



October 15, 2014

VIA ELECTRONIC FILING

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

Re: FirstLight Hydro Generating Company, FERC Project Nos. 2485 and 1889
2014 Initial Study Meeting Summary

Dear Secretary Bose:

Pursuant to the regulations of the Federal Energy Regulatory Commission (FERC), Title 18 Code of Federal Regulations (18 C.F.R.) §5.15(c)(1), FirstLight Hydro Generating Company (FirstLight) filed its Initial Study Report (ISR) for the relicensing of its Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485) on September 15, 2014. Pursuant to §5.15(c)(2), on September 30 and October 1, 2014, FirstLight held its ISR meetings to discuss the study reports. Pursuant to §5.15(c)(3), [Attachment A](#) is FirstLight's meeting summary, including the PowerPoint presentation.

As of the September 15, 2014 ISR filing, only two studies were complete and included final reports. These were: Study Nos. 3.1.1 *Full River Reconnaissance* and 3.6.2 *Recreation Facilities Inventory*. Given that 2014 was the first field season, and given the timing of the ISR meetings, the remaining studies are not yet complete with many having field data collection occurring through September 2014 and many occurring in the 2015 or 2016 field seasons. At the ISR meeting, FirstLight provided a status update on these studies.

During the 2-day ISR meetings, there was considerable discussion regarding the schedule for completing studies and finalizing study reports, many of which likely will be completed before the Updated Study Report to be filed in September 2015. In the interest of making final study reports available to stakeholders for informational purposes, FirstLight plans to place final study reports into the record quarterly as they are completed, unless FERC has already set a specific filing deadline for a particular study. FirstLight's estimated schedule for finalizing and filing study reports is shown in [Attachment B](#). FirstLight will update the schedule as needed.

In addition, comments were received at the ISR meetings on various studies. Some of the comments received can be readily addressed. As such, FirstLight has addressed some of the comments in this filing for the following studies:

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[Attachment C](#): Study No. 3.1.2: *Northfield/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability* (address comments received on ice addendum)

[Attachment D](#): Study No. 3.3.3: *Evaluate Downstream Passage of Juvenile American Shad and 3.3.5 Evaluate Downstream Passage of adult American Eels* (provide information on the typical operating conditions of each turbine at Cabot)

[Attachment E](#): Study No. 3.3.11: *Fish Assemblage Assessment* (addressing proposed amendments made by the United States Fish and Wildlife Service)

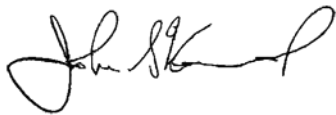
[Attachment F](#): Study No. 3.3.12: *Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace* (provide spill gate data in units of cfs and differentiate between emergency and non-emergency use of the spill gates)

[Attachment G](#): Study No. 3.3.16: *Habitat Assessment, Surveys and Modeling of Suitable Habitat for State-Listed Mussel Species in the Connecticut River below Cabot* (provide a map of mussel survey locations)

FirstLight is filing its ISR meeting summary and Attachments A-G with the Commission electronically. To access the document on the FERC website (<http://www.ferc.gov>), go to the “eLibrary” link, and enter the docket number, P-1889 or P-2485, to access the document. FirstLight is also making the same available for download at the following website: <http://www.northfieldrelicensing.com>.

If you have any questions, or need additional information, please feel free to contact me.

Sincerely,



John Howard

[Attachment A](#): Meeting Summary

[Attachment B](#): FirstLight Projected Schedule for Finalizing Study Reports

[Attachment C](#): Study No. 3.1.2: *Northfield/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability*

[Attachment D](#): Study No. 3.3.3: *Evaluate Downstream Passage of Juvenile American Shad and 3.3.5 Evaluate Downstream Passage of adult American Eels*

[Attachment E](#): Study No. 3.3.11: *Fish Assemblage Assessment*

[Attachment F](#): Study No. 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*

[Attachment G](#): Study No. 3.3.16: *Habitat Assessment, Surveys and Modeling of Suitable Habitat for State-Listed Mussel Species in the Connecticut River below Cabot*

Attachment A: Meeting Summary

**Turners Falls Project (FERC No. 1889) and
Northfield Mountain Pumped Storage Project (FERC No. 2485)
FERC Relicensing
Initial Study Report Meeting
Meeting Notes Summary
September 30 – October 1, 2014
Northfield Mountain Visitor Center
Northfield, MA**

Day 1 – September 30, 2014

List of Attendees: See Appendix A (end of minutes)

Introductions, Meeting Purpose, and Process Timeline

Mark Wamser (Gomez and Sullivan) opened the meeting and welcomed everyone. Mark introduced members of the FirstLight relicensing team, and then recognized FERC staff at the meeting and asked them to introduce themselves. Brandon Cherry (FERC) introduced himself as the new FERC project manager, and asked the other FERC staff present at the meeting to introduce themselves. Mark also introduced parties that were on the phone, including additional FERC staff. Mark then described the meeting structure and reviewed the meeting agenda. Each study was scheduled to have approximately 15-20 minutes for a presentation followed by questions and discussion. Mark reminded stakeholders that only two studies have been completed thus far, the remaining studies are ongoing or will continue into 2015. Mark also provided an overview of the next steps in the ILP process (See Attachment B-Meeting Presentation).

Melissa Grader (USFWS) asked FERC if they are going to issue another ILP schedule with updated process points. Brandon Cherry (FERC) indicated that FERC will work on updating the ILP schedule and possibly adding process points as studies come in. He stated that there would be another round of study and review in accordance with the ILP schedule. He also indicated that stakeholders were free to file comments on studies at any time during the process, even if studies were not complete. However, he clarified that final stakeholder comments on a completed study would be due within approximately 45 days of the completed study being filed as part of the Initial Study Report (ISR) or the Updated Study Report (USR).

Mark provided a summary of all the studies being conducted at the FirstLight projects noting that there were a total of 39 studies. He also provided a brief overview of the status of each of the studies.

Andrea Donlon (CT River Watershed Council or CRWC) indicated she would like additional clarity from FERC about adding a process point, and how that related to the FERC Study Plan Determination (SPD) which established due dates for study reports. Norm Sims (Appalachian Mountain Club or AMC) also questioned whether stakeholders should file comments now or later. Brandon Cherry again noted that FERC will develop a new process plan and that for studies that haven't been completed there will be other opportunities for stakeholders to comment. He clarified that the only studies that stakeholders have to file comments on following the ISR meeting, are the two completed studies.

3.3.4 Evaluate Upstream Passage of American Eel (Apell)

Bryan Apell (Kleinschmidt Associates or KA) noted that this study is still ongoing. He gave an overview of the status of the study, noting that it began in June, 2014, after eels began passing at Holyoke Dam. Bryan provided a complete overview of the work completed to date, including survey dates. He noted that eels were observed at Turners Falls beginning June 26, 2014 and were thereafter observed throughout the survey period, with the most recent survey date being September 16. Bryan reviewed the variances to the study plan, noting that there was a variance in the field schedule as a result of high water conditions. He explained that for safety reasons, and because no eels were observed, beginning July 17 KA did not do further surveys of the process water outfalls. Bryan then discussed the work remaining, noting that an additional survey will be conducted in October, and that the study report would be completed by 1st quarter of 2015.

Ken Sprankle (U.S. Fish and Wildlife Service or USFWS) asked if eel survey data would be examined in relation to river flow, project operations and the discharges in the different survey locations to see if there is a correlation between flow/discharge conditions and eel presence. Bryan responded that the study will look at survey results in relation to river conditions during the survey. There were several questions regarding where at the Project the surveys were finding the most eels. Bryan indicated that the most eels were seen at the spillway fishway at the dam. Andrea asked if there will be another report after the 2015 trap collections are completed. Mark Wamser indicated that there would be, but noted that a completion date for that work has not yet been established.

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 (Apell)

Bryan Apell (KA) summarized the status of the study work, noting that the study began in May and will continue through October, 2015. He noted that data analysis is still ongoing. With respect to variances he explained that there were some adjustments made in how they evaluated the upper extent of the reservoir influence in the tributaries since the field crews found these areas hard to walk due to overhead canopy and extensive mud deposits. He explained that because of the difficult conditions they were using sub-meter GPS and LiDAR data to define the elevation of the upstream extent of reservoir influence in the tributaries. Bryan noted that the work remaining on this study included a final survey in the fall of 2014 and the report which is to be completed in the 1st quarter of 2015.

There were no questions on this study.

3.3.14 Aquatic Habitat Mapping of Turners Falls Impoundment (Apell)

Brian Apell (KA) reviewed the work completed and the methods used for this study. He noted that work on this study would continue into the fall of 2014. He noted one variance to the study, which was the use of water level loggers rather than a benchmarking survey to monitor water surface elevations. Brian explained the work remaining included a final assessment in the fall of 2014 and the report that would be completed in the 2nd quarter of 2015.

Ken Sprankle (USFWS) noted that in FERC's Study Plan Determination Letter (SPDL), they had requested the study include mapping of areas with water depth of 1 foot or less. He wondered if that was being done as part of this study. Bryan thought that Ken's question referred to the previous study (3.3.17) and noted that the depth of the tributary mouths were being recorded along a thalweg transect, but noted that he did not consider the 1 foot depth to necessarily be a barrier to fish movement. Rather, he felt that a depth of 2-3 inches or 2/3 body depth would be a barrier. Ken noted that he would just like to know where these areas of 1 foot or less depth are located, but agreed that they are not necessarily a barrier to

fish movement. Bryan reiterated that as part of the tributary surveys the survey crews took depth measurements along the thalweg from the upstream extent of Turners Falls Impoundment (Impoundment) influence to the tributary confluence, creating a depth profile of each tributary. He noted that these depth profiles would be provided in the tributary access report.

Once it became clear that Ken's question referred to Study Plan 3.3.14, Bryan indicated that the baseline bathymetry data that had been collected for the Impoundment could be used to delineate areas with water depth of 1 foot or less, at lower Impoundment operational levels. He also explained that the microhabitat transects in the Impoundment will also provide some additional habitat depth data. Regarding the microhabitat transects, Ken also asked about the criteria that were used to establish different habitat types for the microhabitat assessment. Brian explained that they had identified 14 microhabitat types based primarily on bank slope, depth, cover, and substrate. Andrea asked whether the final fall assessment had been completed. Brian responded that as of September 25, all the field work had been completed.

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

Chris Tomichek (KA) reminded stakeholders that this study will occur in 2015. As a result, she noted that other than basic planning, not much work has been done. She indicated that the field component for this study will be done in 2015. Chris indicated that the study report will be completed by March, 2016.

There were no questions on this study.

3.3.7 Fish Entrainment and Turbine Passage Mortality Study (Tomichek)

Chris Tomichek (KA) reminded stakeholders that this study will occur in 2015. She reviewed the components of the planned study and noted that the report will be completed in March, 2016.

There were no questions on this study.

3.3.18 Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms (Tomichek)

Chris Tomichek explained that the fall canal drawdown had begun the previous day, September 29, 2014. She explained that there were some delays in initiating the drawdown, and as a result only some of the planned work in the canal had been completed the first day, but that field work would continue and be completed today. She noted that the field work included sampling of quadrats for sea lamprey and mussels. She also explained that a second field survey would be conducted at the end of the drawdown period, on Friday October 3.

There were several questions and some discussion about the nature of the delay in completing the canal drawdown and the resulting change in the sampling schedule. Chris reiterated that the planned sampling would be concluded today, and confirmed that all the established sampling quadrats are dry.

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

Chris Tomichek (KA) reminded stakeholders that this is another study that will occur in 2015. She reviewed the amended study plan. Julia Wood (Van Ness Feldman) noted that FirstLight was waiting for FERC to approve the amended study plan.

There were no questions on this study.

3.3.11 Fish Assemblage (Tomichek)

Chris Tomichek (KA) noted that this is another study that will occur in 2015. She explained that the amended study plan was filed with FERC, but that FERC still needs to approve the study plan.

Melissa Grader (USFWS) noted that they and the National Marine Fisheries Service (NMFS) had commented that they wanted FirstLight to consider adding some snorkeling to the study plan in order to get an idea of fish abundance. She noted that the snorkeling option was not adopted in the ISR amended study plan. Chris explained that the comments were received too late to address in the ISR. Melissa indicated that the USFWS will reiterate that comment in its ISR comments.

3.3.2 Evaluate Upstream and Downstream Passage of Adult American Shad (Tomichek)

Chris Tomichek (KA) explained that this is another study that will occur in 2015. However, she noted that some prep work has been done to evaluate radio telemetry equipment and planned configuration of antennae and receivers. She also explained that they had been reviewing existing radio telemetry data for the site, and were working closely with Conte Lab staff, USFWS staff, and others in conducting the review. Ken Sprankle (USFWS) agreed that progress is being made in evaluating the existing telemetry data.

Ken also noted that tag testing for this study will be important. He indicated that it would be important to conduct testing to ensure that the tags and receivers will be capable of tracking fish at depths greater than 5 feet. There followed a general discussion about the planned testing of tags and receivers and Bryan Apell provided additional information on the tag and receiver testing that KA was conducting. There was general acknowledgement that antennae location and array will be vital to the study, particularly in areas around project infrastructure. Ken reiterated that prior to conducting the actual study it will be critical to test the antennas/receivers to ensure there is good coverage (width, length and depth) of areas where fish may travel around project infrastructure. Ken also noted that based on recent discussion with Conte Lab staff that the current location of the pit tag antennae is too far upstream and should be moved to a point downstream where the fish cannot return upstream.

Melissa Grader (USFWS) asked if there would be further consultation with the fishery agencies on this study as the testing continues and the 2015 study season approaches. Chris confirmed that the FirstLight team will continue to consult with USFWS and other fishery agencies to work out the details of the 2015 field study.

There was more discussion about tag testing, and it was asked if KA had done any testing of the tags for juvenile shad. Bryan indicated that only adult tags had been tested thus far, and he acknowledged that it would be important to check with the tag manufacturer to determine the range of juvenile tags, and possibly to conduct additional testing using the juvenile tags. Bryan noted that if needed, additional receiver(s) could be added.

3.3.3 Evaluate Downstream Passage of Juvenile American Shad (Tomichek)

Chris Tomichek (KA) explained that this is another 2015 study, and outlined the plans for the study work. She also noted that much of the receiver/antennae testing being done for the adult shad study will also inform their efforts in this study. She indicated that some downstream range testing of tags and receivers had occurred. Ken Sprankle (USFWS) raised a concern about the hydroacoustic work planned for the canal downstream of the gatehouse. He clarified that USFWS's greatest interest is the area in front of the

gatehouse, and understanding when the fish arrive there, where they are located, and how they behave in that area. He asked if there will there be an acoustic array in front of the gatehouse for tracking juvenile shad. Chris indicated that the gatehouse area had already been tested but that she has not yet seen the results of that testing.

USFWS also asked if they could receive 5 years of operational data that could be used to determine the best efficiency point for juvenile eel releases. Chris said that operational data had been compiled and is currently going through internal review, but that she would provide it to USFWS soon. There was general discussion about some inconsistencies in some of the requested operational data that concluded with general acknowledgement that the 2011-2013 data are consistent and should provide a good basis for considering appropriate operating conditions under which to release fish.

Ken Sprankle (USFWS) provided the group with a brief update on the hatchery raised juvenile shad that would be used in the next few weeks to test for transport and tagging survival. He noted that the hatchery fish would be transported to Vernon in early October and that dummy tags would be used in the evaluations.

Melissa Grader (USFWS) reiterated her concern about continuing consultation with agencies regarding the fish passage studies and suggested it would be good to get clarification from FirstLight on when interim reports or information would be provided (like the hydroacoustic array testing) and to clearly identify that there will be further consultation with the agencies. Chris indicated that she will send out the report and ask for comments at that time. Melissa suggested that it would be good if there was a meeting to discuss the initial testing and findings.

3.3.5 Evaluate Downstream Passage of American Eel (Tomichek)

Chris Tomichek (KA) reviewed the status of this study, noting again that this was primarily a 2015 study. She also explained that much of the ongoing antennae testing already discussed would be applicable to the eel passage study.

Ken Sprankle (USFWS) stated that Ted Castro-Santos and Alex Haro have come up with some novel new ways to cover intake areas with submerged antennae. He suggested that FirstLight consider this method as a way of getting good detections at depth. Ken also commented on the timing for downstream eel study which was planned for August through October. He indicated that he believed the timing should be shifted to August 15 through November 15.

3.3.15 Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Study Area (Tomichek)

Chris Tomichek (KA) reviewed the status of the study noting that most of the work for this study would be done in 2015. Again, she noted that some receiver and range testing work was ongoing in 2014, but that the real survey work would be done in 2015.

There were no questions on this study.

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

Chris Tomichek (KA) reminded stakeholders that this study was planned to be conducted in 2016, after the completion of study 3.3.2 which will further inform the design and intent of this study. She noted that

an amended study plan for this study would be prepared and filed after completion of the adult shad passage study (3.3.2).

There were no questions about this study.

3.3.20 Study to Evaluate Entrainment of Ichthyoplankton at the Northfield Mountain Pumped Storage Project (Tomichek)

Chris Tomichek (KA) noted that the FERC requested study plan for this study was sent around for agency and stakeholder comments. She explained that the study plan was not included in the ISR at FERC's request. Andrea Donlon (CRWC) asked if everyone had received the study plan. Chris explained that it was distributed via email to agencies that had been indicated by FERC and other interested stakeholders including TU, CRWC and TNC.

3.2.2 Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station (Wamser)

Mark Wamser (Gomez and Sullivan) provided a summary update of the study status, noting that this study involved the development of two separate HEC-RAS hydraulic models; one for the Impoundment and the other for river reach downstream of Cabot Station. Regarding the Impoundment model, Mark outlined work that was ongoing to complete this model. He explained that they were using new bathymetry data in two locations- the reach from Vernon Dam to the NH/MA/VT state border and a reach extending 5 km upstream and downstream of the Northfield tailrace (which was conducted for 2D hydraulic study). In addition, LiDAR data was received from TransCanada that cover the upland riverbanks from Vernon Dam to Holyoke Dam. He noted that they were currently in the process of updating the model transects with the new data. He also explained that new water level loggers were installed and that the model was now being calibrated to the new water level data for 2013 and 2014, which was expected to cover a wide range of flows and operating conditions. Gary Lemay (Gomez and Sullivan) provided some additional detail on the bathymetry data collection done in 2014. This was followed by some questions and discussion about the accuracy of the bathymetry/depth data, and Gary indicated that generally the data was accurate to within 0.25 ft.

Regarding the HEC RAS below Cabot Station, Mark explained that this model was being developed using older FEMA HEC 2 cross sections. He noted that since the FEMA cross sections for the town of Hatfield were missing, Gomez and Sullivan had collected data at 8 cross sections in Hatfield, to fill this data gap. He also noted that The Nature Conservancy (TNC) and U.S. Army Corps of Engineers (USACE) had developed a HEC-RAS model of the river in the Northampton area. Mark noted that it was Gomez and Sullivan's intent to meld together all of this information to develop and calibrate a HEC-RAS model for the river reach below Cabot Station. For the bypass reach, Mark reminded the participants that the Instream Flow Study would also require the collection of cross section data, which would be used in developing the HEC-RAS model.

Mark explained that they were beginning the process of calibrating the HEC RAS models to water level data collected in 2013; noting that thus far, the model calibration results look good.

Don Pugh (Trout Unlimited, TU) questioned whether since the FEMA data is older than the Hatfield data, if the Hatfield data might provide any indication of the quality of the FEMA data. Mark indicated that he had not looked at the modeling results in any detail yet, but suggested that he did not anticipate that the Hatfield data would provide much insight into the quality of the older FEMA data. Bill McDavitt National Marine Fisheries Service, NMFS) asked a couple of detailed technical questions about model calibration and this was followed by a more general discussion on how to adjust variables in the HEC-

RAS during calibration to deal with the melded data sets and older FEMA data set. Mark indicated that he felt confident they could get a good calibration of the HEC RAS model to the water level loggers, but noted that he is interested in checking the completed model calibrations against the older FEMA water surface elevations.

With respect to study variances, Mark noted that one water level logger was not installed until the end of April due to safety concerns. He also noted that FERC had wanted an additional water level logger installed at transect 70000, but that due to concerns about vandalism in that high-traffic area, the location of that logger was moved a bit further downstream to transect 69500 (~500 feet downstream). Mark concluded by noting that the complete hydraulic model report would be done in the 2nd quarter of 2015.

3.3.8 Computational Fluid Dynamics (CFD) Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays (Lemay)

Gary Lemay (Gomez and Sullivan) provided an update on the status of the CFD modeling effort. He explained that they were doing CFD modeling in four locations: Station No. 1 forebay; Cabot Station forebay; the spillway fish ladder; and the Cabot Station fish ladder. He noted that the field work and data collection needed for the models was conducted during the period March through September, 2104 and is essentially done. He provided some details on how the data was collected and how it will be used to construct and calibrate the models. He noted that the field data has already been post-processed and that they had started to develop the 3D CAD models. Gary concluded by saying that he had no findings to report yet, but that the production model runs would be done and that the study report would be completed by the 2nd quarter of 2015.

Bill McDavitt (NMFS) asked about the conditions under which the field data was collected and also questioned what operating scenarios would be evaluated with the models. Gary responded that models will be used to look at various combinations of operational and flow conditions, as outlined in the study plan. This was followed by additional questions about the ability of the CFD models to model various gate discharges, including the log flume and bypass flume as well as the canal emergency spillway gates. Gary indicated that the study plan did not currently anticipate CFD modeling of the emergency release gates. He noted that they may have some of the data needed to do such modeling, including for example, bathymetry data, but that currently there were no plans to do CFD modeling of emergency gate releases.

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 (Lemay)

Gary Lemay (Gomez and Sullivan) explained that this study was essentially divided into two parts, data collection and modeling. He noted that all of the velocity, bathymetry and water level data collection were conducted in 2014. He provided additional detail on how, where, when and under what conditions the data was collected. He noted that some data collection on pumping had to be done at night under lights. He also explained how the transects were located and marked. He further explained that the water level loggers used for this modeling effort were different from the HEC-RAS loggers, because they thought it was important to have separate and independent loggers.

Ken Sprankle (USFWS) asked about the single variance noted in the summary slide which indicated that water column velocity data was collected at 3 transects, not 4. Gary explained that it turned out that the 4th transect recommended for the study was actually located over the intake structure, because the intake extends out under water. He noted that under low water conditions the top of the structure would be exposed, so data could not be collected there. In response to further inquiry by Ken, Gary explained that

transect 3 was located just in front of the intake structure and was as close it could be without extending over the intake concrete, thus achieving the goal of the recommended 4th transect.

Bill McDavitt (NMFS) asked how far upstream the model data suggests there are Northfield Mountain effects on impoundment water surface elevations. Mark and Gary indicated that they had not had a chance to closely evaluate the field data. Andrea Donlon (CRWC) asked if there would be vector maps created for the impoundment. Gary explained that only two-dimensional modeling was being done for the Northfield Mountain intake and Impoundment discharge area. Melissa Grader (USFWS) asked if there was going to be consultation with agencies and stakeholders between 2-D model calibration and production runs, or between the production runs themselves. Mark answered that he was not sure yet what the model calibration and production run process would look like going forward, but acknowledged that the FirstLight team would consider this and get back to stakeholders on this issue.

At this point in the agenda, it was agreed that discussion of Studies 3.3.10 and 3.3.16 would be postponed until later since the study lead, Ethan Nedeau (Biodrawiversity), had not yet arrived at the meeting.

3.3.1 Conduct Instream Flow Habitat Assessment in the Bypass Reach and below Cabot Station (George)

Jason George (Gomez and Sullivan) reviewed the status of the instream flow study. He explained that the focus of the study was the bypass reach that was divided into Reaches 1, 2 and 3, which he showed on a map. Reaches 4 and 5 he noted were located further downstream below Cabot Station. Jason summarized the work that had been done since receiving FERC's SPDL, to address a number of issues and concerns outlined therein. He also updated the group on the water level logger locations, as well as MA NHESP's request to collect detailed velocity measurements in Reach 3 for yellow lampmussel.

Jason reviewed the data collection that had been completed to date for both the 1-D model in Reaches 1 and 2, and for the 2-D model for Reach 3. He explained that the Reach 1 and 2 data was collected at flows of 120, 700 and 4,000 cfs; while the Reach 3 data was collected for flows of 4,500/700 cfs and 8,500/120 cfs. He explained that they had come up with 11 habitat transects, the location of which he showed the group on a map. He also explained that in areas that were not wadeable, they had used a boat-mounted stationing rig or an Acoustic Doppler Current Profiler (ADCP) to collect depth and velocity data.

Jason discussed the work remaining including the data analysis for Reaches 1-3, and the field data collection for Reaches 4-5 which is not scheduled to occur until 2015. He also noted that there would be an assessment of state listed mussels done, including the development of HSI curves for yellow lampmussel, which he noted would be done in conjunction with Ethan Nedeau (Biodrawiversity). He noted that the only variance to the study was the change in the schedule for data collection, which was moved by a year.

Jason explained that once they had completed the instream flow modeling for Reaches 1-3 they would prepare a report on that portion of the study and would then meet with stakeholders to plan the work for Reaches 4-5. Mark Wamser provided further clarification on next steps suggesting that FirstLight wanted to complete the habitat modeling work on Reaches 2-3 and then have a meeting with stakeholders and use the results of Reaches 2-3 to inform what flows should be looked at in the upper part of Reach 1. This led to some general discussion about flow collection points and the range of flows to be modeled. Toward the end of the discussion it was noted that there was no date set for presenting the Reach 1-2-3 study results.

Ken Sprankle (USFWS) asked whether Reach 5 would consider flow impacts to shad spawning. Jason acknowledged that the SPDL had indicated that this was an issue that they recognized needs to be addressed and he noted that representative shad spawning locations will be looked at as part of the Reach 5 evaluation.

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 (George)

Jason George (Gomez and Sullivan) reviewed the status of this study. He summarized the work completed to date including compilation of gate/discharge data for the emergency spillway gates and log sluice gate at Cabot Station and the desk-top analysis of gate discharge. He noted that the desktop analysis utilized 10 minute operational data for the period April 1 through June 30 for the years 2005-2012. Regarding the emergency spillway gates he explained how the gates are configured and operated, and described that under typical operations FirstLight generally uses the two gates closest to the trash boom to move debris; so these gates are used most frequently. Similarly the log sluice is used for debris removal, but is also used to move fish downstream.

