

Annual Monitoring Report 2019 (Year 3)

Exeter River Great Dam Removal Project

PREPARED FOR



Town of Exeter, New Hampshire
10 Front Street
Exeter, New Hampshire, 03833
603-778-0591

PREPARED BY



2 Bedford Farms Drive, Suite #200
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December 2019



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Report Narrative

1.0 Project Overview

Removal of the Great Dam and restoration of the Exeter River in Exeter, New Hampshire, commenced in July 2016 and was completed in October 2016. The dam removal project was subject to the conditions of NH Department of Environmental Services (NHDES) Wetlands Permit 2015-00887.

The former dam presented an obstacle to fish passage along the Exeter River and had been identified as structurally deficient by the NHDES Dam Bureau. Following the completion of a feasibility study in 2013, the Town of Exeter determined that the complete removal of the Great Dam was the preferred option.

The project involved the removal of the existing dam structure and associated fish ladder and weir; restoration and enhancement of approximately 200 linear feet of stream channel upstream of the former dam location; and accessory work to mitigate impacts to nearby structures and water intakes resulting from dam removal. The project is located on the Exeter River immediately downstream of the High Street Bridge in Exeter, New Hampshire at Lat/Long 42.98134 N, 70.94452 W. Refer to **Figure 1** – USGS Project Location Map.

The NHDES Wetlands Permit (2015-00887) issued for the Exeter Great Dam Removal project contains conditions relative to the monitoring of the restored reach of the Exeter River Restoration Site. Specifically, Condition #32 requires that a qualified professional shall conduct a follow-up post-construction inspection after the completion of construction to review the success of the restoration work and to schedule remedial actions, if necessary. VHB prepared a post-construction report in accordance with this condition; the final report was submitted to NHDES on February 3, 2017. Condition #34 also requires similar inspections, reports and remedial actions documented in an annual monitoring program for at least three years following completion of construction. Based on discussions with the Town of Exeter, NHDES, NHFGD, and NOAA, VHB identified eight (8) success standards to quantify compliance with these permit conditions for the annual monitoring program. These standards were identified in the “Great Dam, Exeter, NH, Monitoring Plan” prepared by VHB and dated November 8, 2016.

This document shall serve as the 3rd Annual Monitoring Report submitted to NHDES in accordance with Condition #34. The purpose of this document is to



address whether the Great Dam Removal Site has met the eight success-standards outlined in the 2016 Great Dam Monitoring Plan. A summary of these success standards is included in Appendix B. Based on observations made during inspections conducted by VHB in 2019, the Great Dam Removal continues to meet all eight success standards. Additional data supporting this conclusion is discussed in **Section 3.0** of this report.

2.0 Site History and Project Rationale

The Great Dam impounded the Exeter River about 4.5 miles upstream, including a portion of the Little River. The Exeter River rises in Chester, NH, and flows approximately 33 miles to downtown Exeter, where it is called the Squamscott River. The Exeter/Squamscott River becomes a tidal river and a primary tributary to Great Bay. Its watershed above the Great Dam site covers approximately 107 square miles, including substantial portions of the towns of Brentwood, Chester, Danville, East Kingston, Exeter, Fremont, Kensington, Kingston, Raymond, and Sandown. The Exeter/Squamscott River is an extremely significant coastal ecological resource. The river flows into the Great Bay Estuary, a tidally-dominated system that, at more than 6,000 acres, is one of the largest and most important estuaries on the Atlantic Coast.

VHB prepared a feasibility study of the Great Dam for the Town of Exeter in 2013, identifying potential benefits of dam removal:

- Reduce Exeter’s vulnerability to climate change by reducing the likelihood and magnitude of upstream flooding along the Exeter and Little Rivers.
- Increase public safety by eliminating unsafe and unnecessary dam infrastructure.
- Strengthen the natural ecosystem of the Exeter River for the benefit of fish and wildlife by eliminating a barrier to fish passage.
- Strengthen the natural ecosystem of the Exeter River by decreasing thermal stratification and improving dissolved oxygen conditions, creating a substantial net benefit on water quality.

The removal of the Great Dam and associated stream channel restoration were designed with these benefits in mind, and they were incorporated into grant funding and permitting for the project as permit conditions. The success standards detailed in this report have been selected for this purpose.



3.0 Approval Conditions and Restoration Site Success Standards

The Exeter River Great Dam removal project is subject to Conditions 32-36 of the NHDES Wetlands Permit No. 2015-00887, as well as Condition 4 of the ARM Fund Project Agreement executed by the Town of Exeter and NHDES, and Special Award Condition 8 of the National Oceanic and Atmospheric Administration (NOAA) Coastal Ecosystem Resiliency Grant issued to the Town (Award NA16NMF4630012). The individual approval conditions are outlined below, along with a discussion of efforts to date to comply with each approval condition.

Additionally, the Town of Exeter, in coordination with NHDES, NH Fish and Game Department (NHFGD), and NOAA, developed a set of eight monitoring success-criteria. The success standards were outlined in the Great Dam Monitoring Plan, prepared by VHB and dated November 2016, and are summarized as follows:

1. Design Meets Fish Passage Criteria
2. Streambank Stability & Vegetation Cover
3. Site Passability: Channel Width
4. Site Passability: Channel Depth
5. Site Passability: Average Channel Slope – Lower Riffle (Main Channel)
6. Site Passability: Average Channel Slope – Upper Riffle (Main Channel)
7. Site Passability: Max Jump Height
8. Alewife Presence/ Absence (Adult)

A summary of the eight success criteria is provided in the Exeter Great Dam Removal Success Standards and Criteria Evaluation Table included as [Appendix B](#).

3.1 NHDES Permit Condition No. 32

The qualified professional shall submit a follow-up report including photographs of all stages of construction from designated photo stations and an as-built plan, with water depth within the restoration area, which shall be submitted to the DES Wetlands Program within 60 days of final site stabilization.

VHB conducted regular construction inspections in conjunction with Paul Vlasich, Town of Exeter. Based on VHB observations, final site stabilization was achieved by October 31, 2016. Following completion of construction, VHB prepared a post-construction completion report incorporating the requirements of Condition 32, including a narrative discussion, a catalog of construction-phase photographs, and the final as-built plan depicting water depths within the restoration area. This report was submitted to NHDES on July 26, 2017, and is included as Appendix C.



3.2 NHDES Permit Condition No. 33

The Town of Exeter shall establish and submit to DES for approval at least five (5) permanent monumented cross-sections throughout the stretch of the Exeter River, two of which shall be in locations within 100 feet of the location of the existing dam.

On behalf of the Town, VHB survey staff established five (5) cross-sections with permanent monuments in the locations depicted in **Figure 2**. Cross sections were proposed in locations that would provide good long-term monitoring of stream geomorphology and would allow safe access by survey teams. The locations were discussed with NHDES, NHFGD and NOAA habitat restoration specialists and approved by NHDES on November 8, 2016.

The first cross section is located downstream of the String Bridge through a gravel bar within the tidal reach of the Squamscott River. The second and third cross sections are located at the downstream and upstream limits of the restored upper riffle, and will allow long term evaluation of the restored stream slope through this section. The fourth cross section is located at the end of the Franklin Street in a section of river that was identified as a geomorphic area of concern during development of the Feasibility Study. This location was previously surveyed during the design phase of the project and will provide a baseline for long-term monitoring. The fifth cross section is located at the Town water supply intake, which is a critical interest area for the Town, and this location was also previously surveyed and will provide a baseline for long-term monitoring.

At each cross-section, horizontal coordinates were surveyed in New Hampshire State Plane coordinates (NAD 1983) and vertical elevations in the North American Vertical Datum of 1988 (NAVD 1988) to 0.1 foot or better vertical accuracy using either traditional or Global Positioning System (GPS) methods. For each cross section, the survey collected data at the following locations: Top of bank; Edge of water (on date of survey); Bottom of bank; Thalweg; Points of inflection.

VHB survey staff re-surveyed all five monumented cross-sections on September 26 through September 30, 2019. Survey profiles indicate that the channel remains effectively stable at all cross-sections (accounting for minor deviations in survey point placement), with minimal aggradation and/or degradation observed. Cross-section profiles and data in tabular x, y, z format for each cross-section comparing the 2019 monitoring survey to the 2018 Year 2 survey, 2017 Year 1 survey, and 2016 baseline survey, is included in **Appendix D**.



3.3 NHDES Permit Condition No. 34

The restoration shall be monitored for the first three (3) years following the dam removal/stream channel restoration to ensure the maintenance and success of the stream restoration work and successful fish passage. The annual report shall include cross section data, fish counts at the Pickpocket Dam (provided by NHFGD) and any other notable changes to the project area.

This report represents the final year of the three-year monitoring period in accordance with this condition. The Town of Exeter has conducted monitoring of the project for a three years (2017 through 2019), meeting the permit condition. In addition to survey of the five monumented cross-sections required by Condition 32, this monitoring report includes photographic documentation of each cross-section, information on efforts by the NHFGD to obtain fish counts at the Pickpocket Dam, and visual assessment of vegetation plantings (see Condition 35). Monumented cross-section data is included in **Appendix D**, and Photographic documentation is included in **Appendix E**.

