries and Wildlife or its designee per the schedule below by February 1 of each identified year.

Year after License Issuance	Amount
4	\$50,000
5	\$80,000
6	\$100,000
7	\$150,000
8	\$150,000
9	\$150,000
10	\$150,000
11	\$75,000
12	\$75,000
Total	\$980,000

OPERATIONS

Section C103. Agency Support for Flow Data from Licensee of Vernon Hydroelectric Project (Turners Falls and Northfield Mountain Projects)

The Massachusetts Division of Fisheries and Wildlife (MDFW) shall independently request from the Commission, at the same time the Settlement Agreement is filed, that the Licensee of the Vernon Hydroelectric Project (Vernon Project, FERC No. 1904) shall provide to the Licensees of the Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485) the following upon license issuance:

- Electronically provide by 8:00 am of each day, the next day's 24 hour anticipated Vernon Project total discharge. The next day's 24-hour anticipated Vernon Project total discharge will be updated once the day ahead power bidding market closes and Independent System Operator-New England (ISO-NE) issues the day ahead schedule. If ISO-NE updates the day ahead hourly Vernon Project total discharge, then that revised schedule shall be provided to the Licensees within 2 hours of the Vernon Project Licensee receiving an update from ISO-NE.
- Electronically provide the instantaneous Vernon Hydroelectric Project total discharge and tailwater elevation.

Section C104. Licensee Reporting on Flow Stabilization below Cabot Station Measures for Years 1 -3 after License Issuance (Turners Falls Project)

Upon license issuance, the Licensee shall implement the proposed Flow Stabilization below Cabot Station as defined in Article A160. *Flow Stabilization below Cabot Station and Allowable Deviations for Flexible Operations*¹, recognizing that it will not be required to demonstrate to the Federal Energy Regulatory Commission (FERC), or the Parties, that it is meeting the Flow Stabilization below Cabot Station requirements until the third (3rd) anniversary of the date of license issuance. The Licensee shall provide the Parties an annual report (by March 1 of the following year) for Years 1 and 2 and quarterly reports for Year 3 to demonstrate substantive progress towards implementing the Flow Stabilization below Cabot Station. Quarterly reports for January 1 to March 31, April 1 to June 30, July 1 to September 30 and October 1 to December 31 shall be provided to the Parties by June 1, September 1, December 1 and March 1 (of the following year), respectively.

¹The Flow Stabilization below Cabot Station is based on providing a percentage of the naturally routed flow (NRF). The NRF is defined in Article A110. *Minimum Flows below Turners Falls Dam* as follows:

From December 1 through June 30, the NRF is defined as the hourly sum of the discharges from 12 hours previous as reported by the: Vernon Hydroelectric Project (FERC No. 1904), Ashuelot River United States Geological Survey gauge (USGS, Gauge No. 01161000), and Millers River USGS gauge (Gauge No. 01166500).

From July 1 through November 30, the NRF is defined as the hourly sum of the discharges averaged from 1 to 12 hours previous as reported by the: Vernon Hydroelectric Project, Ashuelot River USGS gauge, and Millers River USGS gauge. Upon license issuance until 3 years thereafter, the Licensee shall operate the Turners Falls Project based on the NRF computational method from July 1 through November 30 to determine if the Turners Falls Project can be operated in this manner. If the Turners Falls Project cannot

be operated in this manner, the Licensee shall consult Massachusetts Division of Fisheries and Wildlife, National Marine Fisheries Service and United States Fish and Wildlife Service on alternative means of computing the NRF that are feasible for Turners Falls Project operation and sufficiently dampen upstream hydroelectric project flexible operations.

Appendix D. Authorized Representatives of the Parties

FirstLight

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American Whitewater

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Northeast Stewardship & Legal Director
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Appalachian Mountain Club

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Appalachian Mountain Club
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Crab Apple Whitewater, Inc.

Frank Mooney
River Manager/Ownership Family
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Massachusetts Division of Fisheries and Wildlife

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The Nature Conservancy

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North America Region
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Zoar Outdoor

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**APPENDIX B: RECREATION SETTLEMENT
AGREEMENT, JUNE 2023**



FirstLight Power
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Justin Trudell
Chief Operating Officer

June 12, 2023

Via Electronic Filing

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

Re: Turners Falls Hydroelectric Project (FERC No. 1889), FirstLight MA Hydro LLC, Northfield Mountain Pumped Storage Project (FERC No. 2485), Northfield Mountain LLC, Recreation Settlement Agreement and Explanatory Statement

Dear Secretary Bose:

Pursuant to Rule 602 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (“FERC” or “Commission”),¹ FirstLight MA Hydro LLC, owner and operator of the Turners Falls Hydroelectric Project (“Turners Falls Project”) and Northfield Mountain LLC, owner and operator of the Northfield Mountain Pumped Storage Project (“Northfield Mountain Project”) (collectively, “FirstLight”), are pleased to submit the attached Recreation Settlement Agreement for the relicensing of the Turners Falls Project and Northfield Mountain Project (together, “Projects”). Also enclosed is FirstLight’s Explanatory Statement as required by Rule 602.

The Recreation Settlement Agreement (“RSA”) was executed among FirstLight and the National Park Service, Massachusetts Department of Conservation and Recreation, Franklin Regional Council of Governments, Towns of Erving, Gill, Montague and Northfield, Massachusetts, American Whitewater, Appalachian Mountain Club, Crab Apple Whitewater, Inc., New England FLOW, Zoar Outdoor, Access Fund, and Western Massachusetts Climbers Coalition (“Recreation Settling Parties”). FirstLight wishes to express its great appreciation to each of these entities for their efforts in achieving this important milestone and the collaborative spirit in which they engaged to achieve this agreement.

The Recreation Settlement Agreement is a package that resolves all issues among the Recreation Settling Parties pertaining to recreation, except recreational flow releases, which are included in the Flows and Fish Passage Settlement Agreement filed with the Commission on March 31, 2023. While recognizing that regulatory processes related to the relicensing of the Projects are not yet completed, the Recreation Settlement Agreement reflects agreement as to FirstLight’s obligations with regard to recreation at the Projects. It further reflects agreement among the Recreation Settling Parties concerning recommendations, terms, conditions, and prescriptions to be submitted to the Commission pursuant to Sections 10(a) of the Federal Power Act.

¹ 18 C.F.R. § 385.602 (2022).

The Recreation Settlement Agreement includes a single proposed license article for each Project as set forth in Appendices A and B requiring FirstLight to implement the Recreation Management Plan (May 2023) (“RMP”), which is attached as Appendix E. The RMP supersedes the proposed recreation management plans FirstLight included with its December 2020 Amended Final License Applications as well as the Agreement in Principle on recreation FirstLight filed with the Commission on February 28, 2022. In addition to maintaining the extensive existing recreation facilities at the Projects, under the RMP FirstLight would construct numerous new recreation facilities and upgrades. These include, for example: establishing several new public recreation access points to the Connecticut River including campsites, parks and picnic areas, boater put-ins, portages, and trails; constructing improvements at the Boat Tour Dock; establishing conservation restrictions on FirstLight-owned lands within the Project boundaries totaling 761.4 acres; constructing several miles of new mountain biking trails; establishing Rose Ledges, a climbing area, as a Project recreation facility; making improvements to meet Americans with Disabilities Act requirements; and installing historical and cultural interpretive signage at several locations throughout the Projects. The total cost of these improvements will be almost \$6 million, representing a substantial investment by FirstLight in the local communities.

Appendix C of the RSA includes measures that the Recreation Settling Parties do not intend to be incorporated into the new licenses for the Projects but are included for the Commission’s information only. The measures in Appendix C include installation of a potential additional pocket park, a conservation restriction at Farley Ledges for rock climbing, establishment of a Recreation Advisory Group, and coordinating advertising of Project recreation facilities with the local communities. To facilitate the conservation restriction at Farley Ledges, FirstLight seeks Commission approval to revise the Northfield Mountain Project boundary to exclude a portion (52.3 acres) of Farley Ledges that is not needed for Project purposes and has attached to its Explanatory Statement a proposed revised Exhibit G map showing the proposed boundary change.

Appendix D of the Recreation Settlement Agreement lists the authorized representative for each Settling Party.

Collectively, the recreational improvements in the RMP reflect the preferences and priorities of federal and state agencies, local communities, and recreation users as articulated by the Recreation Settling Parties. As such, FirstLight asks that the Commission approve the RMP as proposed and without material modification in the public interest.

In accordance with Rule 602(d)(2), FirstLight hereby notifies all relicensing participants that unless otherwise provided by the Commission, comments on the RSA must be filed on or before July 3, 2023, and reply comments must be filed on or before July 12, 2023.

Please do not hesitate to contact the undersigned if you have questions or require additional information regarding the attached.

Respectfully,

A handwritten signature in black ink, appearing to read "J. Trudell". The signature is written in a cursive style with a large initial "J" and a long horizontal stroke.

Justin Trudell
Chief Operating Officer

Enclosures: Explanatory Statement, Recreation Settlement, Proposed Revised Northfield Mountain Exhibit G

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

**FirstLight Hydro MA LLC)
Northfield Mountain LLC)**

**Project Nos. 1889-____
2485-____**

**RECREATION SETTLEMENT AGREEMENT
EXPLANATORY STATEMENT**

JUNE 12, 2023

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

FirstLight Hydro MA LLC)	Project Nos. 1889-___
Northfield Mountain LLC)	2485-___

**RECREATION SETTLEMENT AGREEMENT
EXPLANATORY STATEMENT**

I. INTRODUCTION

Pursuant to Rule 602 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (“FERC” or “Commission”),¹ FirstLight Hydro MA LLC, owner and operator of the Turners Falls Hydroelectric Project (“Turners Falls Project”) and Northfield Mountain LLC, owner and operator of the Northfield Mountain Pumped Storage Project (“Northfield Mountain Project”) (collectively, “FirstLight”), hereby submit this Explanatory Statement in support of the Recreation Settlement Agreement for the relicensing of the Turners Falls Project and Northfield Mountain Project (“Recreation Settlement Agreement”).

The Recreation Settlement Agreement was executed among FirstLight and the National Park Service (“NPS”), the Massachusetts Department of Conservation and Recreation (“MDCR”), Franklin Regional Council of Governments, the Towns of Erving, Gill, Montague and Northfield, Massachusetts, Access Fund, American Whitewater, Appalachian Mountain Club (“AMC”), Crab Apple Whitewater, Inc., New England FLOW, Western Massachusetts Climbing Coalition, and Zoar Outdoor (“Recreation Settling Parties”).²

¹ 18 C.F.R. § 385.602 (2022).

² The other Recreation Settling Parties have had an opportunity to review this Explanatory Statement in advance but FirstLight takes sole responsibility for its content.

The Recreation Settlement Agreement is a package that, by its terms, addresses all of the issues among the Recreation Settling Parties pertaining to recreation for relicensing of the Turners Falls Project and Northfield Mountain Project (“Projects”), with the exception of recreational boating flows which are addressed in a separate Flows and Fish Passage Settlement Agreement.³ While recognizing that regulatory processes related to the relicensing of the Projects are not yet completed, the Settling Parties expressly intend that the Recreation Settlement Agreement establish FirstLight’s obligations with regard to non-flow recreation measures at the Projects. The Recreation Settlement Agreement reflects agreement among the Recreation Settlement Parties concerning recommendations, terms, and conditions to be submitted to the Commission pursuant to Section 10(a) of the Federal Power Act (“FPA”) regarding this topic.⁴

To this end, the Recreation Settlement Agreement includes proposed license articles for the Projects as set forth in Appendices A (Turners Falls Project) and B (Northfield Mountain Project). The proposed license articles would require FirstLight to implement a Recreation Management Plan (May 2023) (“RMP”),⁵ which is Appendix E to the Recreation Settlement Agreement. Consistent with the Recreation Settlement Agreement, FirstLight requests that the Commission adopt the proposed license articles in the new licenses for the Projects and approve the RMP. FirstLight further requests that the Commission not include in the new licenses for the Projects or the RMP any requirement that constitutes a material modification of, or addition to, the

³ FirstLight filed the Flows and Fish Passage Settlement Agreement (March 2023) with FERC on March 31, 2023.

⁴ See Recreation Settlement Agreement, Sections 2.1, 4.2.1.

⁵ The RMP, if approved by the Commission, would supersede the recreation management plans FirstLight filed with its Amended Final License Applications (“AFLA”) on December 4, 2020.

proposed license articles or that is otherwise inconsistent with the RMP or this Recreation Settlement Agreement.⁶

As explained in this document and as supported by substantial evidence in the record of this proceeding, the RMP measures adequately protect and enhance public recreation at the Projects and thus are in the public interest. Approving the RMP as proposed by the Recreation Settling Parties, which include federal and state resource agencies, local communities, and a broad range of other stakeholders with interests in recreation, also would be consistent with the Commission's long-standing policy favoring licensing settlement agreements.⁷

The Recreation Settlement Agreement also includes measures, set forth in Appendix C, which the Recreation Settling Parties do not intend to be incorporated into the new licenses for the Projects. Appendix C is included for the Commission's information only. The measures in Appendix C include FirstLight's commitments to Recreation Settling Parties that relate to recreation activities outside the Project boundaries, are intended to promote community development, exceed regulatory requirements, or are otherwise inappropriate as license conditions. As such, they are not required to address FirstLight's obligations under the FPA and are not subject to FERC's jurisdiction.⁸

II. BACKGROUND

The Turners Falls Project is located on the Connecticut River in Massachusetts at river mile 122. The Turners Falls Dam creates the Turners Falls Impoundment ("TFI"), extending upstream approximately 20 miles to the Vernon Hydroelectric Project (FERC No. 1904). The

⁶ Sections 1.3.6 and 1.3.7 of the Recreation Settlement Agreement define the term "Inconsistent with this Settlement Agreement."

⁷ *Settlements in Hydropower Licensing Proceedings under Part I of the Federal Power Act*, 116 FERC ¶ 61,270 at P 2 (2006).

⁸ *See id.* at P 7.

Turners Falls Project also includes a gatehouse, a power canal, two hydroelectric plants located on the power canal named Station No. 1 and Cabot Station, and fish passage facilities. Cabot Station is the largest conventional hydroelectric station in Massachusetts at over 62 megawatts (“MW”). Between the Turners Falls Dam and Cabot Station tailrace there is an approximately 2.5-mile-long bypass reach; Station No. 1 discharges into the bypass approximately 0.9 miles below the Turners Falls Dam.

The TFI also serves as the lower impoundment for the Northfield Mountain Project, an approximately 1,168 MW pumped storage project in Northfield, Massachusetts that includes an off stream upper reservoir. The Northfield Mountain Project is the largest pumped storage project in New England.

The current licenses for the Turners Falls Project and Northfield Mountain Project were issued on May 5, 1980, and May 14, 1968, respectively. Both licenses expired on April 30, 2018, and the Projects have been operating under annual licenses issued by the Commission.

FirstLight commenced the relicensing process by filing a Notice of Intent and Pre-Application Document (“PAD”) on October 31, 2012. In the PAD, FirstLight indicated that it would use the Integrated Licensing Process (“ILP”) to relicense the Projects. Pursuant to the ILP, FirstLight then engaged with relicensing participants, FERC and the public in scoping environmental issues related to the Projects and in developing and implementing a rigorous study plan to assess the Projects’ environmental impacts and recreation needs. As required by the FPA, FirstLight filed a Final Application for New License for the Projects with FERC two years prior to expiration of the existing licenses, on April 29, 2016.

Because certain environmental studies required by FERC had not yet been completed in 2016, FirstLight filed AFLAs for each Project on December 4, 2020. The AFLAs included

FirstLight's proposed protection, mitigation, and enhancement measures to be included in the new licenses and the scientific and evidentiary basis for those measures. Included with the AFLAs was a proposed recreation management plan for each Project. FirstLight's recreation proposal was based on its relicensing studies which, in FirstLight's view, showed that its existing recreation facilities, combined with informal access and other public recreation sites, currently provide the public with a diversity of recreation opportunities and an abundance of options for accessing and utilizing Project lands and waters for recreation that is sufficient to meet forecasted demand. Nonetheless, FirstLight proposed several enhancements to existing Project recreation sites and new or modified recreation sites in the AFLAs.

In 2017, FirstLight began formal settlement discussions with relicensing participants. The initial focus of these discussions was with state and federal fish and wildlife agencies and certain conservation organizations on fish passage and stream flows for aquatic species protection. Following submittal of the AFLAs, FirstLight, the state and federal fish and wildlife agencies, and conservation organizations resumed discussions on fish passage and flows. The discussions ultimately expanded to include discussions with interested parties on flow releases for recreational boating. Those discussions resulted in the Flows and Fish Passage Settlement Agreement (March 2023), filed with the Commission on March 31, 2023.⁹

In parallel discussions, FirstLight engaged in extensive stakeholder outreach on non-flow recreation measures. These discussions led to an Agreement in Principle on recreation which FirstLight filed with the Commission on February 28, 2022. The Recreation Settling Parties temporarily deferred a final settlement on recreation while relicensing stakeholders explored the

⁹ The Flows and Fish Passage Settlement Agreement superseded an Agreement in Principle on whitewater boating flow releases filed with FERC on February 28, 2022.

possibility of a comprehensive settlement involving all relicensing issues. On January 12, 2023, FERC issued a letter instructing FirstLight to submit any settlement agreements for the Commission's consideration by March 31, 2023.¹⁰ The Recreation Settling Parties were not able to meet this deadline. However, the Recreation Settling Parties have now finalized the settlement and are submitting it for the Commission's consideration. The Recreation Settlement Agreement supersedes the Agreement in Principle on recreation previously filed with FERC.

In the Recreation Settlement Agreement, FirstLight has agreed to implement a number of recreation improvements in addition to those it proposed in the AFLAs. These better reflect the preferences and priorities of federal and state agencies, local communities, and recreation users as articulated during the extensive negotiations over the RMP. In addition, the Recreation Settling Parties anticipate a higher level of recreation use at the Project as a result of the increased flows in the bypass reach of the Connecticut River provided in the Flows and Fish Passage Settlement Agreement. The Recreation Settlement Agreement includes recreation facilities and amenities to account for such increased use as well as to attract additional recreation users to the Project area for the benefit of the local economy. The total cost of the recreation improvements in the Recreation Settlement Agreement RMP is almost \$6 million, representing a substantial investment by FirstLight in the local communities.

¹⁰ Letter from Vincent Yearick, FERC, to Alan Douglass, FirstLight, at 2, Project Nos. 1889-085 and 2485-071 (issued Jan. 12, 2023).

III. OVERVIEW OF THE RECREATION SETTLEMENT MEASURES

A. Proposed License Terms and Conditions

1. Proposed License Articles for the Turners Falls and Northfield Mountain Projects

Proposed License Article A100 for the Turners Falls Projects and B100 for the Northfield Mountain Project would require FirstLight to implement the RMP.

2. RMP

The RMP contains FirstLight's commitments to enhancing public recreation at the Projects for the next license term. For convenience and to avoid having to submit two separate and overlapping RMPs, recreational improvements for both Projects are contained in a single RMP. The RMP designates which recreational improvements pertain to which Project.

Section 5 of the RMP describes and lists the recreational facilities and amenities currently in place at the Projects. Section 6 describes the new recreation sites to be constructed as well as the proposed upgrades to existing sites. Table 6.3-1 of the RMP contains a comprehensive listing and summary of all existing and proposed recreational facilities and features under the RMP. Section 7 of the RMP provides an implementation schedule for the new facility construction and upgrades. FirstLight's commitments to manage and maintain the existing and new facilities are found in Section 8 of the RMP.

Section 4 of the RMP sets forth a number of programmatic or non-Project specific commitments of FirstLight. Highlights of these components are:

Ten-Year Comprehensive Review. The RMP Section 4.1.1 commits FirstLight to conduct a comprehensive review of recreation at the Projects every 10 years to evaluate recreation use and demand. FirstLight will review the information it collects from its recreation facilities, along with information which it will gather from the Recreation Settling Parties. Any updates to the RMP will

be based on consensus among the Recreation Settling Parties and FirstLight. FirstLight will file any updated RMP for FERC's approval. If no updates are proposed, FirstLight will file an explanation of why no changes are needed along with any written comments from consulted entities.

Americans with Disabilities Act. Under RMP Section 4.1.2, for any new construction or rehabilitation of existing Project recreation buildings and facilities, FirstLight will comply with applicable state and federal disability access standards. In addition, within two years of license issuance, FirstLight will conduct a comprehensive assessment of existing Project recreation facilities for consistency with Americans with Disabilities Act ("ADA") requirements. FirstLight will implement applicable ADA improvements within a reasonable period.

Conservation Restrictions. RMP Sections 4.2.1 and 4.3.1 provide that FirstLight will place certain lands it owns within the Project boundaries that are not used for specific Project activities into conservation restriction. These include lands along the river right immediately downstream of the Turners Falls Dam, as well as lands along the TFI. Details will be worked out in consultation with the relevant towns and with MDCR.

FirstLight also will permanently conserve its lands within the Bennett Meadow Wildlife Management Area managed by the Massachusetts Division of Fisheries and Wildlife ("MDFW") in consultation with MDFW. FirstLight will further consult with NPS, the Town of Erving, MDCR, and AMC to conserve, by way of a permanent trail easement, an approximately 1.3-mile long portion of the New England National Scenic Trail that lies inside the Northfield Mountain Project boundary on the eastern side of the Project's upper reservoir.

FirstLight recognizes the Commission may need to approve any conveyances of Project property rights to third parties.¹¹

Flow and Water Level Notification Website. Under Section 4.2.2, FirstLight will provide certain real-time and forecasted data on a website accessible to the public to facilitate recreational use of the Project area. FirstLight will provide hourly TFI water level information measured at the Turners Falls Dam, Turners Falls Dam spill rates, and Station No. 1 discharges. The real-time data will be posted year-round, 24 hours a day.

FirstLight also will include on the website the Naturally Routed Flow (“NRF”),¹² the anticipated Turners Falls Dam spill rate, and the anticipated Station No. 1 discharge for a 12-hour window into the future at any given time. Should FirstLight deviate from passing the 12-hour previous NRF, it will post the revised flows (in the 12-hour look ahead window) to the website as soon as practicable after those flows are known.

Cabot Camp. Cabot Camp consists of multiple structures that are in varying states of disrepair due to insect and animal damage. It is not suitable for use in its current condition. Cabot Camp is not currently designated as a Project recreational facility. Section 4.2.3 of the RMP provides that FirstLight, in consultation with the Town of Montague, will attempt to find a qualified organization to take responsibility for preserving the Cabot Camp historic buildings. FirstLight will conduct a topographic and property survey and a condition assessment of the Cabot Camp parcel and will conduct a market/redevelopment study in collaboration with the Town. If no acceptable means to otherwise preserve the historic structures of Cabot Camp is identified,

¹¹ See Form L-3, Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters of the United States, Article 5, 54 F.P.C. 1817, 1818-19 (1975).

¹² For the definition of the NRF, see Appendix A to Flows and Fish Passage Settlement Agreement, Proposed License Article A110.

FirstLight will repurpose the property for other recreation or alternative use consistent with the FERC-approved Historic Properties Management Plan.

In addition to these programmatic components, FirstLight has agreed to a broad range of new recreational facility construction projects and upgrades to existing sites. These improvements are described in detail in Section 6 of the RMP. They include, for the Turners Falls Project:

- Construct a new pocket park (viewing location, picnic table) at the Pauchaug-Schell Bridge Greenway with signage for historical and cultural interpretation.
- Construct a new paddle access campsite at Mallory Brook or alternate location.
- Construct a new formal access trail and put-in at Cabot Camp with picnic area.
- Construct a new car-top access and put-in at the eastern end of Unity Park, with a means of storing and locking vessels, and reconfigure the Unity Park parking lot to improve vehicle and pedestrian safety.
- Construct a new river access and two put-ins below Turners Falls Dam, one for whitewater rafters closer to the dam and the other to accommodate pass-through boaters who want to avoid Peskeomskut Island.
- Construct a new viewing platform and picnic area below Turners Falls Dam.
- Construct a new river access trail for fishing and non-motorized boats to a put-in just upstream of the Station No. 1 tailrace.
- Install new stairs at the Cabot Woods fishing area just below Rock Dam.
- Construct a new portage trail around Rock Dam for boaters who may want to avoid the sizable vertical drop.
- Improve the existing Poplar Street river access by installing timber stairs with a boat slide railing leading to a concrete landing; anchor a gangway to the concrete abutment which will lead to a floating dock.
- Install interpretive cultural signage at key locations in consultation with area Tribes and the Town of Montague.

For the Northfield Mountain Project:

- Enhance existing trails at Bennett Meadow and add historical and cultural interpretive signage.

- Relocate the Boat Tour Dock further upstream to avoid the fish barrier net that will be installed under the Flows and Fish Passage Settlement Agreement.
- Construct a new, ADA-accessible dock layout in place of the current Boat Tour Dock that will support motorboats, canoes, kayaks, and the Tour Boat.
- Construct approximately five miles of new trails for mountain biking to be incorporated into the existing trail system.
- Provide paddle access camping at a new campsite in the Barton Cove area.
- Establish Rose Ledges as a Project recreation facility to ensure continued use of the area for rock climbing.
- Provide a means to lock canoes and kayaks during the day at the Barton Cove canoe and kayak rental facility in the picnic area.

In total, these improvements will significantly enhance the recreation experience for members of the local communities and others visiting the Projects. As detailed in the RMP, FirstLight will undertake these improvements working closely with the local towns, federal and state agencies, and interested organizations.

3. Fifty-Year License Terms

As stated in the Recreation Settlement Agreement, the Recreation Settling Parties agree that the investment of funds and other commitments associated with the terms of the Recreation Settlement Agreement and the Flows and Fish Passage Settlement Agreement support the issuance of 50-year licenses for the Projects.¹³ Where settling parties request a particular license term, it is the Commission’s policy to defer to the settling parties.¹⁴ Under the terms of the Recreation Settlement Agreement, a license term less than 50 years is defined as “Inconsistent with this Settlement Agreement,” permitting FirstLight to withdraw from the agreement.¹⁵

¹³ Recreation Settlement Agreement, Section 4.3.2.

¹⁴ *See Policy Statement on Establishing License Terms for Hydroelectric Projects*, 161 FERC ¶ 61,078 at P 15 (2017).

¹⁵ Recreation Settlement Agreement, Sections 1.3.6, 6.1.

B. Off-License Provisions

These are the measures, to which the Recreation Settling Parties have agreed, that should not be included in the new Project licenses.

1. Additional Pocket Park

FirstLight has agreed to construct a second pocket park within three years of license issuance at a location yet to be determined in the Town of Northfield. Alternatively, FirstLight will make an equivalent investment for a single river access point which may be within or outside of the Town. The park may include signage for historical and cultural interpretation. Details will be developed in consultation with the Recreation Settling Parties. Because the exact nature and location of this recreation improvement are yet to be determined and may be outside the FERC Project boundaries, the Recreation Settling Parties have agreed to pursue this improvement as an off-license measure.

2. Farley Ledges Conservation Restriction

Farley Ledges is a rock climbing area on the eastern side of Northfield Mountain, some of which lies inside the FERC Northfield Mountain Project boundary and is owned by FirstLight. FirstLight has agreed to grant a conservation restriction to permanently conserve, for public recreational purposes, a portion of Farley Ledges as shown in Exhibit A to the Recreation Settlement Agreement.

FirstLight also has agreed to request the Commission to amend the Northfield Mountain Project boundary to exclude this area from the FERC-licensed Project. This will facilitate the potential conveyance of the property to a third party which would administer the conservation restriction. Attached to this Explanatory Statement as Attachment A is an Exhibit G map to show the proposed boundary change. FirstLight is hereby requesting the Commission to approve the

boundary change as part of its order issuing the new Northfield Mountain Project license. The conservation restriction will ensure that the property continues to be used for rock climbing and other recreational purposes following the boundary change. Rose Ledges, another popular climbing area, would remain within the boundary because it is surrounded by the Project's recreational trail system. FirstLight has agreed to formally designate Rose Ledges as a Project recreational feature.¹⁶

3. Recreation Advisory Group

FirstLight will form and chair a Recreation Advisory Group ("RAG") consisting of any of the Recreation Settling Parties who wish to be members of the RAG. The RAG will meet at least annually to discuss recreation use at the Projects and any operation and maintenance needs. The purpose of the RAG is to address shorter term recreation needs at the Projects, as opposed to the longer term needs to be assessed in the ten-year periodic reviews under the RMP.

4. Advertising

FirstLight has agreed to promote use of its Project recreational facilities with local communities and organizations and improve its digital presence. FirstLight will work with the RAG to identify targeted audiences for this outreach including Environmental Justice communities, Indigenous communities, those with disabilities, visitors to the region, residents, and local communities and organizations. FirstLight will also work with the RAG to develop a schedule for pushing out promotional materials.

III. CONCLUSION

For all of the above reasons, the Commission should (1) adopt the proposed RMP in the new Project licenses without material modification, (2) revise the Northfield Mountain Project

¹⁶ See RMP, Section 6.2.5.

boundary to exclude the portion of Farley Ledges currently within the boundary as shown on Attachment A, and (3) issue FirstLight new Project licenses for terms of 50 years.

Respectfully submitted,

/s/ Michael A. Swiger

Michael A. Swiger

Van Ness Feldman, LLP

1050 Thomas Jefferson Street, NW

Seventh Floor

Washington, DC 20007

(202) 298-1800

mas@vnf.com

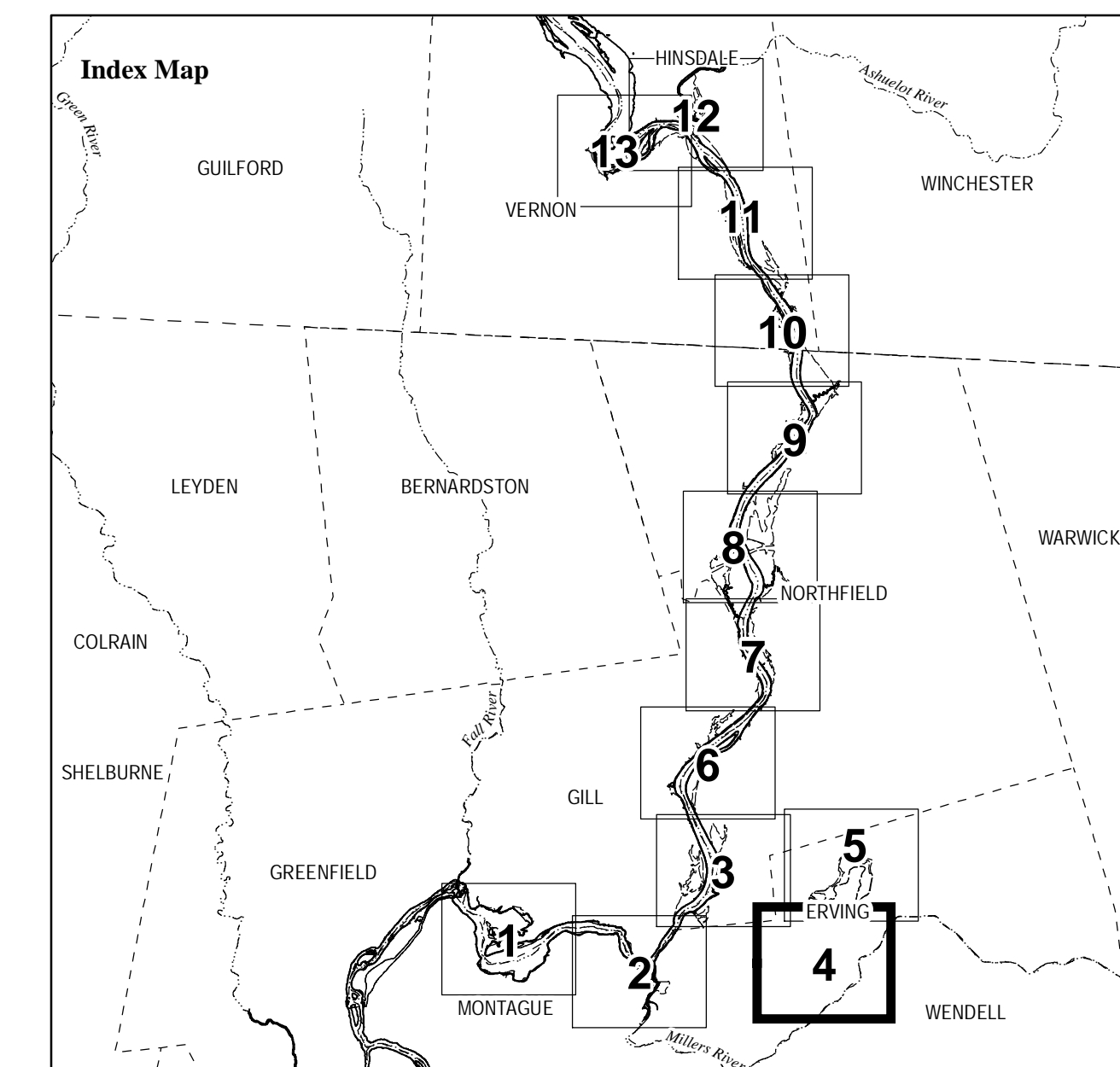
Counsel to FirstLight Hydro MA LLC
and Northfield Mountain LLC

DATED: June 12, 2023

Attachment

Attachment A

Exhibit G Map



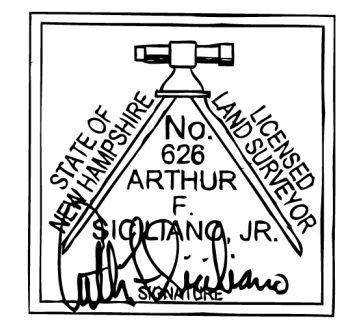
Legend

	Project Boundary		Reference Point
	Point No. (see Project Boundary Data table for metes and bounds)		Maximum Water Surface Elevation (in feet)
	Project Recreation Site		Minimum Water Surface Elevation (in feet)
	Project Recreation Site Proposed to be Non-Project Recreation Site		Shoreline
	Town Boundary		Major Creek
	Area Added to Project Boundary		Project Trail
	Area Removed From Project Boundary		Railroad
	Licensee Land Rights		Transmission Lines
	Own in Fee		Roads
	Flowage Easement		
	License to Occupy		
	Right to be Acquired		

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

Declination changing by 0" 3" E/Year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT (FERC #2485) 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 NORTHFIELD MOUNTAIN PUMPED STORAGE 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.



Northfield Mountain LLC
 NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT
 FERC PROJECT NO. 2485

SHEET 4 of 13

0 200 400 800 1,200 1,600 Feet

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

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Federal Energy Regulatory Commission in these proceedings.

Dated at Washington, DC this 12th day of June, 2023.

/s/ Mealear Tauch

Mealear Tauch

Van Ness Feldman, LLP

1050 Thomas Jefferson Street, NW

Seventh Floor

Washington, DC 20007-3877

RECREATION SETTLEMENT AGREEMENT

**FOR THE RELICENSING OF THE TURNERS FALLS
HYDROELECTRIC PROJECT, FERC PROJECT NO. 1889, AND
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT,
FERC PROJECT NO. 2485**

MAY 2023



**RECREATION SETTLEMENT AGREEMENT FOR
THE RELICENSING OF THE TURNERS FALLS HYDROELECTRIC PROJECT AND
NORTHFIELD MOUNTAIN PUMPED STORAGE PROJECT**

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APPENDICES

- Appendix A - Proposed License Article on Recreation to be Included in the New Turners Falls Hydroelectric Project License
- Appendix B - Proposed License Article on Recreation to be Included in the New Northfield Mountain Pumped Storage Project License
- Appendix C - Measures Agreed to Among the Parties But Not to be Included in New Project Licenses
- Appendix D - Authorized Representatives of the Parties
- Appendix E - Recreation Management Plan

This Recreation Settlement Agreement for the relicensing of the Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project (“Settlement Agreement”) is made and entered into pursuant to Federal Energy Regulatory Commission (“Commission” or “FERC”) Rule 602, 18 C.F.R. § 385.602, by and among:

FirstLight MA Hydro LLC
Northfield Mountain LLC
National Park Service
Massachusetts Department of Conservation and Recreation
Town of Erving, Massachusetts
Town of Gill, Massachusetts
Town of Montague, Massachusetts
Town of Northfield, Massachusetts
American Whitewater
Appalachian Mountain Club
Crab Apple Whitewater, Inc.
New England FLOW
Zoar Outdoor
Access Fund
Franklin Regional Council of Governments
Western Massachusetts Climbers Coalition

each referred to individually as a “Party” and collectively as “Parties.”

RECITALS

WHEREAS,

- A. FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively, “FirstLight”) are the FERC licensees for the Turners Falls Hydroelectric Project, FERC Project No. 1889 (“Turners Falls Project”), and Northfield Mountain Pumped Storage Project, FERC Project No. 2485 (“Northfield Mountain Project”), respectively. Both the license for the Turners Falls Project and the license for the Northfield Mountain Project (collectively, “Projects”) expired on April 30, 2018. The Projects have been operating on annual licenses pursuant to Section 15 of the Federal Power Act (“FPA”) since that time.
- B. In accordance with the requirements of the FPA and FERC’s regulations, FirstLight filed a Notice of Intent to file an application for new license for each of the Projects on October 31, 2012. Pursuant to FERC’s Integrated Licensing Process, FirstLight then engaged with relicensing participants, FERC, and the public in scoping environmental issues related to the Projects and in developing and implementing a rigorous study plan to assess the Projects’ environmental impacts.
- C. As required by the FPA and FERC’s regulations, FirstLight filed a Final Application for New License (“FLA”) for the Projects with FERC on April 29, 2016. Because certain environmental studies required by FERC had not yet been completed as of the statutory

deadline for filing of the FLA, FirstLight filed a separate Amended Final License Application for each Project (“AFLAs”) on December 4, 2020, including FirstLight’s proposed protection, mitigation and enhancement (“PM&E”) measures to be included in the new licenses and the scientific and evidentiary basis for those measures. FirstLight’s filing also included a proposed recreation management plan.

- D. In 2017, FirstLight began formal settlement discussions with relicensing participants. Those discussions initially were not focused on recreation and did not result in agreement on all issues, but nevertheless informed FirstLight’s PM&E proposals in the AFLAs. FirstLight’s PM&E proposals in the AFLAs also were informed by further non-FERC required environmental studies undertaken in consultation with the state and federal fish and wildlife agencies.
- E. Subsequently, FirstLight entered into settlement discussions with a broad group of state and federal agencies, local communities, and other recreation stakeholders which led to the filing with FERC of an Agreement in Principle on recreation on February 28, 2022. This Settlement Agreement is the end product of the Parties’ work on issues relating to recreation at the Projects and, as to the Parties, resolves all outstanding issues for the relicensing of the Projects on recreation.
- F. On March 31, 2023, FirstLight filed with FERC a fully executed Flows and Fish Passage Settlement Agreement among FirstLight, the U.S. Fish and Wildlife Service (“USFWS”), the National Marine Fisheries Service (“NMFS”), the Massachusetts Division of Fisheries and Wildlife, The Nature Conservancy, American Whitewater, Appalachian Mountain Club, Crab Apple Whitewater, Inc., New England FLOW and Zoar Outdoor addressing all issues among those parties pertaining to fish passage, flows (including flows for recreation boating), and protected, threatened and endangered species.

TERMS OF AGREEMENT

NOW THEREFORE, in consideration of the mutual covenants set forth herein, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

1 General Provisions

1.1 Effective Date of Settlement Agreement

Except as provided in Section 1.1.1, this Settlement Agreement shall become effective upon the execution by all Parties of this Settlement Agreement (“Effective Date”).

1.1.1 FirstLight’s Affirmative Acceptance of License

FirstLight’s contractual obligation to the Parties to implement the measures set forth in Appendices A-C and E of this Settlement Agreement shall become effective only upon FirstLight’s acceptance, in its sole discretion, of the Final

New Project Licenses. Within 45 days of the New Project Licenses becoming Final, FirstLight shall provide Notice to all Parties whether it affirmatively accepts the New Project Licenses and its concomitant obligations under this Settlement Agreement. If FirstLight does not timely provide such Notice, it shall be deemed to have affirmatively accepted the New Project Licenses. If FirstLight rejects the New Project Licenses this Settlement Agreement will terminate pursuant to Section 6.5 and will not be binding on FirstLight or any other Party in any subsequent proceeding at FERC or otherwise.

1.1.2 Effective Date of Parties' Obligations

The Parties' obligations under Sections 2 through 8, including the obligation to support this Settlement Agreement in the relicensing and related regulatory proceedings, take effect on the Effective Date.

1.2 Term of Settlement Agreement

The term of this Settlement Agreement shall commence on the Effective Date and shall continue (unless terminated as otherwise provided herein) for the term of the New Project Licenses plus the term(s) of any annual license(s) that may be issued after the foregoing New Project Licenses have expired.

1.3 Definitions

1.3.1 Commission or FERC shall mean the Federal Energy Regulatory Commission.

1.3.2 Consultation shall mean the process under this Settlement Agreement by which FirstLight seeks views through providing drafts of proposals, plans and reports, and seeking and considering comments on such proposals, plans, and reports as appropriate from relevant Parties. Consultation under this Settlement Agreement shall not be construed to satisfy "consultation" under Section 7 of the Endangered Species Act ("ESA") or other federal laws specifically requiring consultation, unless specifically noted.

1.3.3 Disputing Party or Disputing Parties shall mean the Party providing Notice of the dispute, the Party alleged to have failed to perform an obligation, and any other Party that provides Notice of its intent to participate in the dispute resolution.

1.3.4 Final, with respect to the New Project Licenses under this Settlement Agreement, shall mean such licenses after exhaustion of administrative and judicial remedies for any challenge which any Party or other person brings against the New Project Licenses or against any other regulatory approval integral to issuance of the New Project Licenses.

1.3.5 Fishway Prescription shall mean a prescription issued by NMFS or USFWS under Section 18 of the FPA, whether designated as preliminary, modified or final.

1.3.6 Inconsistent with this Settlement Agreement shall mean: (1) any material modification to, deletion of, or addition to the Recreation Management Plan or Proposed License Articles in the New Project Licenses; (2) any material modification to, deletion of, or addition to the Recreation Management Plan or the Proposed License Articles in any ESA Section 7 Biological Opinion, or Clean Water Act (“CWA”) Section 401 Certification issued in connection with the New Project Licenses; (3) changes to the Projects proposed by FirstLight that are materially inconsistent with the assumptions underlying the Settlement Agreement; or (4) New Project Licenses issued for terms of less than 50 years. The term “material” for purposes of this section means a deviation from the Recreation Management Plan that, either individually or collectively with other such deviations, substantially affects a Party’s bargained-for benefits under this Settlement Agreement.

1.3.7 Inconsistent with this Settlement Agreement shall not mean: (1) the inclusion of standard articles from the appropriate L-Form (as defined by 18 C.F.R. § 2.9) in the New Project Licenses; (2) FERC’s reservation of its authority to require changes to implementation schedules, plans, or other requirements of the New Project Licenses; (3) the inclusion in any Fishway Prescription of the issuing agency’s reservation of authority to reopen its prescription, provided that the reservation of authority is consistent with this Settlement Agreement, and provided further that each Party reserves its right to contest the exercise of such reserved authority at such time as the agency may exercise the reserved authority; (4) the inclusion in any ESA Section 7 Biological Opinion of the issuing agency’s criteria for re-initiation of Section 7 consultation pursuant to 50 C.F.R. § 402.16; (5) the inclusion in the New Project Licenses, any Fishway Prescription, any ESA Section 7 Biological Opinion, or any CWA Section 401 Certification, of such reasonable minimization and reporting requirements as FERC or the issuing agency determines are necessary to ensure FirstLight’s compliance; or (6) the exercise of a reserved right under Section 3.2 of this Settlement Agreement or a condition in a CWA Section 401 Certification relating to erosion.

1.3.8 Material New Information shall mean significant and relevant new information which was neither in the administrative record for the relicensing nor otherwise known as of the Effective Date to the Party who seeks to use the Material New Information. Each Party agrees in good faith to share any such information with the other Parties in a timely manner.

1.3.9 New Project Licenses shall mean the new licenses, not to include any annual license extending the current licenses, issued by the Commission to FirstLight pursuant to Section 15 of the FPA for the continued operation of Project Nos. 1889 and 2485.

1.3.10 Notice shall mean a written communication to the Parties which meets the requirements of Section 7.9 and any other requirements for notice specifically provided in any other applicable section of this Settlement Agreement.

1.3.11 Projects shall mean the Turners Falls Hydroelectric Project, currently licensed to FirstLight MA Hydro LLC as FERC Project No. 1889, and the Northfield Mountain Pumped Storage Project, currently licensed to Northfield Mountain LLC as FERC Project No. 2485.

1.3.12 Proposed License Articles shall mean the terms and conditions set forth in Appendices A and B of this Settlement Agreement that the Parties request that the Commission include in the New Project Licenses for the continued operation of the Projects.

1.3.13 Recreation Management Plan shall mean the plan, attached as Appendix E to this Settlement Agreement, to which the Parties have agreed and which the Parties hereby propose for FERC's approval and inclusion as a requirement in the New Project Licenses.

1.3.14 Settlement Agreement shall mean the entirety of this Recreation Settlement Agreement, including the Appendices.

1.4 Acronyms

1.4.1 AFLAs – Amended Final License Applications

1.4.2 CWA – Clean Water Act

1.4.3 ESA – Endangered Species Act

1.4.4 FERC – Federal Energy Regulatory Commission

1.4.5 FLA – Final License Application

1.4.6 FPA – Federal Power Act

1.4.7 MADEP – Massachusetts Department of Environmental Protection

1.4.8 NMFS – National Marine Fisheries Service

1.4.9 NEPA – National Environmental Policy Act

1.4.10 REA – Ready for Environmental Analysis

1.4.11 USFWS – U.S. Fish and Wildlife Service

2 Purpose of Settlement Agreement

2.1 Purpose

The Parties have entered into this Settlement Agreement for the purpose of resolving all issues that have or could have been raised by the Parties in connection with FERC's orders issuing New Project Licenses relating to recreation. While recognizing that several regulatory and statutory processes are not yet completed, it is the Parties' intention that this Settlement Agreement considers all significant issues concerning recreation that may arise in the issuance of all regulatory approvals integral to FERC's issuance of the New Project Licenses, including but not limited to ESA Section 7 Biological Opinions to be

issued by USFWS and NMFS, the CWA Section 401 Certifications to be issued by the Massachusetts Department of Environmental Protection (“MADEP”), and any Environmental Impact Statement or Environmental Assessment issued pursuant to the National Environmental Policy Act (“NEPA”). The Parties recognize that MADEP is the agency responsible for Section 401 Certification and is not a Party to this Settlement Agreement. Pursuant to the Parties’ various rights, authorities, and responsibilities under the FPA, as well as other statutory and regulatory authorities and implied powers, this Settlement Agreement is intended to establish FirstLight’s obligations concerning recreation under the New Project Licenses. It also specifies procedures to be used among the Parties to ensure that implementation of the New Project Licenses is not Inconsistent with this Settlement Agreement, and with other legal and regulatory mandates. The Parties agree that FirstLight’s performance of its obligations under this Settlement Agreement will be consistent with and is intended to fulfill FirstLight’s existing statutory and regulatory obligations relating to the relicensing of the Projects with respect to recreation, with the exception of flows for recreational boating which are addressed in the Flows and Fish Passage Settlement Agreement (March 2023).

2.2 Relationship to Flows and Fish Passage Settlement Agreement

Subject to rights reserved under Section 3.2, the Parties to this Settlement Agreement who are not Parties to the Flows and Fish Passage Settlement Agreement agree that they will not oppose the Flows and Fish Passage Settlement Agreement.

2.3 No Precedent for Other Proceedings

This Settlement Agreement is made with the understanding that it constitutes a negotiated resolution of issues relating to recreation for the New Project Licenses. Accordingly, this Settlement Agreement shall not be offered against a Party as argument, admission or precedent in any mediation, arbitration, litigation, or other administrative or legal proceeding that does not involve or relate to the New Project Licenses or the operation of the Projects. Further, no Party shall be deemed to have approved, admitted, accepted, or otherwise consented to any operation, management, valuation, or other principle underlying any of the matters covered by this Settlement Agreement, except as expressly provided herein. With respect to any mediation, arbitration, litigation, or other administrative or legal proceeding involving or relating to the New Project Licenses, the Parties’ rights and responsibilities shall be as set forth in this Settlement Agreement. This Section shall survive any termination of this Settlement Agreement.

3 Reservations of Rights

3.1 No Effect on Parties’ Other Legal Duties or Rights

Nothing in this Settlement Agreement is intended to, or shall be construed to, affect or limit the authority or obligation of any Party to fulfill its constitutional, statutory, and regulatory responsibilities, to comply with any judicial decision or order, to exercise

reserved rights, or to pursue and advocate on issues defined as not Inconsistent with this Agreement.

3.2 Reserved Rights

Notwithstanding Sections 1.3.6, 2.2, 4.2.1, 4.3.1, and any other provision of this Settlement Agreement, the Parties to this Settlement Agreement who are not a party to the Flows and Fish Passage Settlement Agreement expressly reserve the right, without limitation or restriction, and regardless of whether exercise of this reserved right may affect Project operations or impoundment levels, to pursue and advocate for the inclusion of articles, conditions, or other requirements related to the prevention and mitigation of erosion in the Turners Falls impoundment.

3.3 Future Relicensings

Nothing in this Settlement Agreement is intended or shall be construed to affect or restrict any Party's participation in or comments about the provisions of any future relicensing of the Projects subsequent to the current relicensing.

4 Settlement Agreement Commitments and Implementation

4.1 Parties Bound by Settlement Agreement

The Parties shall be bound by this Settlement Agreement for the term stated in Section 1.2, provided the New Project Licenses are not Inconsistent with this Settlement Agreement.

4.2 Recommendations of Parties to Regulatory Agencies

4.2.1 Recommendations To Be Consistent with Settlement Agreement

(1) Each Party agrees to request that FERC approve and incorporate in the New Project Licenses, without material modification, the Proposed License Articles and the Recreation Management Plan. The Parties shall further request that FERC not include in the New Project Licenses additional measures that are Inconsistent with this Settlement Agreement.

(2) Any Party participating in the Section 401 Certification process shall request that MADEP not include as conditions to the Section 401 Certifications conditions that are Inconsistent with this Settlement Agreement.

(3) Any recommendations of the Parties to FERC or other state or federal agencies with regulatory authority over the New Project Licenses, including but not limited to USFWS, NMFS, the Massachusetts Division of Fisheries and Wildlife, and MADEP, shall not be Inconsistent with this Settlement Agreement;

(4) Any information, comments, or responses to comments by the Parties in the context of relicensing of the Projects shall not be Inconsistent with this Settlement Agreement;

(5) The Parties shall use reasonable efforts to support FERC orders approving this Settlement Agreement and issuing New Project Licenses not Inconsistent with this Settlement Agreement in a timely manner;

(6) The Parties shall support, in all relevant regulatory proceedings in which they participate, regulatory actions not Inconsistent with this Settlement Agreement; and

(7) A Party may only use Material New Information to submit comments or recommendations Inconsistent with this Settlement Agreement if it believes in good faith that such information significantly undermines the Settlement Agreement, taken as a whole for the affected Party, and significantly affects the adequacy of the Recreation Management Plan under the FPA or other applicable law.

4.2.2 Biological Opinion and Incidental Take Statement Inconsistent with This Settlement Agreement

4.2.2.1 If any Biological Opinion or Incidental Take Statement issued by NMFS or USFWS pursuant to Section 7 of the ESA is Inconsistent with this Settlement Agreement, this Settlement Agreement shall be deemed modified to conform to the provisions of the Biological Opinion and Incidental Take Statement, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the Biological Opinion and Incidental Take Statement are filed with FERC.

4.2.2.2 The Disputing Party may, to the extent provided by applicable law, seek administrative and/or judicial review of any Biological Opinion or Incidental Take Statement that is Inconsistent with this Settlement Agreement. The Parties shall follow the dispute resolution process to the extent reasonably practicable while such administrative or judicial review is pursued.

4.2.2.3 Except as provided in Section 4.3.5.4 for omissions based on jurisdiction or if the Settlement Agreement is terminated pursuant to Section 6.5, if any Biological Opinion or Incidental Take Statement is Inconsistent with this Settlement Agreement after a final and non-appealable decision on the administrative or judicial action, this Settlement Agreement shall be deemed modified to conform to the final decision.

4.2.3 Section 401 Certifications Inconsistent with This Settlement Agreement

4.2.3.1 If the MADEP denies FirstLight's application for Section 401 Certification for either of the Projects, the Parties agree such denial shall be considered Inconsistent with this Settlement Agreement, unless (1) the denial is without prejudice, and (2) the denial is not based on a determination that the Recreation Management Plan measures are insufficient for MADEP to issue Section 401 Certifications. If the MADEP issues the Section 401 Certifications and any condition of a Section 401 Certification is Inconsistent with this Settlement Agreement, the Settlement Agreement shall be deemed modified to conform to the Section 401 Certification, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the issuance of the Section 401 Certification.

4.2.3.2 The Disputing Party may, to the extent provided by applicable law, seek administrative and/or judicial review of any Section 401 Certification or denial of Section 401 Certification that is Inconsistent with this Settlement Agreement. The Parties shall follow the dispute resolution process to the extent reasonably practicable while such administrative and/or judicial review is pursued.

4.2.3.3 If any Party or non-party seeks administrative and/or judicial review of the Section 401 Certification, FirstLight or any Party may request that FERC hold the New Project Licenses in abeyance pending a final adjudication of the Section 401 Certification. Any Party objecting to such a request may oppose it, after complying with the dispute resolution procedures of this Settlement Agreement.

4.2.3.4 Except as provided in Section 4.3.5.4 for omission based on jurisdiction or if the Settlement Agreement is terminated pursuant to Section 6.5, if any condition of a Section 401 Certification is Inconsistent with this Settlement Agreement after a final and non-appealable decision on the administrative or judicial action, this Settlement Agreement shall be deemed modified to conform to the final decision.

4.3 New Project Licenses

4.3.1 Support for Issuance of New Project Licenses

The Parties shall support this Settlement Agreement in appropriate written communications to FERC, USFWS, NMFS, and MADEP. The Parties agree not to propose, support, or advocate proposed measures Inconsistent with this Settlement Agreement, except as specifically permitted herein.

4.3.2 Term of New Project Licenses

The Parties recognize the investment of funds associated with the terms of this Settlement Agreement and with the Flow and Fish Passage Settlement Agreement and support FirstLight's request for 50-year licenses to FERC.

4.3.3 Comments on the NEPA Document

The Parties shall comment on any measure recommended by FERC in its draft or final NEPA document which, if approved in the New Project Licenses, would be Inconsistent with this Settlement Agreement. Such comment(s) would aim to urge FERC to adopt the full settlement terms before the issuance of the New Project Licenses.

4.3.4 Measures Not to Be Included in New Project Licenses

The Parties shall request that measures and actions agreed to among the Parties as set forth in Appendix C (Off-License) not be incorporated in the New Project Licenses.

4.3.5 New Project Licenses Inconsistent with This Settlement Agreement

4.3.5.1 Consistency of Licenses with Settlement Agreement

If the New Project Licenses issued by FERC are Inconsistent with this Settlement Agreement, the Settlement Agreement shall be deemed modified to conform to the inconsistency, unless a Party provides Notice to the other Parties that it objects to the inconsistency and initiates dispute resolution within 30 days after the date of the FERC order issuing license.

4.3.5.2 Disputing Inconsistencies

The Disputing Party may, in addition, if it is a party to the FERC relicensing proceeding, petition FERC for rehearing and seek judicial review of the New Project Licenses. If any Party, including FirstLight, or non-party seeks rehearing or judicial review of the New Project Licenses, FirstLight may seek a stay or an extension of time of any or all requirements of the New Project Licenses. Any Party objecting to such a request may oppose it, after complying with the dispute resolution procedures of this Settlement Agreement.

4.3.5.3 Modification of Agreement if Inconsistency

Except as provided in Section 4.3.5.4 for omission based on jurisdiction and Section 4.3.5.5 for inclusion based on jurisdiction, or if the Settlement Agreement is terminated pursuant to Section 6.5, if a provision in the Final New Project Licenses is Inconsistent with this Settlement Agreement, this

Settlement Agreement shall be deemed modified to conform to the final decision.

4.3.5.4 Omission Based on Jurisdiction

If the New Project Licenses do not contain all the measures included in the Recreation Management Plan because FERC expressly determines that it does not have jurisdiction to adopt or enforce the omitted measures, this Settlement Agreement shall not be deemed modified to conform to such omission, and such omission shall not be used as the basis for dispute among the Parties; provided that any measure that FERC excludes from the New Project Licenses based on a lack of jurisdiction shall be automatically included in Appendix C without material modification (including all funds needed to carry out or implement any such measure).

4.3.5.5 Inclusion Based on Jurisdiction or Section 401 Certification

If the New Project Licenses include measures stated in Appendix C of this Settlement Agreement because FERC determines that such measures are required to be included under the FPA and are within FERC's jurisdiction to enforce, or MADEP includes such measures as conditions of a Section 401 Certification, such action shall not be considered Inconsistent with this Settlement Agreement provided there is no material change to the measure other than its inclusion in the New Project Licenses. However, Parties may not assert in any regulatory forum including FERC or MADEP that any measures in Appendix C of this Settlement Agreement should be included in the New Project Licenses.

4.4 Cooperation Among Parties

The Parties shall cooperate in good faith in the implementation of this Settlement Agreement and the New Project Licenses.

4.5 Support for Implementation

Upon notification by FirstLight of the need therefore, the other Parties shall provide written communications (or orally, in the event written communication is impossible to obtain due to reasons outside a Party's control) of support in any administrative approval process required for implementation of this Settlement Agreement, subject to available Party resources.

4.6 Defense Against Measures Inconsistent with This Settlement Agreement

If a Party files a pleading or other document before FERC or another regulatory agency advocating a measure Inconsistent with this Settlement Agreement, whether prior to or following issuance of the New Project Licenses, any other Party may defend by: (1)

stating its opposition to the measure Inconsistent with this Settlement Agreement; (2) requesting that FERC or other regulatory agency disapprove the measure Inconsistent with this Settlement Agreement; and (3) explaining what offsetting measures should be included in and/or excluded from the New Project Licenses if the measure Inconsistent with this Settlement Agreement is approved.

4.7 Responsibility for Compliance with New Project Licenses

Upon acceptance of the New Project Licenses, FirstLight is ultimately responsible for compliance with the New Project Licenses. By entering into this Settlement Agreement, except as expressly provided herein, none of the other Parties is accepting any new or additional legal liability or responsibility for compliance with the obligations under the New Project Licenses. FirstLight shall not be excused from its duty to comply with the New Project Licenses due to a failure by any other Party, entity, or person to provide funding or carry out a duty, obligation, or responsibility it may have with respect to the Projects pursuant to other laws or agreements. Notwithstanding the foregoing, this Settlement Agreement does not alter or abrogate any duty, obligation, or responsibility that any other Party or person may have to provide such funding pursuant to other laws or agreements, nor does this Settlement Agreement prevent FirstLight or any other Party from seeking to enforce such duty, obligation, or responsibility. Further, FirstLight shall have no obligation to reimburse or otherwise pay any other Party for its assistance, participation, or cooperation in any activities pursuant to this Settlement Agreement of the New Project Licenses unless expressly agreed to by FirstLight or as required by law. In the event of administrative rehearing or judicial review, Parties shall bear their own costs and attorneys' fees.

4.8 Availability of Funds

Implementation of this Settlement Agreement by any Party other than FirstLight is subject to the availability of funds. In addition, implementation of this Settlement Agreement by any federal agency is subject to the requirements of the Anti-Deficiency Act, 31 U.S.C. Section 1341 *et seq.*

4.9 Implementation

4.9.1 Implementation Schedule

FirstLight shall ensure that implementation of the Recreation Management Plan is consistent with any schedule specified therein (as it may be modified by the New Project Licenses). FirstLight and other responsible Parties shall implement the measures stated in Appendix C consistent with the applicable schedules.

4.9.2 Permits

Upon acceptance of the New Project Licenses and FERC approval of the Recreation Management Plan, FirstLight shall apply for and use reasonable efforts to obtain in a timely manner and in final form all necessary federal, state,

regional, and local permits, licenses, authorizations, certifications, determinations, and other governmental approvals for purposes of implementing this Settlement Agreement and the New Project Licenses (“Permits”). The applications for such Permits shall be consistent with the terms of this Settlement Agreement. Each Party, upon FirstLight’s request, shall, subject to a Party’s available resources, use reasonable efforts to support FirstLight’s applications for Permits, and shall not file comments or recommend Permit conditions that are Inconsistent with this Settlement Agreement. FirstLight shall pay all fees required by law related to such Permits. The Parties shall work together and cooperate as appropriate during the permitting, environmental review, and implementation of this Settlement Agreement. FirstLight shall not be required by the Settlement Agreement to implement an action required under this Settlement Agreement or the New Project Licenses if a Permit has been denied or contains conditions that are materially Inconsistent with this Settlement Agreement, or until all applicable Permits required for that action are obtained. If a proceeding challenging any Permit required for the action has been commenced, FirstLight shall be under no obligation under this Settlement Agreement to implement the action or any related action until any such proceeding is terminated. In the event any Permit has been denied, FirstLight determines that the Permit contains conditions that are Inconsistent with this Settlement Agreement, or any Permit is not obtained in a timely manner, the Parties shall confer to evaluate the effect of such event on implementation of this Settlement Agreement and seek to develop actions to respond to that event. If the Parties do not agree on actions to respond to that event and nonperformance or prolonged delay in performance of one or more measures due to the event materially reduces the benefit of this Settlement Agreement, a Party may initiate dispute resolution, except that dispute resolution regarding denial of a Permit shall be restricted to the issue of actions to respond to that event. Nothing contained in this section shall be construed to limit FirstLight’s right to apply for a Permit before issuance of the New Project Licenses, provided that any such applications shall not be Inconsistent with this Settlement Agreement.

4.10 Reopener or Amendment of New Project Licenses

4.10.1 Limitation on Reopeners and Modifications

No Party to this Settlement Agreement may seek to modify or otherwise reopen the measures included in the Recreation Management Plan in a manner that is Inconsistent with this Settlement Agreement unless that Party, relying on Material New Information, reasonably demonstrates that such proposed modification or reopener fulfills a statutory, regulatory, or court ordered responsibility, or reasonably demonstrates that the New Project Licenses no longer comply with applicable law.

4.10.1.1 Notice of Proposed Reopener

Prior to seeking modification or reopener, a Party shall provide all Parties at least 90-day Notice to consider the Material New Information and that Party's position. A Party shall not be required to comply with this 90-day Notice provision if it reasonably believes an emergency situation exists. If a Party proposes a modification or reopener that another Party believes would be Inconsistent with this Settlement Agreement and objects, then the dispute resolution provisions of Section 5 apply, and the objecting Party must invoke dispute resolution during the 90-day Notice period or waive its objection.

4.10.2 Amendment of New Project Licenses

Nothing in this Settlement Agreement is intended, or shall be construed, to affect or limit the right of FirstLight to seek amendments of the New Project Licenses that are not Inconsistent with this Settlement Agreement.

4.10.2.1 Notice of Proposed License Amendment

Prior to filing any proposed license amendment that relates to a subject covered by this Settlement Agreement, including a temporary amendment, FirstLight shall provide the other Parties at least 90-day Notice of its intention to do so. At the request of any Party, FirstLight shall consult with any/all interested Parties regarding the need for and the purpose of the amendment. If a Party believes the proposed amendment is Inconsistent with this Settlement Agreement and objects, then the dispute resolution provisions in Section 5 apply, and the objecting Party must invoke dispute resolution within this 90-day Notice period or waive its objection. FirstLight shall not be required to comply with this 90-day Notice provision if it reasonably believes an emergency situation exists or if required to meet its responsibilities under applicable law or an order of an agency with jurisdiction over it.

4.10.2.2 Consultation on Amendments

Except as provided in the New Project Licenses or in the case of an emergency, FirstLight shall allow a minimum of 60 days for any Party to comment and to make recommendations before filing any application for a Project license amendment that relates to a subject covered by this Settlement Agreement and where consultation with Parties is required. If FirstLight does not adopt a recommendation or comment of a Party, it shall include in any filing with FERC copies of the comments/ recommendations and an explanation as to why the comment/ recommendation was not adopted.

4.10.2.3 Exception for FERC Compliance Directives

The notice and consultation requirements of this Section shall not apply to license amendments in connection with compliance matters under Section 4.11 below.

4.10.2.4 Parties' Option to Intervene in Amendment Proceeding

FirstLight shall not oppose, based on the issue of standing, an intervention request by any Party in a proceeding for a Project license amendment that the Party has concluded would be Inconsistent with this Settlement Agreement. The Parties acknowledge that intervention in the relicensing proceeding docket at FERC does not make the Party an intervenor in any post-licensing proceeding.

4.11 Compliance with FERC Project Safety and Other Directives

FirstLight expressly reserves the right to fully and timely comply with any FERC directive or compliance order, including but not limited to any requirement related to Project safety or security. In no instance will any action by FirstLight that is reasonably necessary or appropriate to comply with any such order or direction from FERC trigger the dispute resolution protocols of this Settlement Agreement or be construed as a breach of the Settlement Agreement or an action Inconsistent with this Settlement Agreement. FirstLight agrees to consult with relevant Parties to the extent practicable prior to taking action. All Parties reserve their rights to defend their interests at FERC.

4.12 Amendment of Settlement Agreement

This Settlement Agreement may be amended at any time through the term of the New Project Licenses plus the term(s) of any annual license(s) that may be issued after the New Project Licenses have expired, with the unanimous agreement of all Parties still in existence, including any successor thereto. The Party seeking amendment shall give each other Party at least 60-day prior written Notice. Such Notice shall state that failure of any Party, with the exception of FirstLight, to respond in writing or by electronic mail to the Notice within the applicable 60-day period shall be deemed to be an approval of such amendment. Any amendment of this Settlement Agreement shall be in writing and executed by the responding Parties.

5 Dispute Resolution

5.1 General Applicability

5.1.1 All disputes among the Parties regarding any Party's performance or compliance with this Settlement Agreement, including resolution of any disputes related to the New Project Licenses, Fishway Prescriptions, Biological Opinions, Section 401 Certifications, or Permits related to the New Project Licenses, shall

be subject to the dispute resolution process provided in this Section 5, unless otherwise specifically provided in this Settlement Agreement or required by applicable law. The Parties agree that disputes shall be brought in a prompt and timely manner.

5.1.2 The Disputing Parties shall devote such resources as are needed and as can be reasonably provided to resolve the dispute expeditiously.

5.1.3 The Disputing Parties shall cooperate in good faith to promptly schedule, attend, and participate in the dispute resolution.

5.1.4 Unless otherwise agreed among the Disputing Parties, each Disputing Party shall bear its own costs for its participation in this or any administrative dispute resolution process related to the Settlement Agreement.

5.1.5 Each Disputing Party shall promptly implement any resolution of the dispute.

5.1.6 The dispute resolution process in this Section does not preclude any Party from timely filing and pursuing an action for administrative or judicial relief of any FERC order, compliance matter, or other regulatory action related to the New Project Licenses, provided that any such Party shall pursue dispute resolution pursuant to this process as soon as practicable thereafter or concurrently therewith.

5.1.7 The Party initiating a dispute under this Section may notify FERC when dispute resolution proceedings are initiated relevant to the New Project Licenses. The Parties acknowledge that the initiation of dispute resolution proceedings shall have no effect on filing deadlines or applicable statutes of limitation before FERC.

5.2 Process

5.2.1 Dispute Initiation Notice

A Party claiming a dispute shall give Notice of the dispute. If the dispute includes a claim that a New Project License, or related regulatory approval, is Inconsistent with this Settlement Agreement, the Notice shall be issued within the applicable time periods specified in Section 4. Such Notice shall describe: (A) the matter(s) in dispute; (B) the identity of any other Party alleged to have not performed an obligation provided by the Settlement Agreement; and (C) the specific relief sought. The Parties agree that disputes shall be brought in a prompt and timely manner.

5.2.2 Informal Meetings

The Disputing Parties shall hold at least two informal meetings to resolve the dispute, commencing within 30 days after the Dispute Initiation Notice.

