FirstLight™ Power Resources

GDF SUEZ

Turners Falls Hydroelectric Project (FERC No. 1889)

Northfield Mountain Pumped Storage Project (FERC No. 2485)

2014 Initial Study Report

September 30-October 1, 2014

Purpose of Initial Study Report Meeting [18 CFR 5.15(c)(2)]

Per Regulation…..

Within 15 days following the filing of the Initial Study Report (September 15, 2013), the Applicant shall hold a meeting with licensing participants and Commission staff to discuss the study results and the potential applicant's and/or other participant's proposals, if any, to modify the study plan in light of the progress of the study plan and the data collected.

Meeting Objectives

- For each study, discuss…
  - the work completed to date (if any);
  - preliminary findings to date (if any);
  - variances from the study plan or schedule (if any), and;
  - remaining work.

Relicensing Process- Next Steps

Initial Study Report Meeting (All Stakeholders and FirstLight)

- September 30-October 1, 2014

Initial Study Report Meeting Summary Filed (FirstLight)

- October 17, 2014

Disagreements/Modifications to Study/Propose New Study (All Stakeholders)

- November 16, 2014

File Responses to Disagreements (All Stakeholders)

- December 16, 2014

Last date for the Director to resolve disagreements and amend the approved study plan (FERC)

- January 15, 2015

Study Recap

Total of 39 studies

- 22 studies have some level of field data collection as of September 30, 2014.
- 29 studies are slated to be conducted in 2014 (note some studies have field work in 2014 and 2015)
- 9 studies are slated to be conducted in 2015 and 1 in 2016
- 2 studies are complete (3.1.1 Full River Reconnaissance and 3.6.2 Recreation Facilities Inventory)

Fish and Aquatic Resources
Water Quality Resources

3.3.4- Evaluate Upstream Passage of American Eel

Work Completed

Task 1: Systematic Surveys

- FirstLight consulted with HG&E to determine the beginning of the upstream eel migration.
- Passage of a significant numbers of eel (>100/day) at Holyoke began on June 9, 2014 and prompted the first systematic surveys of the Turners Falls Dam Complex on the evening of June 11, 2014, during which no eel were observed.
- Additional surveys were conducted on the evenings of Jun 26, Jul 2, 10, 17, 21, 31, Aug 7, 21 and Sep 4, 16, 2014.

Findings (if any)

- Eels were first observed on Jun 26 and have been observed in each subsequent survey with varying abundance.

Variances (if any)

- On the evening of Jun 26 the Turners Falls Dam was spilling and Station No. 1 was in operation; on that day these areas were not surveyed for safety reasons.
- No eel were observed in the small turbine and process water outfalls (i.e. Southworth Paper) from the Turners Falls Canal and the survey of these areas was abandoned beginning on July 17 as these areas are particularly difficult to access at night and were deemed a safety hazard.

Work Remaining

- Additional survey will be conducted during October 2014.
- Trap collections will be conducted in 2015.
- Report to completed by 1st quarter of 2015.

3.3.4- Evaluate Upstream Passage of American Eel (continued)

Process Water Outfalls

3.3.17-Assess the Impacts of Project Operations of the Turners Falls Project and Northfield Mountain Project on Tributary and Backwater Area Access and Habitat

Work Completed

- The springtime survey was conducted on May 21, 22, Jun 4, 6, 10 , 11, 2014. The summertime survey was conducted on Aug 5, 11, 12 and 13, Sep 2,3, 2014 and the fall survey is scheduled for the week of Oct 6, 2014.

Findings (if any)

- Data analysis has not yet begun and will commence upon completion of field data collection in the fall of 2014.

Variances (if any)

- The RSP states that surveys will be performed at each tributary to delineate the perimeter of the inundated tributary confluence area with a sub-meter accuracy GPS. Aerial imagery may also be used to delineate tributary confluence areas.
- The upstream extent of the confluence will be delineated with sub-meter GPS and LiDAR data will be used to define the elevation at the upstream extent to calculate and map the perimeter using GIS.
  - Delineation of the perimeter of the tributaries was hindered by extensive mud deposits, making access to the perimeter difficult.
  - Dense canopy over the tributaries reduced the accuracy and connectivity of the Trimble GPS and obscured the tributary in aerial photos.

Work Remaining

- Perform final assessment in fall 2014.
- Report to be completed by 1st quarter of 2015.

3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment

Work Completed

- Field surveys to conduct the delineation phase of field efforts were conducted Aug 25-28, 2014. Subsequent to this effort, a desktop analysis was conducted to identify transect locations to be surveyed during the microhabitat quantified data collection phase, anticipated to occur in early Oct 2014.

Findings (if any)

- Data analysis will commence upon completion of field data collection in the fall of 2014.

Variances (if any)

- Water level loggers, rather than a benchmark survey, was used to monitor changes in the water elevation and to acquire the water surface elevation at the beginning of the survey.

Work Remaining

- Perform final assessment in fall 2014.
- Report to be completed in the 2nd quarter of 2015.

3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat (2015 study)

Work Completed

- Not applicable; study will be conducted in 2015

Findings (if any)

- Not applicable

Variances (if any)

- None to date.

Work Remaining

- Conduct literature review in late 2014/early 2015.
- Conduct field surveys during 2015 field season.
- Report to be completed by March 2016.

3.3.7-Fish Entrainment and Turbine Passage Mortality Study

Work Completed

- A preliminary assessment of entrainment risk was performed for resident species documented in previous studies.

Findings (if any)

- Data analysis has not yet begun and will commence upon completion of field data collection in the fall of 2015.

Variances (if any)

- None to date.

Work Remaining

- Results from the Fish Assemblage Assessment (Study No. 3.3.11, to be conducted in 2015) will be necessary to complete the desktop analyses for resident species.
- Entrainment and turbine mortality of juvenile and adult American shad and adult American eel will be estimated using hydroacoustic and radio telemetry data (*Study Nos. 3.3.2, 3.3.3, and 3.3.5).*
- Report to be completed by March 2016.

3.3.18- Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms

Work Completed

- An amended study plan was developed based on the consultation.
- Initial survey was conducted on September 29.
- Dissolved oxygen in Section 7 was sampled from the two bridges that cross the canal in that section.
- Quadrats for sea lamprey and mussels sampling were added, especially on the Western bank.

Findings (if any)

- None to date.

Variances (if any)

- None to date.

Work Remaining

- Conduct the second field survey at the end of the canal drawdown.
- Complete report.

3.3.6-Impact of Project Operations on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects (2015 Study)

Work Completed

- An amended study plan was developed based on stakeholder consultation.
  - FirstLight proposes to replace shad collection efforts with enhanced visual observations and splash counts below Turners Falls Dam.
  - FirstLight has agreed to collect eggs as described upstream in the Impoundment as this area is beyond the range of the shortnose sturgeon.

Findings (if any)

- Study to be conducted in 2015

Variances (if any)

- None to date.

Work Remaining

- The study will be conducted in 2015 and the report to be completed by March 2016.

3.3.11- Fish Assemblage (2015 Study)

Work Completed

- An amended study plan was developed based on stakeholder consultation.
  - FirstLight will conduct all sampling in the bypass reach after June 30.
  - In the reach below the Deerfield River, FirstLight will use both existing data and the data it obtains in the Turners Falls Impoundment to characterize the fish assemblage in this reach.

Findings (if any)

- Study to be conducted in 2015.

Variances (if any)

- None to date.

Work Remaining

- The study will be conducted in 2015 and the report to be completed by March 2016.

3.3.2-Evaluate Upstream and Downstream Passage of Adult American Shad (2015 Study)

Work Completed

Analysis of existing radio telemetry data:

- Between 2011 and 2012, the USFWS and USGS conducted the Whole River telemetry study, which radio-tagged 364 fish and collected data at 28 receivers from Enfield, CT to Vernon Dam.
- Initial data reduction was performed by the USGS; the dataset (aggregation of 2011 and 2012) contained nearly 12 million records.
- The USGS performed primary data reduction by removing detections from the record set that did not match a list of released tags, had too low of a power, or that were detected before the tag was activated.
- FirstLight employed Beeman and Perry's (2012) Method C, which required two simultaneous detections within series to be considered a true detection. The initial data reduction record set was reviewed by USFWS and USGS; however, they believed that too much data was removed.
- A new data reduction method based on a Naïve Bayes Classifier will be developed that will remove false positive detections probabilistically rather than making arbitrary distinctions. Once a dataset is reviewed by USGS and USFWS, analysis of existing information will continue. This includes the Whole River study data as well as the telemetry data previously collected at the Project fishways.

- Range testing of proposed monitoring locations was conducted on July 15 and 16, 2014. using a Lotek SRX 400 receiver and 4-element yagi antenna and a test tag
- Radio noise information is being collected in 2014 at Cabot Station to help determine which frequencies are best suited for use in the study. The exact frequencies used in the study will be based on availability and the results of the noise testing, and in cooperation with the TransCanada studies.

Findings (if any)

- The monitoring stations will be adequate to monitor shad movement through the study area with one exception. An additional monitoring station at the Shearer Farms location.

Variances (if any)

- None to date.

Work Remaining

- The study will be conducted in 2015 and the report to be completed by March 2016.

3.3.3-Evaluate Downstream Passage of Juvenile American Shad (2015 Study)

Work Completed

Task 1: Evaluation of Timing, Duration and Magnitude of Migration

- In order to optimize the split beam transducers spatial coverage of the targeted areas, field testing was performed in August 2014. Aquacoustics is putting together a summary report of the field testing results.

Task 2: Evaluate Route of Passage

- Range testing was conducted at proposed monitoring locations on July 15 and 16, 2014. using a Lotek SRX 400 receiver. 4-element yagi antenna, and a test tag
- Radio noise information is being collected in 2014 at Cabot Station to help determine which frequencies are best suited for use in the study. The frequencies will be selected based on the results of the noise testing, and in cooperation with the TransCanada studies.

Task 3: Turbine and Dam Passage Survival

- *Reviewed operational data to confirm that near best efficiency conditions are representative of typical operating conditions during the juvenile shad outmigration season (mid-August-October).*

Findings (if any)

- The selected antenna stations will be adequate to monitor shad movement through the study area with one exception: an additional monitoring station at the Shearer Farms location.

Variances (if any)

- None to date.

Work Remaining

- Report to be completed by March 2016.

3.3.5- Evaluate Downstream Passage of American Eel (2015 Study)

Work Completed

Task 1: Evaluation of Timing, Duration and Magnitude of Migration

- In order to optimize the split beam transducers spatial coverage of the targeted areas, field testing was performed in August 2014. Aquacoustics is putting together a summary report of the field testing results.

Task 2: Evaluate Route of Passage

- Range testing of proposed monitoring locations was conducted on July 15 and 16, 2014. using a Lotek SRX 400 receiver and 4-element yagi antenna and a test tag
- Radio noise information is being collected in 2014 at Cabot Station to help determine which frequencies are best suited for use in the study. The exact frequencies used in the study will be based on the results of the noise testing, and in cooperation with the TransCanada studies.

Task 3: Turbine and Dam Passage Survival

- *Reviewed operational data to confirm that near best efficiency conditions are representative of typical operating conditions during the juvenile shad outmigration season (mid-August-October).*

Findings (if any)

- The selected antenna stations will be adequate to monitor shad movement through the study area with one exception: an additional monitoring station at the Shearer Farms location.

Variances (if any)

- None to date.