Monitoring parameters and success criteria for the restoration reach, based on guidance provided from the NOAA Restoration Center and tied to the Coastal Ecosystem Resiliency Grant, are outlined in **Appendix B**. The data collected for this first year during the monitoring period is compared to the parameters listed in **Appendix B** to evaluate the success of the project restoration.

Monitoring parameters include measurements of channel width and depth during low-flow periods. "Low-flow" is considered to be below the 95% exceedance probability daily flow, typically occurring between the months of July and October: 32 cfs at the Project location. Records for USGS Stream Gage 01073587 (Exeter River at Haigh Rd, Brentwood, NH) indicate that Exeter river flows were consistent with historic medians, but dropping below the 95% daily flow for the majority of August and September. Channel survey was performed at the end of a prolonged dry period on September 26 through 30, 2019; measured flows on these dates were approximately 6 cfs. This corresponds to an approximate value of 10 cfs at the Project location, applying a 1.69 scale factor to account for the larger watershed than the USGS gage.

It is important to bear in mind that rivers are dynamic systems, and some changes in the streambed may occur (in both the restored reach and the channel upstream and downstream of our project) which would not present an issue for fish passage or adjacent infrastructure. Thus, the criteria contained in **Appendix B** are intended to provide a frame of reference for the monitoring assessment and are focused on the restoration reach. The key criteria, however, are whether fish can pass through the restoration reach under normal conditions and whether adjacent infrastructure is stable.



Due to complications with operation of the automated fish counter at Pickpocket Dam fish ladder in 2017, NHFGD made modifications to the ladder for the 2018 migration season to operate the ladder as a trap. According to an October 29, 2019 email from Mike Dionne, NHFGD Marine Biologist, the trap passed a total of 28 river herring in 2019.

Mike Dionne also noted the following observations in his email:

- NHFGD staff did not see many fish gathering below Pickpocket Dam. However, this was likely due in part because the run was slow to get going in Spring 2019 due to very cold water temperatures early on in the run. NHFGD fish count numbers were down in all rivers statewide this year due to cold water temperatures.
- NHFGD staff did still see many fish pass the former Great Dam location on a couple of occasions.
- Coastal harvesters reported seeing very high numbers of river herring below the Spring Bridge at the head of tide downstream of the former Great Dam.

3.4 NHDES Permit Condition No. 35

Restoration of temporary impact areas shall have at least 75% successful establishment of vegetation after three (3) growing seasons, or they shall be replanted and reestablished in a manner satisfactory to the DES Wetlands Program.

Planting of the temporary impact areas included seeding of upland areas using the upland seed mix included in the specifications, seeding of riparian areas with a riparian restoration mix, and planting of one 8-inch maple in Founders Park.

At the time of the most recent VHB site visit on September 30, 2019, visual observation of temporary impact areas indicates that percent cover continues to exceed the 75% success criterion. Plantings were completed by the contractor by the completion of construction in October 2016 and informal observation of vegetation establishment indicated that vegetation was fully established by Summer 2017. Based on these observations, the Town of Exeter and VHB believe this success criterion continues to be met.

3.5 NHDES Permit Condition No. 36

The Town shall review the project reach during the first three (3) spring anadromous fish migration seasons following completion of the project (i.e., spring 2017-2019) with staff from the NHFGD and NOAA to perform a visual evaluation of fish passage conditions. This review will determine whether any adjustments to boulder cluster placement or river micro-grades are necessary to allow upstream fish passage. If necessary, such adjustments shall be made during



low flow conditions in 2017 in accordance with agreed upon methodology by DES, ACOE, NOAA, and NHFGD.

In accordance with Wetland Permit Condition 36, the Town of Exeter, together with representatives from NOAA, NHFGD, and VHB conducted a joint inspection of the restoration site on May 17, 2019 to assess fish passage conditions. This was the third annual joint inspection, following previous inspections on April 14, 2017 and May 16, 2018; information on these previous inspections is provided in the Year 1 and Year 2 Annual Monitoring Reports.

During the meeting, attendees did not observe fish swimming in the Exeter River. This was likely due to above-average flow rates and below-average water temperatures from rainy, cloudy spring weather suppressing fish migration upstream. Mike Dionne reported that fish migration in rivers statewide was low in Spring 2019, with only $\pm 13,000$ fish counted statewide by May 16, compared to $\pm 75,000$ counted by that date for a typical year.

Exeter River flows at the time of the visit were approximately 210 cfs, after peaking at an estimated 780 cfs in mid-April. River flows were near the upper limit of the range under which fish passage is expected; the median D_{50} daily flow for mid May is 150 cfs.

Mike Dionne reported that fish had been observed navigating through the former dam location the previous week, when there were a few sunny days and water temperatures were conducive to alewife migration ($13-14^{\circ}\text{C}$); May 17 site visit water temperatures were $9-10^{\circ}\text{C}$.

Attendees at the meeting agreed that the minor channel modifications on the river left side performed by NOAA and NHFGD in 2017 were continuing to perform as intended, and were providing slower flow velocities and resting locations for upstream fish passage.

Refer to **Appendix E** for photographs depicting a stable stream bed and banks as well as permanent stabilization of the surrounding restoration zones. Refer to **Appendix F** for meeting minutes from the May 17, 2019 site visit meeting.

3.6 ARM Fund Grant Condition No. 4

That the Property involved in the project will be monitored by the Town, or their designee, on an annual basis for five years post construction to ensure the success of the activities taken and to ensure that no actions are occurring which could be detrimental to the project objectives outlined in Exhibit A (to remove the Great Dam from the Exeter River to improve aquatic



organism passage and habitat, reduce vulnerability to storm-related floods, and improve water quality), or to surrounding properties.

The ARM Fund Grant Agreement requires monitoring of the river beyond the three-year period stipulated in the NHDES Wetlands Permit. We note that the language of the wetland permit incorporates the recommendations of reviewers from the NHDES Coastal Program, NHFGD and NOAA, and post-dates the standard monitoring language included in the ARM Fund Grant.

At the time of this third monitoring report, all eight success standards have been met in each of the first three monitoring years, and survey indicates that channel geometry has remained stable at all five monitoring cross-sections. Given this progress to date, it is likely that all performance standards will continue to be met for the remainder of the ARM Fund Grant monitoring period. The Town proposes to coordinate with reviewers from the NHDES Wetlands Bureau following review of this Year 3 monitoring report to evaluate the effectiveness of the Project and discuss whether an additional two years of monitoring in 2020 and 2021 would be necessary to document project success. The quantitative assessment of the Monitoring Criteria outlined in **Appendix B** provides a detailed review of trends over the three-year monitoring period.

4.0 Conclusion

After three full seasons, the Exeter Great Dam Removal site has consistently been determined to be successfully meeting all the eight monitoring success standards for the project. There have been no significant changes in the monitoring criteria during this monitoring period, channel geometry remains stable, and successful upstream fish passage has been confirmed in each year of monitoring. Based on this success to date, VHB's opinion is that further monitoring in accordance with the ARM Fund Grant Condition No. 4 is not warranted.

A summary table is provided in **Appendix B**, containing data and commentary on each of the eight success standards to support these conclusions.



Figures

Figure No. Description

- | | |
|---|---|
| 1 | USGS Project Location Map |
| 2 | Exeter Great Dam Monitoring Cross-Sections Plan |



Vanasse Hangen Brustlin, Inc.
 2 Bedford Farms Dr, #200
 Bedford, NH 03110
 603.391.3900 Fax 603.518.7495

Exeter Great Dam Removal Monitoring

USGS Locus Map

SCALE:

