Northfield Mountain Station
99 Millers Falls Road
Northfield, MA 01360
Ph: (413) 659-4489
Fax: (413) 659-4459
Internet: john.howard@gdfsuezna.com

John S. Howard
Director- FERC Hydro Compliance

Via Electronic Filing

December 2, 2013

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

Re: Northfield Mountain Pumped Storage Project (FERC No. 2485)
Sediment Management Plan – Report of 2013 Activities

Dear Secretary Bose:

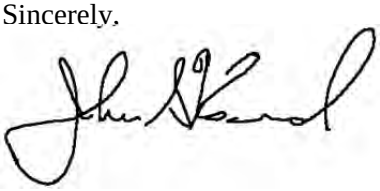
FirstLight Power Resources Services, LLC (FirstLight), as an agent for FirstLight Hydro Generating Company, an affiliate of GDF SUEZ Energy North America, Inc., submits the enclosed report for the Northfield Mountain Pumped Storage Project (Project No. 2485), located along the Connecticut River near Northfield, MA.

On July 15, 2011, FirstLight filed with FERC a Sediment Management Plan (Plan) for the Project which was developed in consultation with the US Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Protection (MADEP). The Plan contained proposed methods to assess sediment dynamics in the Project's Upper Reservoir and Turners Falls Impoundment (Connecticut River) from 2011 through 2014. Following initial field efforts and comments from the agencies, FirstLight revised its initial Plan and filed its revised Plan with the Commission on February 15, 2012. FERC issued its Order approving the Plan on March 28, 2012.

The Revised Plan specifies that a report summarizing sediment monitoring activities of the past calendar year be provided to the MADEP, USEPA, and the Commission by December 1 of the year in which the sediment monitoring was conducted. As such, the enclosed report provides an overview of sampling efforts conducted in 2013. Because December 1, 2013 falls on a Sunday, we are filing this report on December 2, 2013. Specific components of the Plan implemented during this reporting period include: 1) conducting an annual bathymetric survey of the Upper Reservoir, 2) collecting Suspended Sediment Concentration (SSC) and Total Suspended Solids (TSS) grab samples from the Project area, 3) measuring SSC and particle size distribution (PSD) at three locations in the Project area, 4) measuring SSC and PSD across the channel of the Connecticut River and the Northfield Mountain Station tailrace, and 5) reporting requirements.

Following review of this report, if you have any questions or concerns please contact me at (413) 659-4489 or john.howard@gdfsuezna.com.

Sincerely,



John Howard
Director – FERC Hydro Compliance

cc:
Joseph Enrico, FERC NYRO
Robert J. McCollum, MADEP Western Regional Office
George Harding, USEPA Region 1
Toby Stover, USEPA Region 1
Nora Conlan, USEPA Region 1
Ralph Abele, USEPA Region 1
Mark Wamser, Gomez and Sullivan Engineers
Julia Wood, Van Ness Feldman
Mike Swiger, Van Ness Feldman
Adam Kahn, Foley Hoag

Attachment

NORTHFIELD MOUNTAIN
PUMPED STORAGE PROJECT

FERC NO. 2485-058

SEDIMENT MANAGEMENT PLAN –
2013 SUMMARY OF ANNUAL MONITORING

December, 2013

Prepared for:

FirstLight Power Resources
GDF SUEZ

Prepared by:

Gomez and Sullivan Engineers, P.C.

1 BACKGROUND

FirstLight Power Resources Services, LLC (FirstLight), as an agent for FirstLight Hydro Generating Company, an affiliate of GDF SUEZ Energy North America, Inc., owns and operates the Northfield Mountain Pumped Storage Project (Project), a 1,192.2-MW pumped storage project constructed in 1972 along the Connecticut River near Northfield, MA. The project consists of an underground powerhouse, four reversible pump-turbine generators, an underground pressure shaft, four unit penstocks and draft tubes, and a mile-long tailrace tunnel connecting the powerhouse to a 20-mile-long reach of the Connecticut River known as the Turners Falls Impoundment, which serves as the lower reservoir. The manmade Upper Reservoir was formed with four earth-core rockfill embankment structures and a concrete gravity dam.

By letter dated January 20, 2011, Federal Energy Regulatory Commission (FERC, the Commission) staff requested a plan to avoid or minimize the entrainment of sediment into the Project works during reservoir maintenance drawdowns. FirstLight filed its Sediment Management Plan (the Plan) on July 15, 2011. The Plan was developed in consultation with the US Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Protection (MADEP). The Plan contained proposed methods to assess sediment dynamics in the Project's Upper Reservoir and Turners Falls Impoundment (Connecticut River) from 2011 through 2014. The main components of the Plan applicable to this reporting period included conducting annual bathymetric surveys in the Upper Reservoir, collecting turbidity and total suspended solids data routinely from the Project area, and reporting requirements. The Plan specified that a report summarizing the bathymetric survey and sediment monitoring data would be provided to MADEP, USEPA Region 1, and FERC by December 1 of the year in which the sediment monitoring was conducted.

FirstLight's first sediment monitoring report was submitted to MADEP, USEPA and the Commission on December 1, 2011. Based on the results of initial suspended sediment sampling efforts, FirstLight determined that technical improvements and revisions to the original plan were necessary. FirstLight proposed to continuously measure Suspended Sediment Concentration (SSC) and Particle Size Distribution (PSD) in lieu of turbidity to provide a more accurate measure of sediment load in the river. The Commission accepted FirstLight's 2011 report by letter dated December 6, 2011 and requested that a modified plan be filed after consultation with the MADEP and the USEPA. Following review of comments from the agencies, FirstLight revised its initial Plan and filed its revised Plan with the Commission on February 15, 2012. FERC issued its Order of Approval on March 28, 2012.

In its letter of February 16, 2012, the USEPA provided several comments related to the scope of the sampling and requested that FirstLight develop a Quality Assurance Project Plan (QAPP). In response, FirstLight agreed to develop a QAPP in cooperation with the USEPA; the initial draft of which was submitted on June 28, 2012. The USEPA provided FirstLight with comments pertaining to the QAPP on July 31, 2012 which FirstLight addressed. FirstLight submitted revision 1 of the QAPP to USEPA on October 19, 2012.

As a result of experience gained during the 2012 monitoring efforts, combined with the recommendations of the sediment monitoring equipment manufacturer, FirstLight modified certain aspects of the methodology outlined in QAPP revision 1 for the 2013 monitoring season. Due to these modifications,

FirstLight submitted QAPP Revision 2 to the USEPA on August 14, 2013. A meeting was held at USEPA offices on June 24, 2013 with USEPA and MADEP personnel to discuss these proposed modifications. At the time of this report, QAPP Revision 2 was under review by the USEPA.

It should also be noted that as part of the FERC Relicensing of the Northfield Mountain Project (currently underway), USEPA requested that FirstLight incorporate the Plan into its relicensing studies. As such, the Plan was included in the FERC Revised Study Plan (RSP) as Study No. 3.1.3. In addition, due to equipment malfunctions experienced during the last two field seasons, FirstLight plans to extend its sediment monitoring for an additional year through the fall of 2015.

The Revised Plan specifies that a report summarizing sediment monitoring activities of the past calendar year be provided to the MADEP, USEPA, and the Commission by December 1 of the year in which the sediment monitoring was conducted. Annual summary reports were submitted to the agencies in December of 2011 and 2012. The enclosed report provides a summary of sediment monitoring activities that occurred within the Project area during 2013. Components of the Plan applicable to this reporting period include: 1) conducting an annual bathymetric survey in the Upper Reservoir, 2) collecting SSC and TSS samples from the Project area, 3) measuring SSC and PSD at three locations in the Project area, 4) measuring SSC and PSD across the channel of the Connecticut River and the Northfield Mountain Station tailrace, and 5) reporting requirements.

2 BATHYMETRIC SURVEY

Upper Reservoir bathymetry surveys have been conducted in 2010, 2011, 2012, and most recently in 2013 (Figure 2.0) as part of the Plan. In 2013, FirstLight contracted CHA Consulting, Inc. to conduct a bathymetric survey of the Upper Reservoir. This survey was completed October 5-6, 2013[1]. Deliverables for the hydrographic survey included a contour plan and a sounding plan which were generated from the 2013 survey data (See Appendix A).

2.1 Methods & Analysis

Horizontal positioning data were collected using a Trimble 4700 Global Positioning System with Real-Time Kinematic corrections. A Teledyne Odom Hydrotrac 200 kHz precision echosounder was used to collect sounding data. Sound velocity corrections were made using an Odom DIGIBAR and an AML Oceanographic Minos SVP velocity meter to collect acoustic velocity data throughout the water column. All of the positioning and bathymetric data were collected and integrated using the Hypack (version 2012) software package. Corrections for water surface elevation changes were performed in real-time using RTK GPS positioning.

The bathymetric data collected during the survey was imported into a Geographic Information System (GIS) database to create a Triangulated Irregular Network (TIN). The 2012 and 2013 TINs were then used in "cut-fill" and "raster-minus" operations to determine relative changes in elevation between the September 29-30, 2012 and October 5-6, 2013 surveys.

2.2 Summary

In general, an analysis of the entire reservoir comparing the 2012 and 2013 surveys indicates that there have not been any significant changes in the survey contours since the last survey (Appendix A). The differences in surfaces between surveys appear to be affected by depressions and mounds shown on the 2012 TIN surface that were not evident from the 2013 survey data (Appendix A – Figure 5). This may be attributed, in part, to the different survey methods that were employed from one year to the next[2]. Preliminary analysis of this data indicates that changes in elevation may fall within the tolerances of the survey methodology.

Figure 2.0 depicts a comparison the Upper Reservoir intake channel TIN surfaces from the 2010, 2011, 2012, and 2013 surveys.

[1] Results from the 2013 bathymetric survey are preliminary as final data QA is still underway.

[2] The 2012 bathymetry survey was conducted using a multi-beam echosounder while the 2013 survey used a single beam instrument. Differences in data collected with each instrument could be attributed to the varying accuracies of the two systems.