Work Remaining

- Conduct field studies in 2015 and repeat hydroacoustic monitoring (Task 1) and analysis of data in 2016.
- Report to be completed by March 2017.

3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project & Northfield Mountain Project Area (2015 Study)

Work Completed

- Range testing of proposed monitoring locations was conducted on July 15 and 16, 2014. using a Lotek SRX 400 receiver and 4-element yagi antenna and a test tag
- Radio noise information is being collected in 2014 at Cabot Station to help determine which frequencies are best suited for use in the study. The exact frequencies used in the study will be based on the results of the noise testing, and in cooperation with the TransCanada studies.

Findings (if any)

- The selected antenna stations will be adequate to monitor shad movement through the study area with one exception: an additional monitoring station at the Shearer Farms location.

Variances (if any)

- None to date.

Work Remaining

- The study will be conducted in 2015 and the report to be completed by March 2016.

3.3.19- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace (2016 Study)

Work Completed

- This study will be conducted in 2016 pending the results of Study No 3.3.1 (Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station), and Study No. 3.3.2 (Evaluate Upstream and Downstream Passage of Adult American Shad),which *includes* telemetry studies and analysis of historic fish passage data.

Findings (if any)

- None to date.

Variances (if any)

- None to date.

Work Remaining

- File an amended study plan after completion of Study No. 3.3.2 after consultation with stakeholders.
- Conduct the field study in 2016.
- Report to be completed by March 2017.

3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station

Work Completed

- Update Turners Falls Impoundment HEC-RAS model
  - New bathymetry obtained from Vernon tailrace to NH/VT/MA border.
  - New bathymetry obtained 5 km upstream and 5 km downstream of Northfield tailrace.
  - New bathymetry being combined with LiDAR of overbank topography.
- Water level loggers were installed- most installed in late March, one near French King gorge in April (safety concerns)
- Turners Fall Impoundment HEC-RAS model
  - Currently cutting cross-sections using revised bathymetry and LiDAR- in process of calibrating model to water level logger data.
- Below Cabot Dam HEC-RAS model
  - Contacted FEMA; no hydraulic data for town of Hatfield.
  - 8 cross-sections taken in Hatfield.
  - Melding a) Hatfield cross-section data, b) former FEMA HEC-2 cross-sections, HEC-RAS model developed by TNC/Corps in the Northampton area and LiDAR data into model.
  - Starting steady state calibration to water level logger data collected in 2013.

Findings (if any)

- No detailed findings to date.

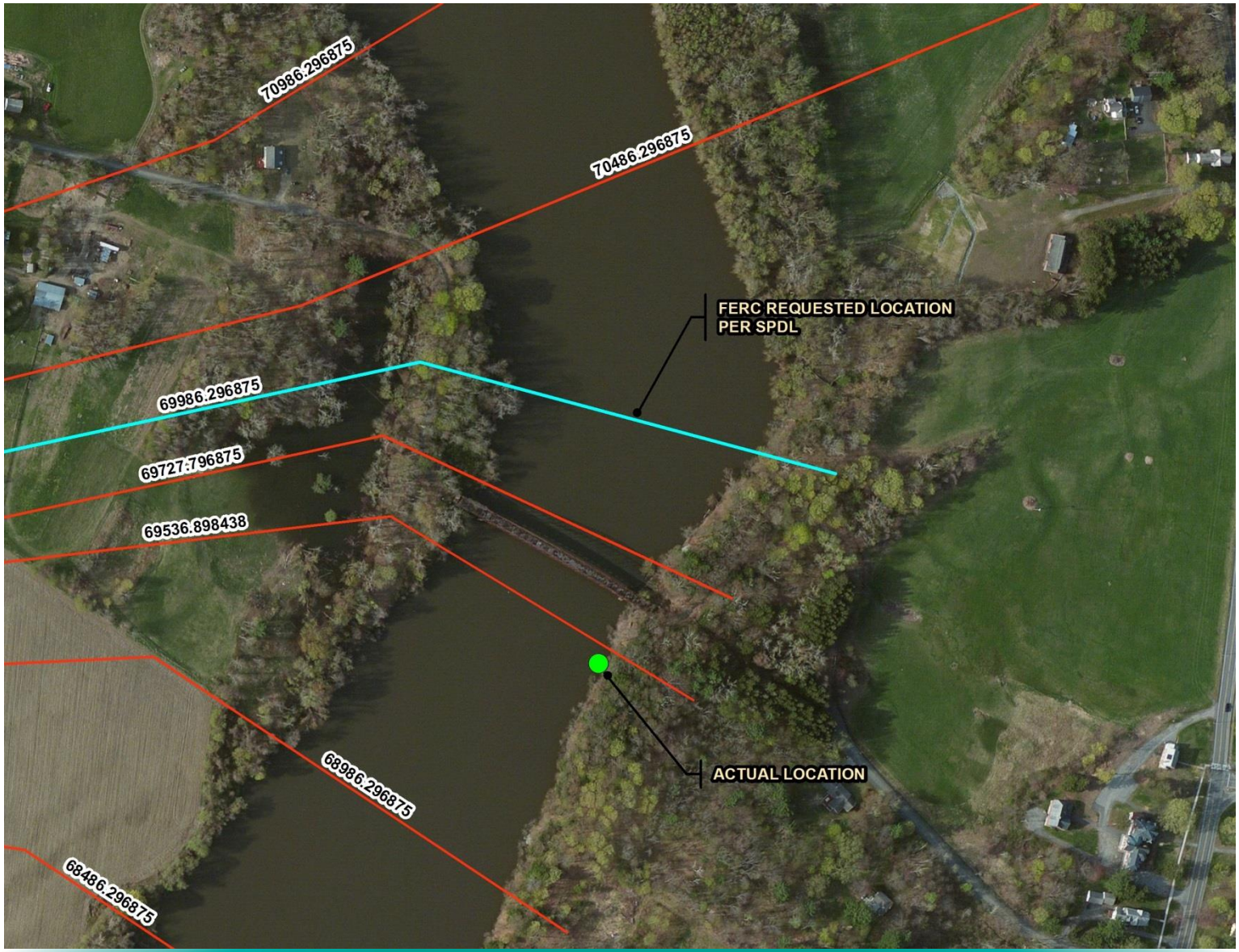
Variances (if any)

- Water level loggers were to be installed in April, the logger at the French King gorge was not installed until the end of April due safety concerns. FERC's SPDL requested FirstLight install an additional water level logger at Transect 70000. Due to vandalism concerns in this area the logger was relocated downstream to transect 69500.

Work Remaining

- Complete the hydraulic models.
- Report to be completed by 1st quarter of 2015.

3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station



3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Work Completed

- Bathymetry and velocity profile data collected at:
  - Station No. 1 Forebay - March 28, 2014.
  - Cabot Forebay - March 29, 2014.
  - Spillway Fish Ladder - September 4, 2014.
  - Cabot Fish Ladder - August 6, 2014.
- Station No. 1 Forebay and Cabot Forebay bathymetry post-processed.
- 3D CAD models developed for Station No. 1 Forebay, Cabot Forebay, Spillway Fish Ladder, and Cabot Fish Ladder.
- Initial CFD model runs for Station No. 1 Forebay started.

Findings (if any)

- None to date.

Variances (if any)

- The only variances from the RSP are schedule related. It is anticipated that a report will be completed by 2nd quarter of 2015.

Work Remaining

- Finish field data collection at the Spillway Fish Ladder.
- Construct the 3D CFD models for all locations.
- Conduct the model production runs at all locations.
- Report to be completed by the 2nd quarter of 2015.

3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Bathymetry and Velocity Profile Collection

3.3.9-Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace

Work Completed

- Water Column Velocity Data Collection
  - 2 Units Generating Scenario – Apr 6, 2014.
  - 2 Units Pumping Scenario – Apr 7, 2014.
  - 4 Units Generating Scenario – Jul 12, 2014.
  - 4 Units Pumping Scenario – Jul 12, 2014.
- Bathymetric Data Collection
  - 5 km upstream and 5 km downstream of Northfield Tailrace – May 27, 2014 and Jun 2-4, 2014.
- Water Level Loggers
  - 7 Installed – Apr 6, 2014 and May 21, 2014.
  - Most recent data offload was Jul 31, 2014.

Findings (if any)

- Quality Assurance/ Quality Control procedures being applied to field data collected to date.

Variances (if any)

- Water column velocity data only collected at three transects as the fourth transect was located on top of the intake structure.

Work Remaining

- Develop and calibrate two-dimensional model.
- Perform 40 initial “production runs”.
- Present initial results to stakeholders.
- Perform additional “production runs”.
- Report to be completed in the 2nd quarter of 2015

3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

Work Completed

- The study plan for 2014 field work was completed in Apr 2014; collection permit issued by NHESP on May 15, 2014.
- Field work was completed in May and Jun 2014. All survey sites requested by NHESP were surveyed as follows:
  - Representative shoreline habitat in Barton's Cove (200 m).
  - Representative shoreline habitat in Reach 3 of the Turner Falls Bypass reach (400 m).
  - Representative shoreline habitat in two reaches below Cabot between Railroad Bridge and Third Island (400 m).
  - Representative shoreline habitat near the Route 116 Bridge (200 m).

Findings (if any)

- None to date.

Variances (if any)

- Included one additional survey site near the Route 116 Bridge to compare species composition here to areas farther upstream. FirstLight added this to assess whether more intensive quantitative surveys planned for 2015, especially studies of emergence behavior could be done in an area that was more accessible.

Work Remaining

- Larval stage odonates collected in 2014 to be identified.
- Study plan for 2015 field work to be submitted to stakeholders for review.
- FirstLight to convene a meeting to finalize quantitative survey methods and level of effort under Task 4.
- Report to be completed by March 2016.

3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station

Work Completed

- The study plan for 2014 field work was completed in Apr 2014; collection permit issued by NHESP on May 15, 2014
- The mussel survey and habitat assessment was completed in Jun 2014.
- Habitat assessments results were discussed with NHESP on Jul 16, 2014. The parties mutually identified ~25 mussel survey locations between Cabot and Route 116 Bridge.

Findings (if any)

- No live state-listed mussels were found in the survey areas. One relic *Lampsilis cariosa* shell was found.

Variances (if any)

- None to date.