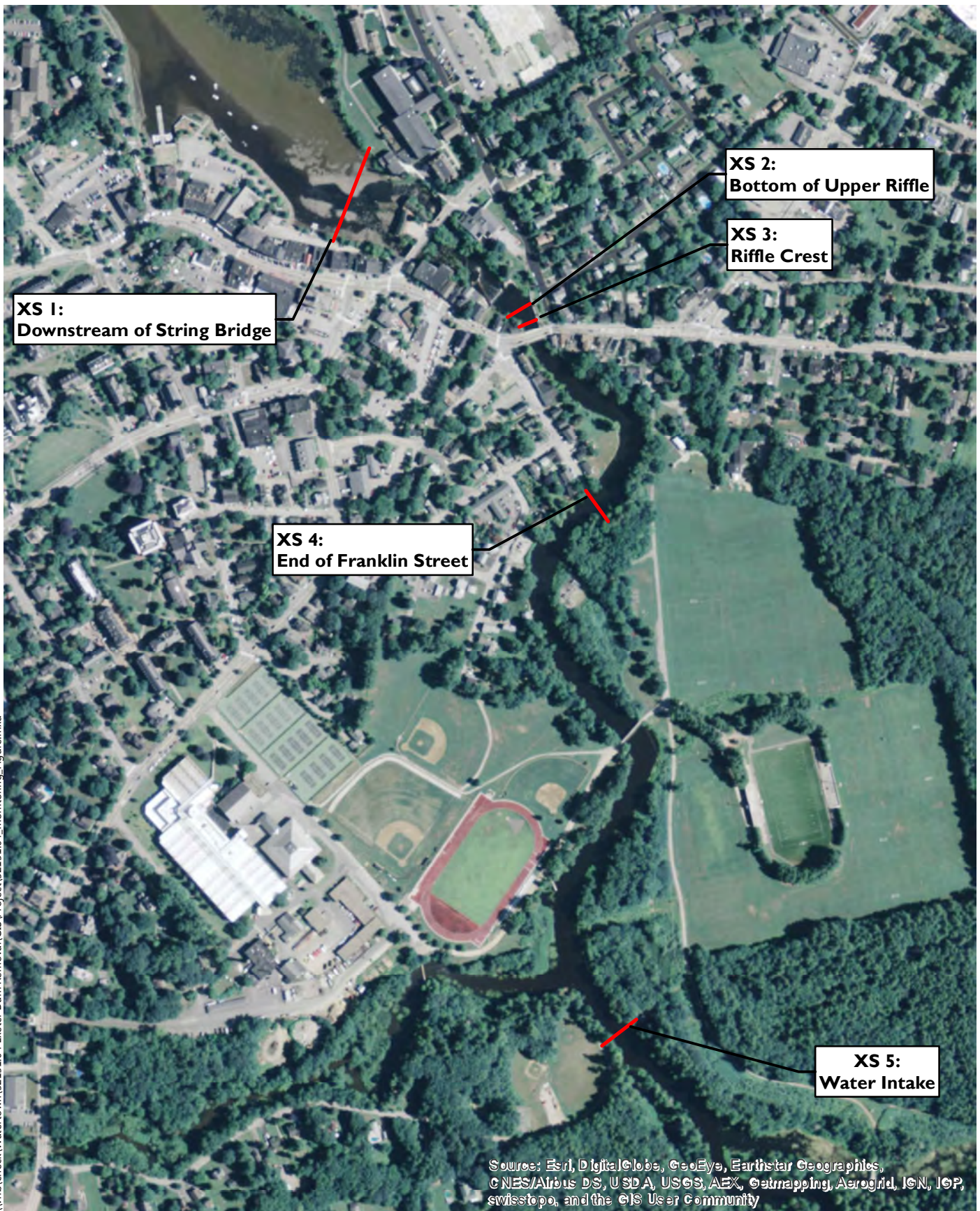
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1"=2,000'

Oct 2018

52151.04



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**Great Dam Removal &
Exeter River Restoration**

| Exeter, NH

**Permanent Monitoring
Cross Section Locations**





Appendices

Appendix	Description
A	NHDES Wetlands Permit 2015-00887
B	Exeter Great Dam Success Standards and Criteria Evaluation Table
C	Post-Construction Completion Report
D	Representative Monitoring Cross-Sections and Data
E	Representative Site Photographs
F	May 17, 2019 Site Meeting Minutes



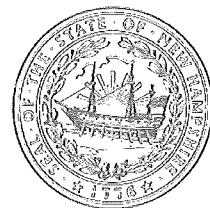
Appendix A

NHDES Permit





The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

APPROVAL LETTER

March 17, 2016

Page 1 of 3

Town of Exeter
Dept. of Public Works
c/o Paul Vlasich
13 Newfields Road
Exeter, NH 03833

RE: NH DES Wetlands Bureau File No. 2015-00887, Great Dam, Exeter

Dear Mr. Vlasich:

Attached please find Wetlands Permit 2015-00887 to dredge and fill a total of 34,200 square feet within the bed and banks of the Exeter River to include 23,520 square feet of permanent impact and 10,680 square feet of temporary impact to remove Great Dam and its appurtenances, reshape the river channel to ensure migratory fish passage through the restored reach, install a dry hydrant at Franklin Street, and modify the existing municipal water intake to maintain the existing water supply withdrawal.

The decision to approve this application was based on the following findings:

1. The Exeter River Great Dam does not comply with DES Dam Safety regulations as indicated in a Letter of Deficiency issued by DES on July 25, 2000 to the Town of Exeter.
2. The Exeter River Great Dam Removal Feasibility and Impact Analysis (VHB, 2013) explored and identified alternatives to resolving the dam deficiencies.
3. Following this study, in March 2014, the Town of Exeter voted to approve the Great Dam Removal Project.
4. The structure was built in 1914 and has deteriorated with age and poses a safety hazard and liability for the Town of Exeter.
5. The Exeter-Squamscott River is a major tributary to Great Bay and has a total of eight tributaries above the Great Dam.
6. This is a minimum impact project per Administrative Rule Env-Wt 303.04(t) Restoration of altered or degraded wetlands provided the project:
 - (1) Receives financial support and direct supervision of a New Hampshire state agency, the US Environmental Protection Agency, the US Army Corps of Engineers, the US Natural Resources Conservation Service, or the US Fish and Wildlife Service;
 - (2) Shall not be used to perform restoration in cases where the applicant is subject to a removal or restoration order;
 - (3) Is not located in or adjacent to prime wetlands; and
 - (4) Does not meet the criteria of Env-Wt 303.02(k).
7. The dam removal and stream restoration has been overseen by NHDES Watershed Management Bureau, NH Fish and Game (NHFG), and The National Oceanic and Atmospheric Administration (NOAA).

8. The need for the proposed impacts has been demonstrated by the applicant per Env-Wt 302.01 as this project is being conducted to remove an unsafe dam, however, the focus of the project is also to restore the impaired surface water created by the dam and to improve fish passage within the Exeter-Squamscott River.
9. The applicant has provided evidence which demonstrates that this proposal is the alternative with the least adverse impact to areas and environments under the department's jurisdiction per Env-Wt 302.03. There will be limited direct impacts to the river by removal of accumulated sediments, existing concrete, and the creation of the new stream channel and banks. It is expected that any indirect impacts to wetlands from lowering the proposed water levels may change wetland cover types.
10. The applicant has demonstrated by plan and example that each factor listed in Env-Wt 302.04(a) Requirements for Application Evaluation, has been considered in the design of the project.
11. In accordance with Env-Wt 304.04, the applicant has received written concurrence from seven of eight abutters whose properties are within 20-feet of the proposed impacts.
12. The applicant requested a waiver of Env-Wt 304.04(a) as the applicant was unable to obtain written concurrence from the abutter identified as Exeter Tax Map 072 Lot 037.
13. DES hereby grants the waiver of Env-Wt 304.04(a) in accordance with Env-Wt 204.04(a) as granting the request will not result in an adverse effect to the environment or natural resources of the state, public health, or public safety; or an impact on abutting properties that is more significant than that which would result from complying with the rule. Furthermore, granting the request is consistent with the intent and purpose of the rule being waived. Strict compliance with the rule will provide no benefit to the public.
14. The applicant has agreed to install a riprap revetment and granite buttress along the length of the abutter's wall at additional expense. Crack gauge monitoring and vibration monitoring will occur throughout the project to ensure the structural integrity of the abutter's wall is not compromised.
15. Furthermore, the Town of Exeter has obtained liability insurance and the selected contractor will also be required to provide proof of liability insurance.
16. The Exeter River from Great Dam to Pickpocket Dam is listed as an impaired water under Section 303(d) of the Clean Water Act due to dissolved oxygen saturation levels. The removal of the dam is expected to improve dissolved oxygen levels.
17. The applicant has conferred with NH Fish and Game and NOAA to implement fish passage monitoring to ensure passage goals are being met.

Any person aggrieved by this decision may appeal to the N.H. Wetlands Council ("Council") by filing an appeal that meets the requirements specified in RSA 482-A:10, RSA 21-O:14, and the rules adopted by the Council, Env-WtC 100-200. The appeal must be filed **directly with the Council within 30 days** of the date of this decision and must set forth fully **every ground** upon which it is claimed that the decision complained of is unlawful or unreasonable. Only those grounds set forth in the notice of appeal can be considered by the Council. Information about the Council, including a link to the Council's rules, is available at <http://nhec.nh.gov/> (or more directly at <http://nhec.nh.gov/wetlands/index.htm>.) Copies of the rules also are available from the DES Public Information Center at (603) 271-2975.

Your permit must be signed, and a copy must be posted in a prominent location on site during construction.

If you have any questions, please contact me at (603) 559-1515 or via email at eben.lewis@des.nh.gov.

Sincerely,



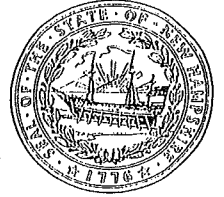
Eben M. Lewis
Compliance Specialist
DES Wetlands Bureau

enclosures

cc: Peter Walker, Principal, VHB
Kristen Murphy, Exeter Conservation Commission
William Meserve, Chair, Exeter-Squamscott River Local Advisory Committee
Cheri Patterson, Supervisor of Marine Programs, NH Fish and Game Department
Eric Hutchins, Fisheries Biologist, NOAA
Melinda Bubier, Wetland Mitigation Program Specialist, DES Wetlands Bureau
Lori Sommer, Wetland Mitigation Coordinator, DES Wetlands Bureau
Frank D. Richardson, Ph.D., Senior Wetlands Inspector, DES Wetlands Bureau
Collis G. Adams, Administrator, DES Wetlands Bureau
Ted Diers, Administrator, DES Watershed Management Bureau
Keyin Lucey, NHDES Coastal Program
Sally Soule, NH DES Watershed Assistance Section
Gregg Comstock, P.E., Supervisor, DES Water Quality Planning Section
James R. Weber, P.E., DES Dam Bureau



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

NOTICE TO RECIPIENTS OF MINIMUM IMPACT N.H. WETLANDS PERMITS

Your permit was approved by the New Hampshire Wetlands Bureau as a minimum impact project, and your project is automatically approved under the Army Corp's New Hampshire Programmatic General Permit.