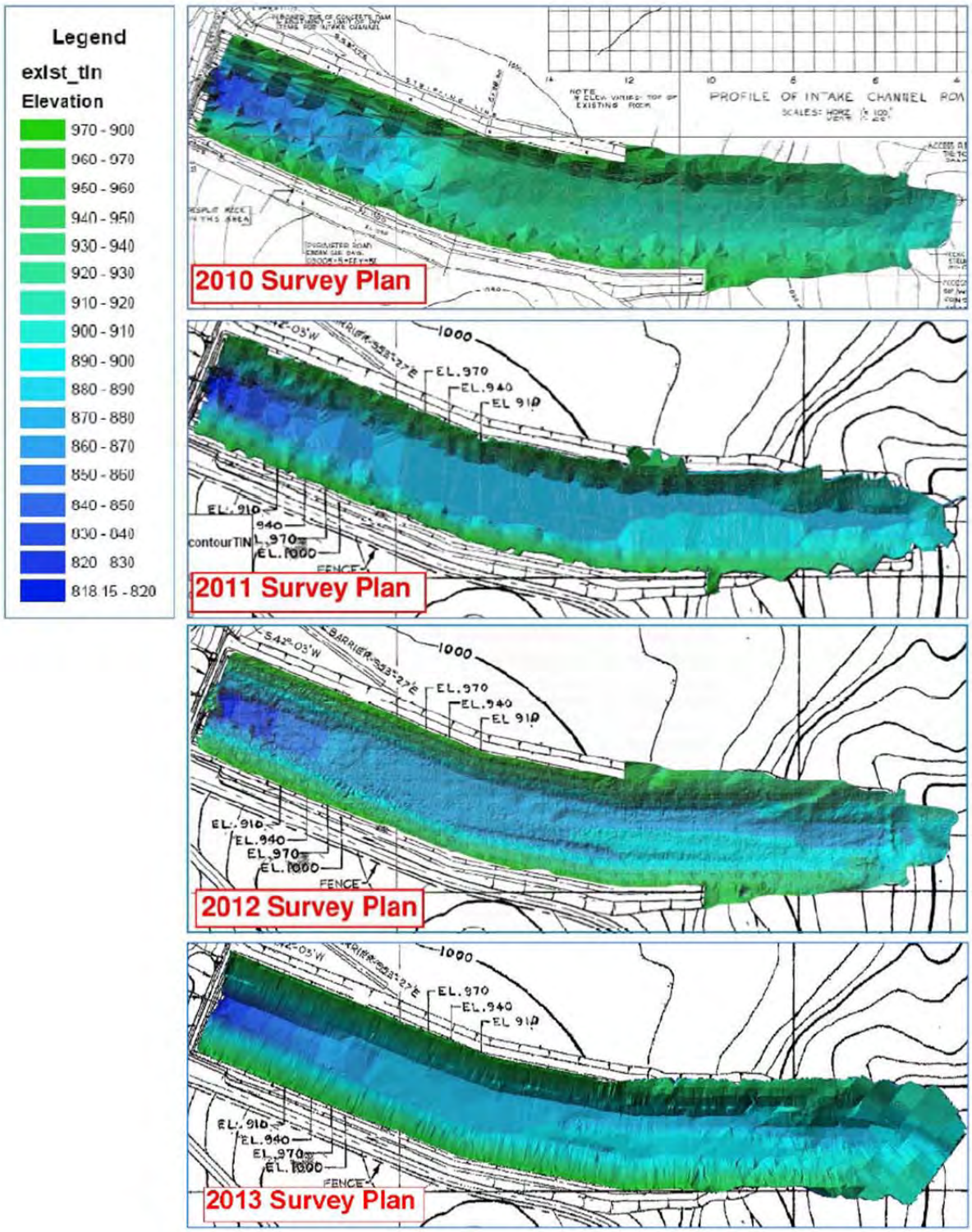


Figure 2.0: Comparison of the Upper Reservoir Intake Channel TIN surfaces from the 2010, 2011, 2012, and 2013 hydrographic surveys

3 SUSPENDED SEDIMENT MONITORING

FirstLight operated continuous suspended sediment monitors at three locations in the Project area during the 2013 field season (Figure 3.0). A LISST StreamSide instrument was installed April 1, 2013 upstream of the Route 10 Bridge in Northfield, MA. The purpose of this instrument was to provide continuous data on suspended sediment transport in the Turners Falls Impoundment over a range of flows. Two LISST HYDRO instruments, LISST HYDRO North and South, were installed August 2013 at the Northfield Mountain Tailrace (Figure 3.1). The HYDRO instruments continuously monitored SSC moving into and out of the Upper Reservoir during Project Operations. These instruments were initially installed in the Powerhouse in-line to service water lines tied directly into the tailrace tunnel, however, due to sampling complications these instruments were reinstalled in the tailrace area. The StreamSide and HYDRO instruments were removed for the season on November 19, 2013 due to freezing temperatures.

Additional discrete sampling was performed using a LISST 100x along transects at the Route 10 Bridge and Northfield Mountain Station Tailrace. LISST 100x sampling was completed at the Route 10 Bridge over a range of flows from April 18 – May 10, 2013 and again from October 3-26, 2013. LISST 100x sampling also occurred at the Northfield Mountain Tailrace from October 3-26, 2013.

In addition to continuously monitoring equipment, FirstLight also collected grab samples for laboratory analysis of SSC and Total Suspended Solids (TSS) from the outflow hoses of the LISST StreamSide and LISST HYDROs over the course of the sampling period. Additional samples were also collected at the Route 10 Bridge and Northfield Mountain Tailrace concurrent with LISST 100x sampling events.

3.1 Methods

LISST StreamSide

The continuously recording sampler was installed on the bank of the Connecticut River upstream of the Route 10 Bridge in Northfield, MA (Figure 3.0 and 3.2). The sampler was connected to a pump installed at a fixed location in the Connecticut River approximately 15-20 feet offshore and suspended approximately 2 feet from the river bottom. Water was pumped from the Connecticut River through the instrument where detailed PSD and SSC were measured using laser diffraction technology. After flowing through the instrument, the water was released through a drain hose and thus a water sample was not retained except for periodic grab samples that were collected. All data were stored on the instrument's hard drive until they were downloaded to a computer.

Samples were collected on 30-minute intervals with the average sampling duration lasting 60 seconds. Each sample consisted of a 40-second clean water flush, 60-second intake flush (river water from the pump), and a 20-second post sample flush. Clean-water background readings were taken from distilled water and stored every twelve samples to automatically "zero" the instrument by subtracting the measurement of light scattering in clean water from that resulting from the turbid sample water.

The instrument was serviced on a weekly schedule during which time the data were downloaded, the clean water tank was refilled, the optical cells were cleaned, the battery voltage was checked, and, if necessary, the connectors, casing, and hoses were cleaned.

LISST HYDRO

Two LISST HYDRO instruments were installed in the Northfield Mountain Tailrace on the left (south) and right (north) banks (Figure 3.1 and 3.3). Each sampler was connected to a pump installed at a representative location within the tailrace. These locations were chosen in order to continuously monitor SSC and PSD data that may be transported through the intake channel to the Upper Reservoir during pumping operations or transported from the Upper Reservoir to the Connecticut River during generation. Two samplers were utilized in this location to account for the potential variability of suspended sediment laterally across the tailrace and/or vertically within the water column depending on Project operations. By installing two samplers and pumps at different horizontal and vertical locations a more representative dataset can be developed.

SSC and PSD were measured using laser diffraction technology at 20-minute intervals. After flowing through the instrument, the river water was released through a drain hose and thus a water sample was not retained except for periodic grab samples that were collected. Clean-water background readings were taken from filtered potable water and stored prior to each sample to automatically "zero" the instrument by subtracting the measurement of light scattering in clean water from that resulting from the turbid sample water. The instruments were visually inspected regularly to ensure proper working order. Data download was not necessary as each HYDRO instrument transmitted the data collected directly to FirstLight's historian computer system.

LISST 100x

To validate data collected by the continuous instruments, and to identify whether continuous sampling locations were representative of SSC across the river and Northfield Mountain Station tailrace, discrete sampling was performed using a LISST 100x instrument. Sampling stations were identified prior to sampling using the Equal-Width Increment Method (EWI). Evenly spaced intervals along transects at each location were established including 11 stations, spaced at 50-foot intervals, at the Route 10 Bridge and 9 stations, at ~30-foot intervals, at the Northfield Mountain Tailrace boat barrier buoy line. Measurements were collected at the surface and 5-foot depth intervals at each increment until the bottom was reached.

Data were collected using a crane and reel setup from the Route 10 Bridge and from a barge at the Northfield Mountain Tailrace (Figure 3.4 and 3.5). A weight with fins was attached to the LISST 100x to orient the instrument against the current and hold it in a constant position (Figure 3.6). At each station, the instrument was held in place for a minimum of 60 seconds with a sample being collected every second. Clean-water backgrounds were collected using distilled water before and after sampling at each transect. Following completion of a transect, the data were downloaded to a computer. The instrument did not require maintenance except for regular cleaning of the optical lenses.

Grab Samples for Laboratory Analysis

FirstLight collected grab samples during the 2013 sampling period from the outflow hoses of the LISST StreamSide and LISST HYDRO instruments as well as from service water taps installed in-line in the Powerhouse. Additional samples were collected at the Route 10 Bridge and Northfield Mountain Tailrace concurrent with LISST 100x sampling events. All grab samples were collected in 1-liter sterile white polyethylene containers and were analyzed for SSC and TSS by Sterling Analytical, Inc. using ASTM D3977 and SM 2540D respectively. The standard reporting limit for both methods was 0.5 mg/L.

Sample containers were marked with identification labels that were matched to the identification information on the field data sheets. All samples were transported in a cooler on wet ice to Sterling Analytical, Inc. under chain of custody; average holding time was 5 days.

An overview map of the sampling locations is provided in Figure 3.0; these locations are described below:

Site	Description
LISST StreamSide	Upstream of the Rt. 10 Bridge in Northfield, MA from the LISST-StreamSide outflow
Northfield Mountain Station Tailrace (North)	Northfield Mountain Station tailrace, from the LISST-HYDRO outflow on north bank or in-line service water taps
Northfield Mountain Station Tailrace (South)	Northfield Mountain Station tailrace, from the LISST-HYDRO outflow on south bank or in-line service water taps
Route 10 Bridge	Under the Rt. 10 Bridge, near shore from the west bank

Grab samples were collected from the drain outflow hose at each instrument during a corresponding LISST sampling event.