5.2.3 Mediation

If the dispute is not resolved in the informal meetings, the Disputing Parties shall decide whether to use a neutral mediator, such as FERC's Office of Dispute Resolution Services. The decision whether to pursue mediation shall be made within 20 days after conclusion of the informal meetings in Section 5.2.2. The Disputing Parties shall agree on an appropriate allocation of any costs of the mediator employed under this section. Mediation shall not occur if the Disputing Parties cannot agree on the allocation of costs. The Disputing Parties shall select a mediator within 30 days of the decision to pursue mediation, including the agreement of allocation of costs. The mediation process shall be concluded not later than 60 days after the mediator is selected. The above time periods may be shortened or lengthened upon mutual agreement of the Disputing Parties.

5.2.4 Dispute Resolution Notice

The Disputing Parties shall provide Notice of any resolution of the dispute achieved under Sections 5.2.2 and 5.2.3. The Notice shall: (A) restate the disputed matter, as initially described in the Dispute Initiation Notice; (B) describe the alternatives which the Disputing Parties considered for resolution; and (C) state whether resolution was achieved, in whole or part, and state the specific relief agreed-to as part of the resolution.

5.3 Enforcement of Settlement Agreement After Dispute Resolution

5.3.1 Enforcement Regarding New Project Licenses

A Disputing Party may seek administrative or judicial relief for an unresolved dispute regarding FirstLight's performance of its obligations under the New Project Licenses only after exhaustion of the dispute resolution process under Section 5, unless applicable processes require a filing for relief before dispute resolution can conclude. Any such relief shall be sought and obtained from FERC or other appropriate regulatory or judicial forum. No Party to the Settlement Agreement may seek damages for breach of the Recreation Management Plan, whether before or after acceptance of the New Project Licenses.

5.3.2 Enforcement Regarding Contractual Obligations

A Disputing Party may seek administrative or judicial relief for breach of a contractual obligation established by this Settlement Agreement only after exhaustion of the dispute resolution process in Section 5. Venue for such action

shall lie in a court with jurisdiction located in the Commonwealth of Massachusetts. In such action, a Disputing Party may only seek specific performance of the contractual obligation or other equitable relief. No Party shall be liable for damages for such breach of contractual obligations. Nothing in this agreement waives the sovereign immunity of the United States, or the Commonwealth of Massachusetts, or any political subdivisions thereof, or constitutes a waiver of any statutory or common law immunity or consent to suit by either a sovereign or any Party in any manner not otherwise provided for by law.

6 Withdrawal from Settlement Agreement

6.1 Withdrawal of Party from Settlement

A Party may withdraw from this Settlement Agreement only if (1) it objects to a Biological Opinion, CWA 401 Certification, or FERC order issuing a New Project License that is Inconsistent with this Settlement, (2) it has complied with the required dispute resolution procedures stated in Section 5 to attempt to resolve the objection, and (3) the objection is to a CWA 401 Certification or FERC order issuing a New Project License, that Party does not file for appeal of the inconsistency. If the Party files an appeal to resolve the inconsistency, that Party may not withdraw until its appeal is concluded and the inconsistency remains uncured. In addition, FirstLight may withdraw as provided in Section 6.2. A Party that withdraws will provide Notice of withdrawal, including its basis for withdrawal.

6.2 Withdrawal of FirstLight from Settlement Agreement Prior to Acceptance of the New Project Licenses

In addition to the provisions of Section 6.1, prior to the acceptance of the New Project Licenses, FirstLight may withdraw from this Settlement Agreement if a Party withdraws from this Settlement Agreement and FirstLight determines, after providing the remaining Parties a reasonable opportunity to meet and discuss the matter with FirstLight, that the withdrawal: (1) may adversely affect the likelihood of NMFS or USFWS issuing a Fishway Prescription or Biological Opinion that is consistent with this Settlement Agreement, (2) may adversely affect the likelihood of MADEP issuing a CWA 401 Certification that is consistent with this Settlement Agreement, (3) may adversely affect the likelihood of FERC issuing a license that is consistent with this Settlement Agreement, or (4) substantially diminishes the value of this Settlement Agreement for FirstLight. FirstLight shall give Notice identifying the reason for withdrawal within 30 days of its knowledge of the event creating the right to withdraw.

6.3 Effective Date of Withdrawal

Withdrawal by a Party shall become effective 10 calendar days after Notice is given by the withdrawing Party.

6.4 Continuity After Withdrawal

The withdrawal of a Party, other than FirstLight, does not automatically terminate this Settlement Agreement for the remaining Parties. If a Party withdraws from this Settlement Agreement, the withdrawing Party shall not be bound by any term contained in this Settlement Agreement, except as provided in this section and in Section 2.3. The withdrawing Party shall not use any documents and communications related to the development, execution, and submittal of this Settlement Agreement to FERC as evidence, admission, or argument in any forum or proceeding for any purpose to the fullest extent allowed by applicable law, including 18 C.F.R. § 385.606. This provision does not apply to any information that was in the public domain prior to the development of this Settlement Agreement or that became part of the public domain at some later time through no unauthorized act or omission by any Party. This provision does not apply to: (1) any information held by a federal agency that is not protected from disclosure pursuant to the Freedom of Information Act or other applicable law; or (2) any information held by a state or local agency that is not protected from disclosure pursuant to M.G.L. ch. 66 §§ 10-10B or other applicable state or federal law. The withdrawing Party shall continue to maintain the confidentiality of all settlement communications to the extent permitted by applicable law.

6.5 Termination of Settlement Agreement

This Settlement Agreement shall terminate as to all Parties and have no further force or effect upon expiration of the New Project Licenses and any annual licenses issued after expiration thereof, upon withdrawal from this Settlement Agreement by FirstLight or upon FirstLight's decision not to affirmatively accept the New Project Licenses, or upon FERC issuing an order approving FirstLight's surrender of one or both of the New Project Licenses. Upon termination, all documents and communications related to the development, execution, and submittal of this Settlement Agreement to FERC shall not be used as evidence, admission, or argument in any forum or proceeding for any purpose to the fullest extent allowed by applicable law, including 18 C.F.R. § 385.606. This provision does not apply to any information that was in the public domain prior to the development of this Settlement Agreement or that became part of the public domain at some later time through no unauthorized act or omission by any Party. This provision does not apply to: (1) any information held by a federal agency that is not protected from disclosure pursuant to the Freedom of Information Act or other applicable law; or (2) any information held by a state or local agency that is not protected from disclosure pursuant to M.G.L. ch. 66 §§ 10-10B or other applicable state or federal law. Notwithstanding the termination of this Settlement Agreement, all Parties shall continue to maintain the confidentiality of all settlement communications to the extent permitted by applicable law, and all Parties remain subject to Section 2.3 of this Settlement Agreement.

7 General Provisions

7.1 Non-Severable Terms of Settlement Agreement

The terms of this Settlement Agreement are not severable one from the other. This Settlement Agreement is made on the understanding that each term is in consideration and support of every other term, and each term is a necessary part of the entire Settlement Agreement. If a court of competent jurisdiction rules that any provision in Sections 1 through 8.2 of this Settlement Agreement is invalid, this Settlement Agreement is deemed modified to conform to such ruling, unless a Party objects. If a Party objects, the other Parties agree to meet and confer regarding the continued viability of this Settlement Agreement.

7.2 No Third-Party Beneficiaries

This Settlement Agreement shall not create any right or interest in the public, or any member thereof, as a third-party beneficiary hereof, and shall not authorize any non-Party to maintain a suit at law or equity pursuant to this Settlement Agreement. The duties, obligations, and responsibilities of the Parties with respect to third parties shall remain as imposed under applicable law.

7.3 Successors and Assigns

This Settlement Agreement shall be binding on and inure to the benefit of the Parties and their successors and approved assigns, unless otherwise specified in this Settlement.

7.3.1 Assignment

Any voluntary assignment by a Party shall not be effective unless approved by FirstLight, which approval shall not be unreasonably withheld. A partial assignment is not permitted. After FirstLight's approval of the assignment, the assignee shall sign the Settlement Agreement and become a Party.

7.3.2 Succession

In the event of succession between public agencies, whether by statute, executive order, or operation of law, the successor agency shall become a Party to and be bound by the terms of this Settlement Agreement, to the extent permitted by law.

7.3.3 Continuation of Certain Obligations

7.3.3.1 Upon completion of a succession or assignment, the initial Party shall no longer be a Party. It shall continue to be bound by Sections 2.3, 6.4, 6.5, 7.2, and 7.3. The initial Party shall not take any action adverse to the Settlement Agreement, or the New Project Licenses to the extent they incorporate the Settlement Agreement.

7.3.3.2 No change in ownership of the Project or transfer of the existing or New Project Licenses by FirstLight shall in any way modify or otherwise affect any other Party's rights or obligations under this Settlement Agreement. Unless prohibited by applicable law, FirstLight shall require in any transaction for a change in ownership of the Projects or transfer of the existing or New Project Licenses, that such new owner shall be bound by, and shall assume all of the rights and obligations of FirstLight under this Settlement Agreement upon completion of the change of ownership and approval by FERC of the license transfer.

7.3.4 Notice

FirstLight transferring pursuant to Section 7.3.3.2 or an assigning Party shall provide Notice to the other Parties at least 30 days prior to the proposed effective date of such transfer or assignment.

7.4 Extension of Time; Inability to Perform

7.4.1 Obligations under New Project Licenses

7.4.1.1 Extension of Time

If FirstLight has good cause, consistent with FERC's standard in 18 C.F.R. § 385.2008, to seek an extension of time to fulfill an obligation under the New Project Licenses, it may file with FERC such a request after consulting with the relevant Parties. The Parties acknowledge that FERC's standard for any such request shall apply. If any Party provides Notice that it disputes the good cause for extension, FirstLight and the Disputing Party shall follow the dispute resolution process in Section 5 of this Settlement Agreement. If the dispute cannot be timely resolved by such process, FirstLight may proceed with its request, if it has not done so already, and any Disputing Party may oppose the request.

7.4.1.2 Inability of FirstLight to Perform

If FirstLight is unable to perform an obligation under the New Project Licenses due to an event or circumstances beyond its reasonable control, FirstLight may file with FERC an appropriate request for relief. The Parties acknowledge that FERC's standard for any such request shall apply. If any Party provides Notice that it disputes the non-performance, FirstLight and the Disputing Party shall follow the dispute resolution process in Section 5 of this Settlement Agreement. If the dispute cannot be timely resolved by such process, FirstLight may proceed with its request to FERC, if it has not done so already, and any Disputing Party may oppose its request.

7.4.2 Contractual Obligations

No Party shall be liable to the other, or be deemed to be in breach of this Settlement Agreement, for failure or delay in rendering performance arising out of causes factually beyond its control and without its fault and negligence. Such causes may include but are not limited to: acts of God or the enemy, wars, fires, floods, epidemics, quarantine restrictions, strikes, unforeseen freight embargoes, unusually severe weather, or unforeseen breakdown or failure of the Project works for the period of time necessary to cure. Dates and times of performance shall be extended to the extent of the delays excused by this covenant, provided that the Party whose performance is affected notifies the others as provided in Section 7.4.3.

7.4.3 Notice of Delay or Inability to Perform

The Party whose performance of an obligation under this Settlement Agreement is affected by any delay or inability to perform under Section 7.4 shall provide Notice as soon as reasonably practicable. This Notice shall include: (1) a description of the event causing the delay or anticipated delay; (2) an estimate of the anticipated length of the delay; (3) a description of the measures taken or to be taken to avoid or minimize the delay; and (4) a proposed timetable for the implementation of the measures or performance of the obligation. The affected Party shall make all reasonable efforts to promptly resume performance of the obligation. It shall provide Notice when it resumes performance of the obligation.

7.5 Governing Law

The New Project Licenses and any other terms of this Settlement Agreement over which a federal agency has statutory or regulatory jurisdiction shall be governed, construed, and enforced in accordance with such authorities. This Settlement Agreement shall otherwise be governed and construed under the laws of the Commonwealth of Massachusetts. By executing this Settlement Agreement, no federal agency is consenting to the jurisdiction of a state court unless such jurisdiction otherwise exists. All activities undertaken pursuant to this Settlement Agreement shall be in compliance with all applicable law.

7.6 Elected Officials Not to Benefit

No elected officials shall be entitled to any share or part of this Settlement Agreement or to any benefit that may arise from it.

7.7 No Partnership

Except as otherwise expressly set forth herein, this Settlement Agreement does not and shall not be deemed to make any Party the agent for, partner of, or joint venturer with any other Party.

7.8 Reference to Regulations

Any reference in this Settlement Agreement to any federal or state regulation shall be deemed to be a reference to such regulation, or successor regulation, in existence as of the date of the action at the time in question.

7.9 Notice

Except as otherwise provided in this Section, any Notice required by this Settlement Agreement shall be written. Notice shall be sent to all Parties still in existence and, as applicable, filed with FERC. For the purpose of this Settlement Agreement and unless otherwise specified, a Notice shall be effective upon receipt, but if provided by U.S. Mail, seven (7) business days after the date on which it is mailed. The Parties agree that if practicable, electronic mail or fax are the preferred methods of providing Notice under this Settlement Agreement. When this Settlement Agreement requires Notice in fewer than seven (7) business days, Notice shall be provided by telephone, fax, or electronic mail and shall be effective when provided. For the purpose of Notice, the list of authorized representatives of the Parties as of the Effective Date is attached as Appendix D. FirstLight shall keep the names and contact information for the Parties to this Settlement Agreement. The Parties shall provide Notice of any change in the authorized representatives designated in Appendix D, and FirstLight shall maintain the current distribution list of such representatives. The Parties agree it is their responsibility to keep FirstLight informed of their current address, telephone, fax, and electronic mail information, and that failure to provide FirstLight with current contact information will result in a waiver of that Party's right to Notice under this Settlement Agreement.

7.10 Section Titles for Convenience Only

The titles for the Sections of this Settlement Agreement are used only for convenience of reference and organization and shall not be used to modify, explain, or interpret any of the provisions of this Settlement Agreement or the intentions of the Parties. This Settlement Agreement has been jointly drafted by the Parties and therefore shall be construed according to its plain meaning and not for or against any Party.

7.11 Entire Agreement

This Settlement Agreement and its Appendices A-E shall exclusively constitute the entire agreement among the Parties, superseding all oral, written, or other understandings and agreements.

8 Execution of Settlement Agreement

8.1 Signatory Authority

Each signatory to this Settlement Agreement certifies that he or she is authorized to execute this Settlement Agreement and to legally bind the Party he or she represents, and

that such Party shall be fully bound by the terms hereof upon such signature without any further act, approval, or authorization by such Party.

8.2 Signing in Counterparts

This Settlement Agreement may be executed in any number of counterparts, and each executed counterpart shall have the same force and effect as an original instrument as if all the signatory Parties to all of the counterparts had signed the same instrument. Any signature page of this Settlement Agreement may be detached from any counterpart of this Settlement Agreement without impairing the legal effect of any signatures thereon, and may be attached to another counterpart of this Settlement Agreement identical in form hereto but having attached to it one or more signature pages.

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

FirstLight MA Hydro LLC and Northfield Mountain LLC,



Date: 5/25/2023

By: Justin Trudell, COO

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

National Park Service

K Fellner

Date: 5/15/2023

By: Kelly Fellner

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Massachusetts Department of Conservation and Recreation



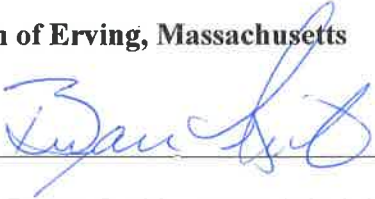
Date: 6.8.23

By:

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Town of Erving, Massachusetts



Date: May 22, 2023

By: Bryan Smith, Town Administrator

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Town of Gill, Massachusetts

Ray Purington

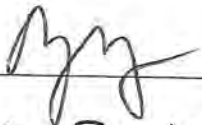
Date: June 5, 2023

By: Ray Purington
Town Administrator

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Town of Montague, Massachusetts



Date: May 15, 2023

By: Richard Kuklewicz
Selectboard Chairman

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Town of Northfield, Massachusetts



Date: May 16th, 2023

By:

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

American Whitewater



Date: 5/10/2023

By: Robert Nasdor
Northeast Stewardship & Legal Director
American Whitewater

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Appalachian Mountain Club

Nicole Zussman

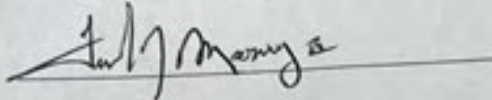
Date: 5/10/2023

By: Nicole Zussman, President & CEO of Appalachian Mountain Club

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Crab Apple Whitewater, Inc.

A handwritten signature in black ink, appearing to read "Julie M...". The signature is written over a horizontal line that extends to the right.

By:

Date: 5-18-23

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

New England FLOW

New England FLOW

Date: 6/7/23

By: Thomas J. Christopher
Secretary/Director

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Zoar Outdoor

Janet Cowie

By:

Date: 5/9/2023

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Access Fund

 _____

Date: 05/08/2023

By: *Zachary Lesch-Huie*



IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Franklin Regional Council of Governments



Date: 5/18/23

By:

IN WITNESS THEREOF,

the Parties, through their duly authorized representatives, have caused this Recreation Settlement Agreement to be executed as of the date set forth in this Recreation Settlement Agreement.

Western Massachusetts Climbers Coalition



Date: 05.05.2023

By: Pamela Matsuda-Dunn

**Appendix A - Proposed License Article on Recreation to be Included in the New
Turners Falls Hydroelectric Project License**

Draft License Article

Article A100. Recreation Management Plan

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

**Appendix B - Proposed License Article on Recreation to be Included in the New
Northfield Mountain Pumped Storage Project License**

Draft License Article

Article B100. Recreation Management Plan

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

Appendix C - Measures Agreed to Among the Parties But Not to be Included in New Project Licenses

RECREATION

Section C101. Pocket Park

Within 3 years of license issuance, the Licensee shall install a pocket park at a location to be determined in the town of Northfield, or an equivalent investment for a single river access point in consultation with the signatories of the Recreation Settlement Agreement. This may include signage for historical and cultural interpretation. The pocket park will be in Northfield; the access point may or may not be in the town of Northfield.

Section C102. Farley Ledges Conservation Restriction

Farley Ledges is a rock climbing area on the eastern side of Northfield Mountain, a portion of which is owned by the Licensee and currently within the Northfield Mountain Project FERC-licensed project boundary. Licensee shall use diligent and commercially reasonable efforts to grant and record a conservation restriction pursuant to M.G.L. c. 184, § 31 (the “Farley CR”) for the purpose of permanently conserving, for recreational purposes, that portion of Farley Ledges owned by Licensee and which Licensee intends to remove from the project boundary as shown in Figure 1 (the “CR Property”). The Licensee will seek FERC approval to revise the project boundary to exclude the portion of Farley Ledges shown in Figure 1 for the purpose of facilitating potential conveyance of property rights under the CR to a third party. The Parties recognize that any conveyance of property rights to a third party may require FERC approval if FERC declines to revise the project boundary to exclude Farley Ledges. The Farley CR shall specifically permit the CR Property to be used for climbing among other defined recreation uses. If, prior to granting the Farley CR, Licensee conveys its interest in any portion of the CR Property to a third party, such conveyance shall be made subject to restrictions, expressly enforceable in gross by any Party to this Agreement, requiring the grantee to (x) make the conveyed property available for public climbing among other defined recreation uses (on substantially the same terms and scope as would be in effect if the Farley CR had been established) and (y) use diligent efforts to encumber the conveyed property with a conservation restriction substantially similar to the Farley CR.

The Licensee shall consult the town of Erving and the Massachusetts Department of Conservation and Recreation regarding the details of the Farley CR, which consultation will be completed within two years after license issuance. Parties intend that the Farley CR will be recorded against the Property no later than six years after FERC license issuance, and Licensee agrees to employ diligent and commercially reasonable efforts to meet that deadline.

If despite these efforts the Farley CR is not in place within six years after FERC license issuance and Licensee has not first conveyed the Property to a third party subject to the conditions specified above, then Licensee shall record an easement or reasonably equivalent instrument that permits the public to access the Property for climbing and other defined recreational uses to an extent and in a manner substantially equivalent to the rights that would have been conferred to the public in the Farley CR.

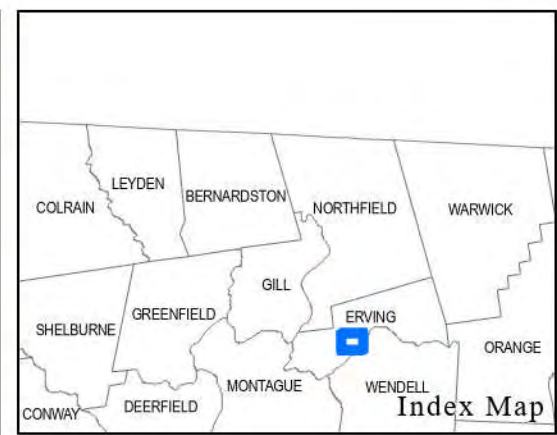
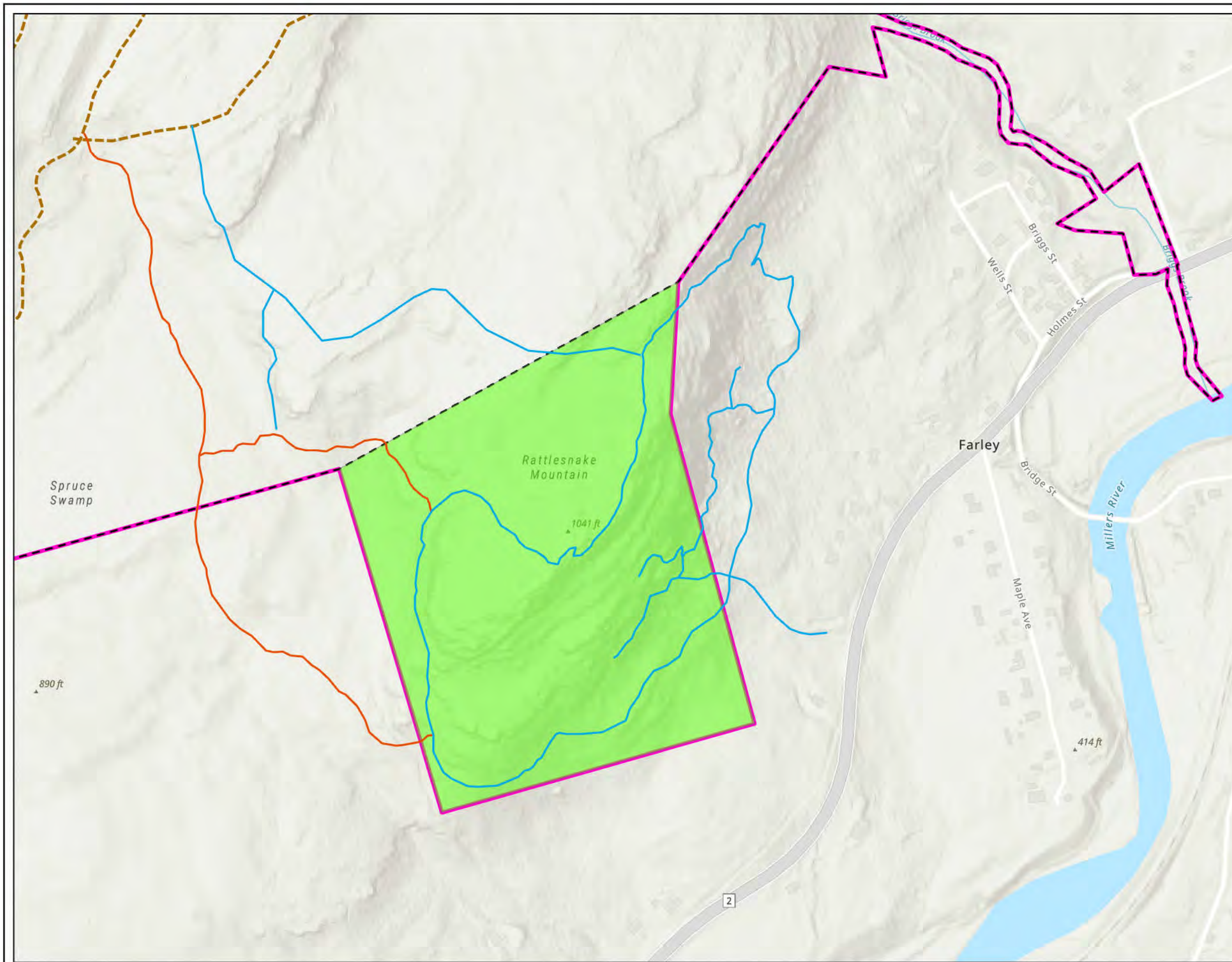
Section C103. Recreation Advisory Group and Recreation Management Plan

The Licensee shall form and chair a Recreation Advisory Group (“RAG”) and shall convene meetings of the RAG (“RAG Meeting”) no less than annually, with the first RAG Meeting to occur within one year of license issuance. Members of the RAG (“RAG Members”) will include signatories to the Recreation

Settlement Agreement, provided that any such signatory may elect not to be a RAG Member by submitting written notice to the Licensee. The purpose of the RAG Meetings shall be to discuss recreation use and operation and maintenance needs at all Project Recreation Facilities included in the Recreation Management Plan.

Section C104. Advertising

Starting one year after license issuance, the Licensee shall coordinate promoting its Turners Falls and Northfield Mountain Project facilities with local communities and organizations and improve its digital presence. The Licensee shall work with the RAG to identify the targeted audiences for this outreach, including Environmental Justice communities, Indigenous communities, those with disabilities, visitors to the region, residents, and local communities and organizations, and a schedule for pushing out facility promotional materials.



FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Figure 1.
 Proposed Northfield Mountain
 Project Boundary Adjustments
 around Farley Ledges

Legend

- Project Trails
- Non-Project Trails
- WMCC Trail
- Potential Rescue Route
- Current FERC Project Boundaries
- Proposed FERC Project Boundary
- Farley Conservation Restriction

N

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 World Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

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Appendix E - Recreation Management Plan

Recreation Settlement Agreement

Recreation Management Plan

Turners Falls Hydroelectric Project (FERC Project Number 1889)
Northfield Mountain Pumped Storage Project (FERC Project Number 2485)



MAY 2023

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LIST OF ABBREVIATIONS

ADA	Americans with Disabilities Act
AIP	Agreement in Principle
AMC	Appalachian Mountain Club
AW	American Whitewater
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
Conte Lab	U.S. Geological Survey's Conte Anadromous Fish Laboratory
FERC	Federal Energy Regulatory Commission
FirstLight	FirstLight MA Hydro LLC and Northfield Mountain LLC
FRCOG	Franklin Regional Council of Governments
GRH	Great River Hydro
HPMP	Historic Properties Management Plan
MA	Massachusetts
MDCR	Massachusetts Department of Conservation and Recreation
MDFW	Massachusetts Division of Fisheries and Wildlife
Northfield Mountain Project	Northfield Mountain Pumped Storage Project
NH	New Hampshire
NHESP	Natural Heritage and Endangered Species Program
NMFS	National Marine Fisheries Service
NMTTC	Northfield Mountain Tour and Trail Center
NPS	National Park Service
NRF	Naturally Routed Flow
OSRP	Open Space and Recreation Plans
PM&E	Protection, Mitigation and Enhancement
RMP	Recreation Management Plan
TFI	Turners Falls Impoundment
Turners Falls Project	Turners Falls Hydroelectric Project
USGS	United States Geological Survey
VT	Vermont
WMCC	Western Massachusetts Climbers Coalition

1 INTRODUCTION AND BACKGROUND

A single Recreation Management Plan (RMP) has been developed for the Turners Falls Hydroelectric Project (Turners Falls Project, FERC No. 1889) and the Northfield Mountain Pumped Storage Project (Northfield Mountain Project, FERC No. 2485). FirstLight MA Hydro LLC and Northfield Mountain LLC (referred to collectively in this document as FirstLight) own the Turners Falls Project and Northfield Mountain Project. In this RMP, FirstLight has separated what recreation facilities are part of the Turners Falls Project and Northfield Mountain Project.

1.1 Turners Falls Project

The Turners Falls Project is located on the Connecticut River in the states of Massachusetts (MA), New Hampshire (NH), and Vermont (VT). It includes the Turners Falls Dam, which creates the approximate 20-mile-long Turners Falls Impoundment (TFI). Below the dam are two FirstLight hydroelectric projects including Station No. 1 and Cabot Station. The Project Boundary includes the TFI and the reach below the dam. The lands and waters within the Turners Falls Project Boundary provide a variety of recreational activities, such as walking, hiking, angling, boating, camping, biking, and picnicking.

1.2 Northfield Mountain Project

The Northfield Mountain Project is located adjacent to the Connecticut River and uses the TFI as its lower reservoir. It includes an Upper Reservoir, intake, underground powerhouse, tailrace tunnel and tailrace into the TFI. The Project Boundary includes the TFI and the area around Northfield Mountain. The land and water in the Project Boundary provide a variety of recreational activities, such as walking, hiking, cross-country skiing, snowshoeing, angling, boating, camping, biking, rock climbing, and picnicking.

1.3 Agreement in Principle and Recreation Settlement Agreement

Between September 2021 and February 2022, FirstLight and recreation stakeholders met to discuss recreation needs in the Turners Falls and Northfield Mountain Project area. On February 2, 2022, FirstLight and recreation stakeholders reached an Agreement-in-Principle (AIP) on recreation related issues on both Projects. The AIP addresses various recreation issues including, but not limited to, new recreation facilities having Americans with Disabilities Act (ADA) accessibility, upgrades to existing recreation facilities, establishing a website to post real-time flow and forecasted flow information, and establishing conservation easements/restrictions. Also, as part of this AIP, FirstLight and the recreation stakeholders agreed to file a revised RMP for the Turners Falls and Northfield Mountain Projects reflecting the agreements in the AIP as part of a Recreation Settlement Agreement. The revised RMP was updated based on stakeholder input when the Recreation Settlement Agreement was finalized. This revised single RMP replaces the separate RMPs filed with the Federal Energy Regulatory Commission (FERC) as part of the Amended Final License Application in December 2020.

The purpose of this revised RMP is to guide FirstLight's management and maintenance of recreation facilities at the Turners Falls and Northfield Mountain Projects over the new license term consistent with the AIP and FERC's requirements to provide adequate public access to Project lands and waters.

2 PROJECT DESCRIPTIONS

2.1 Turners Falls Project

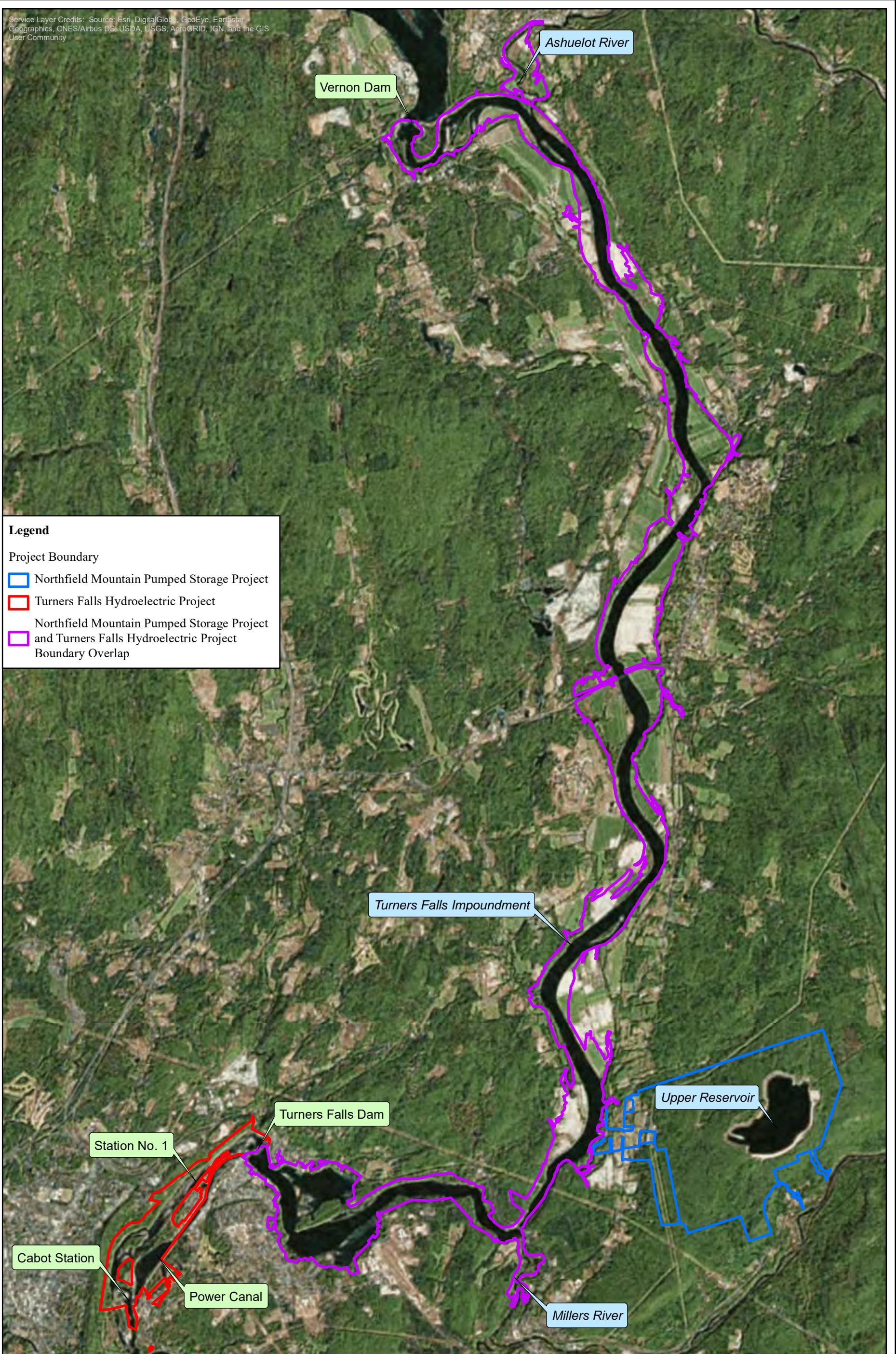
The Turners Falls Project is located on the Connecticut River in the states of MA, NH, and VT. The TFI serves as the lower reservoir for the Northfield Mountain Project. The Project Boundary is shown on [Figure 2.1-1](#) and overlaps with the Northfield Mountain Project Boundary along nearly the entire perimeter of the TFI. The TFI is a shared Project feature with the Northfield Mountain Project. The greater portion of the Turners Falls Project, including developed facilities and most of the lands within the Turners Falls Project Boundary, is located in Franklin County, MA; specifically, in the towns of Erving, Gill, Greenfield, Montague and Northfield. The northern reaches of the shared Project Boundary (TFI) extend into the towns of Hinsdale, in Cheshire County, NH, and Vernon, in Windham County, VT. The TFI extends upstream to the base of Great River Hydro's (GRH) Vernon Hydroelectric Project and Dam (FERC No. 1904). The discharges from GRH's Vernon Project comprise approximately 87% of the drainage area at the Turners Falls Project.

Key Turners Falls Project features are shown in [Figure 2.1-2](#) and consist of the following: a) two individual concrete gravity dams separated by an island; b) a gatehouse controlling flow to the power canal; c) a power canal and a short branch canal leading to Station No. 1; d) two hydroelectric powerhouses, located on the power canal, known as Station No. 1 and Cabot Station; e) a bypassed section of the Connecticut River and f) three fish ladders including the Cabot fish ladder, Spillway fish ladder and Gatehouse fish ladder. Note that as part of the next license, the Cabot fish ladder will be retired and the existing Spillway fish ladder will be replaced with a Spillway Lift.

2.2 Northfield Mountain Project

The Northfield Mountain Project is a pumped-storage facility located on the Connecticut River in MA that uses the TFI as its lower reservoir. The Northfield Mountain Project Boundary is also shown on [Figure 2.1-1](#), which overlaps with the Turners Falls Project Boundary along nearly the entire perimeter of the TFI, but it does not include the Turners Falls Dam. The greater portion of the Northfield Mountain Project, including developed facilities and most of the lands within the Northfield Mountain Project Boundary, are located in Franklin County, MA; specifically, in the towns of Erving, Gill, Montague and Northfield.

Key Northfield Mountain Project features are shown in [Figure 2.2-1](#) and consist of the following: a) Upper Reservoir dam/dikes, b) an intake channel, pressure shaft, c) an underground powerhouse and d) a tailrace tunnel. The tailrace is located approximately 5.2 miles upstream of Turners Falls Dam, on the east side of the TFI. Note that as part of the next license, a barrier net will be installed around the tailrace/intake.



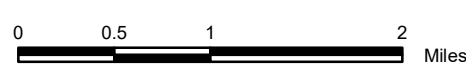
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Project Boundary

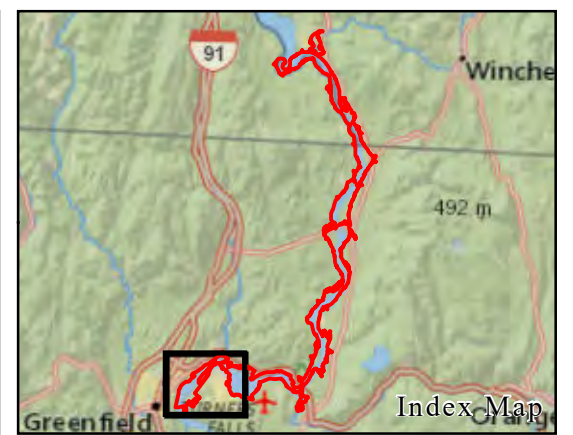
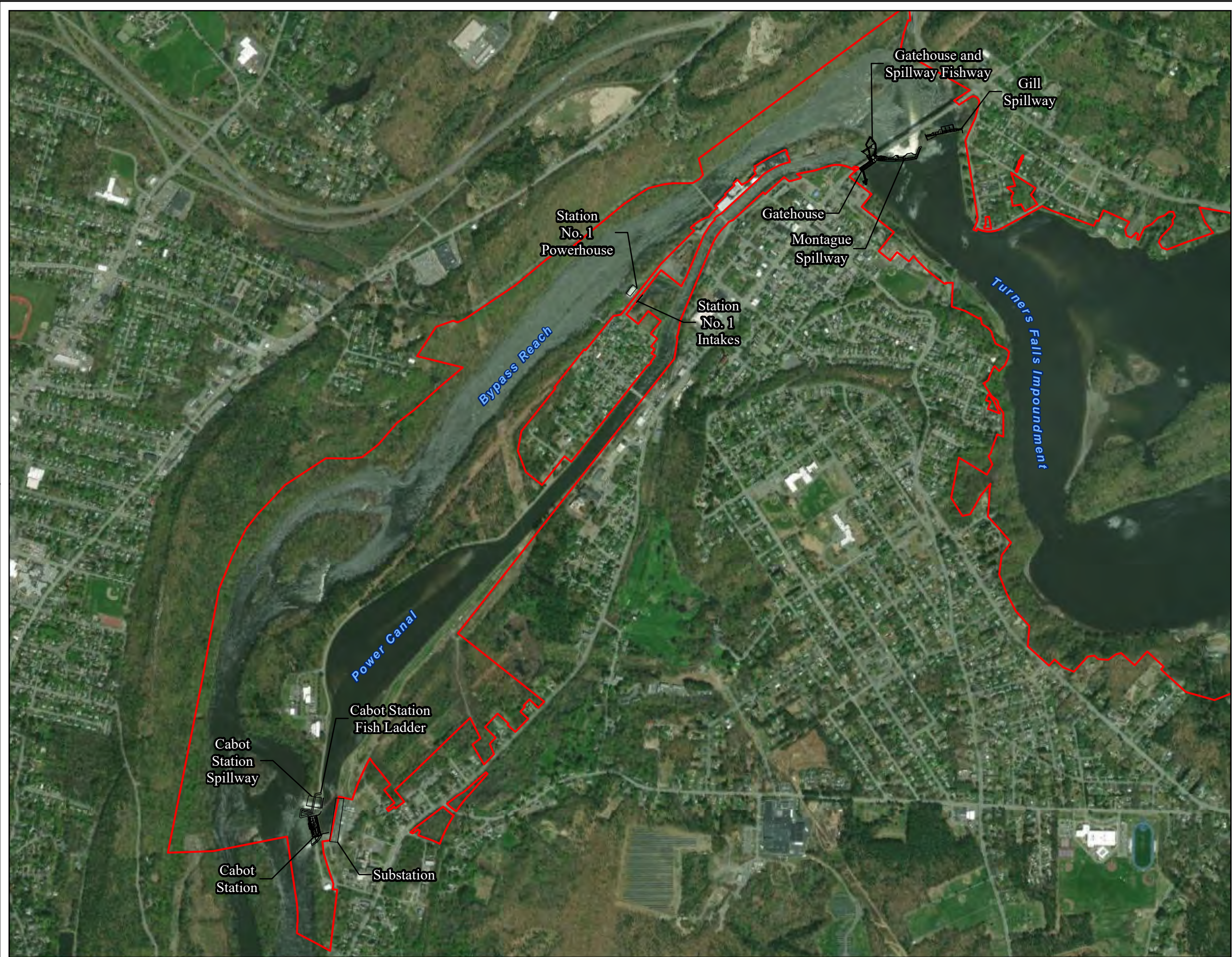
- Northfield Mountain Pumped Storage Project
- Turners Falls Hydroelectric Project
- Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project Boundary Overlap



Turners Falls Hydroelectric Project (No. 1889)
Northfield Mountain Pumped Storage Project (No. 2485)
Recreation Management Plan



**Figure 2.1-1:
Turners Falls Hydroelectric Project and
Northfield Mountain Pumped Storage
Project- Project Boundary Map**



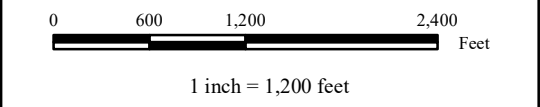
Turners Falls Hydroelectric Project (No. 1889)
 Northfield Mountain Pumped Storage Project (No. 2485)
 Recreation Management Plan

Figure 2.1-2:
 Turners Falls Hydroelectric Project Features

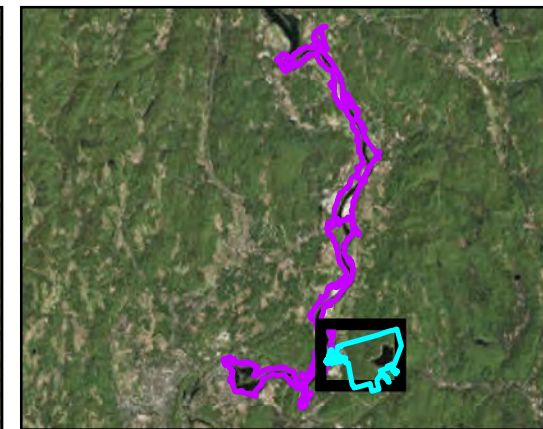
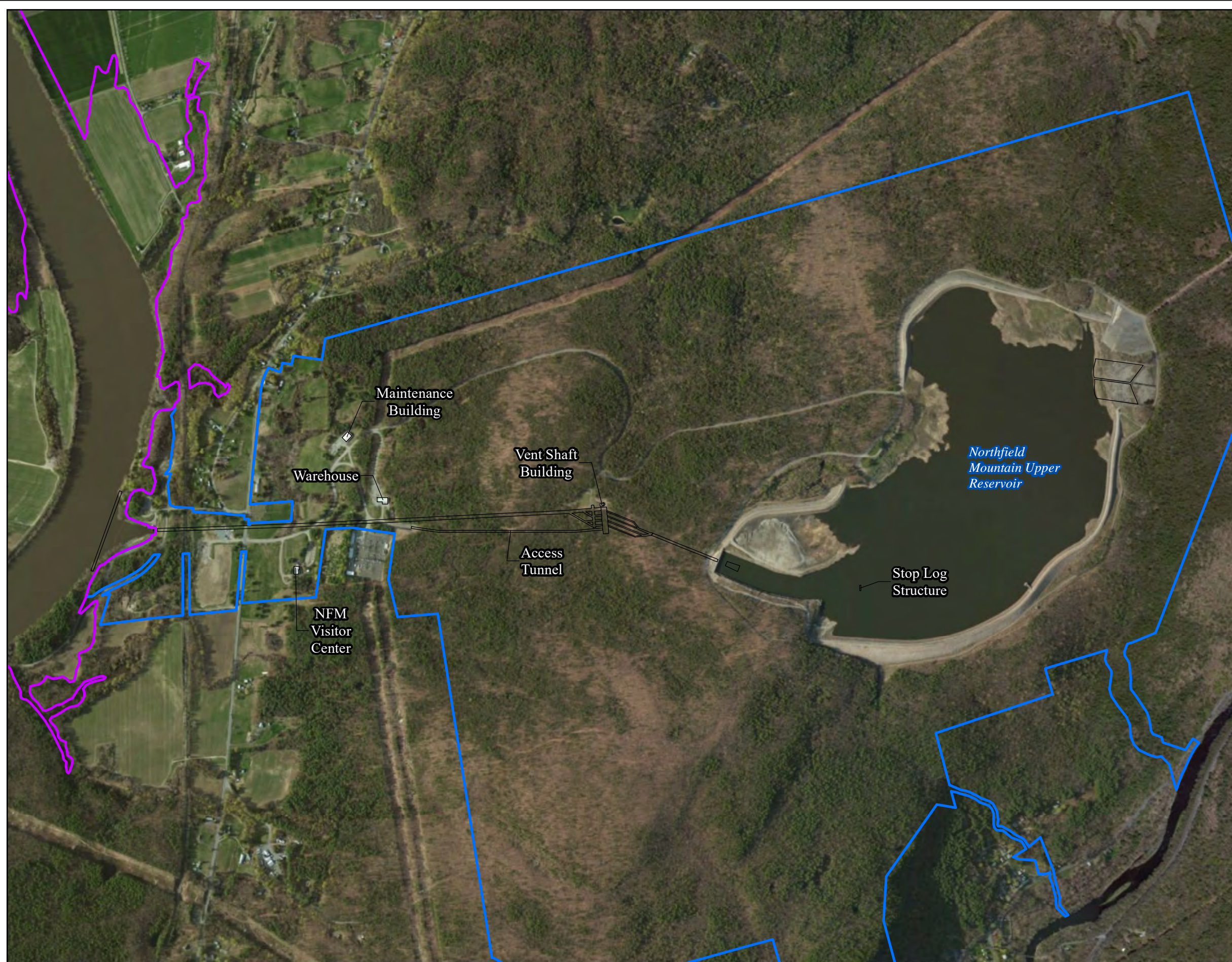
Legend

Project Boundary

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, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.



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Turners Falls Hydroelectric Project (No. 1889)
 Northfield Mountain Pumped Storage Project (No. 2485)
 Recreation Management Plan

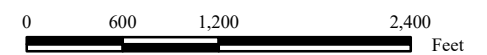
Figure 2.2-1:
 Northfield Mountain Pumped Storage
 Project Features

Legend

- Project Boundary Polygon
- Northfield Mountain (NFM) Project Boundary
 - Combined TF/NFM Project Boundary



Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics,
 IGN, and the GIS User Community



1 inch = 1,200 feet



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3 CONTEXT AND IMPORTANCE OF PROJECT RECREATION FACILITIES IN THE REGION

Outdoor recreation is vital to the economy of rural Franklin County and plays a major role in shaping the identity of this area. The recreation facilities provided by FirstLight under the FERC Licenses for the Northfield Mountain Project and the Turners Falls Project are a critical part of the regional network of recreational assets. Outdoor recreation opportunities are a major attraction for residents and businesses to locate in Franklin County. Supporting projects that enhance outdoor adventure, recreation and cultural tourism was among the top strategic goals for the 2021 regional economic development plan for Franklin County.¹

The FERC relicensing process provides an opportunity for diverse stakeholders to discuss recreation needs with FirstLight. It is also an opportunity to collaborate to conserve, protect and enhance the outstanding recreational, cultural, and natural resources found in the Project Area. Franklin County is the most rural and one of the poorest counties in the state of Massachusetts.² Recreation opportunities enhance the lives of those who reside or work here and attract visitors to the region. In an area struggling economically, recreation opportunities should remain affordable and accessible to residents.

FirstLight owns and/or operates multiple recreation sites along the Connecticut River in the Project Area, making it the largest manager of recreation sites in central Franklin County. The vibrancy and sustainability of recreation opportunities along the Connecticut River is inextricably tied to the health of the river ecosystem. With this as context, FirstLight is committed to protecting ecosystem health. A healthy, easy-to-access river, with abundant recreation opportunities, will greatly enhance life for all those who call Franklin County home and will attract new people to visit here. FirstLight seeks to ensure equitable access to recreational facilities for residents, disabled and underserved populations, and Environmental Justice and Indigenous communities. FirstLight is committed to working with host communities and regional stakeholders to maintain and improve our recreational facilities and to protect cultural and natural resources located in the Project Area.

3.1 State, Local, and Project-Specific Studies and Plans

The existing recreation amenities at the Turners Falls and Northfield Mountain Projects were originally developed as part of a Recreation Management Plan written in 1968. To inform recommendations and planning for the new license, FirstLight conducted seven recreation-related studies as part of the relicensing effort as follows:

- Study No. 3.6.1 Recreation Use/User Contact Survey
- Study No. 3.6.2 Recreation Facilities Inventory and Assessment Report and Addendum
- Study No. 3.6.3 Whitewater Boating Evaluation
- Study No. 3.6.4 Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boating
- Study No. 3.6.5 Land Use Inventory
- Study No. 3.6.6 Assessment of Effects of Project Operation on Recreation and Land Use
- Study No. 3.6.7 Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

¹ [2021 Annual Report Draft 06.10.21 FINAL \(frcog.org\)](#) - Comprehensive Economic Development Strategy

² Residents of Franklin County earn less money than others in the state. According to estimates from the 2016-2020 American Community Survey, Franklin County has a much lower median household income of \$61,198 compared to \$84,385 statewide.

RECREATION MANAGEMENT PLAN

These studies have been summarized in FirstLight’s Amended Final License Application (2020), and results were used and referenced to develop ideas for the new recreation facilities included in this RMP.

Statewide Recreation Priorities

As part of Study No. 3.6.1, FirstLight researched the Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Massachusetts, Vermont, and New Hampshire. FirstLight found that the recreation opportunities, sites, facilities, and amenities proposed to be provided for the Turners Falls and Northfield Mountain Projects are consistent with the findings of, and goals/objectives established by, the three state SCORPs. All three state SCORPs identified outdoor recreation as being of great importance to state residents.

Among the more popular activities identified by the three SCORPs were hiking and walking, and the MA SCORP in particular noted that trails were of particular importance for meeting future recreation demand. This is generally consistent with the findings of FirstLight’s use and user survey which found that hiking/walking/jogging is the most popular recreation activity at the Project. Other popular outdoor recreation activities identified by the three state SCORPs include water-based sports including boating, paddling, and fishing. Again, the use and user surveys conducted at the Projects’ recreation sites also found these activities to be popular and well supported by existing recreation sites, facilities, and amenities.

Local and Regional Open Space and Recreation Plans

FirstLight reviewed local plans, ordinances, statutes, policies, and guidelines that may affect the use and/or management of lands inside the Projects’ boundaries. Table 4.6.5-1 in Study No. 3.6.1 lists the Open Space and Recreation Plans (OSRPs) for the communities in the Project area. Generally, the local plans reviewed recommend the protection of natural resources, farmland, and open space, and promote additional recreation opportunities along the Connecticut River in the vicinity of the Projects. In addition, some of the plans provide specific acknowledgement or notations regarding public recreation use of the Projects. Some of the plans also provide general recommendations for public recreation in the Project vicinity, while others provide more specific recommendations regarding public recreation site/facility needs and improvements at the Projects. Acknowledgements and recommendations regarding Project-related public recreation needs and improvements that are included in the open space plans are summarized in Table 4.6.5-2 of Study No. 3.6.1. Many town OSRPs recommend additional access along the Connecticut River.

These plans informed the discussion between FirstLight and recreation stakeholders when negotiating the Agreement in Principle that led to this RMP.

3.2 Northfield Mountain Tour and Trail Center

The Northfield Mountain Tour and Trail Center (NMTTC) is the central hub of all of the Projects’ recreation facilities, and so is highlighted here in this plan and described in this section. The Visitor Center building has restrooms, seasonal rental equipment, and parking. The parking area is designed to accommodate 50 vehicles and has an additional three (3) American with Disabilities Act (ADA) spaces. The Center is accessible by ramp and has ADA accessible sanitation facilities. Amenities at the Center include three (3) men’s and three (3) women’s bathroom units, one of each being ADA accessible, a rental Yurt, numerous picnic tables, some grills, a fire ring, benches, trash cans and interpretive displays.

The Northfield Mountain trail system includes over 26 miles of trail, which are available for hiking, biking, horseback riding, snowshoeing, and cross-country skiing. The trail system also provides access to additional recreational opportunities, such as rock climbing at Rose Ledge. The trail system begins at the Visitor Center near the parking lot. Most of the trails are located within the Northfield Mountain Project boundary, and the trails can be used to access the mountaintop observation area offering panoramic views of the Northfield Mountain Project’s Upper Reservoir. Surrounding the NMTTC are a variety of important

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recreational facilities including a fishway viewing area, river access put-ins for canoes and kayaks, camp sites, picnic areas and hiking trails. These facilities are located in the host communities of Northfield, Montague, Gill, and Erving and support recreational tourism in the towns and region, which benefits businesses that serve visitors as well as residents.

NMTTC staff provide monthly environmental education activities to the public and also educate school groups and field trips. NMTTC staff coordinate with the FirstLight staff at the Barton Cove paddle boat rental and campground, run the staffing and ticket sales of the Heritage Boat Tours, and schedule reservations of the Riverview Pavilion and the Munn's Ferry camp site. Events are often held at the NMTTC, such as state or regional cross-country running races.

This RMP outlines the current and new recreation amenities that will be offered in the renewed license, some of which will be located or related to the NMTTC. The goal of the NMTCC is to be a recreation destination and regional asset offering varied and affordable recreation and education opportunities for visitors and residents of the region.

4 OVERARCHING COMPONENTS OF THE RECREATION MANAGEMENT PLAN

[Section 5](#) describes the existing recreation facilities at the Turners Falls and Northfield Mountain Projects and [Section 6](#) describes the proposed new recreation facilities or upgrades to existing recreation facilities. Overarching components are discussed below.

4.1 Turners Falls Project and Northfield Mountain Project

4.1.1 Updates to Recreation Management Plan

Recreation use and activities may change over the license term. Given this, the RMP will be reviewed following each 10 years of the license, to evaluate recreation use and demand. FirstLight will review information it collects at its recreation facilities as well as feedback from the towns of Gill, Montague, Northfield and Erving, Massachusetts Department of Conservation and Recreation (MDCR), Franklin Regional Council of Governments (FRCOG), Appalachian Mountain Club (AMC), American Whitewater (AW), Access Fund, Crab Apple Whitewater, Inc, New England Flow, Western Massachusetts Climbers' Coalition (WMCC) and Zoar Outdoor relative to evaluating recreation use³, demand, maintenance, user fees, and condition of the recreation facilities. Any update to the RMP will be based on the consensus of the consulted entities and FirstLight. FirstLight will file any updated RMP with FERC for FERC's approval. If an updated RMP is not filed, FirstLight will file a letter with FERC explaining why no changes are needed, including any written comments from the consulted entities.

4.1.2 Compliance with Americans with Disabilities Act

For any new construction or rehabilitation of existing FirstLight recreation buildings and facilities over the license term, FirstLight will comply with 521 CMR⁴ and with Title III⁵ of the ADA to the extent applicable. In addition, FirstLight will conduct a programmatic assessment of the existing public recreation buildings and facilities for consistency with the requirements of the ADA and will implement ADA improvements within a reasonable period, to the extent applicable. The programmatic assessment, with expected timelines for updates, will be completed within two (2) years of license issuance and will be distributed to the towns of Gill, Montague, Northfield, Erving, MDCR, FRCOG, AMC, AW, Access Fund, Crab Apple Whitewater, Inc, New England Flow, New England Mountain Bike Association, WMCC, and Zoar Outdoor for a 30-day comment period before being filed with FERC.

4.1.3 Donation of Used Sporting Equipment

FirstLight will donate used sporting equipment to local youth organizations.

³ In the case of the Poplar Street take-out, after the first year of operation, FirstLight, the town of Montague, AW, AMC, Crab Apple Whitewater, New England FLOW, Zoar Outdoors, and MDCR will consult relative to vandalism (including to the porta-potty), overnight parking, and inappropriate uses at the location, given its proximity to the residential neighborhood.

⁴ CMR- Code of Massachusetts Regulations Title 521.

⁵ Title III prohibits discrimination on the basis of disability in the activities of place of public accommodations (businesses that are generally open to the public and fall into one of 12 categories listed in the ADA including recreation facilities) and requires newly constructed or altered places of public accommodation to comply with ADA standards.

4.1.4 Recreation Implementation Schedule

FirstLight will complete construction of the proposed and upgraded recreation facilities and meet the other commitments in this RMP according to the schedule shown in [Table 7.0-1](#).

4.2 Turners Falls Project

4.2.1 Establish Conservation Easements/Restrictions

FirstLight will place lands it owns that are not used for specific Project activities (e.g., power production, Project recreation facilities, conflicting existing uses, etc.) located on river right⁶ immediately downstream of the Turners Falls Dam into conservation easement/restriction subject to existing third party property rights. [Appendix A](#) shows FirstLight parcels to be placed in conservation easement/restrictions. FirstLight will consult with the towns of Gill and Greenfield and the MDCR relative to the details of the conservation easement/restriction within two (2) years of license issuance along with a timeline for implementation, with implementation to be completed within six (6) years of license issuance, contingent on any necessary FERC approvals.

4.2.2 Establish Flow and Water Level Notification Website

Real-Time Data

FirstLight will provide real-time (every hour) TFI water level information where it is measured at the Turners Falls Dam. Also, FirstLight will provide real-time (hourly) Turners Falls Dam spill rates and Station No. 1 discharges (in cubic feet per second or cfs). All of the real-time data will be provided year-round, 24 hours a day, on a website accessible to the public within one (1) year of license issuance.

Forecasted Data

FirstLight will also include on its website the Naturally Routed Flow⁷ (NRF), the anticipated Turners Falls Dam spill rate, and the anticipated Station No. 1 discharge for a 12-hour window into the future at any given time. Should FirstLight deviate from passing the 12-hour previous NRF, it will post the revised flows (in the 12-hour look ahead window) to the website as soon as practicable after those flows are known.

4.2.3 Disposition of Cabot Camp Historic Structures

FirstLight, in consultation with the town of Montague (Selectboard and Historical Commission), will attempt to find a qualified organization within the first three (3) years of license issuance to take responsibility for preserving the Cabot Camp historic buildings. During this three (3) year period FirstLight will: a) conduct a topographic and property survey, and a condition assessment of the Cabot Camp parcel, and b) plan and conduct a market/re-development study of Cabot Camp in collaboration with the town of Montague. If no acceptable means to otherwise preserve the historic structures of Cabot Camp is identified, including through a potential transfer of stewardship to a credible and well-established preservation-focused

⁶ River-right assumes one is looking in a downstream direction.

⁷ From December 1 through June 30, the NRF is defined as the hourly sum of the discharges from 12 hours previous as reported by the: Vernon Hydroelectric Project (FERC No. 1904), Ashuelot River United States Geological Survey gauge (USGS, Gauge No. 01161000), and Millers River USGS gauge (Gauge No. 01166500).

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

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organization, the property will be repurposed for other recreation or alternative uses consistent with the Historic Properties Management Plan (HPMP) and the RMP within eight (8) years of license issuance. During this period of time, FirstLight will continue to maintain the property and address any emergent safety issues associated with the condition of these structures, in consultation with the town of Montague and, as appropriate, its Historical Commission.

4.3 Northfield Mountain Project

4.3.1 Establish Conservation Restrictions and Trail Easement

FirstLight will place lands it owns that are not used for specific Project activities (e.g., power production, Project recreation facilities, etc.) along the TFI shoreline into conservation easement/restriction to maintain riparian buffers. [Appendix A](#) shows FirstLight parcels to be placed in conservation easement/restrictions. FirstLight will consult with the towns of Gill, Northfield, Montague, and Erving and MDCR relative to the details of the conservation easements/restrictions within two (2) years of license issuance along with a timeline for implementation, with implementation to be completed within six (6) years of license issuance, contingent on any necessary FERC approvals.

FirstLight will permanently conserve its lands within Bennett Meadow within six (6) years of license issuance. Within (2) years of license issuance FirstLight will consult with the Massachusetts Division of Fisheries and Wildlife (MDFW) on provisions necessary to include in the conservation easement/restriction that would allow continued operation of the property as a Wildlife Management Area., including provisions for hunting, fishing, and wildlife management.

FirstLight will also, in consultation with the National Park Service (NPS), town of Erving, MDCR and AMC conserve via a permanent trail easement the approximately 1.3-mile-long portion of the New England National Scenic Trail in the Project boundary on the eastern side of the Northfield Mountain Upper Reservoir in Erving, MA. FirstLight will consult with these same groups relative to the details of the permanent trail easement and allocation of responsibility within two (2) years of license issuance along with a timeline for implementation, with conveyance of the trail easement to be completed within six (6) years of license issuance, contingent on any necessary FERC approvals.

Collectively, the conservation easements/restrictions that are part of the Turners Falls (see Section 4.2.1) and Northfield Mountain Projects equates to 761.4 acres, which breaks down on a town basis as follows:

Town	Acres FirstLight is Placing into Conservation Easement/Restriction
Northfield, MA	238.4
Erving, MA	65.8
Gill, MA	93.7
Montague, MA	251.4
Greenfield, MA	112.1
Total	761.4

5 EXISTING PROJECT RECREATION SITES

From upstream to downstream, FirstLight operates and maintains the following existing Turners Falls Project and Northfield Mountain Recreation Sites, as shown in [Figure 5.0-1](#) and [Figure 5.0-2](#) (blown up below Turners Falls Dam). Consistent with past practice, FirstLight will continue to operate and maintain the Recreation Sites as part of the RMP. [Table 5.0-1](#) and [Table 5.0-2](#) list the facilities and amenities associated with the Turners Falls Project Recreation Sites. [Table 5.0-3](#) and [Table 5.0-4](#) list the facilities and amenities associated with the Northfield Mountain Project Recreation Sites. (FirstLight, [2014](#) & [2015](#)).

5.1 Turners Falls Project

5.1.1 Gatehouse Fishway Viewing Area

Location: The Gatehouse Fishway Viewing Area is located on the north side of 1st Street across from the town operated Unity Park in the town of Montague.

Description of Facilities: The Gatehouse Fishway Viewing Area provides the public an opportunity to view the fish using the fishway. There are two floors to the facility. On the upper level there are ADA accessible restrooms. The upper level also has a viewing platform that is ADA accessible and contains interpretive displays and a closed-circuit television feed from the fishway counting room. The bottom level contains the fishway viewing area, additional interpretive displays, and also contains the counting room, which is not open to the public. The facility is staffed with seasonal employees during viewing times. The site also contains a picnic area on the north side of 1st Street. The picnic area contains picnic tables, grills, a bike rack, and parking, including an electric vehicle charging station. The Canalside Rail Trail starts at the upstream parking lot adjacent to the old Turners Falls-Gill Bridge abutment and continues along the Turners Falls Power Canal.

Site Operation: The fishway viewing facility is open to the public free of charge during fish migration season, typically mid-May to mid-June. Timing may vary depending on weather and river conditions. Hours of operation are Wednesday through Sunday from 9:00 am to 5:00 pm. The viewing area is contained within a fence which is locked during the off-season. The picnic area is located outside of the fence, allowing it to be open year-round from dawn until dusk, unless there is a scheduled event.

5.1.2 Turners Falls Branch Canal Area

Location: Turners Falls Branch Canal Area is located off Power Street in Montague, along the Station No. 1 forebay.

Description of Facilities: The Turners Falls Branch Canal Area is a day use overlook that provides benches.

Site Operation: The site is available to the public free of charge year-round. There are no posted hours of operation.

5.1.3 Cabot Woods Fishing Access

Location: Cabot Woods Fishing Access is located on Migratory Way in Montague between the power canal and the bypass reach.

Description of Facilities: Cabot Woods Fishing Access is open for day use activities. Recreation facilities provided at the site include picnic tables and two parking areas (upper and lower). The access road along the canal is open to the public. Over time, several informal trails to the shore have been established by anglers.

Site Operation: The fishing access is open year-round free of charge. Anglers access the river either by walking in at the corner of 12th and I Streets, or along paths from Migratory Way. The site abuts a fence

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belonging to the U.S. Geological Survey's Conte Anadromous Fish Laboratory (Conte Lab). At the head of the road (Migratory Way), there is a gate leading to Cabot Woods and the Conte Lab. If the gate is closed, the upper parking lot can be used. Migratory Way is plowed in the winter by the Conte Lab allowing use of the access road, although the parking areas are not plowed. Swimming is prohibited at this site and signs are posted indicating that it is not safe to swim.

Please see [Section 6.1.8](#) for updates to the Cabot Woods Fishing Access under the new license term.

5.1.4 Turners Falls Canoe Portage

Location: The Turners Falls canoe portage operation provides boaters with transportation around the Turners Falls Dam and canal/river section downstream of the dam. Boaters not wishing to navigate the section directly downstream of the dam can get out at Barton Cove and call FirstLight for vehicular portage. They are then picked up and driven downstream of the Turners Falls Dam to the Poplar Street Access site in Montague, where they can continue their trip. Signs explaining the canoe portage operation procedures and providing the portage request call-in number are located at the following Project and Northfield Mountain Project Recreation Sites: Munn's Ferry Boat Camping Recreation Area, Boat Tour and Riverview Picnic Area, Barton Cove Nature Area and Campground, Barton Cove Canoe and Kayak Rental Area, and at the Poplar Street Access Site. Instructions are to paddle to the Barton Cove Canoe and Kayak Rental Area, unload gear, and then call (413) 659-3761 to request a pickup. Typically, a vehicle for the portage will arrive within 15 to 90 minutes of the telephone call. Barton Cove Canoe and Kayak Rental Area has a phone during business hours that boaters can use from Memorial Day through Labor Day. During the off-season, boaters need to use their own phones to make the portage request.

Site Operation: Portage around the Turners Falls Dam for paddlers is available to the public at no charge seven days per week during the paddling season, typically May 1 to October 15. The site is open from dawn until dusk.

5.2 Northfield Mountain Project

5.2.1 Munn's Ferry Boat Camping Recreation Area

Location: Munn's Ferry is located on the east side of the Connecticut River in Northfield.

Description of Facilities: Munn's Ferry is a water access-only overnight and day use site. The camping area at Munn's Ferry includes tent campsites each with a trash can, tent platform, picnic table, grill, and, in some cases, a fire ring.

Site Operation: Munn's Ferry is open from Memorial Day to Columbus Day. Individuals must reserve a site and pay a fee prior to camping. The dock is available during the operating season.

5.2.2 Boat Tour and Riverview Picnic Area

Location: The Boat Tour and Riverview Picnic Area is located off Pine Meadow Road on the east shore of the Connecticut River in Northfield.

Description of Facilities: The Boat Tour and Riverview Picnic area provides an area for picnicking along the river, which includes picnic tables and grills. There is a pavilion, which can be rented from Memorial Day to Columbus Day for group events. The site includes restroom facilities and benches. The site also offers river tours on the Heritage Riverboat, which travels along the Connecticut River between Barton Cove and the Riverview Picnic Area. The riverboat is operated by FirstLight and typically leaves from the Riverview Picnic Area dock.

A formal parking lot is available for those using the picnic area and those who are boarding the Heritage Riverboat. There are ADA accessible parking spaces and an ADA compliant bathroom at the site.

Please see [Section 6.2.2](#) for upgrades to this site under the new license term.

Site Operation: The site is open from dawn to dusk free of charge, although there is a fee to rent the pavilion or cruise on the riverboat. The site opens once the FirstLight boat barrier upstream of Turners Falls Dam is installed (typically May 15th) through Columbus Day weekend. The river boat operates from July to mid-October. The dock is in place during the operating season once the FirstLight boater barriers are installed and removed during the off-season. The entrance to the site has a gate, which is open when the site is open to the public.

5.2.3 Northfield Mountain Tour and Trail Center

Location: The NMTTC is located off Millers Falls Road in Northfield, MA.

Description of Facilities: The NMTTC offers a Visitor Center, parking area, trails, and a mountaintop observation area. The Visitor Center offers self-guided interpretive displays, meeting rooms, a lounge, and public restrooms. The center also offers recreation and environmental education programs year-round, including programs for school classes and organized groups. There is a paved parking area located adjacent to the Visitor Center. Additional overflow parking is provided on a nearby mowed area. Horse trailers and buses utilize the cul-de-sac on the west side of the Visitor Center for parking. ADA accessible parking is available at the Visitor Center, along with a ramp to access the facility.