For the purpose of the NH PGP, Minimum Impact Projects do not include new construction of:

Dams,

Dikes,

water withdrawal or diversion projects which require fill in wetlands or surface waters,

wetlands restoration projects, or any projects which involve work in other than low flow conditions (July 1-September 30),

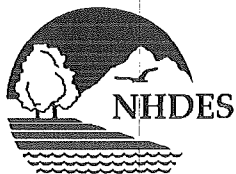
any projects involving more than 3,000 square feet of a water body or wetland fill and secondary impacts.

Also, not included under Minimum Impact Projects are those projects that include the reconstruction or replacement of currently unserviceable structures/fills. The projects must be reviewed through the screening procedures for minor impact projects. The activities in section 10 waters not regulated by the Wetlands Bureau, formerly authorized under the Nationwide Permit Program and listed in Appendix A of this document are designated non-reporting activities.

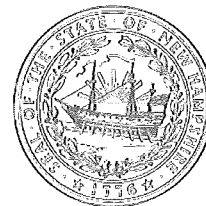
These approvals do not relieve you from obtaining any necessary local permits that may be required by your town.

If you have any questions, feel free to give us a call at 603-271-2147

This notice was sent with minimum impact permit



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

WETLANDS AND NON-SITE SPECIFIC PERMIT 2015-00887 PAGE 1 OF 4

Permittee: Town Of Exeter
Dept Of Public Works
c/o Paul Vlasich
13 Newfields Rd
Exeter, NH 03833

Project Location: Chestnut Street, Exeter

Waterbody: Exeter River

**NOTE --
CONDITIONS**

APPROVAL DATE: 03/17/2016

EXPIRATION DATE: 03/17/2021

Based upon review of the above referenced application, in accordance with RSA 482-A and RSA 485-A:17, a Wetlands Permit and Non-Site Specific Permit was issued. This permit shall not be considered valid unless signed as specified below.

PERMIT DESCRIPTION: Dredge and fill a total of 34,200 square feet within the bed and banks of the Exeter River to include 23,520 square feet of permanent impact and 10,680 square feet of temporary impact to remove Great Dam and its appurtenances, reshape the river channel to ensure migratory fish passage through the restored reach, install a dry hydrant at Franklin Street, and modify the existing municipal water intake to maintain the existing water supply withdrawal.

THIS APPROVAL IS SUBJECT TO THE FOLLOWING PROJECT SPECIFIC CONDITIONS:

1. All work shall be in accordance with plans by VHB dated December 7, 2015, as received by the NH Department of Environmental Services (DES) on December 10, 2015.
2. The permittee shall schedule a pre-construction meeting with DES Land Resources Management Program staff, US Army Corps of Engineers (ACOE), Town of Exeter, NOAA Fisheries Service (NOAA), and the NH Fish and Game Department (NHFGD) to occur at least 48 hours prior to the start of any work authorized by this permit to review the conditions of this wetlands permit. The meeting may be held on-site or at the DES offices in Concord or the Pease International Tradeport. The meeting shall be attended by the permittee; the professional engineer(s); wetlands scientist(s), environmental consultant(s), and/or qualified professional(s); and the contractor(s) responsible for performing the work.
3. The permittee shall notify the DES Wetlands Program in writing of the qualified professionals, as applicable, that will be responsible for monitoring and ensuring that the restoration/enhancement/construction areas are constructed in accordance with the approved plans.
4. The dam removal/stream restoration project shall be performed and/or supervised by the qualified professional with expertise and demonstrated success in the field of stream restoration. The permittee shall re-notify the DES Wetlands Program if the identity of the qualified professional changes during the project.
5. The qualified professional shall monitor the project during construction to verify that all work is done in accordance with the approved plans and narratives, adequate siltation and erosion controls are properly implemented, and no water quality violations occur.
6. Any further alteration of areas on this property that are subject to RSA 482-A jurisdiction will require a new application and further permitting.

7. All development activities associated with this project shall be conducted in compliance with applicable requirements of RSA 483-B and N.H. Code Admin. Rules Env-Wq 1400 during and after construction.
8. No person undertaking any activity shall cause or contribute to, or allow the activity to cause or contribute to, any violations of the surface water quality standards in RSA 485-A and Env-Wq 1700.
9. The permittee shall notify the NH Fish and Game Department as required by RSA 211:11 prior to drawing down or dewatering the resource.
10. Work shall be carried out in a time and manner to avoid disturbances to migratory waterfowl breeding and nesting areas as well as migratory fish spawning and rearing habitat.
11. The time of year the work should be conducted is between July 1 and October 31 (or before freeze occurs). If work is not completed by October 31 then the river must be drawn down to its lowest capacity before freeze occurs then work can continue until March 1st.
12. The primary construction work in the first year shall be done during drawdown or in the dry only. Consultation with ACOE, DES, NOAA, and NHFGD shall determine methodology for in-river work for additional fish passage construction thereafter if needed.
13. Appropriate siltation and erosion controls shall be in place prior to construction, shall be maintained during construction, and shall remain until the area is stabilized. Temporary erosion controls shall be removed once the area has been stabilized.
14. The qualified professional shall inspect the construction areas and submit a monitoring report to DES after a rain event of 1/2" or greater within a 24 hour period during restoration activities. The monitoring reports shall include, but not be limited to, documentation of erosion control deployment, construction sequencing, construction activities and status of construction at time of initial monitoring report. Photographs taken from previously established locations should depict all stages of restoration sequencing.
15. Appropriate turbidity controls shall be installed prior to construction, shall be maintained during construction such that no turbidity escapes the immediate dredge area, and shall remain until suspended particles have settled and water at the work site has returned to normal clarity.
16. Work shall be conducted in a manner so as to minimize turbidity and sedimentation to surface waters and wetlands.
17. All dredged and excavated material and construction-related debris shall be placed outside of the areas subject to RSA 482-A.
18. The contractor responsible for completion of the work shall use techniques described in the New Hampshire Stormwater Manual, Volume 3, Erosion and Sediment Controls During Construction (December 2008).
19. Construction equipment shall be inspected daily for leaking fuel, oil, and hydraulic fluid prior to entering surface waters or wetlands or operating in an area where such fluids could reach groundwater, surface waters, or wetlands.
20. The permittee's contractor shall maintain appropriate oil/diesel fuel spill kits on site that are readily accessible at all times during construction, and shall train each operator in the use of the kits.
21. All refueling of equipment shall occur outside of surface waters or wetlands during construction. Machinery shall be staged and refueled in upland areas only, unless approved by NHDES prior to refueling.
22. Faulty equipment shall be repaired immediately prior to entering areas that are subject to RSA 482-A jurisdiction.
23. Any turbid discharge from dewatering of work areas shall be to sediment basins that are: a) located in uplands; b) lined with hay bales or other acceptable sediment trapping liners; c) set back as far as possible from wetlands and surface waters, with a preferred undisturbed vegetated buffer of at least 50 feet and a minimum undisturbed vegetative buffer of 20 feet, unless an alternative location is approved by NHDES. Non-turbid water may be discharged directly to the river without treatment.

24. Prior to commencing work on a substructure located within surface waters, the permittee or permittee's contractors shall construct a cofferdam to isolate the substructure work area from the surface waters. The permittee or permittee's contractor shall provide DES with provisions for avoiding/preventing cofferdam failure. If failure occurs a monitoring report shall be submitted to DES to include, but not limited to, documentation of reason of failure, damage to restoration site and environmental damage throughout range of affected area, construction sequencing, construction activities and status of construction at time of initial monitoring report. Photographs taken from previously established locations should depict all stages of restoration sequencing.
25. Cofferdams shall not be installed during periods of high flow, whether due to seasonal runoff or precipitation. Once the cofferdam is fully deployed and effective and reviewed by DES, confined work can proceed without restriction.
26. The temporary cofferdam shall be entirely removed within two (2) days after work within the cofferdam is completed and water has returned to normal clarity.
27. Precautions shall be taken to prevent import or transport of soil or seed stock containing nuisance or invasive species such as Purple Loosestrife, Knotweed, or Phragmites. The contractor responsible for work shall appropriately address invasive species in accordance with the NHDOT Best Management Practices for Roadside Invasive Plants (2008).
28. Area of temporary impact shall be regraded to original contours following completion of work.
29. Areas from which vegetation has been cleared to gain access to the site shall be regraded to original contours and seeding with similar native species.
30. Within three (3) days of final grading or temporary suspension of work in an area that is in or adjacent to wetlands or surface waters, all exposed soil areas shall be stabilized by seeding and mulching during the growing season, or if not within the growing season, by mulching with tackifiers on slopes less than 3:1 or jute matting and pinning on slopes steeper than 3:1.
31. Where construction activities occur between November 30 and May 1, all exposed soil areas shall be stabilized within one (1) day of establishing the grade that is final or that otherwise will exist for more than five (5) days. Stabilization shall include placing 3-inches of base course gravels, or loaming and mulching with tack or jute matting and pinning on slopes steeper than 3:1.