Work Remaining

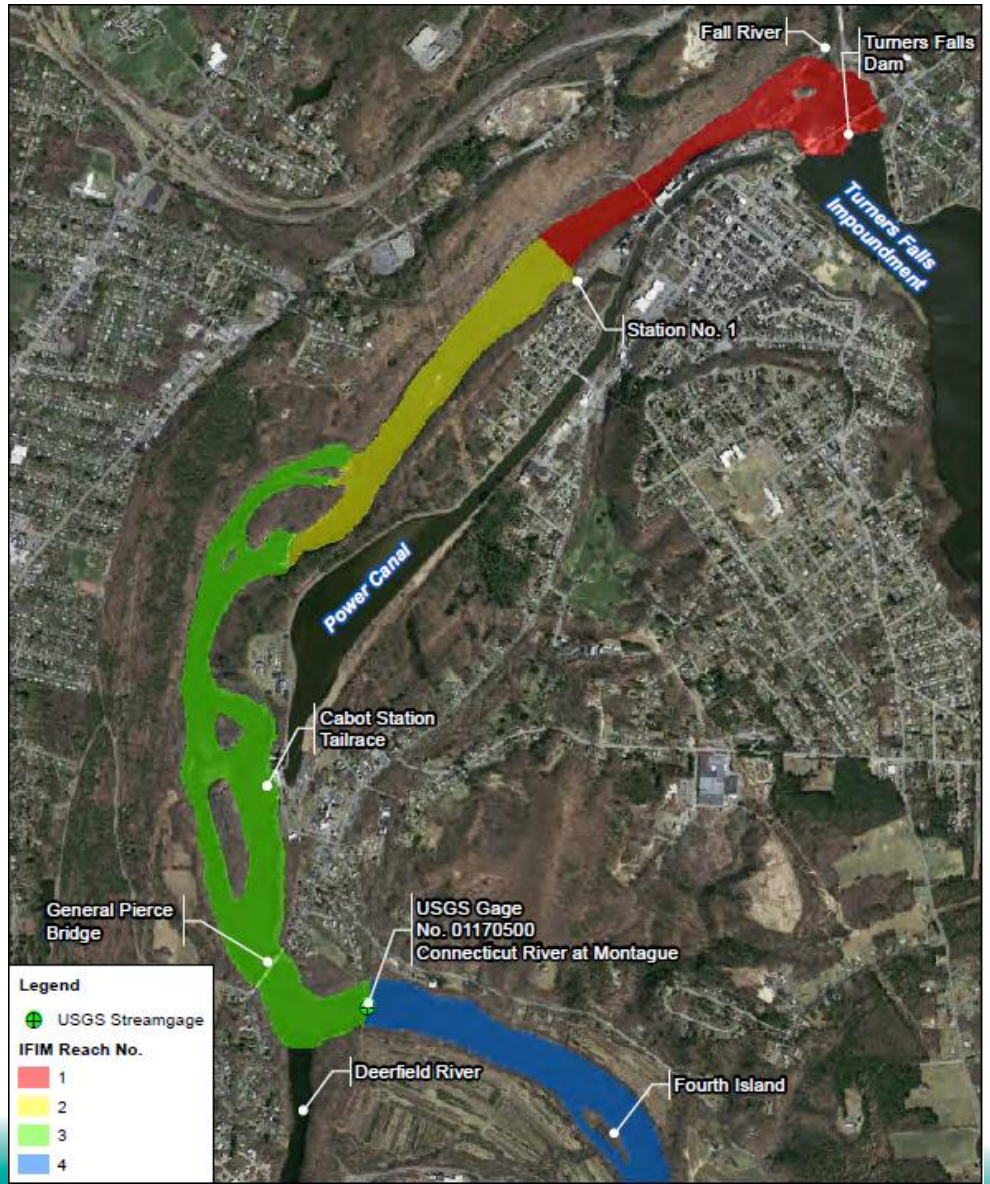
- Development of binary HSI criteria, including input from qualified regional scientists to be conducted in 4th quarter of 2014.
- The effects of the flow regime on state-listed mussels will be examined as part of the Instream Flow Study.
- Report to be completed by March 2016.

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Work Completed

- Consultation to Finalize SPDL items:
  - Substrate Coding
  - Lamprey Curves – USFWS revisions
  - Logger locations
    - Unlike a 1-D model which is limited by transects and defined transect boundaries, a 2-D model is continuous and can model habitat conditions for target species throughout an entire reach, regardless of exact transect locations.
  - NHESP concerns over yellow lampmussel in bypass reach 3
  - Host Fish/Guild Approach
  - Upper Reach 1 Methods
- Reach 1-2, 1-D Transect Data Collection
  - Bypass flows of approximately 120 cfs, 700 cfs, and 4,000 cfs
- Reach 3 2-D Data Collection in process
  - Calibration and Validation Velocity (4,500/700 and 8,500/120 cfs)
  - Substrate, Topography
  - Water Level Data

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



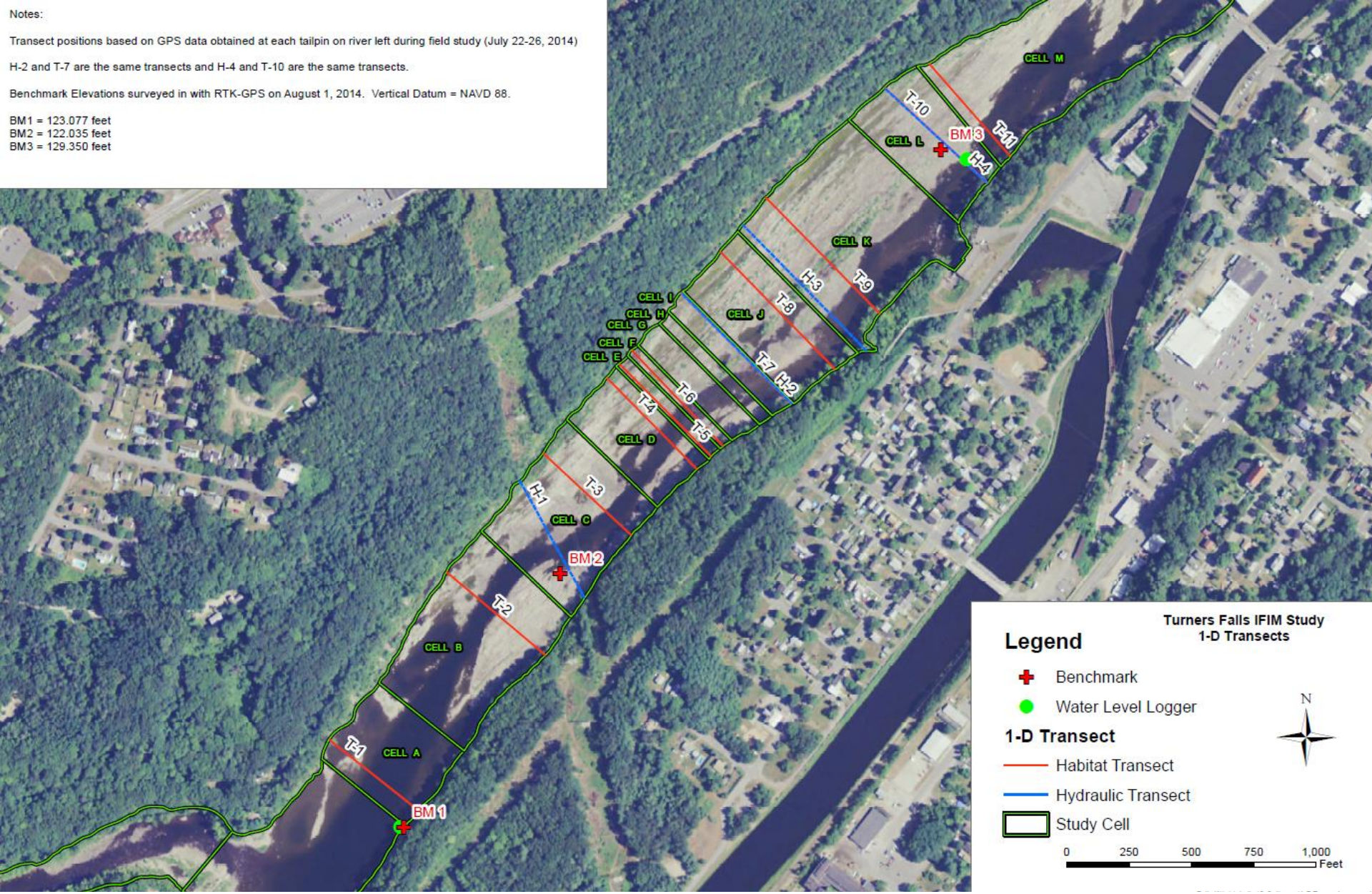
Notes:

Transect positions based on GPS data obtained at each tailpin on river left during field study (July 22-26, 2014)

H-2 and T-7 are the same transects and H-4 and T-10 are the same transects.

Benchmark Elevations surveyed in with RTK-GPS on August 1, 2014. Vertical Datum = NAVD 88.

BM1 = 123.077 feet
BM2 = 122.035 feet
BM3 = 129.350 feet



3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

Findings (if any)

- Nothing to report at this time

Variance (if any)

- Schedule- originally were planning on conducting work in Reaches 1-3 in 2013 and Reaches 4-5 in 2014.

Work Remaining

- Data Analysis and Presentation of Reach 1-3 results.
- Reach 1 Flow Demonstration.
- Assessment of State Listed Mussels (Task 2).
- Consultation to scope Reach 4-5 transect locations (representative locations).
- Reach 4-5 field data collection (2015).
- Report to be completed by March 2016.

3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

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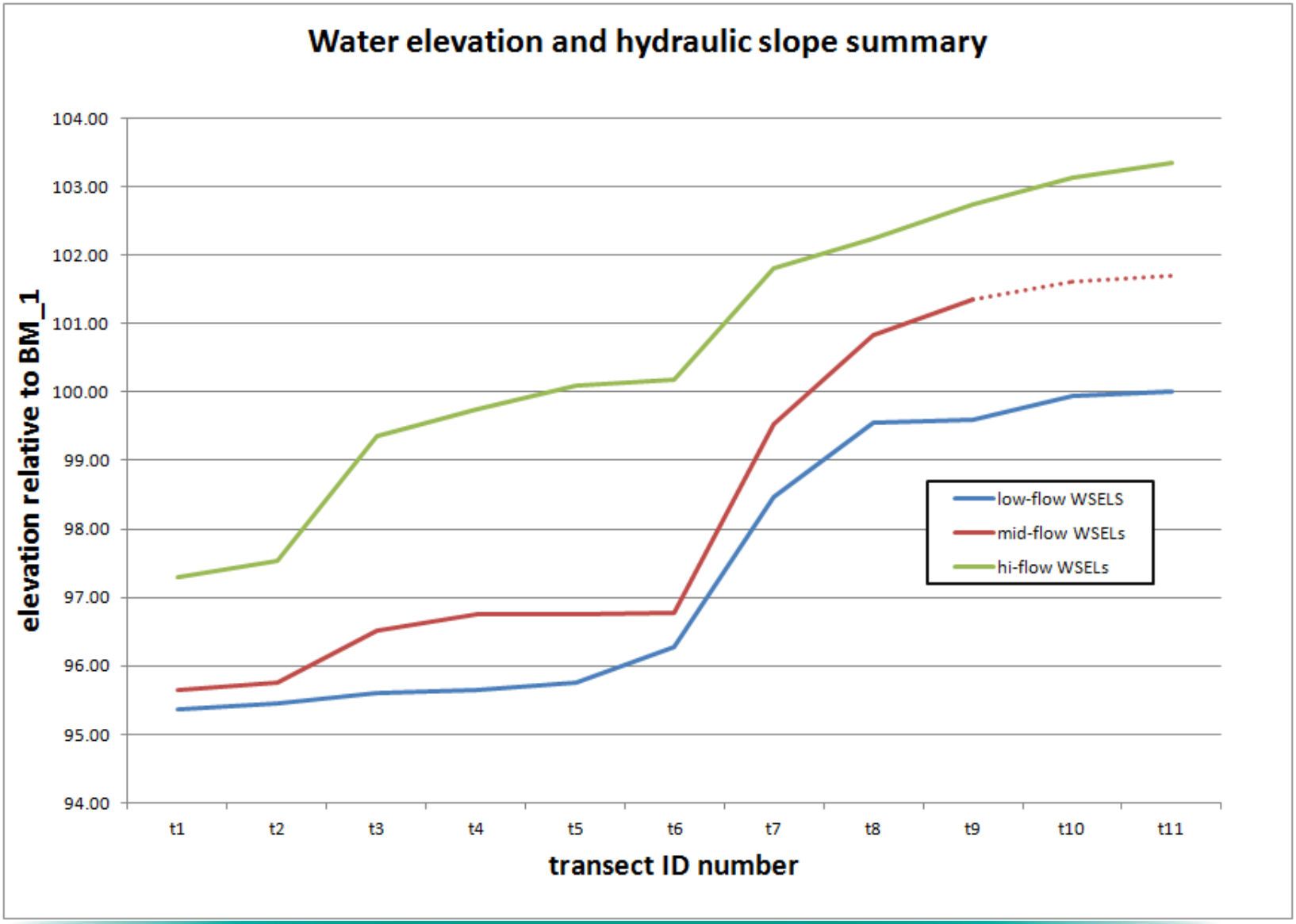


3.3.12-Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station

Work Completed

Task 1 – Desktop Analysis of Gate Discharge

- Operations data every 10 minutes from April 1 to June 30 for the years 2005 through 2012
- Emergency Spill Gates
- Log Sluice

3.3.12-Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station

3.3.12-Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station

Findings

- Sluice gate is opened 5-7 feet when the fish sampler is deployed. This occurred 70% of the time over the period of interest. The gate was open > 7 feet less than 4% of the time. Gate openings >7 feet usually indicate a period of intake rack cleaning.
- Spill Gates - One gate is often left partially open to help route debris from the boom in the canal through the spill gate; one gate is open 57.4% of time (thus over 97.8% of the time, none or one gate is open to some degree). More than two gates were open at 0.6% of the intervals.
- Large magnitude releases very infrequent. Events occurred as an automated response due to the canal forebay elevation being outside of the emergency threshold elevation for a short period.
- Spill events at Cabot Station caused no identifiable increase in total river discharge, because there was only a shift in release location, rather than a shift in discharge volume.