Site Operation: The Visitor Center is typically open year-round for day use activities from 9:00 am to 4:30 pm Wednesday through Sunday. The Center is also open on certain holidays, which are noted on FirstLight's web page. The Northfield Mountain trail system is also open year round, depending on trail and weather conditions. Use of the Visitor Center is free, as is summer trail use and snowshoeing. FirstLight charges a fee for cross country skiing. Seasonal equipment is rented out to users in the winter. A fee may also be charged for the recreation and environmental educational activities to help offset costs.

Mountaintop Observation Area

The Mountaintop Observation Area is a wooden observation platform providing views of the Upper Reservoir from its southern shore. The platform is approximately 20 feet by 20 feet and is accessible from the Northfield Mountain Trail System's Summit Trail.

Trail System

The Northfield Mountain Trail System includes approximately 26 miles of trails, which are used for hiking, mountain biking, equestrian use, snowshoeing, cross-country skiing, and other non-motorized multi-use activities. Trails will continue to be maintained for these uses. A map of the trail system is provided in [Figure 5.3.2-1](#). Approximately 19 miles of trail are wide (8'-15') level corridors with an improved base. Approximately 7 miles are narrow single track trails on natural soils. These trails are typically used for hiking, biking, and snowshoeing. Rose Ledge and a portion of the Farley Ledges are also located within the vicinity of the Northfield Mountain Tour and Trail Center. Rose Ledges can be accessed via the NMTTC parking area and trail system. Both Rose Ledge and Farley Ledges can be accessed via parking and trails outside the Project Boundary on private property.

5.2.4 Barton Cove Nature Area and Campground

Location: Barton Cove Nature Area and Campground are located on Barton Cove Road in Gill.

Description of Facilities: The Barton Cove Nature Area has a set of flush toilets and showers. The site has grills, picnic tables, and a walking trail leading to an overlook. There is a paved parking area at the Nature Area and an adjacent overflow parking area.

The Barton Cove Campground has group campsites, trailer sites, and tent sites. One of the tent sites is considered ADA accessible. Each campsite has a picnic table and fire ring. There are community trash

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containers in the campground. The group sites also have grills and additional picnic tables. There are vault toilets located within the campground. There is an additional parking area within the campground.

See Section 5.2 for improvements to this facility under the new license agreement.

Site Operation: The Nature Area is open to the public free of charge, from dawn to dusk year round. The parking area at the Nature Area is plowed during the winter months. The campground is open from Memorial Day to Labor Day. Quiet hours are from 10:00pm to 8:00 am. There is a fee for overnight camping and sites may be reserved ahead of time.

5.2.5 Barton Cove Canoe and Kayak Rental Area

Location: This site is located on the northern shore of the Connecticut River, off Route 2 in Gill.

Description of Facilities: Barton Cove Canoe and Kayak offers paddlecraft rentals and picnicking. There is a natural gravel carry-in paddlecraft launch, a rental office, picnic tables, parking, and a portable sanitation facility. Paddlecraft rentals include personal flotation devices and paddles or oars.

Site Operation: The facility is open from Memorial Day weekend to Labor Day weekend and is gated in the off-season. The rental office is open on weekends from 9:00 am to 6:00 pm and Monday through Friday 9:00 am to 5:00 pm. Individuals can use the site free of charge, although there is a fee to rent paddlecraft.

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Table 5.0-1. Turners Falls Project: Existing FERC-Approved Project Recreation Sites and Facilities Summary

Recreation Site Name	Recreation Facilities/Amenities
Gatehouse Fishway Viewing Area	<ul style="list-style-type: none"> • parking area (approximately 27 single vehicle spaces; 2 ADA spaces) • picnic area (approximately 6 tables) • bike rack • trail • fishway viewing visitor center (ADA accessible) • restrooms (ADA accessible) • interpretive sign
Turners Falls Branch Canal Area	<ul style="list-style-type: none"> • Overlook (approximately 4 benches) for fishing and picnicking
Cabot Woods Fishing Access	<ul style="list-style-type: none"> • parking areas (approximately 17 single vehicle spaces; 2 ADA spaces) • picnic area (approximately 3 tables)
Turners Falls Canoe Portage	<ul style="list-style-type: none"> • canoe portage take-out (at Barton Cove Canoe & Kayak Rental area) • canoe portage put-in (at Poplar Street Access Site) • On-call vehicular canoe & kayak transport service

RECREATION MANAGEMENT PLAN

Table 5.0-2. Turners Falls Project: Existing FERC-Approved Recreation Sites, Facilities, and Amenities

Recreation Site Name	Recreation Facility/Amenity Type	Facility/Amenity Status	Latitude	Longitude	FERC Citation & Date	Notes
Barton Cove Canoe and Kayak Rental Area	Take-out	Constructed	42.6082	72.5375	18 FERC 62,467 03/17/1982	Put-in and take-out counted as 1 canoe portage
Gatehouse Fishway Viewing Area	Visitor Center	Constructed	42.6097	72.5542	18 FERC 62,467 03/17/1982	fishway viewing areas
Gatehouse Fishway Viewing Area	Picnic Area	Constructed	42.6088	72.5532	18 FERC 62,467 03/17/1982	Approximately 6 tables
Gatehouse Fishway Viewing Area	Interpretive Sign	Constructed	42.6092	72.5536	18 FERC 62,467 03/17/1982	fish species traveling through fish ladder system
Turners Falls Branch Canal Area	Overlook	Constructed	42.6062	72.5629	18 FERC 62,467 03/17/1982	Approximately 4 benches
Cabot Woods Fishing Access	Picnic Area	Constructed	42.5948	72.5788	18 FERC 62,467 03/17/1982	Approximately 3 tables
Cabot Woods Fishing Access	Access Point	Constructed	42.5950	72.5772	18 FERC 62,467 03/17/1982	Angler access
Turners Falls Canoe Portage	Put-in	Constructed	42.5802	72.5752	18 FERC 62,467 03/17/1982	Poplar Street Access Site

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Table 5.0-3. Northfield Mountain Project: Existing FERC-Approved Recreation Sites and Facilities Summary

Recreation Site Name	Recreation Facilities/Amenities
Munn’s Ferry Boat Camping Recreation Area	<ul style="list-style-type: none"> • water access only campsites (approximately 4-5 tent platform sites) • pedestrian foot bridge • picnic area (approximately 1 table) • dock
Boat Tour and Riverview Picnic Area	<ul style="list-style-type: none"> • parking area (approximately 54 single vehicle spaces; 2 ADA) • restroom (ADA compliant) • picnic area (approximately 10 tables) • pedestrian foot bridge • picnic pavilion (approximately 8 tables) • boat tour • dock
Northfield Mountain Tour and Trail Center	<ul style="list-style-type: none"> • parking area (approximately 50 single vehicle spaces; 3 ADA) • restroom • picnic area (approximately 7 tables) • overlook • visitor center and interpretive displays • winter area • trail system • Winter rentals such as cross-country skis • Staffing for educational programming
Barton Cove Nature Area and Campground	<ul style="list-style-type: none"> • nature area parking area (approximately 26 single vehicle spaces) • campground parking (approximately 28 single vehicle spaces) • showers • restroom facilities (2 facilities; ADA compliant) • picnic area (approximately 15 tables) • overlook • interpretive sign • walk-in campground (approximately 2 group sites; 28 campsites; and 1 ADA campsite) • nature trail • dock
Barton Cove Canoe and Kayak Rental Area	<ul style="list-style-type: none"> • parking area (approximately 28 single vehicle spaces) • picnic area (approximately 6 tables) • seasonal restroom • paddlecraft rental service

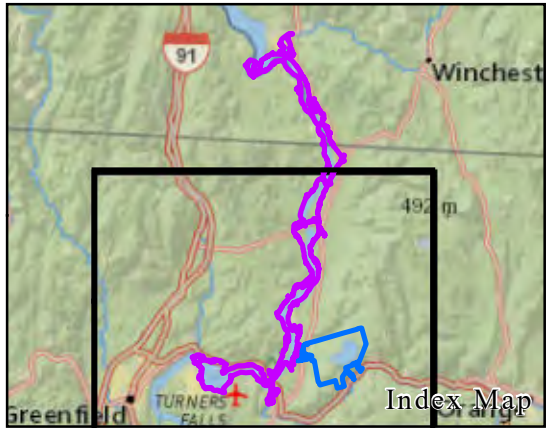
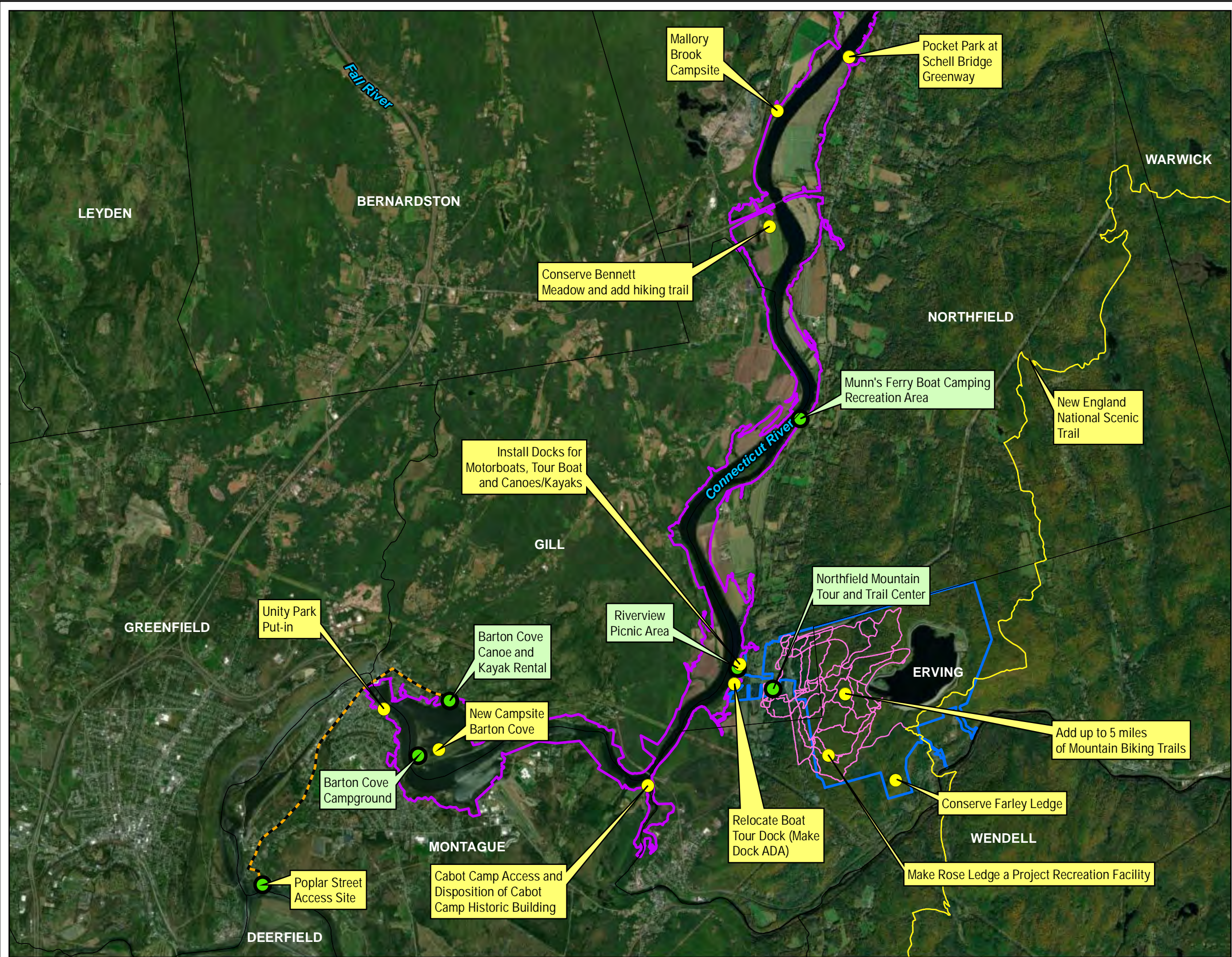
RECREATION MANAGEMENT PLAN

Table 5.0-4. Northfield Mountain Project: Existing FERC Approved Recreation Sites, Facilities, and Amenities

Recreation Site Name	Recreation Facility/Amenity Type	Facility/Amenity Status	Latitude	Longitude	FERC Citation & Date	Notes
Munn's Ferry Boat Camping Recreation Area	Campground	Constructed	42.6512	72.4666	59 FPC 126 July 5, 1977	Water access only, approximately 4 tent sites and 1 shelter site
Munn's Ferry Boat Camping Recreation Area	Picnic Area	Constructed	42.6512	72.4666	59 FPC 126 July 5, 1977	Approximately 1 table
Boat Tour and Riverview Picnic Area	Picnic Area	Constructed	42.6133	72.4792	59 FPC 126 July 5, 1977	Approximately 12 tables
Boat Tour and Riverview Picnic Area	Picnic Pavilion	Constructed	42.6140	72.4788	59 FPC 126 July 5, 1977	Approximately 8 tables
Boat Tour and Riverview Picnic Area	Other Use (Interpretive Boat Tour)	Constructed	42.6130	72.4797	59 FPC 126 July 5, 1977	Heritage Dock
Northfield Mountain Tour and Trail Center	Picnic Area	Constructed	42.6104	72.4713	59 FPC 126 July 5, 1977	Approximately 7 tables
Northfield Mountain Tour and Trail Center	Overlook	Constructed	42.6095	72.4495	59 FPC 126 July 5, 1977	Platform overlooking upper reservoir
Northfield Mountain Tour and Trail Center	Trails	Constructed	N/A	N/A	59 FPC 126 July 5, 1977	
Northfield Mountain Tour and Trail Center	Visitor Center	Constructed	42.6108	72.4716	59 FPC 126 July 5, 1977	Environmental and Educational programs, video displays
Northfield Mountain Tour and Trail Center	Interpretive Display	Constructed	42.6108	72.4716	59 FPC 126 July 5, 1977	
Northfield Mountain Tour and Trail Center	Winter Area	Constructed	42.6108	72.4716	59 FPC 126 July 5, 1977	Skiing, cross country skiing, snowshoeing

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Recreation Site Name	Recreation Facility/Amenity Type	Facility/Amenity Status	Latitude	Longitude	FERC Citation & Date	Notes
Barton Cove Nature Area and Campground	Picnic Area	Constructed	42.6040	72.5332	59 FPC 126 July 5, 1977	Approximately 15 tables
Barton Cove Nature Area and Campground	Overlook	Constructed	42.6031	72.5336	59 FPC 126 July 5, 1977	Platform overlooking Barton Cove
Barton Cove Nature Area and Campground	Campground	Constructed	42.5999	72.5440	59 FPC 126 July 5, 1977	Approximately 2 group sites and 29 camp sites (1 ADA)
Barton Cove Nature Area and Campground	Interpretive Display	Constructed	42.6042	72.5328	59 FPC 126 July 5, 1977	
Barton Cove Nature Area and Campground	Trail	Constructed	N/A	N/A	59 FPC 126 July 5, 1977	Approx. 4,250 feet long nature trail
Barton Cove Canoe and Kayak Rental Area	Picnic Area	Constructed	42.6082	72.5377	103 FERC 62,189 06/30/2003	Approximately 6 tables
Barton Cove Canoe and Kayak Rental Area	Other Use (paddlecraft rentals)	Constructed	42.6082	72.5377	103 FERC 62,189 06/30/2003	Paddlecraft for rent



Turners Falls Hydroelectric Project (No. 1889)
 Northfield Mountain Pumped Storage Project (No. 2485)
 Recreation Management Plan

Figure 5.0-1:
 Existing and Proposed Recreation Facilities
 at the Turners Falls and Northfield
 Mountain Projects

Legend

- Proposed Recreation Facility
- Existing Project Recreation Facility
- Canoe Portage
- Northfield Mountain Trail System
- New England National Scenic Trail
- Northfield Mountain (NFM) Project Boundary
- Combined TF/NFM Project Boundary

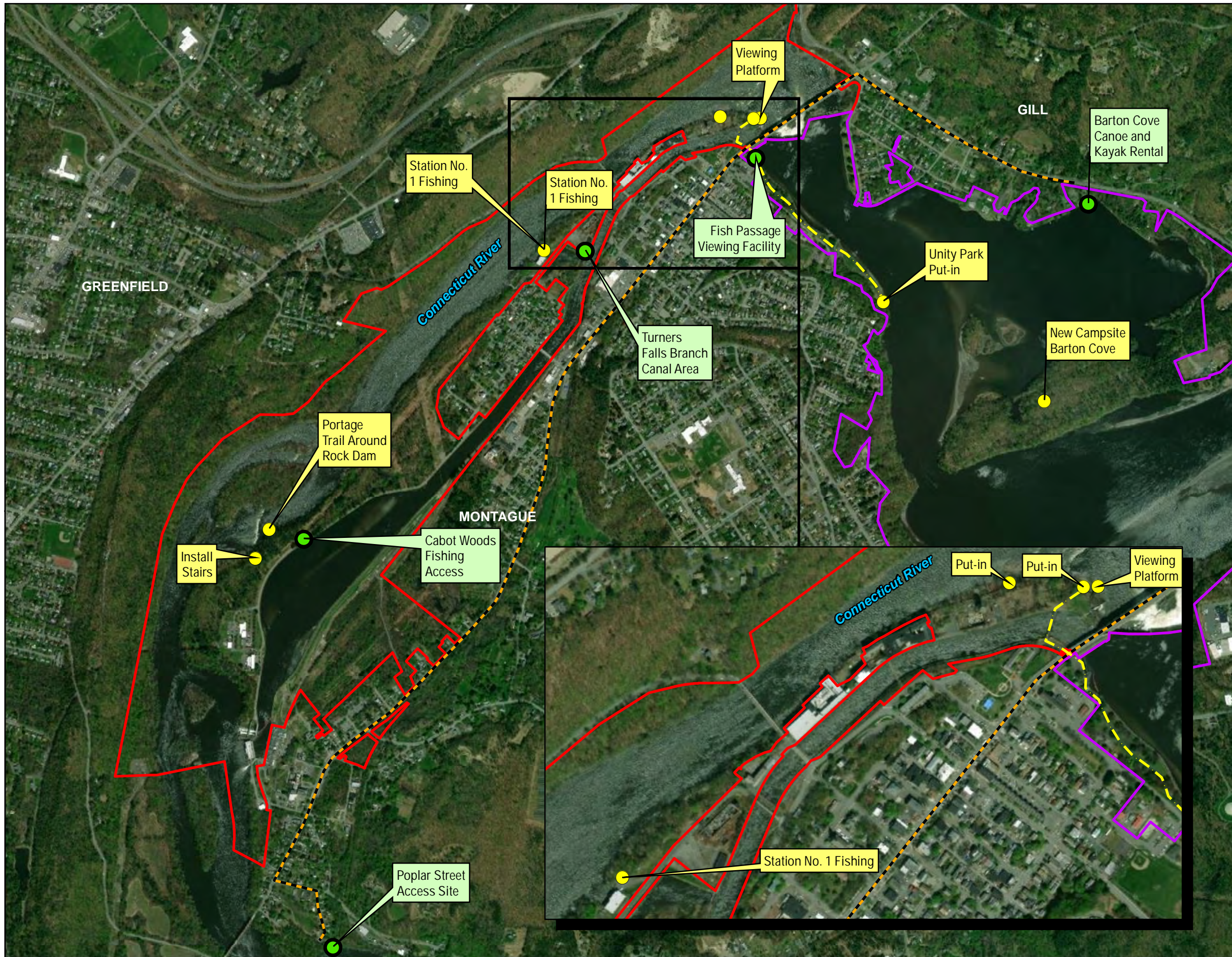
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
 National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS,

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1 inch = 1 miles





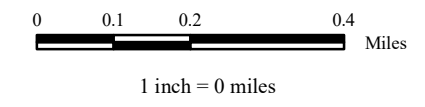
Turners Falls Hydroelectric Project (No. 1889)
 Northfield Mountain Pumped Storage Project (No. 2485)
 Recreation Management Plan

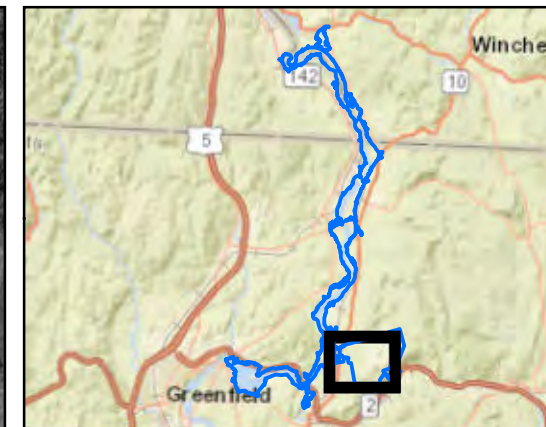
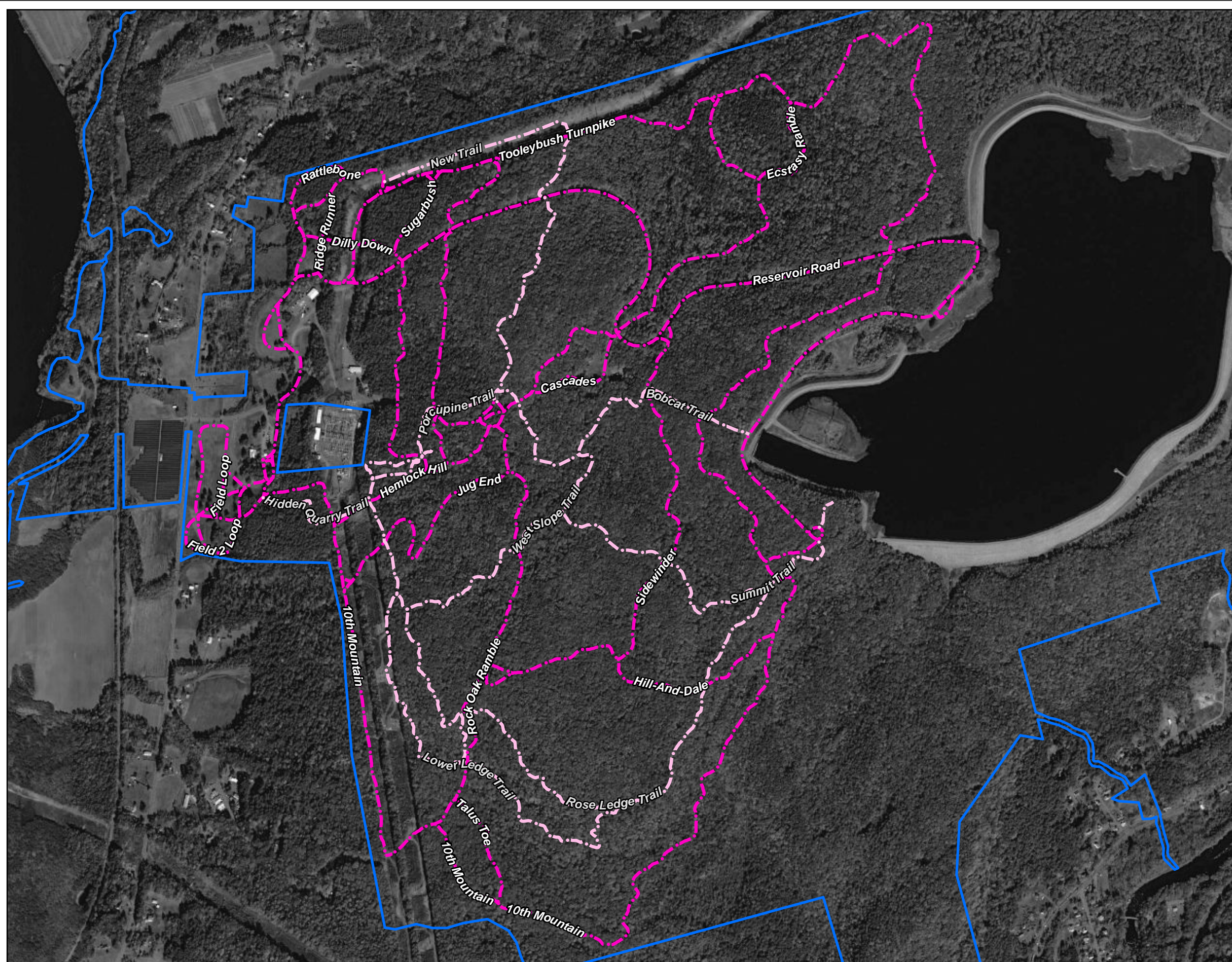
Figure 5.0-2:
 Existing and Proposed Recreation
 Facilities at the Turners Falls and
 Northfield Mountain Projects
 Blown-Up Map below Turners Falls Dam

- Legend
- Proposed Recreation Facility
 - Existing Project Recreation Facility
 - - - Walking Portage
 - - - Canoe Portage
 - ▭ Turners Falls (TF) Project Boundary
 - ▭ Combined TF/NFM Project Boundary



Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
 National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.





Turners Falls Hydroelectric Project (No. 1889)
 Northfield Mountain Pumped Storage Project (No. 2485)
 Recreation Management Plan

Figure 5.3.2-1:
 Existing Northfield Mountain
 Trail System

Legend

FERC Project Boundary

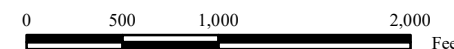
NFM Trail Type

Ski Trail

Snowshoe Trail



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



1 inch = 1,000 feet



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6 NEW AND UPGRADED RECREATION FACILITIES

New and upgraded recreation facilities are summarized below. [Figure 5.0-1](#) and [Figure 5.0-2](#) (blown up version below Turners Falls Dam) show the general location of existing and proposed recreation facilities.

6.1 Turners Falls Project

6.1.1 Construct Pocket Park

New Project Recreation Site: FirstLight will construct one pocket park (viewing location, picnic table) at the Pauchaug-Schell Bridge Greenway and include signage for historical and cultural interpretation. FirstLight will consult with the town of Northfield and MDCR in finalizing the design and will consult with the Nolumbeka Project Inc, Elnu Abenaki Tribe, and the town of Northfield (Historical Commission) regarding signage.

6.1.2 Construct Mallory Brook Campsite

New Project Recreation Site: FirstLight will provide paddle access camping at a new campsite at Mallory Brook (if for some reason that location proves to be problematic, another site will be chosen) in the town of Northfield in consultation with AMC, and the town of Northfield.

6.1.3 Construct Formal Access Trail and Put-In at Cabot Camp

New Project Recreation Site: FirstLight will construct a 10-foot-wide formal path leading from the Cabot Camp parking area to an access point on the Millers River just upstream of the confluence with the Connecticut River. A sign (Project Name and FERC No.) and directional portage sign will be installed along the formal path leading the public from the parking lot directly to the 10-foot-wide gravel path leading to the water's edge. A picnic area will also be added. FirstLight will consult with the town of Montague, AMC, and MDCR in finalizing the design. Shown in [Figure 6.1.3-1](#) and [6.1.3-2](#) is a conceptual layout of the Access Trail and Put-In at Cabot Camp.

6.1.4 Construct Car-Top Access at East End of Unity Park and Reconfigure Parking Lot

New Project Recreation Site: FirstLight will add a new car-top access and put-in at the eastern end of Unity Park, provide a means of storing and locking vessels, and will reconfigure the Unity Park parking lot to improve vehicle and pedestrian safety. The put-in will require construction of a gated road, controlled by FirstLight, from the parking lot to the eastern end of Unity Park that will be usable by cars to off-load canoes/kayaks, and then return to park. FirstLight will consult with the town of Montague, which will conduct public outreach, and MDCR to provide input on the design. Signage will assist paddlers portaging their craft from this location to below the dam (those who will not be using FirstLight's assistance to portage down to the Poplar Street Access). Shown in [Figure 6.1.4-1](#) is a conceptual layout of the Car-Top Access at the North End of Unity Park.

6.1.5 Construct River Access and Two Put-Ins Just Below Turners Falls Dam

New Project Recreation Site: The new access will start via the existing bridge (aka the "IP Bridge") spanning the power canal just below the Gatehouse. Once over the power canal, a 12-foot-wide path will lead recreationists to an elevated bench and opening above the river channel. From this elevated bench there will be two routes to access the river. One route will continue with a 12-foot wide path leading further upstream to a put-in closer to the dam and upstream of Peskeomskut Island. This route will be designed to accommodate whitewater rafters. The second route will lead further downstream to a put-in below Peskeomskut Island. The second route currently consists of an uneven path with jagged rocks creating

unstable footing. The proposed second route will require clearing and grubbing to create an approximate 12-foot-wide level path with better footing before turning right to the put-in. This route will be designed to accommodate pass-through boaters (canoes and kayaks) that want to avoid Peskeomskut Island. Shown in [Figure 6.1.5-1](#) and [6.1.5-2](#) is a conceptual layout of the Two Put-Ins below Turners Falls Dam.

Paddlers using this access can park either at the Fishway Viewing and Picnic area or the Great Falls Discovery Center parking lots and can carry or wheel their boats along the bike path to the IP Bridge. Signage for the walkable portage from Unity Park to the access areas will assist both through-paddlers and paddlers putting in at this location.

Signage including the Project name and FERC No. will be included just after exiting the IP bridge. Signage with directional signs will also be added along the two river access paths leading to the two put-ins. FirstLight will consult with the town of Montague, AW, AMC, MDCR, Massachusetts Natural Heritage and Endangered Species Program (NHESP), and National Marine Fisheries Service (NMFS) (relative to Shortnose Sturgeon) in finalizing the design. Aesthetic improvements to landscaping and man-made features will be made and maintained throughout the area to ensure a respectfulness of the physical environment commensurate with the cultural significance of the Great Falls area to Native American Tribes.

FirstLight, in consultation with the town of Montague (including the town's Historical Commission) will develop ways to restrict access to some of the historic industrial caverns and structures in this area, to reduce the possibility of accidents and degradation from misuse.

6.1.6 Construct Viewing Platform and Picnic Area just Below Turners Falls Dam

New Recreation Site: A viewing platform and picnic area will be constructed below the Turners Falls Dam with the best feasible view of Great Falls (the Turners Falls Dam). The exact location of the viewing platform and picnic area are yet to be determined, with one option being forming a platform atop the existing Spillway Ladder as it is elevated and provides a good view of the Turners Falls Dam. Signage will be added as well. FirstLight will consult with the town of Montague and MDCR in finalizing the design.

6.1.7 Construct River Access Trail at Station No. 1

New Recreation Site: Although there is currently informal access to the Station No. 1 tailrace, FirstLight will provide formal access for fishing and non-motorized boats. It will include an approximately 10-foot-wide path leading from Power Street to a put-in just upstream of the Station No. 1 tailrace. Signage will be added to the path entrance. FirstLight will consult with the town of Montague, AW, AMC, MDCR, NHESP, and NMFS (relative to Shortnose Sturgeon) in finalizing the design. Shown in [Figure 6.1.7-1](#) is a conceptual layout of the Access Trail at Station No. 1.

6.1.8 Install Stairs at the Cabot Woods Fishing Access

Improvements: Historically, there were stairs along the steep topography leading from the picnic area in Cabot Woods to the river's edge; however, they are no longer in place. FirstLight will install and maintain new stairs at the same location as the previous stairs, which leads to just below Rock Dam. Signage will be added to steer the public to the stairs.

6.1.9 Construct Portage Trail Around Rock Dam

New Recreation Site: The "Rock Dam" is a natural rock feature with a sizeable vertical drop located in the bypass reach of the Connecticut River near the Cabot Woods Fishing Area. With boating opportunities expected to increase under the new flow regime, some boaters may opt to avoid Rock Dam and portage around it for safety reasons. Alternatively, some boaters may view the vertical drop at Rock Dam as a "play" area and may want to "run" the drop more than once. For these reasons, FirstLight will construct a portage trail around Rock Dam. Shown in [Figure 6.1.9-1](#) is a conceptual layout for the Portage Trail around Rock Dam.

RECREATION MANAGEMENT PLAN

The portage trail route and design will be determined in consultation with NMFS, NHESP, MDCR, AW, AMC, the Nolumbeka Project Inc., the Elnu Abenaki Native American Tribe, and the town of Montague. The pool below Rock Dam contains habitat for the federally endangered Shortnose Sturgeon. Consultation with NMFS will minimize the potential for construction of the portage trail and potential increased recreation usage of the area to disrupt Shortnose Sturgeon habitat and spawning activity. Consultation with NHESP will minimize the potential for impacts to state-listed rare plants. Consultation with the Nolumbeka Project Inc. and Elnu Native American Tribe will minimize the potential to disturb sensitive cultural resources.

The portage trail is not slated to be completed until Year 5 after license issuance. However, given that the new bypass flow regime will be in place after license issuance, the Licensee will consult with the above parties in Year 1 to stake out and/or flag a desired trail, with directional signage, to avoid critical features. It is anticipated that the portage trail may require clearing of some low lying vegetation and tree saplings after consultation is completed. In Year 5, if needed, the portage trail will be improved.

6.1.10 Improve Poplar Street River Access

Project Recreation Site Improvements: There is existing cartop access at Poplar Street; however, it is extremely steep. Due to steep topography and land ownership restrictions, FirstLight will 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 will be anchored to the concrete abutment and lead to a floating dock in the Connecticut River to accommodate fluctuations in the river elevation. As soon as flows, as measured at the USGS (Gage No. 01170500) on the Connecticut River at Montague City are below 38,000 cfs, the floating dock will be installed but no sooner than April 1. The floating dock will be removed by October 31. The site will include signage (Project name and FERC No.) at the top of the timber stairs. In addition, a porta-potty will be added between Memorial Day and Labor Day subject to re-evaluation as discussed below. Shown in [Figure 6.1.10-1](#) and [6.1.10-2](#) is a conceptual layout for the Poplar Street Take-Out. Final design will consider input from the town of Montague, AW, AMC, Crab Apple Whitewater, New England FLOW, Zoar Outdoors, MDCR, NHESP and NMFS (relative to Shortnose Sturgeon).

The take-out is located at the end of Poplar Street in a residential neighborhood. The existing gravel parking area will be slightly re-designed to make the parking pattern and lot boundaries more obvious; signage will also assist with parking directions. After the first year the Poplar Street take-out is operational, FirstLight, the town of Montague, AW, AMC, Crab Apple Whitewater, New England FLOW, Zoar Outdoors, and MDCR will consult relative to vandalism (including to the porta-potty), variable flow release events⁸ and overnight parking, and inappropriate uses at the location, given its proximity to the residential neighborhood. Modifications to the take-out may be required pending usage. FirstLight will also consult with the same group in finalizing the design. FirstLight will actively engage and support efforts of the town of Montague and relevant state agencies with regard to the potential to link this lot to other available overflow parking, including via the adjacent state-owned Rail Trail.

6.1.11 Install Interpretive Cultural Signage at Key Locations

FirstLight will install interpretive signage in consultation with the Nolumbeka Project Inc., Elnu Abenaki Tribe, and the town of Montague Historical Commission at Cabot Woods (Rock Dam) and Peskeompskut/Great Falls (Turners Falls Dam). FirstLight will work with these parties in the consideration of any other proposed historical/cultural interpretative installations to be located in these areas. Interpretive

⁸The Variable Flow Releases are defined in the Flows and Fish Passage Settlement Agreement filed with FERC on March 31, 2023 (see Draft License Article A150).

signage at Cabot Woods (Rock Dam) will be completed when a) the Cabot Wood stairs are installed and b) the two put-ins below the Turners Falls Dam are constructed.

6.2 Northfield Mountain Project

6.2.1 Enhance Existing Bennett Meadow Trails

Enhance Project Recreation Site: FirstLight will enhance existing riverfront trails south of Route 10 off the parking lot at Bennett Meadow and include historical and cultural interpretive signage. FirstLight will consult with the town of Northfield, MDCR, MDFW, Nolumbeka Project Inc, and the Elnu Abenaki Tribe in finalizing the design, placement of a bench, and the interpretive signage.

6.2.2 Construct Riverview Improvements (Docks)

Modification: The proposed barrier net will be in place during a portion of the summer recreation season. The current layout of the barrier net encloses the existing Boat Tour Dock. Given this, FirstLight proposes to relocate the dock further upstream of its current location. Moving the dock will entail extending the existing road further north and allowing boaters or users of the area the ability to drop a boat closer to the dock or operate a wheelchair down the access road. The dock will be integrated into the New Project Recreation Facility described below.

New Project Recreation Facility: FirstLight will provide an ADA-accessible dock layout that supports motor boats, canoes/kayaks, and Riverboat. Shown in [Figure 6.2.2-1](#) and [6.2.2-2](#) is a conceptual layout for the docks and access at Riverview. FirstLight will try to design access to preserve as many pre-existing trees as possible.

FirstLight will consult with the town of Northfield, MDCR, FRCOG, and AMC in finalizing the design.

6.2.3 Construct New Mountain Biking Trails at Northfield Mountain

New Project Recreation Facility: FirstLight will construct approximately five (5) miles of new trails for mountain biking to be designed all in consultation with the New England Mountain Bike Association and MDCR and to be incorporated into the NMTCC trail system.

6.2.4 Construct Barton Cove Campsite

New Project Recreation Sites: FirstLight will provide paddle access camping at a new campsite in the Barton Cove area in Gill, in consultation with the town of Gill and AMC.

6.2.5 Establish Rose Ledges as a Project Recreation Facility

New Project Recreation Site: Rose Ledges is a rock climbing area on the eastern side of Northfield Mountain. FirstLight will make Rose Ledges a new Project Recreation Facility to allow rock climbing as it is already in the Northfield Mountain Project Boundary. Notwithstanding any other provision of this RMP, access to Rose Ledges shall remain free of charge for the duration of FirstLight's license. FirstLight is not proposing to include additional parking and is limiting the use at Rose Ledges to only climbing.

6.2.6 Implement Barton Cove Improvements (Locking Canoes and Kayaks)

Modification: FirstLight will add the ability to lock canoes and kayaks during the day at the Barton Cove Canoe and Kayak rental facility in the picnic area.

6.3 Summary of Existing and Proposed Recreation Facilities

[Table 6.3-1](#) is a summary of the existing and new/upgraded recreation facilities at the Northfield Mountain and Turners Falls Project, by town.

RECREATION MANAGEMENT PLAN

Table 6.3-1. Existing and Proposed Recreation Facilities or Features at the Northfield Mountain and Turners Falls Projects, Listed by Town

Recreation Facility or Feature	Existing or Proposed	Part of NFM or TF License
Town of Northfield		
<u>Bennett Meadow</u> <ul style="list-style-type: none"> • FirstLight will permanently conserve its lands within Bennett Meadow that are not already under conservation easement. • FirstLight will enhance the existing riverfront trails at Bennett Meadow (southern side of Route 10) and include historical and cultural interpretation and bench. 	Proposed	Northfield
<u>Munn’s Ferry Boat Camping Recreation Area</u> <ul style="list-style-type: none"> • Water access only at camping sites. • Pedestrian footbridge. • Tent campsites, each with trash can, tent platform, picnic table, grill, and some fire rings. 	Existing	Northfield
<u>Riverview</u> <ul style="list-style-type: none"> • Parking lot for 54 vehicles, 2 ADA. • Provides picnic tables (10) and grills along the river, Pavilion (8 tables), ADA compliant restrooms, benches. • Tours on the Riverboat travelling between Barton Cove and Riverview. • Site currently includes dock for Riverboat tours. 	Existing	Northfield
<u>Riverview</u> <ul style="list-style-type: none"> • FirstLight to relocate the dock that would be enclosed by the fish barrier net in the Northfield Mountain Project tailrace. • FirstLight to provide for an ADA-accessible dock layout that supports motor boats, canoes/kayaks, and Riverboat. 	Proposed	Northfield
<u>Northfield Mountain Tour and Trail Center</u> (also includes the Town of Erving) <ul style="list-style-type: none"> • Parking for up to 50 vehicles, 3 ADA. • Visitors Center with self-guided interpretive displays, meeting rooms, lounge, and ADA accessible restrooms. • Offers recreation and environmental education programs year-round. • 26 miles of trails used for mountain biking, x-country skiing, snowshoeing, horseback riding and walking. • Mountaintop Observation Deck. • Retain seasonal ski equipment rentals at the Northfield Visitors Center and continue to maintain ski trails. 	Existing	Northfield

RECREATION MANAGEMENT PLAN

Recreation Facility or Feature	Existing or Proposed	Part of NFM or TF License
<p><u>Northfield Mountain Tour and Trail Center</u></p> <ul style="list-style-type: none"> • FirstLight will construct approximately 5 miles of new trails for mountain biking to be incorporated into the NMTCC trail system. • FirstLight to donate used sporting equipment to local youth organizations. 	Proposed	Northfield
<p><u>Turners Falls Impoundment Access and Viewing</u> (also includes the Town of Gill)</p> <ul style="list-style-type: none"> • FirstLight to provide paddle access camping at 2 new campsites- one in the Barton Cove area in Gill and the other (if possible) at Mallory Brook in Northfield. If for some reason the Mallory Brook location is problematic, another site will be chosen. • FirstLight will install one pocket park at the Pauchaug-Schell Bridge Greenway and include signage for historical and cultural interpretation. 	Proposed	Northfield Turners Falls
Town of Erving		
<p><u>Climbing Ledges</u></p> <ul style="list-style-type: none"> • FirstLight will make Rose Ledges a designated Project Recreation Facility to allow climbing. 	Proposed	Northfield
Town of Montague		
<p><u>Cabot Camp</u></p> <ul style="list-style-type: none"> • FirstLight will construct a formal path leading from the Cabot Camp parking area to a put-in to the Millers River and add a picnic table and improve signage. • FirstLight will attempt to find a qualified organization to take responsibility for preserving the Cabot Camp historic buildings as summarized in Section 4.2.3. 	Proposed	Northfield
<p><u>Unity Park</u></p> <ul style="list-style-type: none"> • FirstLight will add a new car-top access and put-in at the northern end of Unity Park, provide a means of storing and locking vessels, and reconfigure the Unity Park parking lot to improve vehicle and pedestrian safety. 	Proposed	Northfield
<p><u>Gatehouse Fishway Viewing Area</u></p> <ul style="list-style-type: none"> • Continue with providing approximately 27 parking spaces, picnic tables, bike rack, trail, fishway view visitor facility (with feed to above ground TV), ADA accessible restrooms and interpretive signage. 	Existing	Northfield
<p><u>River Access below Turners Falls Dam</u> FirstLight will provide the following river access points:</p> <ul style="list-style-type: none"> • Turners Falls bypass both upstream and downstream of Peskeomskut Island (located just below the Turners Falls Dam). • At the Station No. 1 tailrace for fishing and non-motorized boats. 	Proposed (note that Poplar Street is an existing facility that	Turners Falls

RECREATION MANAGEMENT PLAN

Recreation Facility or Feature	Existing or Proposed	Part of NFM or TF License
<ul style="list-style-type: none"> Improvements at the Poplar Street put-in and take-out to include placement of stairs with boat slide leading to a landing/concrete abutment, a gangway, and a floating dock. 	is being improved)	
<p><u>Safety Improvements</u></p> <ul style="list-style-type: none"> FirstLight will make safety improvements to abandoned water passages, under FirstLight’s ownership, in the Turners Falls bypass (focused between the dam and upstream of Station No. 1 on river left). 	Proposed	Turners Falls
<p><u>Viewing Platform</u></p> <ul style="list-style-type: none"> FirstLight will construct a viewing platform and picnic area below the Turners Falls Dam with the best feasible view of the Great Falls and their surrounding natural environment. FirstLight to maintain the adjacent area near the bridge crossing. 	Proposed	Turners Falls
<p><u>Turners Falls Branch Canal</u></p> <ul style="list-style-type: none"> FirstLight will continue to provide the overlook and benches. 	Existing	Turners Falls
<p><u>Cabot Woods</u></p> <ul style="list-style-type: none"> FirstLight will continue to provide parking for approximately 17 cars, picnic tables, and offer fishing access at Cabot Woods. 	Existing	Turners Falls
<p><u>Cabot Woods</u></p> <ul style="list-style-type: none"> FirstLight will replace and maintain stairs at Cabot Woods. 	Proposed	Turners Falls
<p><u>Portage</u></p> <ul style="list-style-type: none"> Continue with the current portage where boaters can call FirstLight for transport, and maintain signage explaining canoe portage operations, procedures, and the call number. (May 1 – October 15). 	Existing	Turners Falls
<p><u>Portage</u></p> <ul style="list-style-type: none"> FirstLight will construct a portage trail around Rock Dam (on river left; on the Cabot Woods side of the river). 	Proposed	Turners Falls
Town of Gill		
<p><u>Barton Cove Nature Area and Campground</u></p> <ul style="list-style-type: none"> Nature Area Parking for 26 vehicles, Campground Parking for 28 vehicles. Restrooms (2 facilities, ADA compliant). Walking trail to an overlook. Campground for trailer and tents sites, 28 campsites (1 ADA compliant), sites include picnic table, grills and fire ring, trash containers. Nature trail, dock. 	Existing	Northfield

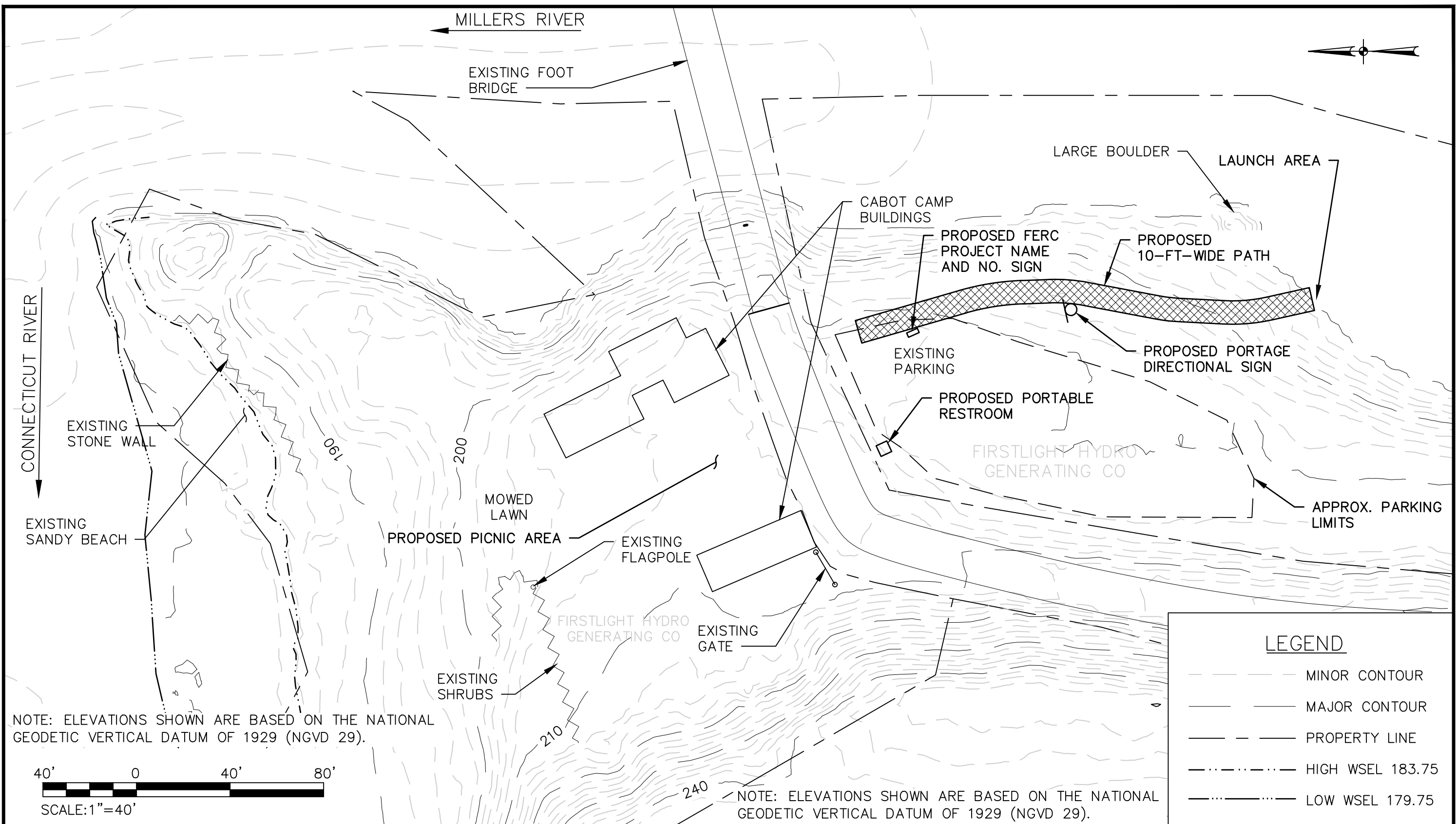
RECREATION MANAGEMENT PLAN

Recreation Facility or Feature	Existing or Proposed	Part of NFM or TF License
<p><u>Barton Cove Canoe and Kayak Rental Area</u></p> <ul style="list-style-type: none"> • Parking for 28 vehicles. • 6 picnic tables, seasonal restroom. • Offers paddlecraft rentals with PFDs, and picnicking. • Paddlecraft rental service. • On-call vehicular canoe and kayak transport service. 	Existing	Northfield
<p><u>Barton Cove Canoe and Kayak Rental Area</u></p> <ul style="list-style-type: none"> • FirstLight will add the ability to lock canoes and kayaks during the day at Barton Cove in the Town of Gill. • FirstLight will donate used sporting equipment to local youth organizations. 	Proposed	Northfield
<p><u>Flow Notification</u></p> <ul style="list-style-type: none"> • FirstLight will provide real-time TFI water level information as measured at the Turners Falls Dam and provide real-time Turners Falls Dam spill rates and Station No. 1 discharges year-round on a website that will be accessible to the public. • FirstLight will develop a flow monitoring plan with the agencies. • FirstLight will provide digital flow notification of the NRF and the anticipated Turners Falls Dam spillage and anticipated Station No. 1 discharge for a 12-hour window into the future at any given time contingent upon advance notification procedures to be followed by the Licensee of the Vernon Hydroelectric Project (FERC No. 1904). Should FirstLight take deviations to passing the 12-hour previous NRF it will post the revised flows (in the 12-hour look ahead window) to the digital location as soon as practicable after they are known. Should the Licensee of the Vernon Hydroelectric Project provide FirstLight with flow data more than 12 hours in advance, FirstLight will publish the information sooner. 	Proposed	Northfield and Turners Falls
<p><u>ADA</u></p> <ul style="list-style-type: none"> • For any new construction and rehabilitation of existing public recreation buildings and facilities, FirstLight will comply with 521 CMR to the extent applicable pursuant to 521 CMR and Title III of the Americans with Disabilities Act. As part of the RMP process and updates, FirstLight will conduct a programmatic assessment of the existing and proposed public recreation buildings and facilities for consistency with the requirements of the ADA and will implement applicable ADA improvements. 	Proposed	Northfield and Turners Falls
<p><u>Recreation Management Plan</u></p> <ul style="list-style-type: none"> • The RMP will be revisited once every 10 years to evaluate recreation use and demand. 	Proposed	Northfield and Turners Falls

RECREATION MANAGEMENT PLAN

Recreation Facility or Feature	Existing or Proposed	Part of NFM or TF License
<p><u>Conservation Easements</u></p> <ul style="list-style-type: none"> • FirstLight will place lands it owns and are not used for specific project activities (e.g., power production, project recreation facilities, etc.) along the TFI shoreline in conservation easement to maintain riparian buffers and river right (looking downstream) downstream of the Turners Falls Dam. The easements will include those lands where agricultural farming occurs up to the river’s edge; however, no conservation easements will be sought on existing developed lands along the TFI. • FirstLight will conserve the approximately 1.3-mile portion of the New England National Scenic Trail in the Project boundary on the eastern side of the Northfield Mountain Upper Reservoir in Erving, MA. 	Proposed	Northfield and Turners Falls

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NO.	DATE	DESCRIPTION	BY	APP

FOR: 

BY: 
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
 www.gomezandsullivan.com

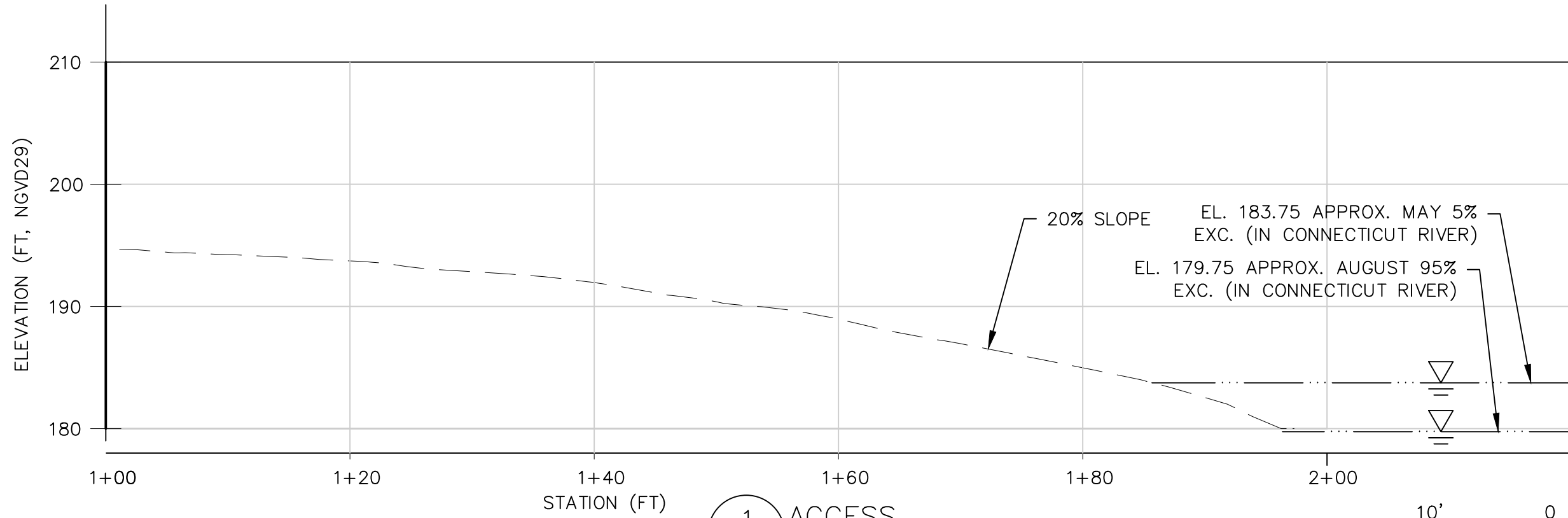
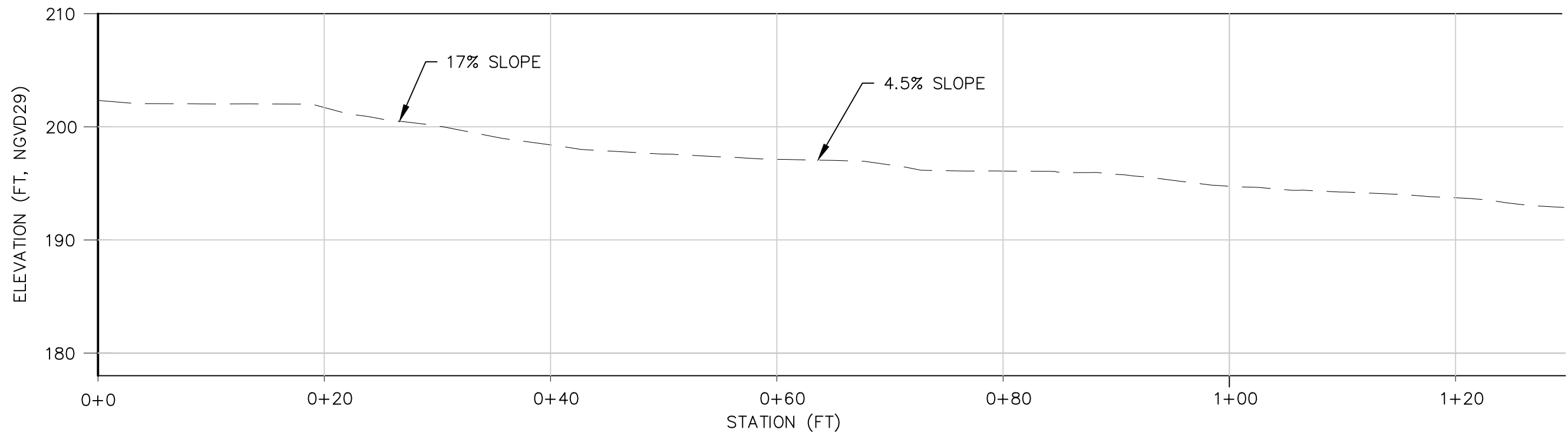
DESIGNED BY:	KJC
DRAWN BY:	JSC
CHECKED BY:	RLS
APPROVED BY:	-
PROJECT NO.:	1490
DATE:	5-4-22

AMENDED FINAL LICENSE APPLICATION

CONCEPTUAL LAYOUT OF ACCESS TRAIL AND PUT-IN AT CABOT CAMP

SCALE:	1" = 40'	DRAWING NO.:	6.1.3-1
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1 ACCESS
2 SCALE: 1" = 10'

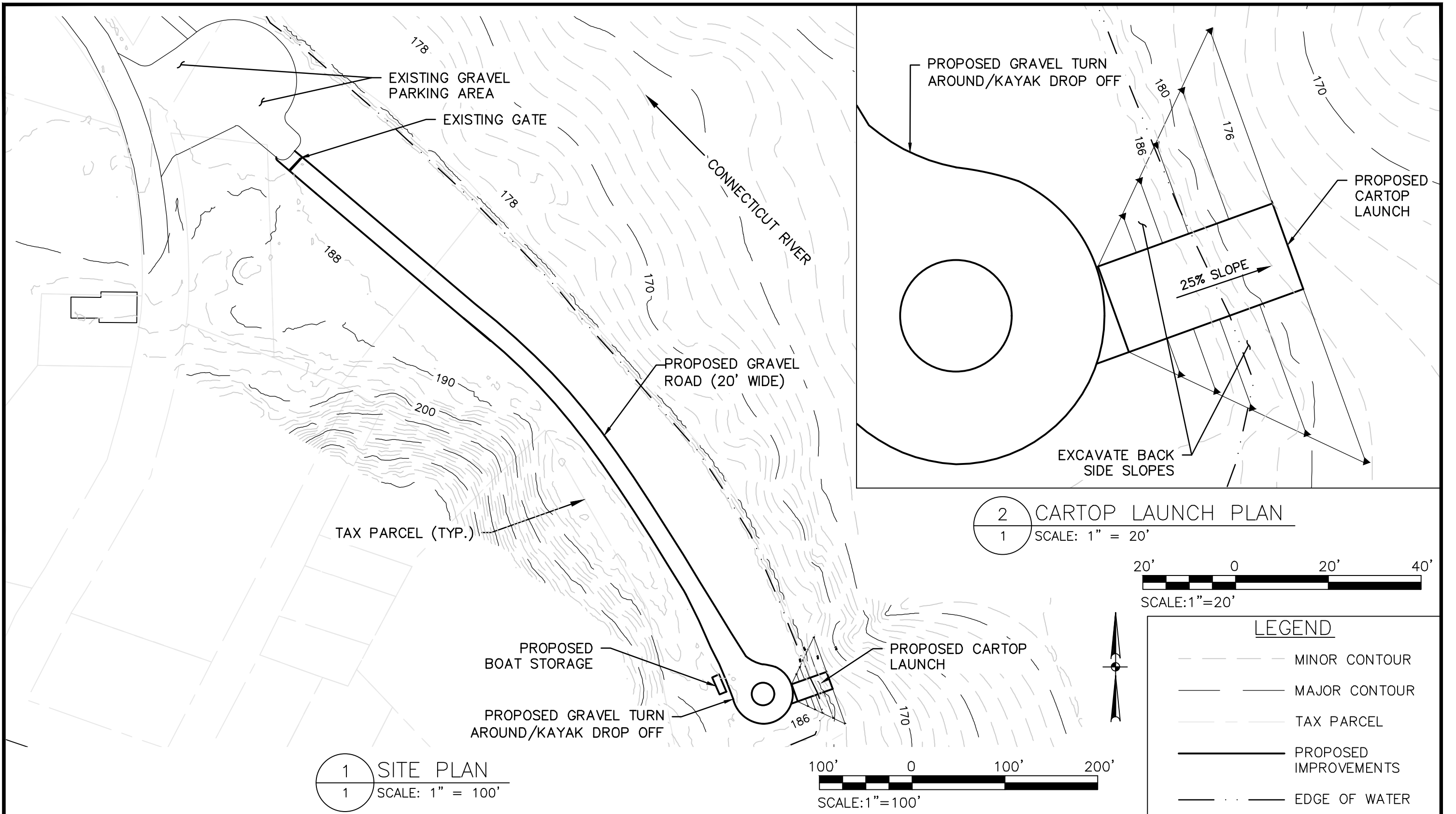
NOTE: ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).

NO.	DATE	DESCRIPTION	BY	APP

FOR:		DESIGNED BY:	KJC
BY:		DRAWN BY:	JSC
	Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH www.gomezandsullivan.com	CHECKED BY:	RLS
		APPROVED BY:	-
		PROJECT NO.:	1490
		DATE:	2-19-20

AMENDED FINAL LICENSE APPLICATION	
CONCEPTUAL PROFILE OF ACCESS TRAIL AND PUT-IN	
SCALE:	1" = 10'
DRAWING NO.:	6.1.3-2

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1 SITE PLAN
SCALE: 1" = 100'

2 CARTOP LAUNCH PLAN
SCALE: 1" = 20'



LEGEND	
	MINOR CONTOUR
	MAJOR CONTOUR
	TAX PARCEL
	PROPOSED IMPROVEMENTS
	EDGE OF WATER

NO.	DATE	DESCRIPTION	BY	APP

FOR:

BY:

Williamsville, NY Utica, NY Albany, NY Henniker, NH
www.gomezandsullivan.com

DESIGNED BY:	KJC
DRAWN BY:	JSC
CHECKED BY:	KJC
APPROVED BY:	-
PROJECT NO.:	1490
DATE:	3-1-23

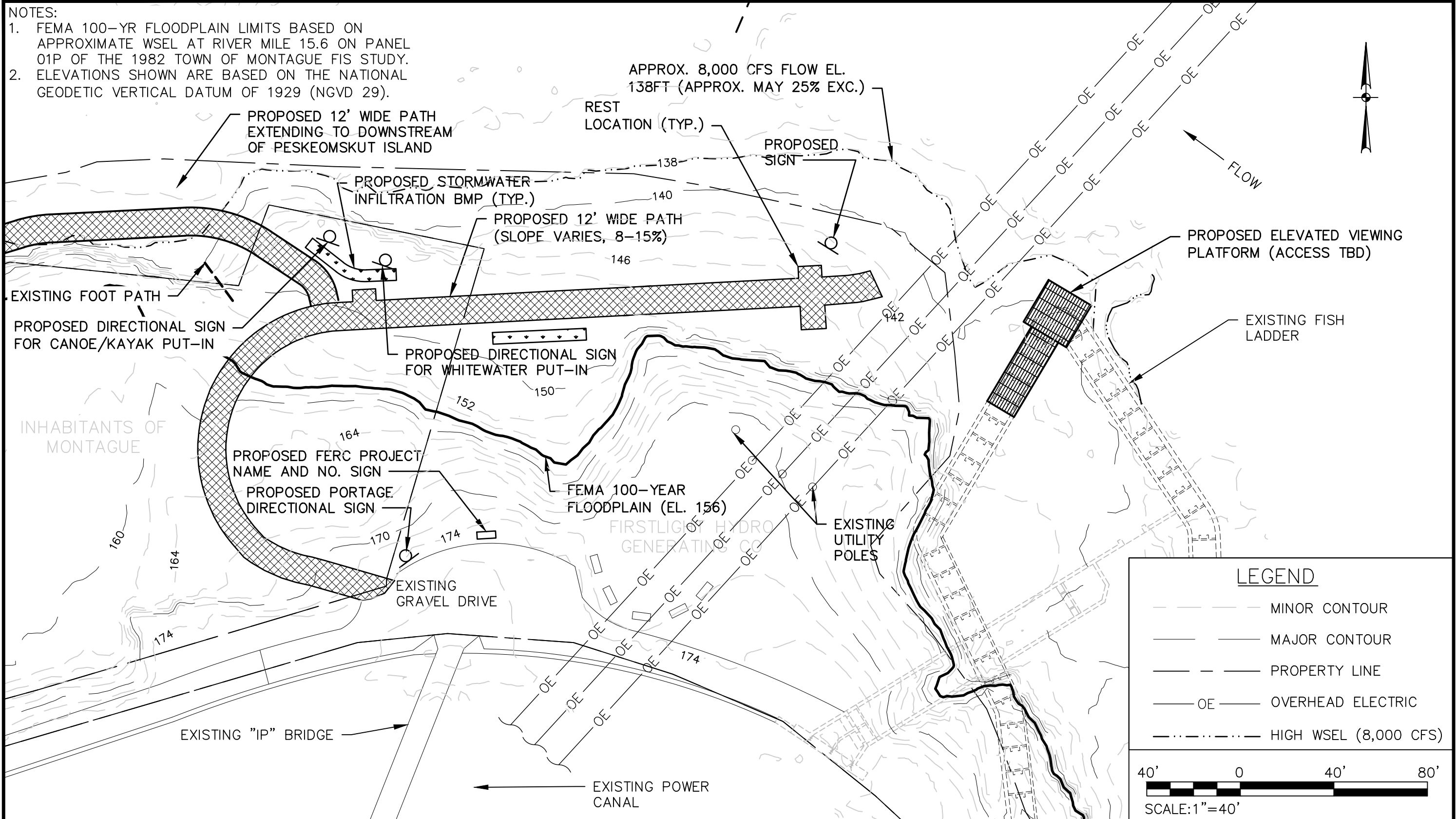
CONCEPTUAL LAYOUT OF CAR-TOP ACCESS AT NORTH END OF UNITY PARK

SCALE: AS NOTED DRAWING NO.: 6.1.4-1

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

NOTES:

1. FEMA 100-YR FLOODPLAIN LIMITS BASED ON APPROXIMATE WSEL AT RIVER MILE 15.6 ON PANEL 01P OF THE 1982 TOWN OF MONTAGUE FIS STUDY.
2. ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).



LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- - - PROPERTY LINE
- OE — OVERHEAD ELECTRIC
- · - · - · - HIGH WSEL (8,000 CFS)

40' 0 40' 80'

SCALE: 1"=40'

NO.	DATE	DESCRIPTION	BY	APP

FOR: **FirstLight**

BY: **GOMEZ AND SULLIVAN ENGINEERS**
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
 www.gomezandsullivan.com

DESIGNED BY: KJC
 DRAWN BY: KSC
 CHECKED BY: KJC
 APPROVED BY: -
 PROJECT NO.: 1490
 DATE: 5-3-22

AMENDED FINAL LICENSE APPLICATION

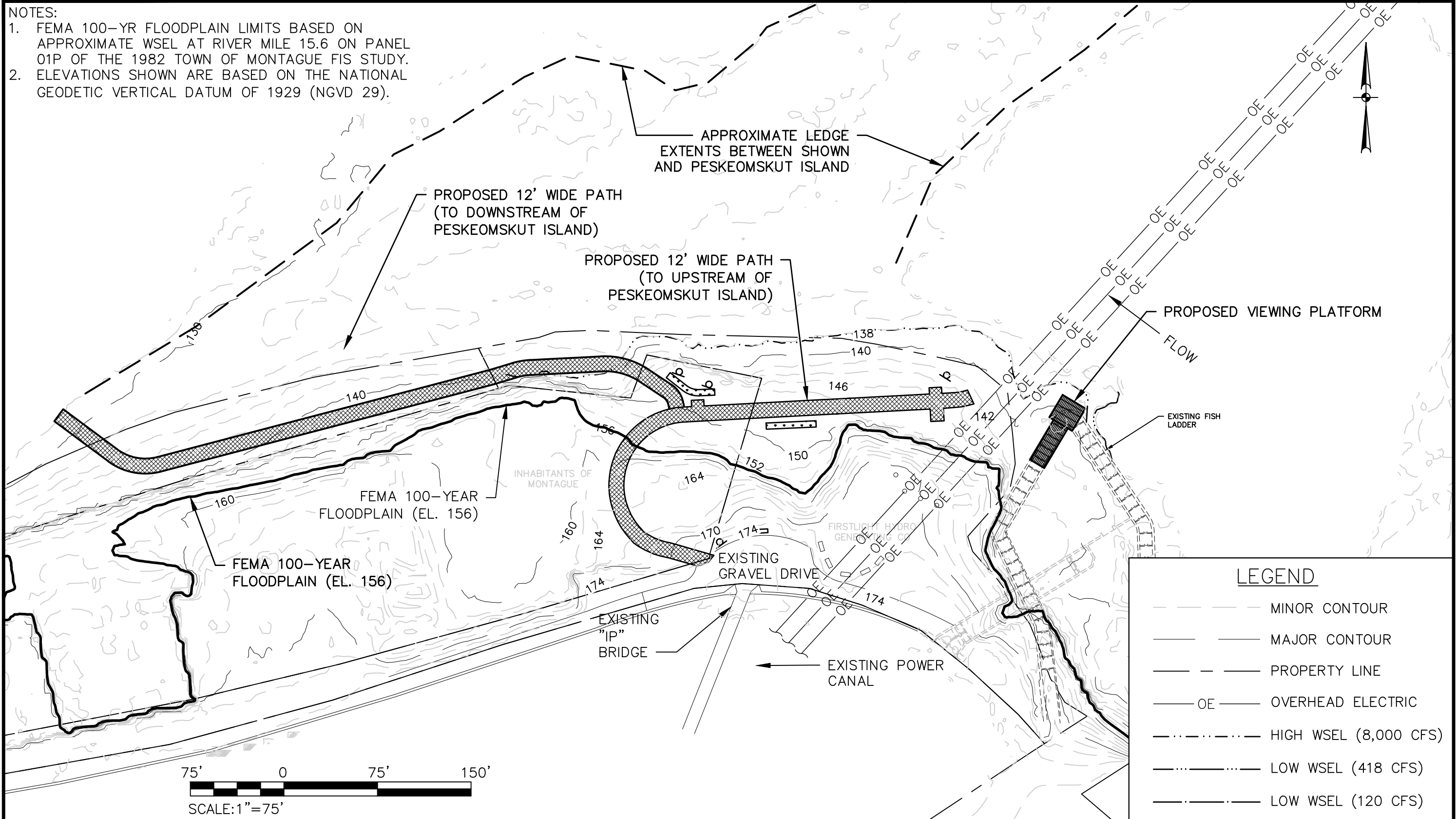
CONCEPTUAL LAYOUT OF TWO PUT-INS BELOW TURNERS FALLS DAM
 (PUT-IN UPSTREAM OF PESKEOMSKUT ISLAND)

SCALE: 1" = 40' DRAWING NO.: 6.1.5-1

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

NOTES:

1. FEMA 100-YR FLOODPLAIN LIMITS BASED ON APPROXIMATE WSEL AT RIVER MILE 15.6 ON PANEL 01P OF THE 1982 TOWN OF MONTAGUE FIS STUDY.
2. ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).



NO.	DATE	DESCRIPTION	BY	APP

FOR: **FirstLight**

BY: **GOMEZ AND SULLIVAN ENGINEERS**
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
 www.gomezandsullivan.com

DESIGNED BY: KJC
 DRAWN BY: JSC
 CHECKED BY: KJC
 APPROVED BY: -
 PROJECT NO.: 1490
 DATE: 5-3-22

AMENDED FINAL LICENSE APPLICATION

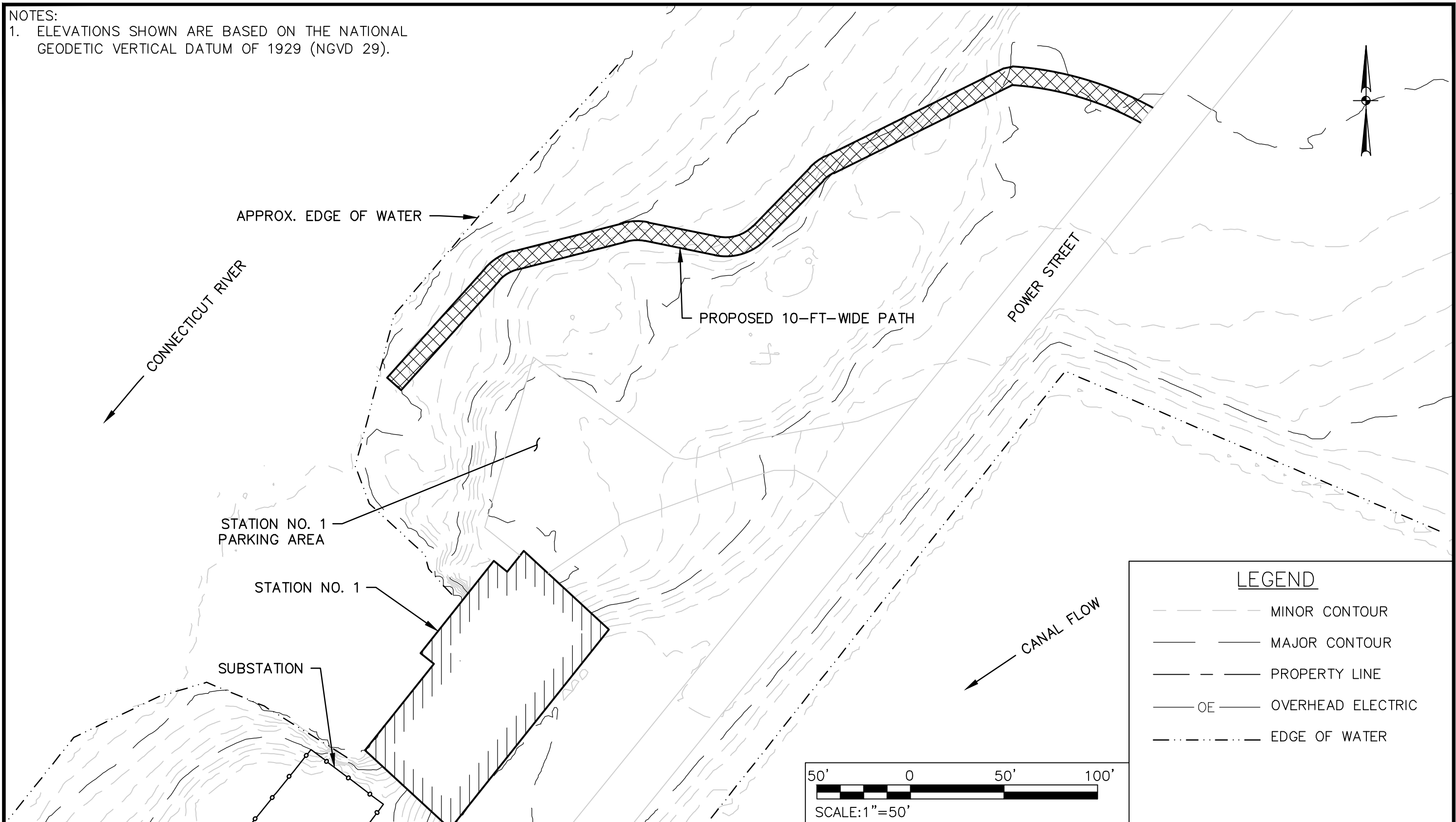
**CONCEPTUAL LAYOUT OF TWO PUT-INS BELOW TURNERS FALLS DAM
 (PUT-IN DOWNSTREAM OF PESKEOMSKUT ISLAND)**

SCALE: 1" = 75' DRAWING NO.: 6.1.5-2

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

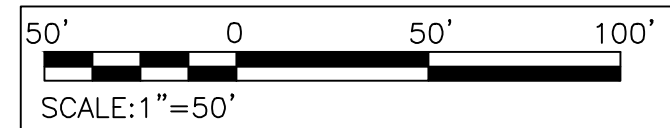
NOTES:

- ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).



LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- — — PROPERTY LINE
- OE — OVERHEAD ELECTRIC
- - - - - EDGE OF WATER



NO.	DATE	DESCRIPTION	BY	APP

FOR: **FirstLight**

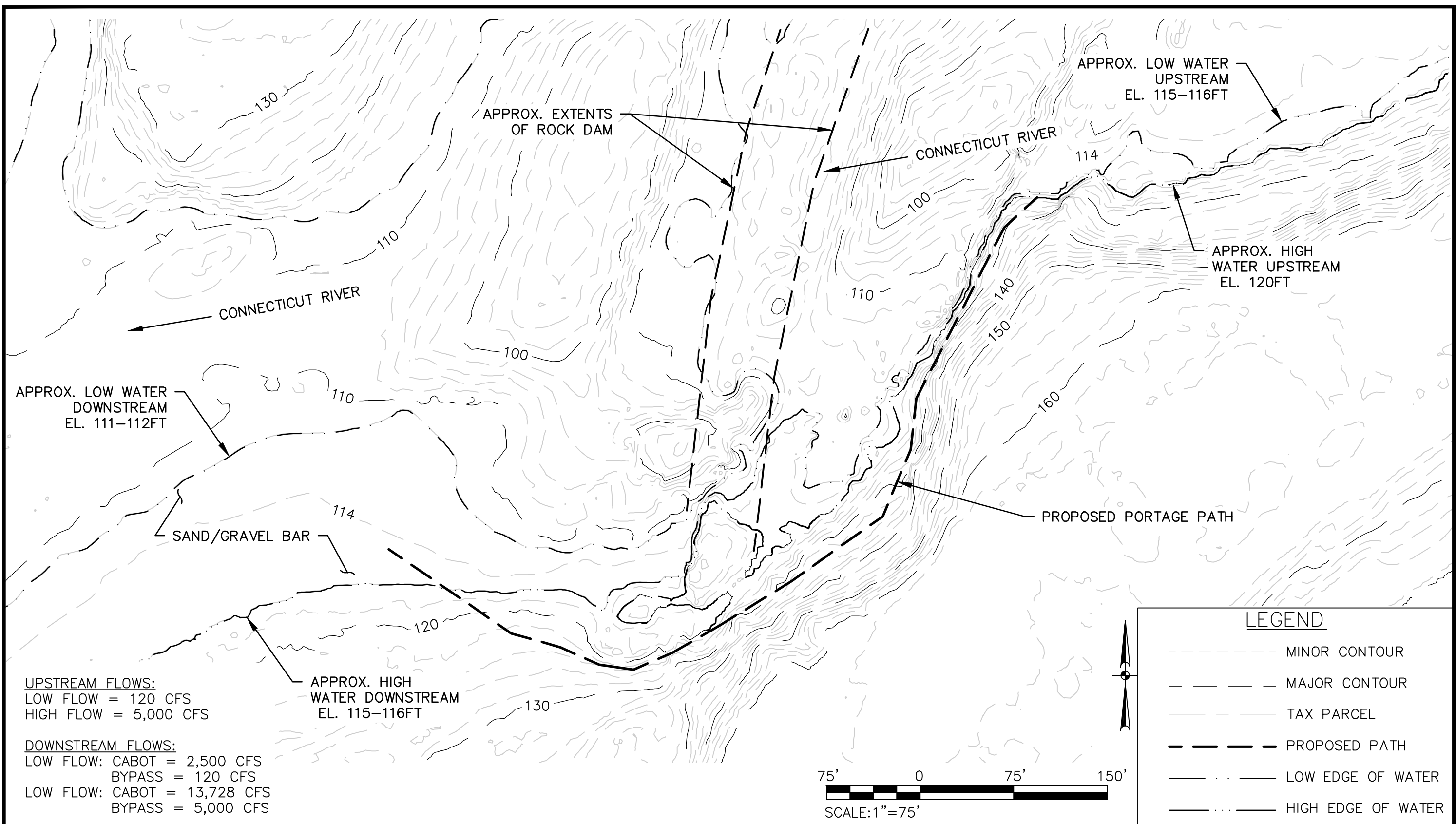
BY: **GOMEZ AND SULLIVAN ENGINEERS**
Williamsville, NY Utica, NY Albany, NY Henniker, NH
 www.gomezandsullivan.com

DESIGNED BY:	KJC
DRAWN BY:	JSC
CHECKED BY:	KJC
APPROVED BY:	-
PROJECT NO.:	1490
DATE:	3-1-23

CONCEPTUAL LAYOUT OF ACCESS TRAIL AT STATION NO. 1

SCALE:	1" = 50'	DRAWING NO.:	6.1.7-1
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IT IS A VIOLATION OF THE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANYWAY UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ALTERATIONS MUST HAVE THE ENGINEER'S SEAL AFFIXED ALONG WITH A DESCRIPTION OF THE ALTERATION, THE SIGNATURE AND DATE.



UPSTREAM FLOWS:
 LOW FLOW = 120 CFS
 HIGH FLOW = 5,000 CFS

DOWNSTREAM FLOWS:
 LOW FLOW: CABOT = 2,500 CFS
 BYPASS = 120 CFS
 LOW FLOW: CABOT = 13,728 CFS
 BYPASS = 5,000 CFS

NO.	DATE	DESCRIPTION	BY	APP

FOR: 

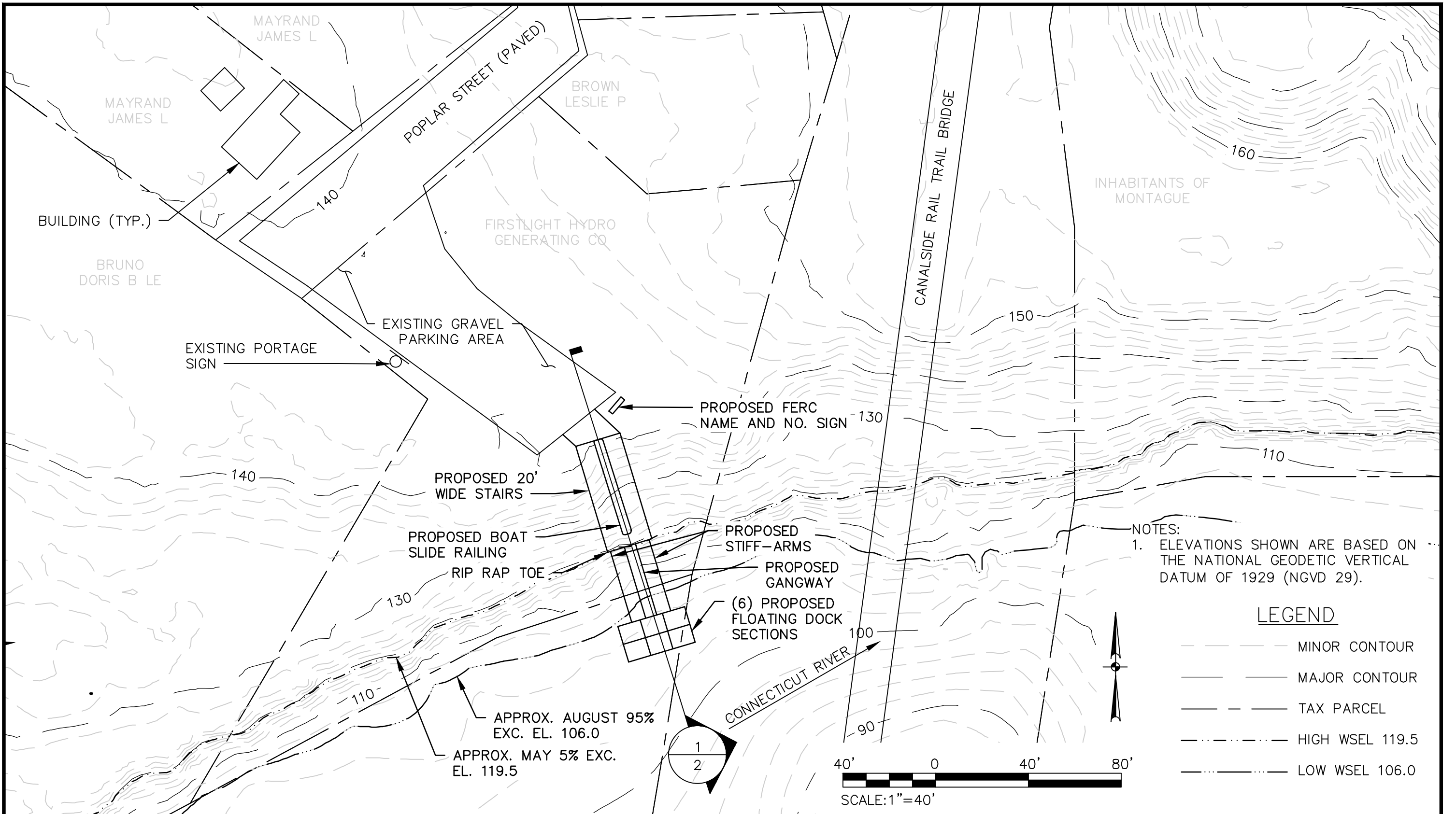
BY: 
 Williamsville, NY Utica, NY Albany, NY Henniker, NH
 www.gomezandsullivan.com

DESIGNED BY: KJC
 DRAWN BY: JSC
 CHECKED BY: KJC
 APPROVED BY: -
 PROJECT NO.: 1490
 DATE: 3-1-23

**CONCEPTUAL LAYOUT OF PORTAGE TRAIL
 AROUND ROCK DAM**

SCALE: 1" = 75' DRAWING NO.: 6.1.9-1

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



NOTES:
 1. ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).

LEGEND

	MINOR CONTOUR
	MAJOR CONTOUR
	TAX PARCEL
	HIGH WSEL 119.5
	LOW WSEL 106.0

NO.	DATE	DESCRIPTION	BY	APP

FOR:

BY:

Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
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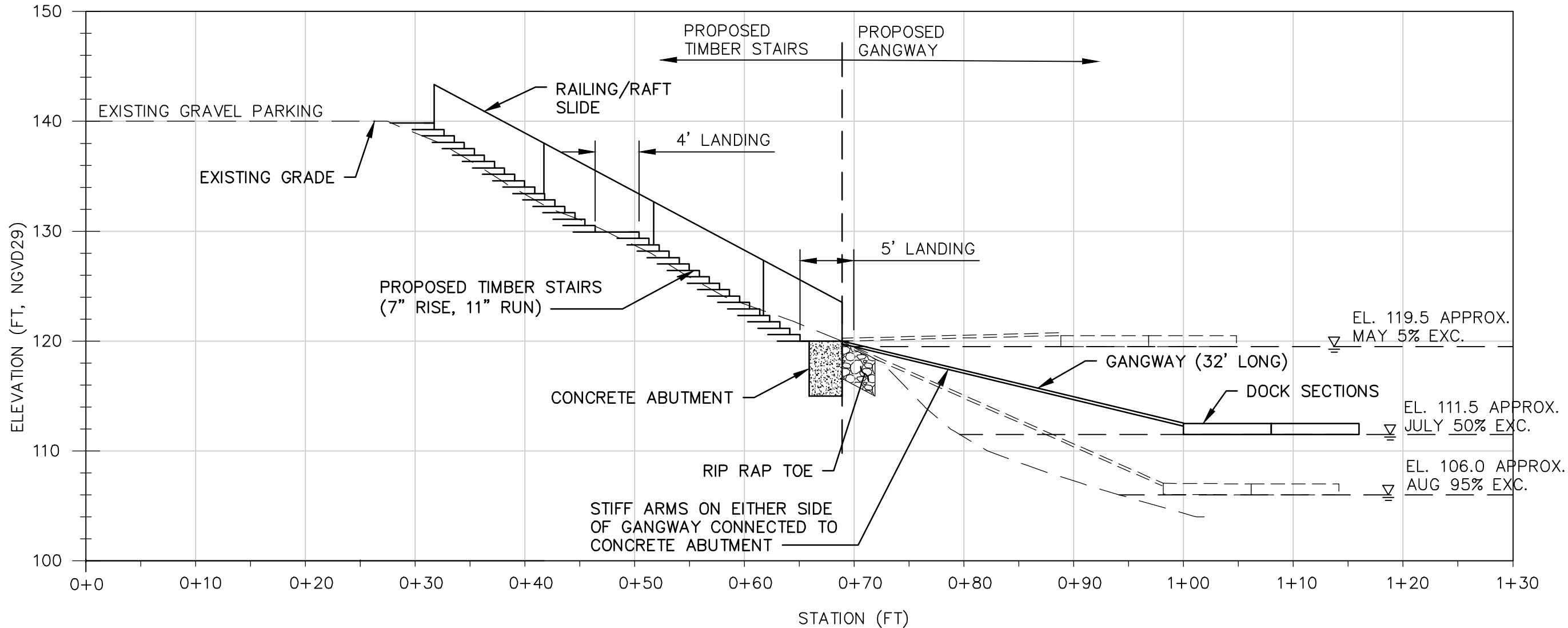
DESIGNED BY:	KJC
DRAWN BY:	KJC
CHECKED BY:	RLS
APPROVED BY:	-
PROJECT NO.:	1490
DATE:	4-9-20

AMENDED FINAL LICENSE APPLICATION

CONCEPTUAL LAYOUT OF POPLAR STREET TAKE-OUT

SCALE:	1" = 40'	DRAWING NO.:	6.1.10-1
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IT IS A VIOLATION OF THE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANYWAY UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ALTERATIONS MUST HAVE THE ENGINEER'S SEAL AFFIXED ALONG WITH A DESCRIPTION OF THE ALTERATION, THE SIGNATURE AND DATE.



NOTES:
 1. ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).

1 STAIR PROFILE
 2 SCALE: 1" = 10'



NO.	DATE	DESCRIPTION	BY	APP

FOR: 

BY: 
 Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
 www.gomezandsullivan.com

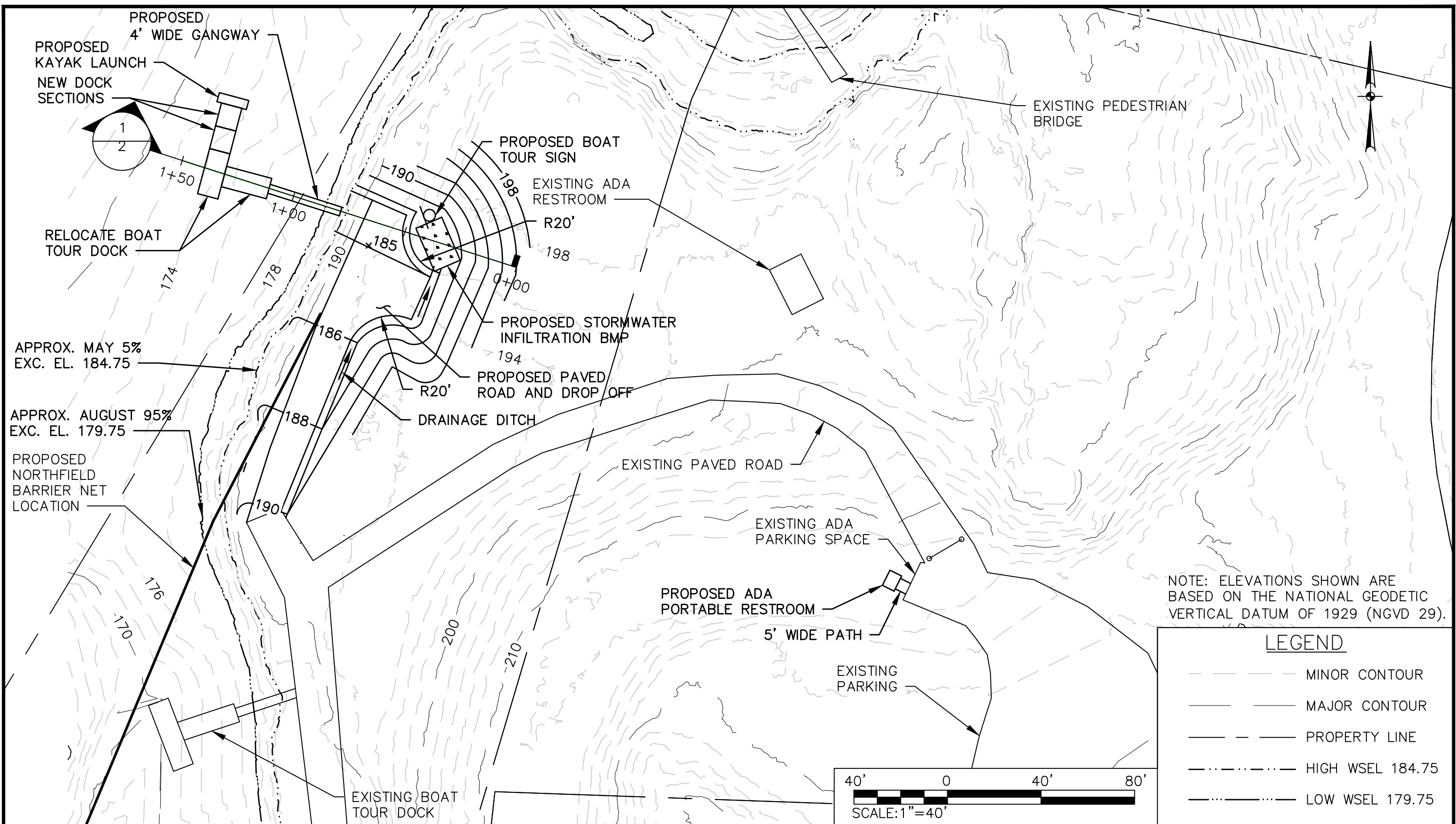
DESIGNED BY: KJC
 DRAWN BY: KJC
 CHECKED BY: RLS
 APPROVED BY: -
 PROJECT NO.: 1490
 DATE: 4-9-20

AMENDED FINAL LICENSE APPLICATION

CONCEPTUAL PROFILE OF POPLAR STREET TAKE-OUT

SCALE: 1" = 10' DRAWING NO.: 6.1.10-2

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



NOTE: ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).

LEGEND	
	MINOR CONTOUR
	MAJOR CONTOUR
	PROPERTY LINE
	HIGH WSEL 184.75
	LOW WSEL 179.75

NO.	DATE	DESCRIPTION	BY	APP

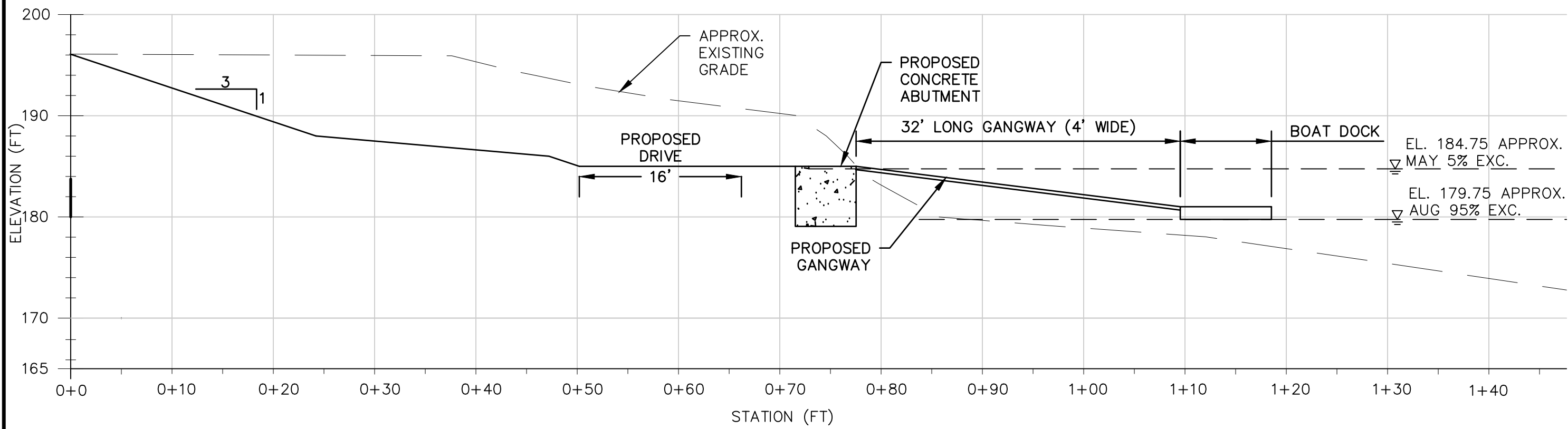
FOR: **FirstLight**

BY: **GOMEZ AND SULLIVAN ENGINEERS**
Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH
 www.gomezandsullivan.com

DESIGNED BY: KJC
DRAWN BY: KJC
CHECKED BY: RLS
APPROVED BY: -
PROJECT NO.: 1490
DATE: 02-19-20

AMENDED FINAL LICENSE APPLICATION	
RIVERVIEW - BOAT TOUR DOCK RELOCATION - PLAN	
SCALE: 1" = 40'	DRAWING NO.: 6.2.2-1

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



1 BOAT DOCK PROFILE
2 SCALE: 1" = 10'

NOTE: ELEVATIONS SHOWN ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29).



NO.	DATE	DESCRIPTION	BY	APP

FOR:		DESIGNED BY: KJC
BY:		DRAWN BY: KJC
	Williamsville, NY • Utica, NY • Albany, NY • Henniker, NH www.gomezandsullivan.com	CHECKED BY: RLS
		APPROVED BY: -
		PROJECT NO.: 1490
		DATE: 02-19-20

AMENDED FINAL LICENSE APPLICATION	
RIVERVIEW - BOAT TOUR DOCK RELOCATION - PROFILE	
SCALE: 1" = 10'	DRAWING NO.: 6.2.2-2

7 IMPLEMENTATION SCHEDULE FOR RECREATION MODIFICATIONS AND UPGRADES

There are many new recreation features associated with the Turners Falls and Northfield Mountain Projects. FirstLight will complete construction of the proposed and upgraded recreation facilities within six (6) years of license issuance. [Table 7.0-1](#) lists FirstLight's new and upgraded recreation protection, mitigation, and enhancement (PM&E) measures including the number of years after license issuance the recreation feature will become operational.

Table 7.0-1. Recreation Implementation Schedule

Feature	Year after License Issuance Feature becomes Operational					
	1	2	3	4	5	6
Updates to Recreation Management Plan	completed					
Compliance with American with Disabilities Act	x	x	x	x	x	x
Donate Used Sporting Equipment	when available					
Establish Conservation Easements/Restrictions (details in Year 2, implementation in Year 6)		x				x
Install Interpretive Signage at Cabot Woods (Rock Dam) and at the Put-in below Turners Falls Dam		x	x			
Turners Falls Project						
Establish Flow and Water Level Notification Website	x					
Disposition of Cabot Camp Historic Structures			x			
Construct Pocket Park			x			
Construct Mallory Brook Campsite			x			
Construct Formal Access Trail and Put-In at Cabot Camp				x		
Construct Car-Top Access at North End of Unity Park and Reconfigure Parking Lot (locking canoes and kayaks)					x	
¹ Construct River Access and Two Put-Ins just below Turners Falls Dam			x			
¹ Construct Viewing Platform and Picnic Area just below Turners Falls Dam					x	
Construct River Access Trail at Station No. 1			x			
Install Stairs at the Cabot Woods Fishing Access		x				
Construct Portage Trail around Rock Dam (trail to be marked in Year 1 after consultation)					x	
Improve Poplar Street River Access/Take-Out			x			
Northfield Mountain Project						
Construct Bennett Meadow Trail	x					
Construct Riverview Improvements (Docks)				x		
Construct New Mountain Biking Trails at Northfield Mountain					x	
Construct Barton Cove Campsite			x			
Establish Rose Ledges as a Project Recreation Facility		x				
Implement Barton Cove Improvements (locking canoes and kayaks)	x					

¹These facilities will be constructed prior to Year 9 when the Spillway Lift will be completed. The facilities may be temporarily disturbed during the Spillway Lift construction.

8 MANAGEMENT AND MAINTENANCE MEASURES FOR PROJECT RECREATION SITES

FirstLight will continue to operate and maintain the existing Project Recreation Sites, as well as the new Project Recreation Sites. [Table 8.0-1](#) and [Table 8.0-2](#) identifies the amenities at the Turners Falls Project and Northfield Mountain Project Recreation Sites, respectively, that are governed by the management and maintenance measures discussed herein. Note that some of the maintenance measures only apply to the Northfield Mountain Project, which are called out below.

8.1 Access Roads and Parking Areas

Access roads and parking areas with paved or gravel surfaces will be inspected prior to the beginning of the summer recreation season and periodically over the course of the operating season. If an issue with the condition of a road or paved surface is noted, a plan to repair the road will be developed and action will be taken. If the road condition is unsafe, it will be closed until repairs can be made. Parking lots shall be maintained and re-graded as needed over the course of the year to ensure the public's ability to use them safely.

8.2 Boat Docks

Prior to installation, boat docks will be inspected. The inspection will include access ramps, docks, deck surface, hardware, and other components. If a problem is noted, plans to repair, or replace the docks will be developed and implemented. Docks will be periodically inspected during the operating season. In the case of the Poplar Street dock access, during the boating season the steps leading to the floating dock may need to be maintained/cleaned from excess sediment build-up.

8.3 Picnic Areas

Picnic areas will be inspected prior to the beginning of the summer recreation season to ensure that the sites are free of debris. Amenities such as picnic tables, grills, and benches will be reviewed for vandalism and condition prior to opening of the sites. Excess vegetation will be removed as needed. If an issue with the amenities arises, a plan to repair or replace the amenity will be developed and implemented. If recreationists note an issue at a facility, an inspection will occur to determine if actions are needed.

8.4 Campsites

Campsites will be inspected prior to opening to assure that the sites are free of debris. Amenities such as picnic tables, grills, and fire rings will be reviewed for vandalism and condition prior to opening of the sites. Excess vegetation will be removed as needed. If an issue with the amenities arises, a plan to repair or replace the amenity will be developed and implemented. If recreationists note an issue at a facility, an inspection will occur to determine if actions are needed.

For the two new primitive campsites at Mallory Brook and Barton Cove, subject to a maintenance agreement, AMC, or its designee, will inspect the facilities at the beginning of the camping season and maintain the campsites throughout the season. AMC, or its designee, will be responsible for notifying FirstLight upon completion of its inspection and indicate what, if any, repairs are needed or if equipment replacement is needed. FirstLight will be responsible for major repairs to the two campsites and replacing equipment, specifically tent platforms, stairs (if applicable) and moldering privy.

8.5 Restrooms

Project Recreation Sites containing restroom facilities will be inspected prior to opening to assure that they are clean and functioning properly. These facilities will be maintained on a regular basis. Vault toilets and portable restroom facilities will be pumped out as necessary to maintain sanitary conditions. If a problem with the structure or facility is noted, it may be closed to execute needed repairs. Restrooms will be inspected on a routine basis and repairs or maintenance will be performed as issues arise. Any portable toilets will be well maintained and monitored for signs of abuse and shall be accessible in design.

8.6 Shower Facilities (Northfield Mountain Project)

Shower facilities will be inspected prior to opening to assure that they are clean and functioning properly. These facilities will be maintained on a regular basis and will be inspected on a routine basis. Repairs or maintenance will be performed as issues arise. If a problem with the structure or facility is noted, it may be closed to execute needed repairs.

8.7 Signs

All signs posted at points of public access to the Project as required by 18 CFR Section 8.2 (known as Part 8 signs) and public safety signs at recreation sites will be inspected and repaired prior to the beginning of the summer recreation season. This inspection will include the condition of the sign and a review of presented information to ensure that it is appropriate and legible. If an issue with the sign is noted or reported the sign will be scheduled for repair or replacement.

8.8 Buildings and Other Structures

Buildings and other structures that are part of the Project Recreation Sites will be maintained and cleaned on a regular basis during the operating season. Structures will be inspected annually and if a structure requires repair, it may be closed until the repairs are complete.

8.9 Trails

All access trails will be inspected on an annual basis to determine if there are existing safety hazards. If an issue is observed FirstLight will establish a plan to correct the issue and execute the plan.

Northfield Mountain Project

The NMTTC trail system, Barton Cove Nature Trail, and Bennett Meadow Trail will be inspected on a routine basis to determine if there is a need for maintenance to the trail tread or drainage, as well as the need for trail clearing or grading. The trail system will be routinely inspected for potential damaged or hazard trees. If an issue is reported or observed, a plan to correct the issue will be developed and implemented.

In the winter, trails at Northfield Mountain will be maintained for cross-country skiing when snow is present.

8.10 FirstLight Heritage Riverboat (Northfield Mountain Project)

The Heritage will be maintained and operated in accordance with Federal (including U.S. Coast Guard), State, and Local, laws and regulations.

8.11 Non-Motorized Boat Put-Ins/Take-Outs

Non-motorized boat put-ins/take-outs will be inspected for condition prior to the beginning of the summer recreation season and periodically over the course of the operating season. If an issue with the condition of the put-in/take-out is noted, a plan to repair the site will be developed and action will be taken. If recreationists note an issue at a put-in/take-out, an inspection will occur to determine if actions are needed.

RECREATION MANAGEMENT PLAN

Table 8.0-1. Amenities at Turners Falls Project Recreation Sites to which Management and Maintenance Measures Apply

Project Recreation Site	Management and Maintenance Measures								
	Access Roads and Parking Areas	Boat Docks	Picnic Areas	Campsites	Restrooms	Signs	Buildings and Other Structures	Trails	Non-motorized Boat Put-ins/Take-Outs
Construct Pocket Park			✓			✓			
Construct Mallory Brook Campsite				✓ (Maintenance by AMC, or its designee)					
Construct Formal Access Trail and Put-in at Cabot Camp	✓		✓		✓ (Porta-potty)				✓
Construct Car-Top Access at North End of Unity Park and Reconfigure Parking Lot	✓					✓	✓ Lockers/racks for canoes	✓	✓
Gatehouse Fishway Viewing Area	✓		✓		✓	✓	✓		
Construct River Access and Two Put-Ins below Turners Falls Dam						✓		✓	✓
Construct Viewing Platform and Picnic Area just below Turners Falls Dam			✓			✓	✓	✓	
Construct River Access Trail at Station No. 1						✓		✓	✓
Turners Falls Branch Canal Area							✓		
Install Stairs at the Cabot Woods Fishing Access	✓		✓			✓			
Construct Portage Trail around Rock Dam						✓		✓	
Turners Falls Canoe Portage	✓					✓			✓
Improve Poplar Street Access	✓	✓			✓ (Porta-potty)	✓			✓
Install Interpretive Cultural Signs at Key Locations						✓			

RECREATION MANAGEMENT PLAN

Table 8.0-2. Amenities at Northfield Project Recreation Sites to which Management and Maintenance Measures Apply

Project Recreation Site	Management and Maintenance Measures										Non-motorized Boat Put-ins/Take-Outs
	Access Roads and Parking Areas	Boat Docks	Picnic Areas	Campsites	Restrooms	Shower Facilities	Signs	Buildings and Other Structures	Trails	Riverboat	
Munn's Ferry Boat Camping Recreation Area		✓	✓	✓	✓		✓	✓			✓
Construct Bennett Meadow Trail							✓		✓		
Boat Tour and Riverview Picnic Area	✓	✓	✓		✓		✓	✓		✓	✓
Construct Riverview Improvements (docks)	✓	✓					✓				✓
Construct New Mountain Biking Trails at Northfield Mountain							✓		✓		
Construct Barton Cove Campsite				✓ (Maintenance by AMC, or its designee)			✓				
Northfield Mountain Tour and Trail Center	✓		✓		✓		✓	✓	✓		
Establish Rose Ledge as a Project Recreation Facility									✓		
Barton Cove Nature Area and Campground	✓	✓	✓	✓	✓	✓	✓		✓		✓
Barton Cove Canoe and Kayak Rental Area	✓		✓		✓		✓	✓			✓
Implement Barton Cove Improvements (locking canoes and kayaks)							✓	✓ (Locking canoes)			
Install Interpretive Cultural Signs at Key Locations							✓				

9 FEES

FirstLight will provide free access to Project waters and undeveloped Project Lands. FERC allows FirstLight to collect fees at Project-developed Recreation Sites to help defray the cost of constructing, operating, and maintaining such facilities. FERC does not allow FirstLight to earn a profit on recreation amenities it offers. FirstLight currently does not charge fees for many of its existing recreation features but may do so for new recreation features to offset operating and maintenance costs. Over the term of the new license, FirstLight may choose to implement reasonable fees to offset rising costs in labor and utilities; changes in operation; or to offset the costs of operating and maintenance costs at the Project Recreation Sites and capital recreation investments. FirstLight will not charge fees at recreation facilities that provide sole direct access to Project waters or undeveloped Project lands unless FirstLight is required to provide additional amenities or services not currently contemplated.

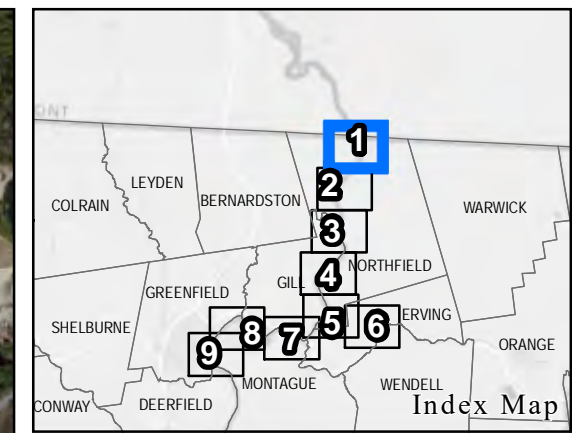
FirstLight will develop a schedule for reduced or no fees for residents in the host towns and Franklin County. No fees will be imposed without consultation with host community officials.

10 LITERATURE CITED

FirstLight (2014). Initial Study Report Summary Relicensing Study 3.6.2 Recreation Facilities Inventory and Assessment. Prepared for FirstLight Hydro Generating Company.

FirstLight (2015). Relicensing Study 3.6.2 Recreation Facilities Inventory and Assessment Addendum. Prepared for FirstLight Power Resources. Northfield, MA.

**11 APPENDIX A: MAPS SHOWING FIRSTLIGHT LANDS TO BE
PLACED INTO CONSERVATION RESTRICTION**



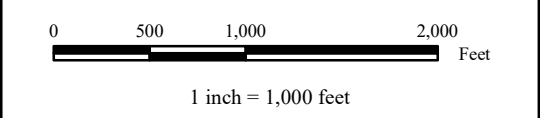
FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 1

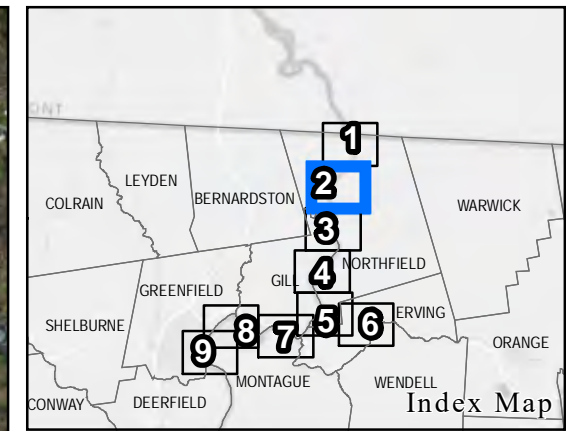
Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community



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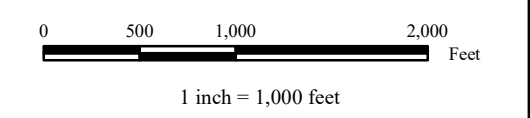
FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 2

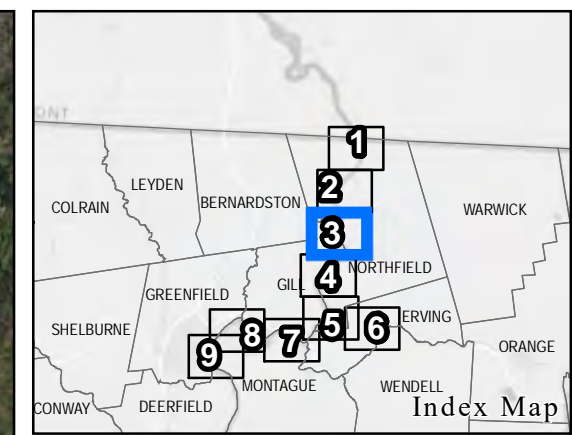
Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community



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FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

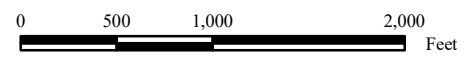
Appendix A:
 Conservation Easement/Restriction Areas
 Map 3

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)



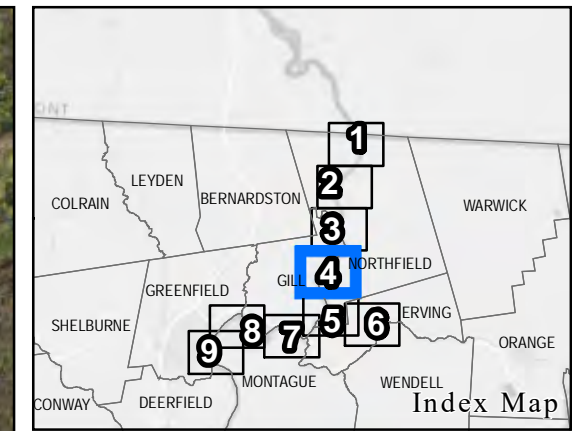
Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community



1 inch = 1,000 feet



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FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 4

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

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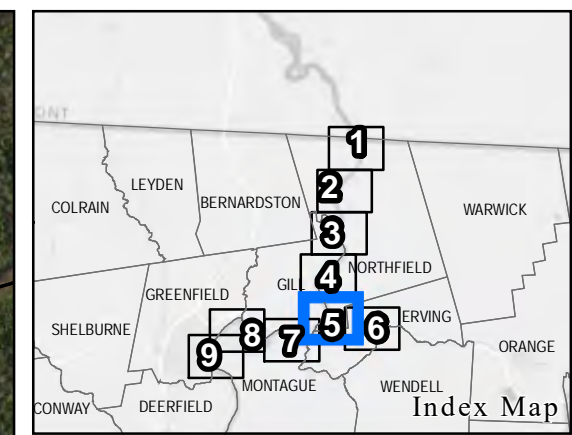
Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community

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 Feet

1 inch = 1,000 feet

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 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 5

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

N

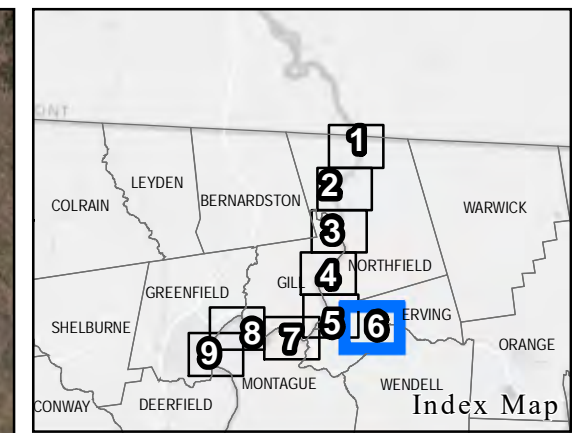
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 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community

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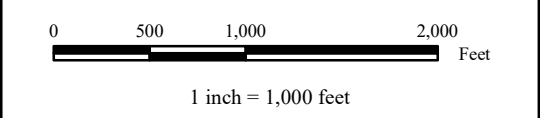
FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 6

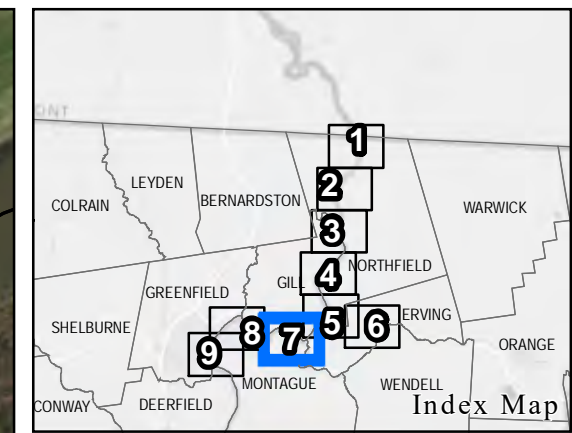
Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

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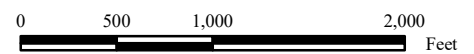
Appendix A:
 Conservation Easement/Restriction Areas
 Map 7

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)



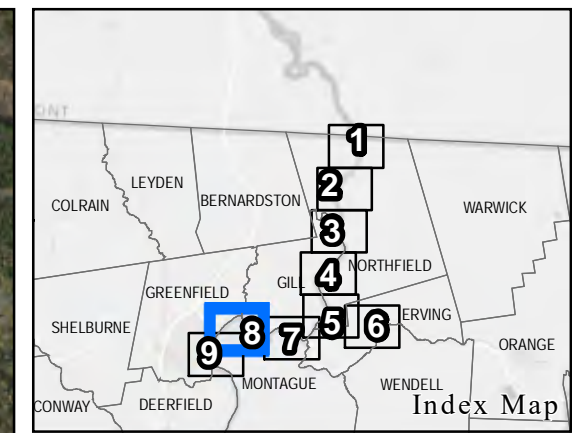
Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
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1 inch = 1,000 feet



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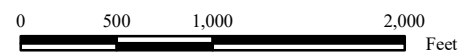
Appendix A:
 Conservation Easement/Restriction Areas
 Map 8

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)



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 Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community

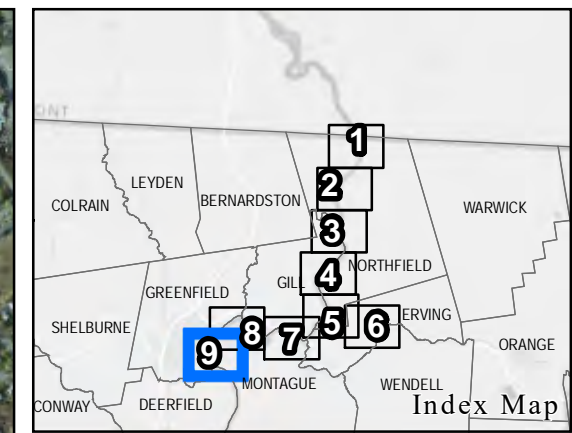


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1 inch = 1,000 feet



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FIRSTLIGHT HYDRO GENERATING COMPANY
 Northfield Mountain Pumped Storage Project No. 2485
 Turners Falls Hydroelectric Project No. 1889

Appendix A:
 Conservation Easement/Restriction Areas
 Map 9

Legend

- Conservation Easements/Restrictions
- Conservation Easements/Restrictions (Subdivided Parcel)

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Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
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 Feet

1 inch = 1,000 feet

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APPENDIX C: CONSULTATION RECORD

Consultation Timeline

Date	Action
12/12/19	Draft Outline of BA sent to USFWS
12/16/19	Conference call between FirstLight and USFWS on Draft BA Outline
01/09/20	FirstLight sent USFWS preliminary Draft BA
06/02/20	Conference call between FirstLight and USFWS on Draft BA
08/27/20	USFWS provides written comments to FirstLight on Draft BA (USFWS written comments and FirstLight's responses are below)
03/31/23	FirstLight files Flow and Fish Passage Settlement reflecting changes in Project operations.
09/28/23	FirstLight sent USFWS revised Draft BA reflecting Project operations in the Flow and Fish Passage Settlement Agreement
02/12/24	USFWS provides written comments to FirstLight on Draft BA (USFWS written comments and FirstLight's responses are below)

Response to USFWS Comments on January 9, 2020 Draft

FirstLight provided a draft of this Draft BA to the USFWS on January 9, 2020. FirstLight met with the USFWS on June 2, 2020 to discuss the draft. On August 27, 2020, the USFWS provided written comments on the draft. FirstLight's responses to these comments are provided below. USFWS comments are included in italic text and FirstLight's responses are in bold.

1.2 Federally Listed Species Considered in this Biological Assessment

Northern Long-Eared Bat

USFWS Comment 1:

FirstLight proposes to implement a seasonal tree clearing restriction for trees greater than 3 inches diameter at breast height, between June 1 and July 31, to avoid the time period when the northern long-eared bat may be occupying nearby roost trees. FirstLight states this measure would result in the Project having no effect on the species.

Although the proposed measure is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO) and associated 4(d) rule, it still may result in adverse effects. While the time-of-year restriction for tree clearing to occur outside of June and July reduces the likelihood of adverse effects on adult and flightless young, it does not avoid all adverse effects. The northern long-eared bat is active from approximately April 1 through October 31, so a time-of-year restriction for tree clearing activities that avoids this active period would be needed to avoid direct adverse effects to northern long-eared bats.

Additionally, on January 28, 2020, the U.S. District Court for the District of Columbia remanded the Service's listing decision for the northern long-eared bat. The Service is in the process of reconsidering our listing decision. While the species' threatened status and 4(d) rule remain in place during this process, both could change as a result of the Service's status review for the northern long-eared bat. Any change in the 4(d) rule could necessitate reinitiation of consultation under section 7 of the ESA. Therefore, the Service recommends that FirstLight, as the non-Federal representative of the Federal Energy Regulatory Commission, consult on the northern long-eared bat as if the 4(d) rule were not in place.

FirstLight's Response:

In response to the USFWS comments, and the updated listing of the Northern Long-Eared Bat to Endangered Status, FirstLight has expanded proposed restrictions for tree clearing activities to span April 1 through October 31. These measures are included in Section 1.2 of the Draft BA, are consistent with the protection of endangered bat species, and would limit the potential effects of the Project on Northern Long-Eared Bat.

3.5 Proposed Environmental Measures

USFWS Comment 2:

FirstLight proposes to provide eight recreational whitewater boating flow releases from the Turners Falls Dam, ranging from 2,500 cubic feet per second (cfs) up to 5,000 cfs for a duration of 4 hours per event. Five of these releases are proposed to occur during the active period for the Puritan tiger beetle (PTB). The DBA should include an analysis of potential impacts of these releases on water levels at Rainbow Beach (i.e., timing, duration, level of inundation, etc.).

FirstLight’s Response:

As part of the FirstLight’s relicensing proposal, FirstLight plans to implement a schedule of whitewater releases from the Turners Falls Dam, nearly 28 miles upstream of Rainbow Beach. These releases would be contingent on the Natural Routed Flow (NRF) inflow to the Turners Falls Impoundment being equal to or greater than the releases. Five of the releases would occur on Saturdays during the adult active period for PTB during July, August, and September, and three other releases would occur in October as shown in the table below.

FirstLight is also proposing higher minimum flow releases from the Turners Falls Dam and from Station No. 1, which is located 1.1 miles downstream of the Turners Falls Dam ([Table C-1](#)). With these minimum flows being provided, FirstLight would need to release only 700 cfs of additional flow to the bypass reach to provide the whitewater releases during July and August. An increase in 700 cfs in the bypass reach would result in miniscule effects at Rainbow Beach once the flow joins other likely flows from Station No. 1, Cabot Station, and is attenuated over such a long distance downstream. In September when proposed whitewater releases are 3,500 cfs for 4 hours, 2,000 cfs of additional flow would be required to be released to the bypass reach. It is anticipated that Cabot Station will need to reduce generation by one unit to provide the whitewater flow release at the dam. Thus, the flow in the river below the Project would be similar during the whitewater release as it was prior to the release (since the releases are contingent on the NRF), and there would be minimal, if any, effects of water level fluctuations at Rainbow Beach.

Synthetic hydrograph modeling conducted by FirstLight as described in Section 6.1 and Appendices B and C, estimated that with a baseflow of 2,000 cfs and 4 hours of 2 unit generation (4,576 cfs) at Cabot, the maximum water surface elevation increase at Rainbow Beach would be between 0.2 and 0.3 feet. The added distance of the releases for the whitewater flows (Turners Falls Dam) and since a large portion of the releases would be instead of the bypass flows, very limited effects are likely 28 miles downstream at Rainbow Beach.

Table C-1: Proposed Whitewater Releases and Bypass Reach Minimum Flows

<i>Date</i>	<i>Turners Falls Dam Magnitude of Discharge (or NRF whichever is less)</i>	<i>Turners Falls Dam Release Duration</i>	<i>Proposed Bypass Flow (TFD and Station No.1)</i>	<i>Difference in bypass flow and WW flow</i>	<i>Hours of single unit at Cabot Station to make up the difference.</i>
<i>1 Saturday in July</i>	<i>2,500 cfs</i>	<i>4 hours</i>	<i>1,800</i>	<i>700 cfs</i>	<i>1.2</i>
<i>1 Saturday in August</i>	<i>2,500 cfs</i>	<i>4 hours</i>	<i>1,800</i>	<i>700 cfs</i>	<i>1.2</i>
<i>3 Saturdays in September</i>	<i>3,500 cfs</i>	<i>4 hours</i>	<i>1,500</i>	<i>2,000 cfs</i>	<i>3.5</i>
<i>1 Saturday in October</i>	<i>3,500 cfs</i>	<i>4 hours</i>	<i>1,500</i>	<i>2,000 cfs</i>	<i>3.5</i>
<i>2 Saturdays in October</i>	<i>5,000 cfs</i>	<i>4 hours</i>	<i>1,500</i>	<i>3,500 cfs</i>	<i>6.1</i>

NOTE: The proposed whitewater releases and bypass reach minimum flows above have been replaced by the F/F Agreement.

4.2.1 Ongoing Activities

USFWS Comment 3

FirstLight states that observations made during relicensing studies by FirstLight’s consultants confirmed recreational use at Rainbow Beach is still occurring in a similar manner reported by Abbott (2003). Please provide any available documentation of these observations including date and time of the observations, photographs, field notes, and comparison of observed activities with those described in previous reports. In addition, if available, please provide the date and time of day the photos shown in Figures 4.2.1-1 and 4.2.1-2 were taken.

FirstLight’s Response:

Due to the prevalence of social media, there is extensive information available on the amount and type of recreational activities occurring on Rainbow Beach. Figures 4.2.1-1 and 4.2.1-2 in the draft BA are screenshots of a YouTube video, which was titled “Rainbow beach on the Connecticut River Northampton mass July 4 2016”.³⁰ The video included drone footage and the time of day the footage was taken is not known. The footage shows a footprint-covered beach with groups of people positioned up and down the beach and many boats pulled up to the water-land interface. There were also many boats passing beyond the beach at high rates of speed, with boat wakes evident through much of the video. The people on the beach were performing a variety of activities, such as walking on the beach, playing lawn/beach games, playing with dogs, and relaxing on lawn chairs either in the sun or under tents or sunshades that had been pitched. Most people on the beach were recreating close to the water-land interface, though people were observed in the video up to the vegetation, and footprints suggest a broad use of Rainbow Beach.

Though this footage was taken on a holiday when recreational activity was expected to be high, a search of social media indicates that extensive recreation on the beach is common during the daytime from May through September.³¹ Photos pulled from Facebook from 2010 through 2020 that show evidence of extensive recreation on the beach are provided in Attachment 1. During interviews with reporters, local law enforcement officials have stated that there could be 1,000 people or more using Rainbow Beach on Saturdays and Sundays in 2020, with recent increases in observed boating and recreation caused by the COVID-19 pandemic.³²

Abbott (2003) reported the greatest number of boats and people at Rainbow Beach in the afternoon hours when compared to midday and morning. In the afternoon on weekends, an average of 103.5 people and 26.7 boats were observed on six visits between June 28 and August 14, 2003. This is in comparison to 20.4 people and 4.4 boats in the afternoon on weekdays (n=14) during the same period. Recreational use was described by Abbott (2003) as being typically concentrated along the shoreline where motorboats and personal watercraft were anchored, and recreational activities observed included sunbathing, grilling food, swimming, walking, running along the shoreline, playing horseshoes, playing catch, and playing volleyball. The recent reports cited above from social media and local law enforcement indicate that these activities are still occurring, though the overall amount of use appears to have increased when compared to observations by Abbott (2003).

The impacts of increased amounts of reported recreation use on Rainbow Beach during the COVID-19 pandemic have not been studied but could have long-term impacts on the Puritan Tiger Beetle population. In the most recent preliminary draft of Gwiazdowski (2020), provided to FirstLight on November 13, 2020, high recreational use of the beach that interfered with surveys was described. Specifically, visitor activity precluded establishing transects at Rainbow Beach on Sunday July 26,

³⁰ <https://www.youtube.com/watch?v=2v2bSRT2H4k>

³¹ [https://www.facebook.com/pages/Rainbow%20Beach%20\(Ct%20River\)/106091049481721](https://www.facebook.com/pages/Rainbow%20Beach%20(Ct%20River)/106091049481721)

³² <https://www.masslive.com/police-fire/2020/08/theres-way-too-many-people-with-more-boat-traffic-than-ever-massachusetts-environmental-police-and-local-officers-team-up-to-patrol-connecticut-river.html>

2020. The site was revisited by Gwiazdowski (2020) on Wednesday/Thursday July 29/30, 2020, during which described much of Quadrat 3 at Transect 2 having human and dog footprints that obscured the sand surface, along with children playing in the transect, and obscuring all sand in Quadrats 1 and 2. In the morning prior to this disturbance of sand, Gwiazdowski (2020) had documented oviposition in Quadrat 2. As such, the disturbance caused by human recreation directly overlapped with critical activities being performed by Puritan Tiger Beetle.

4.2.2 Project-Related Conservation Measures for Puritan Tiger Beetle

USFWS Comment 4:

FirstLight proposed both monthly and daily peaking restrictions to limit water level increases at Rainbow Beach and minimize the potential effects of peaking during the months and times of day when adult PTB typically would be foraging and mating (i.e., during daylight hours). We understand the proposed peaking restrictions from July 1 through August 31 of each year are consistent with current operations and including the restrictions in the proposal would formalize these operations. However, the available information indicates that certain PTB activities, such as oviposition (Gwiazdowski 2020) and adult emergence (Babione 2003), occur outside of daylight hours. In addition, there is new information regarding the location where certain activities occur. Gwiazdowski's (2020) preliminary findings revealed that over 90 percent of oviposition holes were found in Quadrat 1 (the zone near, and below, the wrack line). Lastly, the first through third instar life stages are not encompassed in the monthly peaking restriction period. We recommend FirstLight incorporate this information into the DBA's effects analyses and conclusions relative to the effects of the proposed operational measures on the PTB. Given the importance of the Rainbow Beach population as a component of the species' limited distribution at the northern periphery of its range, we recommend FirstLight consider additional operational measures to minimize Project-related effects on the species and its habitat (e.g., expanding the time period for peaking restrictions to include first through third instar life stages).

FirstLight's Response:

FirstLight concurs with the USFWS that Puritan Tiger Beetle engage in certain activities outside of daylight hours. Specifically, emergence and oviposition by adults. In this Draft BA, FirstLight has appropriately incorporated the best available species- and site-specific data regarding the timing and location that individual Puritan Tiger Beetles perform specific activities.

FirstLight has reviewed Gwiazdowski (2020), including the latest draft provided to FirstLight on November 13, 2020. Gwiazdowski (2020) evaluated the location and timing of Puritan Tiger Beetle oviposition at the primary population in southern Connecticut at Cromwell on the Connecticut River, approximately 58 river miles downstream of Rainbow Beach, in 2019 and 2020. Gwiazdowski (2020) also provided information from one survey at Rainbow Beach in 2020. By visually searching for oviposition holes in the sand, the study found that most Puritan Tiger Beetle were ovipositing primarily below the wrack line at the Cromwell, CT location, within the tidal zone, where the sand was consistently damp (a location defined as Quadrat 1). Oviposition occurred during late afternoon, night, and early morning, with approximately half of oviposition holes made between 1:00am and 6:00am.

FirstLight has determined that the result of Gwiazdowski (2020) finding evidence of oviposition occurring in the intertidal zone is not applicable to Rainbow Beach given the drastic differences in the structure of habitat inhabited by the southern Connecticut population when compared to the Rainbow Beach population. The site in southern Connecticut is a relatively narrow strip of habitat where water levels are driven by daily tidal fluctuations rather than river flow from upstream. These daily tidal fluctuations are more frequent and greater in magnitude than those that occur at Rainbow Beach during the adult active period ([Figure C-1](#) and [Figure C-2](#)), and much of the habitat on the beach becomes inundated due to the tidal cycle. The tidal patterns consistently create a strip of dense,

damp sand that would become exposed twice per day between high tides. In contrast, the habitat at Rainbow Beach consists of a narrow area near the water-land interface that is wetted by waves and boat wakes on short-term time scales (i.e. minute/hourly). The location of the water-land interface at Rainbow Beach can also vary seasonally, daily, and sub-daily depending on the baseflow in the river, flows from the Turners Falls Project, and water levels at Holyoke Dam, as described in FirstLight's analysis. Despite these factors, water levels at Rainbow Beach fluctuate considerably less on a daily and hourly basis than the tidal Connecticut River during the adult active period ([Figure C-1](#) and [Figure C-2](#)).

The habitat structure of Rainbow Beach also differs substantially from the narrow beach in tidal portions of the Connecticut River ([Figure C-3](#)). This difference in habitat structure results in different locations of suitable and selected habitat when the two beaches are compared. When river flows and water levels at Holyoke are low, much of Rainbow Beach is exposed, providing a large area for adult Puritan Tiger Beetle to traverse between the vegetation line and the water-land interface. However, much of Rainbow Beach consists of dry, soft sand that is not suitable for oviposition, egg survival, or for maintaining larval burrows (e.g. Gwiazdowski 2020; Omland 2002). Researchers at Rainbow Beach have documented that adult Puritan Tiger Beetles spend the daytime foraging and mating near the water-land interface and associated wrack. In the evening, they move to higher ground to oviposit. This behavior would result in oviposition at higher elevations of the beach rather than near the water-land interface. Though the preliminary draft of Gwiazdowski (2020) did not specifically define the locations of the quadrats surveyed at Rainbow Beach, no positive identification of oviposition was observed in Quadrat 1 (presumably areas of damp sand near the water-land interface). Rather, oviposition was positively identified at higher elevations on the beach. Further, the relatively few confirmed oviposition holes that Gwiazdowski (2022) documented could not have been distinguished from the active *C. repanda* that were on the beach at that time.

Since development of the initial Draft BA, new larval distribution data has been provided to FirstLight (Gwiazdowski 2020, Gwiazdowski 2021, Davis 2021). Additionally, FirstLight has revised its proposal. These elements have been incorporated into this Draft BA.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

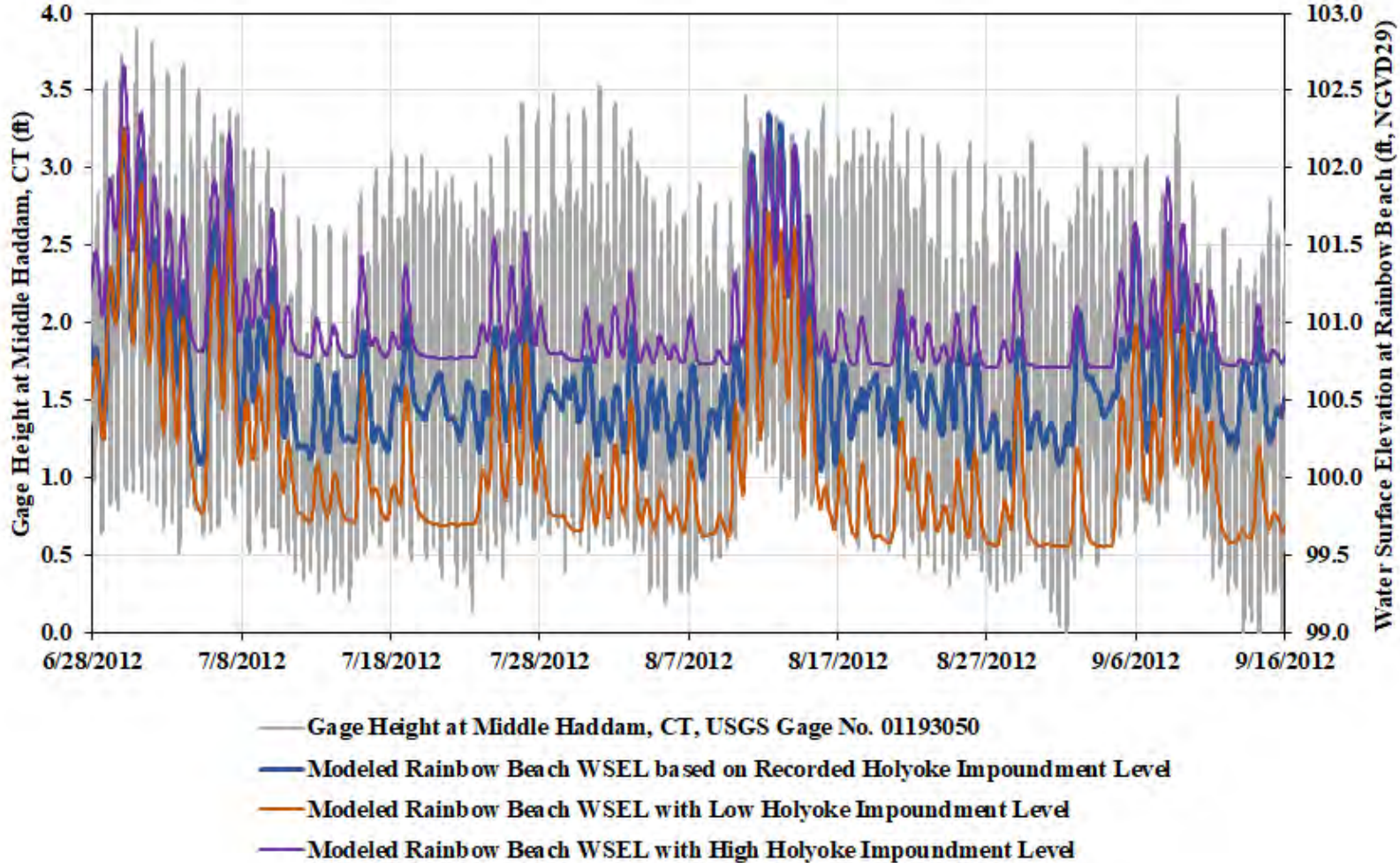


Figure C-1: Modeled Water Surface Elevations on Rainbow Beach near Holyoke, MA and USGS Gage Heights in tidal water at Middle Haddam, CT from late June to mid-September.