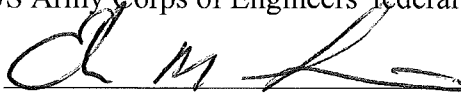
MONITORING:

32. The qualified professional shall submit a follow-up report including photographs of all stages of construction from designated photo stations and an as-built plan, with water depth within the restoration area, which shall be submitted to the DES Wetlands Program within 60 days of final site stabilization.
33. The Town of Exeter shall establish and submit to DES for approval at least five (5) permanent monumented cross-sections throughout the stretch of the Exeter River, two of which shall be in locations within 100 feet of the location of the existing dam.
34. The restoration shall be monitored for the first three (3) years following the dam removal/stream channel restoration to ensure the maintenance and success of the stream restoration work and successful fish passage. The annual reports shall include cross section data, fish counts at the Pickpocket Dam (provided by NHFGD) and any other notable changes to the project area.
35. Restoration of temporary impact areas shall have at least 75% successful establishment of vegetation after three (3) growing seasons, or they shall be replanted and re-established in a manner satisfactory to the DES Wetlands Program.
36. The Town shall review the project reach during the first three (3) spring anadromous fish migration seasons following completion of the project (i.e., spring 2017) with staff from the NHFGD and NOAA to perform a visual evaluation of fish passage conditions. This review will determine whether any adjustments to boulder cluster placement or river micro-grades are necessary to allow upstream fish passage. If necessary, such adjustments shall be made during low flow conditions in 2017 in accordance with agreed upon methodology by DES, ACOE, NOAA, and NHFGD.

GENERAL CONDITIONS THAT APPLY TO ALL DES WETLANDS PERMITS:

1. A copy of this permit shall be posted on site during construction in a prominent location visible to inspecting personnel;
2. This permit does not convey a property right, nor authorize any injury to property of others, nor invasion of rights of others;
3. The Wetlands Bureau shall be notified upon completion of work;
4. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits, and/or consult with other agencies as may be required (including US EPA, US Army Corps of Engineers, NH Department of Transportation, NH Division of Historical Resources (NH Department of Cultural Resources), NHDES-Alteration of Terrain, etc.);
5. Transfer of this permit to a new owner shall require notification to and approval by DES;
6. This project has been screened for potential impacts to **known** occurrences of rare species and exemplary natural communities in the immediate area. Since many areas have never been surveyed, or have received only cursory inventories, unidentified sensitive species or communities may be present. This permit does not absolve the permittee from due diligence in regard to state, local or federal laws regarding such communities or species.
7. Review enclosed sheet for status of the US Army Corps of Engineers' federal wetlands permit.

APPROVED: _____



Eben M. Lewis
DES Wetlands Bureau

=====

BY SIGNING BELOW I HEREBY CERTIFY THAT I HAVE FULLY READ THIS PERMIT AND AGREE TO ABIDE BY ALL PERMIT CONDITIONS.

OWNER'S SIGNATURE (required)

CONTRACTOR'S SIGNATURE (required)



Appendix B

Success Standards and Criteria Evaluation Table





Appendix B: Monitoring Success Standards and Criteria, Great Dam Removal, Exeter River

Objective/ Goal Description	Baseline (Dam in Place)	Target Year	Target (Post-removal)	As-Built (2016)	Year 1 Status (2017)	Year 2 Status (2018)	Year 3 Status (2019)	Explanation/Comments
Design Meets Fish Passage Criteria	n/a	2017	Y	Y	Y	Y	Y	Criterion Met. Stream restoration design approved by state and federal agencies through the review of the NH Wetlands permit application. Baseline As-Built survey indicates constructed project is consistent with design.
Streambank Stability & Vegetation Cover	n/a	2017	75% Vegetative Cover	0%	> 75% Vegetative Cover	> 75% Vegetative Cover	> 75% Vegetative Cover	Criterion Met. Restored temporary impact areas have at least 75% vegetative cover (excluding invasive species) and stream banks are stable (no slumping) based on visual inspection.
Site Passability: Channel Width	Dam in Place	2017	4 feet (min)	5.9 feet	11.7 feet	35 feet	8.4 feet	Criterion Met. Minimum channel width observed at monumented Cross-Section 2: As-built observation on 10/14/2016, Year 1 monitoring observation on 10/9/2017, Year 2 monitoring survey on 8/27/2018, Year 3 monitoring survey on 9/26/2019. Flows at these dates are 1 cfs, 6 cfs, 30 cfs, and 6 cfs respectively (measured at USGS Stream Gage 01073587, Exeter River at Haigh Rd, Brentwood, NH). These flows scaled to the monitoring location are approximately 2 cfs, 10 cfs, 51 cfs, and 10 cfs respectively. 2016, 2017 and 2019 flows were below the 95% exceedance probability flow (19 cfs at the USGS gage, 32 cfs at the monitoring location). Normalizing the 95% exceedance probability flow rate to the 2019 surveyed data, the channel width is estimated to be 14 feet.
Site Passability: Channel Depth	Dam in Place	2017	6-9 inches (min)	6 inches	10 inches	15 inches	12 inches	Criterion Met. Minimum channel depth observed at monumented Cross-Section 2: As-built observation on 10/14/2016, Year 1 monitoring observation on 10/9/2017, Year 2 monitoring survey on 8/27/2018, Year 3 monitoring survey on 9/26/2019. Flows at these dates are 1 cfs, 6 cfs, 30 cfs, and 6 cfs respectively (measured at USGS Stream Gage 01073587, Exeter River at Haigh Rd, Brentwood, NH). These flows scaled to the monitoring location are approximately 2 cfs, 10 cfs, 51 cfs, and 10 cfs respectively. 2016, 2017, and 2019 flows were below the 95% exceedance probability flow (19 cfs at the USGS gage, 32 cfs at the monitoring location). Normalizing the 95% exceedance probability flow rate to the 2019 surveyed data, the channel depth is estimated to be 13 inches.
Site Passability: Average Channel Slope – Lower Riffle (Main Channel)	Dam in Place	2017	3.0% (max)	2.78%	~2.8%	~2.8%	~2.8%	Criterion Met. Design targets 2.8% average slope. Success criterion: Average channel slope through lower riffle reach (Sta. 1+75 to 2+35) remains less than 3%. Channel is carved into bedrock; no post-construction deterioration anticipated.
Site Passability: Average Channel Slope – Upper Riffle (Main Channel)	Dam in Place	2017	3.0% (max)	2.23%	2.11%	2.05%	2.23%	Criterion Met. Design targets 2.5% average slope. Success criterion: Average channel slope remains less than 3.0% through upper riffle reach. Average slope measured between monumented Cross-Sections 2 and 3 (Sta. 2+85 to 3+50).
Site Passability: Max Jump Height	Dam in Place	2017	9 inches (max)	< 6 inches	< 6 inches	< 6 inches	< 6 inches	Criterion Met. Maximum observed jump height estimated by visual inspection: As-built observation on 10/14/2016, Year 1 monitoring observation on October 9, 2017, Year 2 monitoring observation on August 29, 2018, Year 3 monitoring observation on September 26, 2019.
Alewife Presence/ Absence (Adult)	Absent	2018	Present	n/a	Present	Present	Present	Criterion Met. Alewife presence at project site and at Pickpocket Dam observed by representatives of NHFGD, NOAA, and NHDES in 2019. Target is documented presence of adult alewives at the Pickpocket Dam.

(Following NOAA Restoration Center, Fish Passage Barrier Removal Performance Measures and Monitoring Worksheet, April 2010). All field measurements will be performed during flow conditions that are safe for persons wading in the river



Appendix C

Post-Construction Completion Report





Memorandum

To: Eben Lewis, NHDES

Date: July 26, 2017

Project #: 52151.04

From: Jake San Antonio

Re: Great Dam Removal and Exeter River Restoration
Construction Completion Report

This report and accompanying attachments detail the construction process for removal of the Great Dam and associated Exeter River restoration in Exeter, NH. This report was developed in accordance with Specific Condition No. 32 and 33 of the NHDES Wetlands Permit No. 2015-00887.

The Great Dam located in the Exeter River impounded water upstream a distance of approximately 4.5 miles and consisted of a spillway, a fish ladder, a fish weir structure, a low-level outlet and a penstock with the associated headworks. The dam itself was approximately 136 feet long by 16 feet high measured from the top of the tallest abutment to the streambed at the downstream face. In 2000, the NHDES Dam Bureau identified safety problems with the Great Dam, most notably that the dam could not safely pass the routed 50-year design storm event with one foot of freeboard and no operations. The New Hampshire Department of Environmental Services (NHDES) issued a Letter of Deficiency (LOD) to the town on July 25, 2000 calling for the dam to be modified in order to meet regulations. VHB analyzed various alternatives during a Feasibility Study and following the completion of the study in 2013, the Town of Exeter determined that the complete removal of the Great Dam was the most preferred option.