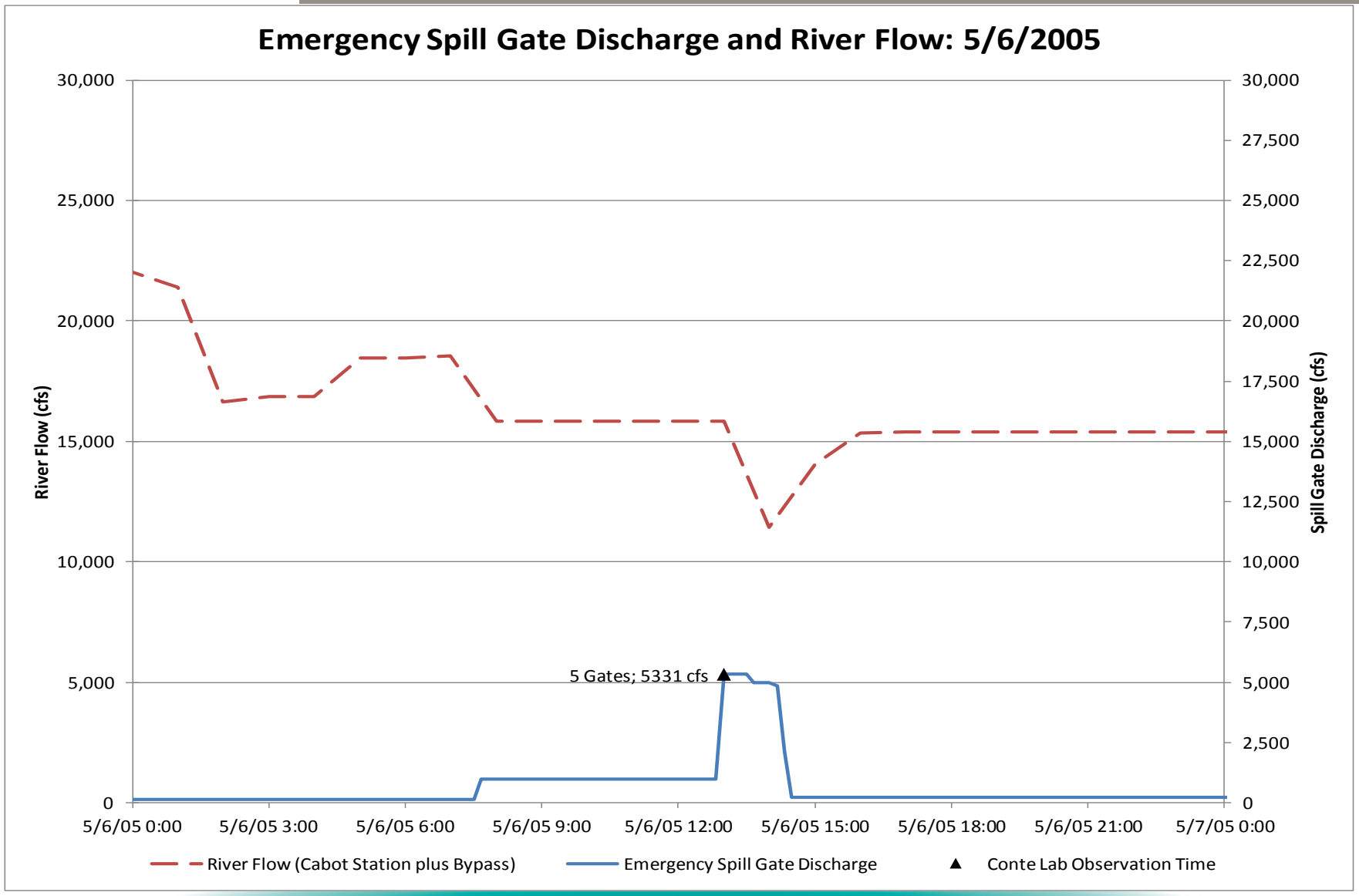
Variances

- Study schedule in August RSP targeted Spring 2014 for distribution of summary report and a meeting with stakeholders to determine the need for field study and targeted Summer 2014 to perform field investigations outside of the sturgeon spawning season, if needed.
- Summary report (submitted with the ISR) issuance was delayed due to the unanticipated delay in receiving the SPDL in February 2014.

Work Remaining

- Determine if field data collection is necessary. FirstLight's position is that the field data collection aspect of this study is not necessary. As stated in the RSP, a mutual agreement will be reached in consultation with interested stakeholders to determine whether additional study is necessary.
- Field data collection, if necessary (2015).
- Reporting, if necessary.

3.3.12-Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station



3.2.1-Water Quality Monitoring Study (2015 Study)

Work Completed

- Drafted Field Sampling Plan.
- Includes Dissolved Oxygen and Temperature Sampling Methods according to Revised Study Plan.
- Proposed Water Temperature Monitoring Locations below Cabot Station.
- Revised Field Sampling Plan to Address Stakeholder Comments.

Findings (if any)

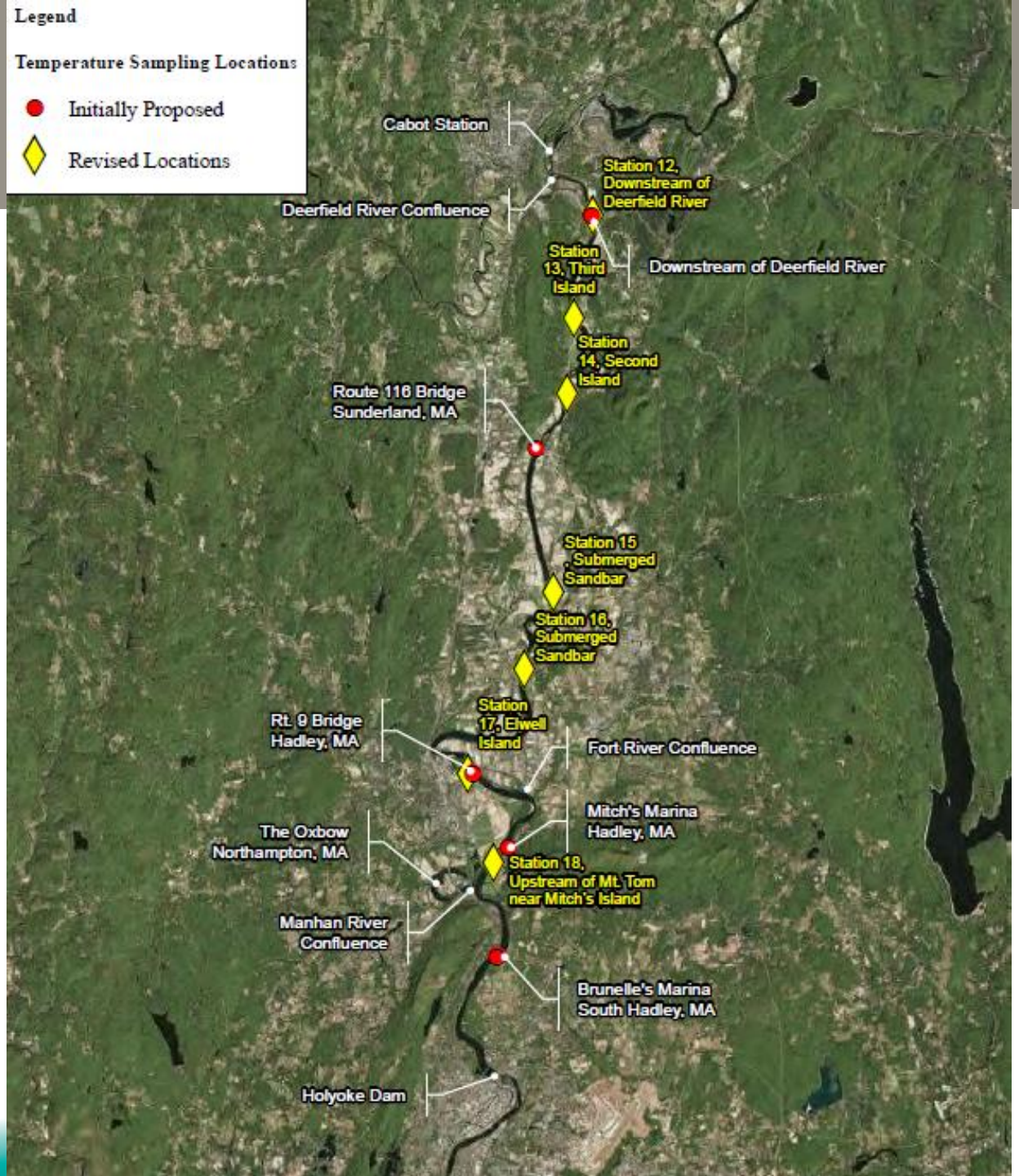
- 2015 Study.

Variance (if any)

- None to date.

Work Remaining

- Approval of Field Sampling Plan.
- Temperature and DO Monitoring in 2015.
- Report to be completed by March 2016.


Legend
Temperature Sampling Locations
Initially Proposed
Revised Locations
Cabot Station
Station 12, Downstream of Deerfield River
Deerfield River Confluence
Station 13, Third Island
Downstream of Deerfield River
Station 14, Second Island
Route 116 Bridge Sunderland, MA
Station 15 , Submerged Sandbar
Station 16, Submerged Sandbar
Rt. 9 Bridge Hadley, MA
Station 17, Elwell Island
Fort River Confluence
Mitch's Marina Hadley, MA
The Oxbow Northampton, MA
Station 18, Upstream of Mt. Tom near Mitch's Island
Manhan River Confluence
Brunelle's Marina South Hadley, MA
Holyoke Dam

Terrestrial and Wildlife Resources

3.4.1-Baseline Study of Terrestrial Wildlife and Botanical Resources

Work Completed

Surveys were completed from May through September 2014

- Wildlife & Habitat Type Mapping
- Botanical Surveys
- Invasive Plant Surveys

Findings (if any)

- Data analysis and reporting is in development.