Jason then reported on the desktop evaluation findings to date. Regarding the log sluice gate he explained that the data showed that the gate is generally opened 5-7 ft whenever the fish sampler is deployed, and that this occurred 70% of the time over the period of interest. Regarding the spillway gates, Jason explained that the data indicated that one gate was open 57.4% of the time over the period of interest (often because one gate is left open through which to sluice trash) and that the data showed that there were no gates open or one gate open 97.8% of the time. Overall, the data demonstrated that large magnitude releases through the spillway gates were very infrequent, and these events occurred as a result of an automated response due to high water levels in the forebay canal. Jason noted that the results of the gate/discharge analysis were presented both as a gate opening and as flow.

Jason described that the only variances to the planned study were unanticipated schedule delays. He went on to describe the remaining work. He reminded the stakeholders that the work remaining for this study was a determination of whether field data was needed to further evaluate potential flow impacts to the sturgeon spawning habitat, associated with either spillway or log sluice gate use. He emphasized that to get to the next steps in the study the group would need to come to consensus either today or in the future on whether field data collection will be necessary in 2015.

Karl Meyer (public) stated that he had been at Cabot Station in June 2013 and observed 2 emergency spillway gates open at that time. He suggested that based on his observations it seemed to him that two or more gates may be open more than 3% of the time as suggested by the study findings. In response Jason pointed out that typically when a spillway gate is opened, flow through the generating station is reduced, such that total discharge to the river below Cabot Station may not change significantly. He showed a plot of discharge conditions from both the gates and the power station for 5/6/05 to demonstrate this point. Karl also asked about a potential data anomaly that he saw in the report during the year 2010. Jason acknowledged that there was one period when all 8 emergency spillway gates were open at once. John Howard (FirstLight) indicated that such an event would probably have been triggered by a load rejection at Cabot and the water level in the forebay was getting too high. When asked, John indicated that such an event would have no correlation with Northfield Mountain Project operations.

Jessica Pruden (NMFS - on phone) asked whether, based on the results of the data analysis, it can be assumed that if two or more spillway gates are open, it equates to emergency operation where the gates opened automatically in response to rising forebay water levels. Jessica also asked if FirstLight could summarize the number of emergency vs. non-emergency events in the report, noting that such information

would be needed for the biological assessment. Bob Stira (FirstLight) clarified that FirstLight could be operating 3-4 gates open without an operating emergency. Don Pugh (TU) noted that the report lacked information distinguishing emergency spillway gate openings from gate openings for trash removal needs. He suggested the report needs more description of the emergency conditions that resulted in multi-gate openings during the period of data. Jason indicated that he could try to get operator data that might allow him to differentiate between emergency (auto-trigger) versus non-emergency opening, but indicated that he wasn't sure if such information was available and that he would need to investigate that with FirstLight. Jessica reiterated that such information would be needed for the biological assessment, so that the NMFS can distinguish between emergency and operation events and evaluate the potential effect on the sturgeon habitat associated with those events.

The review of this study concluded with a discussion about next steps and process going forward. Mark Wamser suggested that the FirstLight team would work with FirstLight to see if the data exists to allow a distinction between emergency and operation gate opening events; if so, the information will be provided to the stakeholders.

Karl asked again about the June 2013 period when he observed 2 spillway gates open and asked why 2013 data was not included in the analysis. Mark noted that the revised study plan contemplated only using data through 2012. Jason suggested that he could check on specific dates from June 2013 to see what the gate openings were.

Don Pugh (TU) indicated that he was concerned that the report focuses on the number of gates open rather than actual discharge flows. He suggested that the results might be better reported as flows. Jason indicated that the report looked at both gate openings and flows, and that the flow data was available in the appendices. He also indicated that they could provide results in the form of discharge duration curves or a similar table showing incremental duration results.

Don then asked if the planned CFD model would be capable of modeling hydraulic conditions resulting from spillway gate discharges. If not, he noted that he would like to see CFD modeling of gate releases. Mark Wamser reminded him that such modeling was not a part of the approved study plan. Mark also suggested that the group wait to see what the gate data and modeling work show and then decide if field data collection is needed.

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

Ethan Nedeau (Biodiversity) described the study purpose and goals and then summarized the study status. He reminded the group that this was a 2-year study (2014-2015) and that he was reporting on the 2014 qualitative (phase 1) portion of the study. He noted that phase 2 of the study would be a quantitative survey conducted in 2015. He noted that the 2014 surveys were conducted in May and June and were focused on particular habitat areas, which he outlined. He noted that one additional site was added near the Route 116 Bridge. He explained that the 2014 work focused on larval stages and pre-emergence odonate samples. He indicated that during the remainder of 2014, he will be evaluating and identifying the collections and compiling the data.

Ethan indicated that the only study plan variance was the additional sampling site at the Route 116 Bridge which was added because access to areas upstream was difficult.

There were no questions on this study.

3.3.16 Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in the Connecticut River below Cabot Station (Nedeau)

Ethan Nedeau (Biodiversity) reviewed with the group that the objective of this study is to document mussels in the entire reach river reach below Cabot Station to 3 miles upstream of Holyoke Dam. He then reviewed work completed, including consultation with the Natural Heritage Program on actual mussel survey locations, and data collection in July and August, 2014. With respect to findings, Ethan reported that only one relic shell of *Lampsilis cariosa* was found. No other state listed mussels, live or relic were found.

He noted that there were no variances to the study plan. With respect to remaining work, he indicated that he would be developing binary HSI criteria for yellow lampmussel, tidewater mucket and Eastern pondmussel. The HSI criteria will be used in the IFIM to look at flow effects on habitat.

Andrea Donlon (CRWC) asked if the 25 mussel locations are secret or whether they could they be shown on a map. Ethan acknowledged that a map of the mussel locations could be included in the report.

3.2.1 Water Quality Monitoring Study (George)

Jason George (Gomez and Sullivan) explained that this is a 2015 study. He indicated that there were some changes to temperature monitoring locations below Cabot Station based on stakeholder comments. He also said the study plan had been revised to include continuous temperature monitoring. He showed a map illustrating the water temperature monitoring locations. He explained that the revised field sampling plan was now awaiting FERC approval. He reminded the group that sampling would occur in 2015 with a report completed by March, 2016.

John Baummer (FERC – on phone) requested that the raw data for DO/temperature, including vertical profiles, be included in the study report. Andrea Donlon (CRWC) asked about the representativeness of the downstream logger locations and questioned whether the downstream stations that were included could be used to look at temperature and rate of change associated with peaking operations. Jason explained that the downstream temperature loggers are anchored near bottom, near shore, while the ones in the Impoundment are the near thalweg at 25% depth. This prompted some discussion amongst the group about the representativeness of the monitoring station locations. Jason indicated that the proposed methods follow Massachusetts DEP protocols, and that the FirstLight has received approval on the sampling plan from DEP.

3.4.1 Baseline Inventory of Terrestrial, Wildlife and Botanical Resources (Cole)

Ian Cole (KA) described that this study is essentially a baseline inventory of terrestrial wildlife and botanical resources around the Impoundment and tailwater areas. He noted that the field work for this study was completed. He explained that as part of the study, they had identified different habitat types and associated plant species. They had also identified invasive plants particularly in high use areas; and noted that many invasives were ubiquitous. Ian indicated that there were no study plan variances and that the report would be completed in the 2nd quarter of 2015.

Andrea Donlon (CRWC) was curious if land owners were cooperative about letting them on the land. Ian explained that much of the work was done from the water, and that most of the representative habitat types looked at were accessible via FirstLight lands, so access was not an issue.

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

Ian Cole (KA) noted that similar to study 3.4.1 the field work for this study was completed, that were no study plan variances, and the report would be completed in the 2nd quarter of 2014.

There were no questions on this study.

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

Ian Cole (KA) described this study, noting that it was essentially an inventory of habitats within the wetted perimeter, with a focus on submerged aquatic vegetation (SAV) and emergent aquatic vegetation (EAV) beds. He noted that the study included a search for 10 sensitive plant species identified by Natural Heritage and Endangered Species Program (NHESP). Ian described the field work that had been done thus far, including preliminary transect data along transects that will be examined in more detail later. Ian also described that a focus of the study was on tiger beetles, and provided the group with some information on Rainbow Beach, which may be the sole location of the tiger beetle. He noted that discussions were continuing on how best to profile the critical habitat beaches. Ian noted variances in the schedule due to high water conditions. He indicated that field work would continue until mid-October, and that the report would be completed in the 2nd quarter of 2015.

John Ragonese (TransCanada) asked about the Impoundment study area, and Ian indicated the Impoundment study area was to the base of Vernon Dam. Andrea Donlon (CRWC) asked about FERC's approved study plan modifications which included transect selection with NHESP. Ian indicated that the transection selection was made consistent with FERC's requested modifications. There were no further questions on this study.

Mark Wamser (Gomez and Sullivan) wrapped up the day's agenda noting that they had finished early. He asked, since there was time, if the group wanted to move into the first item on the day 2 agenda, which was an update on Study 3.8.1. The group indicated that they would like to keep going, but it was noted that the agenda item could be repeated in the morning, if there were any new stakeholders at the day 2 meeting that wanted to be part of the 3.8.1 study discussion.

3.8.1 Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Level and Hydropower Generation (Wamser)

Mark Wamser (Gomez and Sullivan) explained that the project operations modeling would be done using the HEC ResSim model that was provided by USACOE via The Nature Conservancy (TNC). He noted that the model had been developed for the entire Connecticut River basin, but that it was being modified to look in more detail at the Northfield Mountain and Turners Falls projects. He explained that the model was updated to reflect an hourly time step and to better simulate Northfield Mountain pumping/generating cycles. He further explained that the period of record for the original model calibration was 1960-2003. Mark explained that the updated model starts at TransCanada's Wilder Project and includes regulated inflow from Wilder. He noted that the model is being calibrated to generation and flow at the Montague USGS gage.

Mark then described the calibration work that was ongoing, noting that the calibrations were generally good. He noted that he would like to confirm/validate the calibration to a more recent year, and that he planned to do that. Once the calibration and verification were completed, Mark explained that they would have an established baseline model for Northfield Mountain and Turners Falls project operations

that could then be used in a simulation mode to examine potential alternative operations, and impacts on flows, reservoir levels and generation. Mark concluded by describing the schedule for the remaining work, including evaluating alternative modes of project operation, and that the report was scheduled to be completed in the 1st quarter of 2017.

There were several questions about discharge/flow levels being evaluated as part of the instream flow study, and Mark explained that once the operations model is complete, it can be used to look at the effects of providing various flows and habitat (WUA) in the bypass reach on project operations and generation.

Tom Dean (FERC – on phone) asked if it will be possible to graphically show the relationship between bypassed reach flows and generation loss. Mark acknowledged that could be done, but noted that before any evaluation of bypass reach flows is done, the Instream Flow Study would need to be completed so that the flow/habitat relationships are understood. Bob Nasdor (American Whitewater, AW) asked if the model could be used to look at recreational flows as well. Mark indicated that it could. John Ragonese (TransCanada) asked how far upstream the model evaluations of potential alternative flow and operational scenarios would extend. Mark explained that flow from Vernon Dam will be used as a boundary condition to drive the model, but that no changes in Vernon Dam operations will be evaluated. He further noted that if the TransCanada relicensing process results in changes to the operation of the TransCanada projects, those operational changes could be reflected in the model, so the effects of those changes on FirstLight's projects could be evaluated. Bill McDavitt (NMFS) asked how the agencies could get a copy of the flow model data, if they wanted it. Mark told Bill to call him to request the data, which he noted is public information.

As there were no more questions, Mark indicated that meeting was concluded for the day.

End of Day 1

Day 2 – October 1, 2014

List of Attendees: See Appendix A

Introductions, Meeting Purpose, and Process Timeline

Mark Wamser (Gomez and Sullivan) opened the second day of the meeting and welcomed everyone. Mark again introduced key members of the FirstLight relicensing team, and recognized FERC staff at the meeting and asked them to introduce themselves. Brandon Cherry (FERC) introduced himself as the new FERC project manager, and then asked the other FERC staff present at the meeting to introduce themselves. Mark also introduced parties that were on the phone, including additional FERC staff. Mark then reviewed the meeting agenda for the day. Regarding the agenda, Mark noted that Study 3.8.1 had been reviewed at the end of Day 1, but that he would repeat this agenda item today, if anyone wanted to hear it. He also noted that it was likely that the meeting would again conclude early, but indicated that the agenda items related to studies 3.1.1, 3.1.2 and 3.1.3 could be held until after lunch, if there were stakeholders coming in the afternoon specifically to discuss those studies. Since it was indicated that was the case, it was decided that those three studies would be discussed after lunch, beginning at 1:00 PM. There was general concurrence with these agenda revisions.

3.6.1 Recreation Use/User Contact Study (Newell)

Bud Newell (TRC) reviewed the tasks associated with this study and indicated that the field work that began in January, was ongoing, and would continue through December, 2014. He described that TRC was conducting both spot counts and calibration counts, and were also using traffic counters. In addition

Bud explained that several surveys were being conducted, including a user survey and residential abutters survey. He explained that surveys and counts would continue through December.

Bud reviewed the variances from the study plan. Regarding the user surveys, he noted that inadvertently a few modifications to the Recreational Users Survey and the Northfield Mountain Trail Survey that had been requested by FERC had been omitted from the surveys. He noted that once these omissions were recognized in August 2014, the surveys were updated with the modified questions, and that the modified surveys have been in use since mid-August. He also noted that there was a variance related to the distribution of the residential abutters survey which was distributed in July, 2014 rather than in the spring, as originally planned.

In response to several questions about the omitted survey modifications, Bud explained that the omissions to the user survey included modifications to a question requesting additional detail about restroom facilities and river access; a question that had not been modified to ask users to consider their use of the project “within the past 5 years”; and the omission of a Likert-type question about satisfaction with the number of recreational facilities at the projects. On the Northfield Mountain Trail Survey Bud noted that the variable “hours of operation” had been omitted from one of the trail questions. He noted that all of the omitted modifications to the two surveys were aimed at gaining additional information from users that the respondents had the opportunity to comment on elsewhere in the survey. For example, Bud explained that there were over 600 recreational use surveys collected through June 2014, and of those, more than 80% had taken the opportunity to provide general comments about their recreation experience at the projects and their satisfaction with facilities and access. Among those, 60 respondents had specifically mentioned restrooms in their responses to the open-ended survey questions. In addition, Bud reminded the group that the revised surveys have been in use since August 2014, and that he expects to get hundreds of completed modified surveys, as well. Similarly, regarding the omitted modifications to the trail survey, Bud noted that as with the user survey, respondents had plenty of opportunity to comment on the factors that may have contributed to their satisfaction or dissatisfaction with their recreation experience, including hours of operation. Again, Bud noted that a quick review of surveys through June 2014 indicated that many respondents had taken advantage of the open-ended questions, and that 10% of the respondents had specifically commented on hours of operation. Overall, Bud concluded, that he was confident that the surveys will provide FirstLight, FERC and the stakeholders with good information on recreational user perceptions, including the satisfaction with facilities and access.

Norm Sims (Appalachian Mountain Club, AMC) raised a concern about whether the recreational surveys were adequately capturing use of the x-country ski trails. He suggested that if surveys did not capture skiers, then it might be necessary to do some additional winter use surveys. Bud explained that in addition to the counts and surveys conducted by TRC during the winter months of 2014, the study would also look at FirstLight records of skier use of the Northfield Mountain trail system. Bob Nasdor (AW) raised a similar question about whether whitewater boaters were being adequately surveyed. He noted that since whitewater opportunities in the bypass are currently limited to spill events, it might be difficult to adequately judge potential demand for whitewater use based on the current limited use. Norm Sims (AMC) also asked a question about where the surveys were being administered. He noted that if the surveys were only administered at formal recreation sites, whitewater boating use might be under-reported. Bud indicated that he would do an initial review of the data to see if the surveys were picking up winter skiing and whitewater use.

Andrea Donlon (CRWC) asked for some clarifications on the residential abutters survey. In particular she wondered if the two private clubs (the boating club and rod and gun club) that are located on the Impoundment were included in this survey. Bud indicated that he wasn't sure but would check to see if the clubs were mailed a survey. Andrea also noted that since the report for this study was not scheduled

to be completed until the 4th quarter if the stakeholders could get some of the results early to determine if there were any major holes in the recreational use data collected.

3.6.2 Recreation Facilities Inventory and Assessment (Newell)

Bud Newell (TRC) noted that this study was fully completed, and that the completed study report had been submitted to FERC as part of the ISR. Bud reviewed the inventory work that was done and summarized the findings with respect to the number of formal recreation sites at the Projects and their condition, as well as noting that a few informal sites that receive significant use were also surveyed. He showed a table of the sites and a location map. He summarized the findings by noting that the study found that all of the formal recreation sites at the Projects were meeting their intended function, and that most were in good condition. Only one site was found to be in need of facility repairs or replacement. Bud noted that there were no variances to the study plan.

Andrea Donlon (CRWC) noted that the report had indicated that the fishway viewing area was not open at the time of the condition assessments. She suggested that it would be good if a condition assessment of the fishway viewing facilities could be done. Noting that this was one of two completed study reports included in the ISR, Norm Sims (AMC) asked FERC staff when comments on this report would be due. Brandon Cherry (FERC) indicated that formal comments were due on this study report within 30 days of FirstLight filing the ISR meeting summary, or in about 45 days. He noted that this would make the due date about mid-November.

3.6.3 Whitewater Boating Evaluation (Newell)

Bud Newell (TRC) reviewed the tasks that comprise the whitewater boating study. He explained that after consultation and preliminary work, the boating evaluations were conducted July 19-21, 2014. He noted that 6 boating flows were evaluated by 45 participants who boated the bypass reach in a variety of watercraft. He also explained that as part of the study they are evaluating various access points as potential boating put-in and take-out locations. He noted that as yet there were no findings to report, as he had just begun to look at the boater evaluation data. Bud noted one variance from the study plan, the relocation of a videoing site from one bridge site to another. Bud concluded by stating that the study report would be completed in the 1st quarter of 2015.

Norm Sims (AMC) complimented Bud and TRC on the quality of the whitewater boating study. He went on to ask Bud how the other studies, including the whitewater boating study, would inform the recreation use study (3.6.1) results, as indicated in that study plan. He wondered if the responses from the 45 boaters that participated in the whitewater study could somehow be integrated with the user surveys. Bud explained that the responses from the 45 whitewater boaters would be discussed in detail in the 3.6.3 study report, but might also be referenced in the 3.6.1 study report. But both Bud and Mark Wamser (Gomez and Sullivan) indicated that the results of all the studies will be examined collectively as part of the overall assessment of recreation resources and potential project effects on those resources to be included in the draft and final license applications. This prompted some general discussion about the recreation study reports. Adam Beeco (FERC) concurred with Bud's initial response explaining to the group that there would be an individual report from each study and then, in the draft license application or preliminary licensing proposal, there will be a comprehensive look at all of the recreation studies. Adam noted that during their comments on the draft license application or preliminary licensing proposal, stakeholders will have an opportunity to comment on how all the recreation resource issues were tied together.

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

Bud Newell (TRC) reviewed the two primary tasks that comprise this study; literature review and field work. He noted that prior to conducting the field work, internet research and literature searches were conducted regarding the Connecticut River Trail, facilities and access, particularly in the Project area. He also explained that some basic research on land ownership was conducted. Regarding field work Bud explained that the field work was conducted and completed August 28-29, 2014. He said the field survey was conducted by TRC staff and that they were accompanied by representatives from AMC, CWRC and the Northfield Open Space Committee. He explained what was done as part of the field surveys including boating project shorelines, identifying existing and potential use and access sites, and investigating areas where potential canoe portage trails may be beneficial. He explained that there were no findings to report yet, and that there were no variances from the study plan. Regarding remaining work, Bud noted that there would be further consultation with stakeholders to identify possible locations for future carry-in boat launch locations and that the study report would be completed in the 1st quarter of 2015.

Andrea Donlon suggested that FirstLight use the CRWC boating guide as a potential reference. Bud indicated that he would do that. With respect to potential carry-in locations, Norm Sims (AMC) asked Bud if he had any dates in mind for when consultation with stakeholders about these sites would occur. Bud responded that he will be contacting the recreation interest via email with the next few weeks to set a date. Adam Beeco (FERC) asked if the informal use and access sites examined by this study were some of the same informal sites included in the inventory. Bud explained that a few of the informal sites looked at were covered in the inventory study (3.6.2), but that the focus of that study was on sites that received significant recent use. He said that a number of the sites preliminarily identified as part of this survey were sites that have been used sometime in the past but are not currently used or are receiving very little use. Norm Sims (AMC) indicated that he would like to discuss some sites with Bud that he knows of that are currently being used as carry-in access, but which may not be readily observed from the water. Bud indicated he was interested in talking further with Norm about such sites, but noted that some of those sites may already have been identified during the field survey.

3.6.5 Land Use Inventory (Newell)

Bud Newell (TRC) reviewed the tasks that comprise this study, including literature and aerial photography review, and development of land use designations. He indicated that there were no findings to report yet, and no variances from the study plan. He briefly reviewed the work remaining, and noted that the study report would be completed in the 4th quarter of 2015.

Andrea Donlon (CRWC) raised a question about the scope of this study, and asked how it differed from the land use evaluation that was done within the 200 ft buffer as part of the 2013 Full River Reconnaissance (FRR) study. Bud, indicated that study 3.6.5 was intended to look more broadly at land use types with the FERC project boundary, not just those areas within 200 ft of the river. Mark Wamser noted that the FirstLight team would insure consistency among the land use designations made between the two studies, with no overlap.

3.6.6 Assessment of Effects of Project Operation on Recreation and Land Use (Newell)

Bud Newell (TRC) outlined that this study is intended to take data and information from the other recreation studies being conducted and will comprehensively evaluate the effect of project operations on recreation use at the Projects. He noted that the report for this study would be completed in the 2nd quarter of 2016.

Norm Sims (AMC) asked if study 3.6.6 was the compilation report that was being discussed earlier, and if not then wondered about the intended purpose of this study. Bud clarified that this study will specifically examine how Impoundment levels and river flows are affecting or may potentially affect recreation use and recreation facilities. Bud gave a few examples of potential project impacts on recreation facilities or use that might be examined. This engendered a general conversation about how the results of this study might inform the license application. This led Bob Nasdor (AW) to ask FERC if they look at each of the study results separately or together, and what happens if there are conflicts among the study results. Adam Beeco (FERC) explained that FERC does both: They look at each study individually; and also look comprehensively at the all recreational use at the projects. He also noted that generally FERC does not prefer one type of recreation use over another, but would prefer to see a range of recreational opportunities at the projects.

3.6.7 Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use (Newell)

Bud Newell (TRC) reviewed the initial work that has been completed on this study and noted that work remaining to be conducted included a detailed trail condition assessment that was planned for October, 2014. He outlined that the detailed assessment would look at trail characteristics and condition following standard methods adopted from the Universal Trail Assessment Process (UTAP) IMBA guidelines, and/or MADCR guidelines. He noted that the analysis for this study would be completed in in 2015 and the study report completed in the 2nd quarter of 2015.

Norm Sims (AMC) asked Bud if he had talked to AMC about standards that they use for assessing trails in the area. Bud noted that one of the members of the trail survey team doing the field assessment at Northfield Mountain was a former director of the AMC.

3.7.1 Phase 1A, 1B, and II Archaeological Surveys (Will)

Rick Will (TRC) provided the group with an overview of the purpose and value of archaeological surveys conducted at hydropower projects, including the FirstLight Projects. He explained that archaeological surveys were conducted systematically, using a phased approach. He then outlined the tasks associated with the study including consultation, background research, sensitivity model development, and field reconnaissance. Regarding consultation he noted that at the FirstLight Projects, consultation had been conducted with the State Historic Preservation Officers (SHPO's) of three states; Massachusetts, Vermont and New Hampshire as well as the FERC, the Nolumbeka project, the Narragansett Indian Tribe Tribal Historic Preservation Officer (THPO) and the CRWC. Rick also explained that FERC had defined the Area of Potential Effect (APE) for the projects. He also provided a brief review of the background research that had been conducted and explained sensitivity model development process. Rick then outlined the field work that was conducted in July, 2014 and summarized the findings to date. He noted that the study report would be completed in the 4th quarter of 2014.

Andrea Donlon (CRWC) asked Rick if the Phase 1A report would get submitted to only the SHPOs and FERC. Rick indicated that a public version of the report would be prepared and distributed, but that site locations and other sensitive information would be redacted. He explained that this was necessary to keep site locations confidential and to protect the sites from potential looters. Andrea then asked about the definition of the APE. Rick explained that the APE was intended to include all areas within the FERC project boundary as well as other areas potentially affected by project operations.

Bob Nasdor (AW) asked about the relationship between recreation and archaeology, and why this was mentioned in one of the slides as an area to be investigated. Rick explained that the construction of a new

recreation facility, for example, could have impacts on an existing archaeological site. He noted that impacts to sites were generally associated with ground disturbing activities.

3.7.3 Traditional Cultural Properties Study (Will)

Rick Will (TRC) began the overview of this study by explaining that until recently traditional properties were not generally considered. He then spent a few minutes describing what traditional cultural properties were, and noted that they are an important part of cultural heritage. For this study, Rick explained that the intent was to engage Native Americans to learn if there are any TCPs at the Projects identified by Native Americans. However, he acknowledged that despite considerable effort, to date, FirstLight has not had much success on engaging the Native American tribes. He noted that TCP studies can be difficult because sometimes people just don't want to share. Rick reviewed for the group FirstLight's attempts at consultation, and the study work remaining. He noted that it was his intent to make every effort to continue to try to consult with the Tribes.

Bob Nasdor (AW) asked if traditional cultural properties refers to physical structures or activities, such as fishing in the tailwater area. Rick responded that TCPs are generally a physical location, but may or may not involve activities.

3.7.2 Survey and Evaluation of Historic Architectural Resources (Rankin – on phone)

Ellen Rankin (TRC - on phone) gave a brief overview of this study. She reviewed the work completed and summarized the findings to date. She noted that there are 31 previously identified resources and 41 newly identified resources within the Project APE. She highlighted the NRHP listed Turners Falls Historic District, which includes several FirstLight-owned resources. She also noted that the MA SHPO had determined Cabot Station to be National Register Historic Property (NRHP)-eligible in 1987. She concluded by noting that there were no variances from the study plan and that the study report would be completed in the 4th quarter of 2014.

There were no questions on this study.