Note: The USGS Gage Connecticut River at Middle Haddam, CT is approximately 9.6 river miles downstream of the Puritan Tiger Beetle population at Cromwell, CT. A similar tidal variation was noted at the USGS Gage Connecticut River at Hartford, CT which is located about 15 river miles upstream of the Cromwell site. Hourly recorded water surface elevations at Holyoke Dam used for water surface elevation modeling at Rainbow Beach were obtained from the USFWS.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

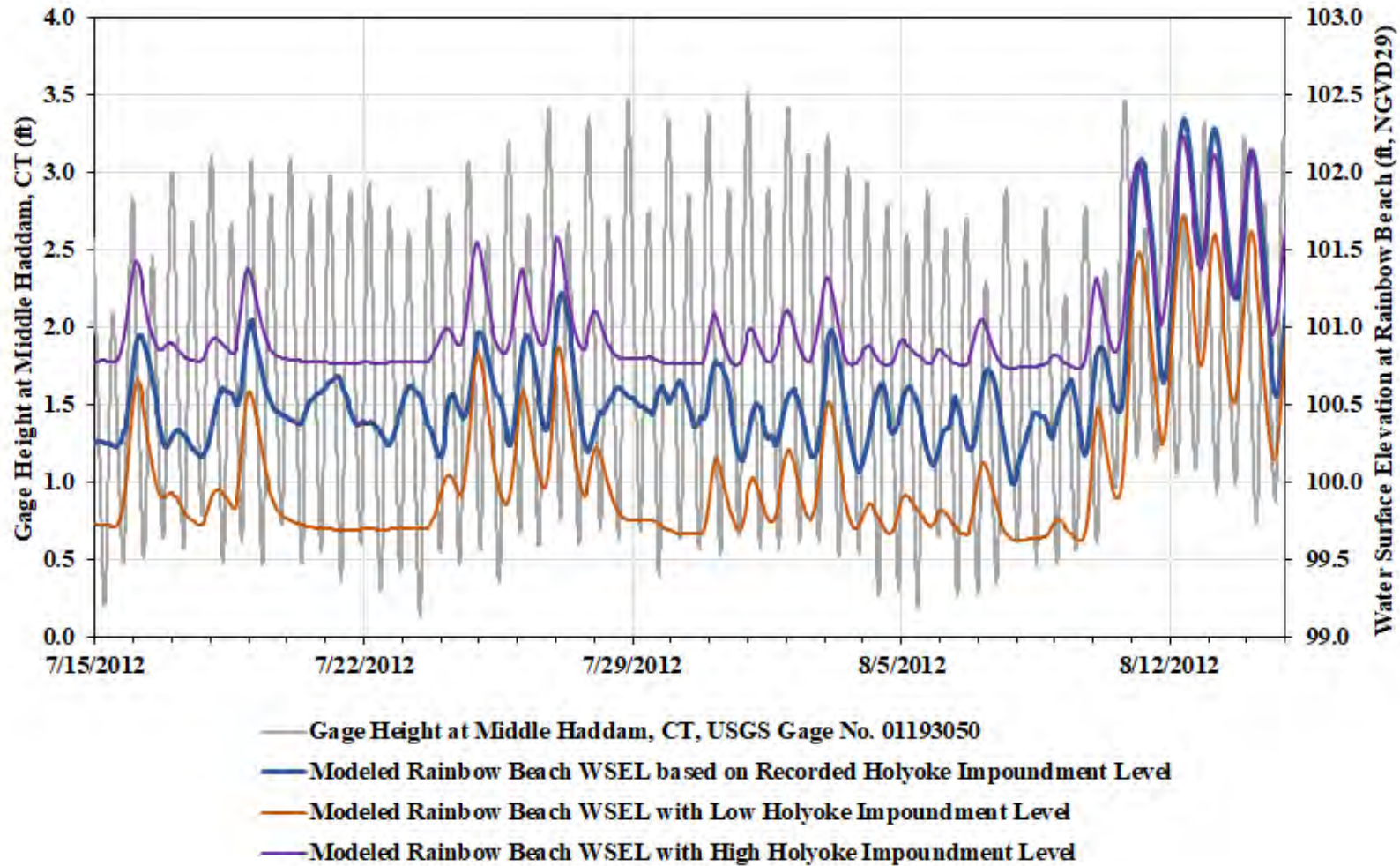


Figure C-2: Modeled Water Surface Elevations on Rainbow Beach near Holyoke, MA and USGS Gage Heights in tidal water at Middle Haddam, CT from mid-July to mid-August (peak adult active period for Puritan Tiger Beetle).

Note: The USGS Gage Connecticut River at Middle Haddam, CT is approximately 9.6 river miles downstream of the Puritan Tiger Beetle population at Cromwell, CT. A similar tidal variation was noted at the USGS Gage Connecticut River at Hartford, CT which is located about 15 river miles upstream of the Cromwell site. Hourly recorded water surface elevations at Holyoke Dam used for water surface elevation modeling at Rainbow Beach were obtained from the USFWS.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

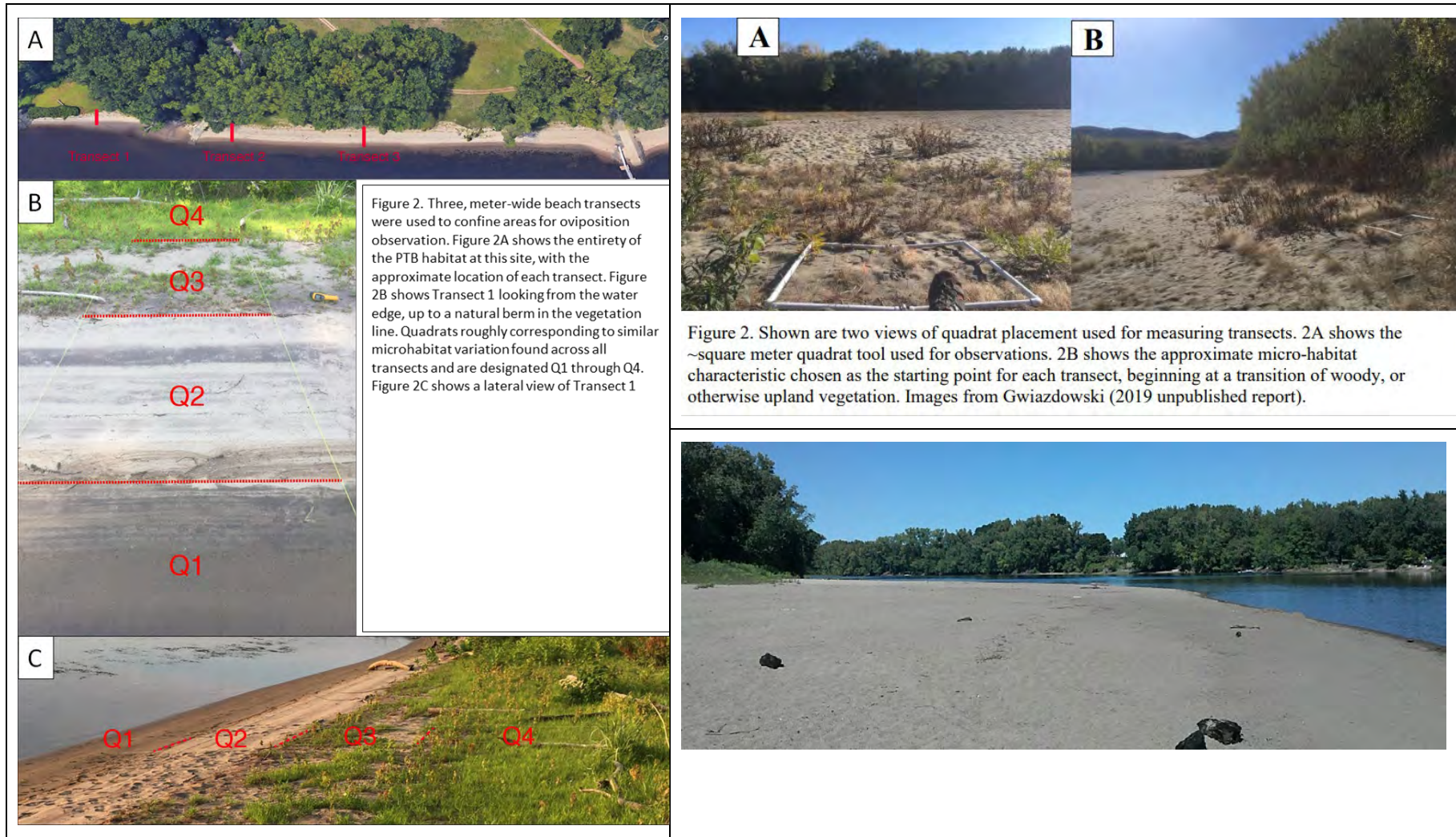


Figure C-3: Figure from Gwiazdowski (2020) showing the structure of habitat in Cromwell, CT (left panels), a figure from Gwiazdowski (2021) showing the structure of habitat at Rainbow Beach (top right panel), and photograph of Rainbow Beach (bottom right panel) for comparison.

5.4.3 Water Level Management at Holyoke Dam

USFWS Comment 5:

FirstLight states that, based on studies performed by Holyoke Gas & Electric (HG&E), maintaining the water surface elevation near 99.47 feet was shown to reduce water level fluctuations at Rainbow Beach, which would be beneficial to PTB when inflows are less than 11,000 cfs. The HG&E reports cited in the DBA not only refer to a maximum inflow (11,000 cfs), but also an average daily flow of less than 7,000 cfs (HG&E 2012). Once flows exceed those parameters, HG&E loses the ability to control water surface elevations at Rainbow Beach in part due to the backwatering effect of The Narrows, a natural topographic constriction in the river located upstream of Holyoke Dam and downstream of Rainbow Beach. Results of the hydraulic modeling undertaken by HG&E (2012) suggested that during sustained high inflows the upper impoundment response is less predictable due to the hydraulic control created by The Narrows. We recommend the DBA discuss how the hydraulic model used to analyze inundation at Rainbow Beach accounts for the unpredictability of water surface elevation response when instantaneous flows exceed 11,000 cfs or average daily flows exceed 7,000 cfs.

FirstLight's Response:

The USFWS states that prior studies by HG&E indicated that water levels at Rainbow Beach become less predictable during sustained high inflows due to a hydraulic control at The Narrows. FirstLight developed a hydraulic model that was well calibrated to observed water surface elevations at various locations in the reach between the Montague USGS gage and Holyoke Dam, including above and below The Narrows (observed water level data was obtained at Holyoke Dam). Based on the modeling, water surface elevations at Rainbow Beach become less dependent on water levels at the Holyoke Dam and more dependent on the constriction at The Narrows as flows increase beyond a certain point. FirstLight's hydraulic model includes both the effects of water levels at Holyoke Dam and the constriction at The Narrows and are confident the hydraulic model reflects the switch in hydraulic control. The hydraulic model is accurate for providing water levels at Rainbow Beach across the modeled flow range, especially at flows up to 30,000 cfs.

Given the variations in natural river flows, Project peaking flows, and Holyoke Impoundment water levels, unsteady-state hydraulic modeling was necessary. Output from the modeling was used to characterize the frequency, duration, and magnitude of exposure under the baseline and proposed environmental flow condition for each life stage and activity period of the Puritan Tiger Beetle. FirstLight's unsteady-state hydraulic model allowed for accurate hourly predictions of water levels at Rainbow Beach based on the substantial routing and attenuation of flow that occurs as releases flow downstream from the Turners Falls Project in the Connecticut River.

6.1.2 Locations of Habitat Relative to Water Levels

USFWS Comment 6:

FirstLight states the locations of larval and adult PTB habitat in relation to elevation at Rainbow Beach was inferred based on observed habitat use from various population assessments. As noted above, information collected as part of an oviposition research project during July 2019 (Gwiazdowski 2020) showed oviposition occurring down-gradient from presumed larval habitat at one of the PTB sites in Cromwell, Connecticut. We recommend FirstLight incorporate this information into the DBA effects analyses and conclusions relative to the effects of its proposed operational measures on the PTB.

FirstLight's Response:

Since development of the initial Draft BA, new larval distribution data has been provided to FirstLight (Gwiazdowski 2020, Gwiazdowski 2021, Davis 2021). This information has been incorporated into the Draft BA.

6.1.3.2 Characterization of Attenuation and Lag Time of Project Flows

USFWS Comment 7:

FirstLight states that peak releases from Cabot generally take over six hours to reach Rainbow Beach, and the timing and magnitude of attenuation is related to the length and magnitude of Cabot peak flow releases, along with other factors. FirstLight proposes peaking restriction from 1 a.m. to 2 p.m., which is intended to minimize inundation at Rainbow Beach during daylight hours. The synthetic hydrograph modeling analyzed multiple operational scenarios based on differing base flows, number of units generating at Cabot, and generation time. While these scenarios inform lag time for peak flows to reach Rainbow Beach under a range of operations, it is unclear which, if any, correlate to FirstLight's proposed operations.

We recommend running scenarios that cover the range of potential Cabot operations under the proposed peaking restriction in order to determine when peak flows under each scenario would reach Rainbow Beach. We request that FirstLight address the issue raised by HG&E relative to the model becoming less predictable during sustained high inflows due to the hydraulic control created by The Narrows; this is relevant as Cabot generation duration increases.

FirstLight's Response:

The purpose of the synthetic hydrograph modeling was to develop reasonable estimates or brackets for the attenuation and travel times to Rainbow Beach based on variables such as: baseflow, number of generating units, and duration of Cabot generation under low and high Holyoke downstream boundary conditions. This was done as a simplistic representation of Project effects without additional confounding variables such as changing inflows, downstream tributary inflows, and Holyoke Impoundment levels. FirstLight Project's operation at any given time depends on the flow into the TFI and water level restrictions within the TFI, energy demand schedules, and other factors such as downstream tributary inflows and Holyoke Impoundment levels also affect water levels at Rainbow Beach. The synthetic hydrographs do not pertain directly to FirstLight's proposal, which was modeled using unsteady-state methods, for comparison to baseline conditions. Further, FirstLight's proposal has changed since development of the initial Draft BA.

As previously stated and described in FirstLight's response to Comment 5, the USFWS statement that water levels at Rainbow Beach become less predictable during sustained high inflows due to a hydraulic control at The Narrows is incorrect. FirstLight's hydraulic model is accurate for a wide variety of flows, especially up to 30,000 cfs, which is far greater than the generation capacity of the Turners Falls Project.

6.1.4.1 Larval Habitat

USFWS Comment 8:

Figures 6.1.4.1-1 and 6.1.4.1-2 show bar graphs of the maximum duration of inundation events over 104 feet in days from 1991 through 2018 under both low and high Holyoke impoundment levels. We request FirstLight organize these graphs by active and inactive larval periods, as the impacts of inundation likely differ based on larval activity level. For example, sustained inundation may not have an impact to growth when larvae typically are not feeding (e.g., winter), whereas there could be a substantial impact to growth due to sustained inundation during the summer, when food intake is high.

FirstLight's Response:

Based on new information on larval Puritan Tiger Beetle distributions, and because FirstLight's proposal has changed, the types of analyses included in the Draft BA have also been modified. Information and analyses differentiating inactive and active larval periods are included.

6.1.4.2 Adult Habitat

USFWS Comment 9:

The DBA states that emergence would typically occur at night, whereas foraging, mating, and oviposition would occur primarily during the daytime hours; however, Gwiazdowski (2020) documented oviposition occurring at night. Therefore, two of the four adult PTB phases may be impacted by the proposed peaking restriction measure, which is intended to minimize daytime inundation of PTB habitat at Rainbow Beach. We recommend FirstLight update its analysis to account for this new information.

FirstLight's Response:

The referenced statement from FirstLight's January 2020 draft DBA was incorrect, and not consistent with FirstLight's actual analyses as described in the subsections following the statement. The analyses provided in the initial draft by FirstLight evaluated each adult Puritan Tiger Beetle activity based on the following time periods:

- **Foraging/Mating: June 16 through September 7, 9am through 8pm**
- **Oviposition: June 16 through September 7, 5pm through 11pm**
- **Emergence: June 16 through September 7, 8pm through 9am**

The time periods were derived from observations of Puritan Tiger Beetle activity at Rainbow Beach. However, based on the limited historical observations of oviposition and emergence timing at Rainbow Beach, and the results of Gwiazdowski (2020), which reported oviposition occurring from the late afternoon into the morning hours, FirstLight has revised the emergence and oviposition analysis to include all 24 hours per day during the adult active period from June 16 through September 7.

6.1.4.2.2 Foraging/Mating

USFWS Comment 10:

The DBA identifies foraging as a daytime activity, although it also may occur at night. Babione (2003) collected both unmarked and marked adult beetles in a night survey. The unmarked individuals constituted 72 percent (13 of 18) of collected individuals and were presumed to be newly emerged adults, as the night survey immediately followed day surveys. Of the five marked individuals captured at night, three were marked during a prior day survey and two during a prior night survey. While we do not know why the marked beetles were active at night, potential reasons include foraging, mating, or oviposition activity.

FirstLight's Response:

The survey described in Babione (2003) was an experiment to determine if a night survey would be as efficient and effective as a daytime survey. The survey design included two sites along the beach, each with three stations for monitoring (3 meters from the forest, center of the beach, and 3 meters from the water's edge). To capture adult beetles at each station, a Coleman lantern was placed at the center of a large sheet and the beetles were caught using a net, presumably when they moved across the sheet.

Though Babione (2003) captured Puritan Tiger Beetles, including a large percentage that had not been marked during daytime surveys, the survey report did not include information on which stations the beetles were captured at. Therefore, FirstLight does not have information from the survey pertaining to habitat use of specific locations on the beach, which would have provided context for which activities the beetles may have been engaged in. Additionally, Babione (2003) theorized that newly emerged adults could have been attracted to the light utilized by the survey, and that the beetles appeared to be "mesmerized" by the light. It was not identified in the survey report whether these individuals would have been actively moving around or performing various activities without the light provided from the lamps.

The best available data from Rainbow Beach and elsewhere suggests that foraging is a daytime activity, where these visual predators benefit from warm temperatures on the sand that allow them to move rapidly in search of prey. At Rainbow Beach, the adult beetles have been documented making forays to the water-land interface during the daytime and back up to near the vegetation and within the larval habitat in the events. In contrast, there has been no information provided suggesting that there are forays to the water-land interface for foraging/mating at night. The report from Babione (2003) does not indicate whether adult Puritan Tiger Beetles would be doing anything other than potentially emerging from larval habitats and moving toward an artificial light source. Therefore, the timing of adult Puritan Tiger Beetle activities in FirstLight's analyses have not been modified based on Babione (2003). However, FirstLight has revised the daily time period for the emergence and oviposition analysis based on available information (and information gaps). The diel periods for each activity in the analyses, based on the best available data, are:

- **Foraging/Mating: June 16 through September 7, 9am through 8pm**
- **Oviposition: June 16 through September 7, 24 hours per day**
- **Emergence: June 16 through September 7, 24 hours per day**

USFWS Comment 11:

Figure 6.1.4.2-2 shows the relationship between average daily flow at the Montague, Massachusetts, U.S. Geological Survey gage and the maximum daily water surface elevation at Rainbow Beach. The figure shows a linear relationship, even above 11,000 cfs. We request FirstLight explain this apparent contradiction with the HG&E report (2012), which states that at this threshold the stage response decouples due to The Narrows.

FirstLight's Response:

As stated in FirstLight's response to Comment 5, water surface elevations at Rainbow Beach become less dependent on water levels at the Holyoke Dam and more dependent on the constriction at The Narrows as flows increase beyond a certain point. Figure 6.1.4.2.2-2³³ shows how the Low or High Holyoke water surface elevation downstream boundary becomes less of a factor as flows increase since the separation of scatterplot lines decreases. However, there is no specific "decoupling" threshold. The HG&E Report (2012) described the effect of the Narrows as "decoupling" in a few areas, such as the first paragraph in Section III on page 12. However in other areas of the document, such as in Section IV Cumulative Analysis & Summary on page 24, the following verbiage is used: "During peak inflows greater than 11,000 cfs measured at the Montague Gage, drawdowns of the lower impoundment up to 1.6 feet at the Dam were likely to result in stage fluctuations at Rainbow Beach of less than 0.5 feet." This statement is comparable to the gradual effects that the Narrows provide with increasing flows.

While the HG&E results were based on a direct assessment of water level recorder data, FirstLight's results are based on a calibrated hydraulic model run in unsteady-state mode, which can account for natural hydraulic constriction points and changing flows through time. FirstLight's unsteady-state hydraulic model allowed for accurate hourly predictions of water levels at Rainbow Beach based on the substantial routing and attenuation of flow that occurs as releases flow downstream from the Turners Falls Project in the Connecticut River. For the analyses provided in the DBA, these hourly water levels were put into context of biological relevance to the Puritan Tiger Beetle.

Natural hydraulic constriction points such as The Narrows below Rainbow Beach and the French King Gorge in the Turners Falls Impoundment are examples of hydraulic controls where the influence is a gradual and becomes more dominant as flows increase. This type of a gradual relationship is shown on water level recorder data plots in the HG&E reports and FirstLight data such as Appendix A of this Draft BA and corresponds well to relationships shown in output from FirstLight hydraulic model.

USFWS Comment 12:

Figure 6.1.4.2.2-5 shows the frequency of hourly water level changes in feet at Rainbow Beach during the PTB daytime active period (9am to 8pm) from June 16 through September 7. We request FirstLight generate this same figure for the period 8pm to 9am in order to understand the magnitude and frequency of hourly water surface elevation changes during the PTB nighttime active period.

FirstLight's Response:

To incorporate potential effects on all adult Puritan Tiger Beetle activities, the histograms have been modified to include all 24 hours of the day. Though the overall magnitude of bins within the histogram increased, the overall shape of the distribution of hourly water level changes remained largely the same.

³³ Note: The USFWS comment referred to Figure 6.1.4.2-2, which was a histogram of the daily timing of peak daily flows at Rainbow Beach given low Holyoke Impoundment conditions. The correct figure number for the figure referenced is 6.1.4.2.2-2.

USFWS Comment 13

To better assess potential impacts to all adult phases, we recommend supplementing the synthetic hydrograph model output to include duration of inundation (i.e., the period of time, in hours, where elevation for a given scenario exceeds 101 feet).

As stated in previous comments, the synthetic hydrographs are a simplified modeling analysis that was developed for a specific purpose (i.e. evaluating travel time and attenuation of operational flows). The synthetic hydrograph analyses do not incorporate a variety of important factors that also affect water surface elevations at Rainbow Beach. Therefore, effects on all activities and life stages for the Puritan Tiger Beetle were evaluated using more appropriate methodologies in the DBA.

Given the variable effects of river flows, Project peaking flows, and Holyoke Impoundment water levels, unsteady-state hydraulic modeling was necessary to characterize the frequency, duration, and magnitude of exposure under the baseline environmental flow condition for each life stage and activity period of the Puritan Tiger Beetle (see [Section 6.1.4](#)). This modeling was performed using 28 years of hourly timeseries flow data (1991-2018) in the Connecticut River at the Montague USGS gage, routed to Rainbow Beach using HEC-RAS. The models produced flow and water level timeseries at Rainbow Beach for those 28 years given low and high Holyoke Impoundment conditions.

Further, the focus of the USFWS on evaluating duration of inundation at elevations as low as 101 feet is unfounded based on the behavior and habitat use of this species. Adult Puritan Tiger Beetle forage and mate among the wrack and near the water-land interface, regardless of where the actual water level is at the time. The further down the water surface elevation is, the greater the distance for the beetles to reach the water-land interface and wrack line after leaving the higher elevations of the beach. As such, higher water levels along the lowest elevations of the beach do not necessarily result in less foraging and mating habitat. Area of the entire beach is irrelevant if much of the beach is unused by the Puritan Tiger Beetle, and high numbers of Puritan Tiger Beetle in Cromwell, CT at a much smaller beach would suggest that area is not the driving factor in population size at the much larger Rainbow Beach. Rather, more appropriate analyses for adult Puritan Tiger Beetles include an evaluation of the frequency, duration, and magnitude of inundation of potential larval habitats where adults oviposit and emerge. These analyses have been provided based on larval distribution information collected in 2020 and 2021.

6.1.4.2.3 Oviposition

USFWS Comment 14

In this section of the DBA, FirstLight cites evidence suggesting PTB oviposit in the evening (5p.m. through 11p.m.), but in section 6.1.4.2, FirstLight states "...oviposition would occur primarily during the daytime hours." Please clarify this inconsistency. Also, the DBA describes oviposition as occurring between elevations 102.75 to 104.0 feet, which is within the presumed larval habitat; however, the most recent information on the life history of the PTB (Gwiazdowski 2020) indicates oviposition could occur between elevations 101 and 102.75. In addition, Gwiazdowski (2020) indicates the oviposition period includes overnight hours, essentially extending the species' oviposition period to any time of day or night. Consequently, we recommend FirstLight (1) undertake a new analysis that considers habitat inundation frequency and duration at elevations 101 to 102.75 feet based on a 24-hour oviposition period, and (2) consider additional measures to minimize impacts to the species' habitat based on new information and FirstLight's analyses.

FirstLight's Response:

As stated in FirstLight's response to Comment 9, the statement from the January draft DBA suggesting that oviposition would occur primarily during the daytime hours was incorrect, and not consistent with FirstLight's actual analyses as described in the subsections following the statement. FirstLight has corrected this error/inconsistency in the updated draft.

As stated in FirstLight's response to USFWS Comment 4, Rainbow Beach and the location in Cromwell, Connecticut are very different in habitat structure and habitat use. The findings there by Gwiazdowski (2020) are therefore not applicable to Rainbow Beach, where researchers have been documenting habitat use extensively. Additional research performed in 2020 by Dr. Gwiazdowski and Chris Davis, who are both Puritan Tiger Beetle experts, confirmed that Puritan Tiger Beetles on Rainbow Beach are exhibiting different behaviors regarding where eggs are deposited and larvae persist relative to the Cromwell, CT location. At Rainbow Beach, oviposition was positively identified in Quadrats 2 and 3, which was higher in elevation than Quadrat 1 near the water's edge. The larval habitat documented at Rainbow Beach in 2020 is limited to a narrow strip near the vegetation line, which is at a relatively high elevation on the beach.

FirstLight's updated analyses differ substantially from the original report, and focus on inundation and duration at various levels along Rainbow Beach. This is important given that adults can forage along the water line, regardless of where it is located, and the distribution of larval elevation at the beach, as documented in 2020 and 2021, differed from what was assumed by the initial analyses.

6.2 Anticipated Response to Exposure

USFWS Comment 15:

We recommend this section be updated to incorporate new Puritan tiger beetle life history information and address the potential impacts of the proposed operational measures on oviposition/hatch success in the context of successful recruitment and population sustainability at Rainbow Beach.

FirstLight's Response:

FirstLight has revised its analysis, as appropriate, based on the new information that was made available by Gwiazdowski (2020; 2021; 2022) and additional information collected at Rainbow Beach in by Chris Davis in 2020 and 2021. These revisions primarily include the locations of documented larval habitats, with limited and/or inconclusive information on oviposition.

7 Conclusion and Determination of Effects

USFWS Comment 16:

*FirstLight identifies several non-project-related factors affecting PTB populations at Rainbow Beach, including recreational impacts, competition with *C. repanda*, and invasive species. These factors, along with the past and current flow regimes implemented at Holyoke and Turners Falls, and the interrelationship of operations at both projects and effects to the PTB, are part of the environmental baseline for the PTB in the action area. If a future consultation under section 7 of the ESA is necessary, non-Project-related, non-Federal activities occurring, or reasonably certain to occur, in the action area would be considered as cumulative effects. The proposed Project and any potential direct and indirect effects of the Project on the PTB would be determined separately from those actions included in the baseline and cumulative effects.*

FirstLight's Response:

FirstLight has revised this section per the USFWS comments and removed factors pertaining to the environmental baseline, which are included in earlier sections of the DBA.

USFWS Comment 17:

Given the new information relative to the timing and location of PTB oviposition (Gwiazdowski 2020), we recommend FirstLight revise relevant analyses regarding potential effects to all PTB life stages and reconsider the effects determinations under section 7 of the ESA.

FirstLight's Response:

FirstLight has revised its analysis, as appropriate, based on the new oviposition information that was made available by Gwiazdowski (2020; 2022). Generally, the information provided regarding oviposition of these studies was limited and inconclusive.

Response to USFWS Comments on September 28, 2023 Draft

FirstLight provided a revised draft of this Draft BA to the USFWS on September 28, 2023. On February 12, 2024 the USFWS provided written comments on the revised draft. FirstLight's responses to these comments are provided below. USFWS comments are included in italic text and FirstLight's responses are in bold.

USFWS Comment 1: The amended final license application and the previous version of the draft biological assessment included tree cutting to address very small maintenance needs and hazard tree issues. The 2023 revised draft BA expanded the potential scenarios under which tree removal could occur as part of project operations to include "...development of recreation areas, implementation of timber management practices, or clearing of Project land for other purposes (e.g., installation of additional renewable energy facilities)." The revised draft BA does not define the likely extent of these new activities; however, the typical footprints for these types of activities are large enough that they may affect listed bats present in the project area through habitat alteration, even if the habitat disturbance is limited to the inactive season for bats. We recommend FirstLight remove these additional activities from the final BA. Should FirstLight seek to undertake clearing of Project land for purposes other than small maintenance needs and hazard tree issues during the term of any new license issued for the Projects, it should notify FERC to initiate the consultation protocol described in the Interagency Task Force's report on Improving Coordination of ESA Section 7 Consultation with the FERC Licensing Process (ITF 2000).

FirstLight's Response: The Revised Draft BA has removed potential tree-clearing activities except for those that would typically occur as part of routine maintenance and hazard trees.

USFWS Comment 2: USFWS states that analyses that describe the overall impact of Project operations, including the conclusion that only 2.5% of larval habitat occurs at or below elevation 103 ft (NGVD29), could be inaccurate. Multiple reasons were stated by the USFWS.

FirstLight's Response: Responses to each of the reasons provided by USFWS are addressed separately in the responses below (USFWS Comments 2a through 2d).

USFWS Comment 2a: Larval surveys occurred above the water line. Water surface elevation varied substantially over the course of the survey periods. There likely were larval burrows at lower beach elevations (i.e., between elevations 101 and 103) that could not be surveyed due to inundation.

FirstLight's Response: The larval survey data collected in 2020 and 2021 occurred during various times of the year and at a variety of water surface elevations at Rainbow Beach. The surveys were also standardized, such that quadrats were surveyed for larvae from the forested vegetation line all the way to the water's edge during each survey along transects distributed across the entire Rainbow Beach area. Based on the quadrat data, estimated lowest elevation of quadrats are provided in the table below for surveys performed by Roger Gwiazdowski in 2020 and 2021. Surveyed elevations in 2020 reached elevations as low as 100.3 feet, and surveys in 2021 reached elevations as low as 101.6 feet. Additionally, the water surface elevation recorded at transects during the early October survey performed in 2021 by Chris Davis averaged 100.5 feet. Due to the number of surveys that included data collection between 100.3 and 103 feet, and the lack of any Puritan Tiger Beetle larvae found at elevations lower than 101.9 feet, it is likely that the surveys documented the extent of Puritan Tiger Beetle habitat being utilized at Rainbow Beach.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

Survey Date	Lowest Elevation Quadrat (ft, NGVD29)
7/30/2020	100.4
9/24/2020	100.4
10/14/2020	100.3
11/9/2020	102.6
7/28/2021	102.5
8/9/2021	102.3
8/11/2021	101.6
9/17/2021	102.1
9/29/2021	102.1
10/13/2021	102.0
10/29/2021	102.0
11/17/2021	102.9
12/1/2021	102.3

The Revised Draft BA has been updated to include this information.

USFWS Comment 2b: Although most observed larval burrows were at upper elevations, some were found at lower elevations that are inundated by project-induced increases in water surface elevation. This demonstrates that the Project can directly affect larval habitat.

FirstLight's Response: In the Draft BA, FirstLight describes the observed proportion of larvae documented that could be influenced by Project operations. However, the entirety of the beach and associated Puritan Tiger Beetle habitat can also be affected by river flows, independent of Project operations, as demonstrated in the Draft BA. Additionally, given that this species could be affected both positively or negatively by water level changes, it is not possible to quantify whether the net effects are negative or positive.

USFWS Comment 2c: According to the BA, current project operations typically result in peaking discharges at Cabot Station reaching Rainbow Beach at night. Gwiazdowski (2020) documented oviposition during the night and early morning hours both in the laboratory and at Cromwell Beach, Connecticut, while oviposition was observed in the early morning and late afternoon hours at Rainbow Beach (Gwiazdowski 2022). This difference in oviposition timing could be an effect of small sample size or influenced by the unusually wet weather during July and August of the study year at Rainbow Beach (Figure 1; Gwiazdowski 2022) limiting oviposition habitat to the higher elevations. Regardless, if oviposition behavior in a typical water year occurs at night, the timing of peaking flows from the reaching Rainbow Beach could possibly explain why more larvae are found at higher elevations, as the water line would be at a higher beach elevation.

FirstLight's Response: As demonstrated in the Draft BA, steady state flows on the order of 20,000 cfs would inundate only 3-5% of the larval observations at Rainbow Beach. Water levels that result in maximum peaking from the Project (combined hydraulic capacity of 15,938 cfs) also become substantially attenuated by the time the peaks reach Rainbow Beach. Though peaking could influence the lower elevation limit of oviposition that occurs at a specific time, the concentration of Puritan Tiger Beetle larvae at high elevations that are not within the range of the Project to inundate cannot

be explained by any Project operational effect. Rather, it is more likely that Puritan Tiger Beetle adults find the habitat there more suitable for depositing their eggs due to the characteristics of that habitat. Regardless, FirstLight’s proposed flow regime would substantially reduce the water level fluctuations that occur downstream of the Project.

USFWS Comment 2d: A recent grain size analysis study revealed a correlation between distance from forest edge and grain size, but no relationship between grain size and beach elevation (Yellen 2023). In a larval habitat suitability study, Omland (2002) found a relationship between sand grain size and larval PTB density, with higher densities found at beaches with fine grain size. Fine grained sand suitable for PTB larvae is found in the northern and southern portions of Rainbow Beach, close to the forest or vegetation line. However, fine grained sand is not confined to these areas (Yellen 2023) and is found in areas below elevation 103. Basing effects analyses on occupied habitat rather than suitable habitat likely underestimates the impact of current Project operations on larval PTB.

FirstLight’s Response: No study performed here or elsewhere has demonstrated the ability to accurately quantify Puritan Tiger Beetle habitat. Such a study would be extremely difficult to perform, given the dynamic nature of beach and shoreline habitats, along with natural or artificial water level fluctuations.

Yellen (2023) evaluated one parameter that pertains to Puritan Tiger Beetle – grain size in the top 0.5-1.0cm of sand that could be selected for oviposition by adult Puritan Tiger Beetle. Grain size of sand is only one component for determining potential suitable habitat for Puritan Tiger Beetle at Rainbow Beach and elsewhere. Other important components include moisture (which is lacking on much of the open beach areas during dry conditions) and temperatures. Though they do prefer areas with fine-grained sand, larvae do not reside everywhere that fine-grained sand is located. As explained in the Draft BA: “There are also broad, lower-elevation areas of the beach that contain soft sand that becomes very hot and dry when exposed, which would not be suitable for burrowing and larval survival. Some areas closer to the water’s edge may be temporarily suitable for larvae due to lower temperatures and moisture there, though these areas would be frequently inundated by river flows, regardless of Project operation.”

Additionally, FirstLight has reviewed Yellen (2023) in detail. Though the report describes grain size of sand at Rainbow Beach, it is not suitable as an indicator for Puritan Tiger Beetle habitat quality or predicted occupancy. Specifically, at transects with larval observations from 2020-2021 that overlapped with grain size analysis information from 2022 (Yellen 2023), the grain size samples were collected at lower elevations relative to where a large percentage (and sometimes all) of larval Puritan Tiger Beetle have been documented. As such, Yellen (2023) did not document grain size from within the specific microhabitat where most Puritan Tiger Beetles have been observed and should not be interpreted to represent the conditions of known or predicted Puritan Tiger Beetle larval occupancy.

PURITAN TIGER BEETLE DRAFT BIOLOGICAL ASSESSMENT

Transect	Yellen Max Sample El.	Highest Larvae Obs. El. (2020- 2021)	Lowest Larvae Obs. El. (2020- 2021)	Total Larvae Obs. El. (2020- 2021)	Total PTB Obs. above Yellen	% PTB above Yellen
2	104.1	105.3	102.8	96	39	40.6%
4	103.7	104.3	103.9	7	7	100.0%
6	103.6	104.4	101.9	16	10	62.5%
12	103.5	105.1	105.1	2	2	100.0%
14	104.9	105.6	104.7	26	26	100.0%
17	107.4	107.9	107.8	157	157	100.0%
18	104.3	108.8	103.5	33	31	93.9%
20	102.0	103.5	103.2	2	2	100.0%
Total				339	274	80.8%

Note: All elevations have been standardized to ft, NGVD29.

USFWS Comment 3: In the BA, FirstLight correctly states that adult PTB foraging and mating activities primarily occur during the daytime. Emergence and ovipositing occur during day and night (Gwiazdowski 2022), and it is possible that foraging and mating occur at night also. The BA does not consider or evaluate the effects of higher nighttime water levels, which would decrease the available habitat and prey, for these activities.

FirstLight's Response: In the Draft BA, FirstLight performed habitat timeseries analysis that incorporated all water levels that occurred at Rainbow Beach for larval and adult activities over time, which included all hours of the day and night. This included water levels within and above the capacity of the Project to control.

USFWS Comment 4: FirstLight states that exposure of any life stage/activity to Project operations is limited. This statement conflicts with analysis results presented in the draft BA. For example, Figure 6.1.3.2-1 provides modeled water surface elevations at Rainbow Beach over a 5- day period in July 2017. This figure shows how peaking operations affect water surface elevations at Rainbow Beach and contribute to inundation of PTB habitat.

FirstLight's Response: Figure 6.1.3.2-1 was provided as an example of how peaking flow changes from Cabot Station affect water levels at Rainbow Beach. As shown, the largest peaking event in the plot, which resulted in a peak flow of 18,200 cfs at the USGS Gage in Montague, MA, only resulted in a water level increase that reached the 2.5th percentile elevation of larvae documented at Rainbow Beach. 97.5% of the larval occurrences documented were above that elevation. Not all peaking events at Cabot Station would reach this magnitude. Habitat timeseries analyses in the Draft BA demonstrate how existing and proposed operations affect water levels at Rainbow Beach in a more rigorous manner.

USFWS Comment 5: The BA concludes that peaking flows have likely been beneficial to adult foraging and mating, due to those peaking flows arriving at Rainbow Beach during nighttime, but the BA does not support this conclusion with surveys, studies, or other evidence. As noted above, emergence and ovipositing occur at night, and foraging and mating may also occur at night. The final revised BA should include all available information supporting this conclusion.

FirstLight's Response: The Revised Draft BA explains the potential positive and negative benefits of water level changes that could affect Puritan Tiger Beetle, and further explains that it is unknown whether the benefits are net-positive or net-negative. The overall conclusions of the Draft BA have not changed.

USFWS Comment 6: In this section of the BA, FirstLight compares PTB to northeastern beach tiger beetle (NBTB; Cicindela dorsalis). While there may be similarities between the two species, there also are differences, which argue for caution when drawing parallels between the two species. The NBTB is only found in coastal habitats, whereas the PTB occurs in tidally influenced and non-tidally influenced freshwater habitats. At a minimum, there likely are differences in species biology, prey base, and habitat dynamics. For example, FirstLight posits that, because NBTB larvae benefit from tidal fluctuations by providing moisture and abundant prey, PTB larvae likely benefit from rising water levels due to peaking operations. However, NBTB larvae's primary prey are amphipods (USFWS 1994), whereas PTB larvae's primary prey are collembola and ants (Gwiazdowski 2019). Amphipods are aquatic, while collembola and ants are nearly all terrestrial.

FirstLight's Response: Though FirstLight agrees that caution is necessary for drawing parallels between species, the NBTB is an example of a related tiger beetle species with similar biology, behavior, and habitat characteristics to the Puritan Tiger Beetle where potential effects of water level

have been discussed in the literature. Similarly, Puritan Tiger Beetle is known to occur in areas where water level changes occur on a frequent basis, and sometimes on the same beaches as the NBTB. Whether in a river system or along a coastal beach, water level fluctuations are a condition that these species have adapted to given the locations where they occur and there is the potential for both habitat increases and decreases with water level fluctuations over time, but also replenishment of forage. The Revised Draft BA explains the potential positive and negative benefits of water level changes that could affect Puritan Tiger Beetle, and further explains that it is unknown whether the benefits are net-positive or net-negative. The overall conclusions of the Draft BA have not changed.

ATTACHMENT 1: PHOTOS OF RECREATION ON RAINBOW BEACH FROM FACEBOOK



August 3, 2020



June 14, 2020



May 24, 2020



July 13, 2019



July 4, 2019



July 4, 2019



June 27, 2019



July 1, 2018



August 13, 2016



August 9, 2014



August 10, 2013 (from opposite side of the river)



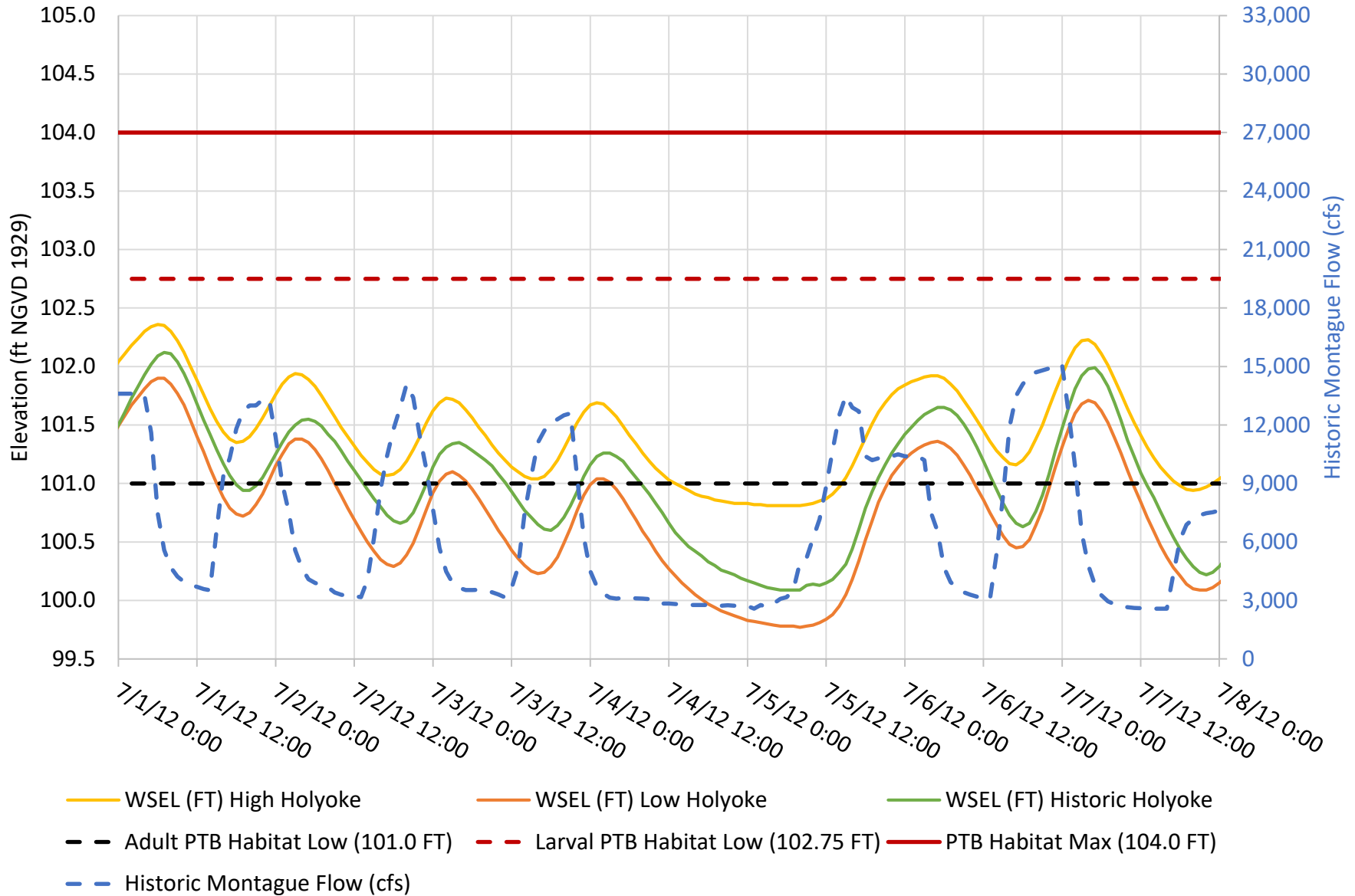
July 21, 2013



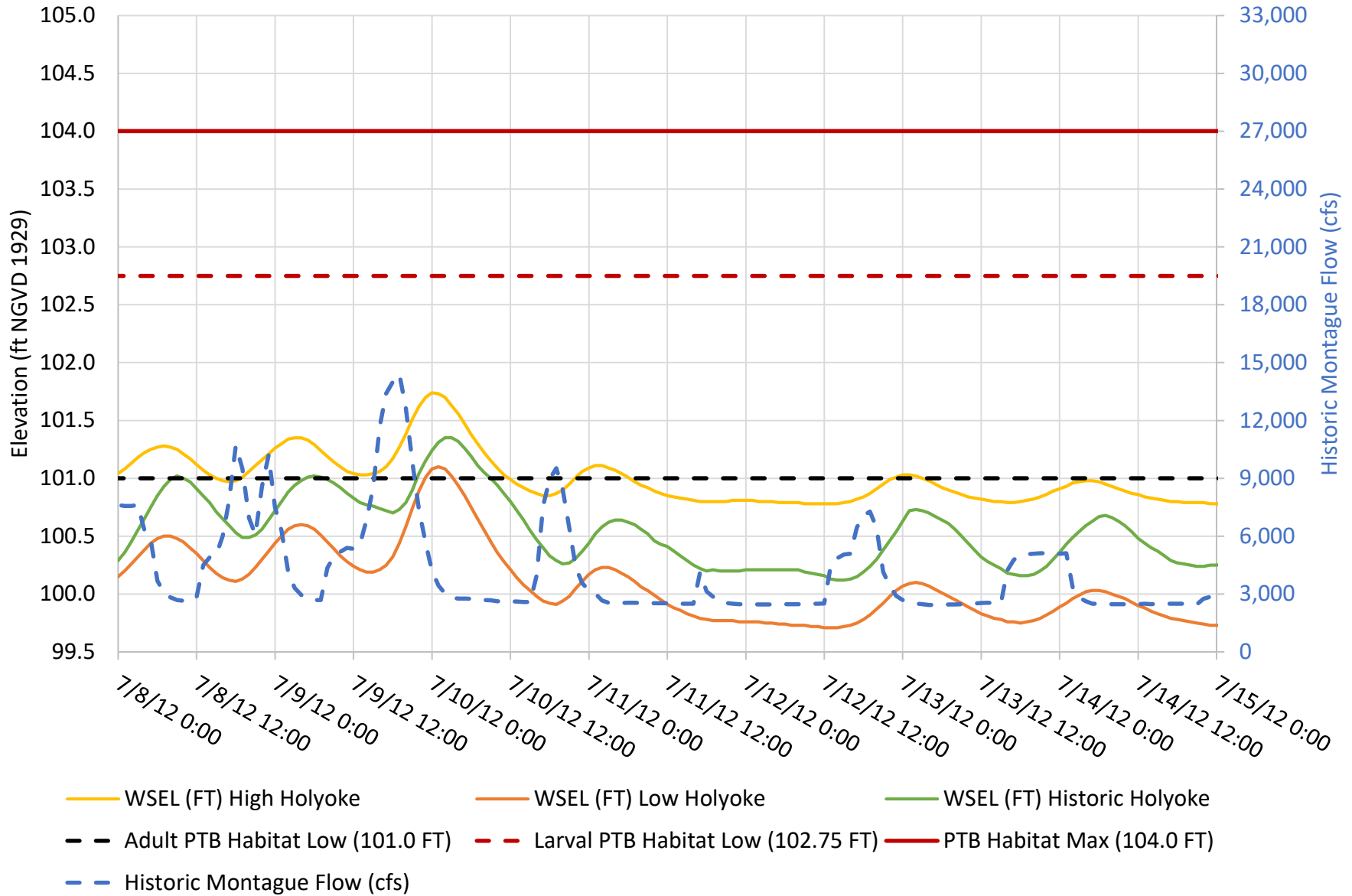
June 26, 2010

**APPENDIX D: MODELED WATER SURFACE
ELEVATION DATA USING ACTUAL HOLYOKE
IMPOUNDMENT LEVEL DATA**

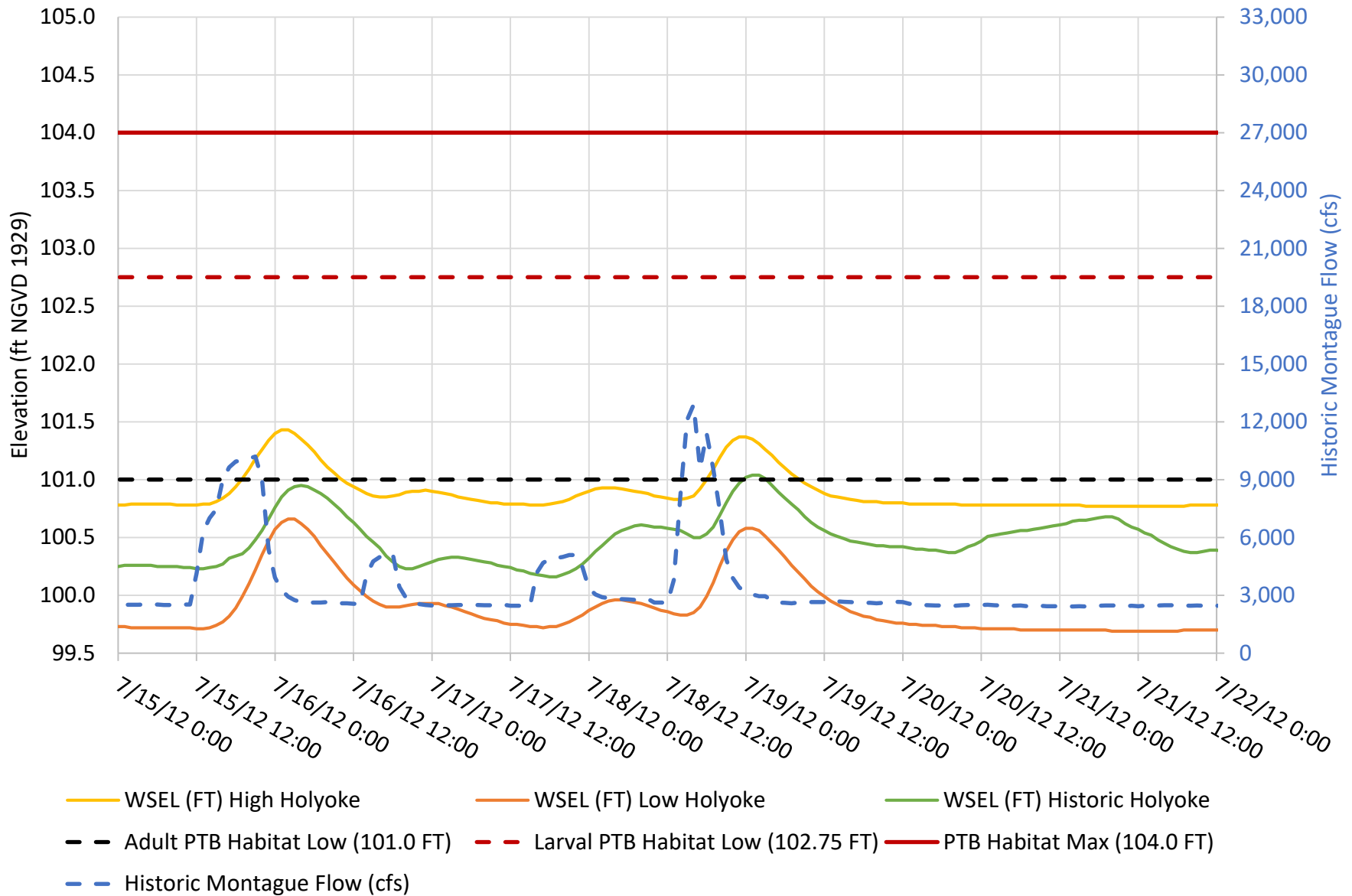
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



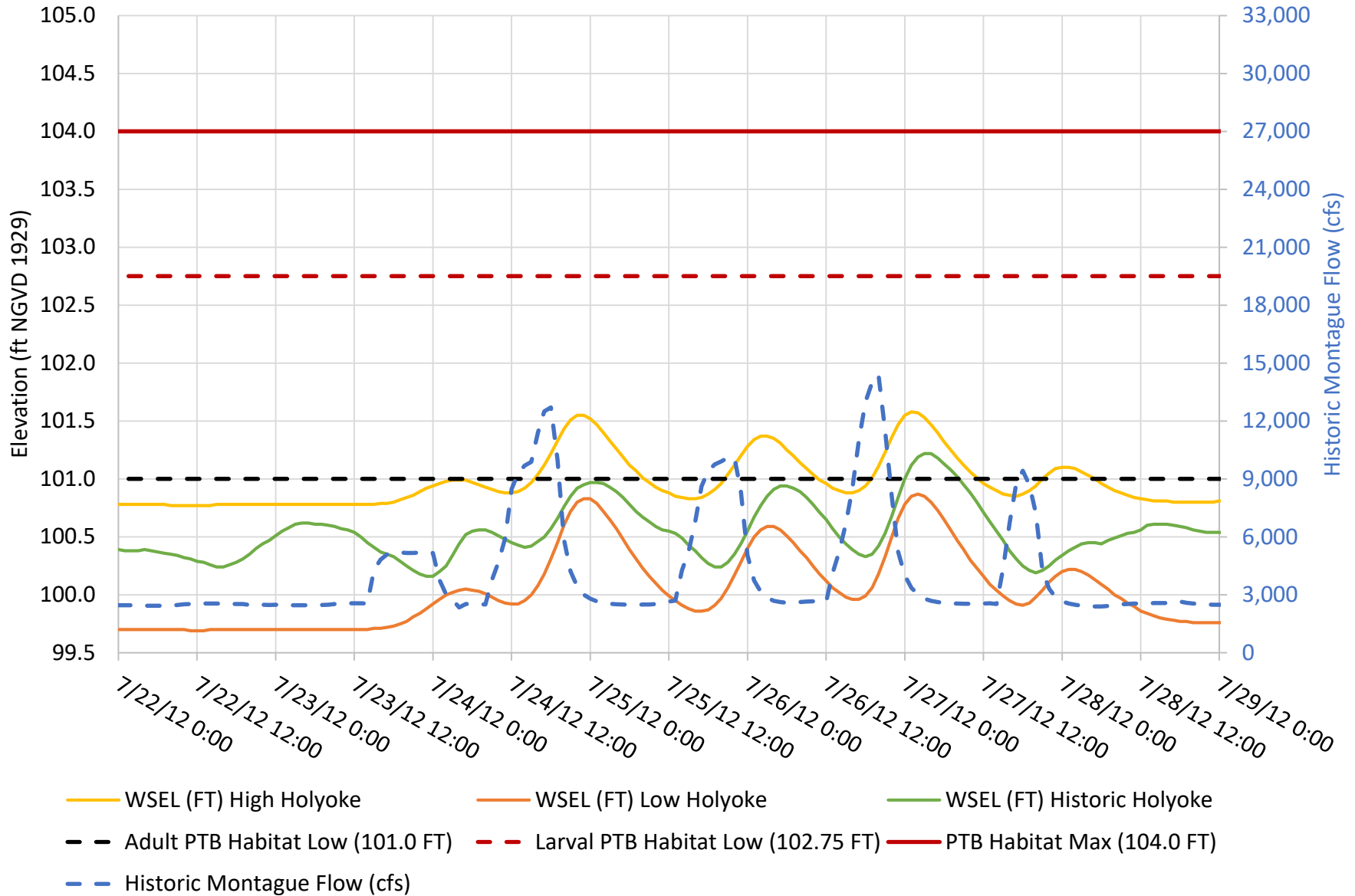
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



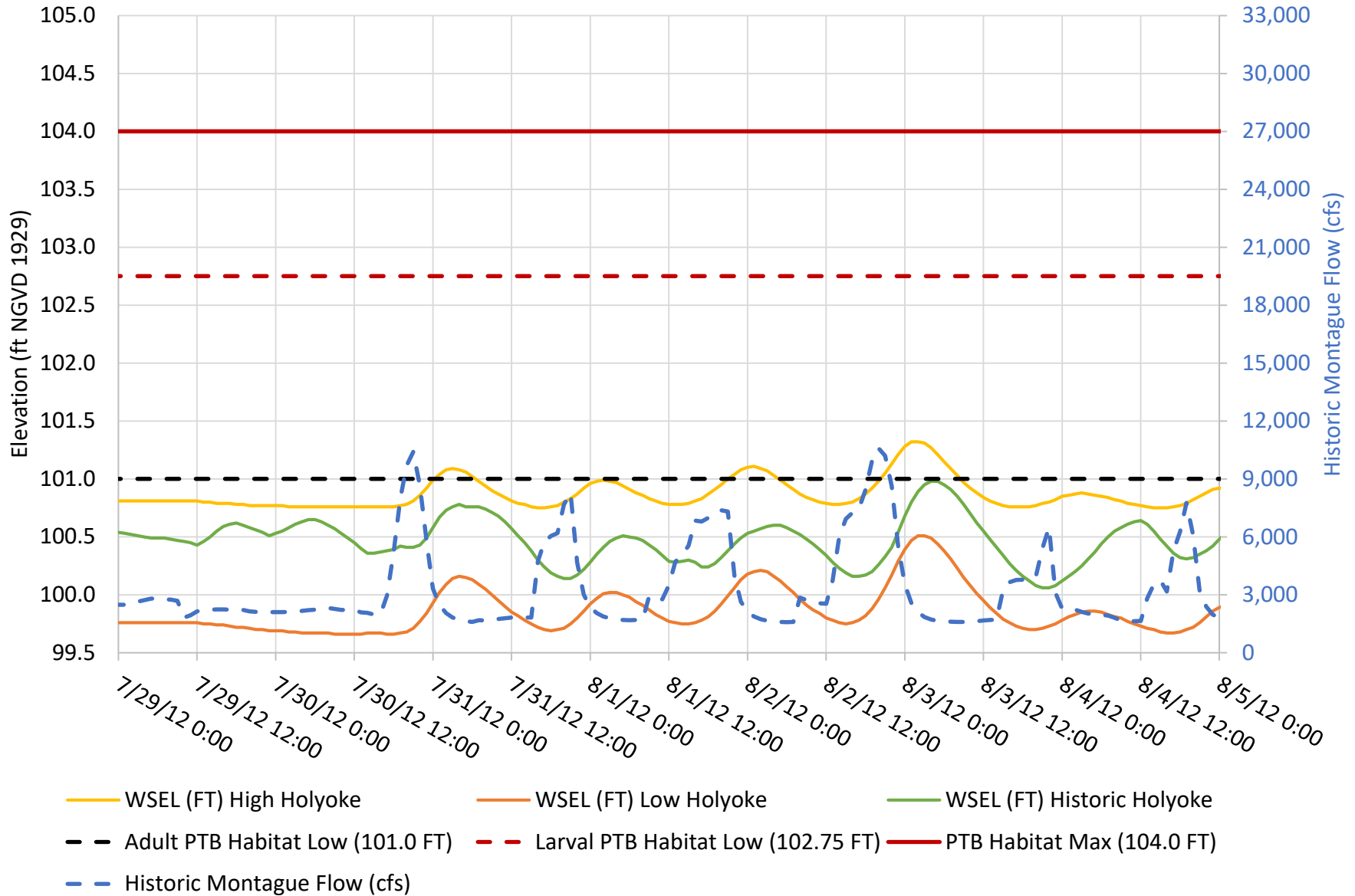
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



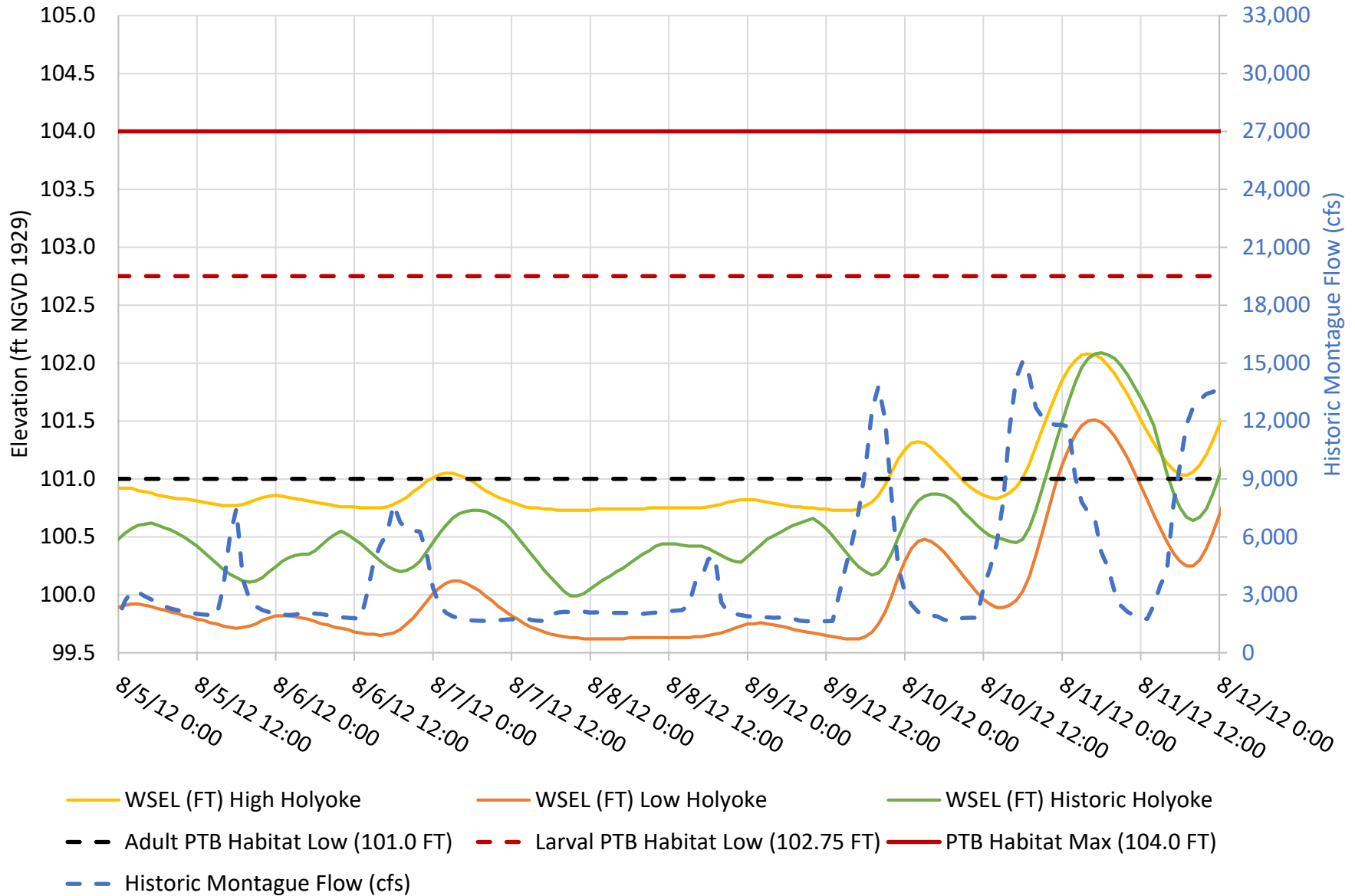
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



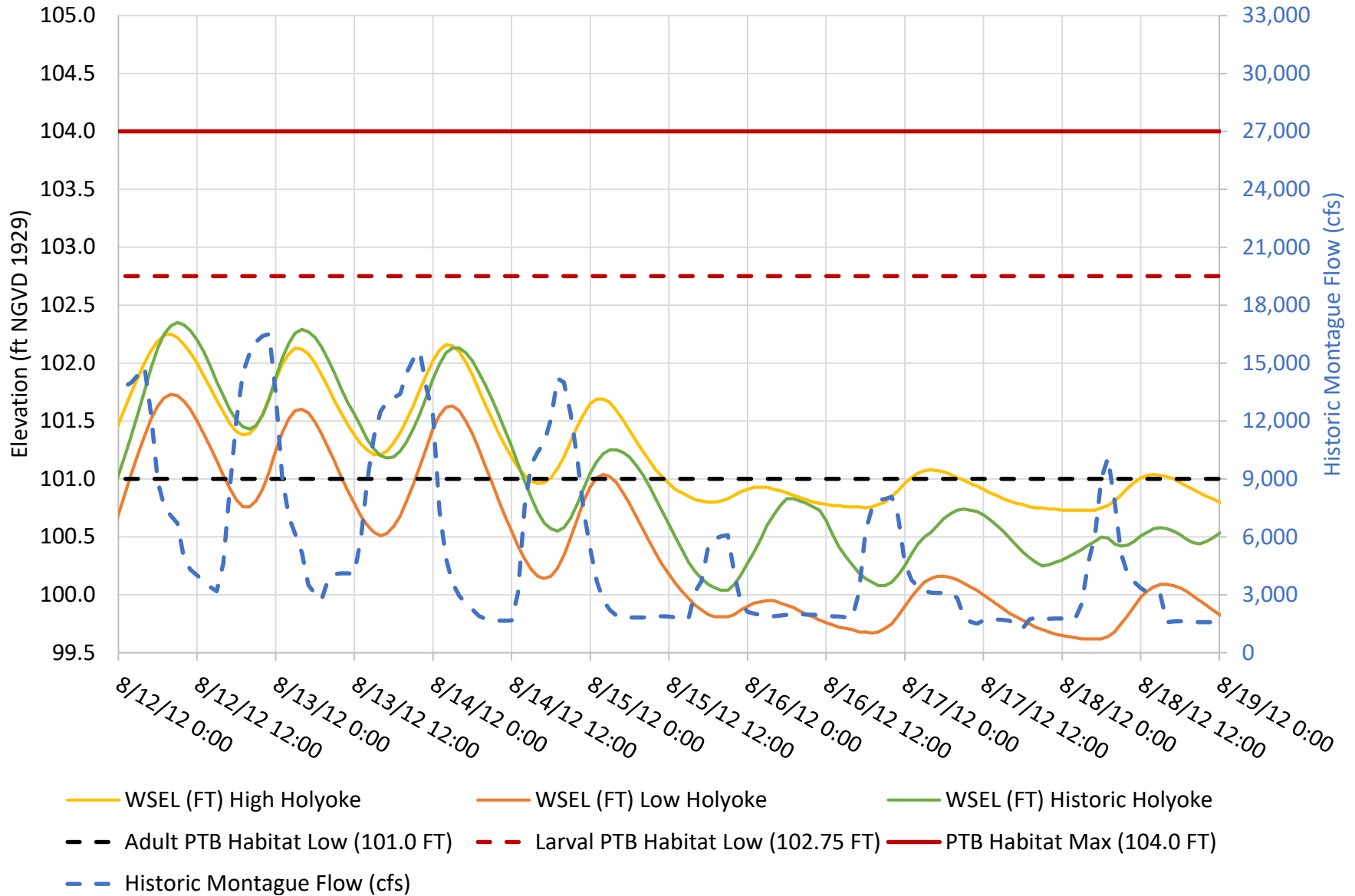
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