The proposed channel design consisted of a roughened channel that was meant to be generally similar to the concept developed during the Feasibility Study. The design employed a natural channel that was designed to be stable under high flow conditions and accommodate fish passage during lower flows expected during the migration period of target fish species. The need to restore the stream channel to conditions that would allow upstream passage for anadromous fish was one of the key issues of the project. VHB designed the restored stream channel to maintain a minimum river elevation during low flows, consistent with the feasibility study, to allow continued use of the Town of Exeter's Municipal Pump Station. The continued use of the pump station is required following removal of the Great Dam and its use is dependent on maintaining a minimum river elevation during low flow periods. The Great Dam Removal / Restoration Project included modifications to the pump station, which included lowering the pump supply gravity intake to the lowest possible elevation based on the building's existing layout. The proposed riffle crest at the upstream limits of the project was designed to maintain a minimum low flow elevation and also has the added benefit of protecting the Great Bridge from potential headcut. The design included placement of fill upstream of the cross vane to provide a smooth transition between the river bed and keystone of the riffle crest. The design also included a stone revetment wall on the western bank of the Exeter River at the base of 37 Water Street to address concern raised by the property owner.

Construction and removal of the Great Dam began the week of July 11, 2016 following drawdown of the Exeter River, which was initiated on July 1, 2016. Construction proceeded steadily throughout the summer until the end of October when all equipment was removed from the site and Founder's Park was fully restored. A severe drought, which occurred throughout eastern New England, resulted in minimal flow in the Exeter River which aided construction. Bi-weekly meetings were held onsite throughout construction and attendees including VHB, the Town of Exeter, the Contractor (SumCo Eco-Contracting, LLC), as well as regulatory agencies, which included staff from NHDES, NHFGD,

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P 603.391.3900

and NOAA participated in the weekly meetings. Meeting minutes from the construction meetings are included as Attachment 1.

During construction the channel design was modified based on the exposed bedrock conditions and a secondary channel was added. Attachment 3 details the design modifications.

Photographs of all stages of construction were taken from designated photo stations throughout construction and are included as Attachment 2. Additionally, an As-Built survey of the completed restoration of the Exeter River was completed by an independent survey firm on October 5, 2016. The As-Built details site topography and bathymetry, location of placed boulders and the riffle crest, and the existing water line and depth during low flow conditions at the time of the survey in early October 2016. The As-Built is included as Attachment 4.

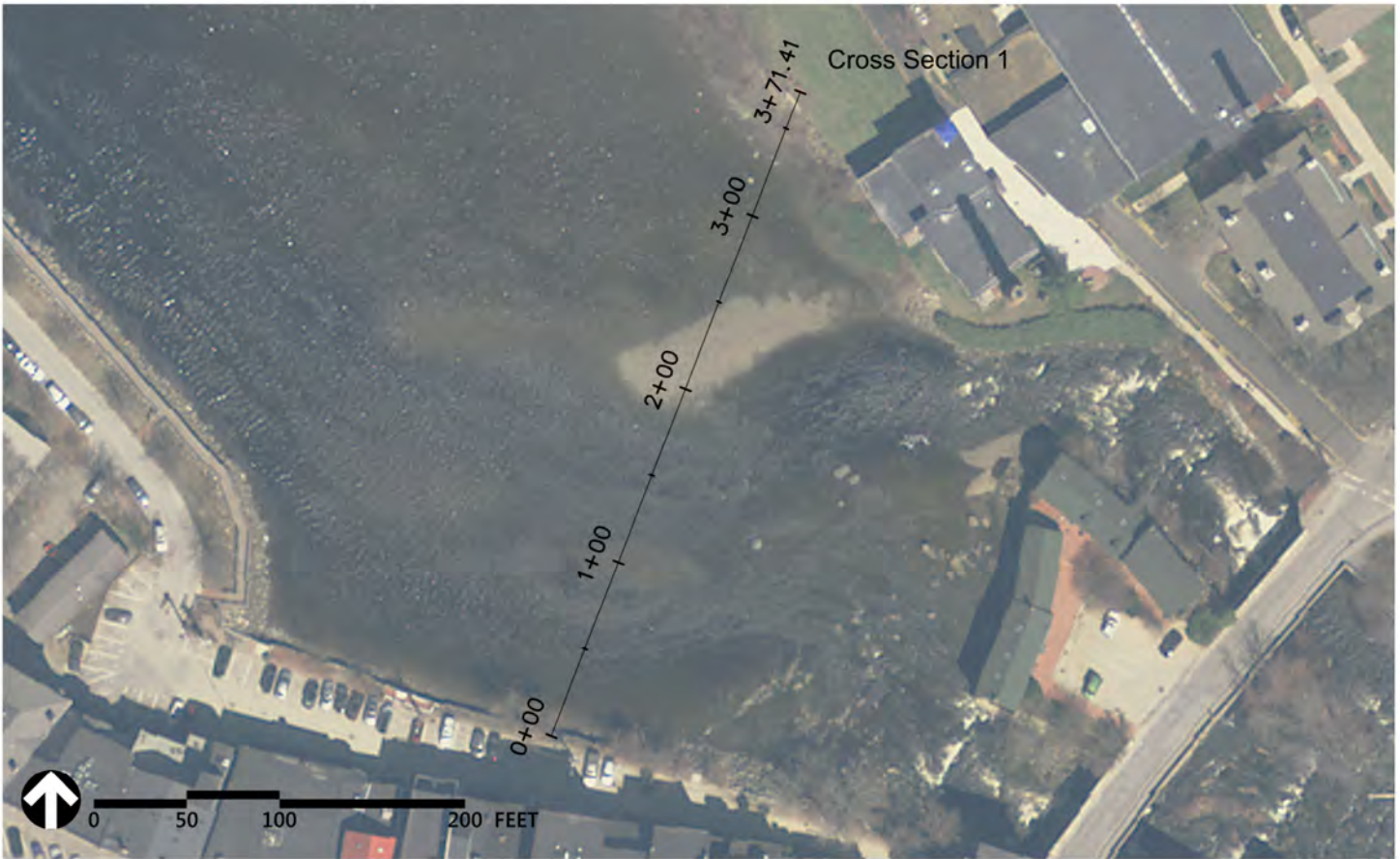
In addition to the as-built data, Special Condition 33 required establishment of five (5) permanent monumented cross-sections throughout the study reach. The cross-section locations were approved by DES on November 8, 2016. Attachment 5 includes the xyz data for each cross-section and a plan and section view.