Lunch Break until 1:00 PM

3.1.3 Northfield Mountain Project Sediment Management Plan (Sullivan)

Tim Sullivan (Gomez and Sullivan) provided an overview of this study. He began by detailing the work completed to date including continuous suspended sediment monitoring and cross-sectional measurements to check that the continuous measurements are representative. He noted that while much data has been collected, there are not yet any findings to report, and that data QA/QC is still ongoing for period 2012-2014. After responding to a few technical questions about field data collection methods and equipment, Tim then outlined the work remaining on this study. He explained that continuous suspended sediment monitoring will continue through 2015. However, he explained that the 2014 annual report will be filed on December 1, 2014, while the final study report for this study will be completed and filed in September, 2015. Tim showed pictures of some of the sampling locations including the Route 10 Bridge site and the area around the Northfield Mountain tailrace.

Bill McDavitt (NMFS) asked a couple of questions about the observed hydraulic character at the sites which Tim answered. Andrea Donlon (CRWC) asked if they had experienced any difficulties with the LISST units. Tim explained that in 2012 two LISST-HYDRO units were installed in the plant, but it was eventually determined by the manufacturer that the units could not withstand the pressure from the intake taps in the powerplant and could not reliably be used there. Tim noted that the units were moved to their

current locations based on consultation with the manufacturer, and that the manufacturer has approved the current sites and has been reviewing the data. After some additional discussion amongst the group about the location of the LISST HYDRO units, Tim concluded the discussion by stressing that FirstLight is confident that the current pump locations for the HYDRO units are representative for both pumping and generating conditions at Northfield Mountain.

3.1.2 Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability (Sullivan)

Tim Sullivan (Gomez and Sullivan) reviewed the status of this study which he noted is also known as the “Causation Study”. Tim began by reviewing the work completed thus far including the selection of study sites, which were agreed upon by the stakeholder group and were subsequently submitted to FERC as part of the ISR. Other tasks that have been completed include data gathering and literature review, geomorphic understanding of the Connecticut River, and identification of potential causes of erosion. Tim then discussed the field studies and data gathering that is still ongoing for this study. He indicated that preliminary BSTEM related field work has been completed; however, supplemental field work collection may be needed in the future. Field data collected in 2014 still needs to be post-processed and QA/QC-ed. Tim described the variances from the study plan explaining that due to the closure of the Vermont Yankee Nuclear Plant the potential role of ice on shoreline erosion will now be addressed as part of this study. As a result Tim indicated that monitoring of ice will continue through 2015 and the study report will be completed in the 2nd quarter of 2016.

Bill McDavitt (NFMS) asked about monitoring water level fluctuations in relation to boat waves. Mark Wamser indicated that the water level recorders now record every 15 minutes. Bill also asked if it had been determined how far upstream in the Impoundment from the Northfield Mountain intake/discharge it is before you are upstream of the influence of Northfield Mountain operations. Mark Wamser responded that while they haven’t had a chance to look at the data yet, the extent of upstream influence of Northfield Mountain operations will be examined. Bill McDavitt (NFMS) also asked about the effects of flow fluctuations from Vernon inflow. Mark explained that the intent would be to calibrate the hydraulic model under constant conditions and then start to introduce variable changes in Northfield Mountain and Vernon operations. This prompted further discussion within the group about the complexity of the system and how best to model it.

Andrea Donlon (CRWC) recalled that the FERC SPDL had suggested comparing the base map to a more recent map to examine the shoreline changes. She asked if such a comparison is being made. Tim indicated that work will be included in the final report. John Howard (FirstLight) added that FirstLight surveyors are comparing aerial images with project boundary maps to try to get a sense of the movement of the riverbank over time. However, Tom Sullivan (Gomez and Sullivan) cautioned that survey techniques and accuracy have changed over time and the comparisons being made are for contextual purposes only, and that no quantification is going to be done.

Kimberly Noake MacPhee (Franklin Regional Council of Governments, FRCOG) asked Brandon Cherry (FERC) about the process and the review opportunities. She noted that since the final report for this study won’t be completed until 2016 another field season will be missed. She asked if stakeholders can request an interim report that they can review before next field season. Brandon Cherry (FERC) reiterated that by mid –November, stakeholders need to comment on the ISR study report. This prompted further discussion about the timing of the studies and the ILP process. FirstLight was asked if they have plans to issue progress reports and provide opportunities for further consultation. In response, Mark Wamser clarified that FirstLight would rather not issue the study results in pieces, but rather as a complete assessment at the conclusion of the study. Kimberly reiterated her concern that under the study schedule

stakeholders won't get the study report until the 2nd quarter of 2016. She then asked if FirstLight can provide the field data.

Discussion about the timing of the study report and the ILP process continued with a number of stakeholders expressing concern over the timing of the study and the lack of opportunity to review the study results until 2016. Brandon Cherry (FERC) again reminded stakeholders that they can submit comments at any time, and also that comments submitted at the conclusion of the study will be considered by FERC and that if more information is needed the ILP schedule could be extended.

Stakeholders continued to ask a variety of questions about the details of the study data collection and modeling. Kimberly Noake MacPhee (FRCOG) asked about the data gaps identified under Task 1. She also asked FirstLight about the number of transects used in the study, and noted her concern with the number of transects. She asked specifically about the cost of collecting data at each transect. Tim Sullivan (Gomez and Sullivan) indicated that the number of transects used was based on the opinion of the modeling experts (Andrew Simon and Bob Simons). He also noted that the 25 transects being used in this study will provide more information than they have ever had on similar studies conducted at other projects. Regarding the study costs, John Howard (FirstLight) explained that there is a budget for the whole relicensing process that he has to endeavor to remain within.

Discussion of the modeling work continued with Kimberly Noake MacPhee (FRCOG) asking about how the study will examine the potential correlation between operational changes and observed changes in erosion rates. Tim explained that this work will be done as part of Tasks 5 and 6, but hasn't been started yet. Bob Simons explained that historic data can be used to look at the range of fluctuations from one time period compared to another. Kimberly Noake MacPhee (FRCOG) asked if the permanent transects will be used to evaluate observed changes in erosion rates, and how erosion rates will be determined? Bob Simons explained that cross sections were established in 1999 then were resurveyed annually through the end of the calibration period, so model results can be calibrated to the actual survey data. Tom Miner (FRCOG) asked Mark Wamser several more questions about the BSTEM model and how it will be used to evaluate the causes of erosion.

This was followed by some discussion of the status of the Northfield Mountain Project license temporary amendment application. Several stakeholders expressed their concern about FirstLight's filing of a temporary amendment application that could result in operational changes at the Project in the midst of the relicensing process. FirstLight explained that the amendment application was prompted by regional operational needs for this winter. It was also noted that the PAD identified potential future changes in operations, and that it was the responsibility of the licensee to fully evaluate any new operational proposals included in their license application. FirstLight clarified that the temporary amendment and operational changes contemplated in the PAD are separate things. This led to further discussion about how studies and information being gathered could be used to evaluate operational changes proposed as part of the amendment application. Brandon Cherry (FERC) told stakeholders that if they have comments on the temporary amendment, then comments need to be filed with FERC within the next few days.

3.1.1 Full River Reconnaissance Study (Sullivan)

Tim Sullivan (Gomez and Sullivan) reviewed the FRR study. Tim started by telling the stakeholders that they were prepared to discuss the FRR study today, but that in addition, FirstLight was planning a follow-up meeting with interested stakeholders in 2-3 weeks to further discuss the FRR study and results. Tim also reminded the group that the FRR study was one of two completed studies, and that the final study report was submitted to FERC as part of the ISR.

Tim provided an outline of the tasks that were done as part of the FRR study. He reminded stakeholders that the reconnaissance evaluation field work was conducted in November and December of 2013, with some supplemental work done in 2014. Tim explained how the field surveys were conducted, including both land and boat based surveys. He reminded stakeholders that the intent of the surveys was to provide a complete picture of the riverbank and islands and to identify riverbank features, characteristics, and erosion conditions. Tim described that the FRR produced 38 detailed site assessments as part of the land-based survey which were selected to represent a reach, or more typically specific features of interest. Tim then summarized some of the study findings. He noted that the study found the forested areas accounted for most of the riverbank, followed by agricultural lands.

Tim also reviewed the methods used to evaluate the river banks. He noted that the river banks were determined to be comprised of two distinct portions, the upper and lower portions, and the features and characteristics were identified for both. He noted that the bank delineations conducted for this study used the same methods used in 2008. He explained that assessment of erosion conditions looked at the entire riverbank, but it was found that most erosion occurred along the upper bank, or at the toe of the upper bank. Tim explained that all of the field data is included in the study report, including all photos and video.

Tim concluded his overview of the study by discussing the evaluation of stabilization projects that have been done throughout the Impoundment. He noted that the evaluations examined the success of various stabilization techniques, and included site recommendations for future stabilizations projects. He outlined that the study found that over 9 miles of riverbank have been stabilized since 1999, most successfully. He also noted that the overall comparison of the 2013 to 2008 FRR indicated decreased rates of erosion and that riverbanks are more stable now than then. Tim showed the group a table comparing the 2008 and 2013 FRR results. He highlighted that in 2008 83.3% of the riverbank had been determined to be in the “None/Little” category, while in 2013 the amount of riverbank in that category had increased to 84.8%.

John Bennett (Franklin Conservation District, FCD) asked if the follow-up meeting planned for this study would occur before or after comments on the FRR report are due at FERC. After some discussion it was clarified that the meeting was being offered by FirstLight to allow more time to discuss the FRR report. However, formal comments on the FRR report would still be due to be filed with FERC by November 14.

Several stakeholders asked additional detailed questions about the FRR study methods and findings which prompted more discussion about the FRR study, the erosion evaluations, and the bank stabilization sites. John Bennett (FCD) expressed concern with this study which essentially repeated the 2008 FRR evaluation which he indicated he also had concerns with. After still further discussion of the study results with respect to how types of erosion were categorized and the percentage of riverbank that was determined to be experiencing significant erosion, some of the other stakeholders also expressed their concern with the study’s conclusions.

Discussion continued with a question from Kimberly Noake MacPhee (FRCOG) regarding the speed at which the video was shot. Bob Simons (on-phone) responded that he did not know the exact boat speed, but that it could be estimated based on the shoreline covered each day. He also noted that the video was conducted at a higher speed than the FRR boat-based survey. This prompted some discussion on the availability of slower video or software that could be used to track the location of the video on Google Earth maps. The discussion concluded with Kimberly reiterating her concern that there seemed to be discrepancies in what the video shows and what the report concludes about the extent of shoreline erosion. Tim Sullivan (Gomez and Sullivan) indicated that the FirstLight team would consider how to get Kimberly the data/video/photos that would allow her to assess the erosion aggregations.

Questions on the study continued with John Bennett (FCD) asking why Table 4-3 of the report includes open water summary statistics for only New Hampshire and Massachusetts, but not Vermont. Tim Sullivan indicated that he would have look at the study report to see why, but suggested that it was probably because the Vermont soils data does not include the “open water” category.

The discussion of the FRR study continued with more questions and comments from stakeholders. John Bennett (FCD) indicated that he was concerned about the definition of the lower riverbank, and the finding that no erosion occurs on the lower bank, and mostly in upper bank. Patrick Crile (FERC) asked about whether there was a change in number of erosion sites between 2008 and 2013 in the “none/little” category versus the total length of the sites. Bob Simons responded that he had not looked at the number of sites versus the total length of the sites, but indicated that he would look into it.

John Bennett (FCD) asked about the discussion of adjacent land use on pg 6-31 of the report. He noted that the example of bank erosion where agricultural land exists (Figure 6.3) does not seem to be indicative of overland flow erosion, and wondered how the conclusion was drawn. Tim Sullivan explained that what the picture does not show well are the conditions on top of bank. This prompted additional discussion about the photos and video available to stakeholders as part of the report, and Tim reiterating that the report includes all of the photos, including the land based survey photos.

Andrea Donlon (CRWC) asked about the Task 5 stabilization projects discussed in Section 8 of the FRR report. She noted her disappointment with the study evaluation of the relative success or failure of bank stabilization projects. She said she was hoping the study report might include a list of what stabilization techniques work best and which don’t seem to work at the Project. She noted that it would be useful for the study report to summarize stabilization techniques that work and those that don’t work, based on what has been learned from all the old stabilization projects. Tim Sullivan (Gomez and Sullivan) noted that Section 8.2 of the report includes an evaluation of each site assessment of stabilized site, and that the site evaluations do consider what stabilization methods are working for that particular site.

Review of the FRR study concluded with several questions about the planned additional stakeholder meeting. Kimberly Noake MacPhee (FRCOG) asked if Dr. Simons would be available for the upcoming stakeholder meeting to discuss the FRR report. It was indicated that he would be. Mark Wamser asked FERC if both FERC compliance and relicensing staff would be interested in attending the meeting. Brandon Cherry (FERC) indicated that he thought compliance staff would be interested, but that he would check with them. Tim Sullivan (Gomez and Sullivan) stated that he would propose a specific date or time for meeting.

The meeting adjourned at 3:40 PM

**Appendix A
Initial Study Report Meeting
Attendance List**

Attendees Day 1 (September 30, 2014):

Bryan Apell – KA
Ian Cole - KA
Andrea Donlon – CRWC
Kathryn Kennedy – TNC
Gary Lemay - Gomez and Sullivan
Bill McDavitt – NMFS
Karl Meyer – Public
Ethan Nedeau – Biodiversity
Don Pugh – TU
John Ragonese- TransCanada
Rick Simmons – Normandeau
Norman Sims – AMC
Ken Sprankle, USFWS
Tom Sullivan – Gomez and Sullivan

Chris Tomichuk - KA
Mark Wamser – Gomez and Sullivan
Jason George – Gomez and Sullivan
Melissa Grader – USFWS
Kimberly Noake MacPhee- FRCOG (partial)
Owen David – NHDES (partial)
Nick Ettema - FERC
Bill Conelly - FERC
Patrick Crile - FERC
Adam Beeco - FERC
Brandon Cherry - FERC
Steve Kartalia - FERC
Caleb Slater - MADFW
John Warner USFWS

Julia Wood – Van Ness Feldman
Bob Nasdor -AW
Wendy Bley – TRC
Bob Stira – FirstLight
Anne Wibiraklee, CRWC (partial)
John Howard- FirstLight

On Phone:

Jessica Pruden- NMFS
John Baummer – FERC
Tom Dean – FERC
Mike Watts – FERC

Attendees Day 2 (October 1, 2014)

Andrea Donlon – CRWC
Norm Sims - AMC
Tim Sullivan - Gomez and Sullivan
Tom Sullivan - Gomez and Sullivan
Mark Wamser - Gomez and Sullivan
Rick Will - TRC
Kim Noges – FirstLight (partial)
Bob Nasdor - AW
Bud Newell - TRC

Wendy Bley - TRC
Dwight Harrison – FirstLight
Patrick Crile - FERC
Jennifer Griffin – TransCanada
Adam Beeco – FERC
Brandon Cherry – FERC
Julia Wood – Van Ness Feldman
Kimberly Noake MacPhee – FRCOG (afternoon)
John Bennett – FCD (afternoon)

Tom Miner – FRCOG (afternoon)
Bill McDavitt – NMFS
John Howard- FirstLight

On Phone:

Ellen Rankin - TRC
Mike Watts - FERC
Tom Dean - FERC
Mike Swiger – Van Ness Feldman
Bob Simons- Simons and Associates



**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.

- 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.

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

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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

Variations (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.

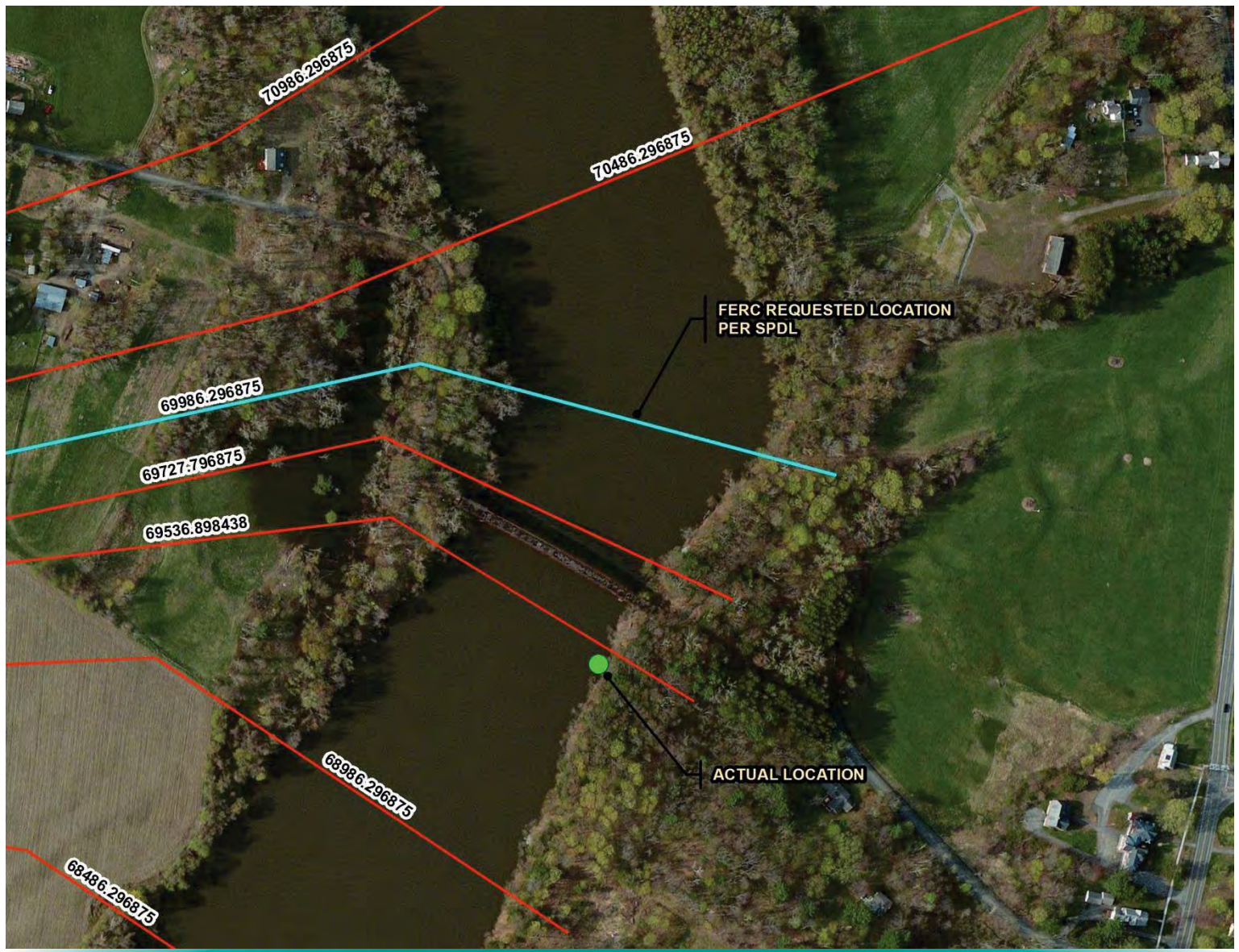
Variances (if any)

- 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.

Variations (if any)

- The only variations 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.

Variations (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.

Variations (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

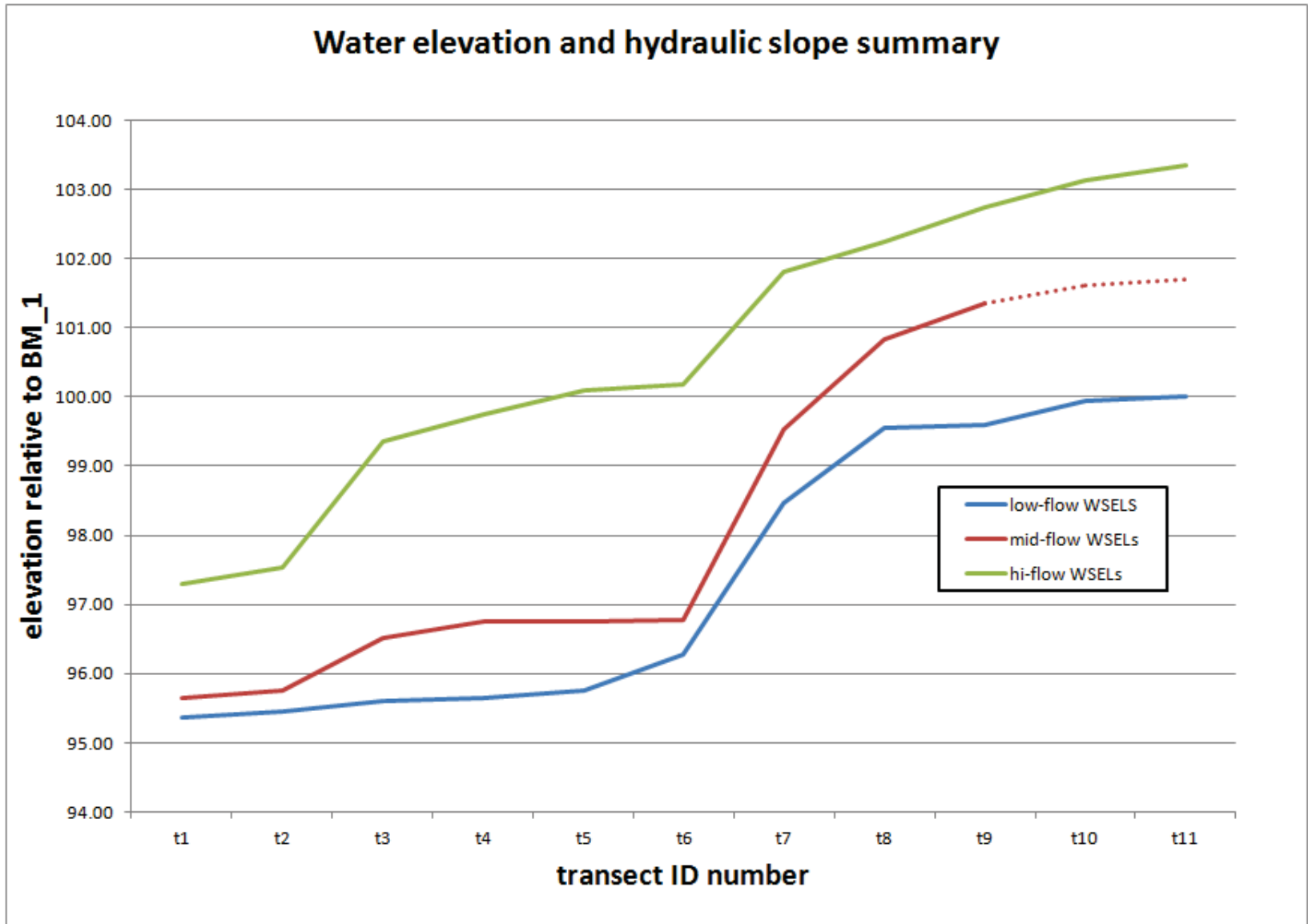
- Data Analysis and Presentation of Reach 1-3 results.
- Reach 1 Flow Demonstration.
- Assessment of State Listed Mussels (Task 2).
- Consultation to scope Reach 4-5 transect locations (representative locations).
- Reach 4-5 field data collection (2015).
- Report to be completed by March 2016.

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



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

Water elevation and hydraulic slope summary



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

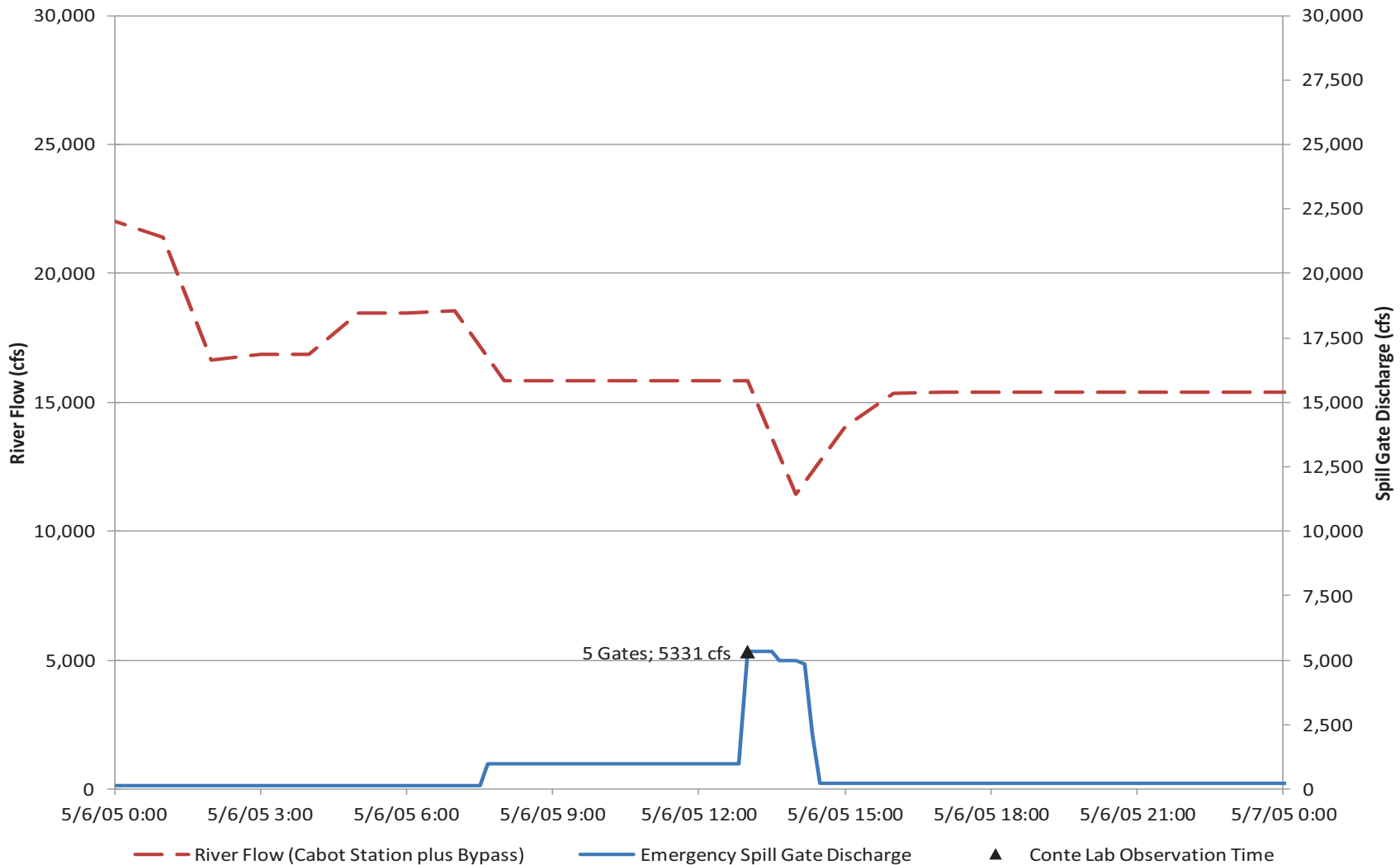
- Study schedule in August RSP targeted Spring 2014 for distribution of summary report and a meeting with stakeholders to determine the need for field study and targeted Summer 2014 to perform field investigations outside of the sturgeon spawning season, if needed.
- Summary report (submitted with the 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

Emergency Spill Gate Discharge and River Flow: 5/6/2005



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.