3.2 Data Results

Due to technical difficulties experienced with the LISST equipment during the 2012 sampling season, FirstLight invited the equipment manufacturer to the Project April 17-18, 2013 to inspect the equipment setup and troubleshoot any problems. The goal of this visit was to ensure that the equipment was in proper working order and collecting reliable data prior to the spring freshet.

At the time of the April visit, the LISST HYDRO instruments were still installed in the Powerhouse in-line to service water taps, however, the instruments were not functional and were unable to collect SSC or PSD data. Following extensive troubleshooting by the manufacturer it was determined that due to the pressure present in the service water lines, the HYDRO instruments would be unable to operate properly and therefore would be unable to collect data. At the recommendation of the manufacturer, alternative sites were examined and the Northfield Mountain Tailrace was selected. In addition to examining the HYDROs, the manufacturer also visited and inspected the LISST StreamSide setup and delivered and provided training for the LISST 100x.

Following the April site visit numerous LISST HYDRO and StreamSide equipment issues were still experienced throughout the field season (detailed below). After conducting extensive in-house troubleshooting throughout the summer, FirstLight again requested the manufacturer visit the site to troubleshoot the equipment and verify the configuration of the instruments. As a result of this request, the manufacturer visited the Project October 9-10, 2013. During this site visit, all equipment configurations were reviewed and verified by the manufacturer, remaining equipment issues were identified, an action plan was put in place, and data QA protocols were discussed. Appendix B contains correspondence from the manufacturer certifying the equipment setup.

In addition to coordinating two site visits to troubleshoot various issues FirstLight frequently provided LISST HYDRO and StreamSide data to the manufacturer for their review and to confirm the instruments were in proper working order. Following preliminary review of the data the manufacturer indicated that due to the relatively low levels of SSC found in the Connecticut River during the sampling period the LISST StreamSide and LISST HYDRO instruments were frequently operating at, or below, the minimum detection limit of the instruments. While the instruments can still collect data below this limit, the data may not be reliable and therefore should not be included in the final dataset. FirstLight is still working with the manufacturer to determine what the appropriate SSC cutoff should be. Alternatively, the LISST 100x has a much lower detection limit than that of the StreamSide or HYDRO instruments and as a result does not have the same issues with measuring low levels of SSC.

See below for a general description of the data collection process and a summary of data collected where available. When reviewing the preliminary data it is important to note that all SSC values measured by LISST equipment are collected in volume concentration units (µl/L), not mass concentration (mg/L). Volume concentration (µl/L) is not equal to parts per million (ppm), only mass concentration is (mg/L). In order to convert a volume concentration to mass concentration the effective density of the sediment must be calculated through laboratory analysis of grab samples. Once the effective density has been determined it is multiplied by the volume concentration to convert the SSC value to a mass concentration.

LISST StreamSide

The LISST StreamSide sampler was installed adjacent to the Route 10 Bridge on April 1, 2013. Preliminary data collected from the StreamSide are shown in Figure 3.7. Initially, the instrument functioned normally until late May when voltages became erratic, causing system shut-down. Multiple diagnostics were performed before determining that the intake pump required replacing; the intake pump was replaced on June 25, 2013. Other than the occasional short-term shut-down, the instrument functioned normally until the voltage became erratic in early September, eventually becoming severe and resulting in frequent system shut-down. Multiple diagnostics and minor repairs were performed, however, the ultimate cause of this issue was not found. During the October manufacturer site visit the instrument was inspected and equipment issues were addressed. Based on the findings of the site inspection, the manufacturer made the following recommendations: 1) reposition the intake pump to point downward thus preventing a buildup of sediment on the pump and 2) separate the power supply for the pump and the StreamSide instrument. In addition, the manufacturer set the instrument to “auto-start” so that the system would re-start automatically in the event of a system shut-down. By changing this system setting, the amount of data lost due to power variation was reduced dramatically. The intake pump was repositioned on October 16, 2013.

Preliminary review of the data suggest that suspended sediment concentrations in the river were relatively low (median concentration = 3.4 µl/L), with the occasional peak during high flow events, including spring freshets and a summer high flow event (Figure 3.7). Increased variability of measurements for SSC was evident during the late summer and fall months (Figure 3.7). The reasons for this variability are still being examined by the equipment manufacturer and FirstLight.

LISST HYDRO

FirstLight operated two separate LISST HYDRO instruments within the powerhouse from January to May 2013. Prior to 2013 sampling, repairs and maintenance were made with remote guidance from the

manufacturer, however, once 2013 data collection resumed problematic equipment malfunctions and questionable data values were observed regularly and minimal usable data was collected. Due to these continued malfunctions, FirstLight scheduled a site visit with the manufacturer on April 17-18, 2013. Representatives from the manufacturer visited the site and inspected both instruments. Based on their initial inspection it was believed that the pressure relief system necessary to run sample water through the instrument was problematic in that it filtered out sediment particles and was prone to clogging. FirstLight installed a new pressure-relief system during the site visit with a design developed in collaboration with the manufacturer to address this issue, however, the new configuration also proved to be ineffective. Ultimately it was concluded that the pressure from the service lines was too great for the equipment to handle. Alternatives were discussed in detail, and it was decided that both LISST HYDRO samplers would be removed from the powerhouse and reinstalled in the tailrace area.

Due to the complexity of this installation (i.e. construction of new secure closets, installation of solar panel power system, installation of intake pumps by divers), the LISST HYDRO systems were not operational in the tailrace area until August, 2013. Initial data collected at this time was deemed to be reasonable according to the manufacturer. Over the course of August and September the HYDRO instruments continued to be plagued by equipment issues and questionable data. Following extensive in-house repairs and troubleshooting FirstLight invited the manufacturer back to the Project for a site visit on October 9-10, 2013 to inspect the equipment and make necessary alterations. Based on this inspection the manufacturer verified the equipment configuration and addressed lingering equipment issues (Appendix B).

Due to the issues described above, LISST HYDRO data collected during the 2013 field season is limited to measurements collected from August - November 2013 (Figure 3.8). The two instruments provided similar patterns overall for total concentration during the sampling period. Median concentrations for the North and South instruments were 1.5 µl/L and 0.5 µl/L respectively.

LISST 100x

LISST 100x sampling was performed during April/May 2013 from the Route 10 Bridge and again during October 2013 at both the Route 10 Bridge and the Northfield Mountain Tailrace buoy-line (Table 3.1). During spring sampling at the Route 10 Bridge, samples were collected during four different events when river flows ranged from 8,838 to 35,663 cfs (CT River, Naturally Routed Flow[3]). During the fall, sampling occurred at the Route 10 Bridge during three different events when flows ranged from 2,180 to 6,705 cfs. High discharge events did not occur during the fall sampling period. Northfield Mountain Tailrace sampling occurred during five events, on separate days over a range of Project operation conditions including: No operations; 1-unit generating; 2-units generating; 3-units generating; and 2-units pumping. Table 3.1 provides an overview of LISST 100x sampling events.

[3] The natural routed flow of the impoundment is calculated by taking the sum of the outflow from the Vernon Project and the flow of the Ashuelot River.

LISST-100x data post-processing was derived from a spherical particle model in accordance with manufacturer recommendations. The data were processed separately using the preliminary and final clean water backgrounds at which time the backgrounds were averaged to account for biological fouling. Preliminary results support those from the LISST StreamSide and the LISST HYDROs.

Grab Samples

At the request of the USEPA, grab samples were collected. Samples were collected from the LISST HYDRO and StreamSide drain hoses as well as from service water taps installed in-line in the Powerhouse. Grab samples were also collected at the Route 10 Bridge and Northfield Mountain Tailrace concurrent with LISST 100x sampling events. Grab samples were submitted to an independent laboratory and analyzed for SSC and TSS; results from each test produced the same concentration measurement. All laboratory results were in units of mg/L (mass). Given that the SSC measurements collected by the LISST equipment are in units of µl/L (volume) these datasets cannot be directly compared. Although a direct comparison is not possible, the grab samples still serve two important purposes: 1) they provide an independent dataset from the LISST equipment to gain a better understanding of SSC levels in the Connecticut River and 2) they can be used to convert volume concentration (LISST data) to a mass concentration by determining the effective density of sediment.

Effective density values will be calculated by dividing the mass concentration (mg/L) of the laboratory grab sample by the volume concentration (µl/L) at each LISST instrument drain hose (measured at the same time as the grab sample). The effective density is then multiplied by the volume concentrations measured by the LISST instruments to convert SSC values from volume (µl/L) to mass (mg/L). Due to the fact that this conversion requires a mass and volume concentration measured at the same time, data from grab samples used to calculate effective density is limited to those for which there is an associated LISST measurement.

The table below provides a breakdown of grab samples collected during the 2013 sampling season.

Site	Number Grab Samples Collected	SSC Mean and Range (mg/L)	TSS Mean and Range (mg/L)	Scenarios
LISST StreamSide	23	21.4 (0.7-140)	21.4 (0.7-140)	2,052 – 45,819 cfs
Northfield Mountain Station Tailrace (North)*	167	3.7 (<0.5-49.6)	3.7 (<0.5-49.6)	1-3 Units Generating 1-3 Units Pumping
Northfield Mountain Station Tailrace (South)*	167	3.3 (<0.5-56.4)	3.3 (<0.5-56.4)	1-3 Units Generating 1-3 Units Pumping
Route 10 Bridge	3	10.6 (2.0-26.5)	10.6 (2.0-26.5)	2,064 – 33,927 cfs
Northfield Mountain Station Tailrace (LISST 100x events)	4	3.0 (2.2-4.1)	3.0 (2.2-4.1)	0-3 Units Generating 2 Units Pumping

** Note: Northfield Mountain Station Tailrace samples were collected from the outflow hose of the HYDRO instruments or from service water taps installed in-line in the Powerhouse.*

3.3 Summary

Although the 2013 field season yielded more data than the 2012 season, equipment issues continued to impact sampling efforts during the reporting period. LISST StreamSide data were collected from April through November with intermittent data gaps due to various technical difficulties while HYDRO data were collected from August through November with intermittent data gaps as well. LISST 100X data were collected over a range of flows at the Route 10 Bridge during the spring and fall as well as at the Northfield Mountain Tailrace boat barrier during the fall. The LISST 100x data will yield valuable cross-section SSC data that can be used to verify the point data collected at the LISST StreamSide and HYDROs as well as to confirm that the location of the pumps for those instruments are installed in representative locations.