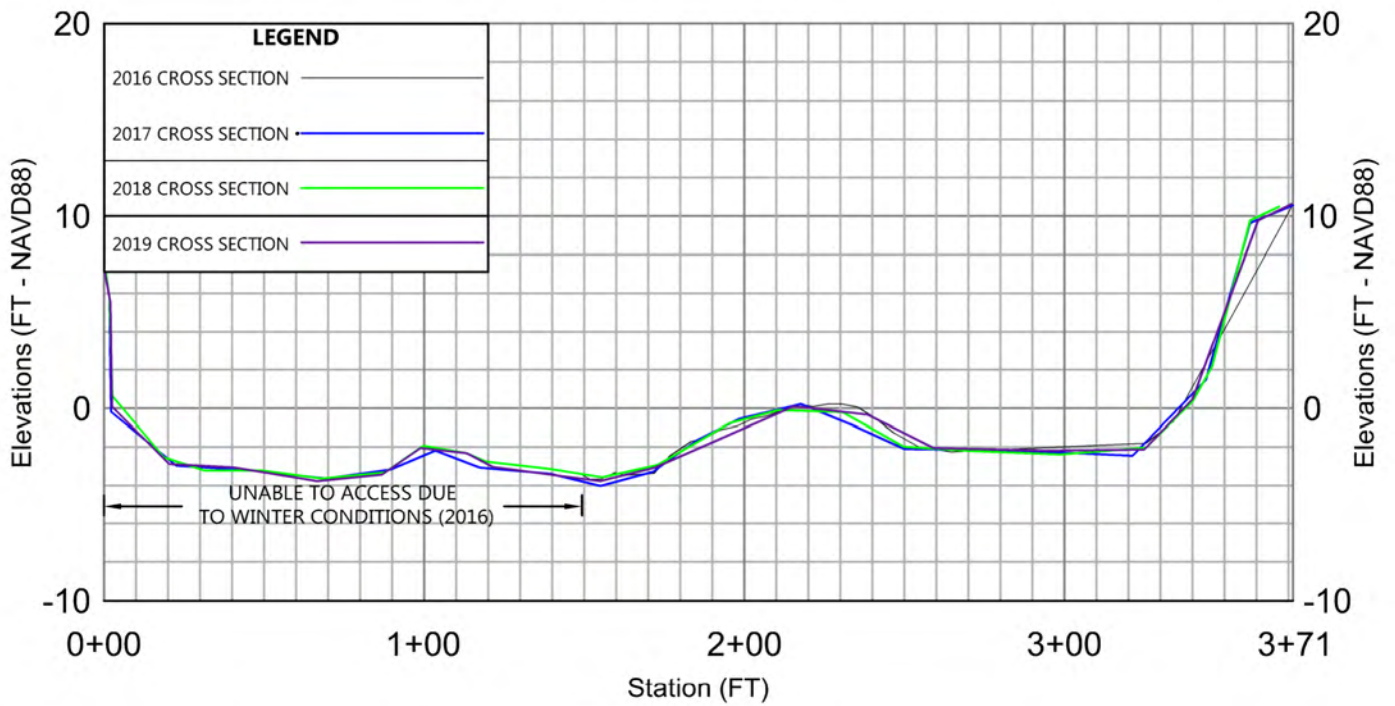
Appendix D

Representative Monitoring Cross-Sections and Data





Cross Section 1



Cross Sectional Elevation data obtained by VHB Survey, September 2019

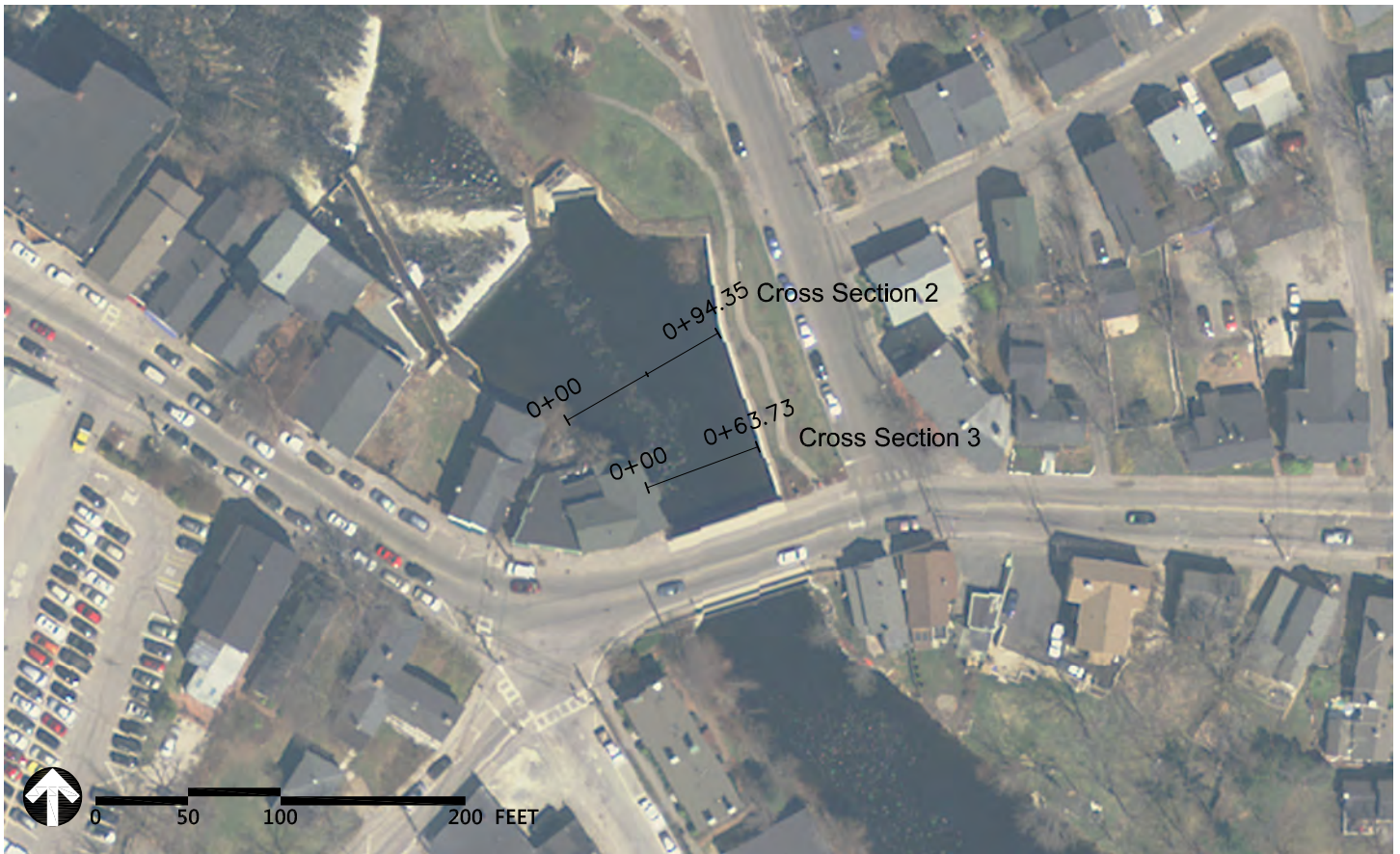
Horizontal Scale: 1" = 60'
Vertical Scale: 1" = 10'



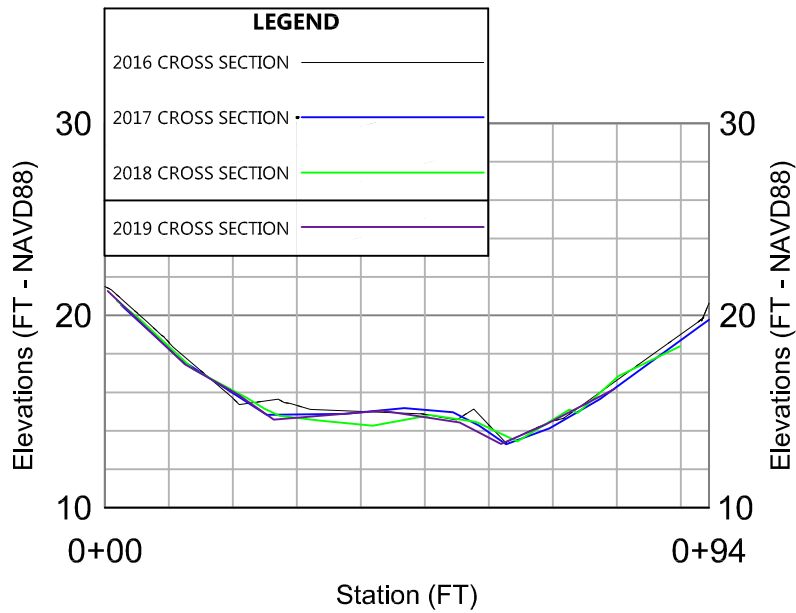
2019 Monitoring Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 1

10/8/2019



Cross Section 2



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

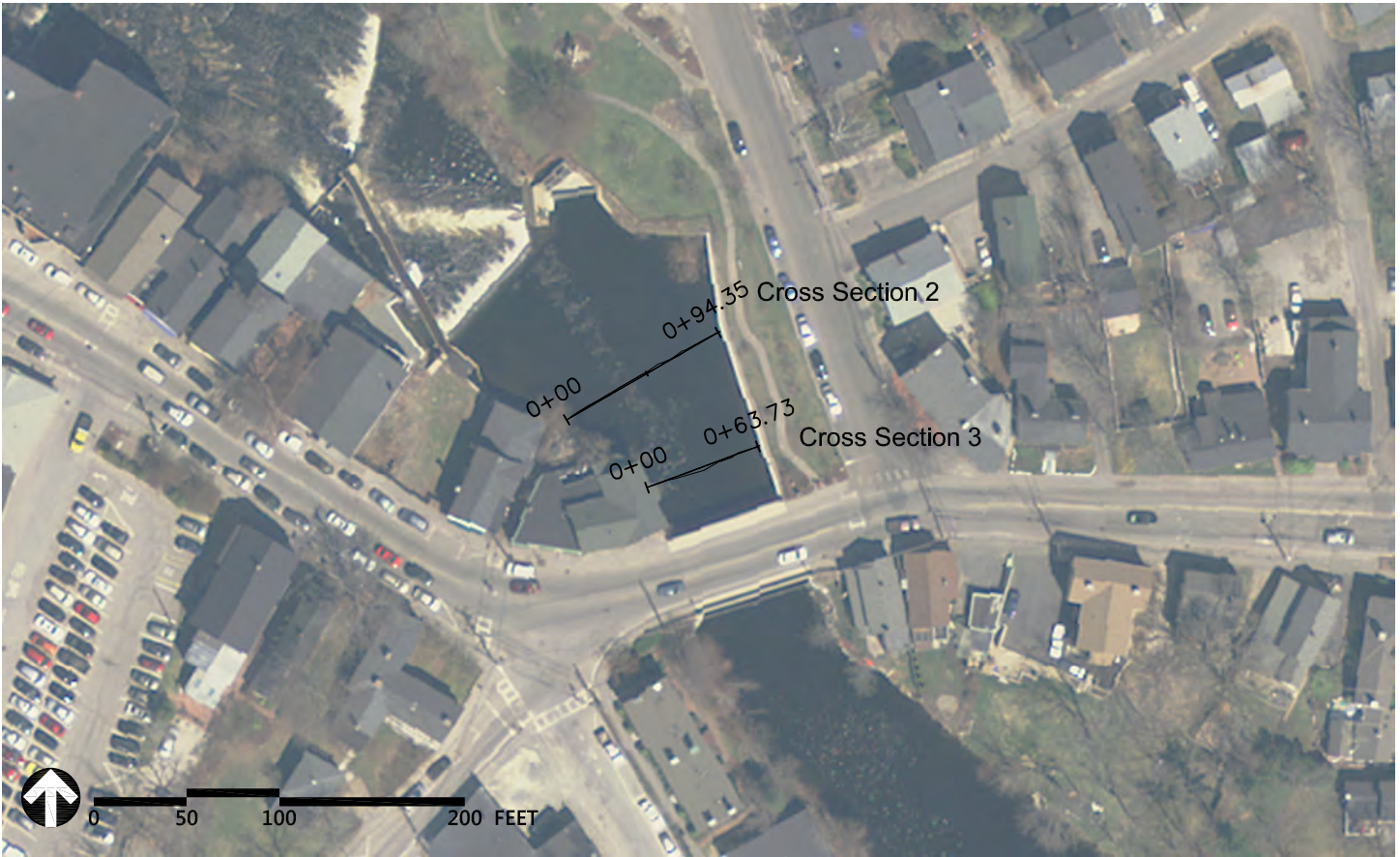
Cross Sectional Elevation data obtained by VHB Survey, September 2019