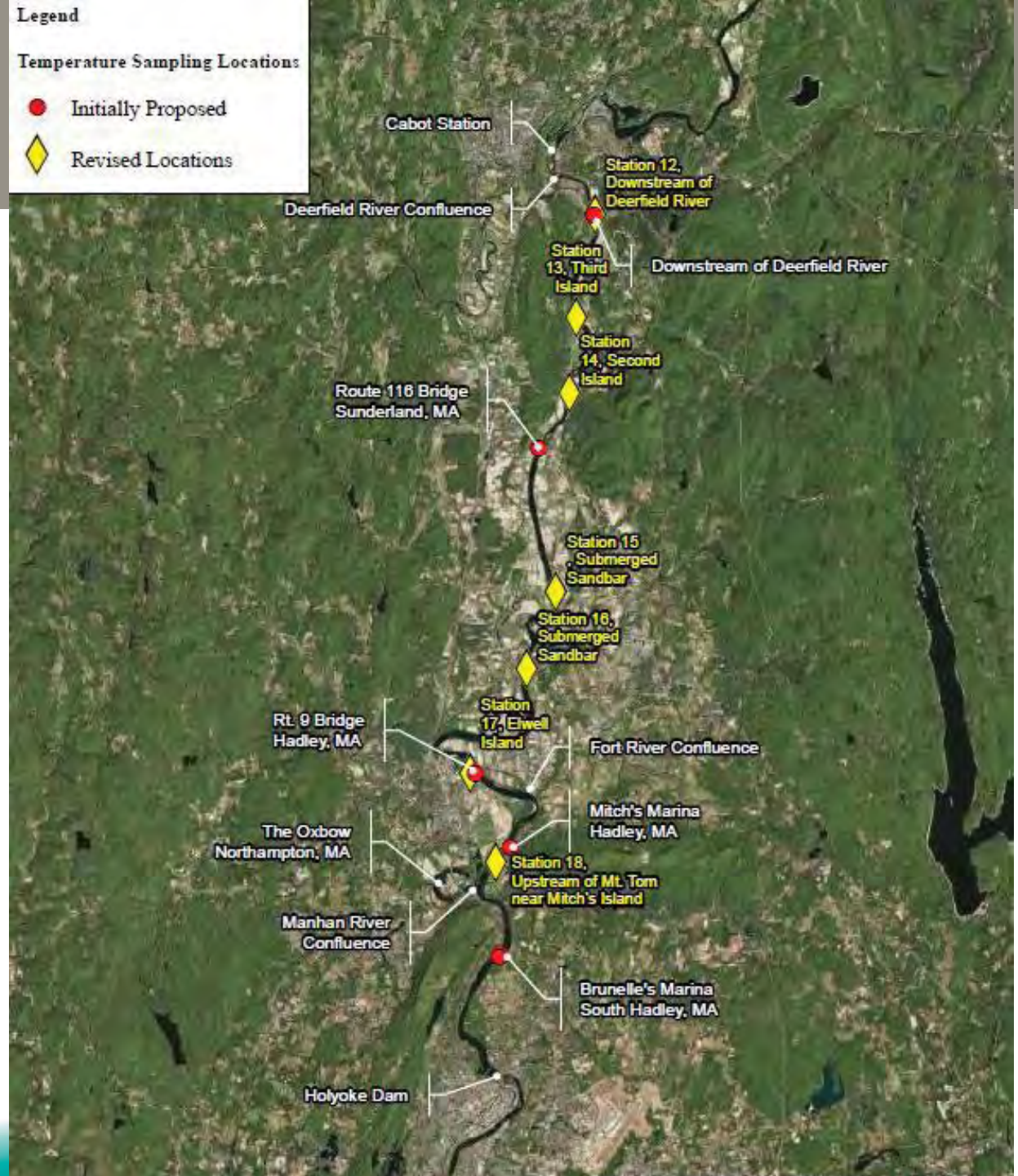
Work Remaining

- 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



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.

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.

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.

Variations (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

Variations (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 “*in 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

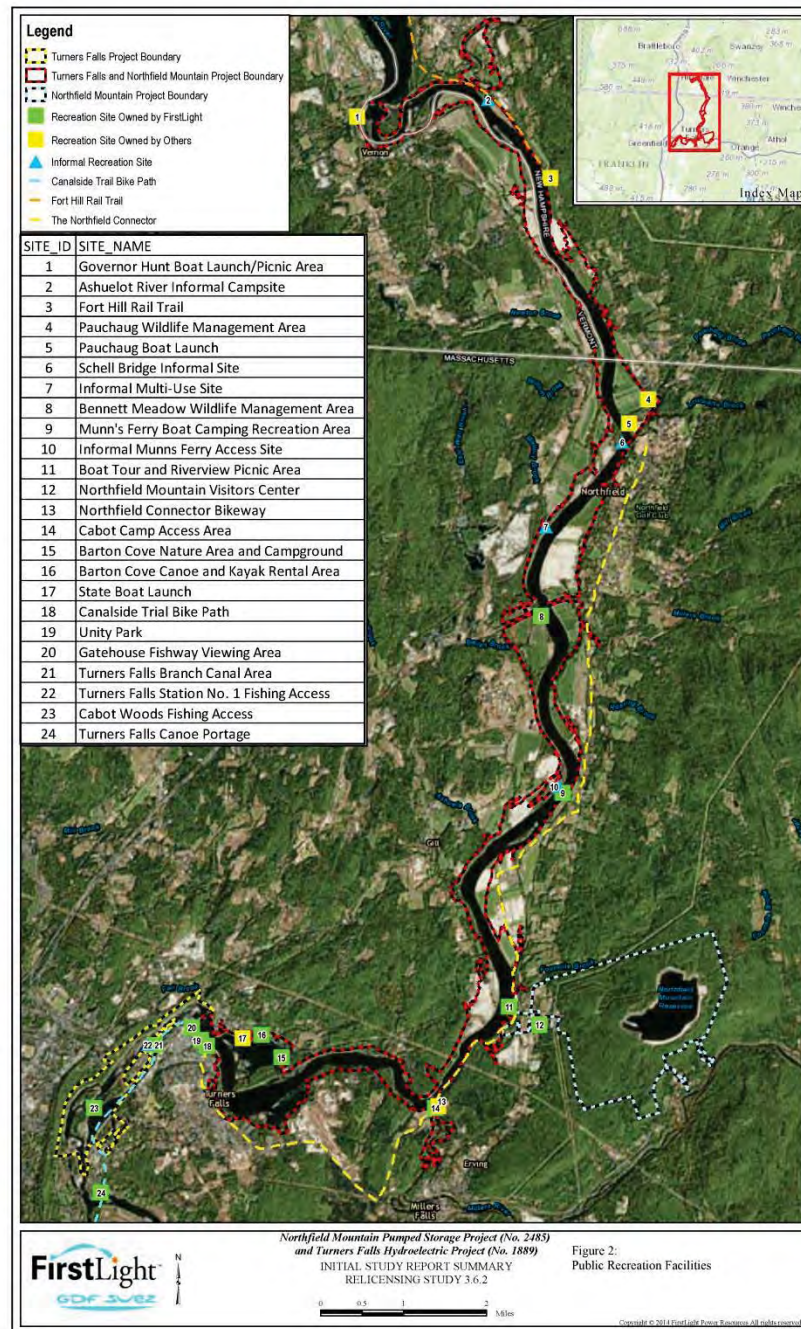
N/A: Not Applicable

Variations (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.

Variations (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.

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.

Variations (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.

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

Variations (if any)

- None to report.

Work Remaining

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

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%

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%		

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.

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

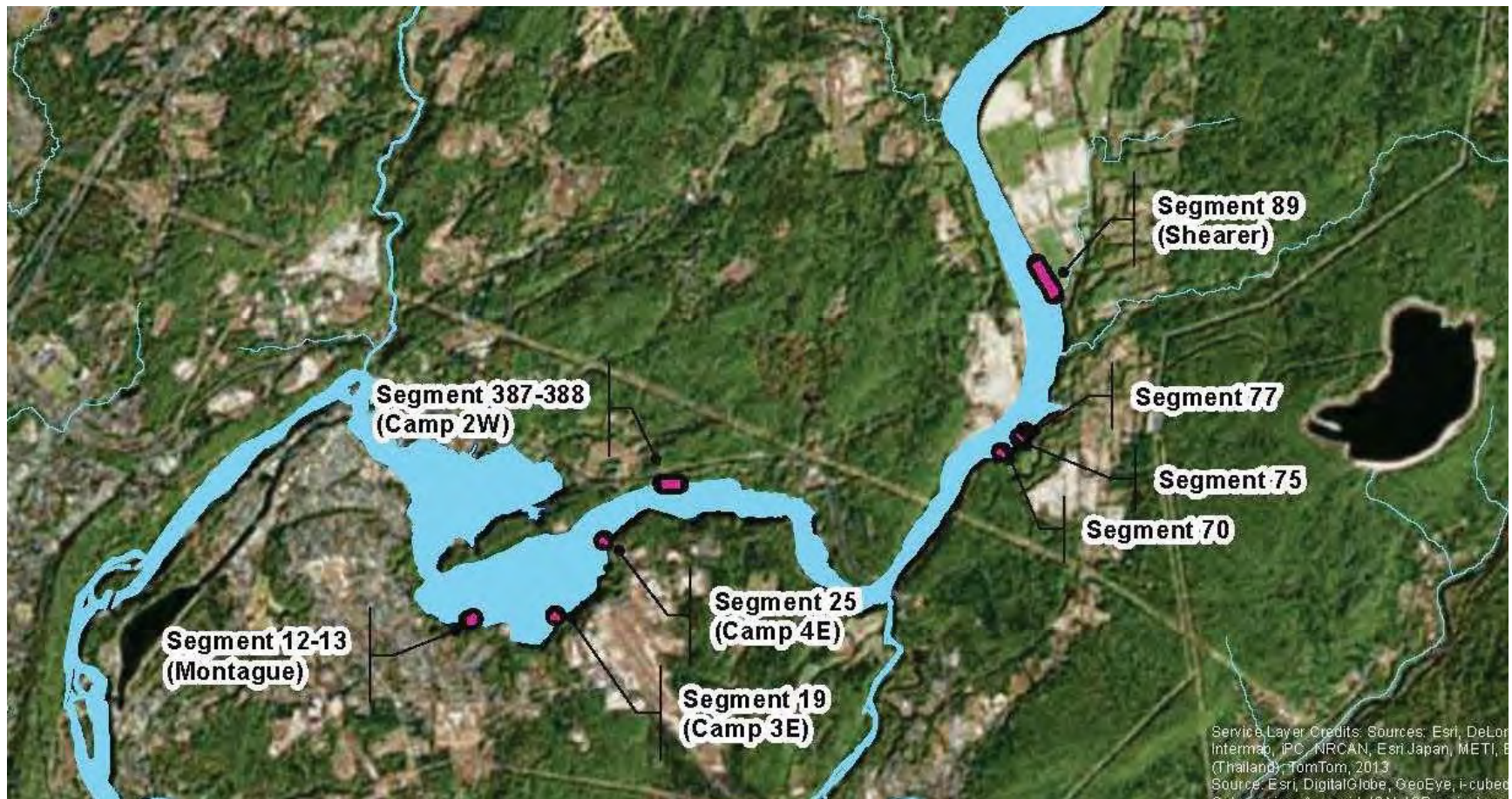
Findings (if any)

- 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 ($\mu\text{l/l}$) 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.

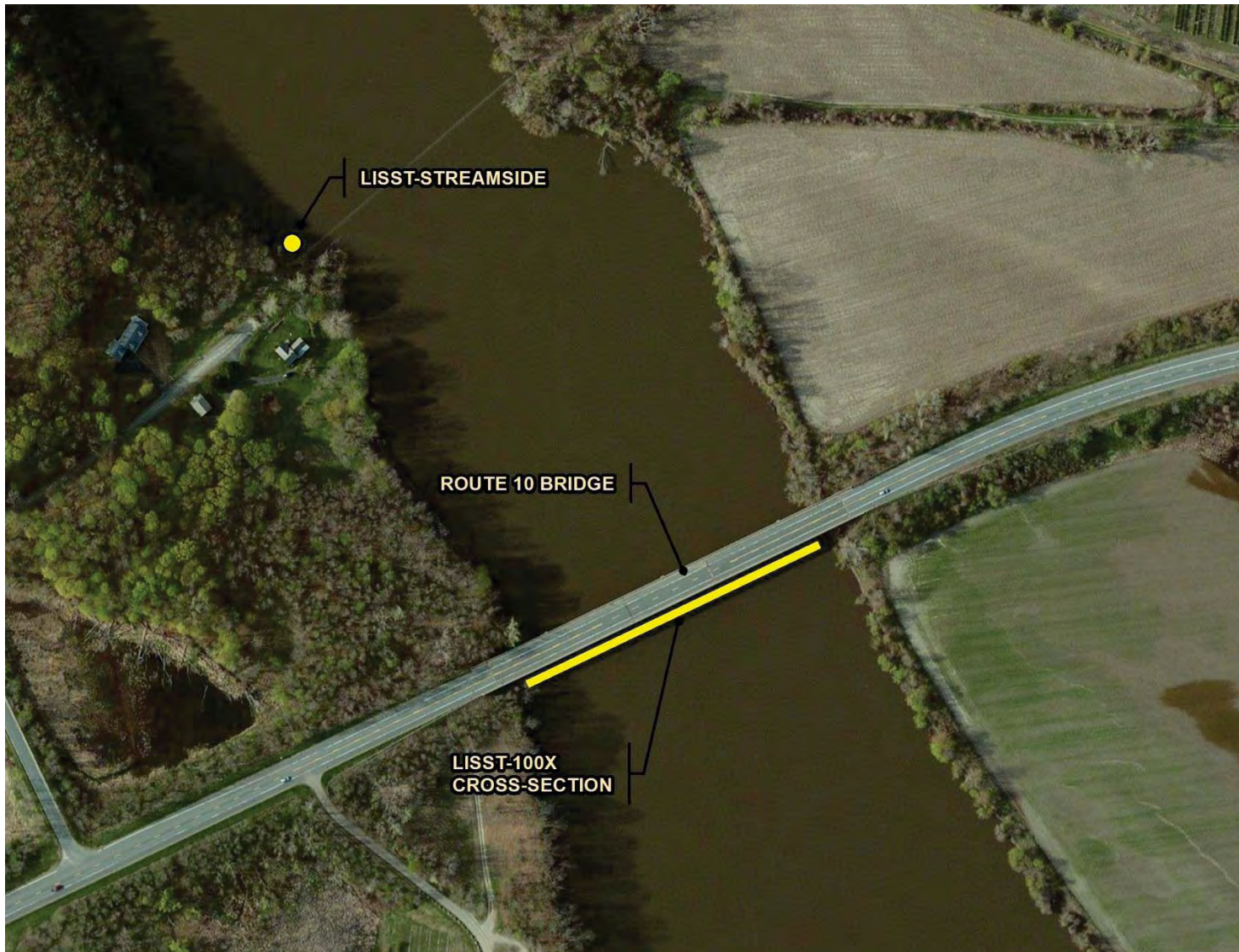
Variances (if any)

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

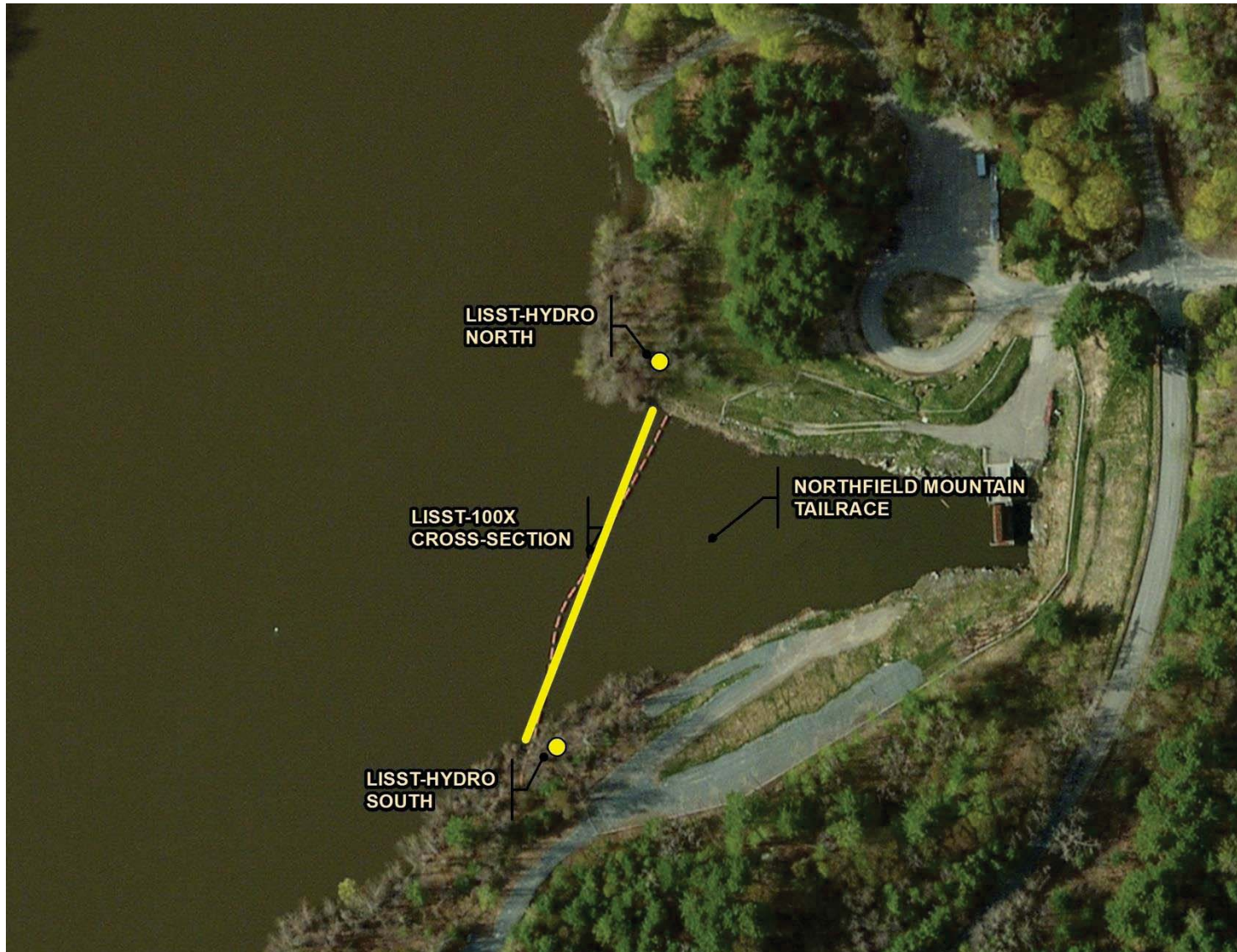
Work Remaining

- 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



Attachment B: FirstLight's Projected Schedule for Finalizing Study Reports

Study No.	Title	2014	2015				2016				2017			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
3.1.1	2013 Full River Reconnaissance	X												
3.1.2	Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability							X						
3.1.3	Northfield Mountain Project Sediment Management Plan	X				X								
3.2.1	Water Quality Monitoring Study						X							
3.2.2	Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot		X											
3.3.1	Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station						X							
3.3.2	Evaluate Upstream and Downstream Passage of Adult American Shad						X							
3.3.3	Evaluate Downstream Passage of Juvenile American Shad						X							
3.3.4	Evaluate Upstream Passage of American Eel at the Turners Falls		X											
3.3.5	Evaluate Downstream Passage of American Eel									X				
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						X							
3.3.7	Fish Entrainment and Turbine Passage Mortality Study						X							
3.3.8	Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays			X										
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			X										
3.3.10	Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River						X							
3.3.11	Fish Assemblage Assessment						X							
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	TBD												
3.3.13	Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat						X							
3.3.14	Aquatic Habitat Mapping of Turners Falls Impoundment			X										
3.3.15	Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Area						X							
3.3.16	Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in the CT River below Cabot Station		X(A)				X(B)							
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		X											
3.3.18	Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms		X											
3.3.19	Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace				X					X				
3.3.20	Ichthyoplankton Entrainment Assessment at the Northfield Mountain Pumped Storage Project							X						
3.4.1	Baseline Study of Terrestrial Wildlife and Botanical Resources			X										
3.4.2	Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats			X										

Study No.	Title	2014	2015				2016				2017			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
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			X										
3.6.1	Recreation Use/User Contact Survey					X								
3.6.2	Recreation Facilities Inventory and Assessment	X												
3.6.3	Whitewater Boating Evaluation		X											
3.6.4	Assessment of Day Use and Overnight Facilities Associated with Non-Motorized Boats		X											
3.6.5	Land Use Inventory					X								
3.6.6	Assessment of Effects of Project Operation on Recreation and Land Use						X							
3.6.7	Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use			X										
3.7.1	Phase IA, IB, and Phase II Archaeological Surveys	X												
3.7.2	Historic Structures Inventory and National Register Evaluation	X												
3.7.3	Traditional Cultural Properties Study		X											
3.8.1	Evaluate the Impact of Current and Proposed Future Modes of Operation on Flow, Water Elevation and Hydropower Generation										X			

Attachment C: Study No. 3.1.2 Northfield/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

On August 14, 2013 FirstLight filed its Revised Study Plan (RSP). On September 13, 2013, FERC issued its Study Plan Determination Letter (SPDL) on 20 of FirstLight's 38 proposed studies. FERC delayed issuing a SPDL on the remaining 18 studies because the Vermont Yankee (VY) Nuclear facility, which discharges heated water to the Vernon Impoundment for cooling purposes, is closing no later than December 29, 2014.¹ FERC held a meeting on November 25, 2013 with FirstLight and various stakeholders to determine which of the remaining 18 studies may need to be modified in light of the VY closure. In addition to the remaining 18 studies, Study No. 3.1.2 *Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability* for which FERC already issued a SPDL was mentioned as a study that may need to be re-evaluated due to the closure of VY. More specifically, it was noted at the November 25 meeting, that the Turners Falls Impoundment currently does not completely ice over, which could be attributable to VY's discharge of heated water to the Connecticut River for cooling purposes. On December 13, 2013, FERC issued an Interim ILP schedule for Study Plan Determination. In the letter FERC stated:

"In addition to the 19 deferred studies, stakeholders noted that the previously approved study 3.1.2: Project Impacts on Existing Erosion and Potential Bank Instability, did not consider ice process erosional effects within the Turners Falls reservoir. As a result, FirstLight requested that it be provided an opportunity to consider whether any modifications to the approved study are needed. Because any modifications to study 3.1.2 for this purpose could not be implemented in 2014 while Vermont Yankee is operational, we recommend that FirstLight evaluate the need for a study modification in consultation with stakeholders during the 2014 study season. FirstLight should present its findings and any proposed modifications to stakeholders, providing 30-days for stakeholder comment, and consider stakeholder input when determining the need for a modification to study 3.1.2. FirstLight should then present its findings and responses to stakeholder comments in its Initial Study Report (ISR) following the 2014 field season".

On August 12, 2014 FirstLight distributed to stakeholders an addendum to Study No. 3.1.2 which addressed how ice would be evaluated as a potential cause of erosion in the Turners Falls Impoundment. At the time of filing, FirstLight requested that comments be received no later than September 11, 2014 per FERC's December 13, 2013 letter. On September 11, 2014 the Connecticut River Watershed Council (CRWC) filed comments on the addendum. Enclosed is FirstLight's response to those comments.

CRWC Comment #1: Reviewing the CRREL database on historic ice jams along the Connecticut River, contacting USGS for similar information, and contacting TransCanada to obtain information about ice sheet development and ice break-up at their upstream hydropower facilities makes sense.

FirstLight Response: Comment noted.

CRWC Comment #2: CRWC recommends that 1) FirstLight collect field information and historical information on ice thickness, 2) that the study report include stage records or river level recordings for the

¹ Entergy, owners of the Vermont Yankee facility, indicated at a November 25, 2013 meeting with FERC that the facility will close no later than December 29, 2014.

winter, and 3) that FirstLight conduct pre-winter and post-winter surveys at established representative transects already monitored as part of this study.

FirstLight Response: To the extent that it is available FirstLight will review historical ice thickness data as part of its examination of CRREL, USGS, and TransCanada data. Due to site accessibility and safety concerns FirstLight does not propose to collect ice thickness data during winter 2015/2016 monitoring.

FirstLight maintains permanent water level recorders throughout the Turners Falls Impoundment (below Vernon, Northfield Mountain Tailrace, and Turners Falls Dam). To the extent that this data will inform the analysis of ice as a potential cause of erosion water level data will be reviewed and incorporated in the causation analysis. FirstLight does not propose installing additional water level recorders as part of this addendum.

Pre- and post-winter observations will be made at select detailed study sites to the extent they can be safely accessed. Pre-winter observations will include photographs, site sketches, and field notes of vegetation and riverbank conditions. Post-winter observations will include photographs, site sketches, field notes, and measurements of ice related damage to vegetation and riverbanks. The pre- and post-winter observations will then be compared to examine the impact of ice, if any, on bank instability and erosion.

CRWC Comment #3: Photos should verify ice thickness. They should be taken at the representative transect locations that are accessible in the winter. The sites listed in the proposal include many locations that are not interesting in terms of erosion (French King bridge, the Turners Falls dam), and in fact have little connection to the rest of the study. The addendum does not explain how FirstLight will know when the right time is for taking ice sheet formation and ice break-up photos. More detail is needed about how FirstLight staff and/or consultants plan to monitor the river and decide on the best day for a photograph. The site list should be modified to include sites that are already part of the study.