Although the equipment issues identified above have limited the usability of some data collected during the past year, FirstLight was proactive in addressing all issues encountered through numerous conference calls and correspondence with the manufacturer, along with site visits to the Project in April and October (during which time the manufacturer certified the configuration of the HYDRO and StreamSide instruments, Appendix B).

FirstLight and its technical team are currently in the process of evaluating all LISST data collected in 2013 in conjunction with the quality control measures identified in the QAPP Revision 2 and recommended by the manufacturer. Additionally, FirstLight continues to work with the manufacturer to ensure that the data collected in 2013 were of high quality. Based on this evaluation a determination will be made by the technical team regarding the usability and reliability of the 2013 LISST data. If the data, or portions thereof, are deemed inadequate, adjustments will be made prior to the 2014 sampling effort. In light of the equipment issues encountered in 2012 and 2013, FirstLight will expand field data collection activities through the 2015 field season.

Grab sample data collected during the sampling period will provide a valuable independent, synchronous dataset that can be used to analyze levels of SSC being transported into and out of the Upper Reservoir during Project operations as well as in the Connecticut River mainstem in general. In addition, SSC laboratory results derived from the grab samples will be instrumental in calculating the effective density(s) of sediment which can be used to convert volume concentrations measured by the LISST equipment to mass concentrations.

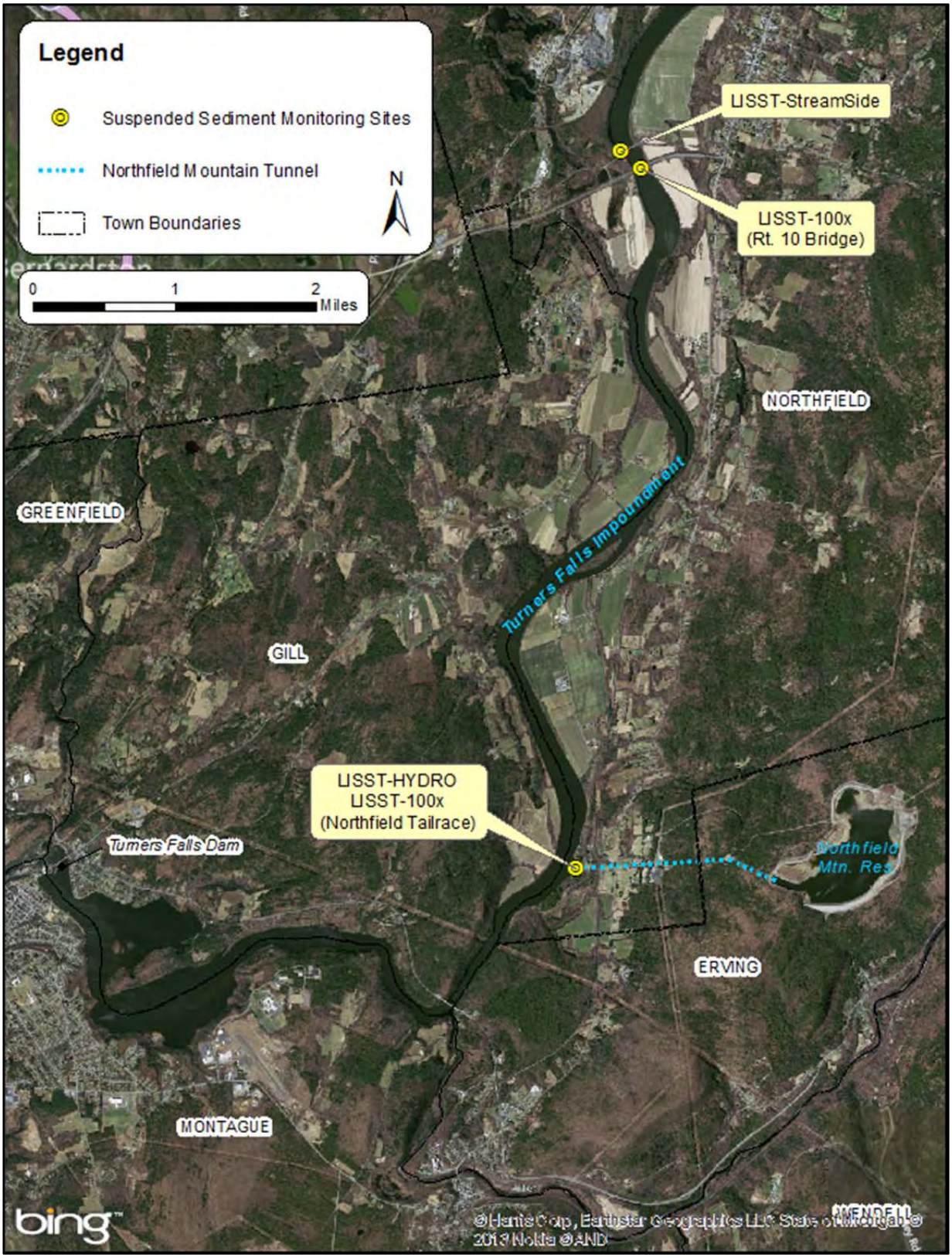


Figure 3.0: Suspended Sediment Sampling Locations

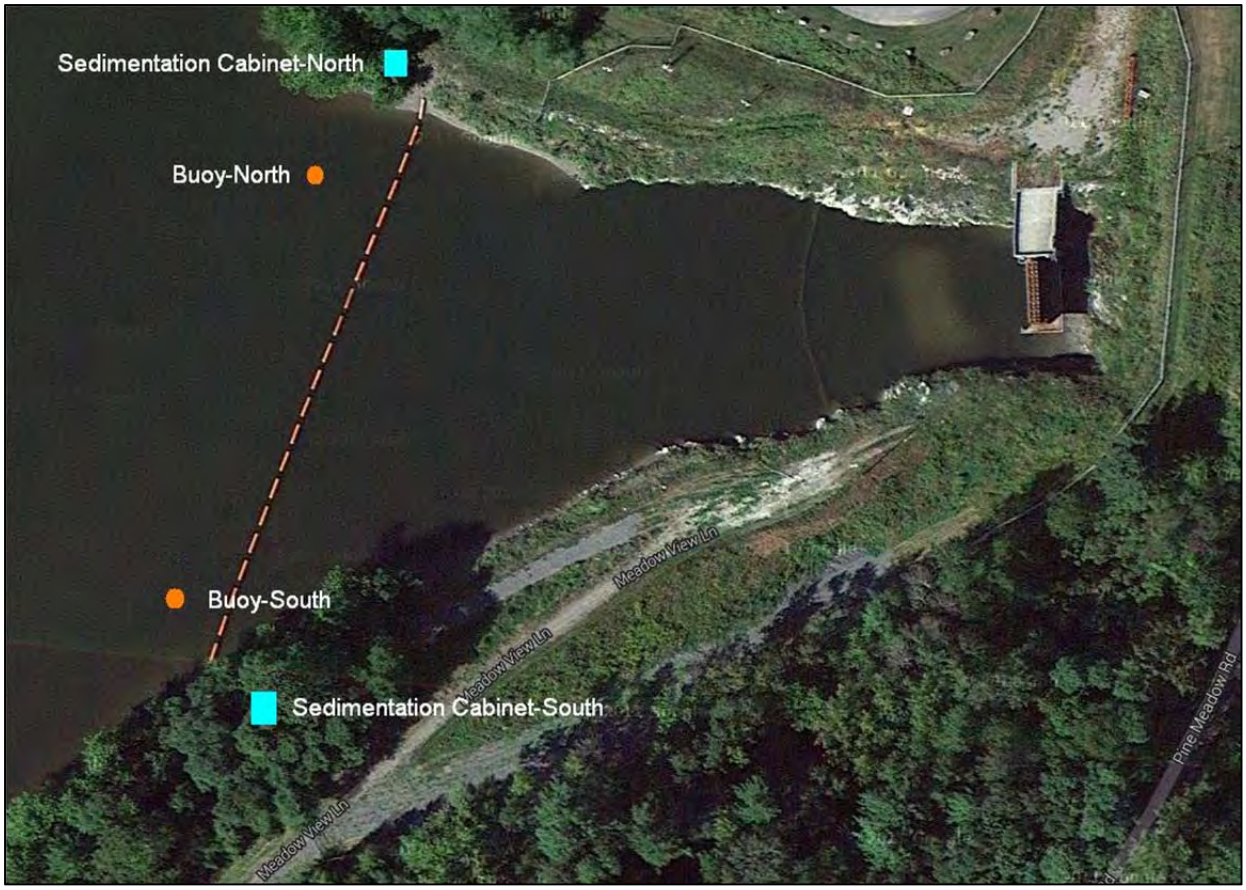


Figure 3.1: Aerial view of the Northfield Mountain Tailrace, showing LISST-HYDRO instrument locations. Sampling with the LISST-100x was also performed along the buoy-line.

Figure 3.2: Configuration of the LISST StreamSide. The batteries were charged using solar panels.

Figure 3.3: Typical configuration of LISST HYDRO as installed at the Northfield Mountain Tailrace (North HYDRO shown). Batteries for each instrument were charged using solar panels.

Figure 3.4: Configuration of the LISST-100x during sampling at the Northfield Mountain Tailrace with a small barge.

Figure 3.5: Crane system used to lower the LISST-100x from the Route 10 Bridge.

Figure 3.6: Configuration of the LISST-100x.