Variances (if any)

- None to date.

Work Remaining

- Field data collection is scheduled to be completed by September 30, 2014. Following the completion of field work a technical report will be prepared for this study.
- Report to be completed by 2nd quarter of 2015.

3.4.2-Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats

Work Completed

Field Surveys completed from April through September 2014

- Wildlife & Habitat Type Mapping
- Botanical Surveys
- Invasive Plant Surveys
- Land Management Practices & Recreation Uses

Findings (if any)

- Data analysis and reporting is in development.

Variances (if any)

- None to date.

Work Remaining

- Following the completion of field work, report to be completed by 2nd quarter of 2015.

3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species

Work Completed

Riparian and Littoral Zone Botanical Survey

- Botanical surveys – in progress- census list of plants found within each habitat and are collecting an overall list of all plant species identified within the Project Area
- SAV and EAV beds are being surveyed from a boat and kayaks

Sensitive Plant Survey

- 10 Target Species as identified by NHESP, Surveys completed in the Impoundment and from the Turners Falls Dam downstream to the Route 116 Bridge in Sunderland, MA.
- Field survey efforts assisted by Steven Johnson PhD. – NHESP approved botanist
- Initial Recon completed in June 2014
- A survey to gather presence/ absence data on state-listed plants at identified potential habitat and historic EO was conducted over the weeks of August 18 – October 10 2014.
- During the presence / absence survey, botanists will select preliminary transects which will later be used to collect additional fine scale data and complete biological evaluations on representative populations.
- Following the presence / absence surveys, maps will be generated showing locations of suitable but otherwise unoccupied, occupied RTE plant habitat, historic EO and proposed plant survey transects.
- Using these maps FirstLight will consult with NHESP for concurrence on final selection of plant transects.

3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species (continued)

Work Completed (continued)

Invasive Plant Survey

- The riparian and aquatic invasive plant surveys are in the process of being completed along the perimeter of the Impoundment downstream to Route 116 on both sides of the river, up to the limit of project-influenced stream banks.

Mapping Wetlands and Waters of the United States

- Within the Impoundment and up to 200 feet from the Impoundment shoreline, NWI mapped wetlands are being field verified and described.

Project Water Level Fluctuation Assessment

- Data collected during this study, along with the results of hydraulic modeling (Study 3.2.2), will be used to evaluate the effect of Project-related water level fluctuations on known populations of Puritan and cobblestone tiger beetles habitat. This task is in development

Tiger Beetle Habitat Field Evaluation

- NHESP approved Tiger Beetle expert Chris Davis is assisting with field surveys and data analysis.
- As a result of high river water level elevation and habitat inundation, Tiger beetle surveys were delayed until mid -late August 2014.
- Following surveys, FirstLight will consult with agencies on the placement of transects, to collect fine scale information.

3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species (continued)

Work Completed (continued)

Task 6b: Water Level Fluctuation Evaluation

- This task has not been started.
- Hydraulic modeling will include a combination of models at key locations including a HEC-RAS model, IFIM-related hydraulic model, and water level loggers. The HEC-RAS modeling is in process.

Findings (if any)

- Data analysis and reporting is in development.

Variances (if any)

- Higher than normal river flows inundated habitats for prolonged periods of time during the 2014 survey period. Because of the high spring river flow, field studies originally scheduled to begin in early May were delayed until early June when river flows were both safer and low enough to expose habitats. As a result of higher than average flows, Tiger beetle surveys were delayed from an original projected survey window of early July 2014 to mid -late August 2014.

Work Remaining

- Field data collection is scheduled to be completed by mid October 2014.
- Report to be completed by 2nd quarter of 2015.

Developmental Resources

3.8.1-Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation

Work Completed

- Using HEC-ResSim simulation model provided by the USACOE via The Nature Conservancy.
- Model was updated to reflect hourly time step, pumping/generating cycles at Northfield and fishway/attraction flows.
- Model calibrated to generation and flow at the Montague USGS Gage.
- Established a baseline model reflecting current operations.

Findings (if any)

- None to date.

Variances (if any)

- None to date.

Work Remaining

- Model period of record to be updated to include hydrologic record from 2004-2012.
- Validate model calibration for period of record 2004-2012.
- Once studies are complete, evaluate alternative modes of operation.
- Report to be completed by 1st quarter of 2017.

Recreation and Land Use Resources

3.6.1-Recreation Use/User Contact Survey

Work Completed

- Task 1: Study Preparation
  - Developed field data collection schedule and trained field staff (December, 2013 and January, 2014)

- Task 2: Field Work
  - Field work initiated in January 2014 (ongoing through December, 2014)
  - Spot counts and calibration counts at formal recreation sites (ongoing through December, 2014)
  - Traffic counters installed Memorial Day and data collection ongoing
  - User contact surveys at formal recreation sites (ongoing through December, 2014)
    - Over 600 surveys collected through July, 2014
  - Residential abutters surveyed in July/August, 2014; 211 residences surveyed
    - 38% returns though September 1, 2014

- Task 3: Data Entry and Statistical Analysis
  - Data entry into electronic spreadsheets is ongoing

3.6.1-Recreation Use/User Contact Survey

Findings (if any)

- None to report at this time

Variances (if any)

- FERC recommended modifications (September 13, 2013) to Recreation User Survey and Northfield Mountain Trail User Surveys were inadvertently left out. Surveys were modified in August, 2014 and modified surveys have been in use since. Modifications to surveys made in August included:
  - Recreation User Survey:
    - Question 11, which asked users to indicate which activities they participate or have participated in at the Projects was to be modified to add the qualifier "i*n the past five years*"
    - Question 15, which asked users to rate amenities, was to be modified to include "*toilets and restrooms*" and "*river access*";
    - A Likert-type question about satisfaction with the number of recreational facilities at the Projects was to be added to the survey.
  - Northfield Mountain trail user survey:
    - Question 13, which asked users to provide their opinion on a variety of issues about the trails was to be modified to add the variable of "*Hours of Operation*" and to conclude with an open-ended inquiry into how any rated variables could be improved.

- Data from the WMCC's website was used to determine appropriate locations for collection of data from rock climbers instead of directly consulting with WMCC. FirstLight met with WMCC on September 19, 2014 to discuss and confirm appropriate survey locations.

- Mail survey was to be mailed in the spring of 2014 to residential abutters. The mail survey was mailed to residential abutters in July, 2014.

3.6.1-Recreation Use/User Contact Survey

Work Remaining

- Field work will be completed in December 2014.
- Data entry will continue until all the collected information has been compiled.
- Data will undergo QA/QC check.
- FirstLight will consult with the MA Environmental Police and local police prior to the end of 2014.
- Statistical/data analysis will begin upon completion of data entry.
- Data from the other pertinent relicensing studies will be reviewed and assimilated into the final report for this study.
- Report to be completed by 4th quarter of 2015.

3.6.2-Recreation Facilities Inventory and Assessment

Work Completed

- Desktop review of public recreation facilities
- Recreation facilities inventory conducted during multiple field visits between October, 2011 and February, 2013
  - 24 formal and informal sites evaluated
- Data analysis and report development complete.

Findings (if any)

- 19 formal recreation sites identified
  - 10 of the formal recreation sites are owned and managed by FirstLight as Project Recreation Sites
- Remaining sites are either:
  - Formal recreation sites that provide public access to the Project and that are operated by others (mostly by the Commonwealth of Massachusetts)
  - Formal recreation sites operated by others, a portion of which lies within the Project boundaries
  - Informal sites that receive significant regular use and provide access to the Projects

- Formal recreation sites at the Projects provide opportunities for boat launching, fishing, camping, picnicking, hiking, biking, walking, skiing, sightseeing, and educational opportunities.

- All formal recreation sites within Project boundaries were found to be meeting their intended function
  - Most facilities given a condition rating of 4: good condition, and functioning as intended
  - A few facilities given a condition rating of 3: in need of some maintenance, but functioning
  - One facility was given a condition rating of less than 3: in need of facility equipment repairs or replacement

3.6.2-Recreation Facilities Inventory and Assessment

Table: Site ID, Facility Name, Ownership and Management of Recreation Facilities in the Project Area

Site ID	Recreation Site Name	Site Ownership	Site Management	Formal/Informal Site	Site Relationship to Project Boundary
1	Governor Hunt Boat Launch/Picnic Area	TransCanada	TransCanada	Formal	A portion of the site along the river is within the Project boundary of both Projects. The entirety of the site is also located within the Project boundary of TransCanada's Vernon Hydroelectric Project.
2	Ashuelot River Informal Campsite	Private Ownership	N/A	Informal	Within the Project boundary of both Projects
3	Fort Hill Rail Trail	State of New Hampshire	State of New Hampshire	Formal	A portion of the trail is within the Project boundary of both Projects. Trail parking outside of the Project boundaries
4	Pauchaug Wildlife Management Area	Massachusetts, Division of Fisheries and Wildlife	Massachusetts, Division of Fisheries and Wildlife	Formal	Within the Project boundary of both Projects
5	Pauchaug Boat Launch	Commonwealth of Massachusetts	Commonwealth of Massachusetts	Formal	Within the Project boundary of both Projects
6	Schell Bridge Informal Site	Town of Northfield	N/A	Informal	Within in Project boundary of both Projects
7	Informal Multi-Use Site	FirstLight	N/A	Informal	Within the Project boundary of both Projects
8	Bennett Meadow Wildlife Management Area	FirstLight	Massachusetts Division of Fisheries and Wildlife	Formal	Within the Project boundary of both Projects
9	Munn's Ferry Boat Camping Recreation Area	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects
10	Informal Munn's Ferry Access Site	Private Ownership	N/A	Informal	A portion of the site is within the Project boundary of both Projects
11	Boat Tour and Riverview Picnic Area	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects
12	Northfield Mountain Visitor Center	FirstLight	FirstLight	Formal	Within the Project boundary of the Northfield Mountain Project