FirstLight Response: Currently the proposed locations where photographs will be taken and observations will be made as part of ice monitoring efforts include:

- Vernon Dam,
- confluence of Ashuelot River,
- Pauchaug Boat Launch,
- Route 10 Bridge,
- Northfield Tailrace,
- French King Bridge,
- confluence of Millers River, and
- Turners Falls Dam

The proposed sites were selected due to their accessibility during winter conditions once the snowpack has formed as well as for the vantage point each location provides of the river and its banks. Furthermore, these locations provide a well-balanced set of sites that are distributed throughout the geographic extent of the Impoundment. Selected locations include sites at the confluence of major Impoundment tributaries (Millers and Ashuelot Rivers) where ice jams could potentially form, hydraulic controls such as the French King Gorge, and features of interest such as the Turners Falls Dam and Northfield Mountain Tailrace.

Detailed study sites previously identified in the *Selection of Detailed Study Sites Report* were not selected for observation as these sites are not readily accessible during winter conditions once the snowpack has

formed, however, FirstLight will continue to refine the final list of monitoring locations and, if possible, include select detailed study sites if accessibility and safety issues can be resolved.²

FirstLight will conduct observations and take photographs along the Impoundment while sheet ice develops, as ice sheet formation occurs, during ice breakup, and after ice break up occurs. The primary factor in determining when to mobilize for field observations and photographs will be air temperature data both in the Impoundment and from upstream reaches. Information relative to ice behavior from upstream reaches will also be obtained as a means of comparison and to better understand when to expect ice formation to occur in the Impoundment.

CRWC Comment #4: As for correlating air temperature to ice formation and break-up, we recommend reviewing CRREL research in addition to using the Simons & Associates studies (for example, see <http://faculty.babson.edu/goldstein/goldsteingroup/TN04-3.pdf>). If local temperature and ice data will be used, please identify the source.

FirstLight Response: FirstLight will review the recommended literature prior to developing correlations between air temperature and ice formation and break-up. The final report for Study No. 3.1.2 will include the appropriate citations for all temperature and ice data used in developing this correlation.

CRWC Comment #5: Lastly, we recommend the field work for this component of Study 3.1.2 take place both this winter and next. Each winter is very different, and though Vermont Yankee may be operating this December, there may be information the rest of the winter will offer that won't be available the next winter. Moreover, if taking photographs at the right time proves to be difficult, the first winter could help iron out the kinks. Also, if FirstLight's temporary license amendment is approved by FERC, FirstLight will likely be asked to do a pre-winter and post-winter survey of bank transects that could fit nicely into this study as well.

FirstLight Response: Based on conversations with Entergy, the VY facility will be in operation until the end of December 2014. The objectives of this addendum are to examine the presence of ice as a potential cause of erosion when VY is offline and water temperatures are not affected by the release of heated water from VY into the Connecticut River. As such it is anticipated that river conditions during the winter of 2014/2015 will not meet the study criteria of this addendum. Given this FirstLight does not propose conducting any field investigations during the winter of 2014/2015. All field investigations associated with this addendum will occur between December 1, 2015 and March 31, 2016 once VY is offline for an entire winter.

Any data collected during relicensing efforts or as a result of the temporary amendment (if approved) that will inform the analysis of ice as a potential cause of erosion will be reviewed as appropriate.

² The *Selection of Detailed Study Sites Report* was filed with FERC by FirstLight on September 15, 2014 as a Appendix to the Initial Study Report for Study No. 3.1.2.

Hourly Average Generation Data
At Cabot Station by Unit
2009, 2011, 2012, 2013

Study Plan Nos. 3.3.3, *Evaluate Downstream Passage of Juvenile American Shad* and 3.3.5 *Evaluate Downstream Passage of American Eels* both include turbine survival testing. Per the Federal Energy Regulatory Commission's (FERC) February 21, 2014 Study Plan Determination Letter (SPDL), relative to Study No. 3.3.3, it was recommended that FirstLight consult with the United States Fish and Wildlife Service (USFWS), Massachusetts Division of Fisheries and Wildlife (MDFW), and National Marine Fisheries Service (NMFS) and establish the typical operating condition of each test turbine evaluated during the juvenile shad out-migration season. Relative to Study No. 3.3.5, FERC requested the same-consult with the same agencies and establish the typical operating condition of each test turbine evaluated during the study.

As noted in FirstLight's Initial Study Report (ISR) filing, consultation to date has included:

- On September 3, 2014 FirstLight sent consultation correspondence to the agencies and stakeholders describing best efficiency conditions and verified that the Cabot units and Station No. 1 units are typically operated at or near best efficiency.
- On September 4, 2014, NMFS, USFWS and Trout Unlimited (TU) replied and requested graphical depiction of the past 5 years of operational data at Cabot Station during the study period (August through November). Data was requested in MW and cfs.

This document is in response to an agency request for operational data at Cabot Station for the past 5 years (hourly) for the juvenile shad and American eel outmigration season (August 1 through November 30) to evaluate typical turbine operating conditions. FirstLight typically operates its Cabot Station units at or near best efficiency conditions. There are some exceptions when units operate below best efficiency, but they are uncommon.

This document includes generation information at Cabot Station for four (4) years (2009, 2011, 2012 and 2013) during the months August to November. Cabot Station has six (6) identical units. Data for 2010 was excluded as generation by unit was not readily available. In addition, the Northfield Mountain Pumped Storage Project did not operate during most of the August through November 2010 period due to the silt incident. Because of this, Cabot operations may not be representative of "normal" conditions.

Data was generated by averaging 15 minute generation (MW- megawatt) data by unit by hour. The frequency of the hourly average generation was recorded and plotted by unit and year. The total number of "points" plotted equals the number of days from August 1 to November 30 (122 day) times 24 hours/day or 2,928 points.

As demonstrated in Table 1 and the attached graphs, most times the Cabot units were either off (0-1 MW generation interval) or running at or near best efficiency conditions (9-10 and 10-11 MW generation intervals). Generally, generation reported between 9 and 11 MW represents near best gate efficiency as generation varies with tailwater elevation. During high flows (high tailwater) -- a Cabot unit may generate closer to 9 MW. Alternatively, under normal or low flows (low tailwater) -- a Cabot unit may generate closer to 10.3 MW (full capacity). In either case, the amount of water conveyed through the unit is similar. Overall, the generation data and supporting graphs demonstrate that the units operate near best efficiency the majority of the time over this period.

Data was requested to be depicted in generation (MW) and flow (CFS). Generation data is recorded in MW; however, the flow was indirectly calculated. The flow ranges, as shown in Table 1, were calculated using a conversion factor of: 1 kWH ~0.2214 cfs.

Table 1: Hourly Average Counts of Generation and Flow by Unit at Cabot Station from August 1 to November 30, 2009 to 2013 (2010 excluded).

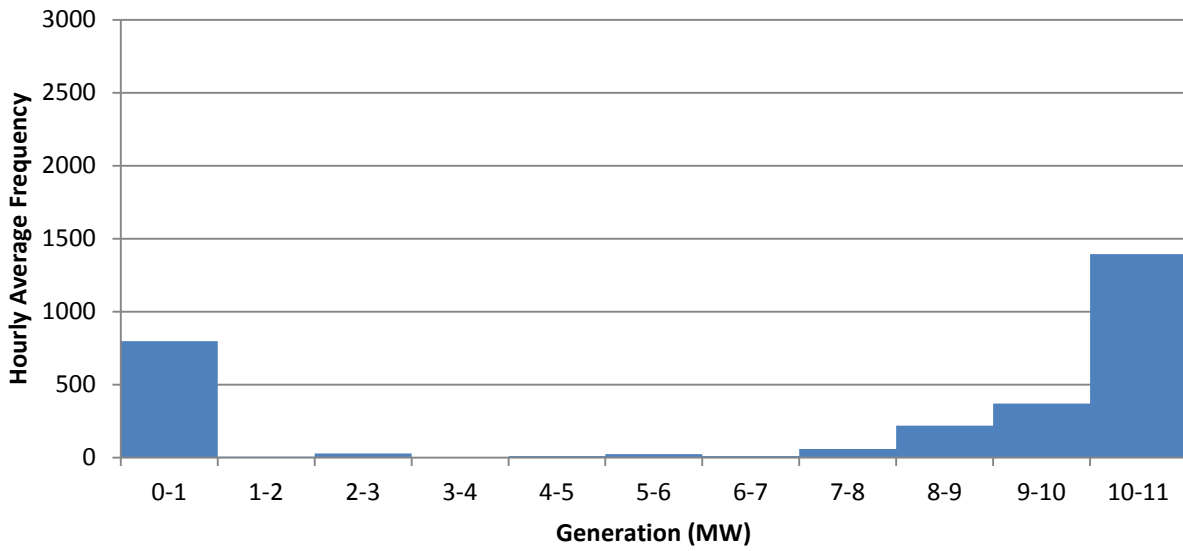
2009							
Generation Range (MW)	Flow Range (cfs)	Unit 1 Frequency	Unit 2 Frequency	Unit 3 Frequency	Unit 4 Frequency	Unit 5 Frequency	Unit 6 Frequency
0-1	0-220	799	958	536	1190	1548	1144
1-2	221-442	6	2	0	3	4	4
2-3	443-663	29	30	15	39	43	23
3-4	664-885	5	7	2	5	2	3
4-5	886-1106	12	13	9	19	15	12
5-6	1107-1327	25	28	18	48	32	23
6-7	1328-1549	10	12	14	7	8	27
7-8	1550-1770	59	88	123	91	51	150
8-9	1771-1992	219	156	331	122	103	317
9-10	1993-2213	370	431	541	528	330	437
10-11	2214-2435	1395	1204	1340	877	793	788

2011							
Generation Range (MW)	Flow Range (cfs)	Unit 1 Frequency	Unit 2 Frequency	Unit 3 Frequency	Unit 4 Frequency	Unit 5 Frequency	Unit 6 Frequency
0-1	0-220	845	1539	553	1379	1046	890
1-2	221-442	4	2	1	4	2	4
2-3	443-663	21	28	14	35	47	24
3-4	664-885	5	7	21	12	1	2
4-5	886-1106	25	21	32	7	13	6
5-6	1107-1327	35	25	23	19	24	20
6-7	1328-1549	16	17	49	48	19	35
7-8	1550-1770	81	61	86	105	74	73
8-9	1771-1992	98	76	122	164	145	173
9-10	1993-2213	357	189	468	536	395	590
10-11	2214-2435	1442	964	1560	620	1163	1112

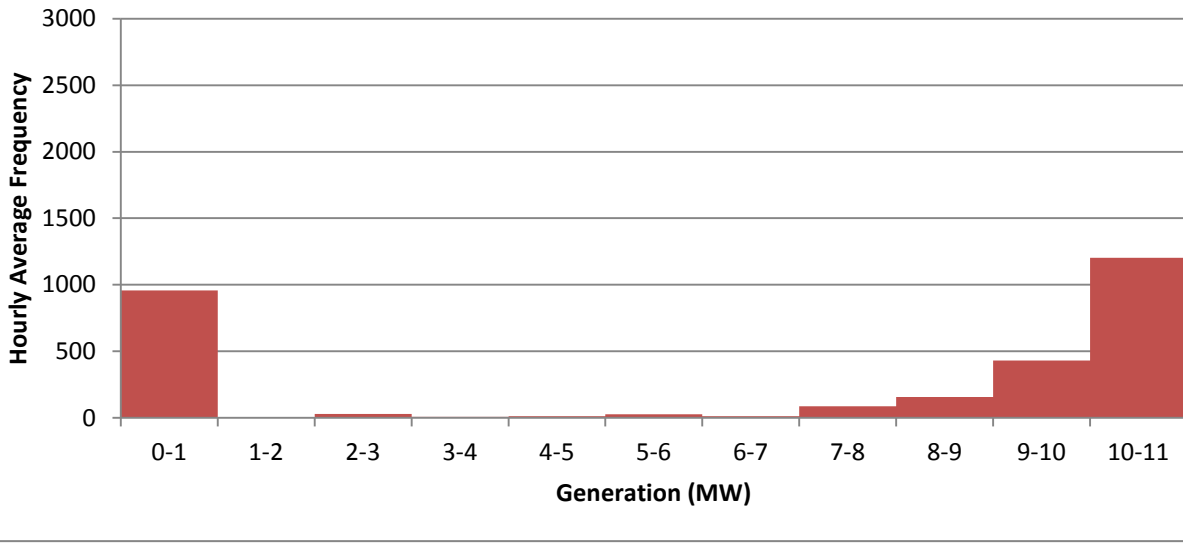
2012							
Generation Range (MW)	Flow Range (cfs)	Unit 1 Frequency	Unit 2 Frequency	Unit 3 Frequency	Unit 4 Frequency	Unit 5 Frequency	Unit 6 Frequency
0-1	0-220	881	2049	1794	2778	1836	2039
1-2	221-442	1	0	2	0	4	1
2-3	443-663	27	45	43	12	39	43
3-4	664-885	10	1	1	0	0	3
4-5	886-1106	13	1	4	1	13	6
5-6	1107-1327	29	29	34	8	36	32
6-7	1328-1549	7	0	3	0	2	3
7-8	1550-1770	53	38	50	8	43	46
8-9	1771-1992	187	4	7	0	1	2
9-10	1993-2213	159	92	156	12	164	107
10-11	2214-2435	1562	670	835	110	791	647

2013							
Generation Range (MW)	Flow Range (cfs)	Unit 1 Frequency	Unit 2 Frequency	Unit 3 Frequency	Unit 4 Frequency	Unit 5 Frequency	Unit 6 Frequency
0-1	0-220	294	1481	1768	1861	1887	2145
1-2	221-442	1	3	1	2	0	0
2-3	443-663	8	43	34	43	40	40
3-4	664-885	0	3	6	2	0	0
4-5	886-1106	2	8	7	2	9	4
5-6	1107-1327	7	44	29	35	37	34
6-7	1328-1549	1	1	0	0	0	0
7-8	1550-1770	82	43	27	41	40	37
8-9	1771-1992	401	5	75	2	1	0
9-10	1993-2213	216	69	72	53	73	72
10-11	2214-2435	1917	1229	910	888	842	597

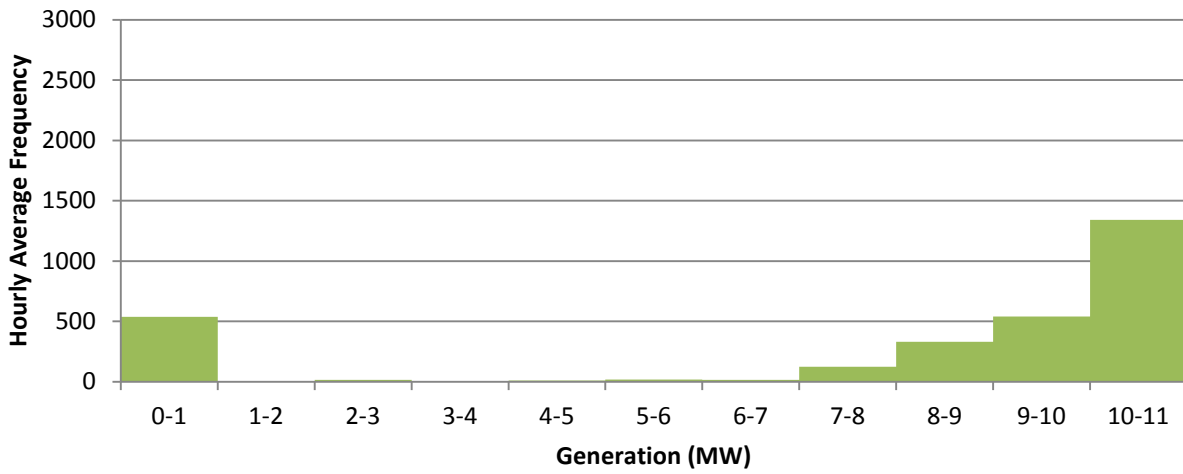
2009 Hourly Average Generation Frequency Cabot Station Unit 1



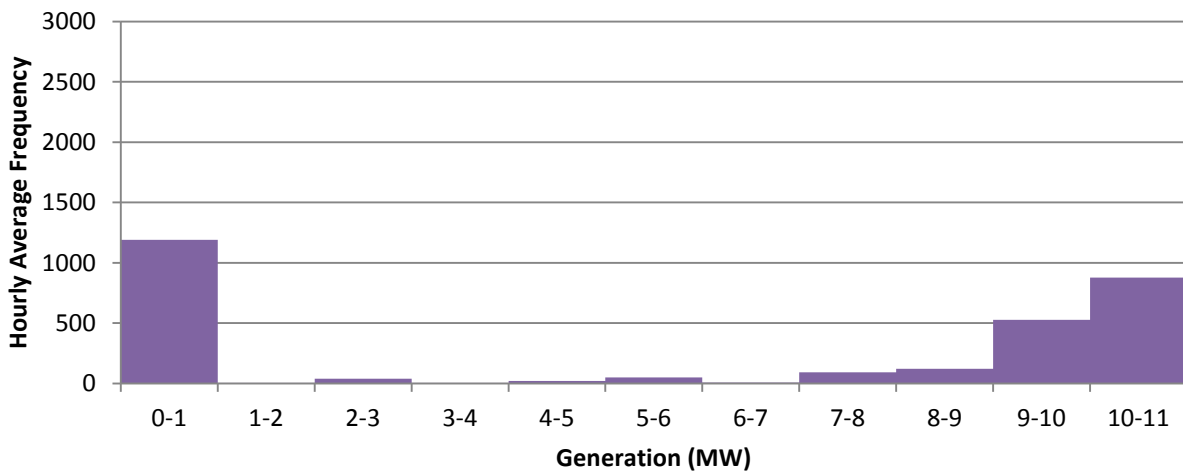
2009 Hourly Average Generation Frequency Cabot Station Unit 2



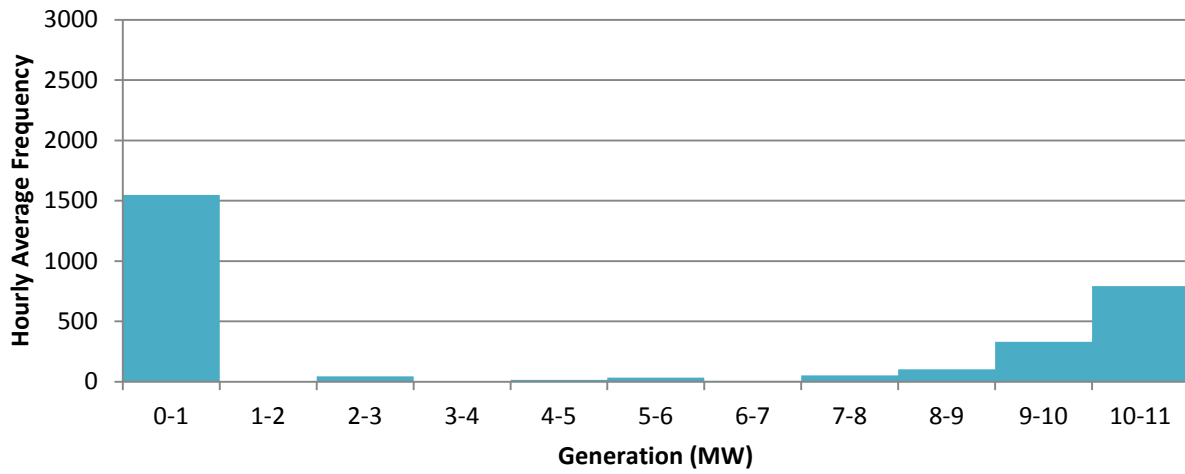
2009 Hourly Average Generation Frequency Cabot Station Unit 3



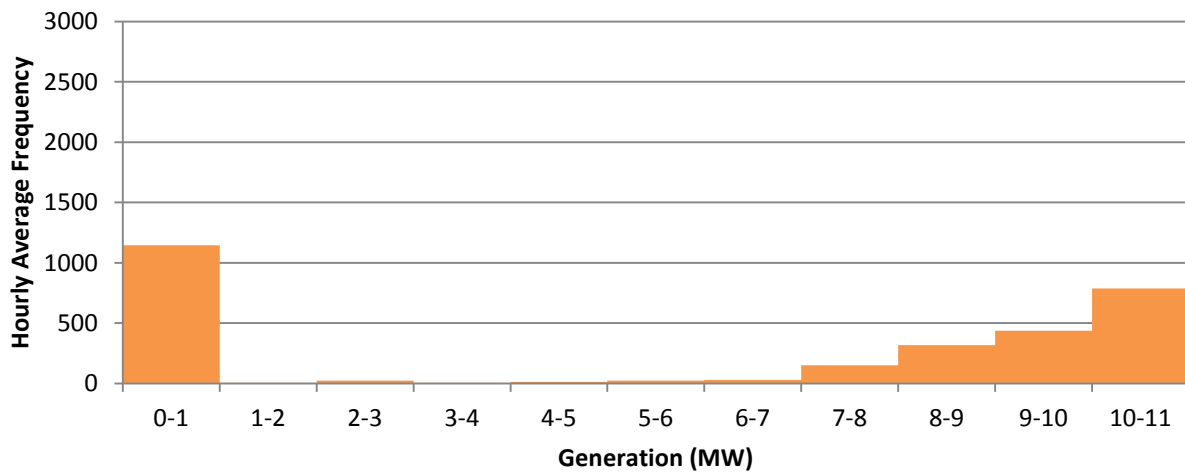
2009 Hourly Average Generation Frequency Cabot Station Unit 4



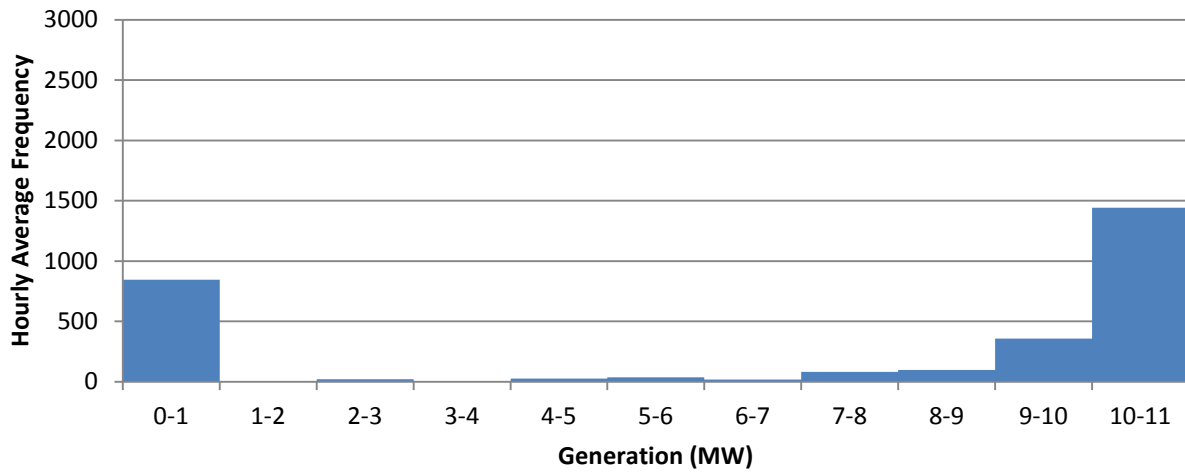
2009 Hourly Average Generation Frequency Cabot Station Unit 5



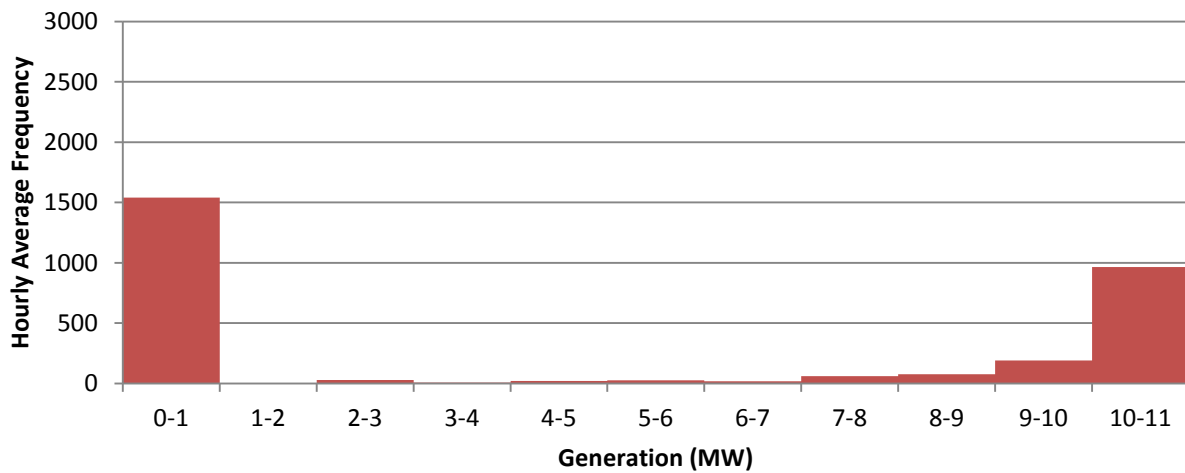
2009 Hourly Average Generation Frequency Cabot Station Unit 6



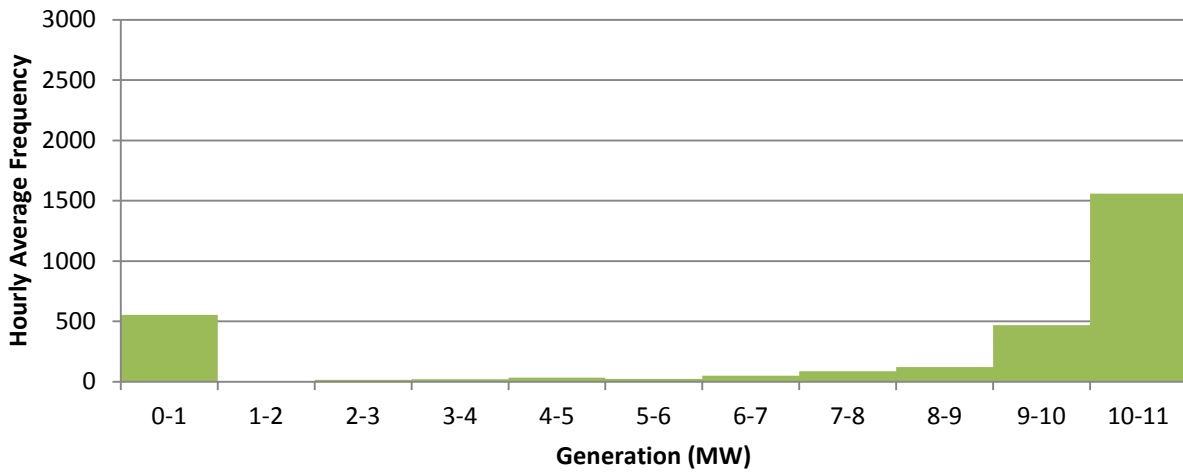
2011 Hourly Average Generation Frequency Cabot Station Unit 1