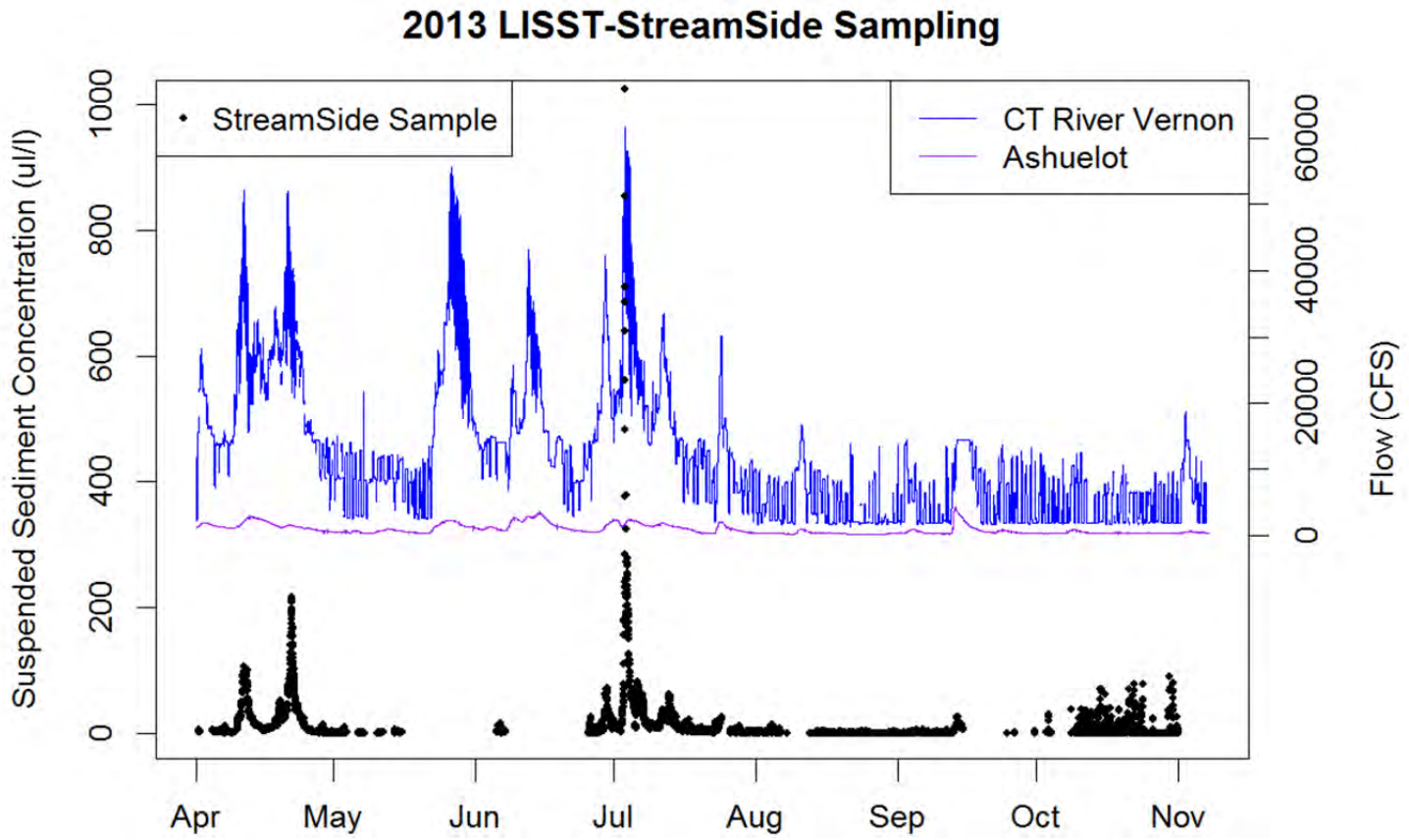


Figure 3.7: Provisional LISST StreamSide SSC measurements collected in the vicinity of the Route 10 Bridge during 2013. All data are provisional and subject to revision[4].

[4] *NOTE: Periods of time where SSC data does not appear (i.e. mid-May to June, mid-June, etc.) represent intervals when the StreamSide was not operational due to various equipment malfunctions.*

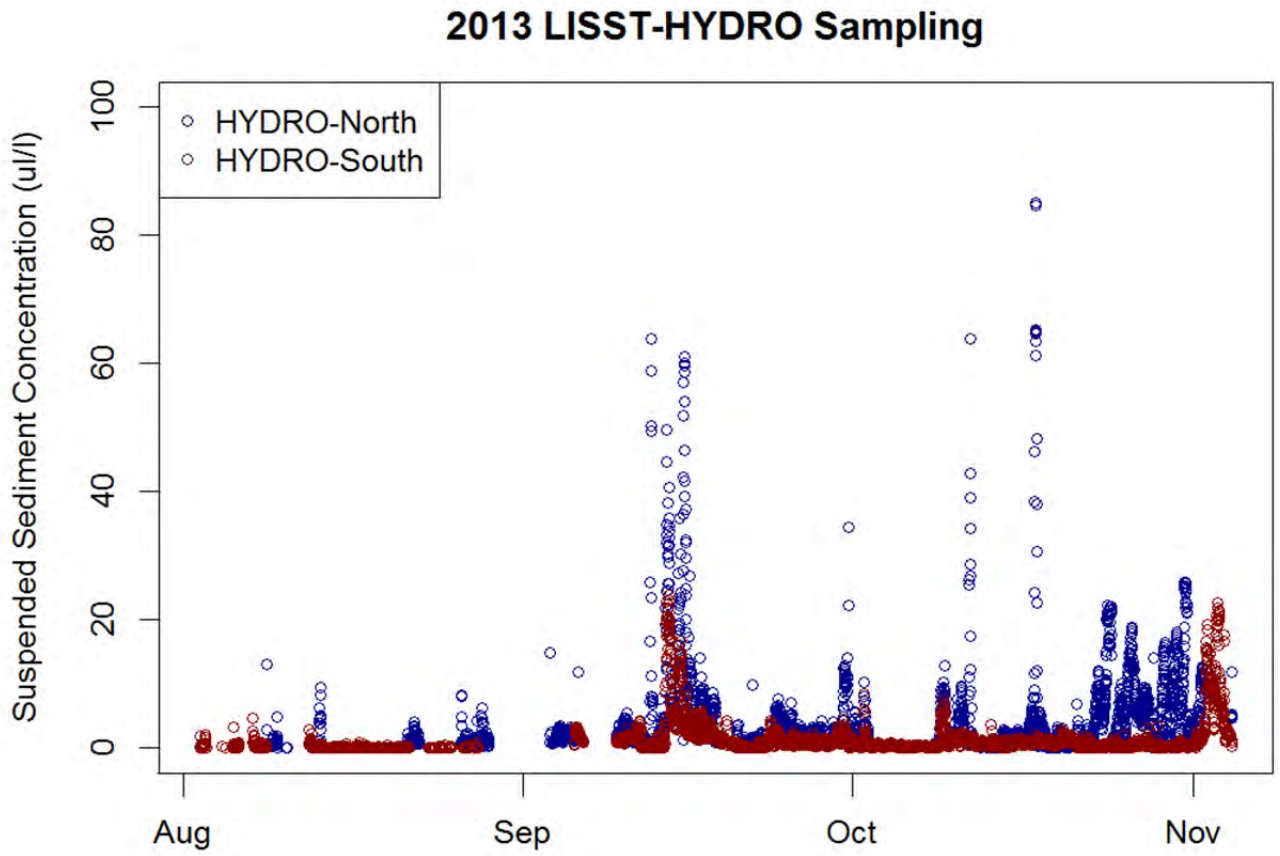


Figure 3.8: Provisional LISST HYDRO SSC measurements collected in the Northfield Tailrace during 2013. All data are provisional and subject to revision[5].

[5] *NOTE: Periods of time where SSC data does not appear (i.e. beginning of September) represent intervals when the HYDROs were not operational due to various equipment malfunctions.*

Table 3.1: Summary of transects surveyed during 2013 with the LISST-100X. All suspended sediment data are provisional and subject to revision.

Date	Location	Average Concentration (ul/L)	Vernon Flow	Ashuelot Flow	Comments
4/18/2013	Route 10 Bridge	35.3	34,243	1,420	
4/26/2013	Route 10 Bridge	10.5	15,516	908	
5/2/2013	Route 10 Bridge	2.6	8,470	435	
5/10/2013	Route 10 Bridge	3.8	8,301	537	
10/3/2013	Route 10 Bridge	3.6	1,809	255	
10/10/2013	Northfield Tailrace	4.8	1,963	564	No Operations
10/11/2013	Route 10 Bridge	5.1	1,767	448	
10/15/2013	Northfield Tailrace	2.1	1,956	319	1-Unit Generating
10/16/2013	Route 10 Bridge	2.5	1,697	390	
10/23/2013	Northfield Tailrace	3.0	6,415	290	2-Units Generating
10/24/2013	Route 10 Bridge	3.8	1,886	294	
10/26/2013	Northfield Tailrace	2.7	2,973	319	2-Units Pumping
10/26/2013	Northfield Tailrace	3.0	2,216	328	3-Units Generating

4 CONCLUSIONS

In general, an analysis of the entire reservoir comparing the 2012 and 2013 bathymetric surveys indicates that there have not been any significant changes in the survey contours since the last survey (Appendix A). The differences in surfaces between surveys appear to be affected by depressions and mounds shown on the 2012 TIN surface that were not evident from the 2013 survey data (Appendix A – Figure 5). This may be attributed, in part, to the different survey methods that were employed from one year to the next. Preliminary analysis of this data indicates that changes in elevation may fall within the tolerances of the survey methodology.

Logistical issues encountered with the LISST equipment limited the usability of some of the data collected during the 2013 field season. FirstLight and its technical team are currently in the process of evaluating all LISST data (StreamSide, HYDRO, and 100x) collected in 2013 in conjunction with the quality control measures identified in the QAPP Revision 2 and recommended by the manufacturer. Based on this evaluation a determination will be made by the technical team regarding the usability and reliability of the 2013 LISST data as well as any potential modifications to the sampling program for 2014-2015.