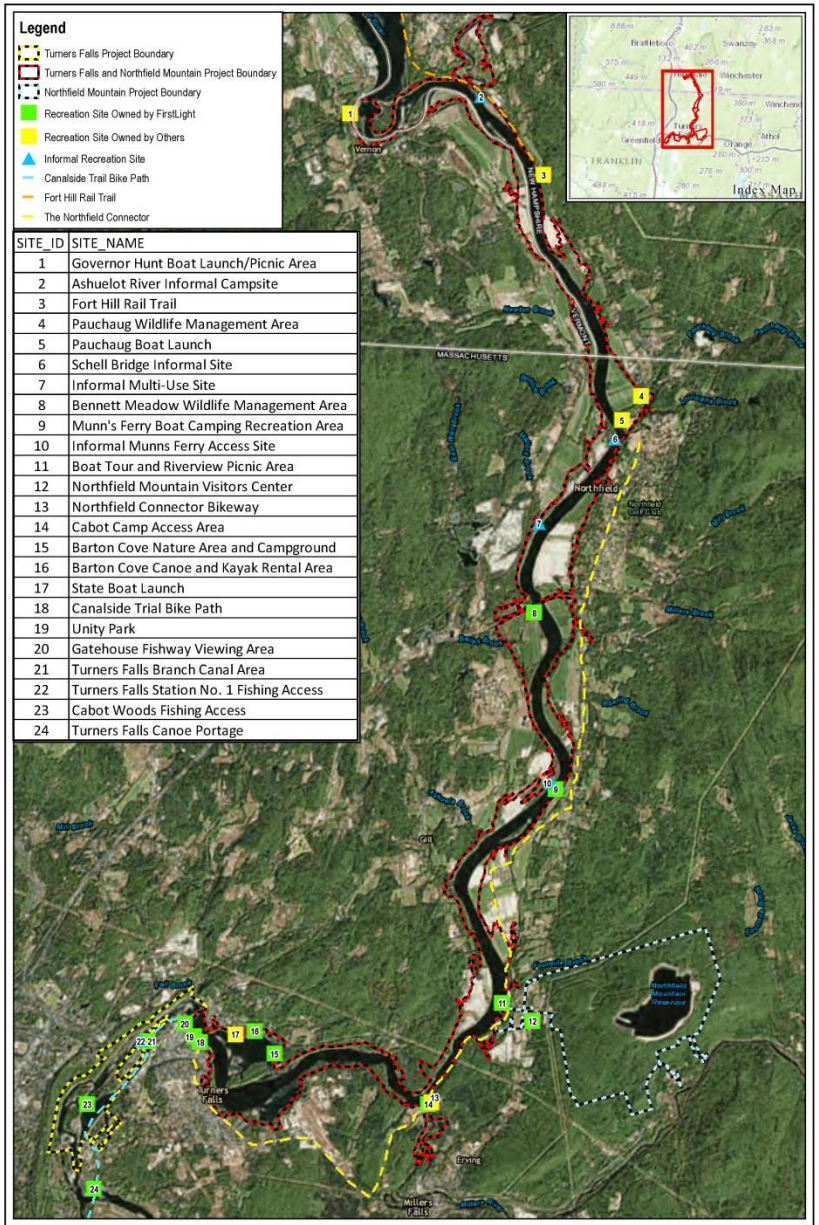
3.6.2-Recreation Facilities Inventory and Assessment

Table: Site ID, Facility Name, Ownership and Management of Recreation Facilities in the Project Area (continued)

Site ID	Recreation Site Name	Site Ownership	Site Management	Formal/Informal Site	Site Relationship to Project Boundary
13	Northfield Connector Bike Path	Utilizes existing roadways.	Franklin Regional Council of Governments maintains the sign program.	Formal	A portion of the trail is within the Project boundary of both Projects
14	Cabot Camp Access Area	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects.
15	Barton Cove Nature Area and Campground	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects
16	Barton Cove Canoe and Kayak Rental Area	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects
17	State Boat Launch	Commonwealth of Massachusetts	Commonwealth of Massachusetts	Formal	A portion of the site (launch and small part of parking lot) is within the Project boundary of both Projects.
18	Canalside Trail Bike Path	FirstLight	Massachusetts Department of Conservation and Recreation	Formal	Within the Project boundary of both Projects
19	Unity Park	FirstLight (Unity Park North) Town of Montague (Unity Park South)	FirstLight (Unity Park North) Town of Montague (Unity Park South)	Formal	The north side of the park (Unity Park North) is within the Project boundary of both Projects. A small portion of Unity Park South is within the Project boundary of both Projects.
20	Fishway Viewing Area	FirstLight	FirstLight	Formal	Within the Project boundary of both Projects
21	Turners Falls Branch Canal Area	FirstLight	FirstLight	Formal	Within the Project boundary of the Turners Falls Project
22	Turners Falls Station No. 1 Fishing Access	FirstLight	FirstLight	Informal	Within the Project boundary of the Turners Falls Project
23	Cabot Woods Fishing Access	FirstLight	FirstLight	Formal	Within the Project boundary of the Turners Falls Project
24	Turners Falls Canoe Portage	FirstLight	FirstLight	Formal	Take-out at Barton Cove is within the Project boundary; Put-in is outside of the Project boundary

N/A: Not Applicable

3.6.2-Recreation Facilities Inventory and Assessment



SITE_ID	SITE_NAME
1	Governor Hunt Boat Launch/Picnic Area
2	Ashuelot River Informal Campsite
3	Fort Hill Rail Trail
4	Pauchaug Wildlife Management Area
5	Pauchaug Boat Launch
6	Schell Bridge Informal Site
7	Informal Multi-Use Site
8	Bennett Meadow Wildlife Management Area
9	Munn's Ferry Boat Camping Recreation Area
10	Informal Munns Ferry Access Site
11	Boat Tour and Riverview Picnic Area
12	Northfield Mountain Visitors Center
13	Northfield Connector Bikeway
14	Cabot Camp Access Area
15	Barton Cove Nature Area and Campground
16	Barton Cove Canoe and Kayak Rental Area
17	State Boat Launch
18	Canalside Trial Bike Path
19	Unity Park
20	Gatehouse Fishway Viewing Area
21	Turners Falls Branch Canal Area
22	Turners Falls Station No. 1 Fishing Access
23	Cabot Woods Fishing Access
24	Turners Falls Canoe Portage

Variances (if any)

- None.

Work Remaining

- None, report filed on 9/15/14.

3.6.3-Whitewater Boating Evaluation

Work Completed

- Consultation:
  - Consultation with Agencies and Stakeholders to plan study; Fall, 2013; Spring and Summer, 2014

- Task 1. Develop Boating Evaluation Protocol, Logistics and Schedule:
  - Finalized based on FERC recommendations to Modified RSP and discussions from July 1, 2014 consultation meeting

- Task 2. On-Water Boating Evaluation:
  - Prior to evaluation, rebar removed from bypass area
  - Evaluation conducted on three days July 19-21, 2014
  - 6 flows evaluated in a variety of watercraft
  - 45 participants (various levels of boating experience) rated the flows and boating experience

- Task 3. Identify and Evaluate Access to the Turner Falls Bypass Reach:
  - Conducted property records research for land ownership along the Turners Falls bypass reach
  - Conducted site visits to potential bypass access points, including two specifically identified by NE FLOW

- Task 4. Data Review and Analysis
  - Review and analysis of data has begun

3.6.3-Whitewater Boating Evaluation

Findings (if any)

- None to report at this time.

Variances (if any)

- "Photograph/Videotape Coverage Locations" component of Task 1 of the Modified RSP:
  - FirstLight originally proposed a site near the Turners Falls Road Bridge. Based on discussions with the boater stakeholders at the July 1, 2014 consultation meeting, this site was eliminated and replaced with a site at the the Gill-Montague Bridge near Turners Falls Dam.

Work Remaining

- Complete data review and analysis for boating evaluation.
- Report to be completed in 1st quarter of 2015.

3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats

Work Completed

- Task 1: Literature Review
  - Conducted internet and literature search for information regarding the Connecticut River Trail, facilities, access and use of the Connecticut River through the Projects' areas.

- Task 2: Field Work
  - Prior to field work, municipal property records reviewed to determine general land ownership adjacent to study area
  - Field work occurred and was completed on August 28-29, 2014.
  - Representatives from AMC, CWRC, and Northfield Open Space Committee participated in field work on one or both days.
  - Field work included:
    - Boating shorelines of study area.
    - Ground-verifying location of existing and potential use and access sites, including those identified in the "MA-CT Expansion Feasibility Study".
    - Investigating areas where potential canoe portage trails may be beneficial to paddlers.

3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats

Findings (if any)

- None to report at this time.

Variances (if any)

- None to date.

Work Remaining

- Additional consultation with stakeholders to identify additional literature for review and possible locations for future carry-in facilities.
- Field data review and analysis.
- Report to be completed in 1st quarter of 2015.

3.6.5-Land Use Inventory

Work Completed

- Task 1: Literature and Aerial Photography Review
  - Conducted internet search for local plans, ordinances, statutes, policies and guidelines that may affect use and/or management of Project lands. Items reviewed included:
    - open space and recreation plans for Northfield, Montague, and Gill
    - Gill Community Development Plan
    - Hinsdale New Hampshire Master Plan
    - Greenfield Master Plan
    - Massachusetts Rivers Protection Act
    - Sustainable Franklin County – A Regional Plan for Sustainable Development for Franklin County
  - Completed a brief review of available aerial photography to determine areas that may need site visits to verify or determine existing uses
  - Ground-truthed sites identified in review of aerials, July, 2014
- Task 2: Development and Application of Land Use Designations
  - Development of land use classifications is underway

3.6.5-Land Use Inventory

Findings (if any)

- None to report at this time.

Variances (if any)

- None to date.

Work Remaining

- As planned, the bulk of the work on this study will occur in 2015 including the following:
  - Continue to obtain and review available documents which may affect the use and/or management of Project lands.
  - Conduct a search and review of conservation easements within 200 feet of the Projects' boundaries.
  - Complete aerial photography review.
  - Complete development and application of land use designations to Project lands.
- Report to be completed in 4th quarter of 2015.

3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use

Work Completed

Study results will be based on data from other relicensing studies, including:

- Recreation Use/User Contact Survey (Study No. 3.6.1).
- Recreation Facilities Inventory and Assessment (Study No. 3.6.2).
- Whitewater Boating Evaluation (Study No. 3.6.3).
- Assessment of Day Use and Overnight Facilities Associated with Non-Motorized Boats (Study No. 3.6.4).
- Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use (Study No. 3.6.7).
- Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station (Study No. 3.2.2).
- Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace (Study 3.3.9).
- Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability (Study No. 3.1.2).

3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use

Findings (if any)

- None to report at this time.

Variances (if any)

- None to date.

Work Remaining

- Results from all supporting studies will not be available until 2015-2016: completion of data compilation, data analysis and report development will occur as results from supporting studies become available.
- Report to be completed in 2nd quarter of 2016.

3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

Work Completed

- Task 1: Review of Existing Information
  - Review of best trail management practices and trail guidelines completed. Sources identified include:
    - International Mountain Bicycling Association (IMBA)
    - United States Forest Service (USFS)
    - Massachusetts Department of Conservation and Recreation (MADCR)
  - Preliminary review of other trail opportunities in the Project area.
  - Review of FirstLight's operation and maintenance guidelines of its trail system.

- Task 2: Field Work
  - Recreation Use and User Contact Survey (Study No. 3.6.1) ongoing to identify use and recreation users' opinions of the Northfield Mountain facilities and programs.
  - Preliminary winter trail inspection conducted in February 2013 and second preliminary trail inspection conducted in October 2013.

3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

Findings (if any)

- None to report at this time.

Variances (if any)

- None to date.

Work Remaining

- Detailed trail condition assessment planned for October 2014 during leaf-off conditions – this will include:
  - Field review of the current trail system, climbing sites, and the existing portion of the New England National Scenic Trail that is within the Project boundary.
  - Assessment of trail characteristics, such as grade, cross slope, width, surface material/firmness, width, and drainage on representative sections of trails using standard methodologies adopted from the Universal Trail Assessment Process (UTAP), IMBA guidelines, and/or MADCR guidelines.
  - Assessment of representative sections of trails with steep slopes, drainage/erosion issues, and areas subject to regular maintenance.
  - Field measurements to determine trail characteristics and conditions, with emphasis on repair/stabilization needs
- Desktop analysis will be completed in 2015.
- Report to be completed in 2nd quarter of 2015.