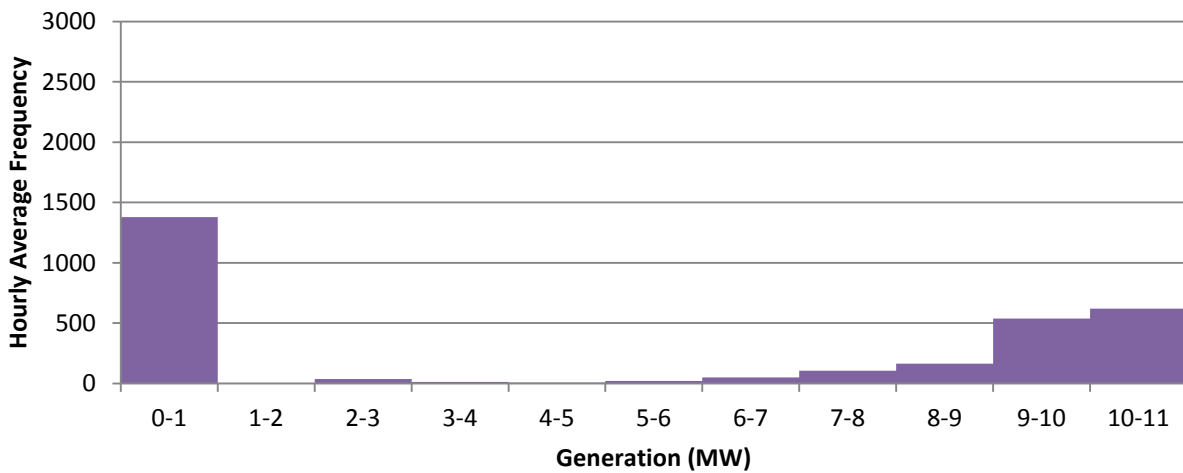
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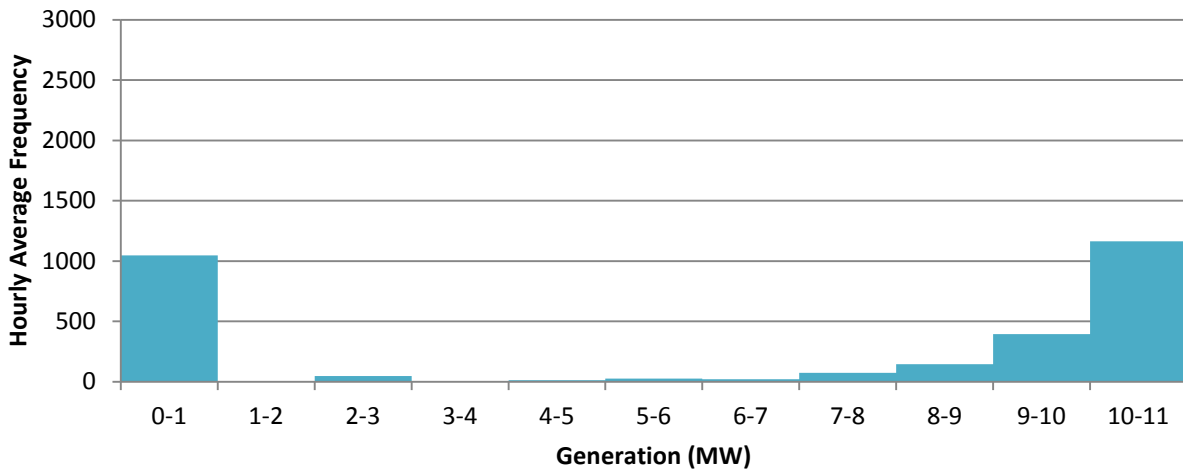
2011 Hourly Average Generation Frequency Cabot Station Unit 3



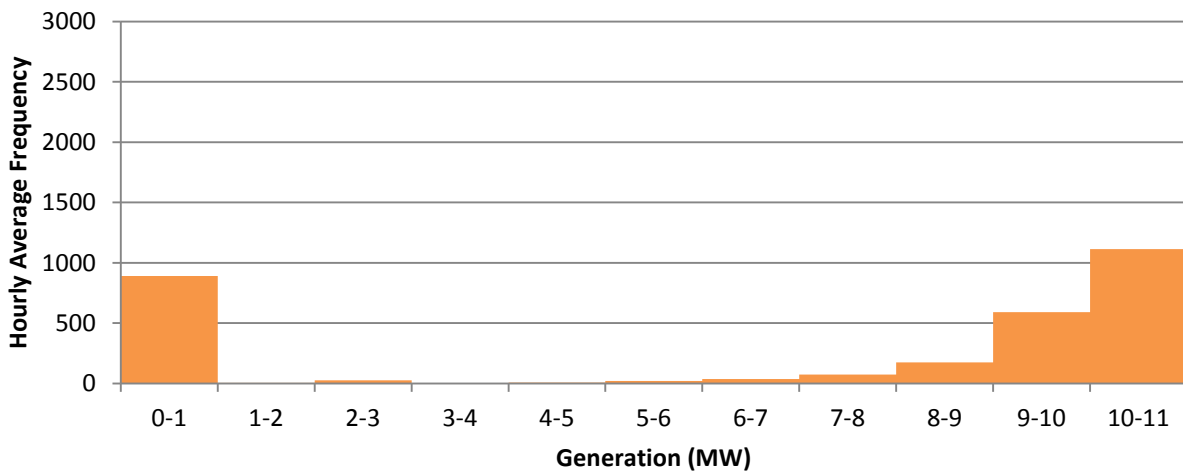
2011 Hourly Average Generation Frequency Cabot Station Unit 4



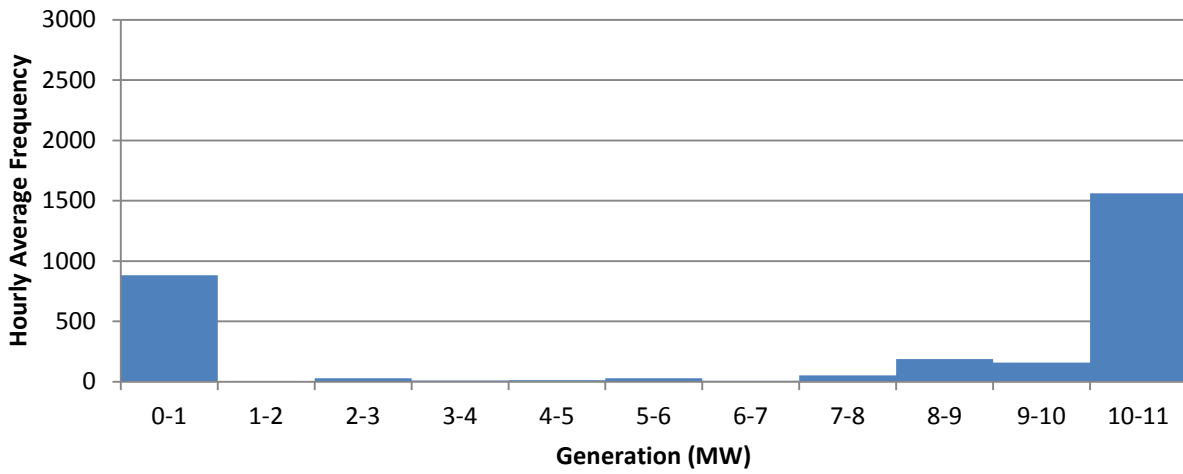
2011 Hourly Average Generation Frequency Cabot Station Unit 5



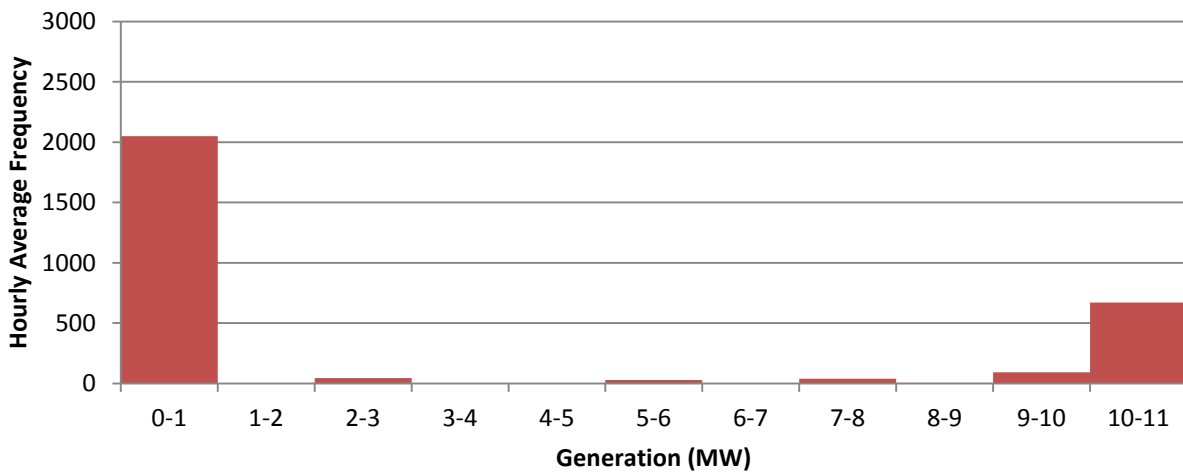
2011 Hourly Average Generation Frequency Cabot Station Unit 6



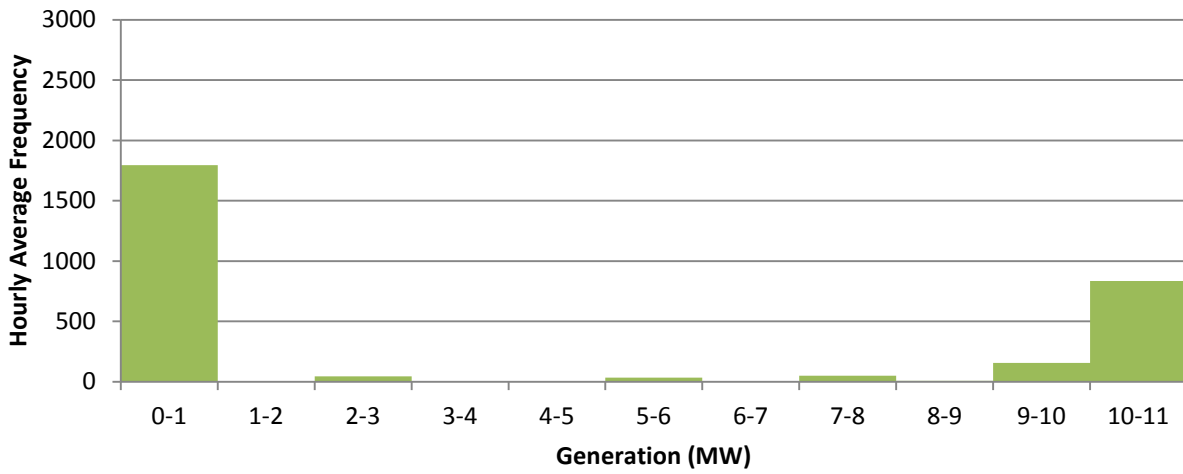
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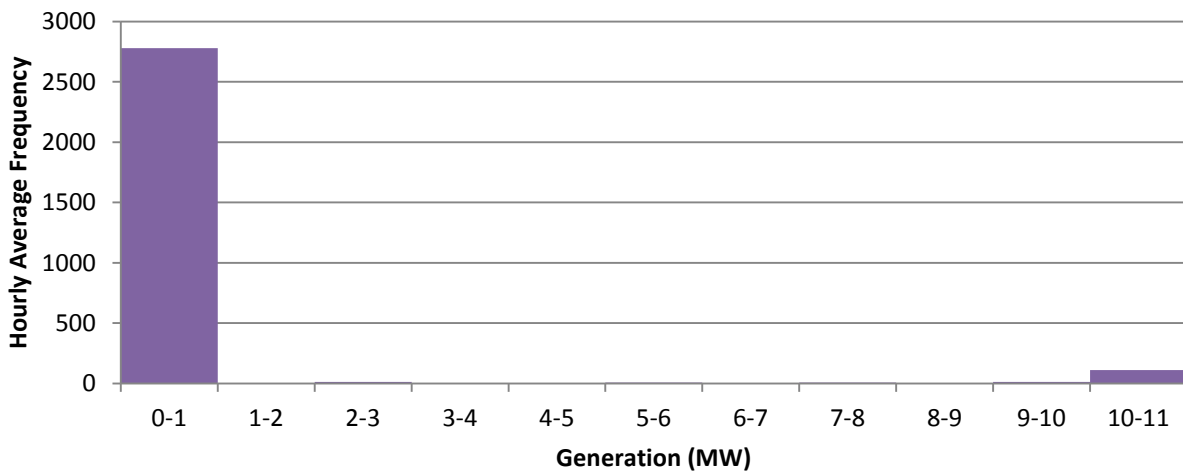
2012 Hourly Average Generation Frequency Cabot Station Unit 2



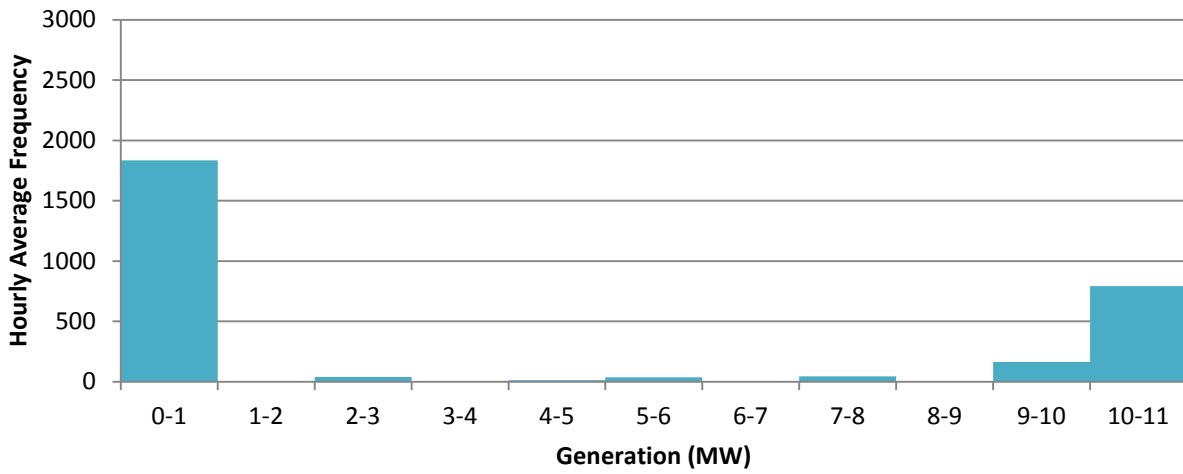
2012 Hourly Average Generation Frequency Cabot Station Unit 3



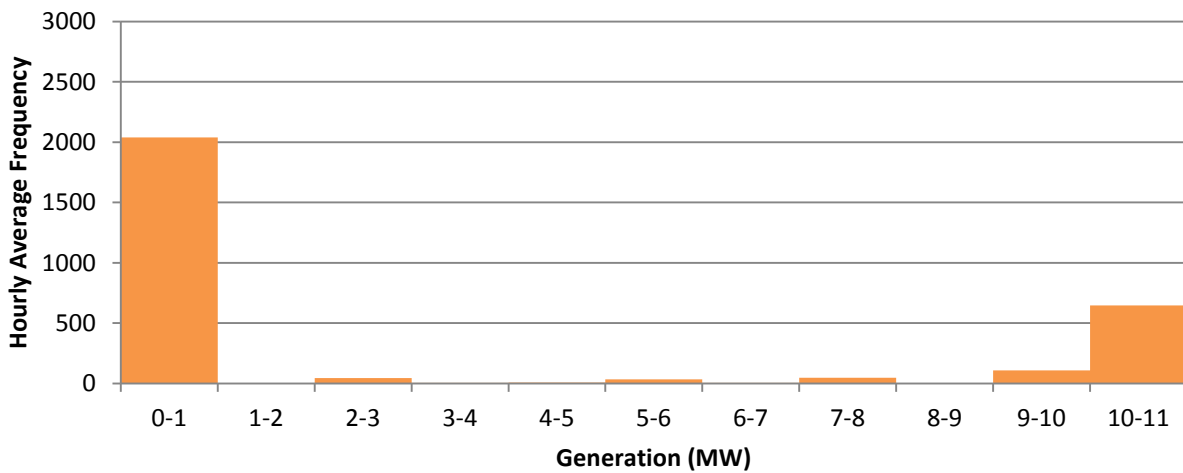
2012 Hourly Average Generation Frequency Cabot Station Unit 4



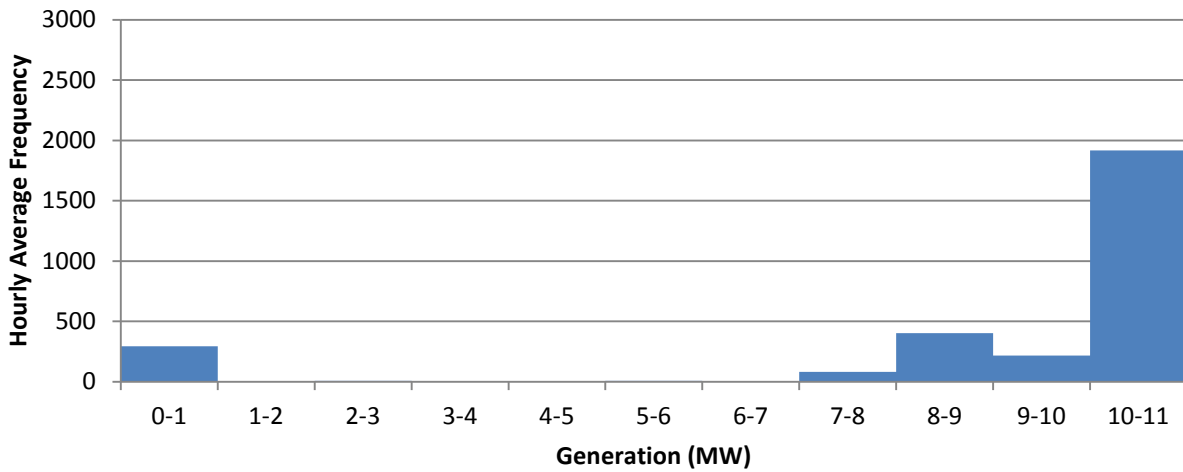
2012 Hourly Average Generation Frequency Cabot Station Unit 5



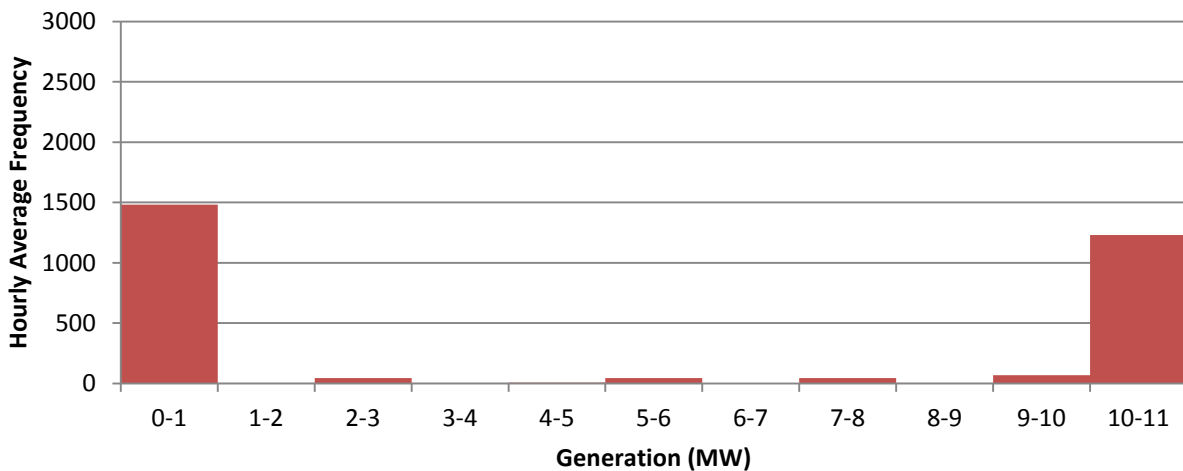
2012 Hourly Average Generation Frequency Cabot Station Unit 6



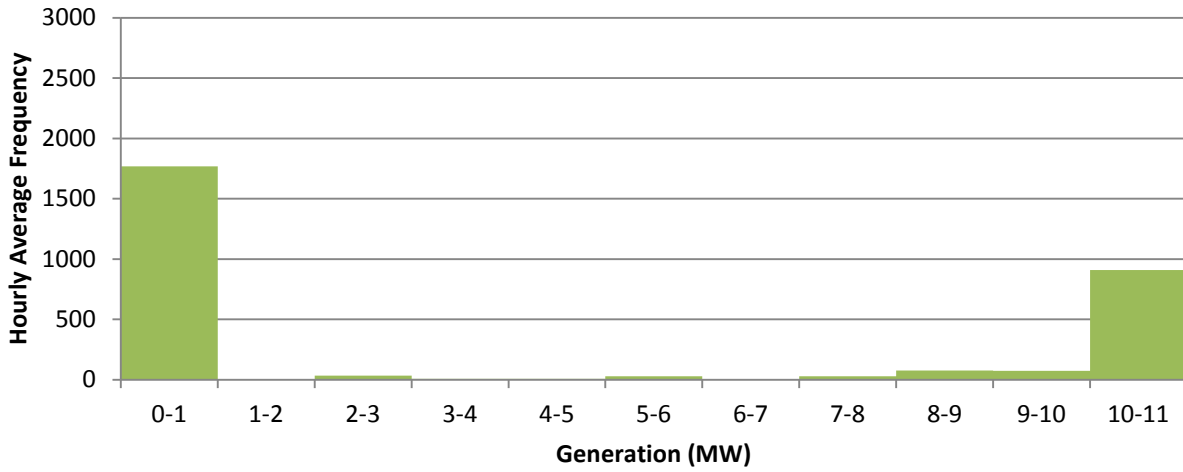
2013 Hourly Average Generation Frequency Cabot Station Unit 1



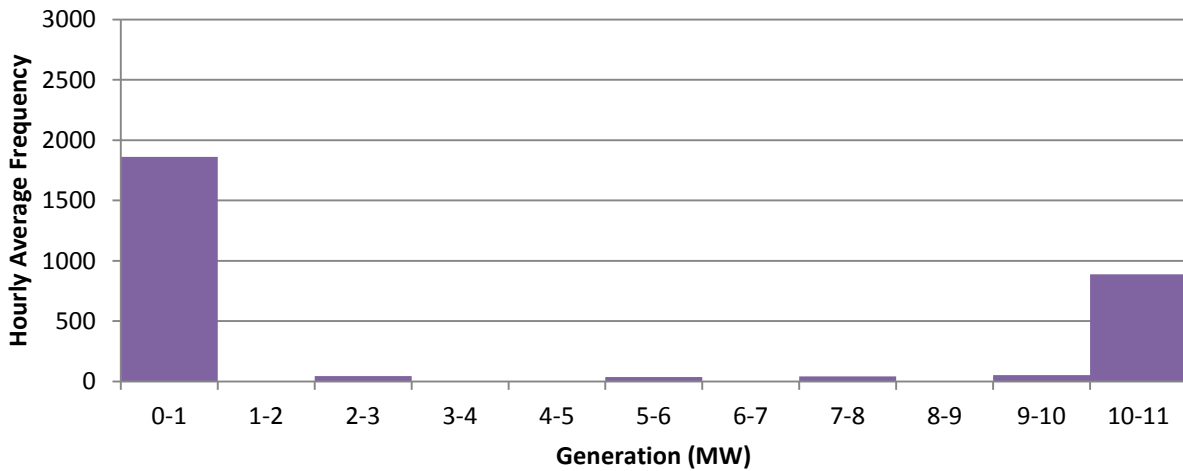
2013 Hourly Average Generation Frequency Cabot Station Unit 2



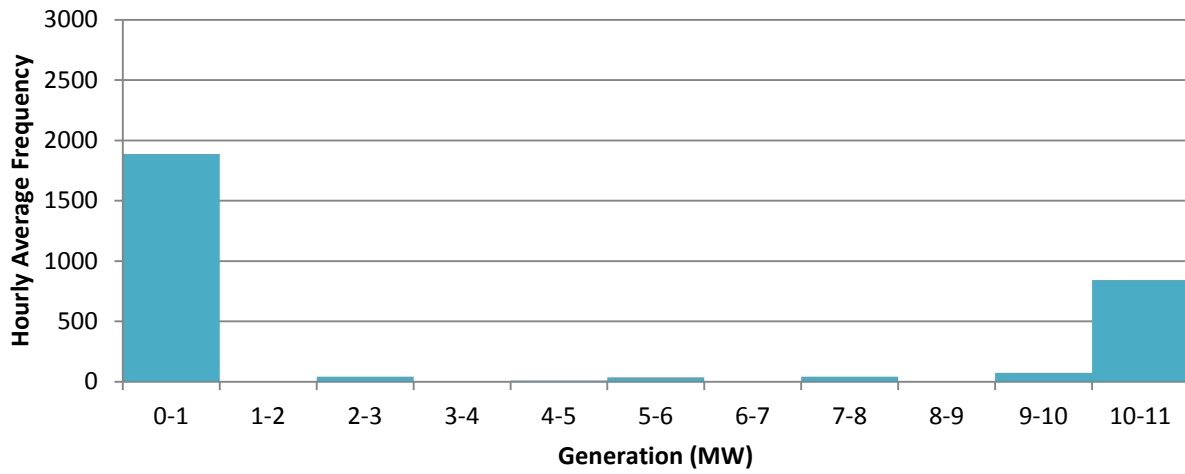
2013 Hourly Average Generation Frequency Cabot Station Unit 3



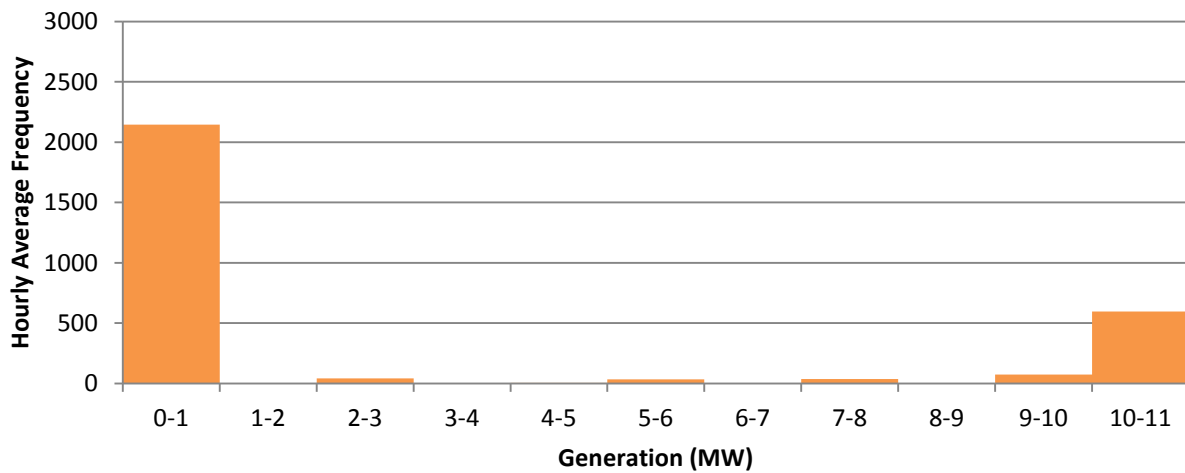
2013 Hourly Average Generation Frequency Cabot Station Unit 4



2013 Hourly Average Generation Frequency Cabot Station Unit 5



2013 Hourly Average Generation Frequency Cabot Station Unit 6



Attachment E: Study No. 3.3.11 Fish Assemblage Assessment

In its February 21, 2014 Study Plan Determination, the Federal Energy Regulatory Commission (FERC) required FirstLight to consult with the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MDFW) and FERC staff on an amendment to the revised study plan for Study No. 3.3.11 that would "*seek to avoid all effects to shortnose sturgeon and provide sufficient information needed by the jurisdictional agencies and the Commission for their needs.*"

On June 3, 2014, FirstLight held a meeting with stakeholders (John Warner, Ken Sprankle, Melissa Grader, USFWS, Caleb Slater, MDFW, Jessica Pruden, Bill McDavitt, NMFS - participated via phone, Ken Hogan, FERC- participated via phone, Katie Kennedy, The Nature Conservancy, Andrea Donlon, Connecticut River Watershed Council) to discuss possible ways to modify the study to avoid interactions with shortnose sturgeon. With respect to the bypass reach, FirstLight proposed to sample after June 30, after the sturgeon spawning season concludes. For the reach below Cabot Station, FirstLight proposed to use existing data and data it obtains in the Turners Falls Impoundment to characterize the fish assemblage. Some stakeholders suggested that snorkeling could be a viable alternative in the reach below Cabot Station. FirstLight subsequently communicated to USFWS and NMFS that it was not proposing any changes to the proposed study.