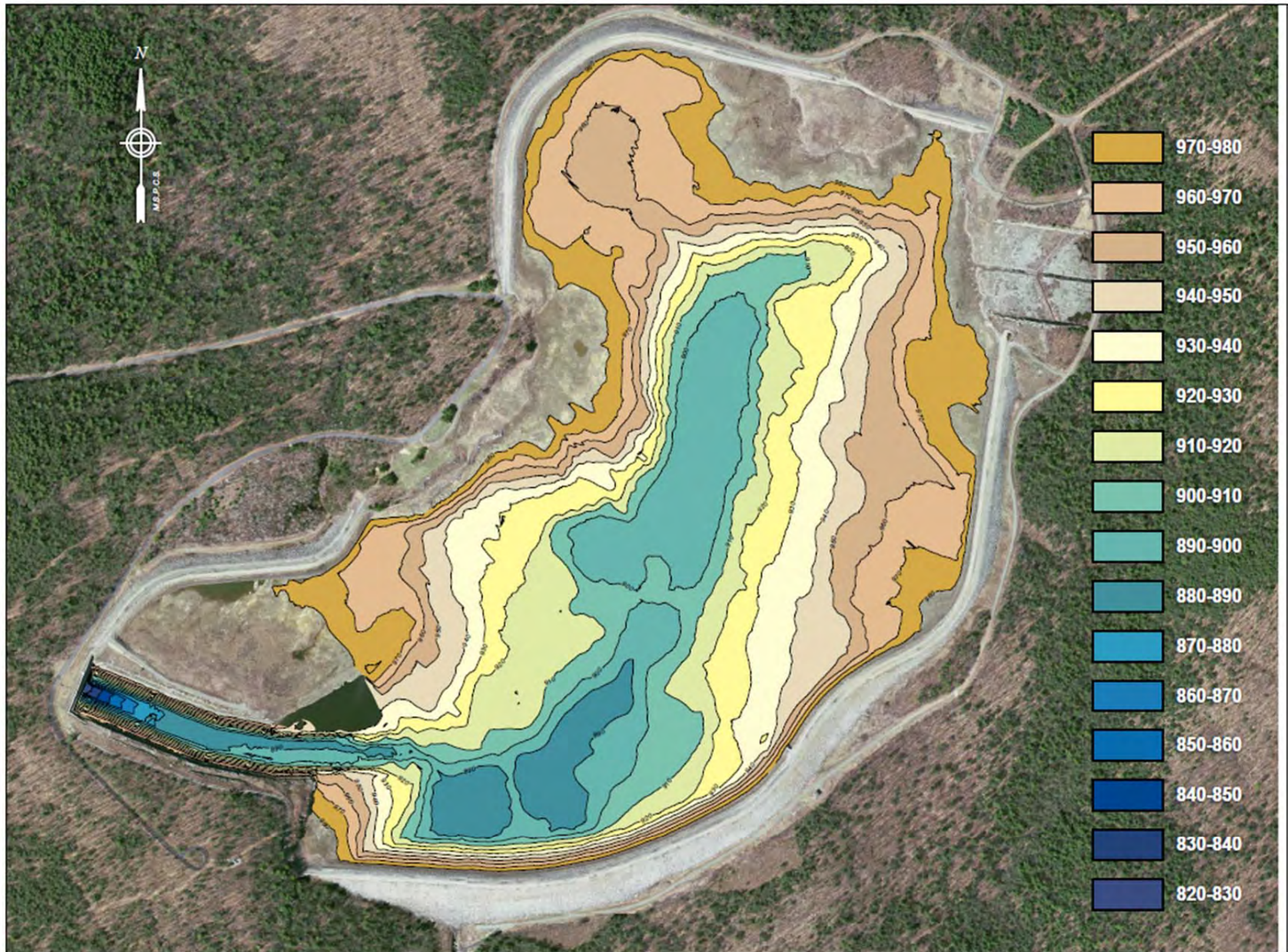
Based on a preliminary review of the LISST data a strong relationship between flow and SSC was observed. In general, it was observed that moderate to high levels of SSC were present in the river during high flow conditions (20,000-30,000 cfs) with the highest SSC events observed occurring when flows exceeded 40,000 cfs. This relationship was also observed when analyzing the laboratory results derived from the grab samples. It is also important to note that 2013 was an uncharacteristically dry summer and fall resulting in low river flows and therefore relatively low levels of SSC throughout much of the sampling period (particularly when the LISST HYDROs were in service).

Data collected during LISST 100x sampling events seems to confirm the general patterns observed in the LISST StreamSide and HYDRO data. The laboratory results derived from the grab samples confirm these patterns. In addition, laboratory results will also be used to calculate the effective density of sediment which can then be used to convert volume concentration to mass concentration if necessary. Data collected in 2013 will continue to be reviewed and relationships between Project operations, water levels, and flow as they relate to SSC will be examined in greater detail.

FirstLight plans to continue sampling in 2014 and also extend sampling to 2015 due to equipment-related issues. The data collected by FirstLight will continue to be evaluated to support the development of management measures to address entrainment of sediment into the Project works during Upper Reservoir drawdown or dewatering activities.

5 APPENDIX A – 2013 BATHYMETRY MAPS[6]

[6] All figures presented here are from a preliminary report and are subject to revision.



GENERAL NOTES:

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$$EL_{NMPSF} = EL_{NAVD88} + 0.398\ FT$$

4. THE VERTICAL BENCHMARK HELD FOR THIS SURVEY IS A LEAD PLUG AND TACK LOCATED ON THE NORTH WEST CORNER OF THE CONCRETE MDC INTAKE STRUCTURE AND IS KNOWN AS CP-9 (EL=1009.94 FT. (NMPSF)).

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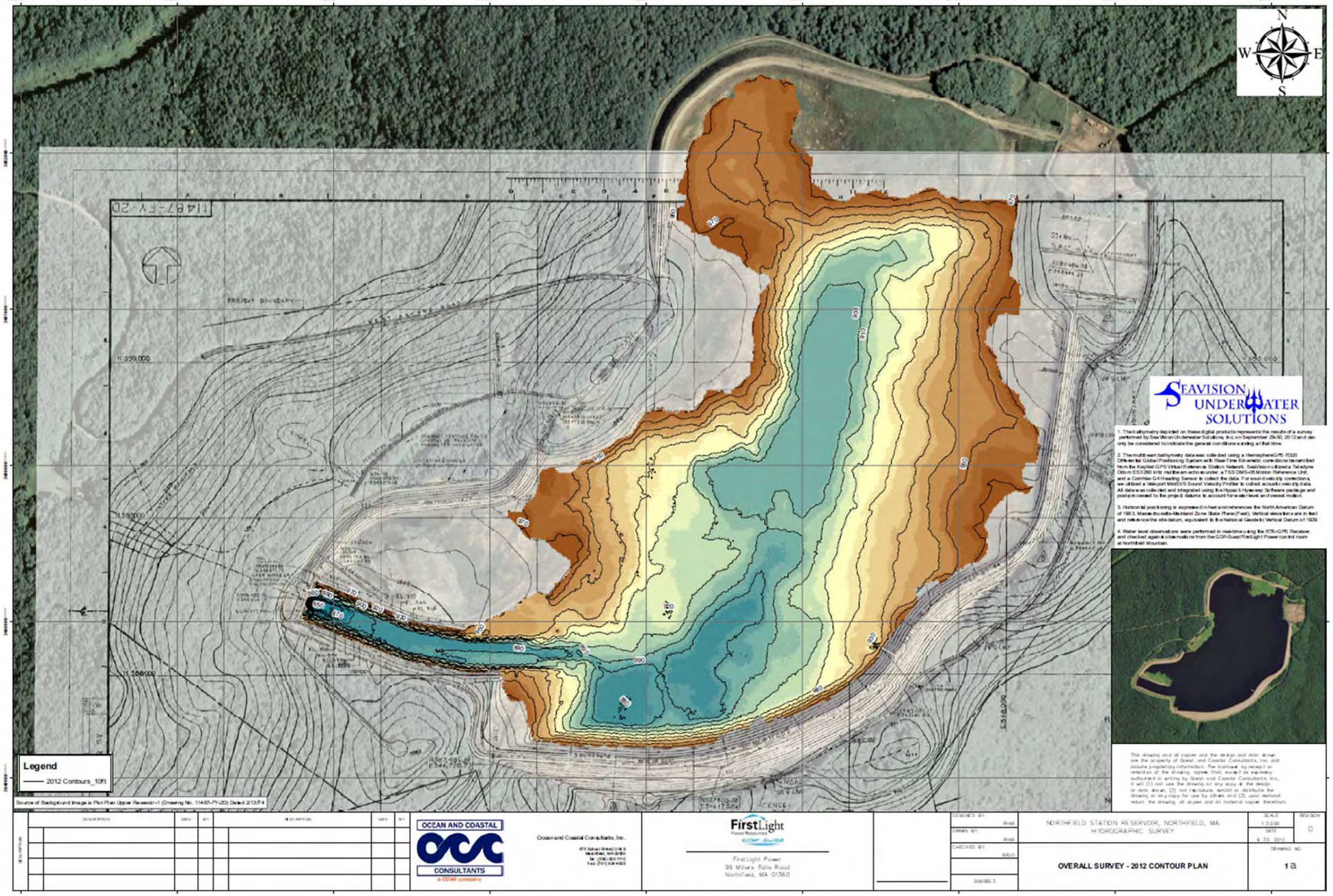
99 MILLERS FALLS ROAD
NORTHFIELD, MA 01360

TITLE:

2013 HYDROGRAPHIC SURVEY - CONTOUR PLAN
NORTHFIELD MOUNTAIN UPPER RESERVOIR
NORTHFIELD, MA 01360

DATE: OCTOBER 31, 2013
SCALE: 1"=600'
DRAWN: AMC CHECK: EJP
DWG NAME: 26727 Upper Reservoir Hydro 2013