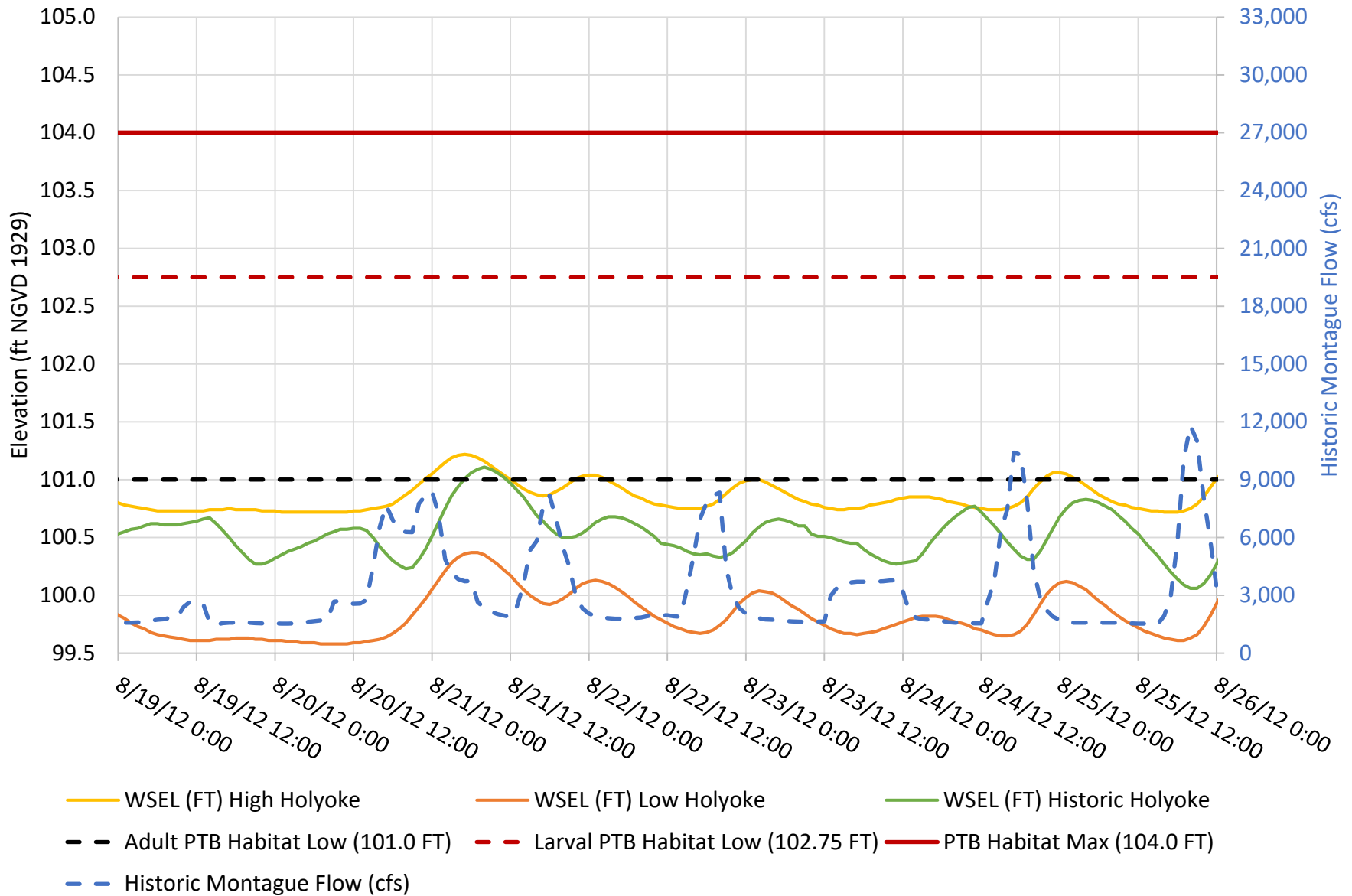
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



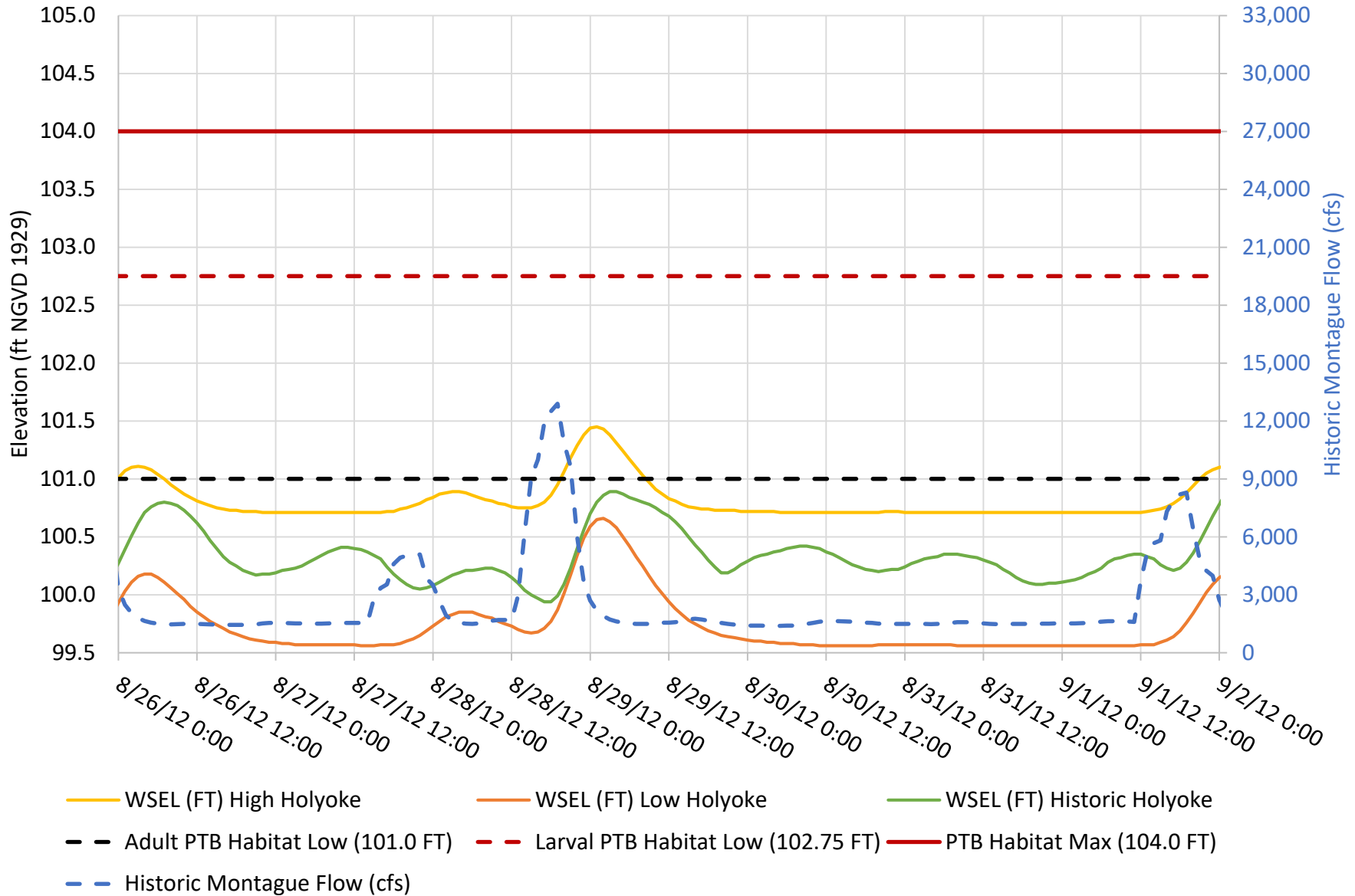
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



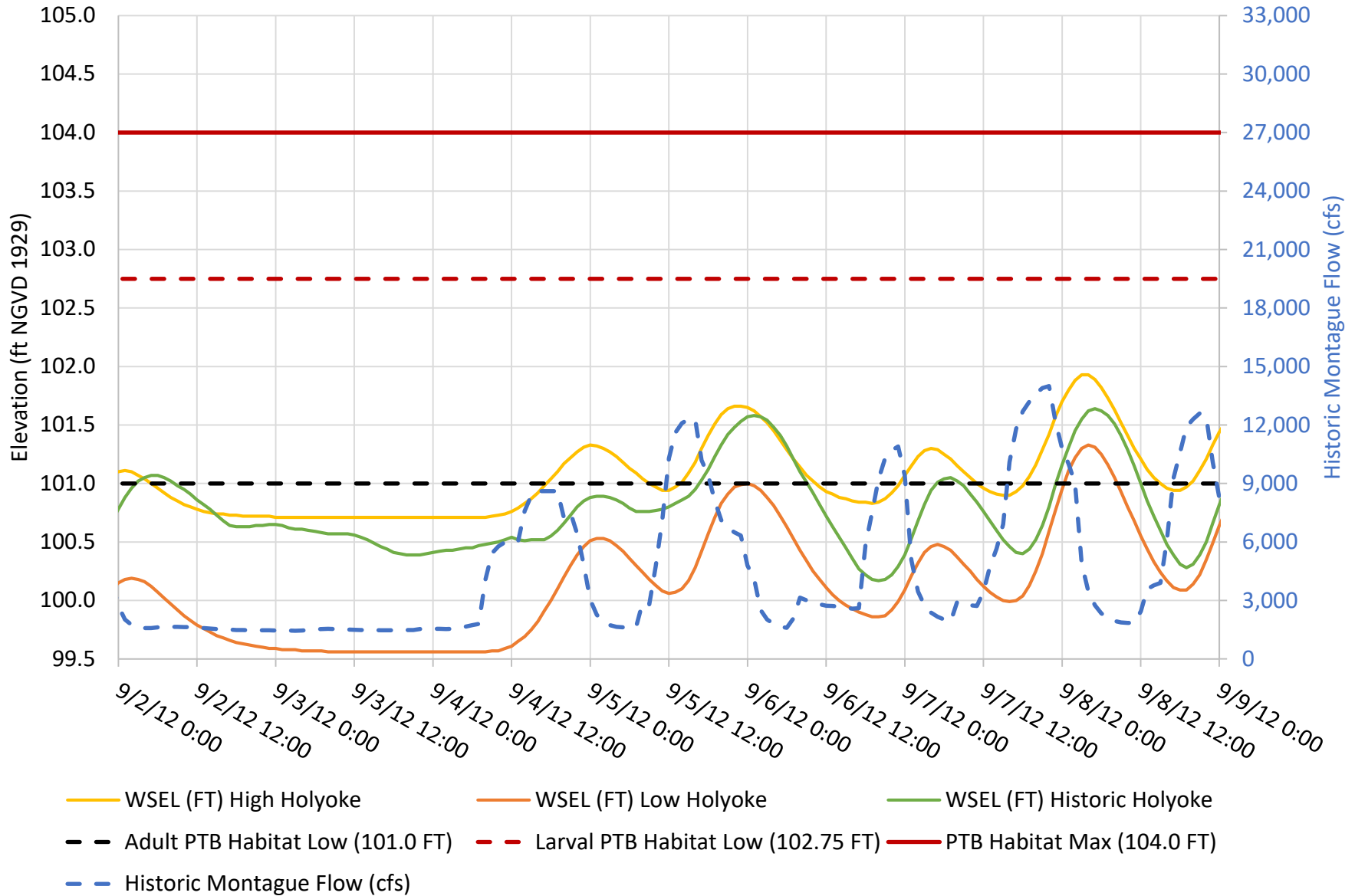
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



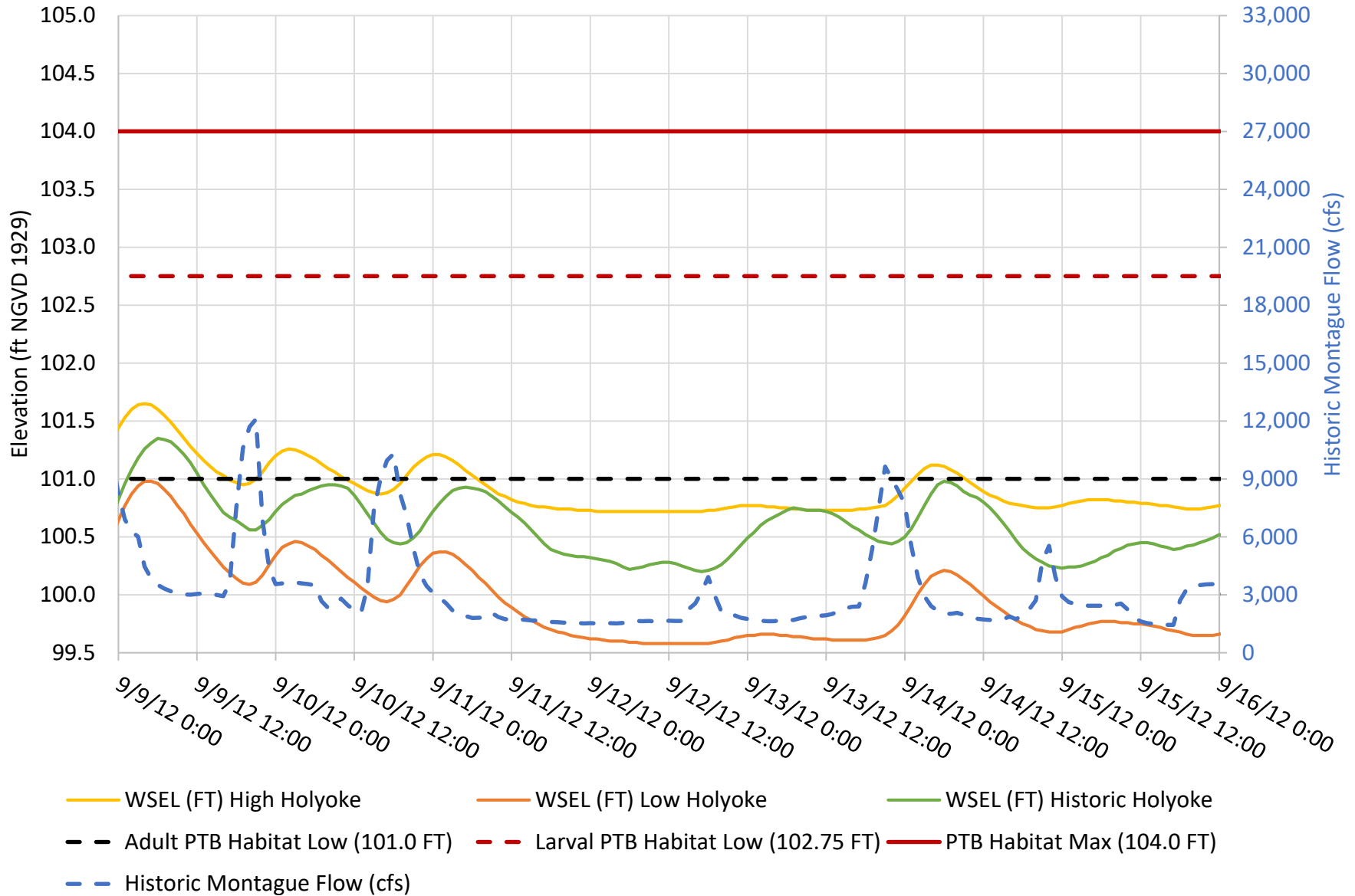
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



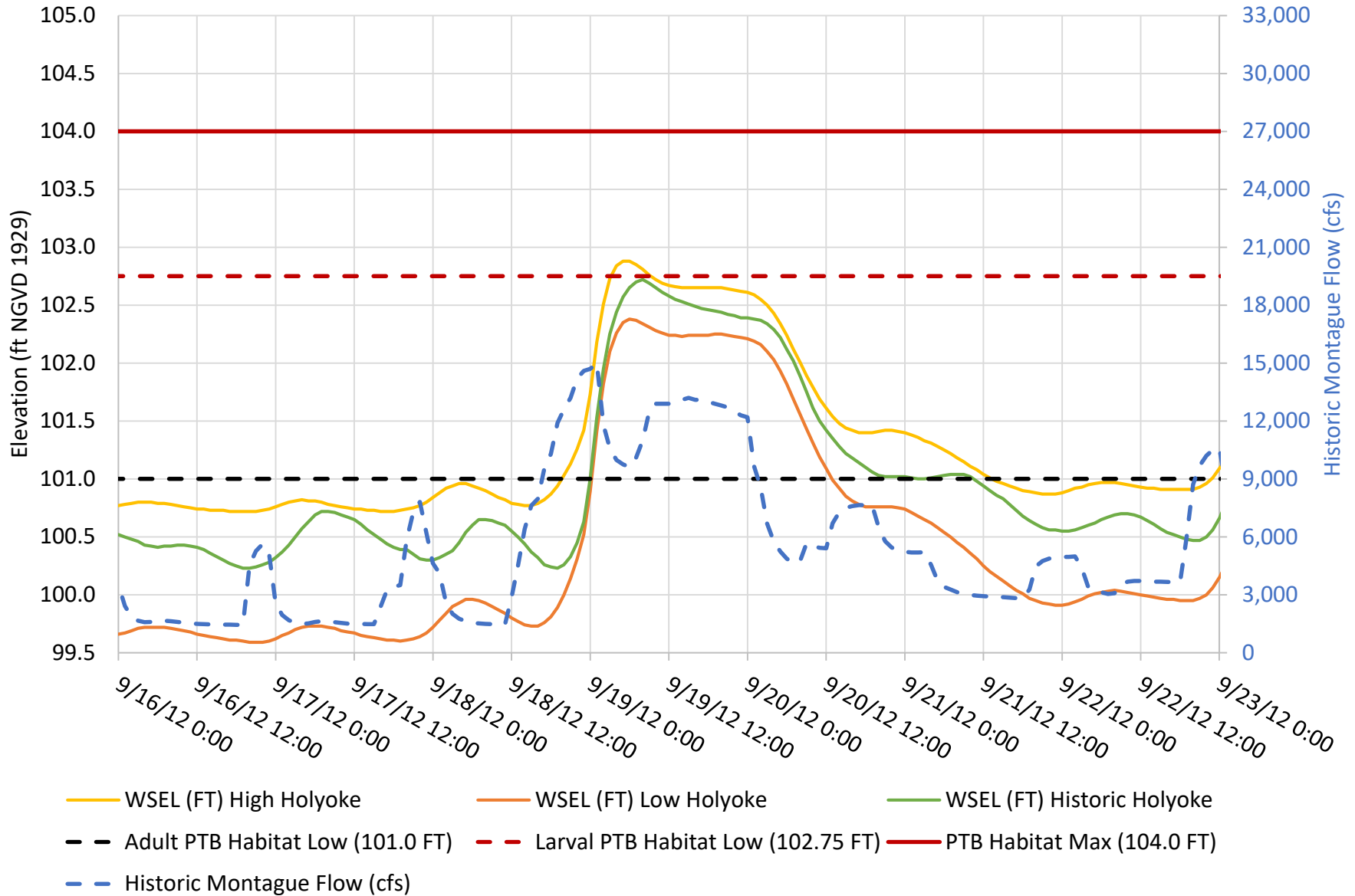
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



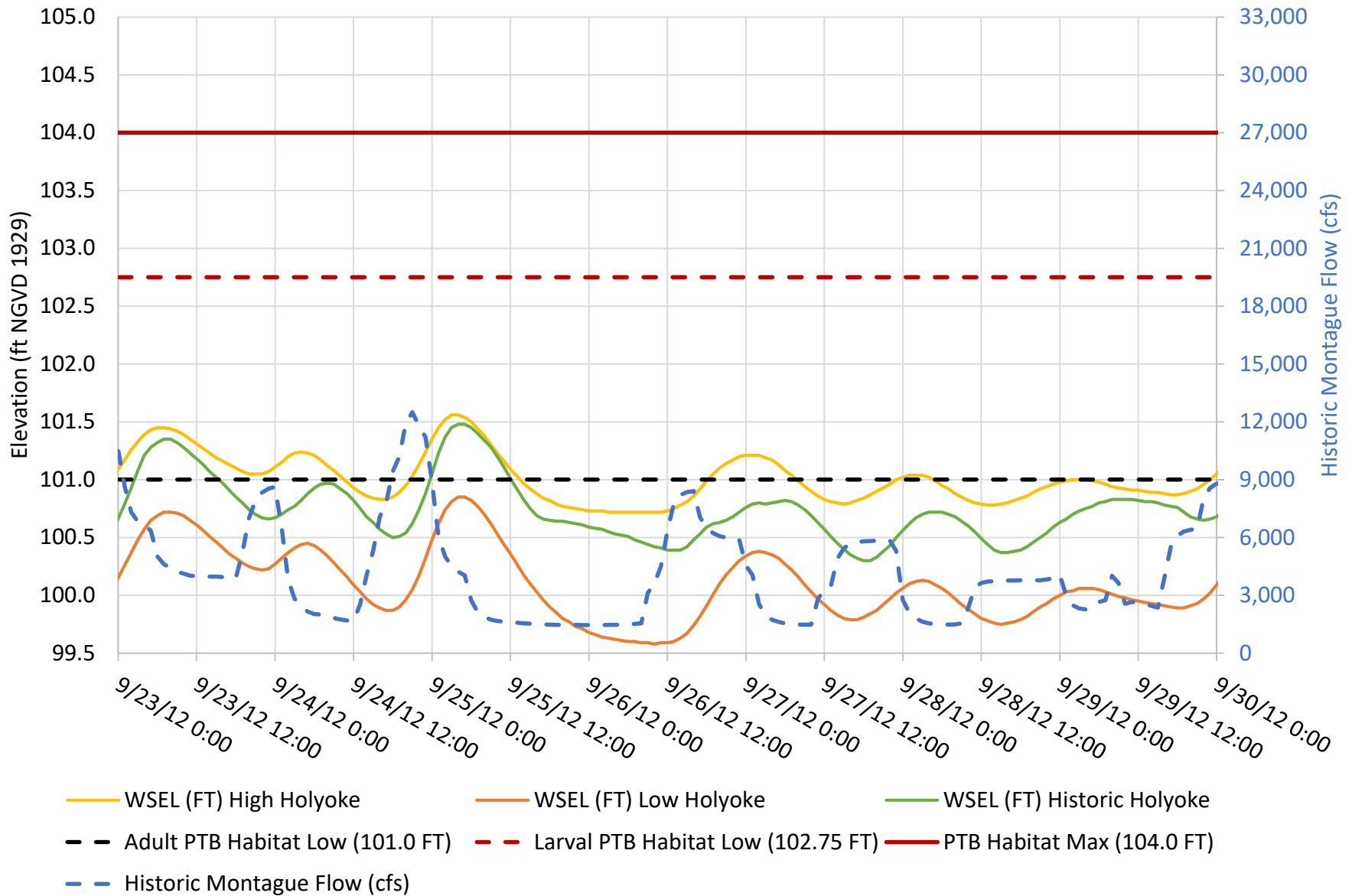
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



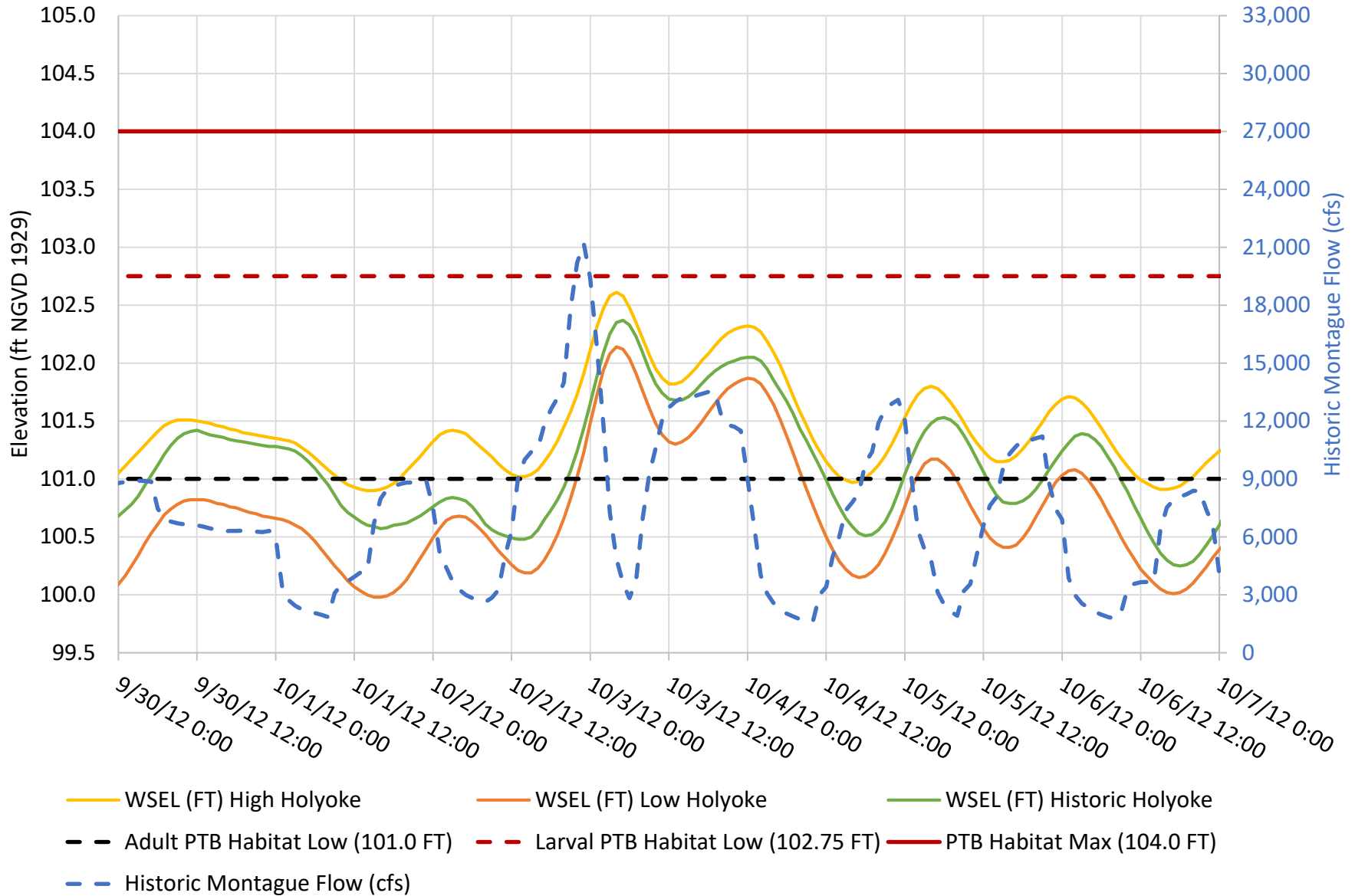
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



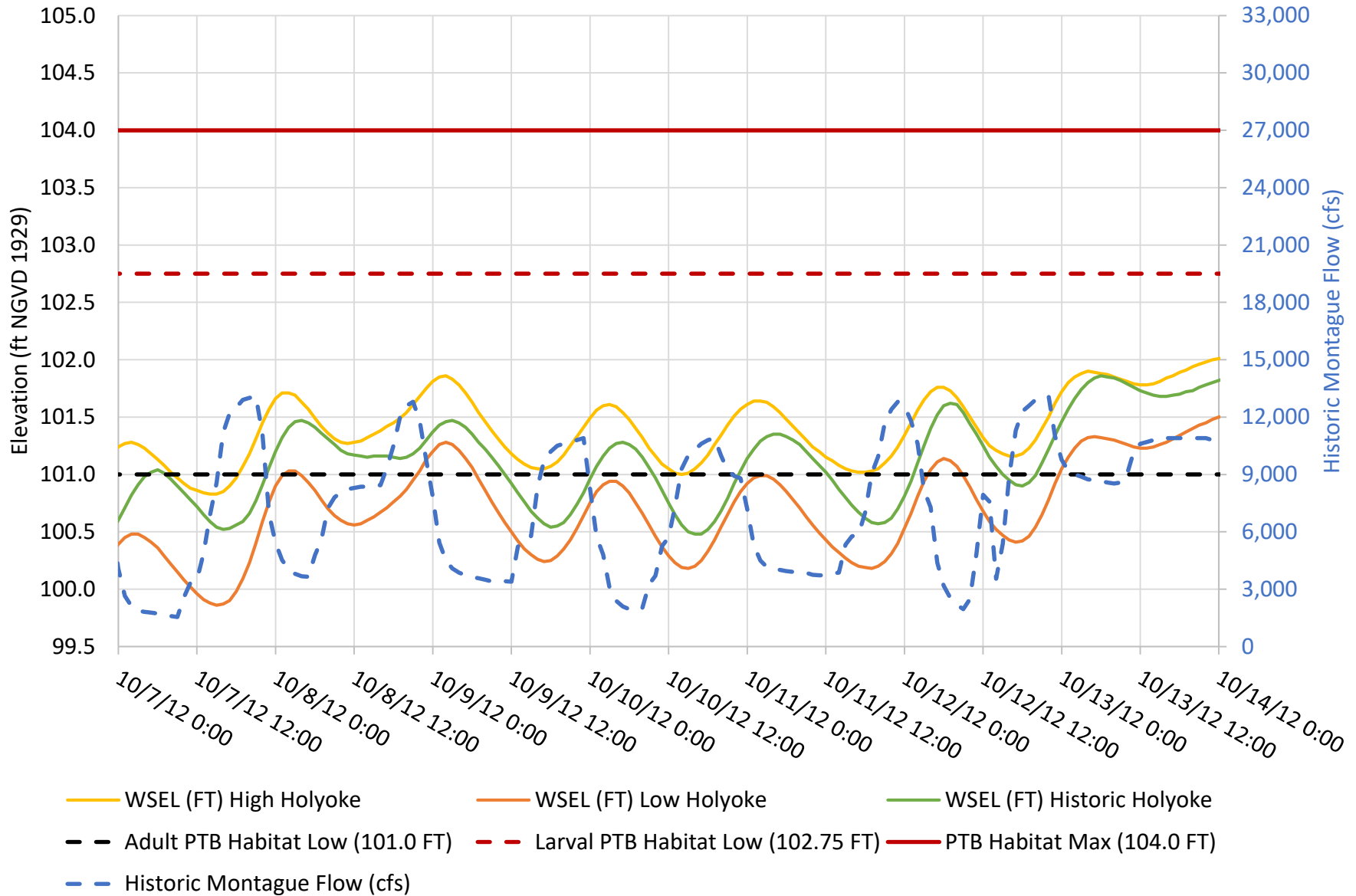
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



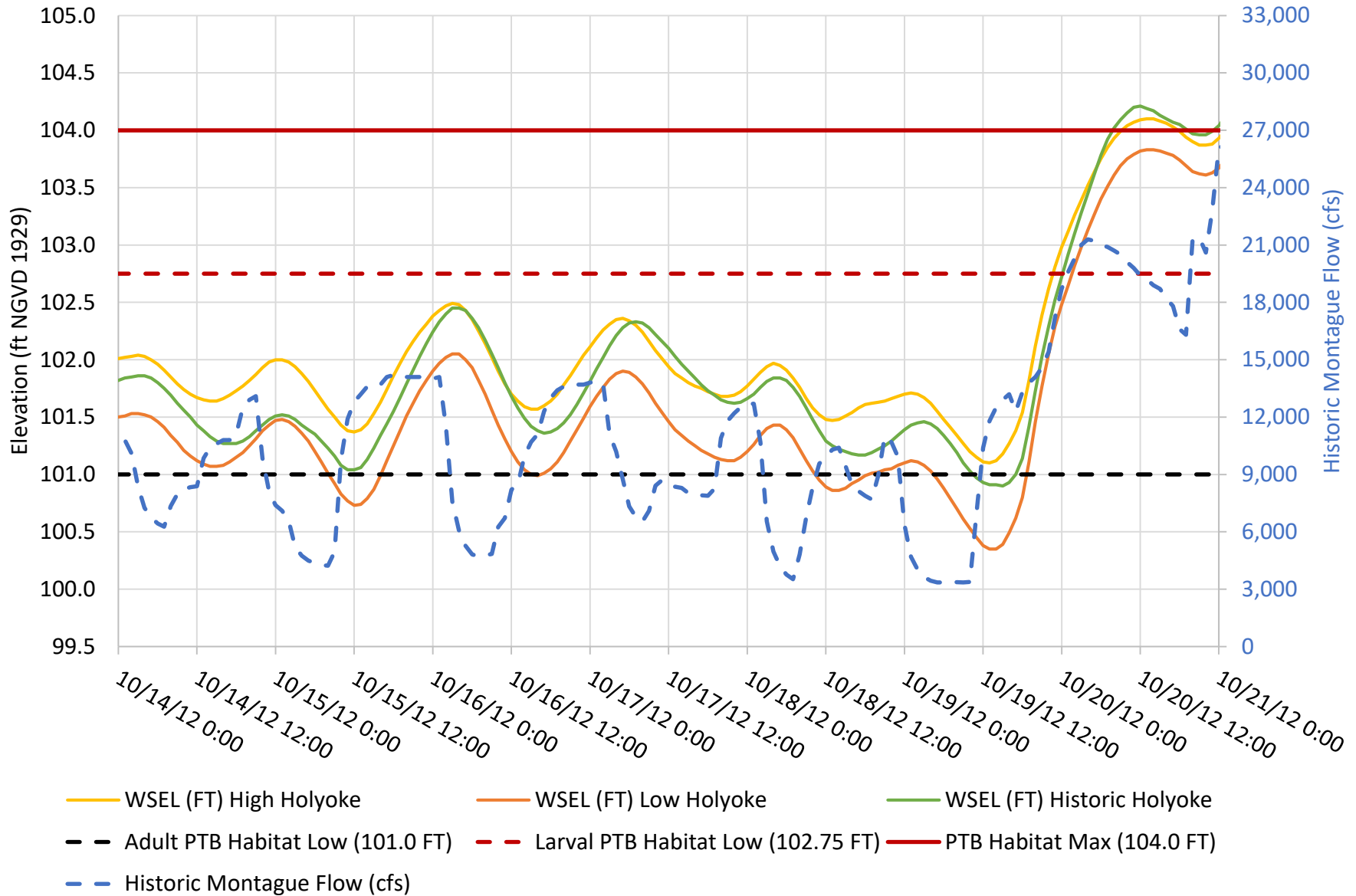
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



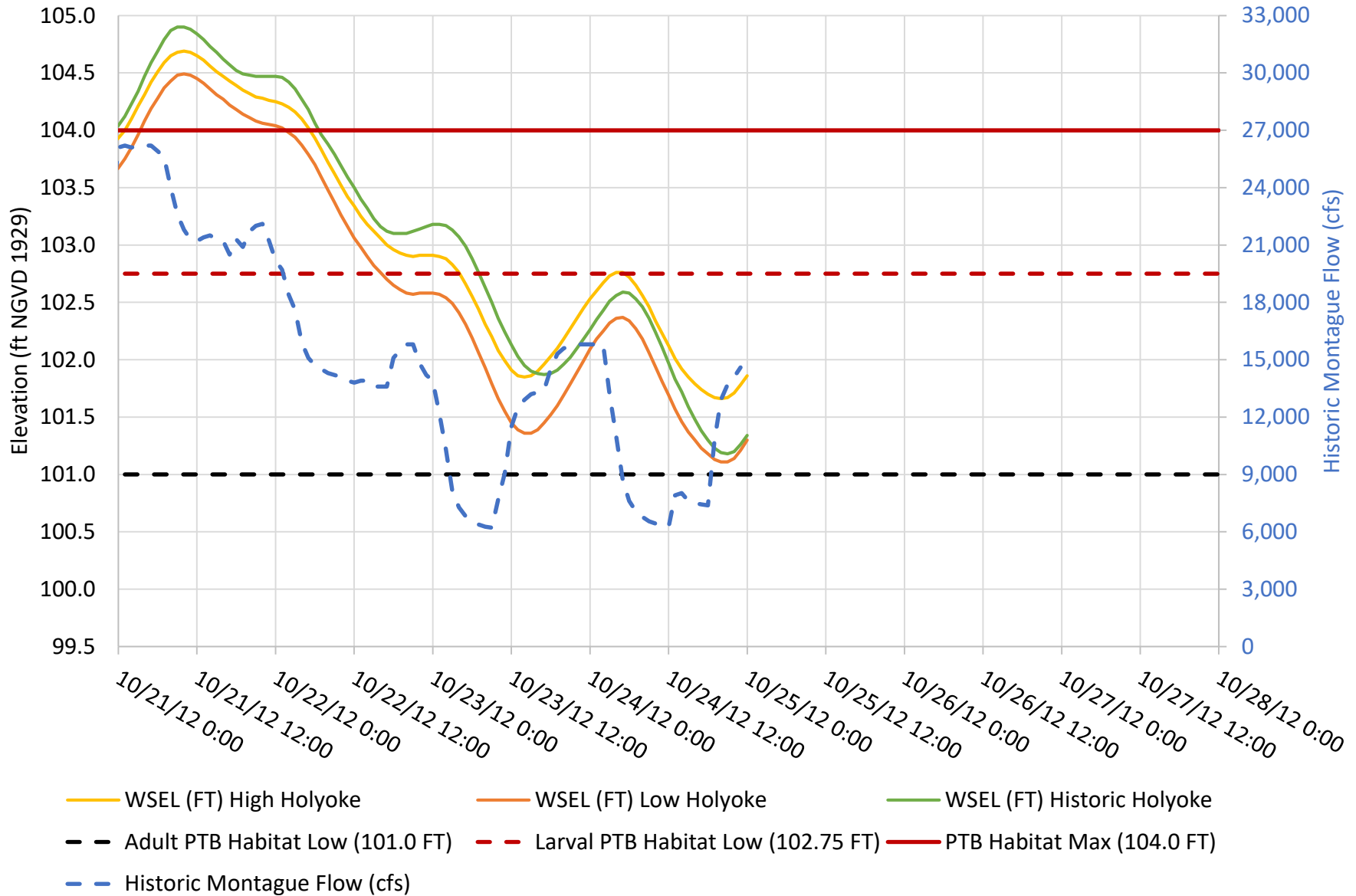
2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



2012 Modeled Water Surface Elevations at Rainbow Beach Based on High, Low, and Historic WSELs at the Holyoke Dam



APPENDIX E: SYNTHETIC MODELING SUMMARIES

Synthetic Modeling Summary:

- A low Holyoke WSEL boundary condition results in a larger amount of WSEL increase at Rainbow Beach, but a lower overall WSEL.
- Higher baseflow result in a faster arrival time of the peak at Rainbow Beach
- While a longer peaking duration, delays the arrival of the peak at Rainbow Beach this is largely a function of a longer rise to higher WSEL associated with the longer peaking duration..

Below are summaries of the model results and some figures.

	Low Holyoke				High Holyoke				Difference Between High - Low Holyoke			
	2000 cfs Base Flow and 2 Cabot Units				2000 cfs Base Flow and 2 Cabot Units				2000 cfs Base Flow and 2 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max WSEL Increase (ft)	0.14	0.28	0.54	0.71	0.09	0.19	0.34	0.45	-0.05	-0.09	-0.20	-0.26
Max Elevation (ft NGVD29)	99.76	99.90	100.16	100.33	100.83	100.93	101.08	101.19	1.07	1.03	0.92	0.86
Timing of Peak (Hours since start at Montague)	8.75	10.00	12.50	14.75	6.25	8.50	10.75	14.50	-2.50	-1.50	-1.75	-0.25
1/2 of Peak (ft NGVD29)	99.69	99.76	99.89	99.98	100.79	100.84	100.91	100.97	1.09	1.07	1.02	0.99
Time of 1/2 rising peak since Start	5.25	6.25	7.75	8.75	4.25	5.25	6.75	7.75	-1.00	-1.00	-1.00	-1.00
	4000 cfs Base Flow and 2 Cabot Units				4000 cfs Base Flow and 2 Cabot Units				4000 cfs Base Flow and 2 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.19	0.36	0.64	0.83	0.13	0.25	0.45	0.59	-0.06	-0.11	-0.19	-0.24
Max Elevation (ft NGVD29)	100.17	100.34	100.62	100.81	101.06	101.18	101.38	101.52	0.89	0.84	0.76	0.71
Timing of Peak (Hours since start at Montague)	7.50	8.75	11.50	14.50	6.25	7.75	10.75	14	-1.25	-1.00	-0.75	-0.50
1/2 of Peak (ft NGVD29)	100.08	100.16	100.30	100.40	101.00	101.06	101.16	101.24	0.92	0.90	0.85	0.84
Time of 1/2 rising peak since Start	4.75	5.75	7.00	8.00	4.25	5.00	6.50	7.25	-0.50	-0.75	-0.50	-0.75

	6000 cfs Base Flow and 2 Cabot Units				6000 cfs Base Flow and 2 Cabot Units				6000 cfs Base Flow and 2 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.21	0.39	0.67	0.86	0.17	0.3	0.52	0.66	-0.04	-0.09	-0.15	-0.20
Max Elevation (ft NGVD29)	100.64	100.82	101.10	101.29	101.37	101.5	101.72	101.86	0.73	0.68	0.62	0.57
Timing of Peak (Hours since start at Montague)	7.00	8.50	10.75	14.50	6.75	7.50	10.25	13.75	-0.25	-1.00	-0.50	-0.75
1/2 of Peak (ft NGVD29)	100.54	100.63	100.77	100.86	101.285	101.35	101.46	101.53	0.75	0.72	0.70	0.67
Time of 1/2 rising peak since Start	4.25	5.25	6.50	7.50	4.00	4.75	6.25	7.00	-0.25	-0.50	-0.25	-0.50
	2000 cfs Base Flow and 4 Cabot Units				2000 cfs Base Flow and 4 Cabot Units				2000 cfs Base Flow and 4 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.31	0.62	1.19	1.57	0.21	0.43	0.83	1.09	-0.10	-0.19	-0.36	-0.48
Max Elevation (ft NGVD29)	99.93	100.24	100.81	101.19	100.95	101.17	101.57	101.83	1.02	0.93	0.76	0.64
Timing of Peak (Hours since start at Montague)	8.25	9.00	11.75	14.75	6.75	8.00	10.75	14.00	-1.50	-1.00	-1.00	-0.75
1/2 of Peak (ft NGVD29)	99.78	99.93	100.22	100.41	100.85	100.96	101.16	101.29	1.07	1.02	0.94	0.88
Time of 1/2 rising peak since Start	5.00	5.75	7.25	8.25	4.25	5.00	6.75	7.75	-0.75	-0.75	-0.50	-0.50
	4000 cfs Base Flow and 4 Cabot Units				4000 cfs Base Flow and 4 Cabot Units				4000 cfs Base Flow and 4 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.39	0.74	1.31	1.68	0.28	0.55	0.99	1.26	-0.11	-0.19	-0.32	-0.42
Max Elevation (ft NGVD29)	100.37	100.72	101.29	101.66	101.21	101.48	101.92	102.19	0.84	0.76	0.63	0.53
Timing of Peak (Hours since start at Montague)	7.50	8.75	11.00	14.25	6.50	8.00	10.50	13.75	-1.00	-0.75	-0.50	-0.50
1/2 of Peak (ft NGVD29)	100.18	100.35	100.64	100.82	101.07	101.21	101.43	101.56	0.89	0.86	0.79	0.74
Time of 1/2 rising peak since Start	4.50	5.25	6.75	7.50	4.00	5.00	6.25	7.25	-0.50	-0.25	-0.50	-0.25
	6000 cfs Base Flow and 4 Cabot Units				6000 cfs Base Flow and 4 Cabot Units				6000 cfs Base Flow and 4 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.63	0.78	1.34	1.69	0.34	0.63	1.09	1.37	-0.29	-0.15	-0.25	-0.32
Max Elevation (ft NGVD29)	101.06	101.21	101.77	102.12	101.54	101.83	102.29	102.57	0.48	0.62	0.52	0.45
Timing of Peak (Hours since start at Montague)	6.75	8.25	10.75	13.75	6.75	7.75	10.50	13.75	0.00	-0.50	-0.25	0.00
1/2 of Peak (ft NGVD29)	100.75	100.82	101.10	101.28	101.37	101.52	101.75	101.89	0.63	0.70	0.65	0.61
Time of 1/2 rising peak since Start	4.00	5.00	6.25	7.00	3.75	4.75	6.00	6.75	-0.25	-0.25	-0.25	-0.25
	2000 cfs Base Flow and 6 Cabot Units				2000 cfs Base Flow and 6 Cabot Units				2000 cfs Base Flow and 6 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12

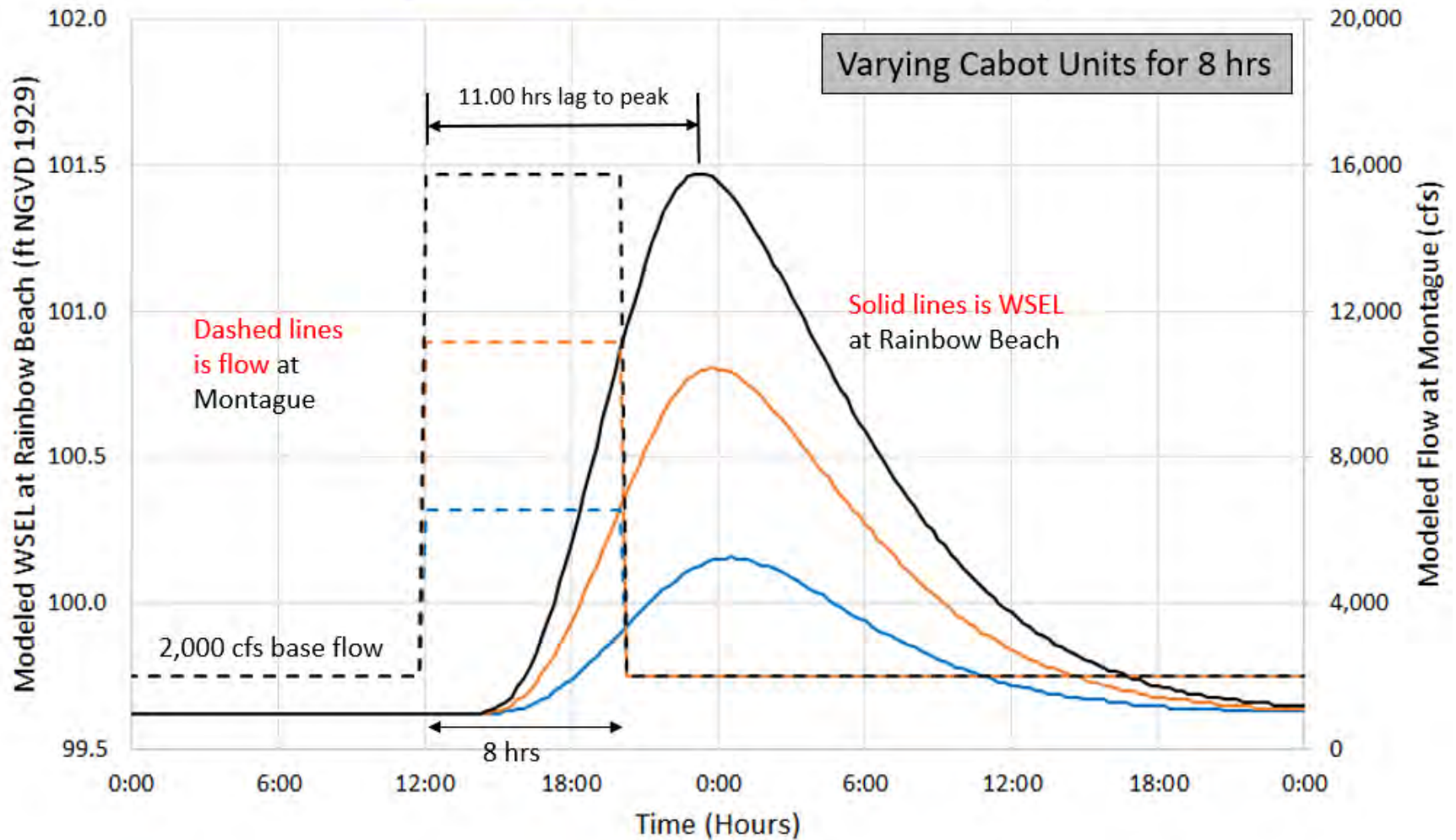
Max WSEL Increase (ft)	0.49	0.99	1.85	2.41	0.34	0.71	1.38	1.79	-0.15	-0.28	-0.47	-0.62
Max Elevation (ft NGVD29)	100.11	100.61	101.47	102.03	101.08	101.45	102.12	102.53	0.97	0.84	0.65	0.50
Timing of Peak (Hours since start at Montague)	8.25	9.00	11.00	14.25	6.75	7.75	10.75	13.75	-1.50	-1.25	-0.25	-0.50
1/2 of Peak (ft NGVD29)	99.865	100.115	100.545	100.825	100.91	101.10	101.43	101.64	1.04	0.98	0.89	0.81
Time of 1/2 rising peak since Start	4.75	5.50	7.00	7.75	4.25	5.00	6.50	7.25	-0.50	-0.50	-0.50	-0.50
	4000 cfs Base Flow and 6 Cabot Units				4000 cfs Base Flow and 6 Cabot Units				4000 cfs Base Flow and 6 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.60	1.13	1.98	2.51	0.44	0.86	1.56	1.98	-0.16	-0.27	-0.42	-0.53
Max Elevation (ft NGVD29)	100.58	101.11	101.96	102.49	101.37	101.79	102.49	102.91	0.79	0.68	0.53	0.42
Timing of Peak (Hours since start at Montague)	7.75	8.50	10.75	14.00	6.50	7.50	10.50	13.50	-1.25	-1.00	-0.25	-0.50
1/2 of Peak (ft NGVD29)	100.28	100.55	100.97	101.24	101.15	101.36	101.71	101.92	0.87	0.82	0.74	0.69
Time of 1/2 rising peak since Start	4.50	5.00	6.50	7.25	4.00	4.75	6.00	7.00	-0.50	-0.25	-0.50	-0.25
	6000 cfs Base Flow and 6 Cabot Units				6000 cfs Base Flow and 6 Cabot Units				6000 cfs Base Flow and 6 Cabot Units			
Length of Cabot Release (Hours)	2	4	8	12	2	4	8	12	2	4	8	12
Max Increase (ft)	0.63	1.16	2.00	2.50	0.51	0.96	1.67	2.09	-0.12	-0.20	-0.33	-0.41
Max Elevation (ft NGVD29)	101.06	101.59	102.43	102.93	101.71	102.16	102.87	103.29	0.65	0.57	0.44	0.36
Timing of Peak (Hours since start at Montague)	6.75	7.75	10.50	13.75	6.25	7.50	10.25	13.50	-0.50	-0.25	-0.25	-0.25
1/2 of Peak (ft NGVD29)	100.75	101.01	101.43	101.68	101.46	101.68	102.04	102.25	0.71	0.67	0.60	0.56
Time of 1/2 rising peak since Start	4.00	4.75	6.00	6.75	3.75	4.50	5.75	6.50	-0.25	-0.25	-0.25	-0.25

At Rainbow Beach about 25 miles downstream of Cabot Station (Low Holyoke Conditions more WSEL change and a slower peak arrival time than under High Holyoke)

Baseflow (cfs)	Number of Cabot Units	Length of Cabot Peak (hours)	Maximum WSEL increase (ft)	Delay of the Peak (hours)
2,000	2	2	0.14	8.75
2,000	2	4	0.28	10
2,000	2	8	0.54	12.5
2,000	2	12	0.71	14.75
4,000	2	2	0.19	7.5
4,000	2	4	0.36	8.75
4,000	2	8	0.64	11.5
4,000	2	12	0.83	14.5
6,000	2	2	0.21	7
6,000	2	4	0.39	8.5
6,000	2	8	0.67	10.75
6,000	2	12	0.86	14.5
2,000	4	2	0.31	8.25
2,000	4	4	0.62	9
2,000	4	8	1.19	11.75
2,000	4	12	1.57	14.75
4,000	4	2	0.39	7.5
4,000	4	4	0.74	8.75
4,000	4	8	1.31	11
4,000	4	12	1.68	14.25
6,000	4	2	0.63	6.75
6,000	4	4	0.78	8.25
6,000	4	8	1.34	10.75
6,000	4	12	1.69	13.75
2,000	6	2	0.49	8.25
2,000	6	4	0.99	9
2,000	6	8	1.85	11
2,000	6	12	2.41	14.25
4,000	6	2	0.60	7.75
4,000	6	4	1.13	8.5
4,000	6	8	1.98	10.75
4,000	6	12	2.51	14
6,000	6	2	0.63	6.75
6,000	6	4	1.16	7.75
6,000	6	8	2.00	10.5
6,000	6	12	2.50	13.75

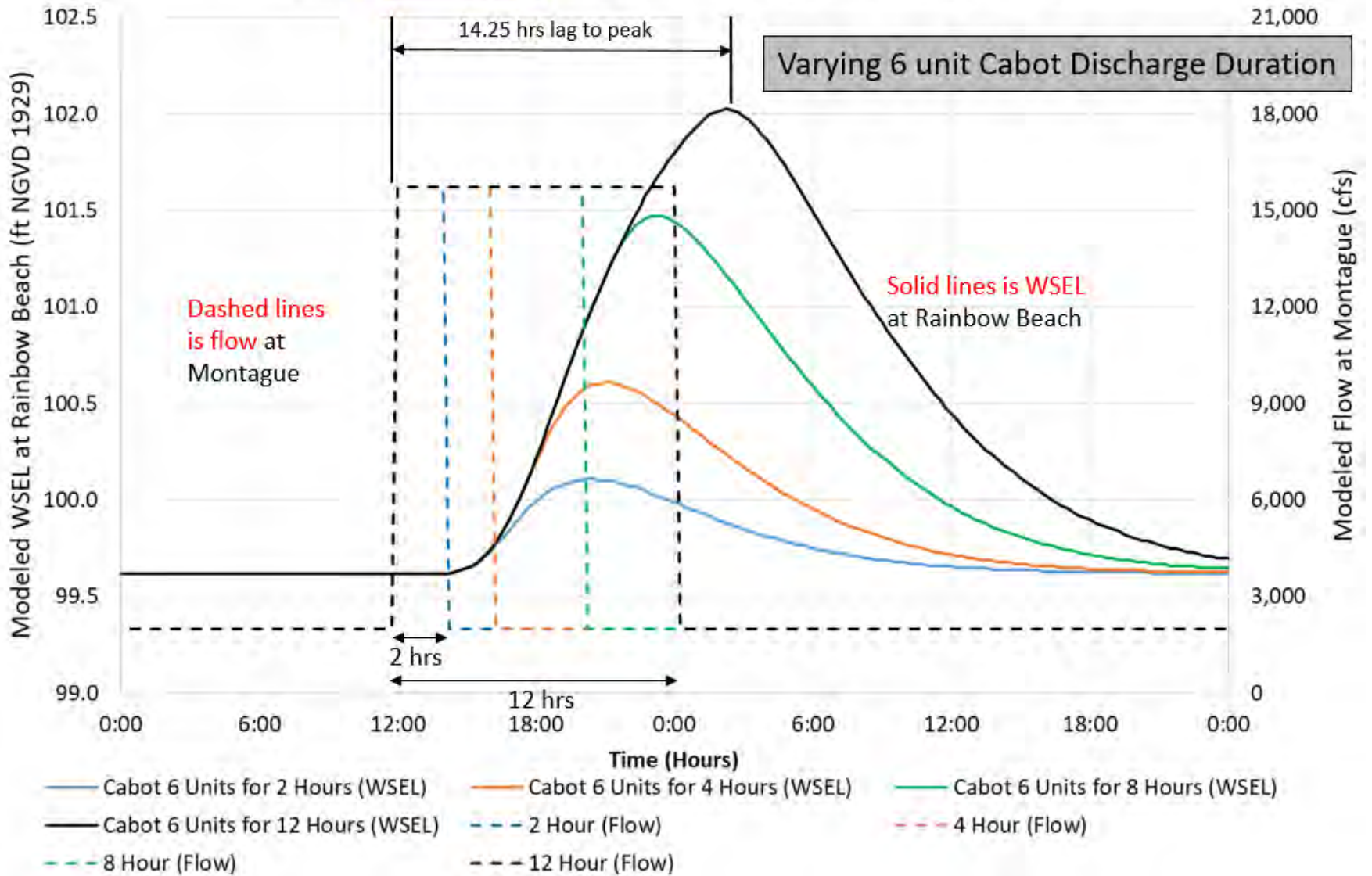
Note: model timestep was 15 minutes

Cabot Peaking at 2, 4, and 6 Units for 8 Hours
 Under **Low Holyoke** Conditions and a base flow of 2,000 cfs



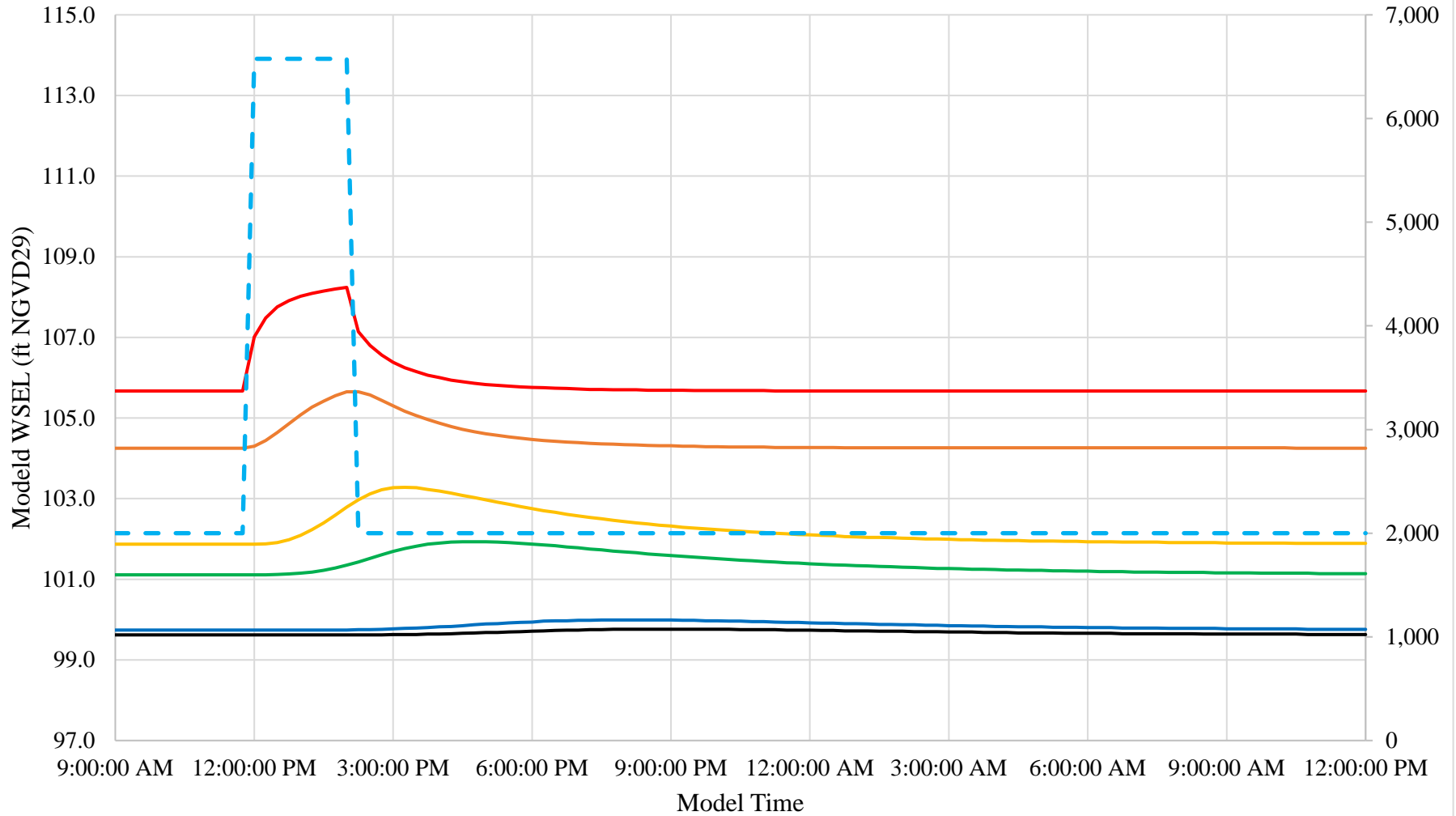
- Cabot 2 Units for 8 Hours (WSEL) — Cabot 4 Units for 8 Hours (WSEL) — Cabot 6 Units for 8 Hours (WSEL)
- - - 2 Units (Flow) - - - 4 Units (Flow) - - - 6 Units (Flow)

Cabot Peaking at 6 Units (13,728cfs) for 2, 4, 8, and 12 Hours
 Under **Low Holyoke** Conditions and a base flow of 2,000 cfs



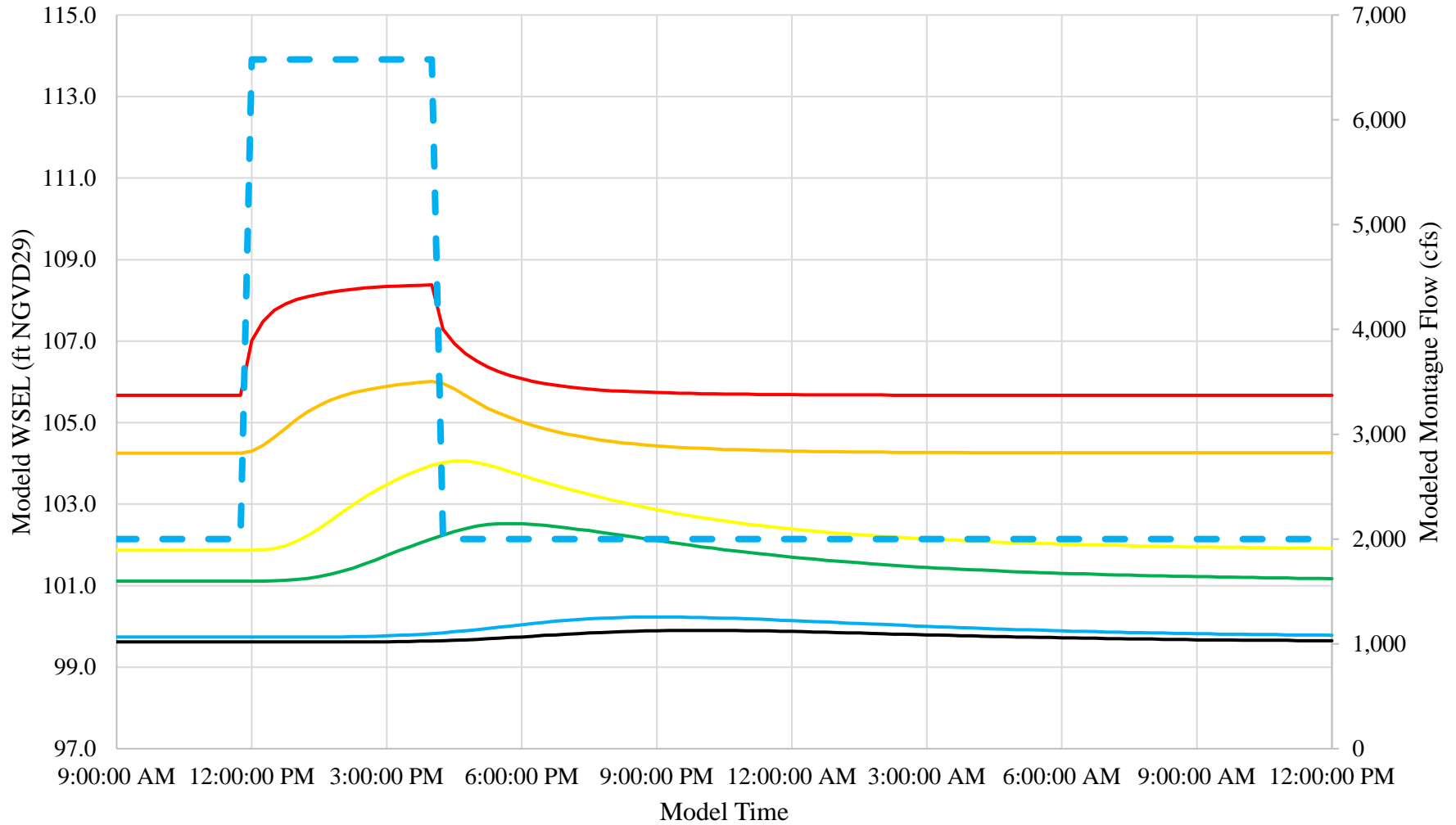
APPENDIX F: TIMESERIES GRAPHS OF SYNTHETIC MODELING SCENARIOS

Synthetic Model Scenario #1 2,000 cfs Baseflow and 2 Cabot Units for 2 Hours



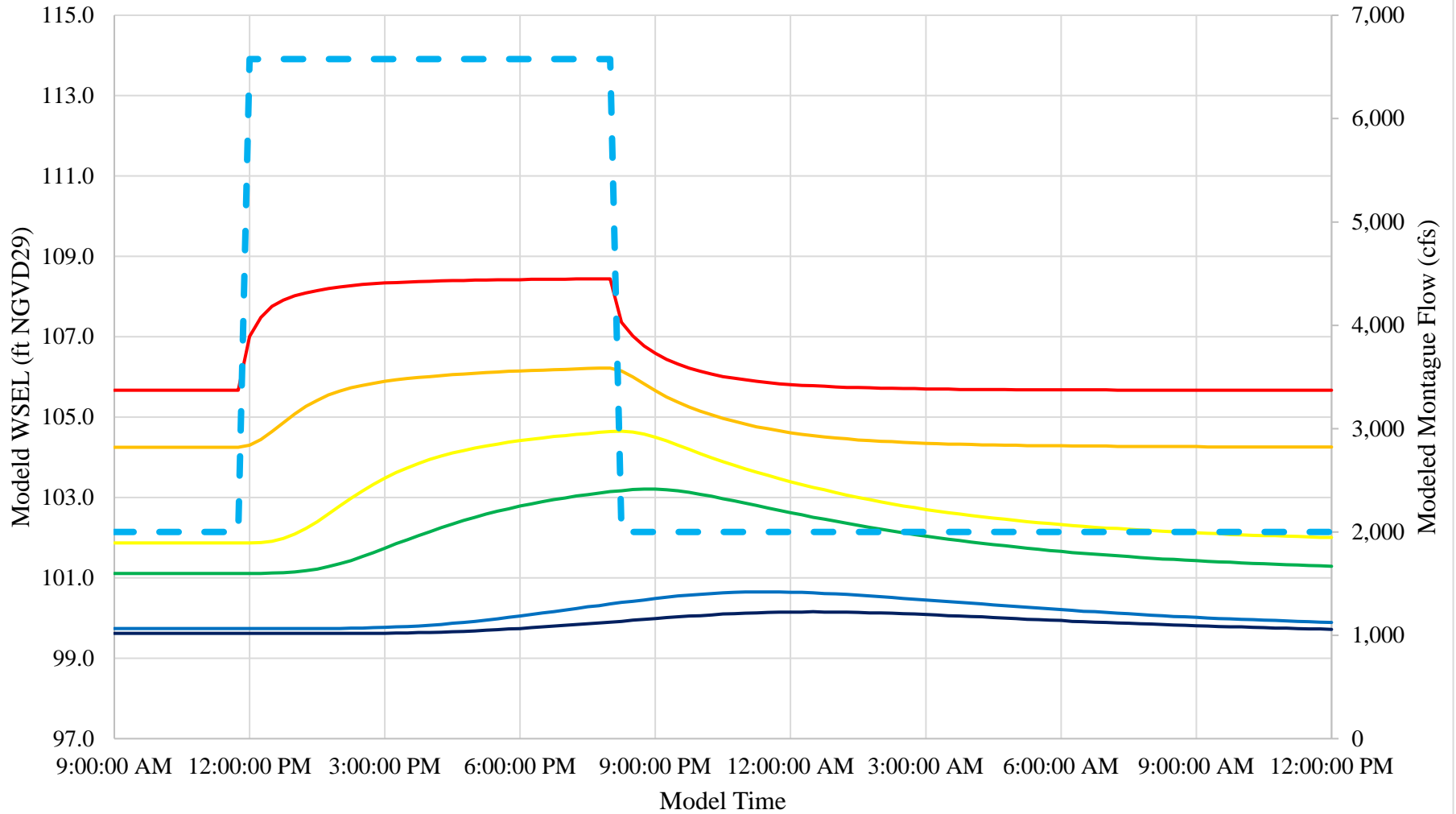
- 118.508, S1 Low
- 115.07, S1 Low
- 112.36, S1 Low
- 109.52, S1 Low
- 100.24, S1 Low
- 94.298 (Rainbow Beach), S1 Low
- - - Montague Flow S1 Low