On September 9, Melissa Grader, USFWS, emailed FirstLight proposed amendments to Study Plan 3.3.11 (Appendix A). USFWS essentially recommended that FirstLight conduct visual observations downstream of Cabot Station and in other riverine reaches using snorkeling, SCUBA diving, or hookah diving. FirstLight reviewed the proposed amendments and has the following concerns/comments on the proposed amendments.

- The sampling design in the other reaches calls for a relatively high statistical precision, for example "*stratified random sampling ... results in substantial improvement in precision when variation within strata (mesohabitat type) is less than variation among strata*".... " *a stratified-random sampling design will be utilized to provide unbiased and precise fish assemblage data.*" The use of the proposed visual sampling technique in the lower reach will result in bias and statistical imprecision that will render the data inconsistent with other reaches and may lead to biased conclusions. Specifically:
- Small, similar looking species such as cyprinids and centrarchids cannot be accurately identified;
- The likelihood of miscounting fish is very high due to missed fish or double counting;
- Pelagic schooling fish such as young-of-year alosids are unlikely to be accurately enumerated;
- Accurate enumeration, weighing, and total length metrics cannot be collected;
- Fish size estimates may be biased due to light refraction and magnification (Thurow *et al.* 2013);
- Many species flee, hide, or attack when approached by a diver (Thurow *et al.* 2013);
- Sampling accuracy can only be validated by comparing with electrofishing estimates; however, such estimates cannot be performed (Thurow *et al.* 2013). Such calibrations performed in other

river reaches are not likely applicable to the study area in question due to habitat disparity that could affect gear differentially;

- Bonar, *et al.*, 2009, recommend visual observations as an alternative to sampling for surveys in wadeable streams, and coldwater rivers, however it is *not* a recommended method for large warmwater rivers. The Connecticut River below Cabot station is most closely classified as **Warmwater river** according to Bonar *et al* (2009). Not surprisingly the type of fish assemblage documented by recent electrofishing surveys in the reach below Cabot is also characteristically a warmwater fish assemblage (Yoder, et al. 2009).
 - **Coldwater wadable streams** are defined as “generally less than 1 m deep, and fish can be sampled without the use of water craft. Cold waters are defined as having mean 7-d summer max water temperatures of less than 20°C and providing habitat for coldwater fishes.” **Rivers** are large natural streams ... most effectively and safely sampled from a boat or raft. ... because of current velocities or depths of pools and runs, they are generally unwadable over segments of 10–100 mean wetted channel widths. In most instances, coldwater rivers are occupied by trout and salmon, sculpins, or other coldwater taxa. Midsummer temperatures in the main stems of coldwater rivers usually do not exceed 20 C, although coldwater habitats (e.g., groundwater springs or tributary inputs) may support coldwater species during periods when temperatures are greater than 20 C. The water in coldwater rivers can vary in color (0.5–4.0 mg dissolved organic carbon per liter), turbidity (0–10 nephelometric turbidity units), and conductivity (25–1,000 mS/ cm). Nutrient and chloride concentrations are usually low.
 - **Warmwater river:** Large warmwater rivers are complex ecosystems and often contain numerous species and habitats. We loosely define a large river as having a drainage area greater than 50,000 km² and a stream order great than six. Further, these rivers typically have mean discharges greater than 1,500 m³/s. Channel patterns are highly variable among and within large rivers, generally forming a meandering pattern. Currently, many large rivers are confined by bank stabilization and are characterized by a straight channel because of anthropogenic alterations. Further, most large rivers in North America have altered hydrographs because of main-stem dams or dams within the drainage area. Large rivers that have been modified to reduce meandering and flooding present challenges for deployment and operation of fish sampling gear.

FirstLight’s proposed plan to sample the bypass reach after June 30th and use existing data on the fish assemblage below Cabot, as well as the data it obtains in the Turners Falls Impoundment, to characterize the fish assemblage for the reach below Cabot Station will provide sufficient baseline information about species composition and relative abundance in the Project area to meet the goals and objectives of the study (Appendix B). Snorkeling or other visual observation will not produce useful information. Therefore, FirstLight does not agree with the recommendation to conduct visual observations below Cabot.

USFWS edits to Study No. 3.3.11. Additions are show by the text underlined.

Appendix A

3.3.11 Fish Assemblage Assessment

Methodology (18 CFR § 5.11(b)(1), (d)(5)-(6))

The study area includes the Connecticut River from Vernon Dam to the Route 116 Bridge in Sunderland. The study will employ a stratified-random sampling design. The study area will be divided into strata based on mesohabitat type. Proposed sampling methods include daytime boat electrofishing, nighttime boat electrofishing, gill nets, seine nets, and visual observation. Sampling will be performed during the early summer (June) and again in the fall (September).

The stratified random sampling design will randomly assign sampling stations within particular mesohabitat types in proportion to their linear habitat distance. Thus for mesohabitat types having a larger proportion of linear mesohabitat, more random sites will be assigned. A stratified random sample will capture key population characteristics that are proportional to the overall Connecticut River fish assemblage. Furthermore, stratified random sampling performs as well or better than simple random sampling and results in substantial improvement in precision when variation within strata (mesohabitat type) is less than variation among strata (Hansen, Beard and Hayes 2007). In stratified random sampling, an estimate for the whole population is obtained by weighting estimates from each stratum by the fraction of the whole population contained in each stratum. It is important to note that stratified random sampling requires that the entire sampling frame be divided into strata before sampling begins (Hanson, Beard and Hayes 2007). Multiple methods of fish capture will be used in each stratum, except in the riverine reach below Cabot Station where only visual observation methods will be used to avoid impacts to shortnose sturgeon. Selected locations within each station will be sampled either by day and night-time boat electrofishing (shoreline and littoral habitat), gill nets (deeper, benthic areas), seine net (wadeable shoreline and littoral habitat), and visual observation (shoreline, littoral, or benthic habitat) during the early summer and again in the fall. The exact number of sampling locations will be dependent on the weighted stratification of the study area by mesohabitat but it is anticipated that at least 18 stations will be sampled during each sampling event.

Stakeholders requested an additional spring sampling. FirstLight is not proposing to sample during the spring for the following reasons: 1) Anadromous fish will be available for capture during the proposed early summer collection. 2) The fall collection will occur when young-of-the-year (age-0+) fish had grown to sizes such that they were readily susceptible to capture using various sampling gears. 3) All species of fish that are found within the study area should be readily captured during the early summer and fall sampling events that FirstLight proposes. 4) FirstLight is proposing to conduct a comprehensive survey of the nesting fish in the littoral zone during the spring which will provide information on the occurrence, distribution, and relative abundance of these fish species.

Task 1: Sampling Location Selection

During this assessment, a stratified-random sampling design will be utilized to provide unbiased and precise fish assemblage data. The proposed design incorporates general river morphology along with mesohabitat through the use of strata and sub-strata. To accomplish this, the underlying strata allow for delineation of the study area spatially, based on locations where changes in river morphology occur. For all areas downstream of Cabot Station to the Route 116 Bridge, mesohabitat sub-strata were derived from surveys performed during 2012. Alternatively, the bypass reach contains the greatest diversity of mesohabitats, but each mesohabitat segment is relatively small; thus, random stations will be selected from shoreline, deep water, and tailwater habitats such that a representative sample from multiple habitats

will be collected. Sub-strata in the Turners Falls Impoundment will be derived from bathymetry data, because the impoundment contains areas with relatively deep water.

Due to inherent variability of flows, water levels, and likely fish movements within the study area, different sampling locations will be selected for each sampling event; this statistically valid practice will avoid bias. Prior to field sampling, stations to be sampled will be selected to ensure all mesohabitat types are adequately represented. Mesohabitat types include:

- **Riffle:** shallow, moderate velocity, turbulent, high gradient, moderate to large substrates (cobble/gravel)
- **Rapid:** shallow, moderate to high velocity, turbulent, chutes and eddies present, high gradient, large substrates or bedrock
- **Run:** moderately deep to deep, well defined non-turbulent laminar flow, low to moderate velocity, well defined thalweg, typically concave stream geometry, varying substrates, gentle slope
- **Glide:** moderately shallow, well defined non-turbulent laminar flow, low velocity, well defined thalweg, typically flat stream geometry, typically finer substrates, transitional from pool
- **Pool:** deep, low velocity, well defined hydraulic control at outlet
- **Backwater:** varying depth, minimal or no velocity, long backwatered reaches
- **Impounded:** varying depth, low velocity influenced by the presence of a dam
 - **Nearshore/Shallow:** less than 8ft in depth
 - **Mid-Channel**
 - **Deep water:** depths greater than 20ft

Alternative sampling locations will also be identified by mesohabitat in case a selected sampling station is inaccessible.

Task 2: Fish Capture

FirstLight anticipates using a variety of techniques to sample the various habitat types within the study area, including day and nighttime boat electrofishing, gill netting, seining, and visual observation as described below. The type of gear utilized will be largely dictated by habitat type, with visual observation methods used at riverine sampling stations. In addition to biological data, supporting data will also be collected for each sample site including: location (GPS), sampling gear type, sampling effort, mesohabitat type, average depth, average velocity, river flow, water temperature, turbidity, predominant substrate, time of day, day of year, presence of cover, and proportion of vegetation cover. All data will be recorded on dedicated data sheets. Upon return from the FGS, data sheets will be review for quality assurance and archived.

The MADFW has recommended that sampling include the use of eel pots. Boat electrofishing is effective at collecting eel within the littoral habitat and will therefore be adequately represented within the sampled fish assemblage. The sampling effectiveness of collecting eel in the Connecticut River was demonstrated by Yoder (unpublished data 2009) whom found that the American eel was the most abundant species collected using boat electrofishing methods in the Connecticut River below the Holyoke Dam. The VANR has recommended the use of a benthic trawl; however, FirstLight proposes to use gill nets to sample deeper sections of the river.

Boat Electrofishing

Due to the presence of spawning and juvenile surgeon in the bypass reach during the spring, no electrofishing will be performed in this stratum from April 15 – June 30 as suggested by the NMFS.

Boat electrofishing will occur during the daytime and night. All electrofishing transects will be standardized by time (500 seconds fished) such that a catch per unit effort (CPUE) may be calculated. Boat electrofishing can effectively sample fish from most near-shore littoral habitats present within the Connecticut River (typically 10 feet deep or less).

Electrofishing will be accomplished with the use of a 16-ft jonboat rigged with a pulsed-DC Smith-Root GPP 5.0 electrofisher with the capacity to adjust the pulse rates between 30 - 120 pulses/second and vary voltage to accommodate ambient conductivity. The electrode array includes an array of cathodes suspended from the bow to a depth of approximately six feet to project the electric field into both the shoreline epibenthic zone, as well as the upper water column. The anode array is suspended from the bow on an adjustable boom. Both anodes and cathodes will be configured to optimize the electric field under ambient low conductivity conditions. A smaller vessel capable of negotiating riffles and shoals, similarly rigged with a 2.5 GPP unit may be deployed for sampling in the shallower riverine habitats. This smaller boat will consist of a 14 ft inflatable Sea-Eagle raft with retractable anodes and side-mounted cathodes.

Electrofishing will be conducted in a downstream manner, following standardized methods developed specifically for large river quantitative electrofishing surveys (MBI, 2002, Yoder and Kulik, 2003). The start point, end point, and boat track for each sampling station will be geo-referenced using a handheld Garmin GPS (or similar device) and transposed to corresponding USGS topographic mapping software program (Terrain Navigator).

All stunned fish will be collected with ¼-inch mesh dip nets and deposited into a live-well filled with aerated ambient river water. At the conclusion of each sample, all captured fish will be identified to species, classified as adult, juvenile or Young-of-Year (YOY), enumerated, weighed, measured for total length, and then released. If large numbers ($n > 25$) of small fish (YOY fish or cyprinids less than 100 mm) are captured, they will be grouped by size class, enumerated, and batch-weighed with length measurements only taken from one large and one small representative specimen within each group. Fish that are not able to be identified in the FGS, such as small cyprinids, will be brought back to the lab for identification.

Gill Netting

For sampling deeper habitat sub-strata (Depth 12-25 feet; Depth 25-40 feet; Depth > 40 feet), where electrofishing will not be effective, sampling will be conducted with experimental gill nets consistent with standardized methods for fish capture from rivers (Bonar, Hubert, & Willis, 2009). The nets will be 12-foot high by 100-foot in length and will be constructed of 4 to 5 panels of increasing mesh size (e.g., 1.5, 2, 2.5, 3, 3.5-inch stretched mesh) to accommodate collection of the various sized fish in the project waters.

The nets will be deployed to maximize capture area where water depths are greater than net height. Nets will be set in selected locations and allowed to fish for 4 hours prior to retrieval.

The exact locations of each net set will be recorded using a handheld Garmin Vista HCx GPS (or similar device) and the time of deployment and retrieval will also be recorded. Fish processing will occur as described above for electrofishing.

Seining

In shallow shoreline locations where boat access may not be feasible sampling will be performed via seining with a 100-ft long, 6-ft deep, 1/4-inch mesh bag seine net.

Seine samples will be collected by extending the net parallel to shore and then pulling the upstream end of the net into the water and in a downstream direction for a 180 degree sweep while the opposite end of the net is held in place (Bonar, Hubert, & Willis, 2009). The start point and end point for each sweep will be geo-referenced using a handheld Garmin Vista HCx GPS (or similar device) and transposed to corresponding USGS topographic mapping software program (Terrain Navigator). Total fish catch will be processed following each haul in the same manner as described above for electrofishing and gill netting.

Visual Observation

Direct visual observation is a simple, versatile, cost-effective, and proven method for collecting fish assemblage data that is also nonintrusive, making it an ideal technique in rivers occupied by threatened or endangered species (e.g., shortnose sturgeon) that could be disturbed or injured by other methods such as electrofishing (Bonar et al. 2009; Thurow et al. 2013). Visual observation was used in the recently completed Maryland darter survey as part of the relicensing of the Conowingo Project on the Susquehanna River (RSP 3.10, 2013). Visual observation surveys will be conducted in the riverine portions of the study area. Below Cabot Station, this will be the only sampling method employed (due to the presence of the endangered shortnose sturgeon in this reach). In both the bypass reach and the riverine reach below Vernon Dam, visual observation will be used in addition to the other gear types, to validate the technique as well as collect data that could be used to calibrate the visual observation-only data collected below Cabot Station (i.e., to assess whether visual observations may have missed certain species and/or sizes of fish).

Methods should follow those described in Bonar et al. (2009) and Thurow et al. (2013). All visual observations will occur during daylight hours with optimum light conditions (e.g., 10:00 am to 5:00 pm). Visual observation is an effective fish sampling technique in a variety of habitats, but may be impeded by high velocities. If measured velocities are > 1.5 m/s, sampling should be delayed if possible; if not possible, an alternative sampling method should be employed. Visual observation is also highly dependent upon water transparency and turbidity. Before sampling, visibility distance will be measured using a Secchi disk or similar method (see Bonar et al. 2009:153). Visual observation methods should only be used when visibilities are 2 m or greater. If low visibilities are due to a recent rain event or other temporary disturbance, sampling should be postponed to a later date; if low visibilities are the result of chronic turbidity, an alternative sampling method should be employed.

Visual observation surveys will be conducted using snorkeling, SCUBA diving, or hookah diving (see Thurow et al. 2013 for detailed methods) along multiple transects (or lanes) parallel with the current, as described in Thurow et al. (2013). Snorkeling will be limited to the shallower areas of banks and bars, whereas SCUBA and hookah diving methods may be used at most depths. At greater depths, handheld underwater lights may be necessary to improve visibility. Because observers moving upstream are less likely to disturb fish, observers should enter the water downstream and proceed slowly upstream (using a supporting stick or rod if necessary). If conditions do not permit a downstream entry, observers will float downstream with the current while limiting motion as much as possible (Thurow et al. 2013). The location and time of beginning and end points will be recorded for each transect.

For each fish observed, species and estimated length should be recorded. If a large school of fish is encountered, all species observed should be recorded; average number and length of fish in the school should be estimated. Any uncertainty regarding species identification should also be noted. See Bonar et al. (2009) for methods to estimate fish length underwater and Thurow et al. (2013) for methods of underwater data recording.

Visual observation transects will be standardized by observation time and area sampled. Area sampled will be equivalent to (length of transect) * (2*visibility distance).

Task 3: Data Analysis and Reporting

All data will be standardized by effort expended (seconds of electrofishing, net-hours, observation hours, and number of seine hauls for electrofishing, gill netting, visual observation, and seining respectively). Catch per unit effort (CPUE) and standard errors will be calculated for each species, station, and sampling technique. Data will also be separated into groups by size and a CPUE per size group will be calculated. Values of CPUE for each segment and gear type will be calculated as the sum of catch from all samples within a station divided by the sum effort expended within that station. The Shannon-Weiner index of diversity, which is a function of species richness and evenness, will also be calculated.

Information collected during this study will be compiled and presented in a final report. The report will include tabular data summarizing length, weight, and size class of fish captured, a map of the study area to depict the location of sample stations, and overall results including occurrence, distribution and relative abundance. Comparisons will be made with historical records. Results will be described in relation to studies described in study plans [3.3.14 – Aquatic Habitat Mapping of the Turners Falls Impoundment](#) and [3.3.13 – Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat](#). Raw data will be provided to stakeholders in digital format upon request.

Level of Effort and Cost (18 CFR § 5.11(d)(6))

FirstLight believes the proposed level of effort will adequately address the objectives by documenting fish species occurrence, distribution and abundance within the project area along spatial and temporal gradients. FirstLight estimates the cost of this study to be \$75,000 to \$85,000.

Study Schedule (18 CFR § 5.11(b)(2) and (c))

The study described herein is scheduled to be conducted in the early summer and fall of 2014, with Task 1 occurring prior to field studies. Because the study effort will be ongoing when the Initial Study Report is due to Stakeholders in September 2014, FirstLight proposes to provide Stakeholders with a study report supplement to summarize results in February 2015.

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January 28, 2014

VIA ELECTRONIC FILING

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

Re: FirstLight Hydro Generating Company, FERC Project Nos. 2485-063 and 1889-081
Response to National Marine Fisheries Service Supplemental Comments on Study Plan

Dear Secretary Bose:

On December 2, 2013, the National Marine Fisheries Service (NMFS) filed a letter with the Federal Energy Regulatory Commission (FERC or Commission) containing supplemental comments on FirstLight Hydro Generating Company's (FirstLight) study plan for relicensing the Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485). NMFS's comments expressed concern that three of FirstLight's study plans; Study Plan 3.3.6, *Impact of Project Operations on Shad Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects*; Study Plan 3.3.11, *Fish Assemblage Assessment*, and Study Plan 3.6.3; *Whitewater Boating Evaluation*—had the potential to adversely affect shortnose sturgeon, an endangered species under the Endangered Species Act. NMFS therefore suggested that these studies should be designed or modified to avoid effects to shortnose sturgeon. The purpose of this letter is to respond to NMFS's comments on two of these study plans, Study Plans 3.3.6 and 3.3.11, to enable the Commission's Director of the Office of Energy Projects to issue a study plan determination that directs FirstLight to implement studies that will avoid potential effects to shortnose sturgeon.¹

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

Study Plan 3.3.6 addresses requests by resource agencies to determine if Turners Falls Project operations affect shad spawning, by conducting night time surveys to document shad spawning. The agencies requested that following this documentation, FirstLight observe spawning activity under a range of

¹ FirstLight has already addressed NMFS's concerns on the third study plan, Study Plan 3.6.3, *Whitewater Boating Evaluation*, in its modified revised study plan filed on January 13, 2014, by proposing to conduct the evaluation outside of the April 15 – June 22 shortnose sturgeon spawning and rearing period.

operating conditions. FirstLight's revised study plan for Study Plan 3.3.6 includes these parts of the study as requested, during the May – June shad spawning time period.

The agencies also requested that shad egg collections be conducted in areas of spawning activity to further determine if spawning has occurred. It has been documented that shortnose sturgeon spawn in the vicinity of the Cabot Station tailrace (Kieffer and Kynard 2012). Kieffer and Kynard (2012) have documented a spawning period of 5-17 days during the same 26 day period each year (April 27-May 22). Early life history stages (eggs and larvae) are present in the project area for 20 to 30 days after spawning (Kynard et al. 2012a). So the period when shortnose sturgeon eggs and larvae are present overlaps with the proposed sampling period for shad egg collection. Consequently, the collection of shad eggs may have the potential to impact shortnose sturgeon, and NMFS recommended in its December 2 letter that the study be revised.

To address this potential concern, FirstLight proposes to replace shad egg collection efforts, which studies have shown are duplicative of visual observations of shad spawning, with enhanced visual observations and splash counts. Ross (1993) has quantified spawning of adult American shad by counting spawning splashes over 5-min intervals. Splashing events were verified to be spawning American shad through direct observations. Ross (1993) concluded that that this technique was valid and useful to quantify spawning activity for this species. FirstLight therefore believes that visual observations and splash counts of shad spawning, which will have no impact to shortnose sturgeon, will fulfill the goals and objectives of the study.

Study Plan 3.3.11, *Fish Assemblage Assessment*

Study Plan 3.3.11 addresses regulatory agency requests to characterize the fish assemblage above and below the Turners Falls Dam. Although the study is not targeting shortnose sturgeon, NMFS has pointed out that non-targeted sampling in certain areas may have the potential to affect shortnose sturgeon, whose historic upstream range on the Connecticut River is Turners Falls. While sampling as proposed can occur in the Turners Falls impoundment because this is beyond the range of shortnose sturgeon, sampling efforts below Turners Falls Dam may need to be modified to avoid potential impacts to shortnose sturgeon.

In its comments dated July 15 on proposed Study Plan 3.3.11, NMFS recommended the study be modified to eliminate the potential for effects on shortnose sturgeon. Specifically, NMFS recommended that: (1) no electrofishing occur in the reach of the Connecticut River below the Deerfield River (which NMFS refers to as Transect 6); and (2) a seasonal restriction be placed on sampling in the bypass reach (which NMFS refers to as Transect 5) to ensure that no electrofishing is carried out when shortnose sturgeon may be present (April 15 – June 30).

In its revised study plan, FirstLight noted that the geographic scope of the study was being reviewed by NMFS, and that the potential impact on shortnose sturgeon may result in modifying the geographic area. FirstLight therefore agreed not to perform any electrofishing in the bypass reach from April 15 – June 30.

While NMFS did not provide any additional comments on FirstLight's revised study plan for Study 3.3.11, FirstLight believes that additional modifications to the plan may be necessary to avoid potential impacts to shortnose sturgeon in both the bypass reach and the reach of the river below the Turners Falls Dam. To avoid any potential impacts to sturgeon, FirstLight proposes to conduct all sampling in the bypass reach after June 30, and in the reach below the Deerfield River, FirstLight proposes to use both existing data and the data it obtains in the Turners Falls Impoundment.

A 2009 electrofishing survey of the area below Turners Falls Dam downstream to the Route 116 Bridge was conducted as part of a larger Environmental Protection Agency effort to sample the entire Connecticut River from Lake Francis to the freshwater extent of the tidal estuary. Sampling occurred at three 1-km stations in the bypass reach and eight 1-km stations between the bypass reach and the Route 116 Bridge in Sunderland (Figure 1). The species composition and relative abundance (Table 1) is typical of fish assemblages described for inland fishes of Massachusetts (Hartel et al. 2002). FirstLight believes that these recent data, coupled with the data FirstLight will obtain in the Turners Falls Impoundment will provide sufficient information on species composition and relative abundance in the Project area to accomplish the study's goals and objectives.

If you have any questions regarding this filing, please feel free to contact me.