Fig-3


N
W
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PROJECT BOUNDARY
WEST ASCENT ROAD
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Legend
2012 Contours_10ft
Source of Background Image is Plot Plan Upper Reservoir-1 (Drawing No. 11487-PY-2D) Dated 2/13/74
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1. The bathymetry depicted on these digital products represents the results of a survey performed by SeaVision Underwater Solutions, Inc. on September 29-30, 2012 and can only be considered to indicate the general conditions existing at that time.
2. The multibeam bathymetry data was collected using a HemisphereGPS R320 Differential Global Positioning System with Real-Time Kinematic corrections transmitted from the KeyNet GPS Virtual Reference Station Network. SeaVision utilized a Teledyne Odom ES3 200 kHz multibeam echosounder, a TSS DMS-05 Motion Reference Unit, and a CompNav G4 Heading Sensor to collect the data. For sound velocity corrections, we utilized a Valeport MiniSVS Sound Velocity Profiler to collect acoustic velocity data. All data was collected and integrated using the Hypack Hysweep Software package and post-processed to the project datums to account for water level and vessel motion.
3. Horizontal positioning is expressed in feet and references the North American Datum of 1983, Massachusetts Mainland Zone State Plane (Feet). Vertical elevations are in feet and reference the site datum, equivalent to the National Geodetic Vertical Datum of 1929.
4. Water level observations were performed in real-time using the RTK-GPS Receiver, and checked against observations from the GDF-Suez/FirstLight Power control room at Northfield Mountain.
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Northfield, MA 01360
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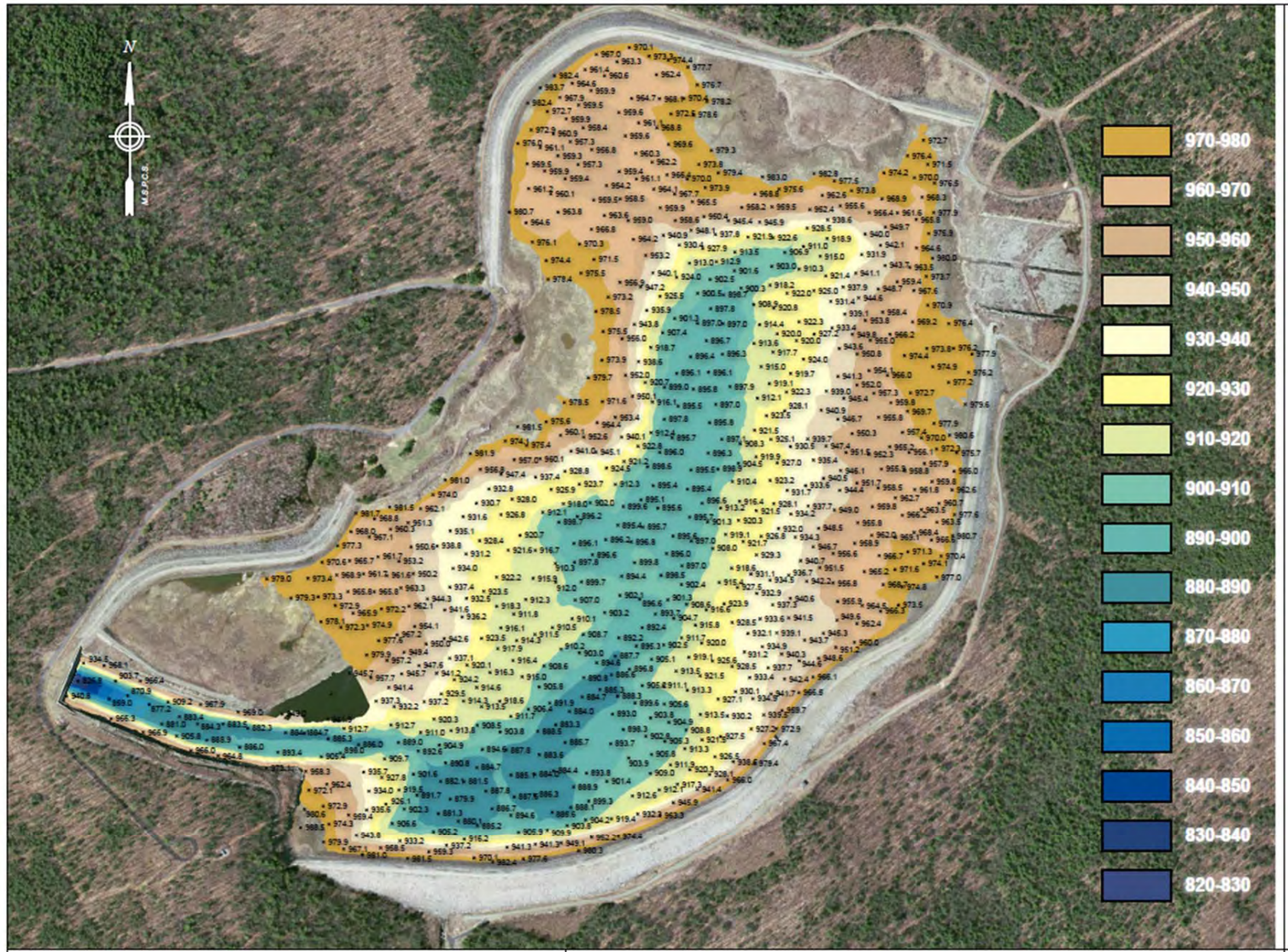
DRAWN BY: RHR
CHECKED BY: BJLO
309.080.3
NORTHFIELD STATION RESERVOIR, NORTHFIELD, MA
HYDROGRAPHIC SURVEY
SCALE: 1:3,000
DATE: 4.30.2013
REVISION: 0
DRAWING NO.: 1a
OVERALL SURVEY - 2012 CONTOUR PLAN



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4. THE VERTICAL BENCHMARK HELD FOR THIS SURVEY IS A LEAD PLUG AND TACK LOCATED ON THE NORTH WEST CORNER OF THE CONCRETE MDC INTAKE STRUCTURE AND IS KNOWN AS CP-9 (EL=1009.94 FT. (NMPSF)).

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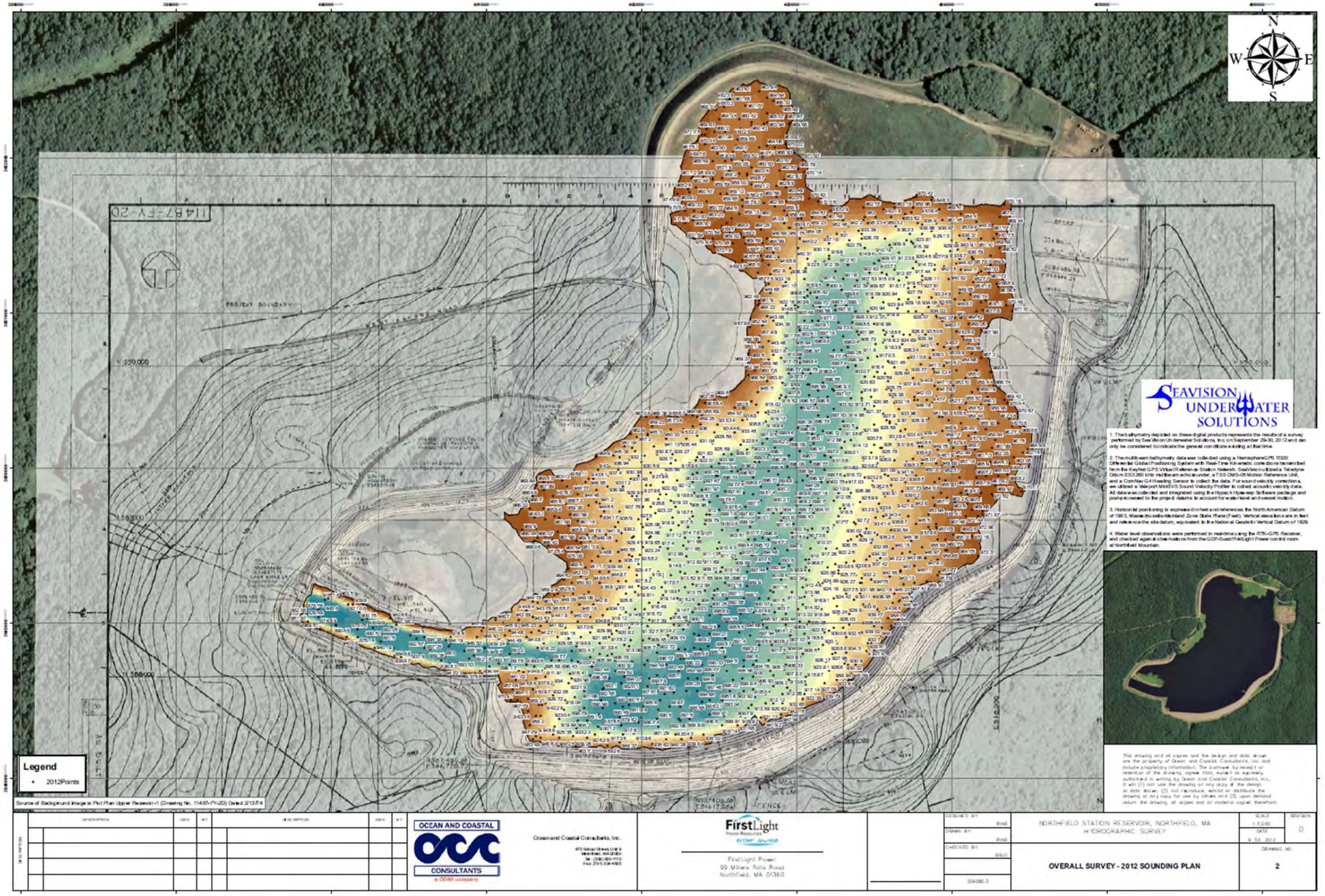
99 MILLERS FALLS ROAD
NORTHFIELD, MA 01360

TITLE:

2013 HYDROGRAPHIC SURVEY - SOUNDING PLAN
NORTHFIELD MOUNTAIN UPPER RESERVOIR
NORTHFIELD, MA 01360

DATE: OCTOBER 31, 2013
SCALE: 1"=600'
DRAWN: AMC CHECK: EJP
DWG NAME: 26727 Upper Reservoir Hydro 2013