Synthetic Model Scenario #2 2,000 cfs Baseflow and 2 Cabot Units for 4 Hours



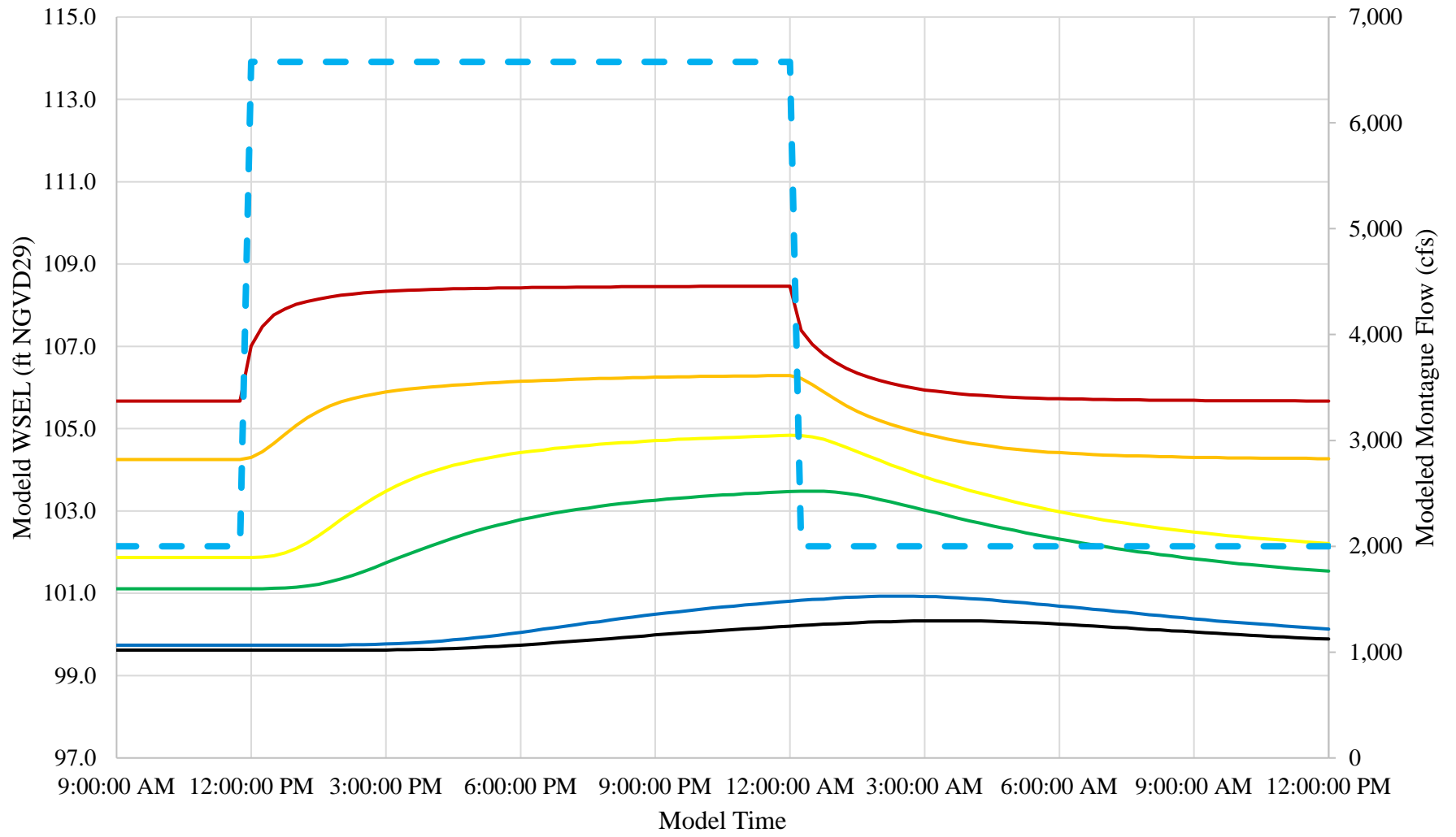
- 118.508, S2 Low
- 115.07, S2 Low
- 112.36, S2 Low
- 109.52, S2 Low
- 100.24, S2 Low
- 94.298 (Rainbow Beach), S2 Low
- - - Montague Flow S2 Low

Synthetic Model Scenario #3 2,000 cfs Baseflow and 2 Cabot Units for 8 Hours



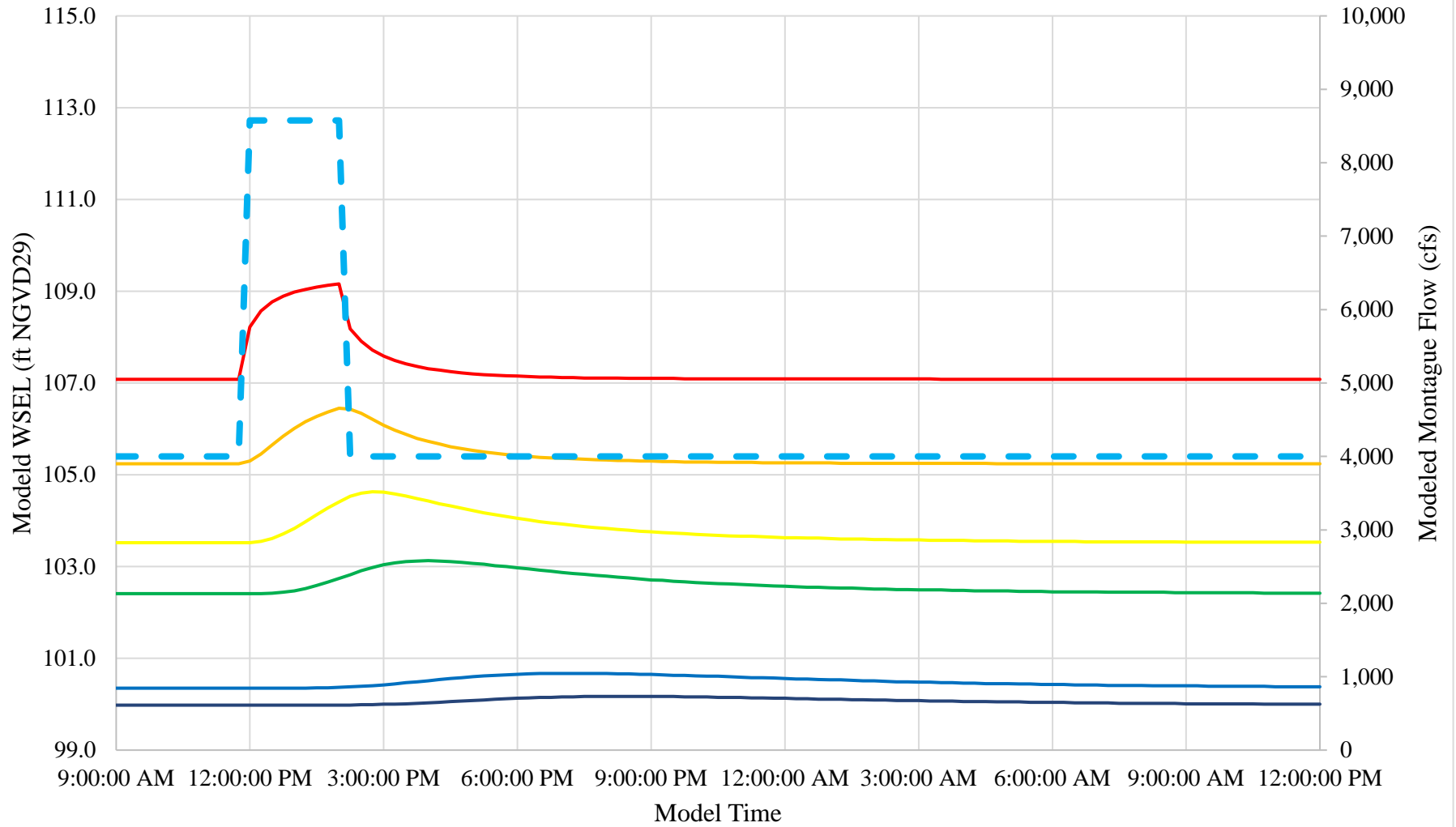
- 118.508, S3 Low
- 115.07, S3 Low
- 112.36, S3 Low
- 109.52, S3 Low
- 100.24, S3 Low
- 94.298 (Rainbow Beach), S3 Low
- - - Montague Flow S3 Low

Synthetic Model Scenario #4 2,000 cfs Baseflow and 2 Cabot Units for 12 Hours



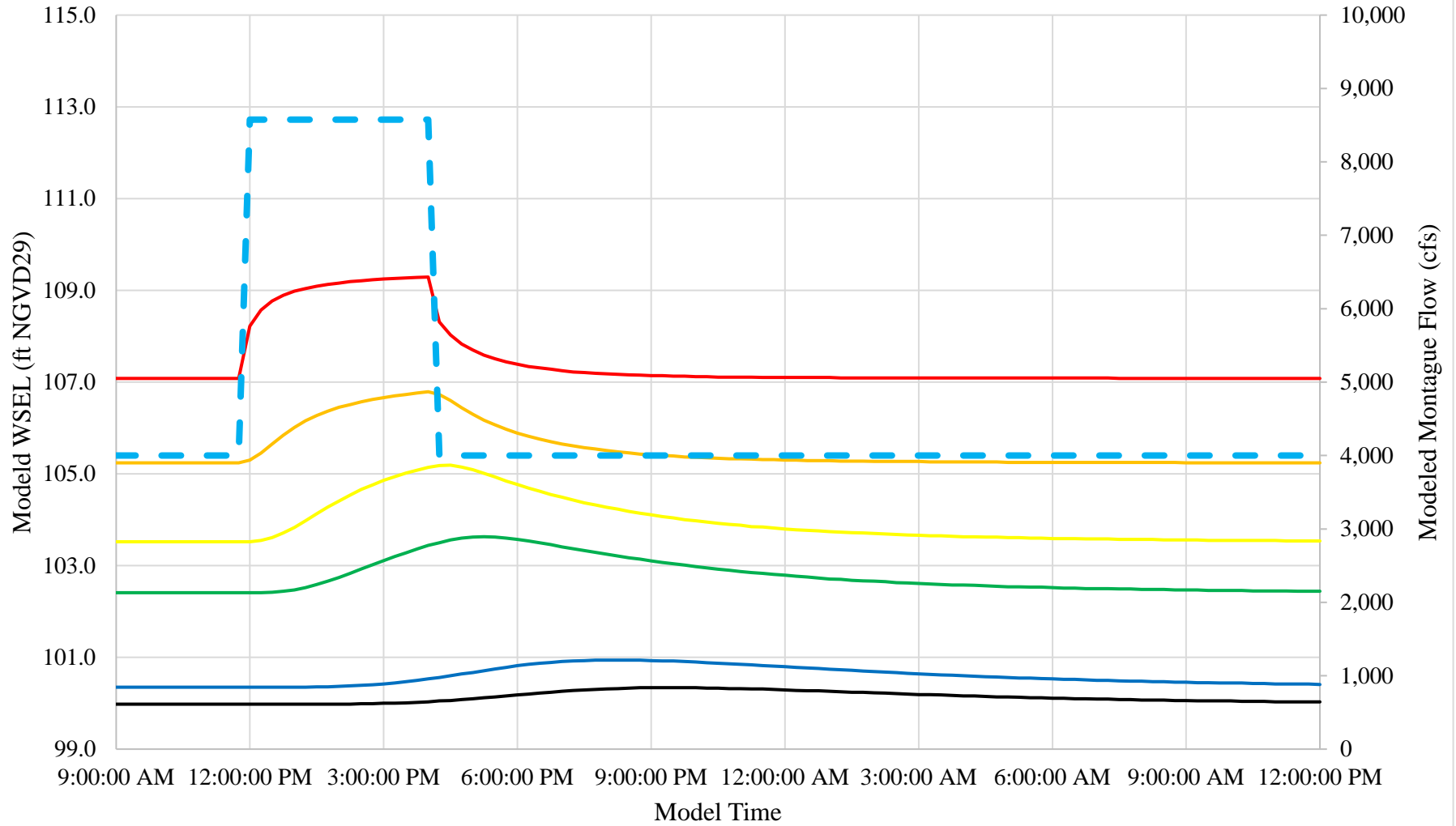
- 118.508, S4 Low
- 115.07, S4 Low
- 112.36, S4 Low
- 109.52, S4 Low
- 100.24, S4 Low
- 94.298 (Rainbow Beach), S4 Low
- - - Montague Flow S4 Low

Synthetic Model Scenario #5 4,000 cfs Baseflow and 2 Cabot Units for 2 Hours



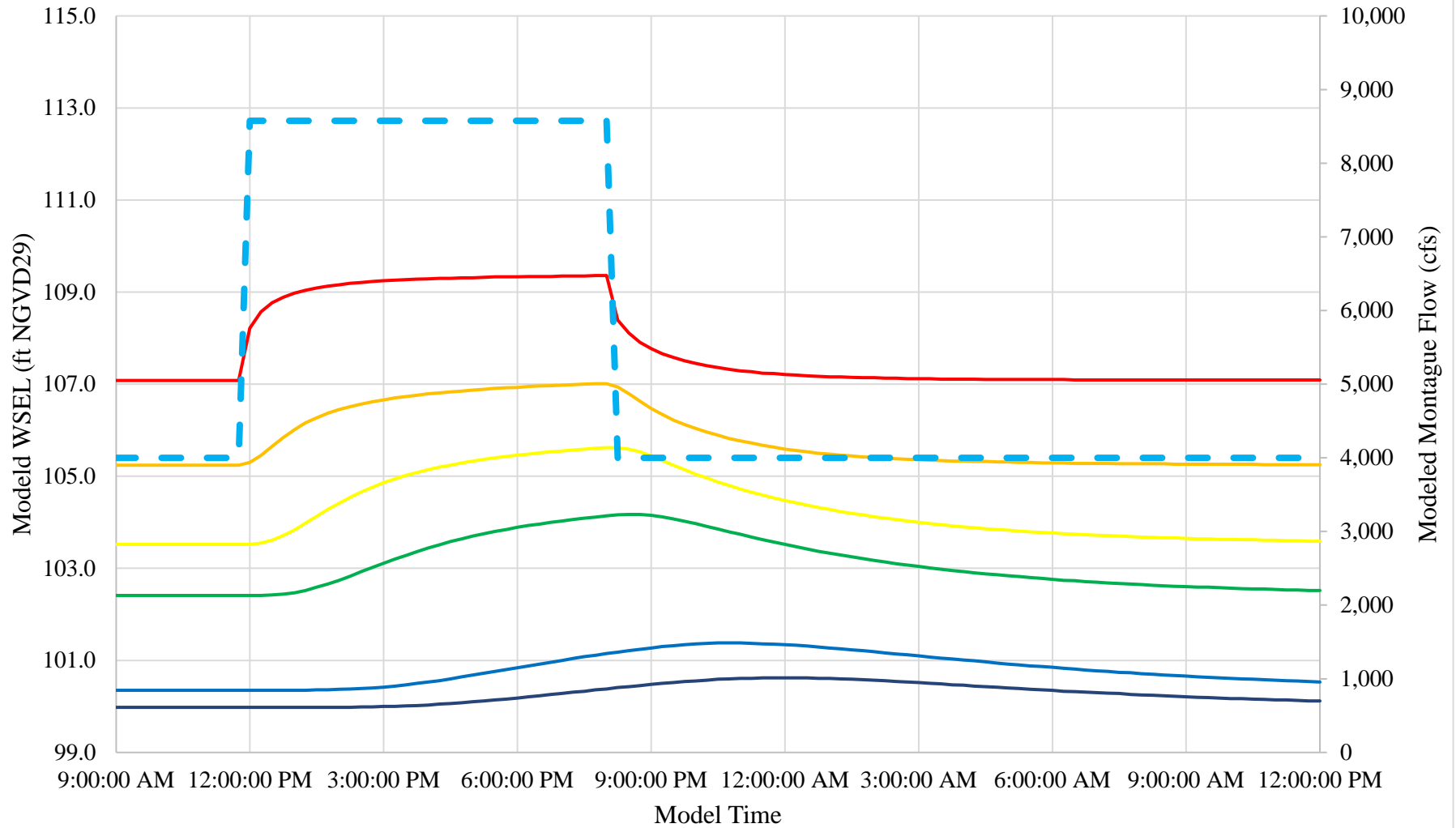
- 118.508, S5 Low
- 115.07, S5 Low
- 112.36, S5 Low
- 109.52, S5 Low
- 100.24, S5 Low
- 94.298 (Rainbow Beach), S5 Low
- - - Montague Flow S5 Low

Synthetic Model Scenario #6 4,000 cfs Baseflow and 2 Cabot Units for 4 Hours



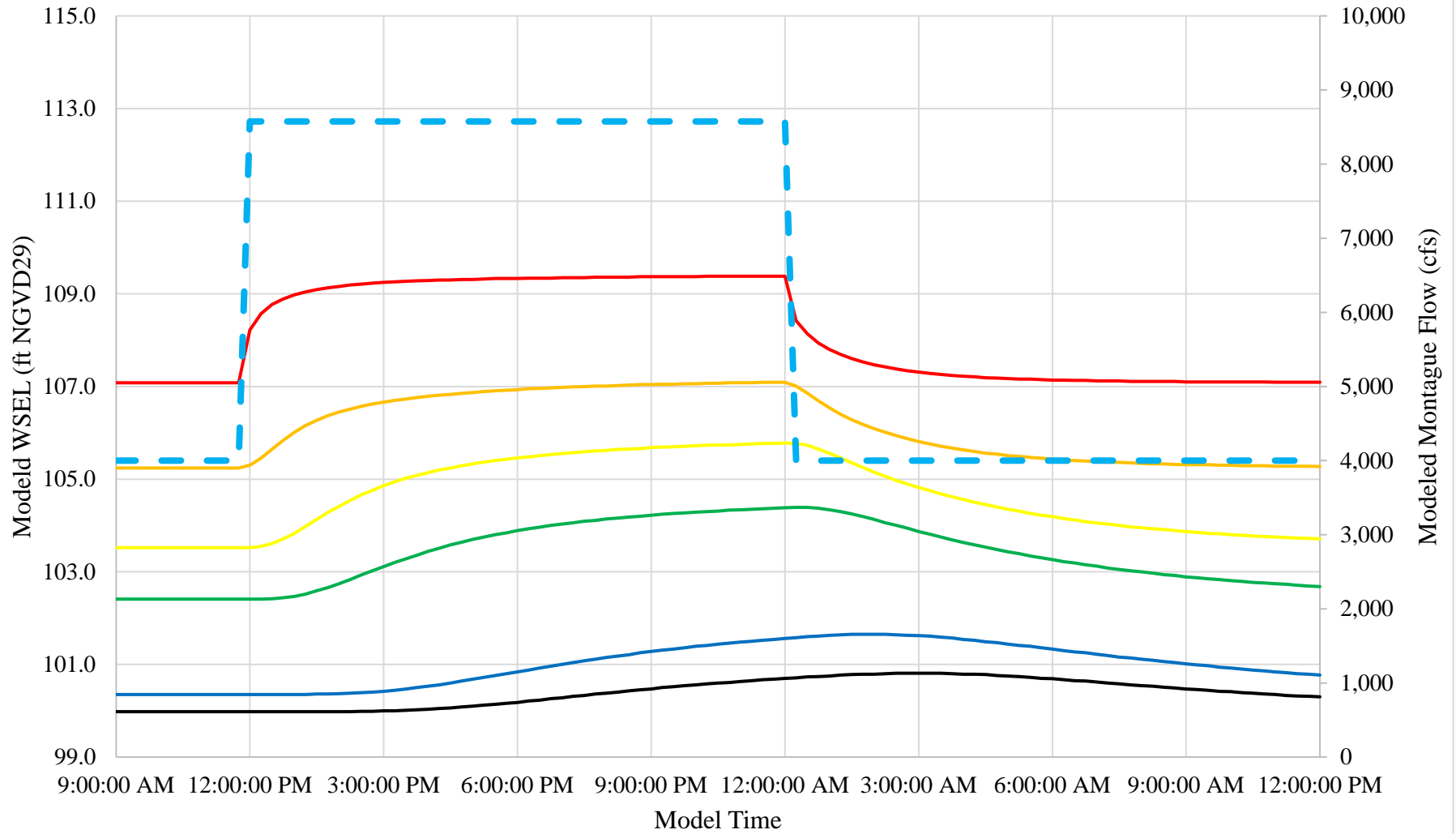
- 118.508, S6 Low
- 115.07, S6 Low
- 112.36, S6 Low
- 109.52, S6 Low
- 100.24, S6 Low
- 94.298 (Rainbow Beach), S6 Low
- - - Montague Flow S6 Low

Synthetic Model Scenario #7 4,000 cfs Baseflow and 2 Cabot Units for 8 Hours



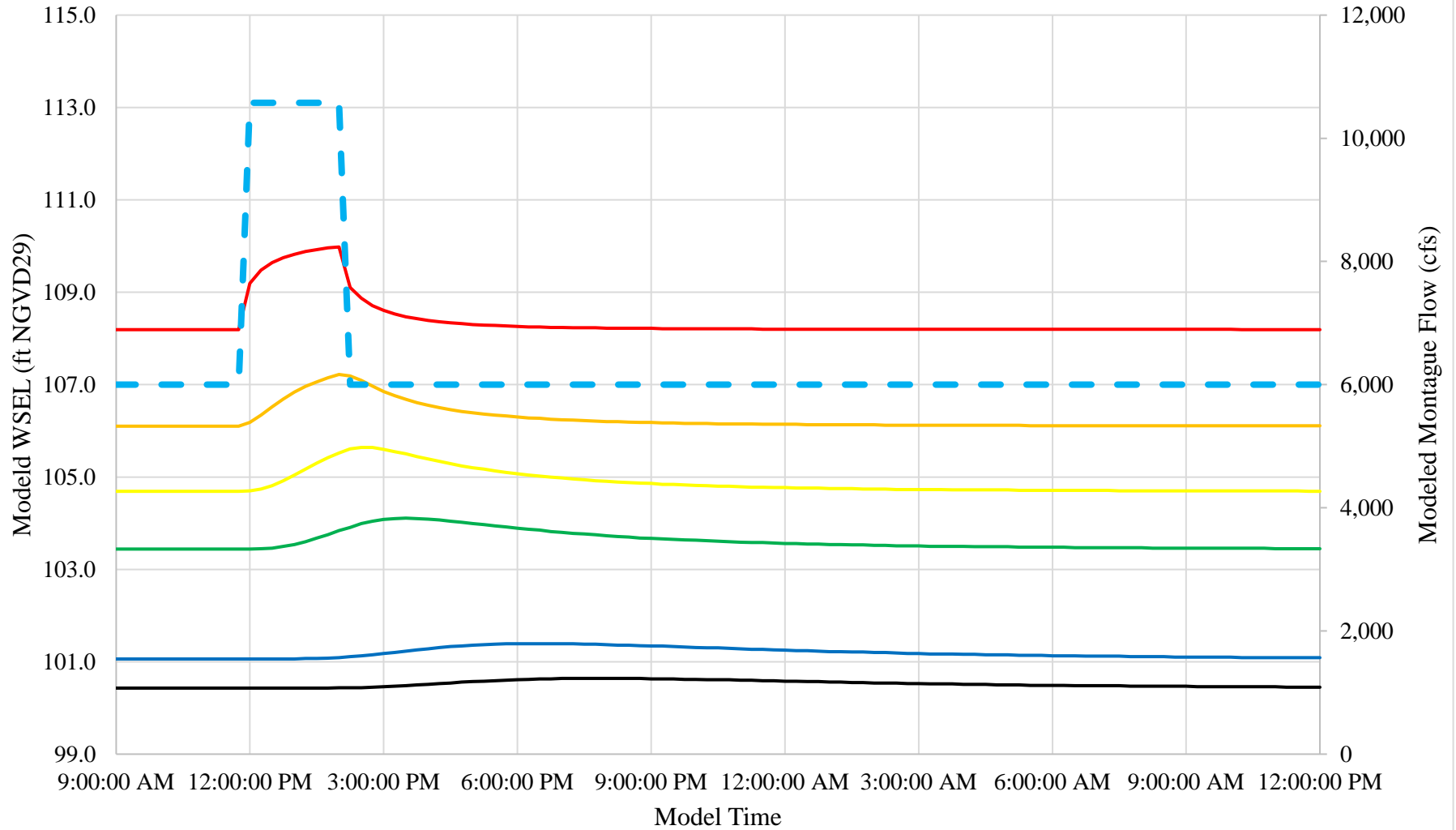
- | | | |
|--|--|--|
| — 118.508, S7 Low | — 115.07, S7 Low | — 112.36, S7 Low |
| — 109.52, S7 Low | — 100.24, S7 Low | — 94.298 (Rainbow Beach), S7 Low |
| - - - Montague Flow S7 Low | | |

Synthetic Model Scenario #8 4,000 cfs Baseflow and 2 Cabot Units for 12 Hours



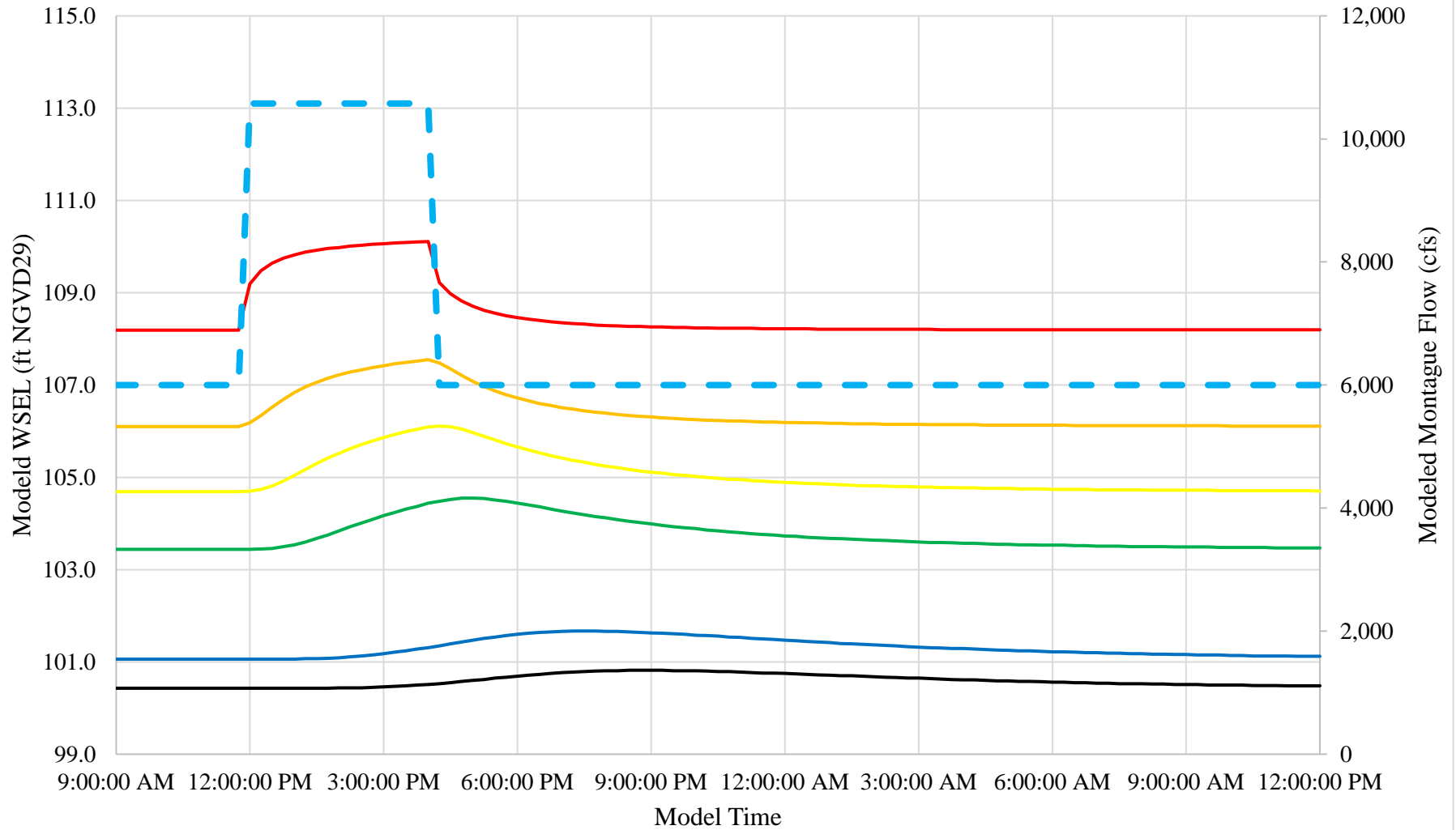
- 118.508, S8 Low
- 115.07, S8 Low
- 112.36, S8 Low
- 109.52, S8 Low
- 100.24, S8 Low
- 94.298 (Rainbow Beach), S8 Low
- - - Montague Flow S8 Low

Synthetic Model Scenario #9 6,000 cfs Baseflow and 2 Cabot Units for 2 Hours



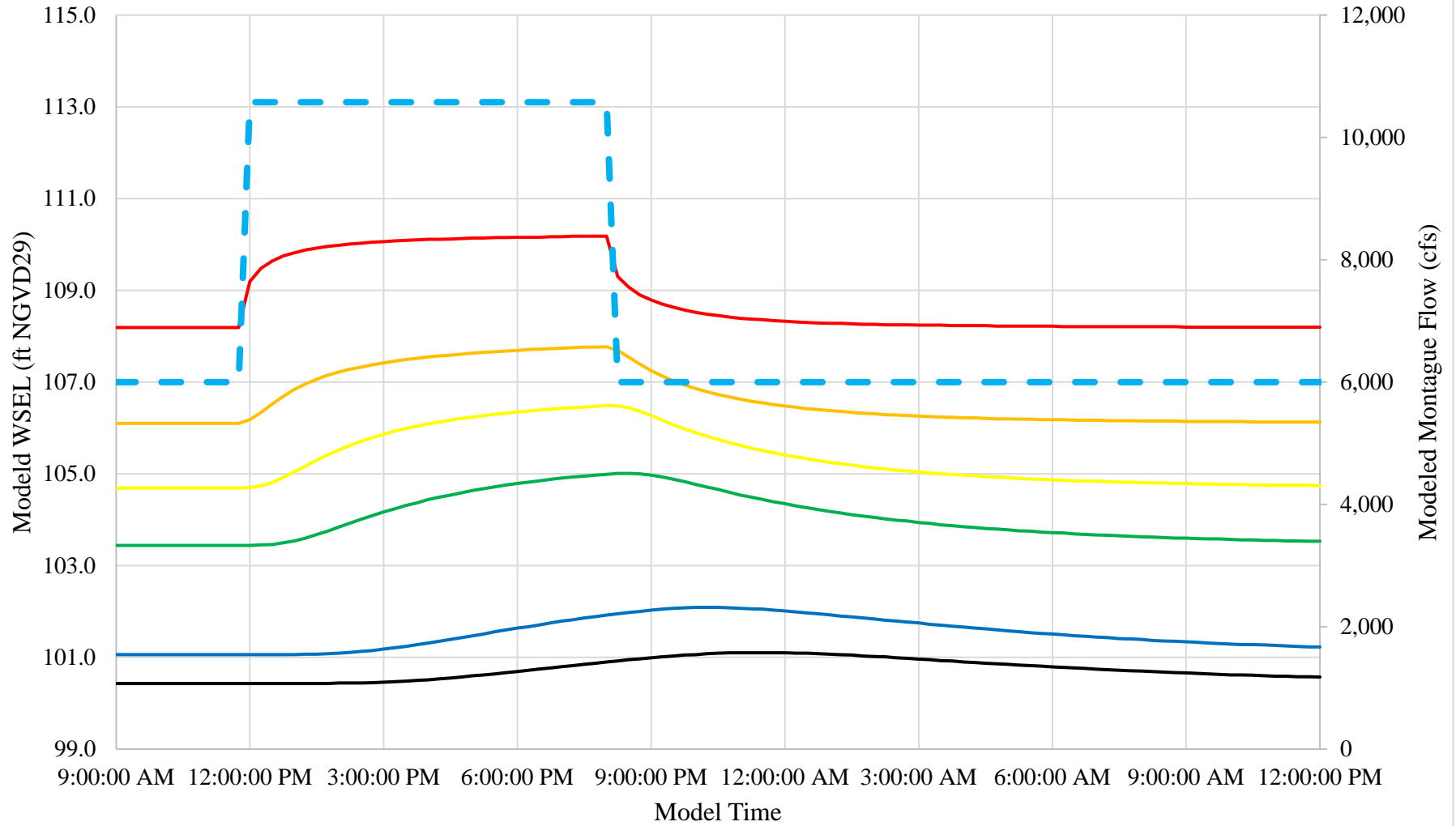
- 118.508, S9 Low
- 115.07, S9 Low
- 112.36, S9 Low
- 109.52, S9 Low
- 100.24, S9 Low
- 94.298 (Rainbow Beach), S9 Low
- - - Montague Flow S9 Low

Synthetic Model Scenario #10 6,000 cfs Baseflow and 2 Cabot Units for 4 Hours



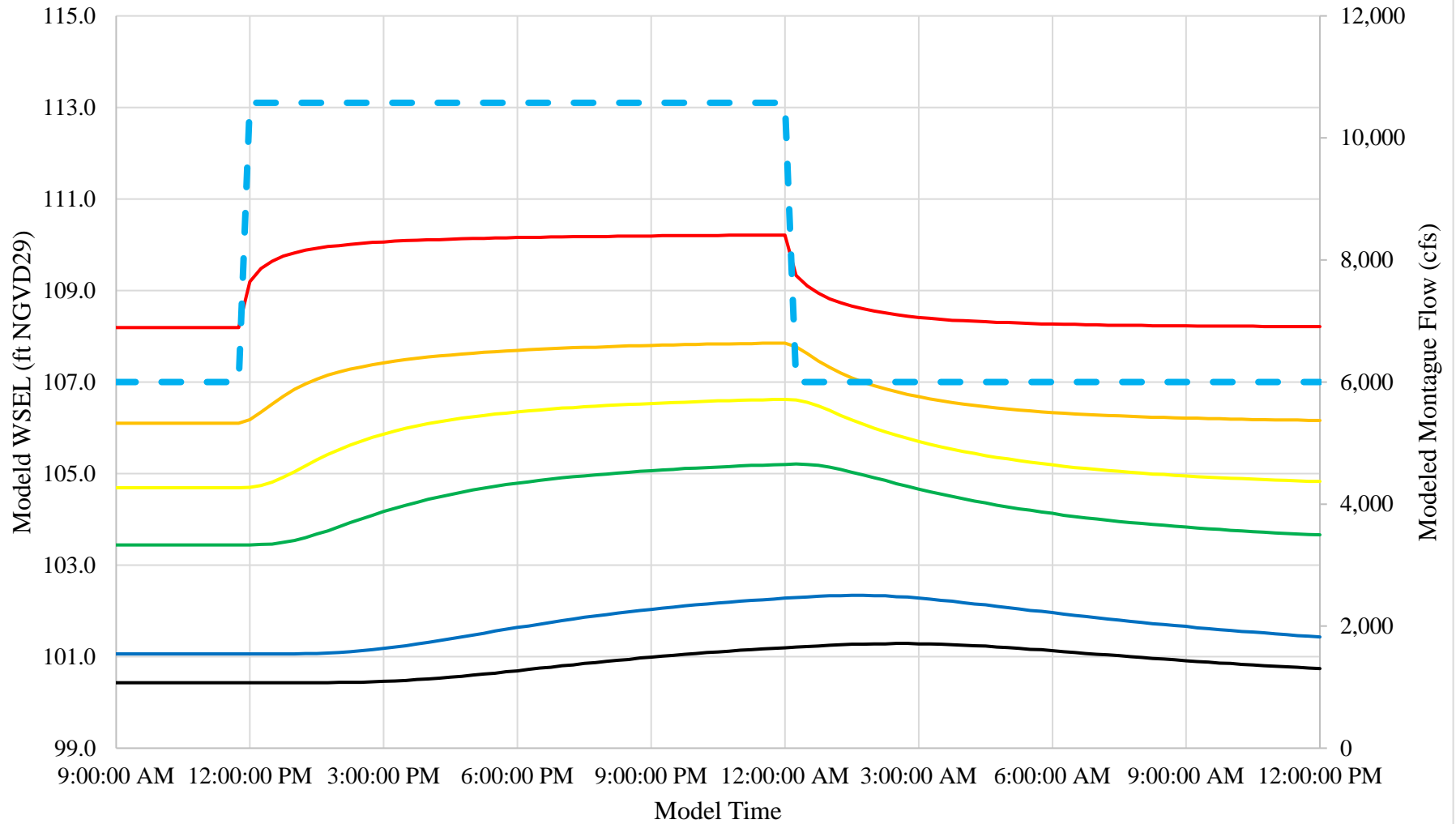
- 118.508, S10 Low
- 115.07, S10 Low
- 112.36, S10 Low
- 109.52, S10 Low
- 100.24, S10 Low
- 94.298 (Rainbow Beach), S10 Low
- - - Montague Flow S10 Low

Synthetic Model Scenario #11 6,000 cfs Baseflow and 2 Cabot Units for 8 Hours



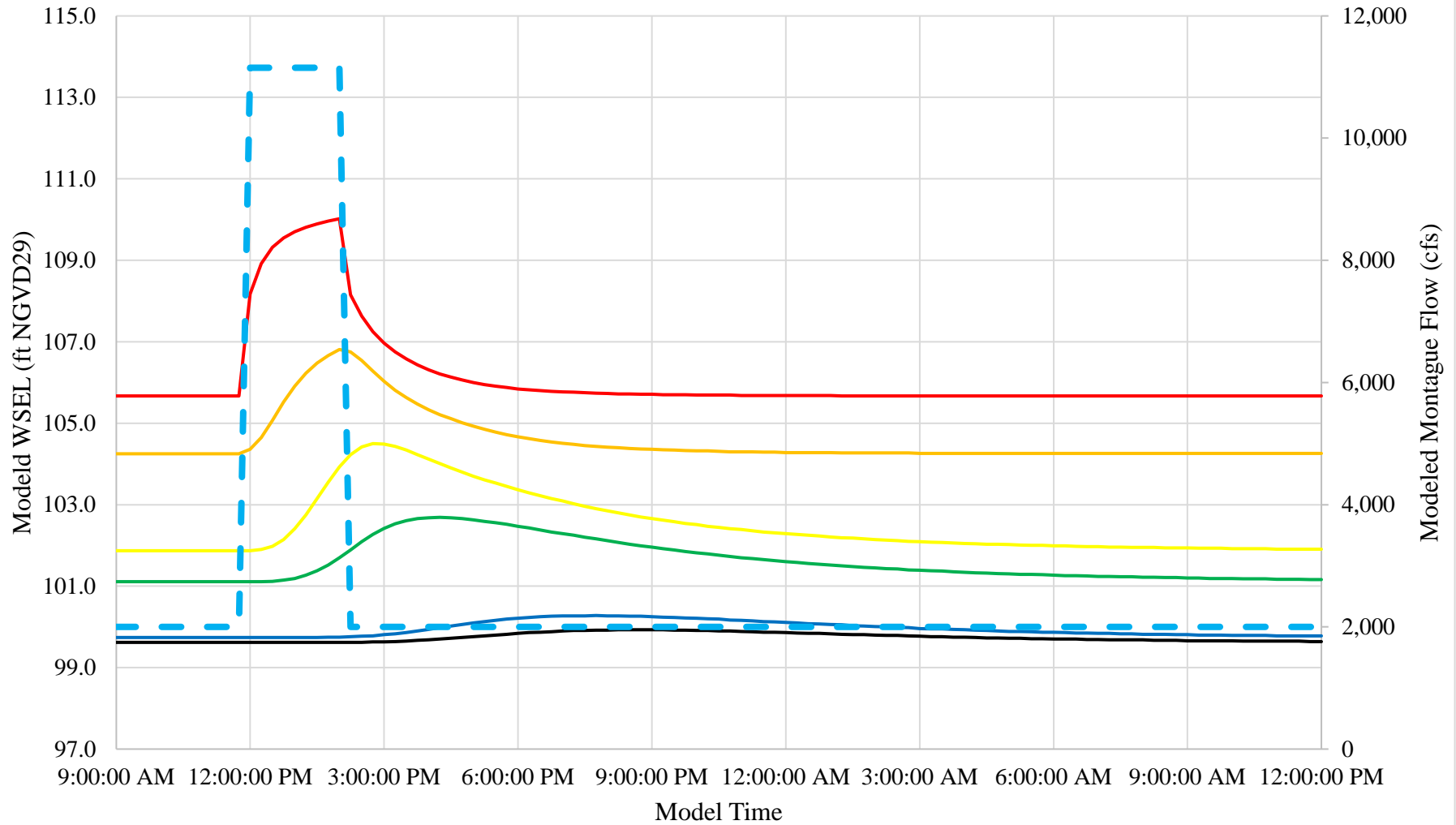
- 118.508, S11 Low
- 115.07, S11 Low
- 112.36, S11 Low
- 109.52, S11 Low
- 100.24, S11 Low
- 94.298 (Rainbow Beach), S11 Low
- - - Montague Flow S11 Low

Synthetic Model Scenario #12 6,000 cfs Baseflow and 2 Cabot Units for 12 Hours



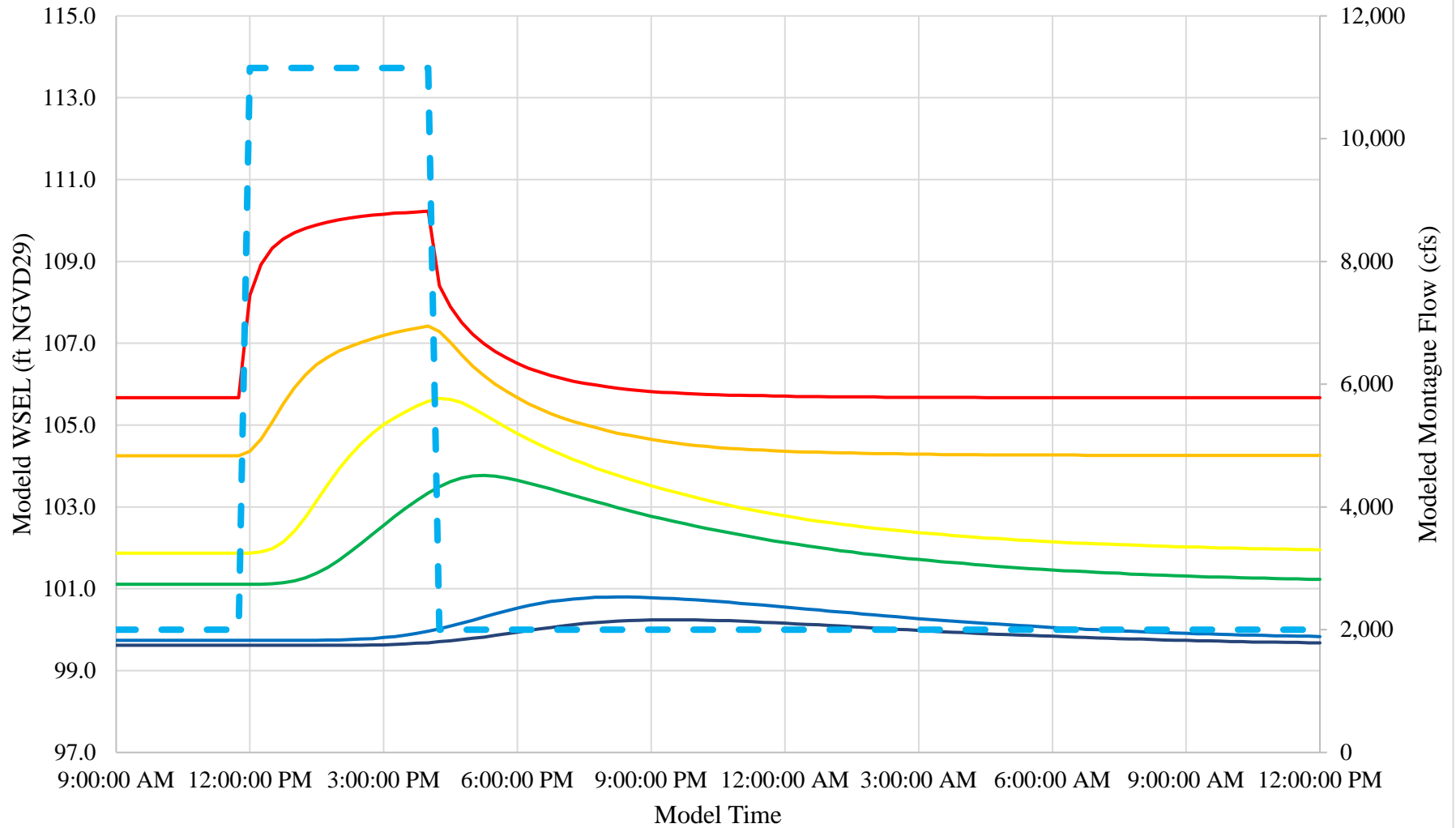
- 118.508, S12 Low
- 115.07, S12 Low
- 112.36, S12 Low
- 109.52, S12 Low
- 100.24, S12 Low
- 94.298 (Rainbow Beach), S12 Low
- - - Montague Flow S12 Low

Synthetic Model Scenario #13 2,000 cfs Baseflow and 4 Cabot Units for 2 Hours



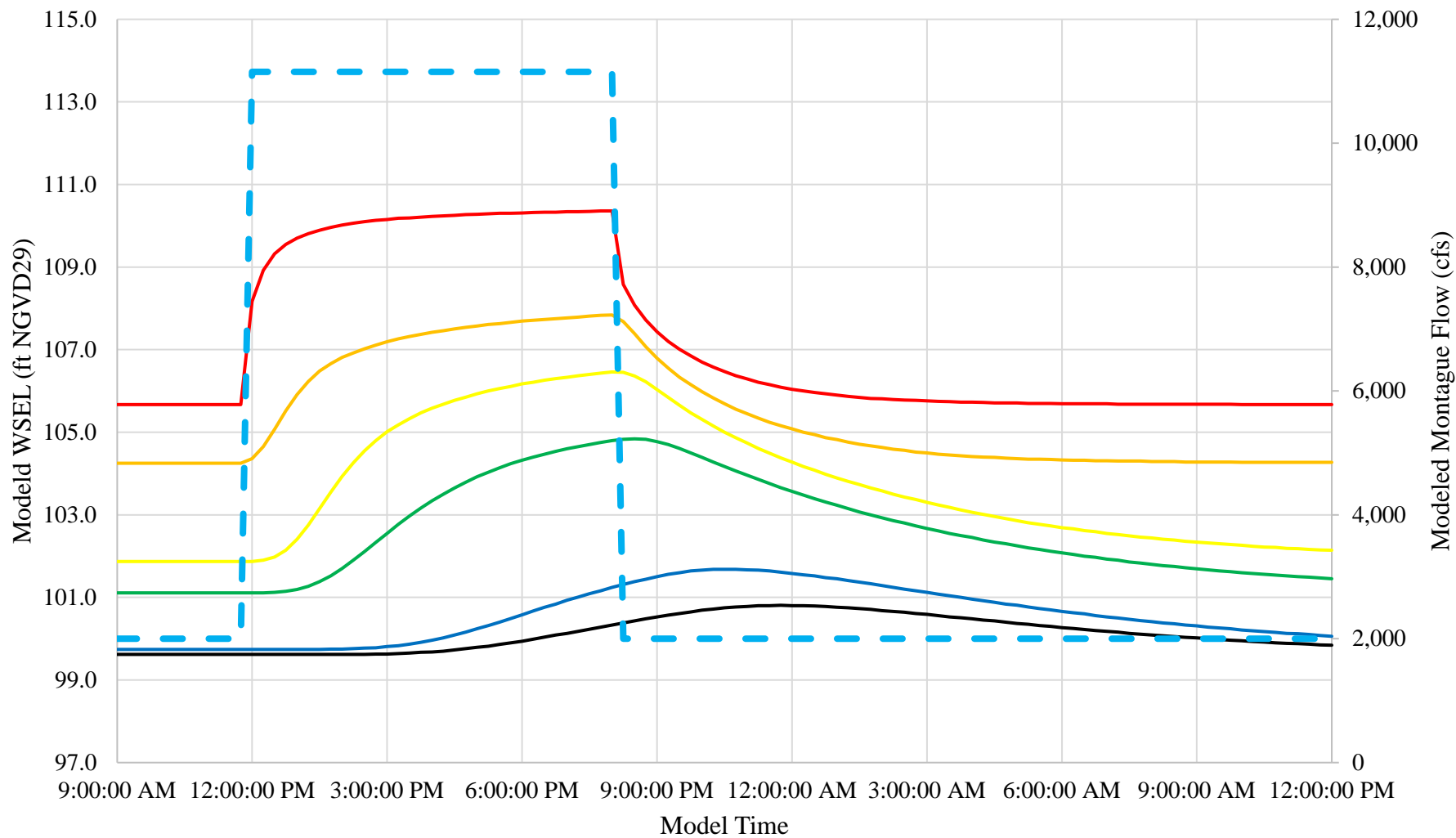
- | | | |
|---|---|--|
| — 118.508, S13 Low | — 115.07, S13 Low | — 112.36, S13 Low |
| — 109.52, S13 Low | — 100.24, S13 Low | — 94.298 (Rainbow Beach), S13 Low |
| - - - Montague Flow S13 Low | | |

Synthetic Model Scenario #14 2,000 cfs Baseflow and 4 Cabot Units for 4 Hours



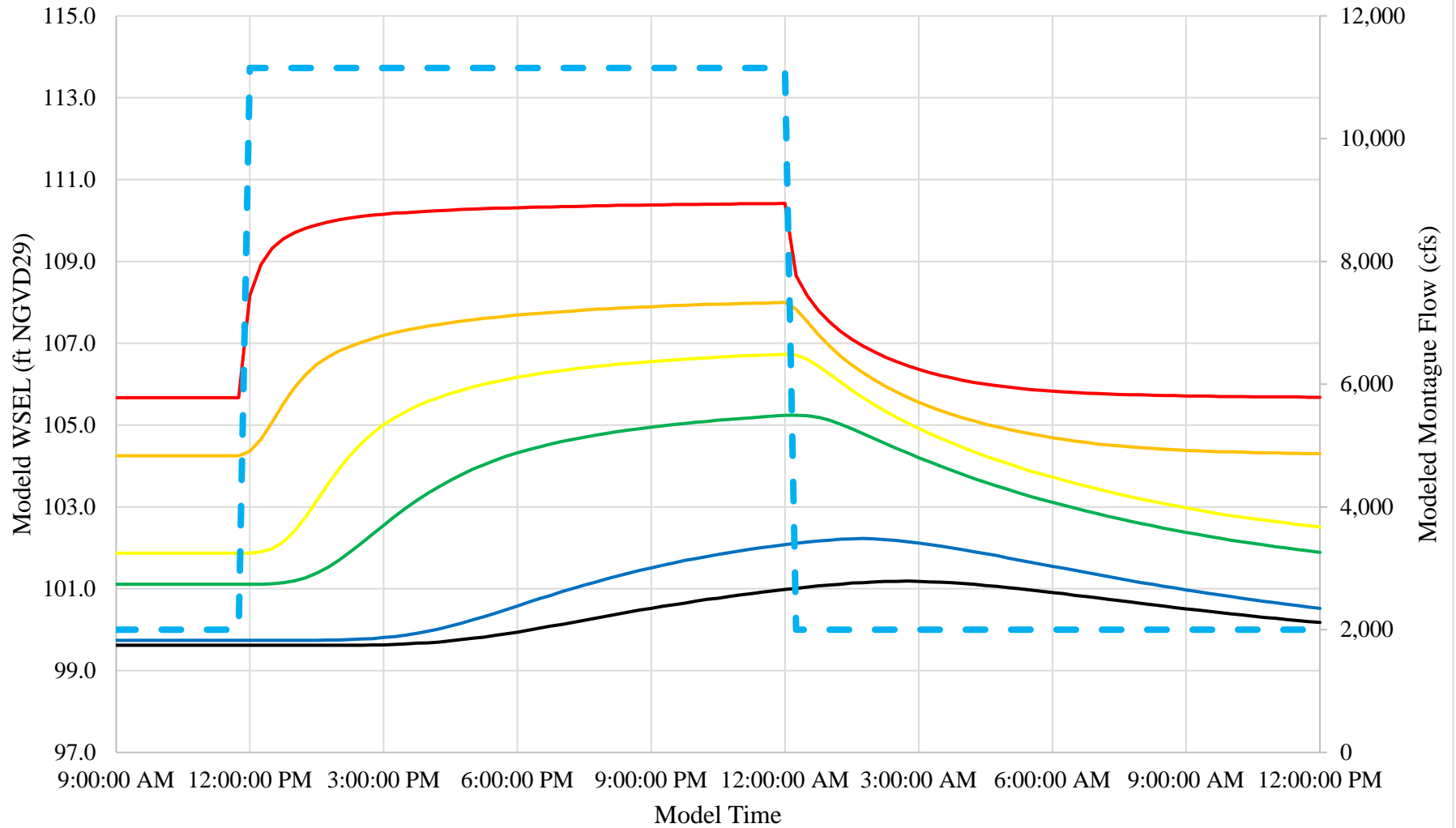
- 118.508, S14 Low
- 115.07, S14 Low
- 112.36, S14 Low
- 109.52, S14 Low
- 100.24, S14 Low
- 94.298 (Rainbow Beach), S14 Low
- - - Montague Flow S14 Low

Synthetic Model Scenario #15 2,000 cfs Baseflow and 4 Cabot Units for 8 Hours



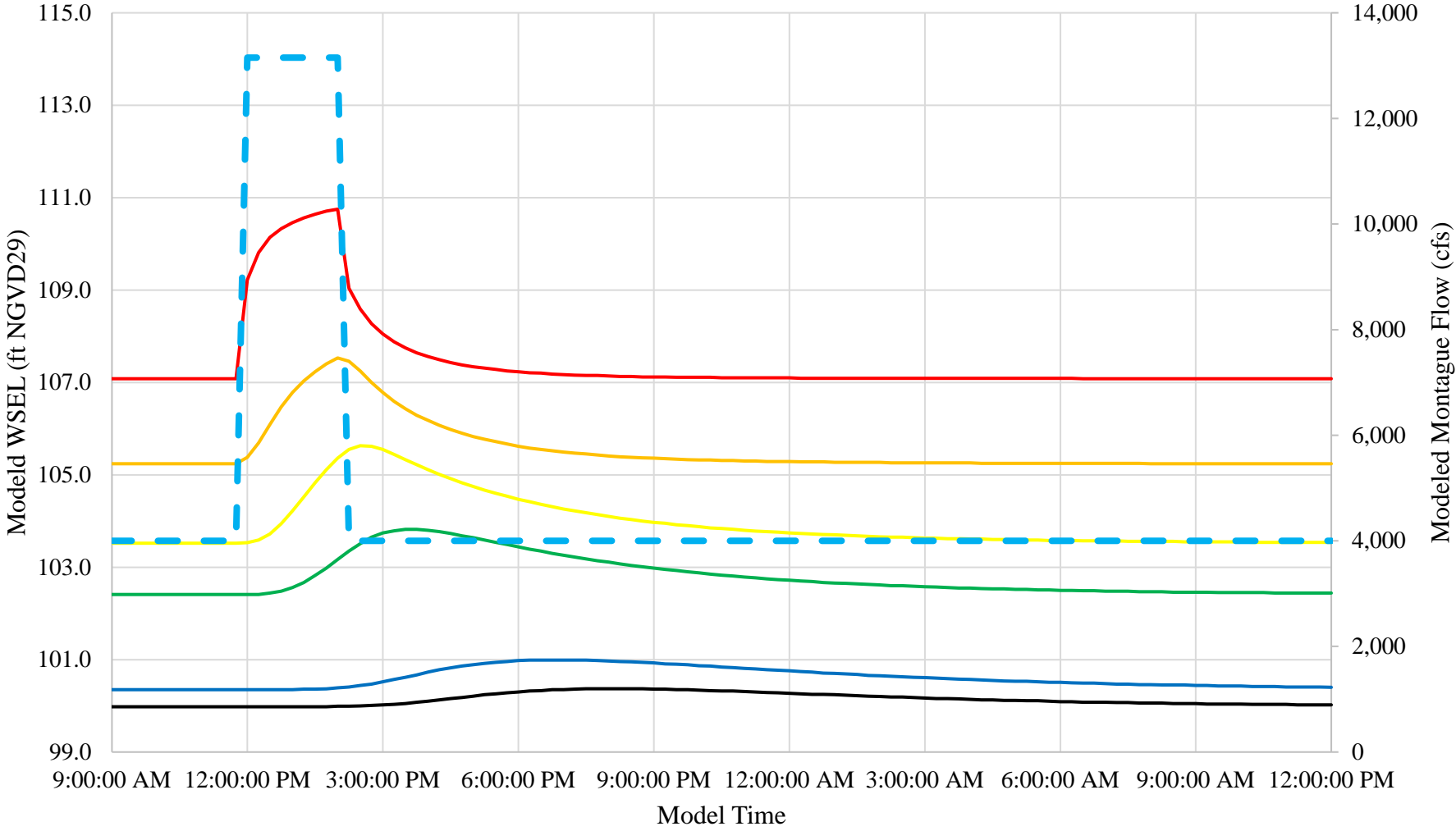
- | | | |
|---|---|--|
| — 118.508, S15 Low | — 115.07, S15 Low | — 112.36, S15 Low |
| — 109.52, S15 Low | — 100.24, S15 Low | — 94.298 (Rainbow Beach), S15 Low |
| - - - Montague Flow S15 Low | | |

Synthetic Model Scenario #16 2,000 cfs Baseflow and 4 Cabot Units for 8 Hours



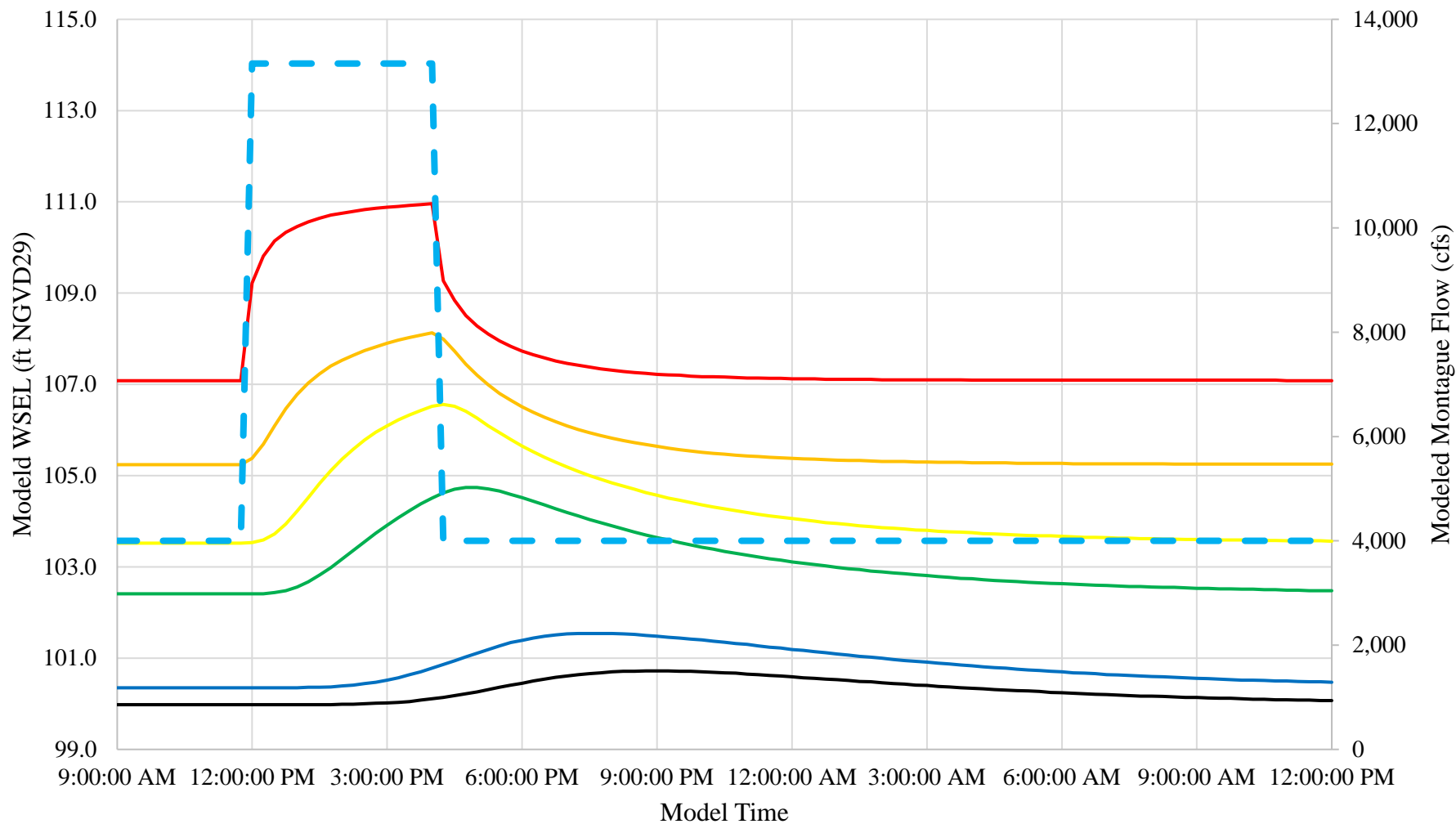
- 118.508, S16 Low
- 115.07, S16 Low
- 112.36, S16 Low
- 109.52, S16 Low
- 100.24, S16 Low
- 94.298 (Rainbow Beach), S16 Low
- - - Montague Flow S16 Low

Synthetic Model Scenario #17 4,000 cfs Baseflow and 4 Cabot Units for 2 Hours



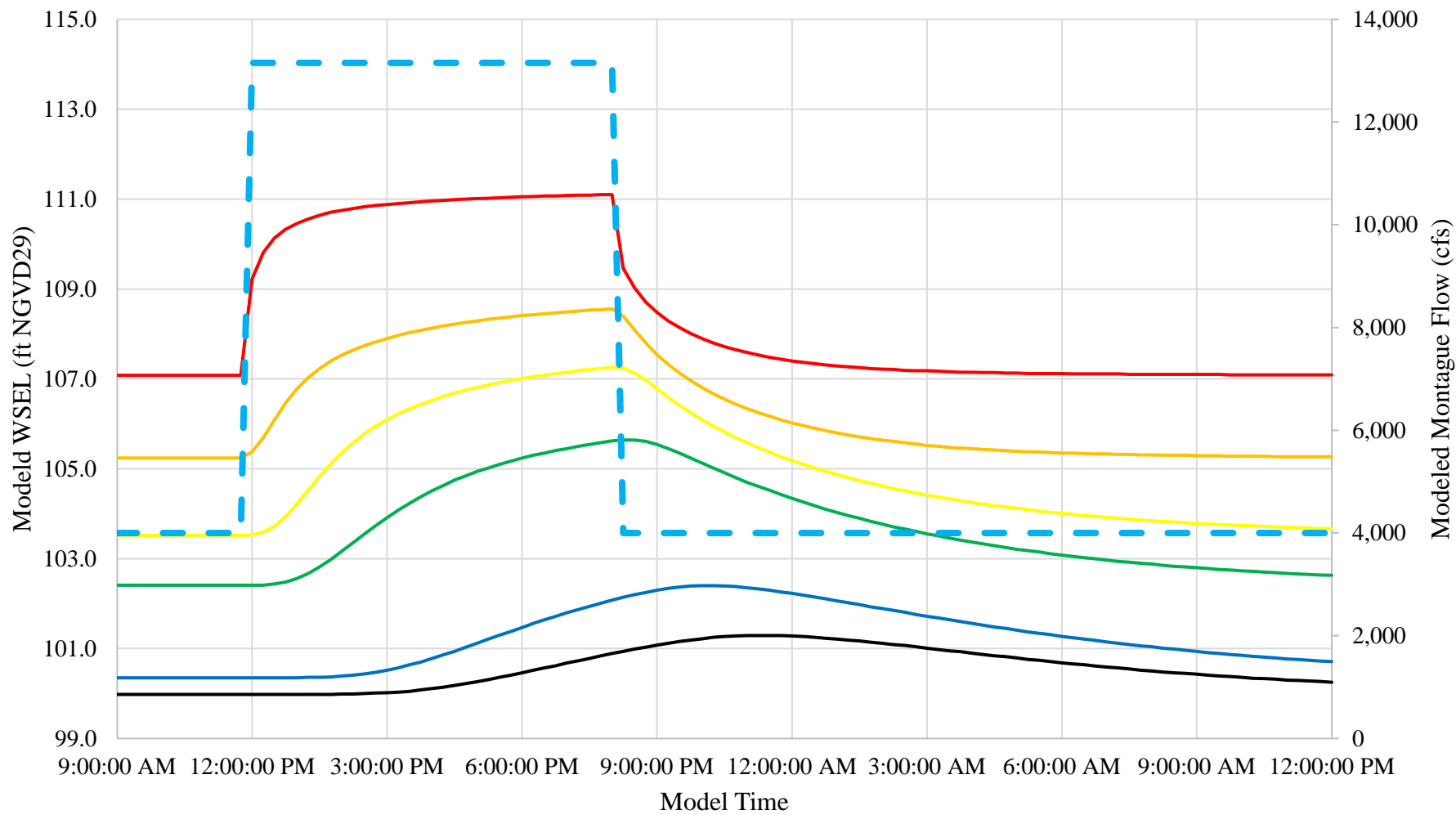
- 118.508, S17 Low
- 115.07, S17 Low
- 112.36, S17 Low
- 109.52, S17 Low
- 100.24, S17 Low
- 94.298 (Rainbow Beach), S17 Low
- - - Montague Flow S17 Low

Synthetic Model Scenario #18 4,000 cfs Baseflow and 4 Cabot Units for 4 Hours



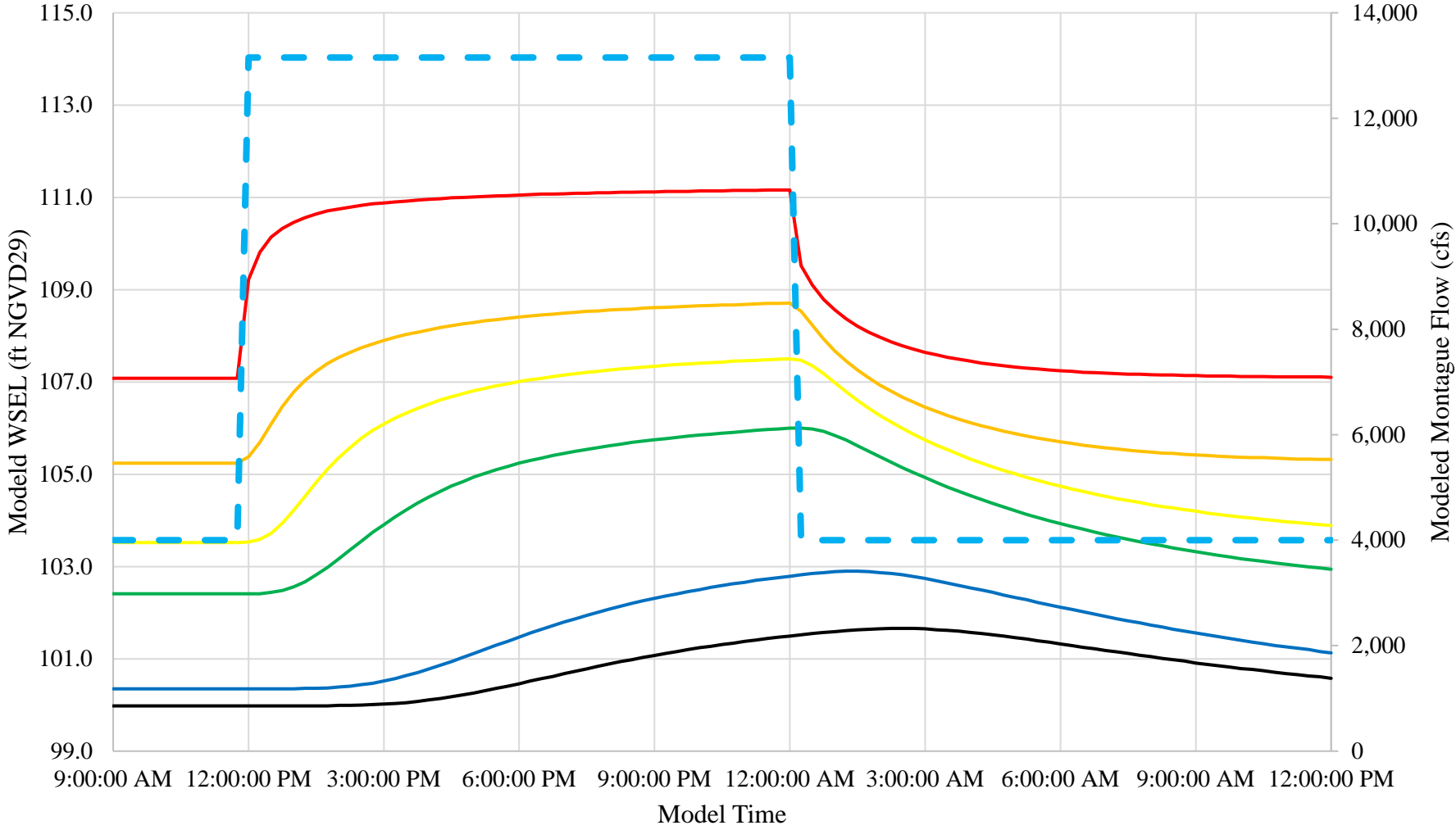
- | | | |
|---|---|---|
| <p>— 118.508, S18 Low</p> <p>— 109.52, S18 Low</p> <p>— Montague Flow S18 Low</p> | <p>— 115.07, S18 Low</p> <p>— 100.24, S18 Low</p> | <p>— 112.36, S18 Low</p> <p>— 94.298 (Rainbow Beach), S18 Low</p> |
|---|---|---|