Cultural Resources

3.7.1-Phase 1A, 1B, and II Archaeological Surveys

Work Completed

- Task 1. Consultation with the Massachusetts, Vermont, and New Hampshire SHPOs and THPOs
  - FirstLight conducted consultation with the following entities regarding definition of the Area of Potential Effect:

    FERC ▪ Massachusetts SHPO ▪ Vermont SHPO ▪ New Hampshire SHPO ▪ Nolumbeka Project ▪ Connecticut River Watershed Council ▪ Narragansett Indian Tribe THPO

    - For the archaeology survey, the APE, as defined by FERC is: *"the lands enclosed by the Projects' boundary and lands or properties outside of the Project's boundaries where project construction and operation or project-related recreational development or other enhancements may cause changes in the character or use of historic properties, if any historic properties exist."*

- Task 2. Background Research
  - The following sources were utilized
    - Site inventory forms at SHPOs.
    - Previous research and cultural resource management reports.
    - MHC Reconnaissance Survey Town Report for the towns of Erving, Gill, Greenfield, Montague, and Northfield
    - Local historical commissions, historical societies, and libraries in the towns of Erving, Gill, Greenfield, Montague, and Northfield in Massachusetts.
    - Massachusetts Archaeological Society (MAS), Pocumtuck Valley Memorial Association, and the Springfield Museums.
    - Groups or individuals knowledgeable of the archaeological resources of the Connecticut River Valley.

  - 73 previously recorded archaeological sites identified: 71 in Massachusetts, 2 in Vermont, none in New Hampshire.

3.7.1-Phase 1A, 1B, and II Archaeological Surveys

Work Completed (continued)

- Task 3. Development of a Sensitivity Model
  - Development in process, including:
    - Review information on known archaeological resources within a 1-mile buffer of the Projects' APE
    - Examination of past and present environmental conditions.
    - Identification of Precontact period land use patterns using environmental attributes (e.g. landform type, distance to a water source, elevation, etc.).
    - Determination of Postcontact archaeological sensitivity within the Projects' APE.
  - After identifying patterns of landscape use, landforms within the Projects' APE are being ranked as sensitive or not sensitive for Precontact period archaeological resources.
- Task 4. Field Reconnaissance
  - Field investigation occurred in July 2014: areas accessed on foot or by motorboat.
  - Data recorded on standardized forms.
  - Photographic data collected using digital camera.
  - Soil profiles and/or cores assessed.

3.7.1-Phase 1A, 1B, and II Archaeological Surveys

Findings (if any)

- Three previously recorded Precontact period sites were identified.
- Six previously unrecorded archaeological sites were identified:
  - A Precontact-period lithic scatter near Ashuela Brook.
  - Remnants of historic Munns Ferry near Kidds Island.
  - Remnants of two small summer cottages on upland ridges overlooking the Connecticut River.
  - Historic surface scatter near Cabot Camp.
  - A partial stacked-stone foundation and spring-related feature near the Route 2 Bridge (French King Bridge).

Variances (if any)

- Phase IB and Phase II archaeological surveys have not been conducted during the 2014 survey season because the Massachusetts SHPO would only grant a State Archaeologists Permit for a Phase IA reconnaissance survey. Any necessary Phase IB site identification or Phase II site evaluation surveys will be conducted in 2015 after state permits for those activities are obtained.

Work Remaining

- Phase 1A report to be completed by end 4th quarter of 2014.

3.7.2-Survey and Evaluation of Historic Architectural Resources

Work Completed

- FERC has defined the Area of Potential Effects (APE) for the Project in consultation with SHPOS from MA, VT and NH, Narragansett tribe, and Nolumbeka project. (November 27, 2013).
- Consultation by FirstLight/TRC with SHPOs has been by letter, electronic mail, and in person to discuss the APE and respective state survey methodologies. (December 2013-March 2014).
- Background research has been conducted at SHPO archives to identify NRHP-listed, NRHP-eligible, and previously surveyed resources within the APE. (March 2014).
- Additional historic background research has been conducted at local and state historical societies and libraries, the National Register in Washington DC, and online in to write a historic context for the Project APE. (March-April 2014).
- Research was conducted at FirstLight archives for historic photographs and engineering drawings of FirstLight-owned architectural and engineering resources. (March 2014).
- TRC conducted field survey to document all resources 50 years or older within the APE. Information was recorded on SHPO survey forms and photographed digitally.

Findings (if any)

- There are 31 previously identified resources (buildings, objects, structures, sites, and districts) and 41 newly identified resources in the Project APE.
- NRHP-listed Turners Falls Historic District includes several FirstLight-owned resources: Power Canal, Fifth Street and Keith Mill Footbridges, and Sixth Street and International Paper Co. Bridges.
- MA SHPO determined Cabot Station NRHP-eligible in 1987.
- Four (4) highway bridges within Project APE have been determined NRHP-eligible by MA SHPO.

Variances (if any)

- None to date.

Work Remaining

- Preparation of final report, submittal of state survey forms to SHPOs for review ,and submittal of final report and survey forms to SHPOs and FERC for determinations of NRHP eligibility.
- Report to be completed and sent to respective SHPOs by the 4th quarter of 2014.

3.7.3-Traditional Cultural Properties Study

Work Completed

Task 1: Meeting with the Massachusetts, Vermont, and New Hampshire SHPOs, the Narragansett THPO, and the Nolumbeka Project

- FirstLight conducted consultation with the following entities regarding definition of the Area of Potential Effect (APE):

  FERC ▪ Massachusetts SHPO ▪ Vermont SHPO ▪ New Hampshire SHPO ▪ Nolumbeka Project ▪ Connecticut River Watershed Council ▪ Narragansett Indian Tribe THPO

  - For the TCP survey, the APE is defined as ….

Task 2: Tribal Consultation and Documentation of TCPs

- Documentation of Traditional Cultural Properties (TCPs) has not occurred.
  - FirstLight contacted NIT on several occasions to introduce its ethnographer to discuss documentation of TCPs in accordance with the FERC-approved Study Plan.
  - NIT has not yet responded to several requests for a meeting.
  - FirstLight has offered to reimburse Tribal members for their labor and expenses incurred in participating in the TCP.
  - NIT has expressed that FirstLight should provide funding to the Tribe so that the NIT can conduct its own parallel studies.

3.7.3-Traditional Cultural Properties Study

Work Completed (continued)

Task 3: Background Research

- Background research conducted at the three state SHPO offices and on the internet.

Task 4: Field Visit

- No field visit has occurred.

Findings (if any)

- There are no reported TCPs in the Projects' APE.
- There is one NIT TCP in the Project vicinity
  - Turners Falls Sacred Ceremonial Hill Site, located at the municipal airport in Turners Falls, Franklin County, Massachusetts, listed in the NRHP in December 2008.
- Further information on additional TCPs, if any, would be gathered through interviews with NIT elders.

Variances (if any)

- The schedule for the FERC-approved Study Plan has not been met because it has not been possible to document TCPs with the NIT.

Work Remaining

- Report to be completed by 1st quarter of 2015.
- Tasks 2 (Tribal Consultation and Documentation of TCPs) and 4 (Field Visit) will be conducted if the NIT participates in the FERC-approved TCP study.

3.1.1-2013 Full River Reconnaissance Study

Work Completed

- Task 1: Land-based observations (Land-based Survey)
  - Identified and defined indicators of potential erosion
  - Land-use and Sensitive Receptor Mapping
  - Detailed Site Assessments
- Task 2: Classify Riverbank Features, Characteristics, and Erosion (Boat-based Survey)
  - Identified and Defined Riverbank Features and Characteristics
  - Identified and Defined the Type(s), Stage(s), Indicators, and Extent of Erosion
- Task 3: Spatially Defined Riverbank Transition Points
- Task 4: Video and Photographic Documentation
  - Boat-based geo-referenced video
  - Land- and Boat-based Surveys geo-referenced photos
  - Re-creation of 2007 Field Geology Services photo log – summer 2014
- Task 5: Riverbank Stabilization Projects
  - Evaluation of Past Bank Stabilization Projects
  - Recommendations for Future Bank Stabilization Projects
- Task 6: Final Report, Data Analysis, and Deliverables

Variances (if any)

- None to report.

Work Remaining

- None - final report filed on 9/15/14.

3.1.1-2013 Full River Reconnaissance Study

Findings (if any)

- The boat-based survey resulted in delineation of 641 total riverbank segments (including islands)
  - Segment lengths ranged from 13 ft to 3,330 ft. with an average length of 383 ft.

- The majority of the **upper riverbanks** in the Impoundment were found to have:
  - Moderate to steep slopes,
  - Heights greater than 12 ft,
  - Be comprised of silt/sand, and
  - Heavy vegetation.

- The majority of the **lower riverbanks** in the Impoundment were found to have:
  - Flat/beach to moderate slopes,
  - Be comprised of silt/sand, and
  - None to very sparse vegetation.

- Erosion conditions in the Impoundment were found to be generally stable with None/Little erosion

- The **Extent of Current Erosion** of Impoundment riverbanks (including islands) was found to be:
  - None/Little – 84.8%
  - Some – 14.1%
  - Some to Extensive – 0.5%
  - Extensive – 0.6%

- The **Stage of Erosion** of Impoundment riverbanks (including islands) was found to be:
  - Potential Future Erosion – 5.5%
  - Active Erosion – 0.6%
  - Eroded – 9.1%
  - Stable – 83.5%
  - In the Process of Stabilization – 1.3%

Findings (if any)

- 2013 FRR Results:
  - Summary statistics were developed by calculating the sum of the length of all individual segments for a given feature or characteristic and dividing it by the sum of the length of all riverbank segments in the Impoundment (including stabilized sites and islands) to determine a percentage.

  - Erosion classifications were based on the entire riverbank. It was observed in the field that erosion processes almost exclusively occurred at the transition point between the lower and upper bank or higher and not on the lower bank itself. Thus the classification of the riverbank into upper and lower does not affect the overall calculations of eroded or eroding bank length.

Riverbank Features	Characteristics[25]					
Upper Riverbank Slope	Overhanging 1.8%	Vertical 1.6%	Steep 28.0%	Moderate 59.8%	Flat 8.8%	
Upper Riverbank Height	Low 15.5%	Medium 5.7%	High 78.8%			
Upper Riverbank Sediment	Clay -	Silt/Sand 95.6%	Gravel -	Cobbles -	Boulders 0.9%	Bedrock 3.5%
Upper Riverbank Vegetation	None to Very Sparse 1.9%	Sparse 1.3%	Moderate 17.1%	Heavy 79.7%		
Lower Riverbank Slope	Vertical 0.8%	Steep 2.3%	Moderate 27.5%	Flat/Beach 69.4%		
Lower Riverbank Sediment	Clay <0.1%[26]	Silt/Sand 59.6%	Gravel 7.9%	Cobbles 8.7%	Boulders 11.9%	Bedrock 11.9%
Lower Riverbank Vegetation	None to Very Sparse 88.3%	Sparse 3.5%	Moderate 3.2%	Heavy 5.0%		
Type of Erosion	Falls-Undercut 43.4%	Falls-Gullies 0.03%	Topples 1.1%	Slide or Flow 6.2%	Planar Slip 1.1%	Rotational Slump 1.5%
Potential Indicators of Erosion	Tension Cracks <0.10[27]%	Exposed Roots 38.1%	Creep/Leaning Trees 62.7%	Overhanging Bank 12.7%	Notch 5.0%	Other 1.1%
Stage of Erosion	Potential Future Erosion 5.5%	Active Erosion 0.6%	Eroded 9.1%	Stable 83.5%	In Process of Stabilization 1.3%[28]	
Extent of Current Erosion	None/Little 84.8%	Some 14.1%	Some to Extensive 0.5%	Extensive 0.6%		