Fig-4


N
W
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SEAVISION UNDERWATER SOLUTIONS
Legend
2012Points
PROJECT BOUNDARY
WEST ALDRICH ROAD
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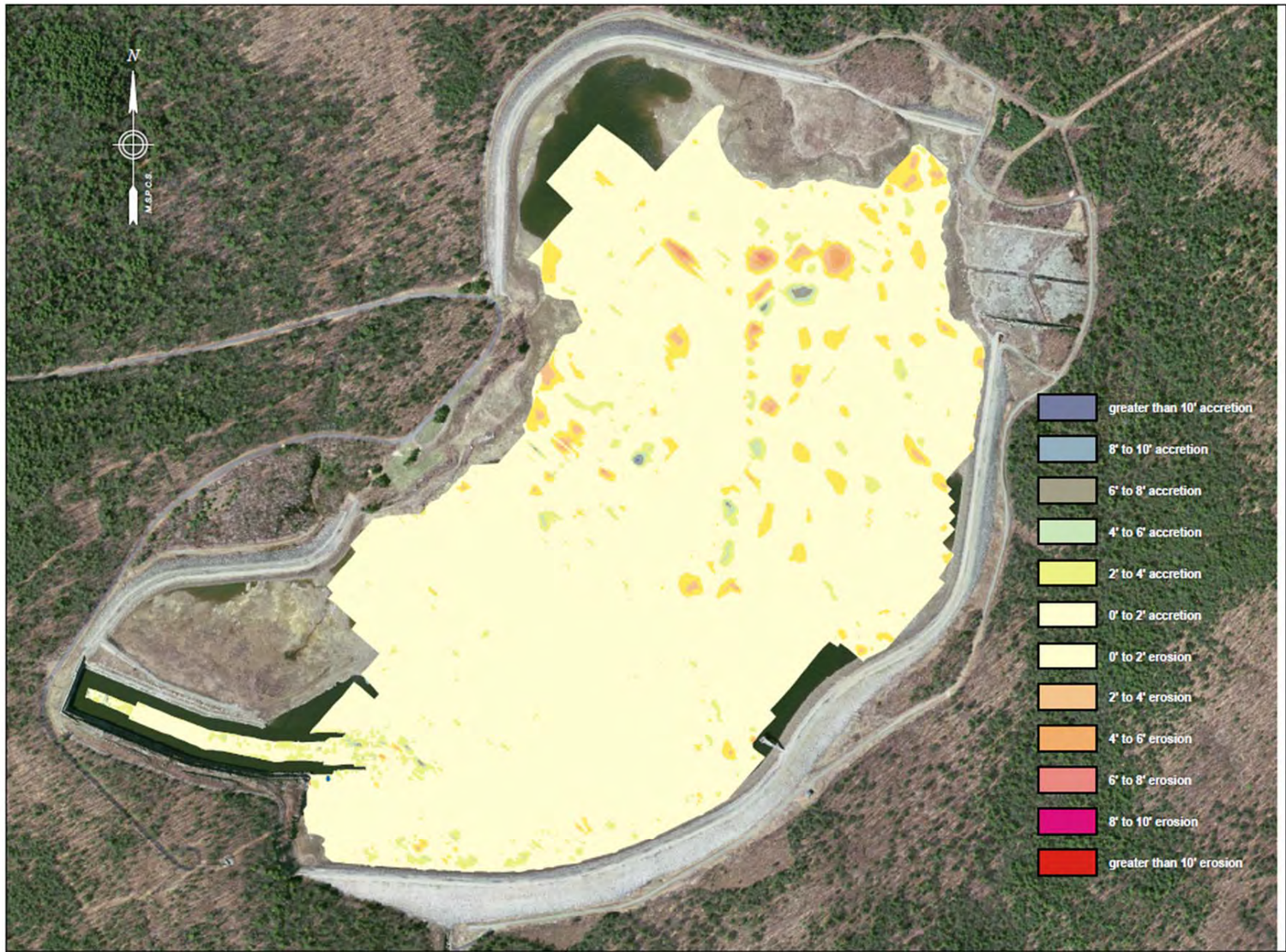
HYDROGRAPHIC SURVEY
OVERALL SURVEY - 2012 SOUNDING PLAN
SCALE: 1:3,000
DATE: 9.30.2012
REVISION: 0
DRAWING NO: 2



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PREPARED FOR:

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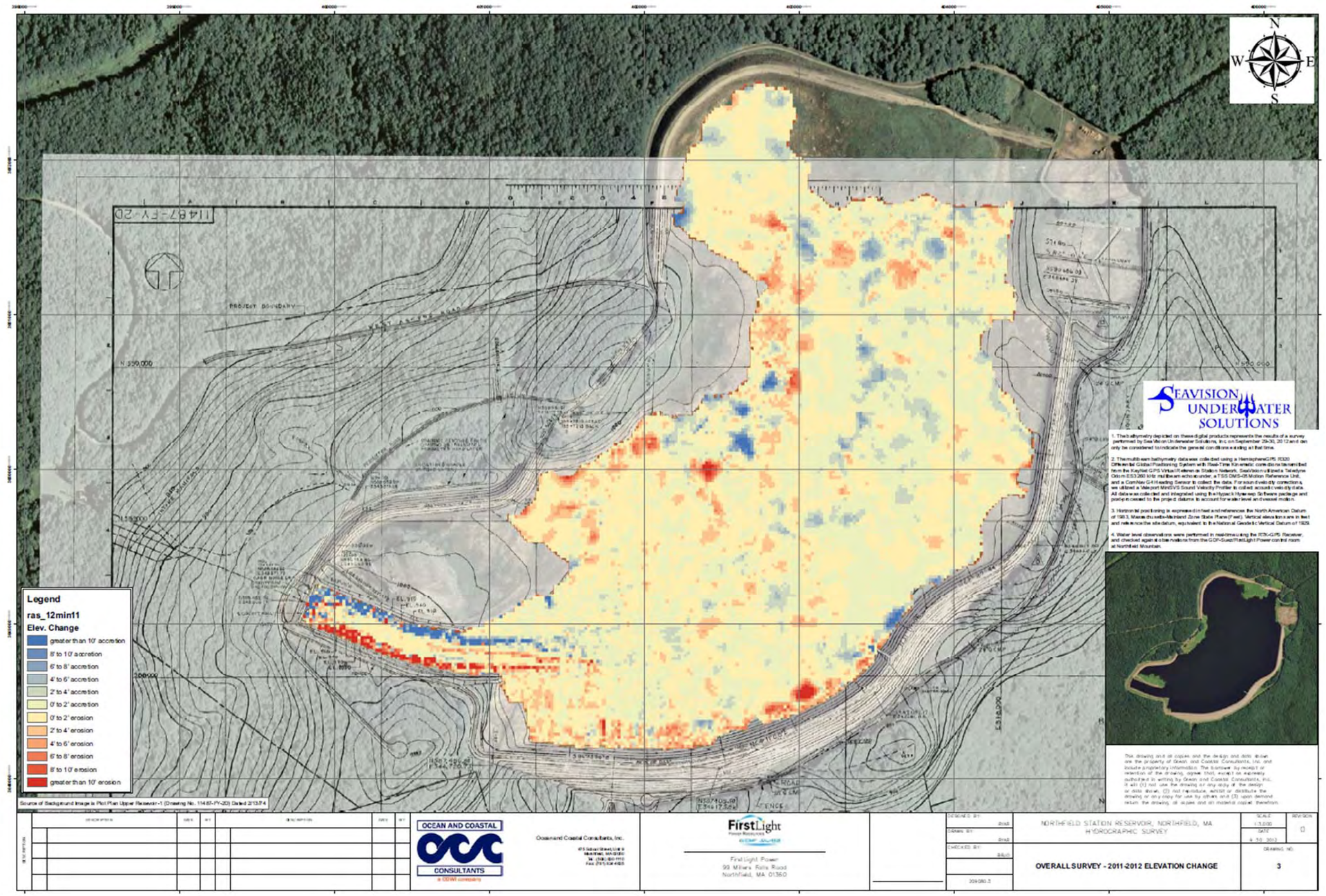
99 MILLERS FALLS ROAD
NORTHFIELD, MA 01360

TITLE:

2013 HYDROGRAPHIC SURVEY - ELEVATION CHANGE PLAN
2013 SURVEY vs. 2012 SURVEY
NORTHFIELD MOUNTAIN UPPER RESERVOIR
NORTHFIELD, MA 01360

DATE: OCTOBER 31, 2013
SCALE: 1"=600'
DRAWN: AMC CHECK: EJP
DWG NAME: 26727 Upper Reservoir Hydro 2013

Fig-5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HYDROGRAPHIC SURVEY
OVERALL SURVEY - 2011-2012 ELEVATION CHANGE
SCALE 1:5,000
DATE 9-30-2012
REVISION 0
DRAWING NO. 3

6 APPENDIX B – CORRESPONDENCE WITH SEQUOIA SCIENTIFIC, INC. AND CERTIFICATIONS

Sequoia Scientific, Inc.
2700 Richards Road, Suite 107
Bellevue WA 98005 USA
425.641.0944 (T); 425.643.0595 (F)
www.SequoiaSci.com ; info@SequoiaSci.com

Thursday, November 14, 2013

Brian Sousa
FirstLight Power Resources - GDF Suez NA
Northfield Mountain Pump Storage Project - Turners Falls Project
99 Millers Falls Road
Northfield, MA 01360
Tel: (413) 659-4412

Dear Brian,

On October 9th and 10th I visited First Light's two LISST-Hydro instruments installed near the Northfield Mountain Pump Storage Project. The purpose of the visit was to review the installation and offer any suggestions for changes. The details of notes and resulting action items from my visit are documented in the "Chuck Pottsmith Site Visit Recap – 10-2103" document created by Tim Sullivan.

Both the North and South LISST-Hydro installations are well executed. The enclosure for the instruments is more than adequate, the battery and solar power chargers are well done, the clean water tank is large and has the necessary filters, and the pump is correctly mounted and its cable and hose is well protected. The installations are well within the requirements needed for proper operation of the LISST-Hydros.

During the same visit the installation of the LISST-StreamSide was also reviewed. It was also found to have an adequate enclosure, battery power and solar charging is adequate. Clean water tank is acceptable. The installation of the LISST-StreamSide is within the requirements needed for proper operation.

Please let me know if you have any additional questions. I can be reached by email at cpottsmith@sequoiasci.com or by phone at 425-641-0944 ext 107.

Sincerely,

Chuck Pottsmith

Chuck Pottsmith
VP , Sales and Market Development