Synthetic Model Scenario #19 4,000 cfs Baseflow and 4 Cabot Units for 8 Hours



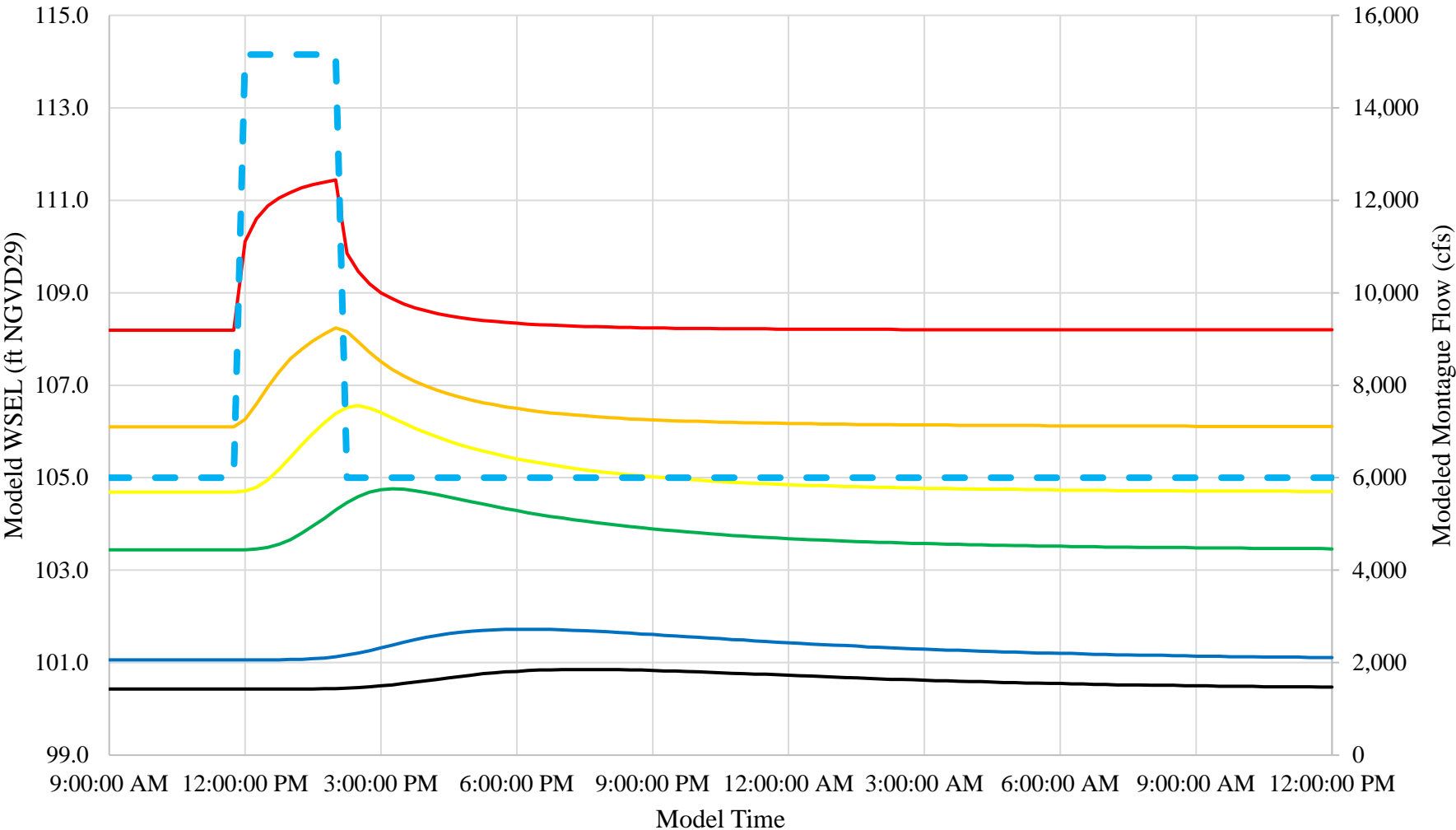
- 118.508, S19 Low
- 115.07, S19 Low
- 112.36, S19 Low
- 109.52, S19 Low
- 100.24, S19 Low
- 94.298 (Rainbow Beach), S19 Low
- - - Montague Flow S19 Low

Synthetic Model Scenario #20 4,000 cfs Baseflow and 4 Cabot Units for 12 Hours



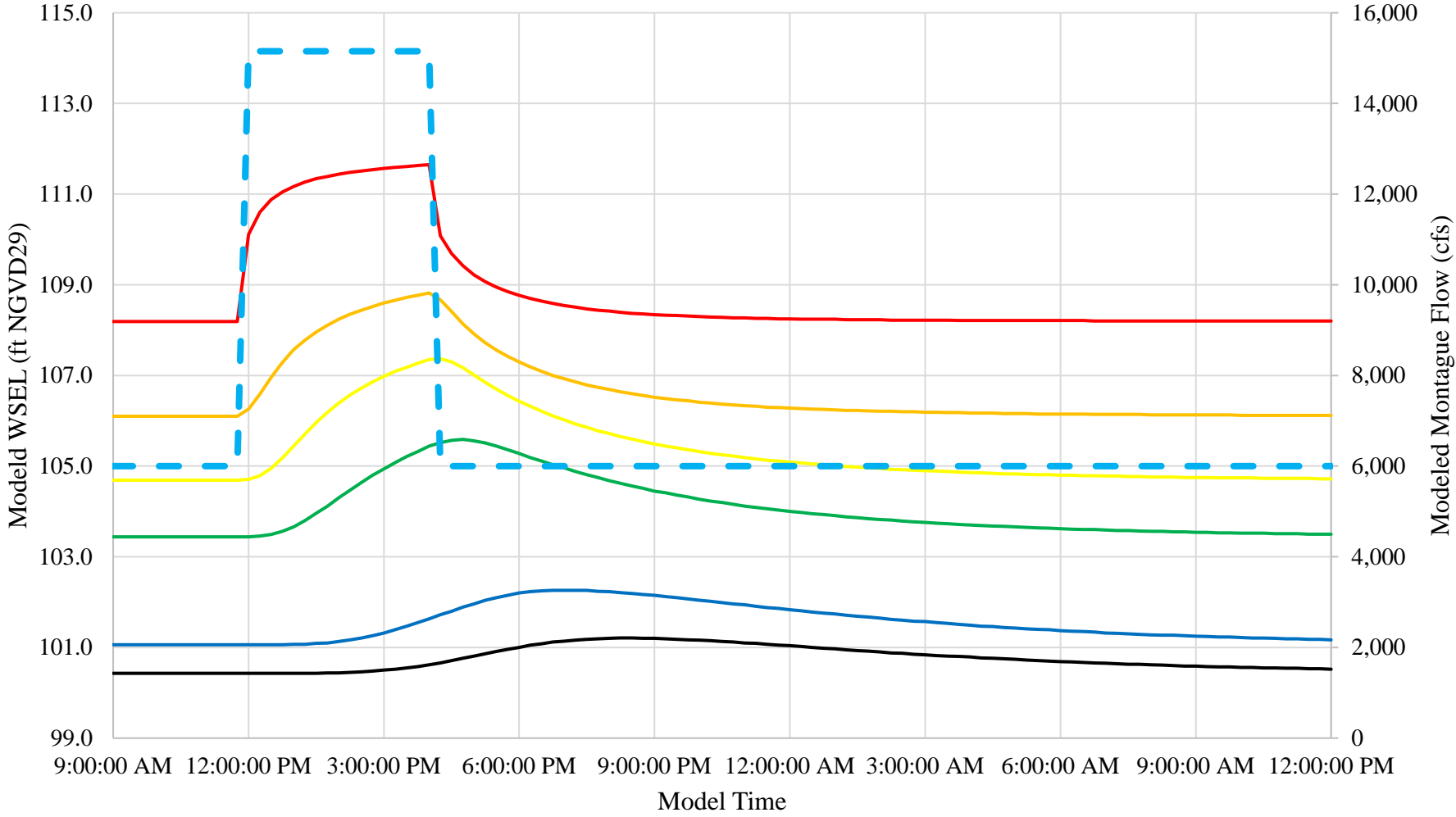
- 118.508, S20 Low
- 115.07, S20 Low
- 112.36, S20 Low
- 109.52, S20 Low
- 100.24, S20 Low
- 94.298 (Rainbow Beach), S20 Low
- - - Montague Flow S20 Low

Synthetic Model Scenario #21 6,000 cfs Baseflow and 4 Cabot Units for 2 Hours



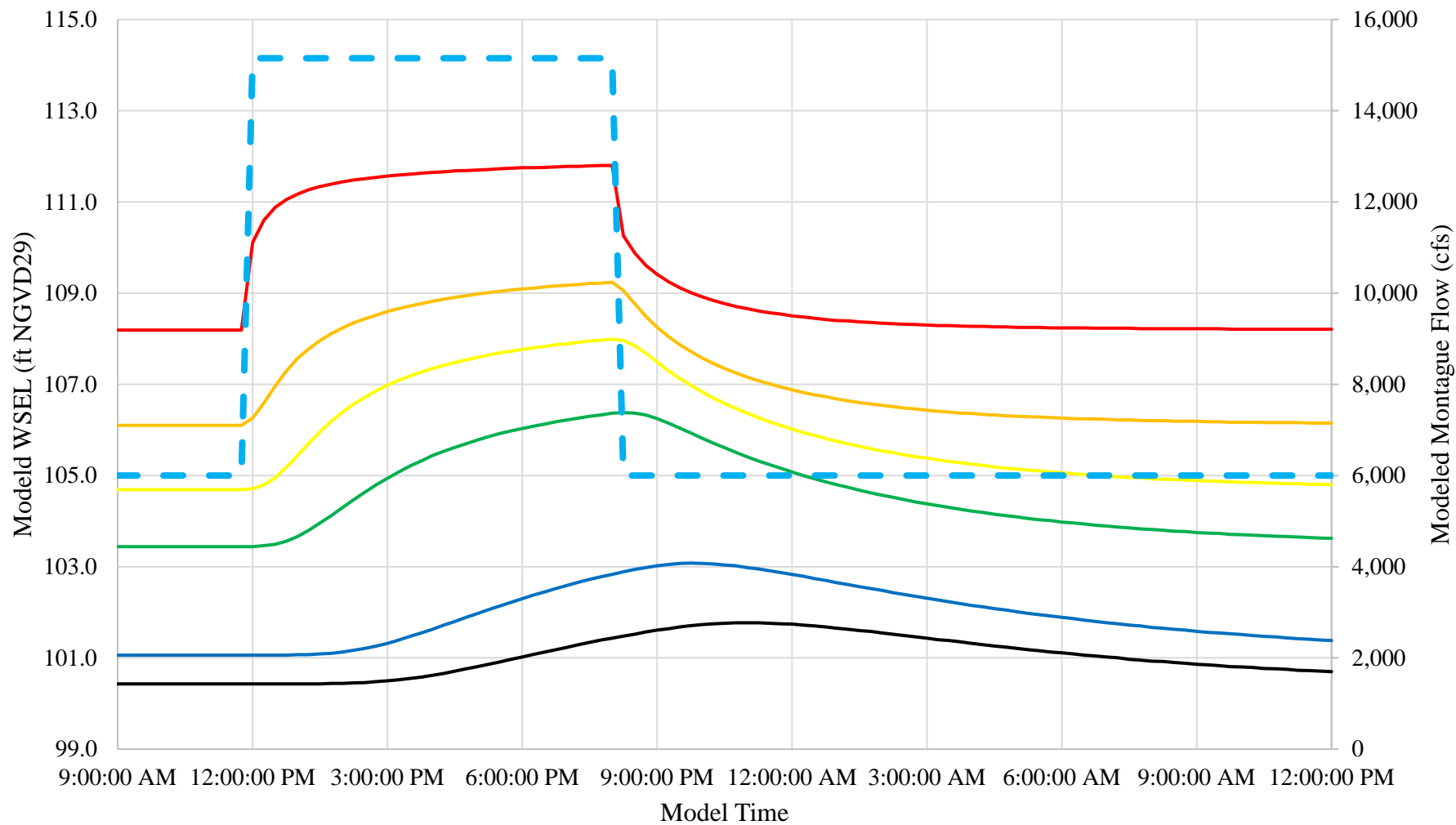
- 118.508, S21 Low
- 115.07, S21 Low
- 112.36, S21 Low
- 109.52, S21 Low
- 100.24, S21 Low
- 94.298 (Rainbow Beach), S21 Low
- - - Montague Flow S21 Low

Synthetic Model Scenario #22 6,000 cfs Baseflow and 4 Cabot Units for 4 Hours



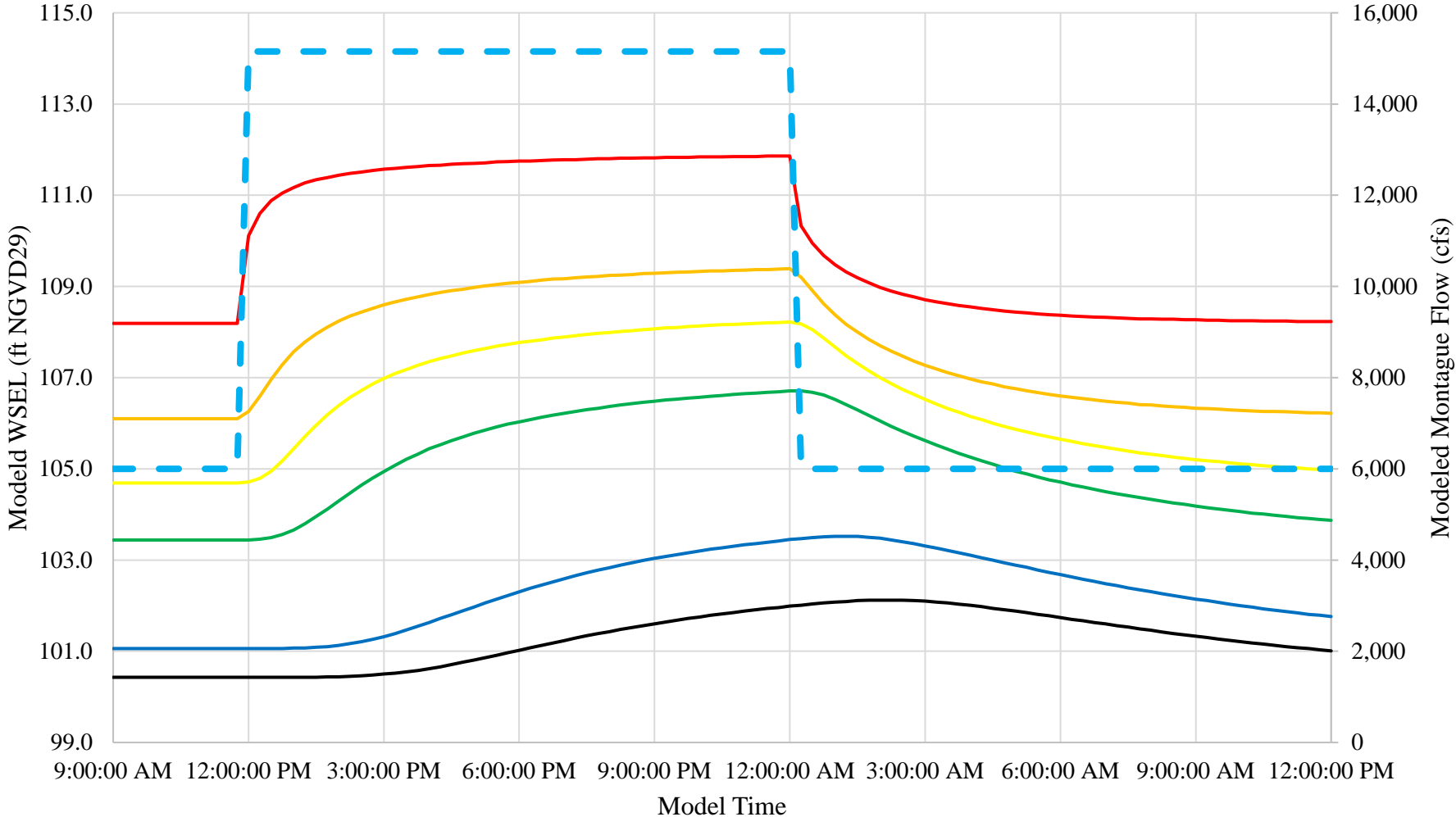
- 118.508, S22 Low
- 115.07, S22 Low
- 112.36, S22 Low
- 109.52, S22 Low
- 100.24, S22 Low
- 94.298 (Rainbow Beach), S22 Low
- - - Montague Flow S22 Low

Synthetic Model Scenario #23 6,000 cfs Baseflow and 4 Cabot Units for 8 Hours



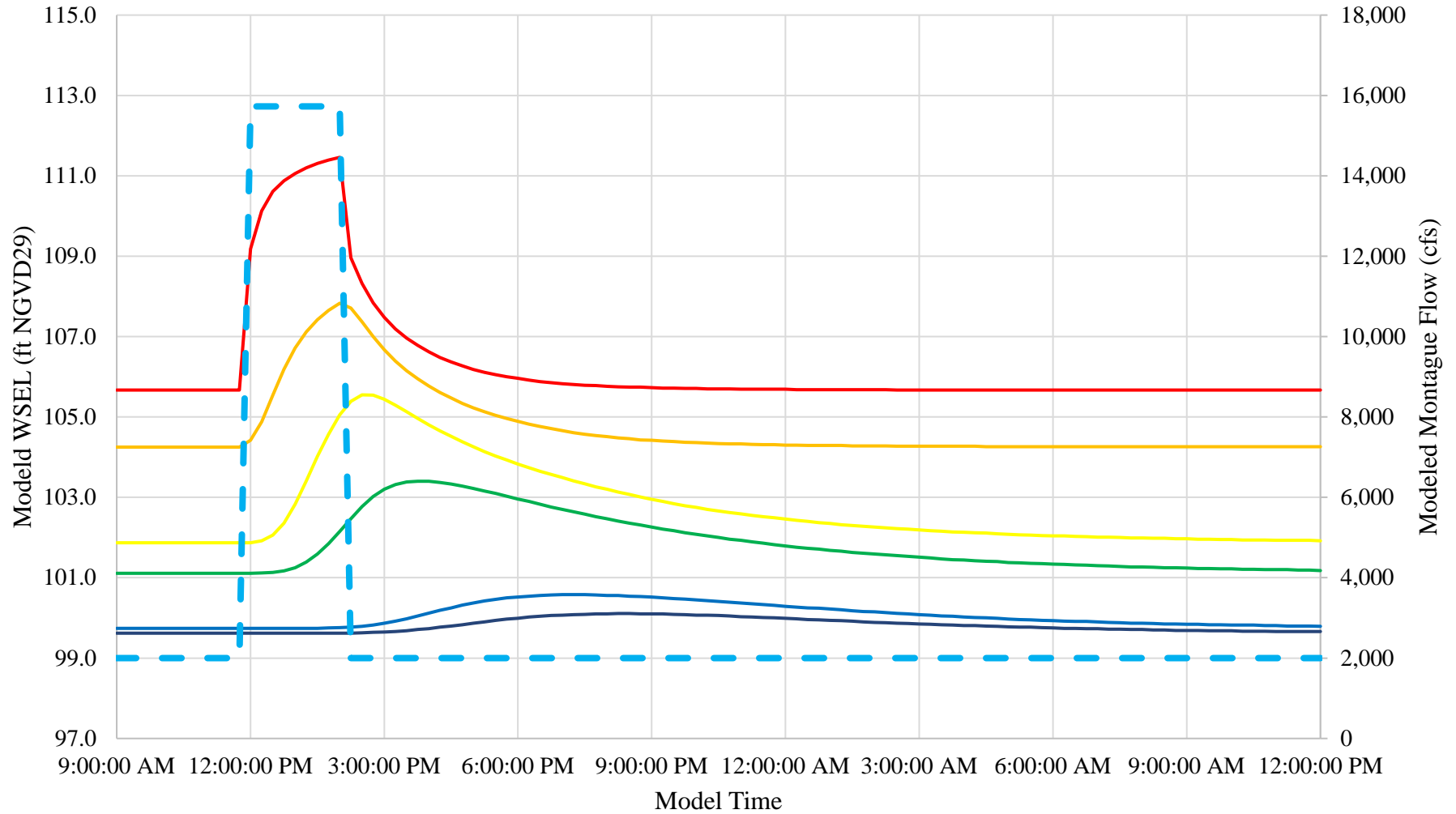
- 118.508, S23 Low
- 115.07, S23 Low
- 112.36, S23 Low
- 109.52, S23 Low
- 100.24, S23 Low
- 94.298 (Rainbow Beach), S23 Low
- - - Montague Flow S23 Low

Synthetic Model Scenario #24 6,000 cfs Baseflow and 4 Cabot Units for 12 Hours



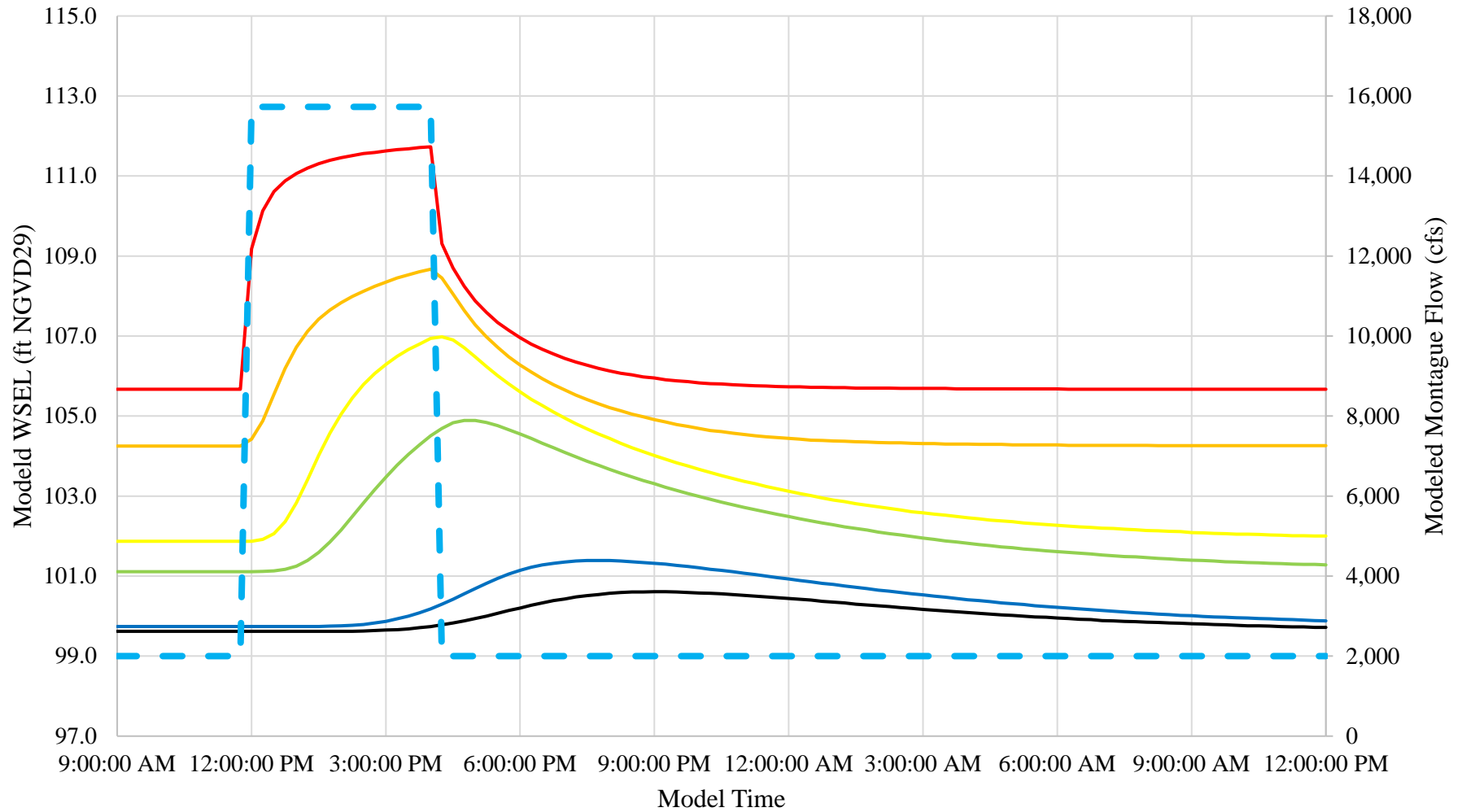
- 118.508, S24 Low
- 115.07, S24 Low
- 112.36, S24 Low
- 109.52, S24 Low
- 100.24, S24 Low
- 94.298 (Rainbow Beach), S24 Low
- - - Montague Flow S24 Low

Synthetic Model Scenario #25 2,000 cfs Baseflow and 6 Cabot Units for 2 Hours



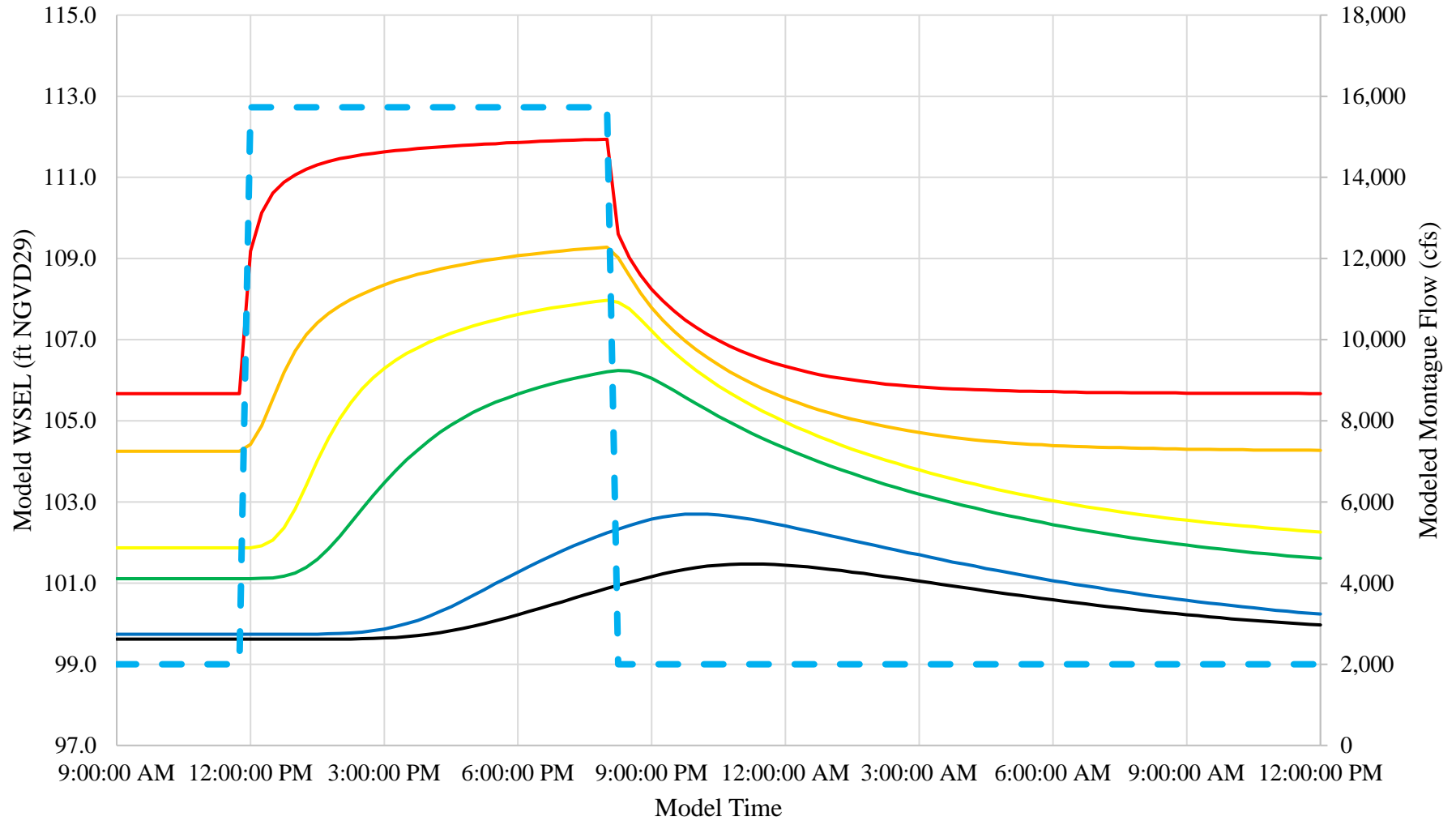
- 118.508, S25 Low
- 115.07, S25 Low
- 112.36, S25 Low
- 109.52, S25 Low
- 100.24, S25 Low
- 94.298 (Rainbow Beach), S25 Low
- - - Montague Flow S25 Low

Synthetic Model Scenario #26 2,000 cfs Baseflow and 6 Cabot Units for 4 Hours



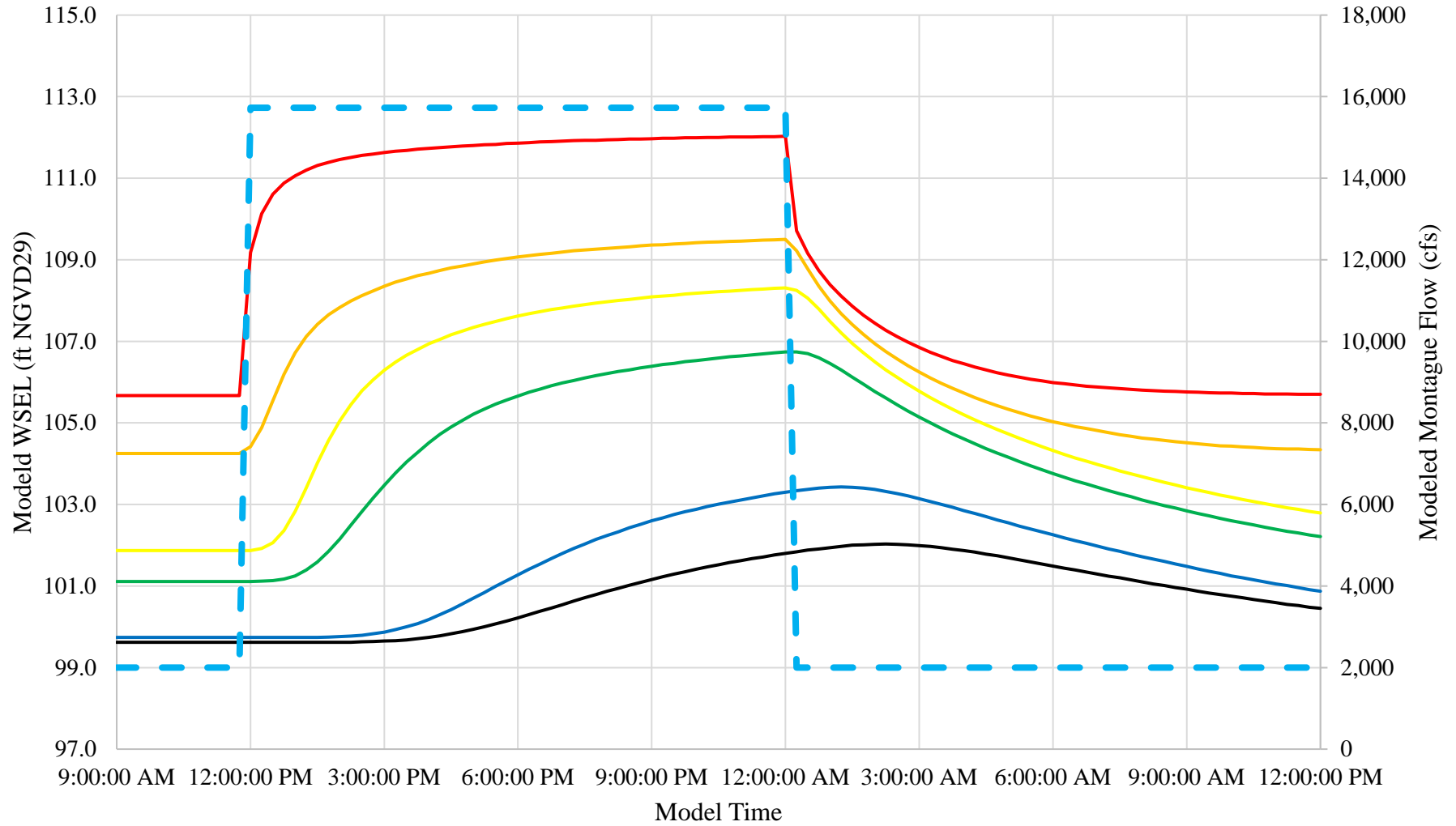
- 118.508, S26 Low
- 115.07, S26 Low
- 112.36, S26 Low
- 109.52, S26 Low
- 100.24, S26 Low
- 94.298 (Rainbow Beach), S26 Low
- - - Montague Flow S26 Low

Synthetic Model Scenario #27 2,000 cfs Baseflow and 6 Cabot Units for 8 Hours



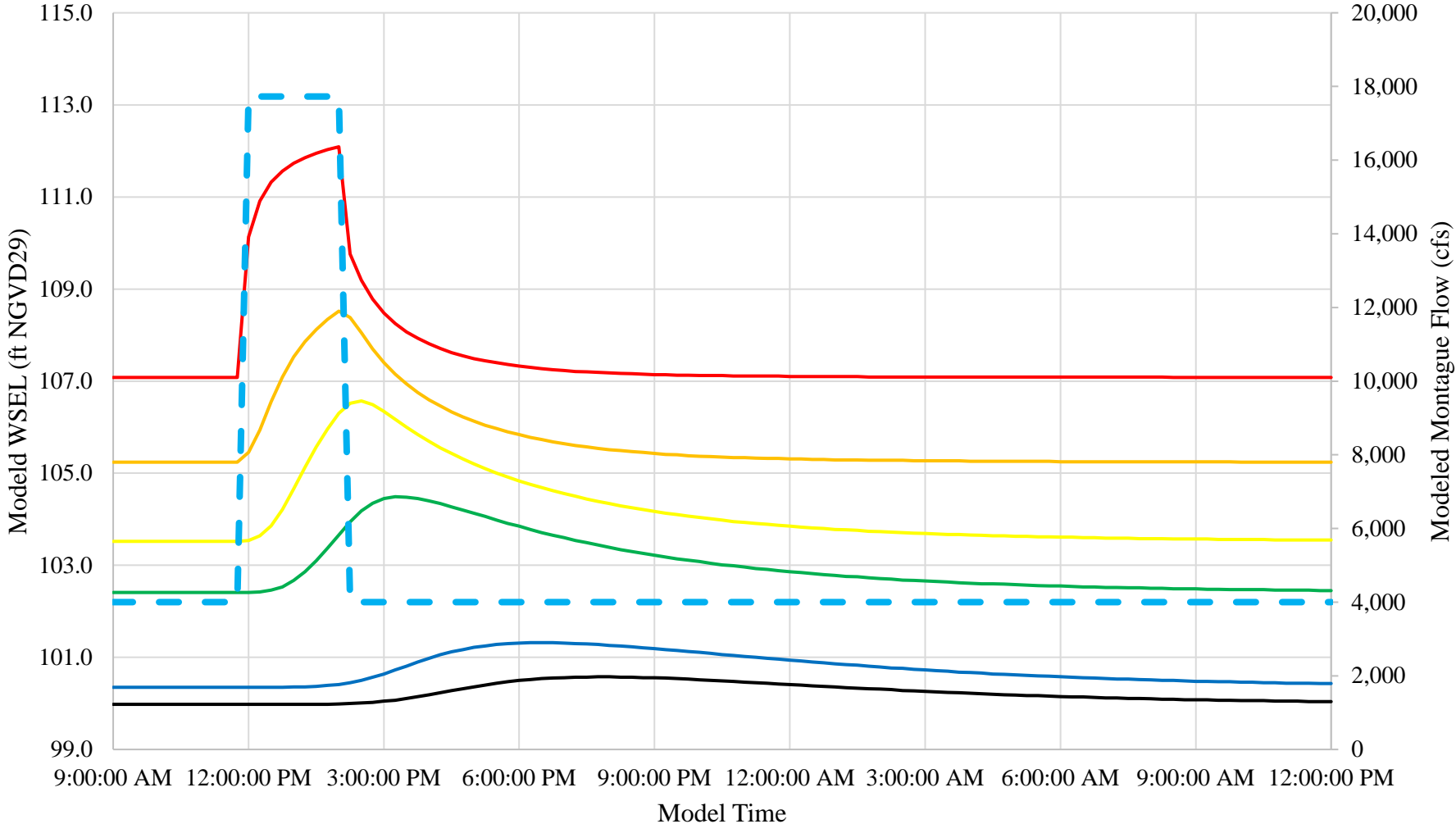
- | | | |
|---|---|--|
| — 118.508, S27 Low | — 115.07, S27 Low | — 112.36, S27 Low |
| — 109.52, S27 Low | — 100.24, S27 Low | — 94.298 (Rainbow Beach), S27 Low |
| - - - Montague Flow S27 Low | | |

Synthetic Model Scenario #28 2,000 cfs Baseflow and 6 Cabot Units for 12 Hours



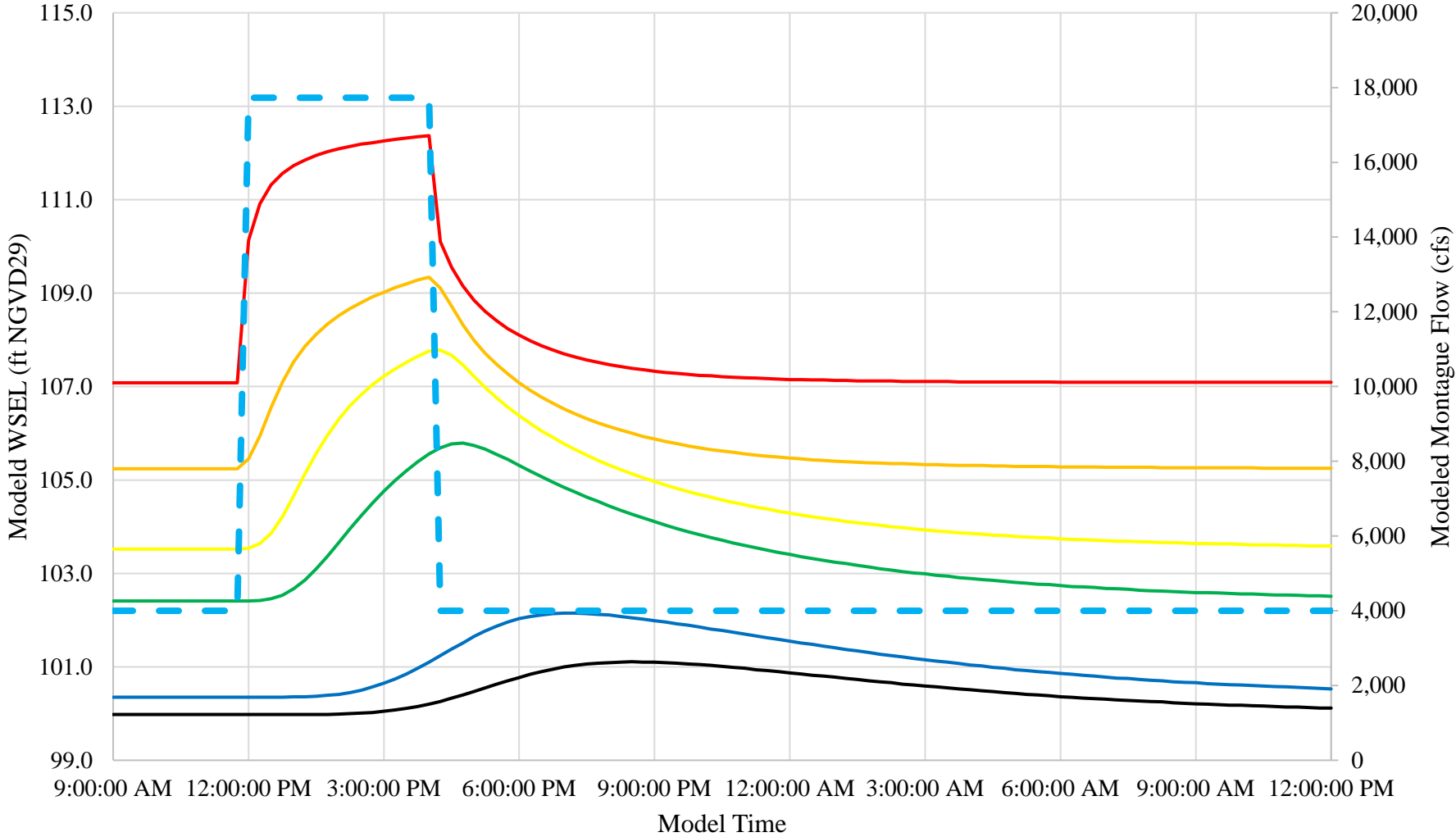
- 118.508, S28 Low
- 115.07, S28 Low
- 112.36, S28 Low
- 109.52, S28 Low
- 100.24, S28 Low
- 94.298 (Rainbow Beach), S28 Low
- - - Montague Flow S28 Low

Synthetic Model Scenario #29 4,000 cfs Baseflow and 6 Cabot Units for 2 Hours



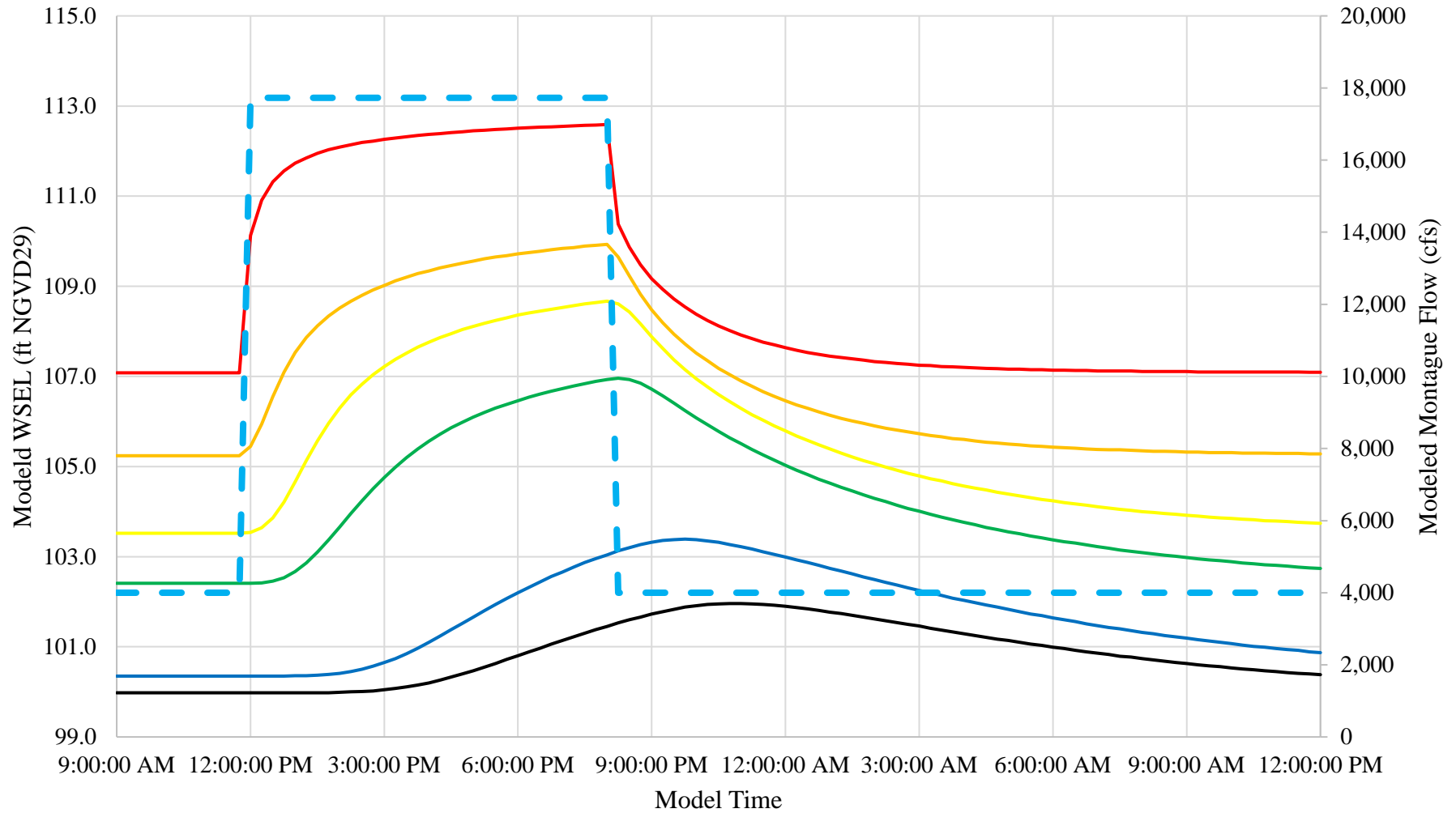
- 118.508, S29 Low
- 115.07, S29 Low
- 112.36, S29 Low
- 109.52, S29 Low
- 100.24, S29 Low
- 94.298 (Rainbow Beach), S29 Low
- - - Montague Flow S29 Low

Synthetic Model Scenario #30 4,000 cfs Baseflow and 6 Cabot Units for 4 Hours



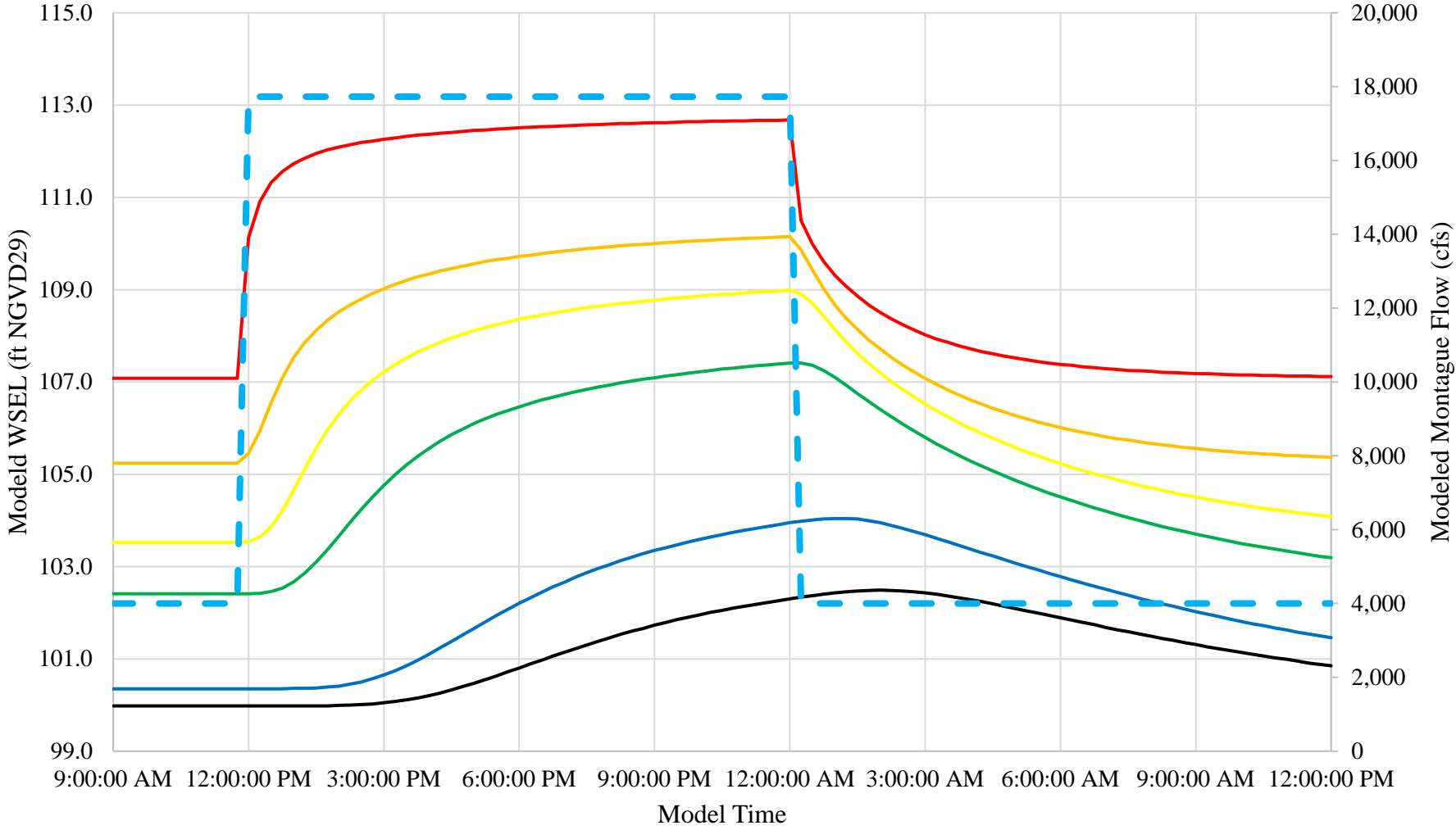
- 118.508, S30 Low
- 115.07, S30 Low
- 112.36, S30 Low
- 109.52, S30 Low
- 100.24, S30 Low
- 94.298 (Rainbow Beach), S30 Low
- - - Montague Flow S30 Low

Synthetic Model Scenario #31 4,000 cfs Baseflow and 6 Cabot Units for 8 Hours



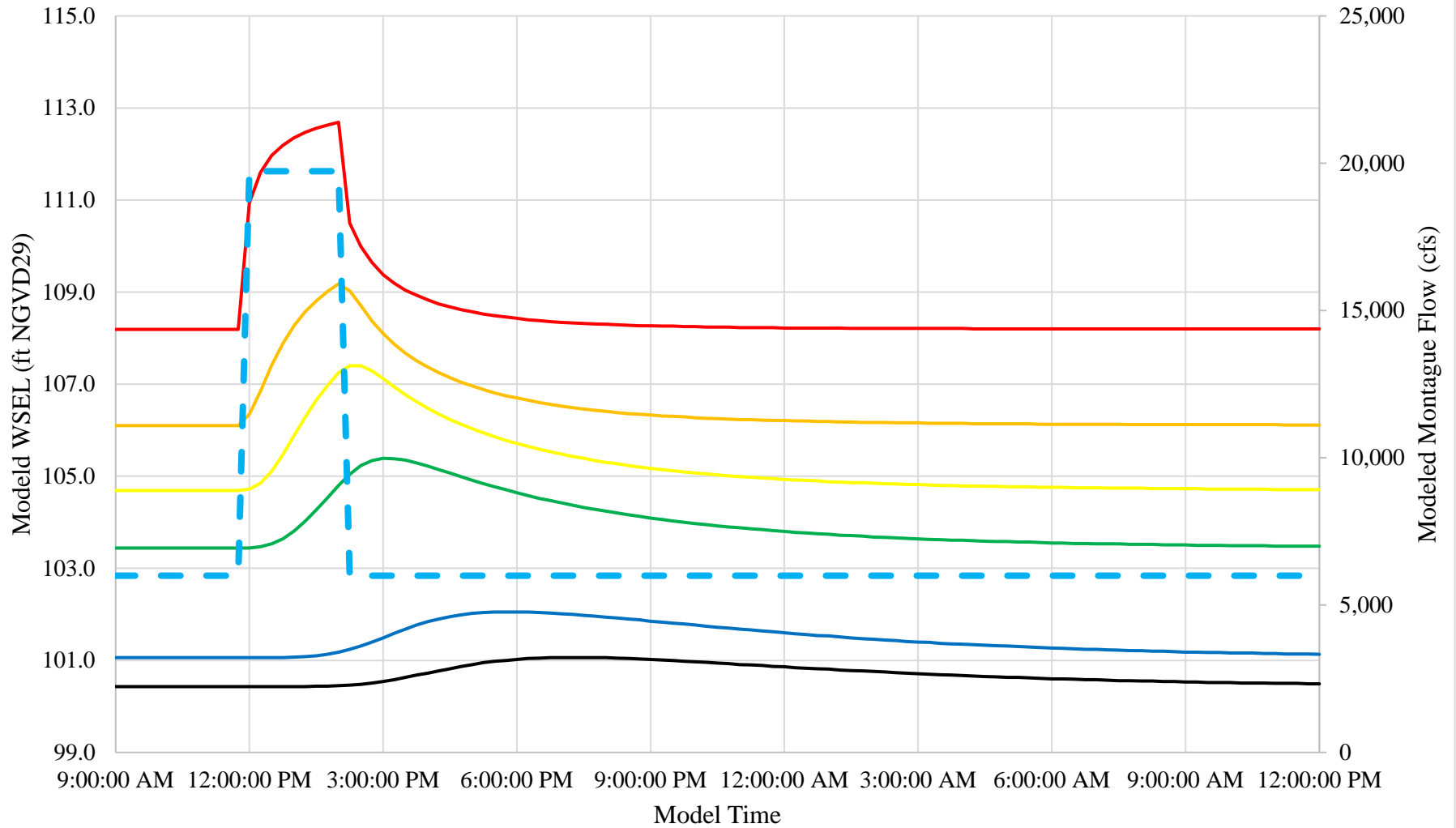
- 118.508, S31 Low
- 115.07, S31 Low
- 112.36, S31 Low
- 109.52, S31 Low
- 100.24, S31 Low
- 94.298 (Rainbow Beach), S31 Low
- - - Montague Flow S31 Low

Synthetic Model Scenario #32 4,000 cfs Baseflow and 6 Cabot Units for 12 Hours



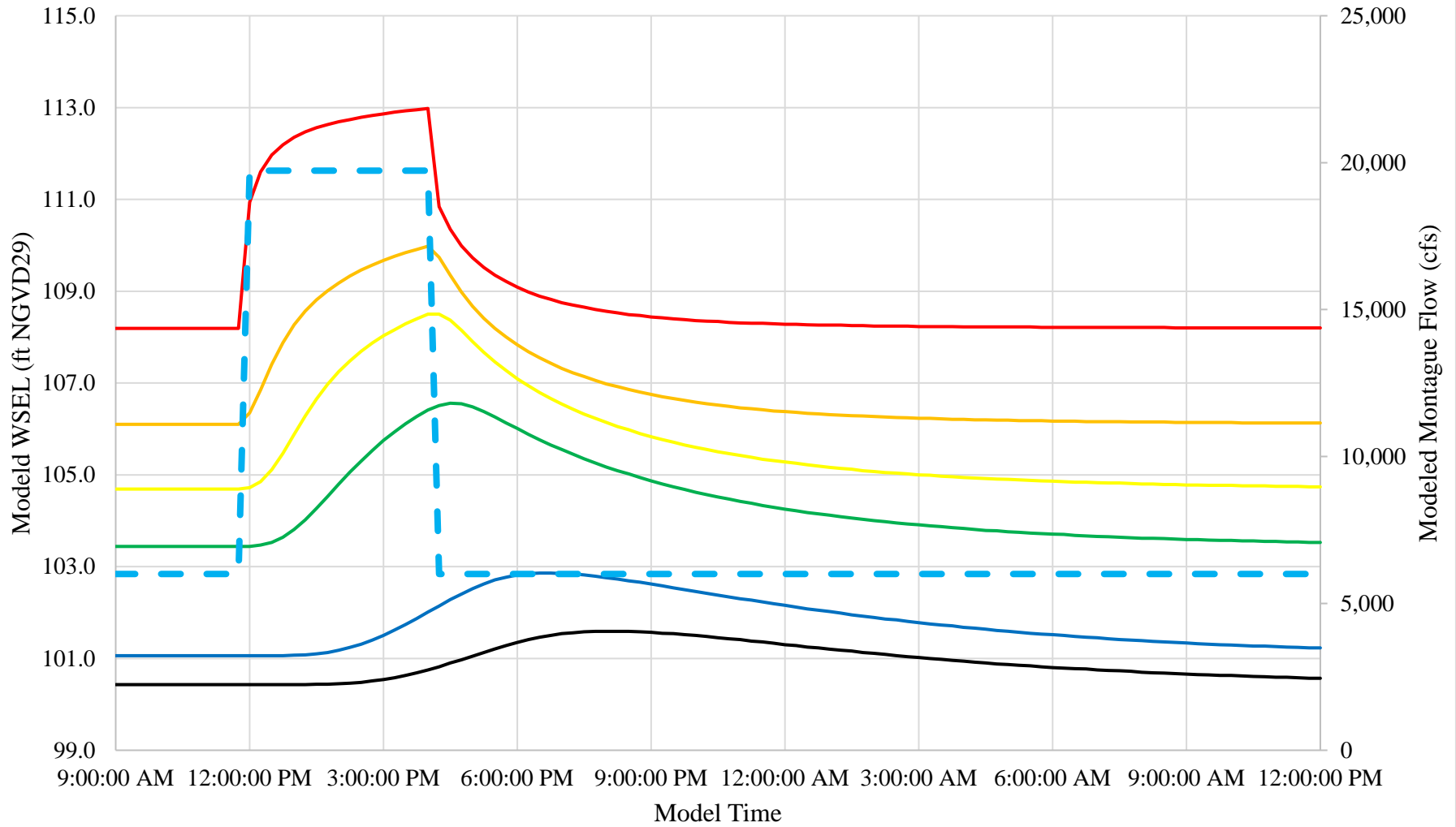
- 118.508, S32 Low
- 115.07, S32 Low
- 112.36, S32 Low
- 109.52, S32 Low
- 100.24, S32 Low
- 94.298 (Rainbow Beach), S32 Low
- - - Montague Flow S32 Low

Synthetic Model Scenario #33 6,000 cfs Baseflow and 6 Cabot Units for 2 Hours



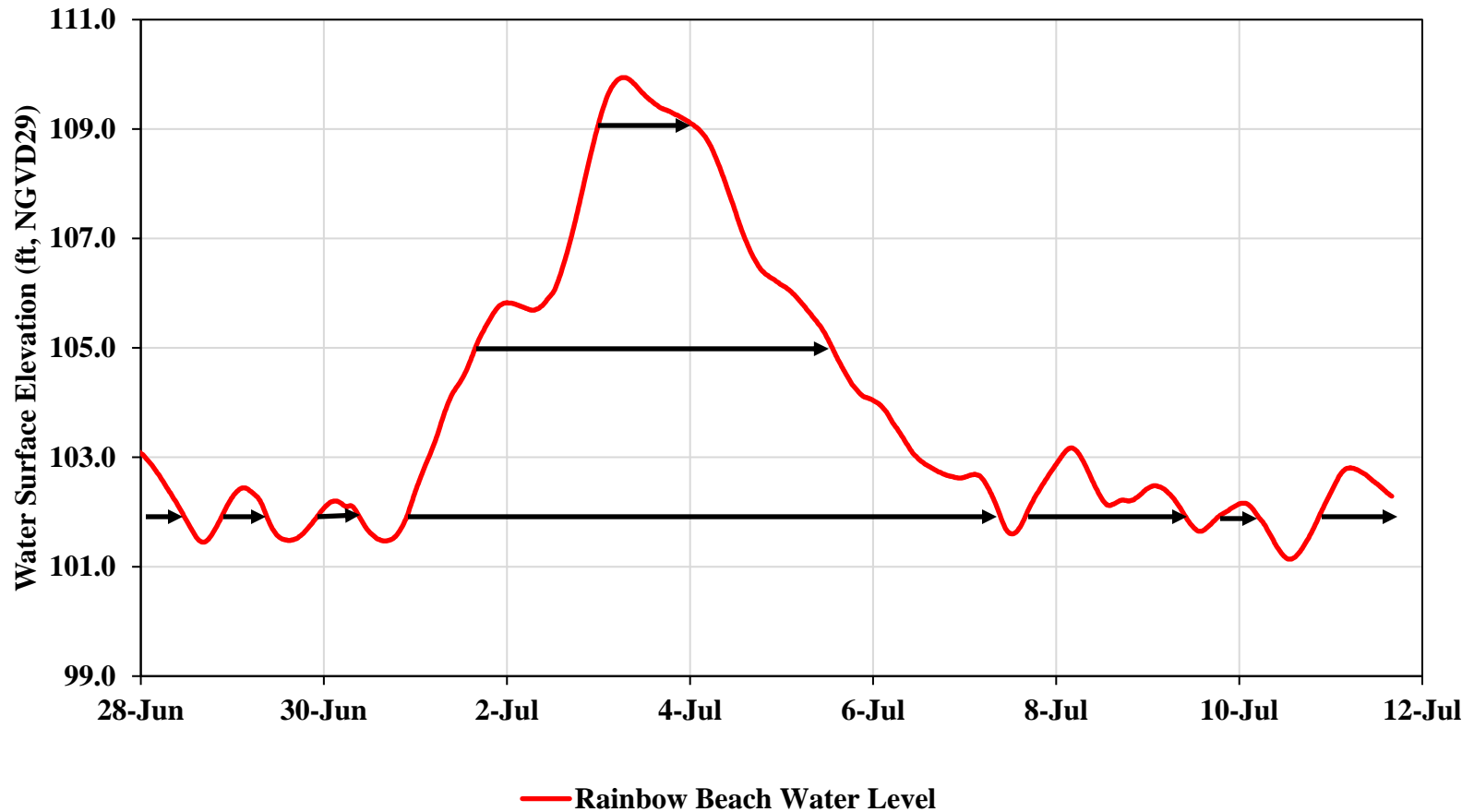
- 118.508, S33 Low
- 115.07, S33 Low
- 112.36, S33 Low
- 109.52, S33 Low
- 100.24, S33 Low
- 94.298 (Rainbow Beach), S33 Low
- - - Montague Flow S33 Low

Synthetic Model Scenario #34 6,000 cfs Baseflow and 6 Cabot Units for 4 Hours



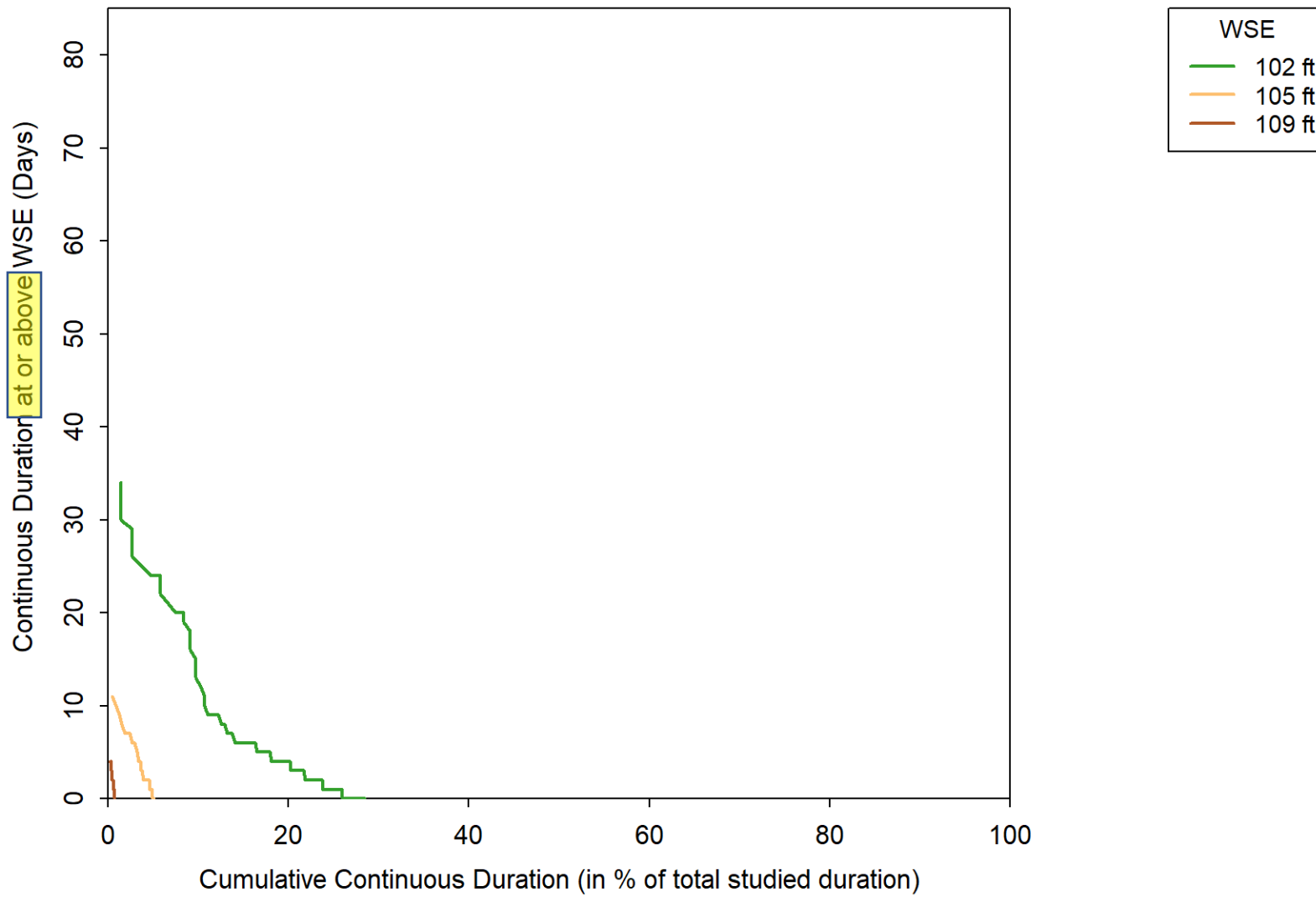
- 118.508, S34 Low
- 115.07, S34 Low
- 112.36, S34 Low
- 109.52, S34 Low
- 100.24, S34 Low
- 94.298 (Rainbow Beach), S34 Low
- - - Montague Flow S34 Low

APPENDIX G: DEMONSTRATION/EXAMPLE OF UCUT ANALYSIS



Key Points for Example Timeseries Plot (Designed to show habitat limitation events (inundated)):

- Higher water levels occur less frequently and with events that have shorter durations
- Lower water levels, in the presence of both peaking and natural flows, can result in a high frequency of shorter duration inundation events, and also a wider range of durations associated with events
- Inundation events are defined as the water level being **at or above** the defined threshold. In this case, 102 feet, 105 feet, and 109 feet
- An example UCUT plot showing this type of analysis (for a longer timeseries) is shown on the following page.



Example UCUT: Very rare instances of water levels reaching or exceeding 109 feet, for short durations (1-4 days), and slightly more frequent but still relatively rare instances of water levels reaching or exceeding 105 feet, with a broader range of durations (1-11 days). Water levels reaching or exceeding 102 feet occurred a modest amount, with durations between 1-34 days, though long durations of inundation occurred rarely.