3.1.1-2013 Full River Reconnaissance Study

Findings (if any)

- The 2013 FRR found that riverbank stability has increased and erosion has decreased since with 2008 FRR.
- Through natural processes of vegetation recruitment and growth and ongoing stabilization work as required by the ECP, repair work is more than keeping pace with the rate of erosion.
- A comparison of 2008 and 2013 FRR results found:

Extent of Current Erosion	2008	2013
None/Little	83.3%	84.8%
Some	16.1%	14.1%
Some to Extensive	N/A	0.5%
Extensive	0.6%	0.6%

3.1.1-2013 Full River Reconnaissance Study

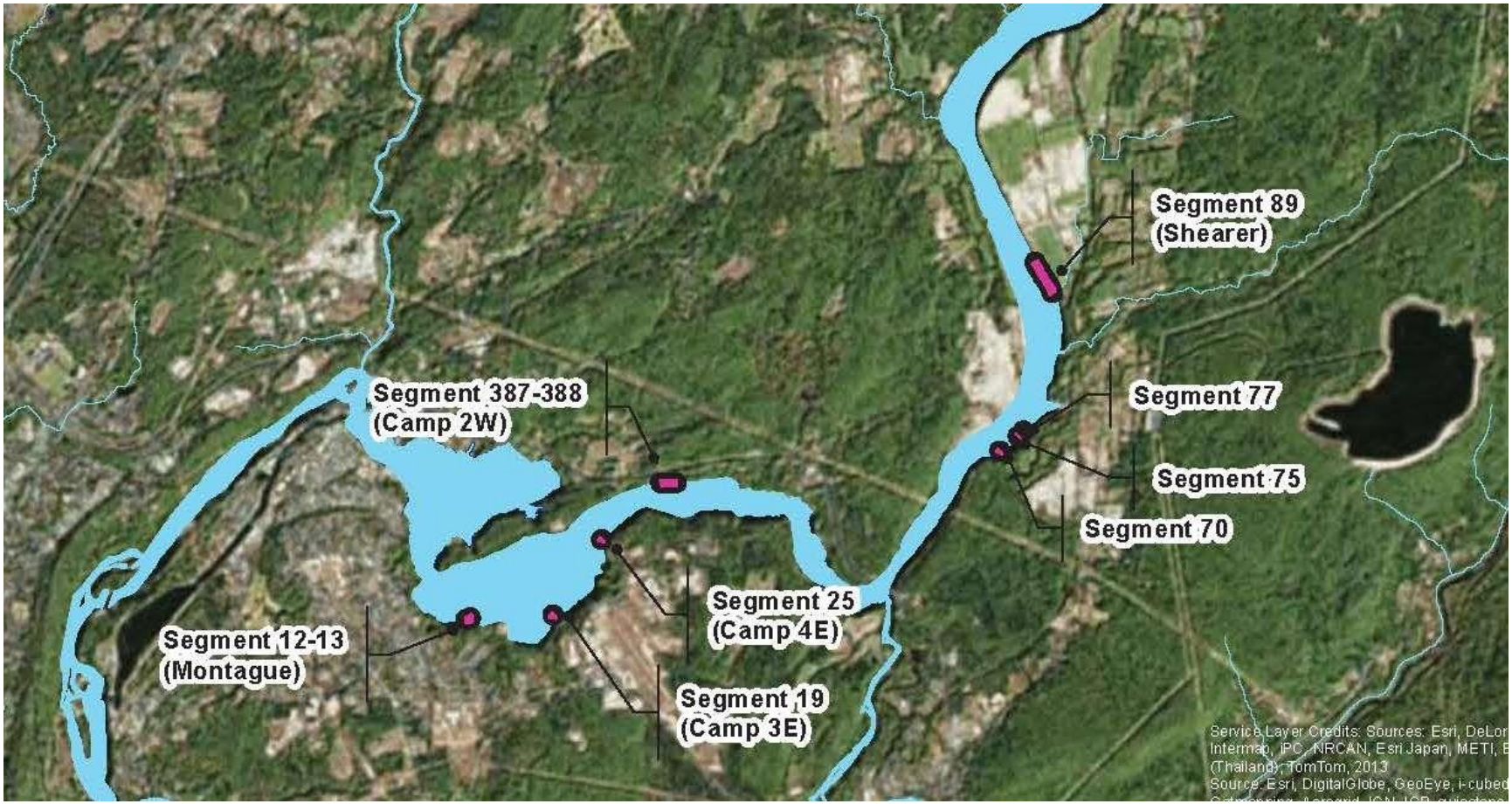
Findings (if any)

- 9 sites were recommended for Phase IV stabilization.
- The recommended sites represent projects that can be reasonably completed prior to the expiration of the current FERC license while still meeting the objectives and goals of the ECP.
- Recommended Bank Stabilization/Preventative Maintenance Sites include:

Year of Construction	Location/Name	Length (ft)
2014	Shearer (89)	1056
2015	Camps 4E & 3E	95 & 118
2016	Camp 2W (387, 388)	500
2017	70, 75, 77 12-13 (Montague)	105, 33, 154 280

3.1.1-2013 Full River Reconnaissance Study

Location of Recommended Bank Stabilization Sites



3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

Work Completed

- Selection of detailed study sites through consultation with agencies and stakeholders. Final Selection of Detailed Study Sites Report was included as an Appendix to the ISR.
- Task 1: Data gathering and literature review.
- Task 2: Geomorphic understanding of the Connecticut River.
- Task 3: Identification of potential causes of erosion.
- Task 4: Field studies and data collection (on going).

Findings (if any)

- None at this time. Data collected during the summer/fall 2014 has yet to undergo QA/QC review.

Variances (if any)

- Due to the closure of the Vermont Yankee Nuclear Plant in December 2014 the role of ice as it relates to shoreline erosion could have increased significance. In order to determine the effects, if any, the plant closure may have on potential increases in ice and shoreline erosion processes, FirstLight distributed an addendum to the RSP to agencies and stakeholders on August 12, 2014.

Work Remaining

- Complete field work for BSTEM and boat wave analyses.
- Review, post process, and QA/QC all field collected data.
- Task 5: Data Analyses.
- Task 6: Evaluation of the Causes of Erosion.
- Task 7: Report and Deliverables.
  - Final report to be completed by 2nd quarter of 2016.

3.1.3-Northfield Mountain Project Sediment Management Plan

Work Completed

- Continuous suspended sediment (SSC and PSD) monitoring has occurred at the Route 10 Bridge (LISST-StreamSide) and Northfield Mountain Tailrace (LISST-HYDRO North and LISST-HYDRO South) from April to November 2012, 2013, and 2014 (on-going).
- Cross-sectional SSC and PSD measurements were collected across the Route 10 Bridge and the Northfield Mountain tailrace boat barrier over a range of flow and operating conditions in 2013. Data was collected using a LISST-100X, crane, and sounding reel.
- Water samples have been, and continue to be, collected from the discharge hoses of the LISST equipment over a range of flow conditions for laboratory analysis of SSC and TSS. This data is also used to convert SSC volume (µl/l) to SSC mass (mg/l)
- Annual reports were filed with FERC on December 1 of each year.

Findings (if any)

- Data QA/QC is still on going for all data collected 2012-2014.

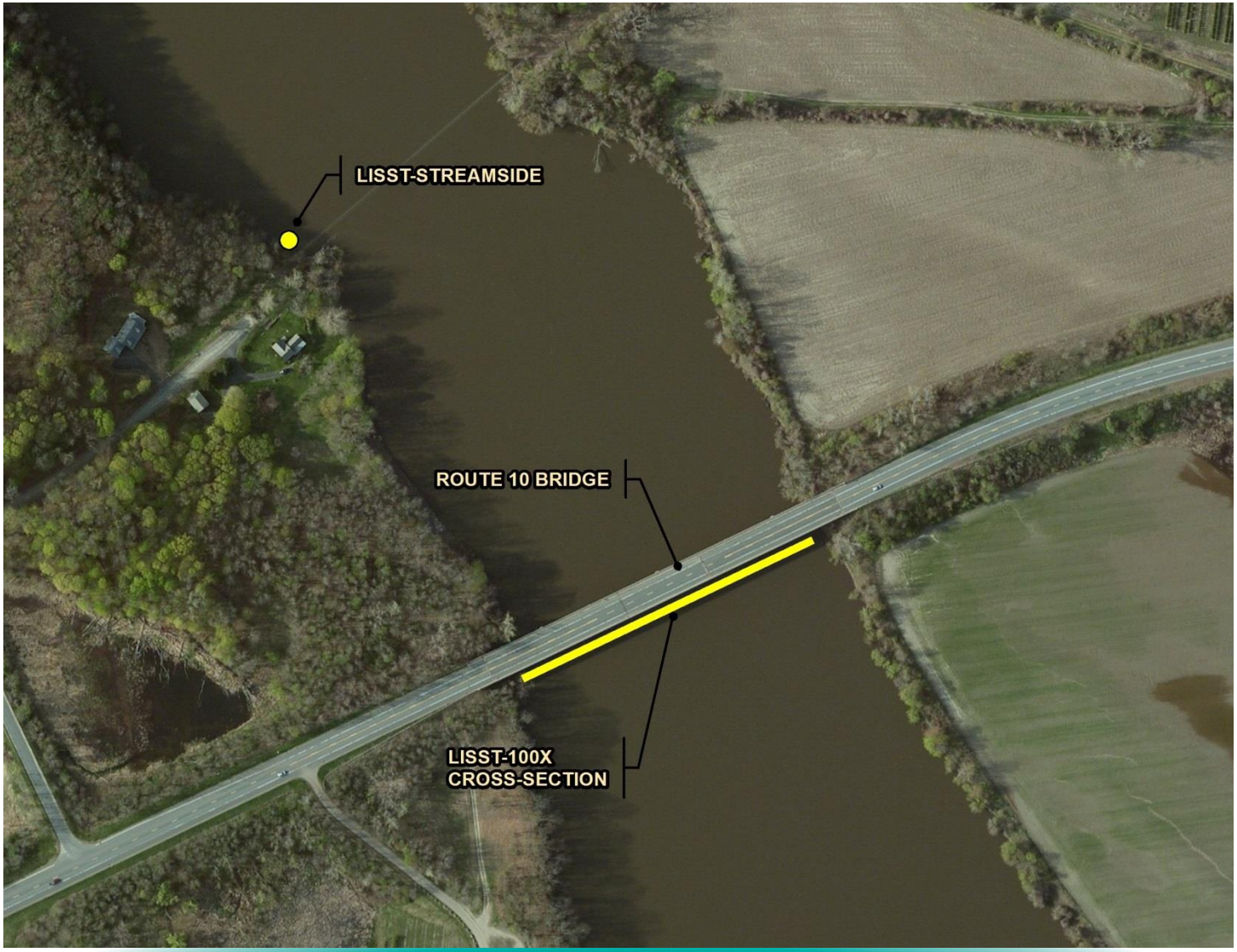
Variances (if any)

- None to date, with the exception of expanding the sampling to include 2015.

Work Remaining

- Data review, QA/QC, and analysis
- 2015 continuous monitoring (April-November) at the Route 10 Bridge (LISST-StreamSide) and Northfield Mountain Tailrace (LISST-HYDROs)
- The 2014 annual report will be filed on December 1, 2014. The final report for this study will be filed when the Study Reports are due September 12, 2015.

3.1.3-Northfield Mountain Project Sediment Management Plan



3.1.3-Northfield Mountain Project Sediment Management Plan