Sincerely,

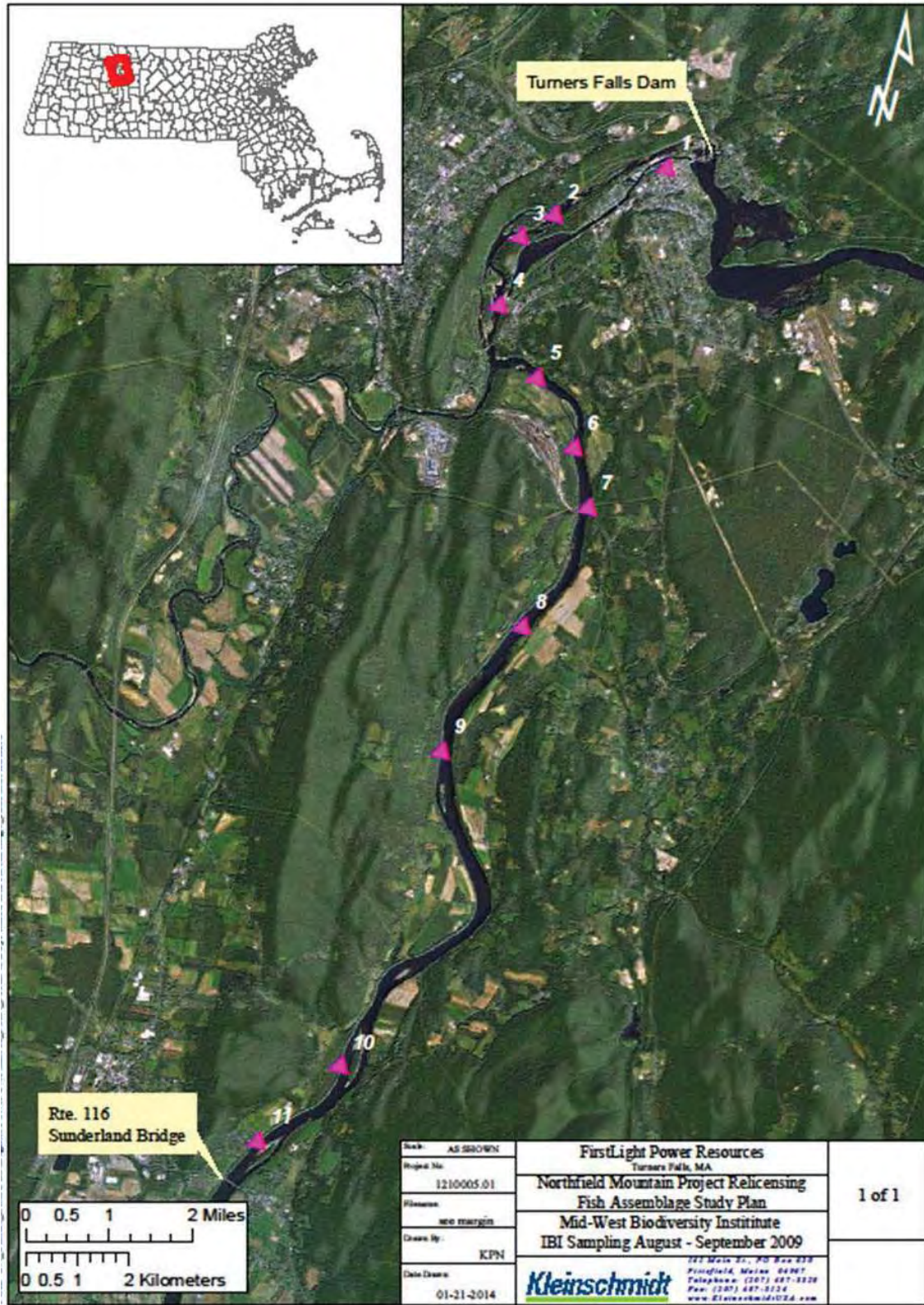
A handwritten signature in black ink, appearing to read "John Howard". The signature is written in a cursive style with a large initial "J" and a distinct "H".

John Howard

Table 1. Fish collected at eleven 1 km sample sites on the Connecticut River below the Turners Falls Dam to the Route 116 Bridge in Sunderland MA by electrofishing (2009).

Species	Stations											Total
	1	2	3	4	5	6	7	8	9	10	11	
Date Sampled (2009)	8/31	9/28	8/15	8/16	8/16	9/2	8/16	10/5	8/17	8/17	8/17	
American eel	13	12	5	14	0	0	3	2	29	0	0	78
American shad	0	0	0	7	7	6	0	0	0	1	25	46
Atlantic salmon	0	8	0	1	0	0	0	0	0	0	1	10
Black crappie	0	0	0	0	1	0	0	0	0	0	0	1
Bluegill	15	0	3	5	7	8	8	0	12	14	9	81
Brown trout	1	0	0	0	0	0	2	0	0	0	0	3
Chain pickerel	0	0	0	0	0	1	0	1	0	0	0	2
Channel catfish	0	0	0	0	0	0	1	0	0	0	0	1
Common carp	1	0	0	2	0	0	0	0	0	0	0	3
Common shiner	0	0	0	4	0	0	0	0	0	0	0	4
Fallfish	0	0	14	4	29	150	10	10	99	128	8	452
Largemouth bass	0	0	0	0	2	0	0	0	0	4	0	6
Longnose dace	11	0	1	0	0	0	0	0	0	0	0	12
Northern pike	0	0	1	0	1	0	0	1	0	2	0	5
Pumpkinseed	0	0	1	0	0	0	0	0	2	0	0	3
Rock bass	2	3	8	1	3	3	4	0	12	0	0	36
Sea lamprey	14	1	1	0	0	0	0	2	3	0	2	23
Smallmouth bass	85	56	70	42	45	46	81	19	12	33	25	514
Spottail shiner	13	0	133	0	9	354	0	8	53	10	0	580
Tessellated darter	17	0	8	3	1	2	1	4	1	0	0	37
Walleye	0	0	0	0	0	0	1	0	0	0	0	1
White sucker	6	5	9	5	4	23	9	3	1	4	2	71
Yellow perch	1	1	3	0	0	2	1	2	1	7	5	23
Total	179	86	257	88	109	595	121	52	225	203	77	1992
Sampling effort (Seconds)	9272	3356	4856	3298	3495	6360	4415	6578	3708	3595	3441	52374

Figure 1: Locations of fish collection sites on the Connecticut River below the Turners Falls Dam to the Route 116 Bridge in Sunderland MA by electrofishing (2009).



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Document Content(s)

FirstLight Response to NMFS.PDF.....1-6

Attachment F: Study No. 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*

As part the Initial Study Report (ISR) Summary for Study No. 3.3.12, a data report was provided describing the operation of the emergency spill gates and sluice gates at the Turners Falls Project. During the ISR meeting on September 30, 2014, stakeholders requested additional information relative to this data analysis.

Specifically, stakeholders requested that the emergency spill gate releases be presented as discharge values in cubic feet per second (cfs), as opposed to the number of gates open, and that FirstLight differentiate emergency-triggered discharges vs. non-emergency discharges through the spill gates over the period of interest. This information is provided below.

Table 4-1 in the report initially provided the Frequency of Emergency Spill Gate Openings from April 1-June 30, 2005-2012. This table has been revised and is submitted below to highlight the occurrences that were related to emergency-triggered events. When the spill gates open automatically in response to a potential emergency (i.e., canal water level rise), all 8 gates open. These events are highlighted in red in Table 4-1 and 4-2. Within the period of interest, there were a total of 26 occurrences when at least five gates were open to some degree; of these 26 events, five were emergency-related (Table 4-2).

In addition, Table 4-1b, provided below, was created to provide a summary of non-emergency discharges through the spill gates from April 1-June 30, 2005-2012.

Table 4-1: Frequency of Emergency Spill Gate Openings from April 1-June 30, 2005-2012.

Number of gates open	Occurrences per year (10-minute intervals)									Frequency (2005-2012)
	2005	2006	2007	2008	2009	2010	2011	2012	Total	
0 (no gates open)	4,742	4,121	5,437	6,057	2,320	6,145	4,001	9,589	42,412	40.5%
1	7,915	8,749	7,278	6,981	9,821	6,930	9,032	3,455	60,161	57.4%
2	190	80	302	31	951	16	41	13	1,624	1.5%
3	156	42	53	11	3	4	29	32	330	0.3%
4	55	80	30	16	7	0	1	15	204	0.2%
5	42	28	0	8	0	1	0	0	79	0.1%
6	4	4	2	0	0	4	0	0	14	0.0%
7	0	0	0	0	2	0	0	0	2	0.0%
8	0	0	2	0	0	4	0	0	6	0.0%
Total Readings	13,104	13,104	13,104	13,104	13,104	13,104	13,104	13,104	104,832	-

Note 1: As an example of how to read the table, the value of 4,742 means that from April 1 to June 30, 2005, there were 4,742 readings (based on a 10-minute interval) out of 13,104 when no spill gates were open.

Note 2: Red box indicates emergency-triggered spill events. See Table 4-2 for discharge values.

Table 4-1b: Summary of Non-Emergency Discharges Through Emergency Spill Gates from April 1-June 30, 2005-2012.

Discharge (cfs)	Occurrences per year (10-minute intervals)									Frequency (2005-2012)
	2005	2006	2007	2008	2009	2010	2011	2012	Total	
0	4,553	4,080	5,398	439	2,281	6,140	3,869	9,470	36,230	34.6%
1-500	7,386	5,761	5,967	12,454	8,808	6,903	8,233	3,525	59,037	56.3%
501-1000	545	2,956	1,526	60	23	12	909	14	6,045	5.8%
1001-2500	233	150	132	74	1,951	37	57	24	2,658	2.5%
2501-5000	198	109	70	23	10	3	13	36	462	0.4%
5001-12000	9	6	0	0	0	3	0	0	18	0.02%
Records	12,924	13,062	13,093	13,050	13,073	13,098	13,081	13,069	104,450	99.6%
Null	180	42	11	54	31	6	23	35	382	0.4%
Total Readings	13,104	13,104	13,104	13,104	13,104	13,104	13,104	13,104	104,832	100%
Maximum Discharge (non-emergency)	5,399	5,252	4,463	4,400	3,423	5,745	3,492	3,528	-	-

Note: As an example of how to read the table, the value of 7,386 means that from April 1 to June 30, 2005, there were 7,386 readings (based on a 10-minute interval) out of 13,104 when discharge through the spill gates ranged from 1-500 cfs.

Table 4-2: Periods When More Than Four Spill Gates Were Open From April 1-June 30, 2005-2012.

Time	Gate Opening (feet)								Number of gates open	Spill Gate Discharge (cfs)
	SG03	SG04	SG05	SG06	SG07	SG08	SG09	SG10		
4/2/2005 19:10	0.00	9.31	0.38	0.40	6.12	9.90	10.00	8.50	5	4,368
4/2/2005 19:20	0.00	9.31	0.38	0.40	6.12	9.90	10.00	8.50	5	4,304
4/2/2005 19:30	0.00	9.32	0.38	0.40	6.12	9.90	10.00	8.50	5	4,464
4/2/2005 19:40	0.00	9.32	0.38	0.40	6.12	9.90	10.00	8.50	5	4,446
4/2/2005 19:50	0.00	9.32	0.38	0.40	6.12	9.91	10.00	8.50	5	4,498
4/2/2005 20:00	0.00	9.32	0.38	0.40	6.12	9.91	10.00	8.50	5	4,511
4/2/2005 20:10	0.00	9.32	0.38	0.40	6.13	9.91	10.00	8.50	5	4,399
4/2/2005 20:20	0.00	9.32	0.38	0.40	6.12	9.91	10.00	8.50	5	4,353
4/2/2005 20:30	0.00	9.32	0.38	0.40	6.12	9.91	10.00	8.50	5	4,310
4/3/2005 18:00	0.00	9.32	0.02	4.04	10.00	3.77	10.00	8.49	6	4,786
4/3/2005 18:10	0.00	9.33	0.02	5.21	9.04	2.98	10.00	8.49	6	4,155
4/5/2005 5:30	0.00	9.31	0.02	0.03	4.11	10.00	10.00	8.50	5	4,193
4/7/2005 13:50	0.00	9.34	0.33	7.01	10.00	10.00	10.00	0.09	5	4,954
4/7/2005 14:00	0.00	9.34	0.33	10.00	10.00	10.00	10.00	0.09	5	5,202
4/8/2005 12:40	0.00	9.35	2.64	0.04	10.00	10.00	10.00	0.09	5	4,580
4/8/2005 12:50	0.00	9.35	8.02	0.04	10.00	10.00	10.00	0.09	5	5,143
4/8/2005 13:00	0.00	9.35	6.02	0.04	10.00	10.00	10.00	0.09	5	4,739
4/8/2005 13:10	0.00	9.35	3.94	0.04	10.00	10.00	10.00	0.09	5	4,504
4/8/2005 13:20	0.00	9.35	3.94	0.04	10.00	10.00	10.00	0.09	5	4,584
4/8/2005 13:30	0.00	9.35	3.94	0.04	10.00	10.00	10.00	0.10	5	4,578
4/8/2005 13:40	0.00	9.35	3.94	0.04	10.00	10.00	10.00	0.09	5	4,497
4/17/2005 6:00	0.00	9.31	5.58	4.71	10.00	10.00	10.00	0.09	6	5,164
4/17/2005 6:10	0.00	9.31	5.58	4.71	10.00	10.00	10.00	0.09	6	4,883
4/26/2005 12:40	0.00	5.38	0.00	9.90	4.96	10.00	10.00	0.09	5	3,984
4/26/2005 12:50	0.00	5.38	0.00	9.91	7.01	10.00	10.00	0.09	5	4,314
4/26/2005 13:00	0.00	5.38	0.00	9.91	7.01	10.00	10.00	0.09	5	4,280
4/26/2005 13:10	0.00	5.38	0.00	9.91	7.01	10.00	10.00	0.09	5	4,226
4/26/2005 13:20	0.00	5.38	0.00	9.91	5.86	10.00	10.00	0.09	5	4,029
4/26/2005 13:30	0.00	5.38	0.00	9.91	5.86	10.00	10.00	0.09	5	3,981
4/26/2005 13:40	0.00	5.38	0.00	9.91	5.86	10.00	10.00	0.09	5	3,970
4/26/2005 13:50	0.00	5.38	0.00	9.91	3.88	10.00	10.00	0.09	5	3,705
5/6/2005 13:00	0.00	9.35	9.77	10.00	0.05	10.00	10.00	0.09	5	5,348
5/6/2005 13:10	0.00	9.35	9.77	10.00	0.05	10.00	10.00	0.09	5	5,389
5/6/2005 13:20	0.00	9.35	9.77	10.00	0.05	10.00	10.00	0.09	5	5,390
5/6/2005 13:30	0.00	9.35	9.77	10.00	0.05	10.00	10.00	0.09	5	5,399
5/6/2005 13:40	0.00	9.35	9.77	10.00	0.05	10.00	7.92	0.09	5	4,971
5/6/2005 13:50	0.00	9.35	9.77	10.00	0.05	10.00	7.92	0.09	5	5,154
5/6/2005 14:00	0.00	9.35	9.77	10.00	0.04	10.00	7.92	0.09	5	5,030
5/6/2005 14:10	0.00	9.35	9.77	10.00	0.04	10.00	7.01	0.09	5	4,853

STUDY NO. 3.3.12: EVALUATION OF EMERGENCY GATE AND BYPASS FLUME DISCHARGES

Time	Gate Opening (feet)								Number of gates open	Spill Gate Discharge (cfs)
	SG03	SG04	SG05	SG06	SG07	SG08	SG09	SG10		
6/2/2005 12:40	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,677
6/2/2005 12:50	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,658
6/2/2005 13:00	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,612
6/2/2005 13:10	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,535
6/2/2005 13:20	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,498
6/2/2005 13:30	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,429
6/2/2005 13:40	0.00	9.37	4.86	10.00	0.05	10.00	10.00	0.09	5	4,362
4/1/2006 13:30	4.26	2.42	2.23	0.26	0.23	0.18	2.23	2.48	5	556
4/26/2006 7:20	0.00	9.31	9.74	0.04	0.04	2.97	8.77	8.47	5	3,964
4/26/2006 7:30	0.00	9.31	9.74	0.04	0.04	7.09	8.77	8.48	5	4,480
4/26/2006 7:40	0.00	9.31	9.74	0.04	0.04	10.00	8.77	8.48	5	4,788
4/26/2006 7:50	0.00	9.31	9.74	0.04	5.09	10.00	8.80	8.48	6	5,252
4/26/2006 8:00	0.00	9.31	9.74	0.04	5.09	10.00	8.79	8.48	6	5,206
4/26/2006 8:10	0.00	9.31	9.75	0.04	5.09	10.00	8.79	8.48	6	5,086
4/26/2006 8:20	0.00	9.31	9.75	0.04	5.09	10.00	8.80	8.49	6	5,094
4/26/2006 9:00	0.00	9.31	9.75	0.04	0.04	10.00	9.50	8.49	5	5,013
4/26/2006 9:10	0.00	9.31	9.75	0.04	0.04	10.00	9.49	8.49	5	4,937
4/26/2006 9:20	0.00	4.86	9.75	0.04	0.04	10.00	9.49	8.49	5	4,273
5/5/2006 12:50	0.00	8.06	0.03	0.04	5.09	7.71	9.58	8.52	5	3,783
5/5/2006 13:00	0.00	8.06	0.03	0.04	5.09	7.72	9.57	8.52	5	3,720
5/14/2006 11:40	0.00	9.32	0.01	0.04	3.97	10.00	9.60	8.50	5	4,236
5/14/2006 11:50	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,167
5/14/2006 12:00	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,175
5/14/2006 12:10	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,153
5/14/2006 12:20	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,224
5/14/2006 12:30	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,112
5/14/2006 12:40	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,170
5/14/2006 12:50	0.00	9.33	0.01	0.04	3.97	10.00	9.60	8.50	5	4,167
6/11/2006 7:50	0.00	9.13	3.84	0.04	0.00	10.00	9.86	8.51	5	4,006
6/11/2006 8:00	0.00	9.33	2.91	0.04	0.00	10.00	9.86	8.51	5	3,949
6/11/2006 8:10	0.00	9.33	2.91	0.04	0.00	10.00	9.86	8.51	5	3,961
6/11/2006 8:20	0.00	9.33	2.91	0.04	0.00	10.00	9.86	8.51	5	3,937
6/12/2006 3:40	0.00	9.17	9.76	0.04	5.14	10.00	0.00	8.51	5	4,487
6/29/2006 15:20	0.00	9.36	9.79	4.98	0.00	0.02	10.00	8.53	5	4,446
6/29/2006 15:30	0.00	9.36	9.79	7.28	0.00	0.02	10.00	8.53	5	4,802
6/29/2006 15:40	0.00	9.36	9.79	10.00	0.00	0.02	10.00	8.53	5	5,196
6/29/2006 15:50	0.00	9.36	9.79	10.00	0.00	0.02	10.00	8.53	5	4,898
6/29/2006 16:00	0.00	9.36	9.79	10.00	0.00	0.02	10.00	8.53	5	4,829
6/29/2006 16:10	0.00	9.36	9.79	10.00	0.00	0.02	10.00	8.53	5	4,720
6/4/2007 8:00	9.81	9.92	9.74	9.99	10.00	10.00	8.70	8.44	8	7,429
6/4/2007 8:10	9.81	9.87	9.74	10.00	10.00	10.00	0.00	0.09	6	5,927

STUDY NO. 3.3.12: EVALUATION OF EMERGENCY GATE AND BYPASS FLUME DISCHARGES

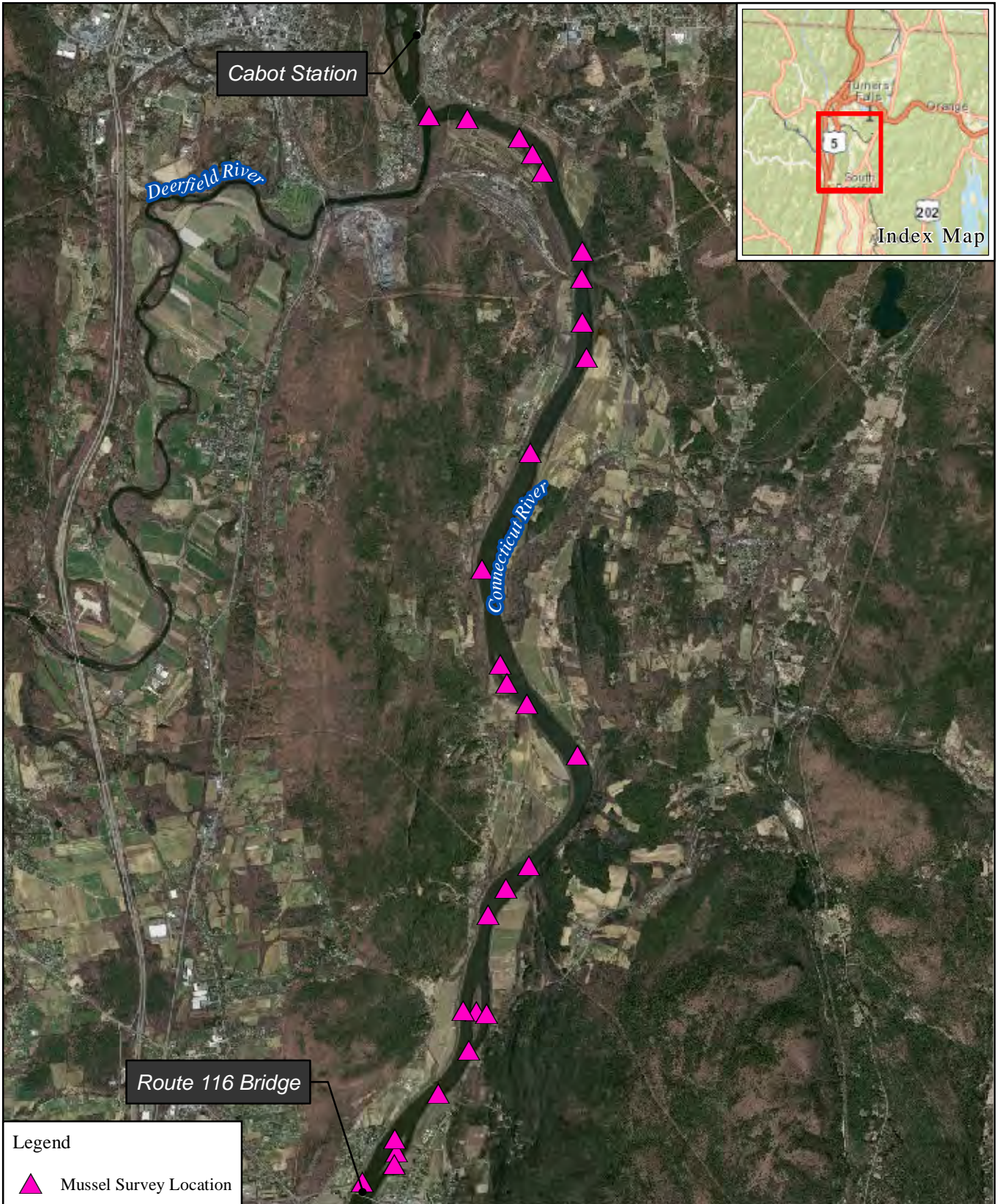
Time	Gate Opening (feet)								Number of gates open	Spill Gate Discharge (cfs)
	SG03	SG04	SG05	SG06	SG07	SG08	SG09	SG10		
6/27/2007 18:20	9.81	9.89	9.76	10.00	10.00	10.00	7.48	6.56	8	7,653
6/27/2007 18:30	3.86	7.03	7.41	10.00	4.86	2.73	0.00	0.09	6	2,358
5/7/2008 4:20	0.0	9.2	1.1	0.0	4.1	10.0	10.0	8.4	5	4,298
5/7/2008 4:30	0.0	9.2	1.1	0.0	4.1	10.0	10.0	8.4	5	4,267
5/7/2008 4:40	0.0	9.3	1.1	0.0	4.1	10.0	10.0	8.4	5	4,339
5/7/2008 4:50	0.0	9.4	1.1	0.0	4.1	10.0	10.0	8.4	5	4,344
5/7/2008 5:00	0.0	9.5	1.1	0.0	4.1	10.0	10.0	8.4	5	4,400
5/7/2008 5:10	0.0	9.3	1.1	0.0	4.1	10.0	10.0	8.4	5	4,346
5/7/2008 5:20	0.0	9.3	1.1	0.0	4.1	10.0	10.0	8.4	5	4,188
6/8/2008 23:40	4.1	2.5	1.1	3.8	3.3	3.4	0.0	0.1	5	1114
6/2/2009 23:00	5.90	7.03	0.01	5.83	5.51	5.83	4.82	5.03	7	3,385
6/15/2009 4:30	5.89	6.19	0.01	5.81	5.49	5.80	4.84	1.92	7	2,750
5/4/2010 2:40	6.57	10.00	6.42	6.46	6.38	6.94	6.14	6.80	8	5,184
5/4/2010 2:50	0.00	4.49	0.00	4.54	5.47	10.00	10.00	3.98	6	3,103
5/4/2010 4:00	2.76	7.58	3.08	3.30	3.20	3.62	3.13	3.87	8	2,187
5/4/2010 4:10	2.76	10.00	5.97	3.30	3.20	3.62	3.13	3.96	8	2,855
5/26/2010 23:20	5.57	5.85	5.42	0.30	5.02	0.27	4.39	3.16	6	2,416
5/26/2010 23:30	9.79	10.00	3.75	0.31	9.83	0.27	9.99	9.81	6	5,745
5/26/2010 23:40	9.79	10.00	3.75	0.31	9.83	0.27	9.99	9.81	6	5,012
5/26/2010 23:50	9.79	10.00	3.75	0.31	9.83	0.27	4.11	0.19	5	3,367
6/14/2010 2:40	9.78	10.00	9.88	10.00	9.88	10.00	10.00	9.83	8	8,223

Note 1: There were no occurrences when >4 spill gates were open during the period April 1-June 30, in 2011 or 2012.

Note 2: Red box indicates emergency-triggered spill events.

Attachment G: Study No. 3.3.16 *Habitat Assessment, Surveys and Modeling of Suitable Habitat for State-Listed Mussel Species in the Connecticut River below Cabot*

During the ISR meeting, Andrea Donlon of the CRWC requested information on the specific locations of the mussel field surveys performed by FirstLight in 2014. A map depicting this information is included in the figure below.



Legend

▲ Mussel Survey Location



RELICENSING STUDY 3.3.16
 NORTHFIELD MOUNTAIN/TURNERS FALLS
 HABITAT ASSESSMENT, SURVEYS, AND MODELING OF
 SUITABLE HABITAT FOR STATE-LISTED MUSSEL SPECIES
 IN THE CT RIVER BELOW CABOT

2014 Mussel
 Survey Locations



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