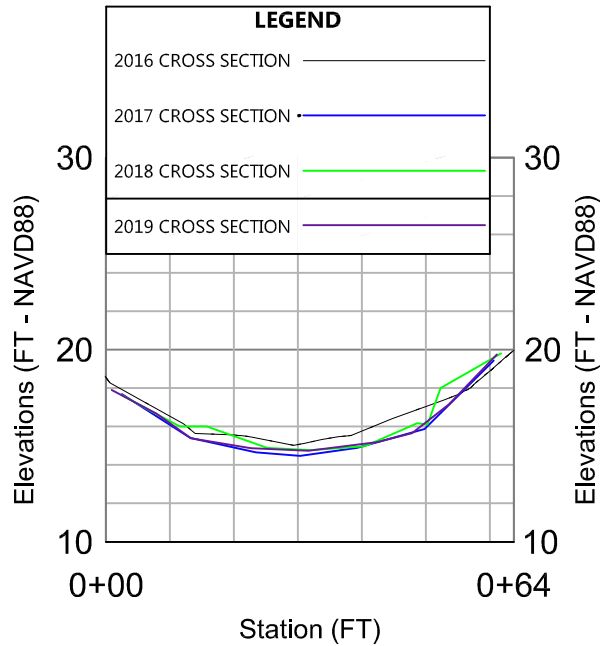
2019 Monitoring Cross Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 2

10/8/2019



Cross Section 3



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

Cross Sectional Elevation data obtained by VHB Survey, September 2019



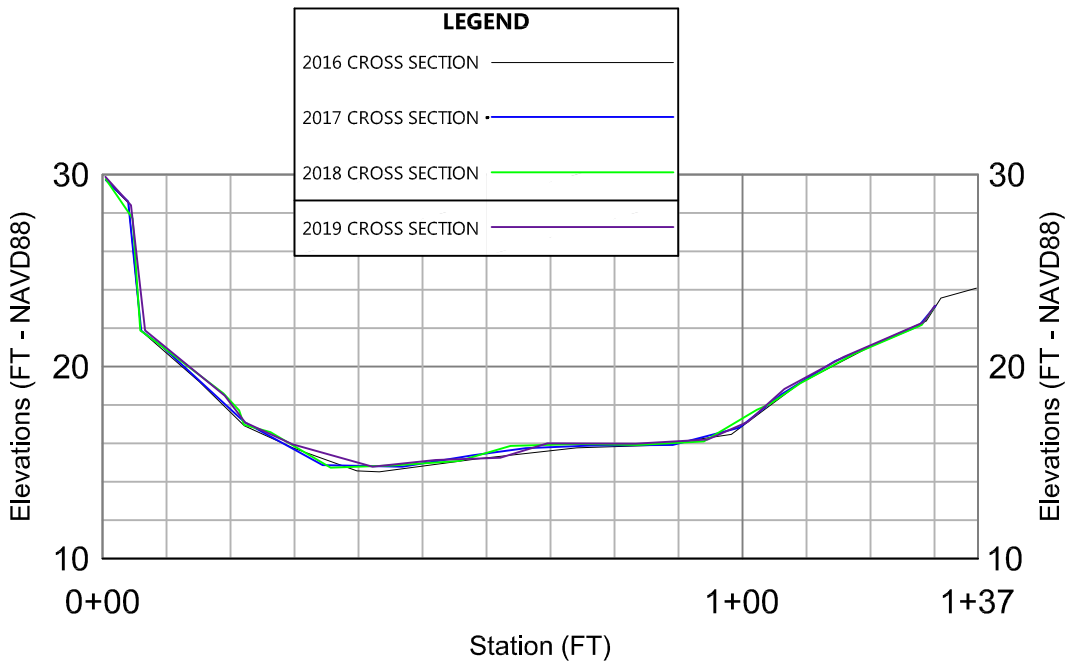
2019 Monitoring Cross-Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 3

10/8/2019



Cross Section 4



Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'

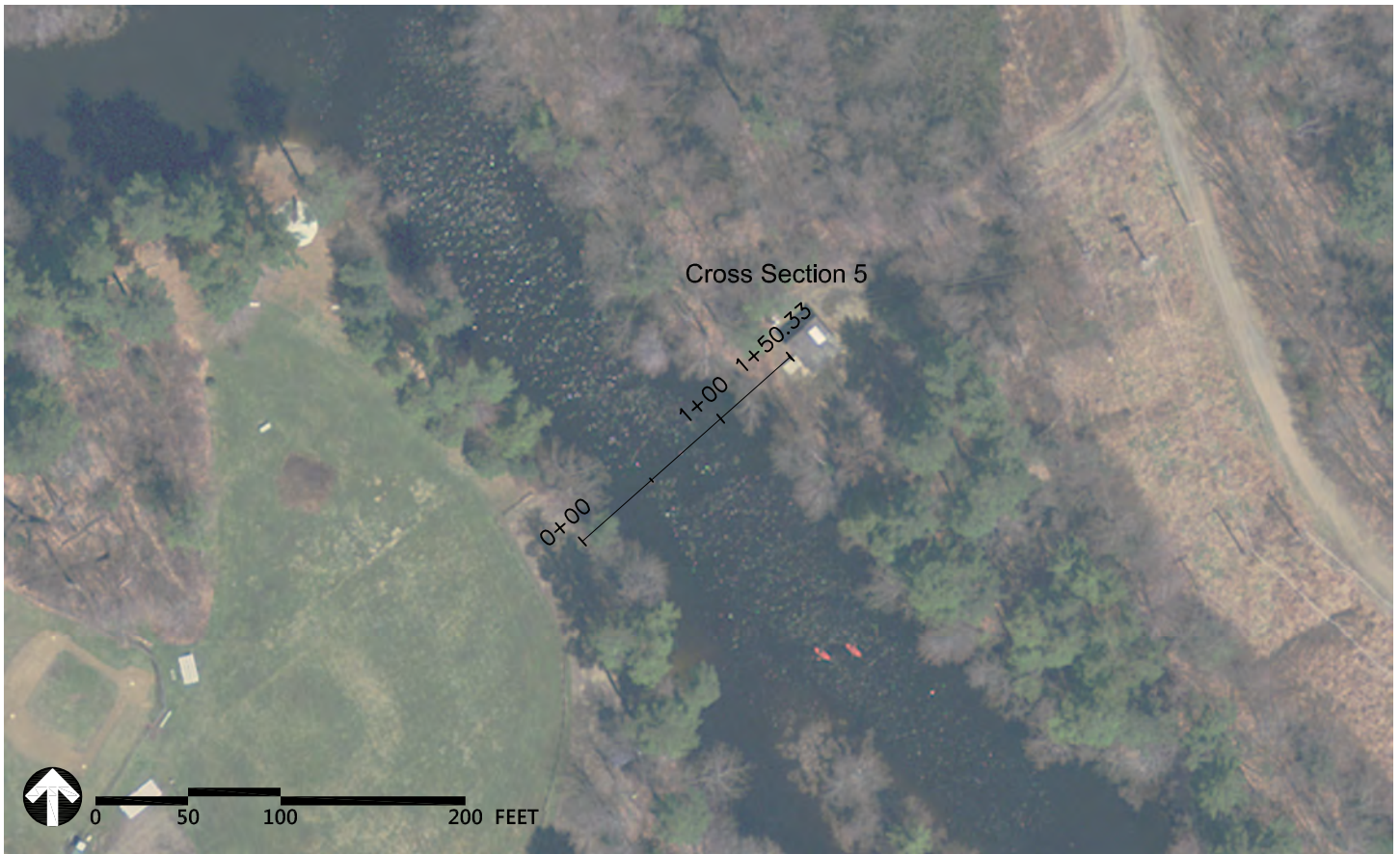
Cross Sectional Elevation data obtained by VHB Survey, September 2019



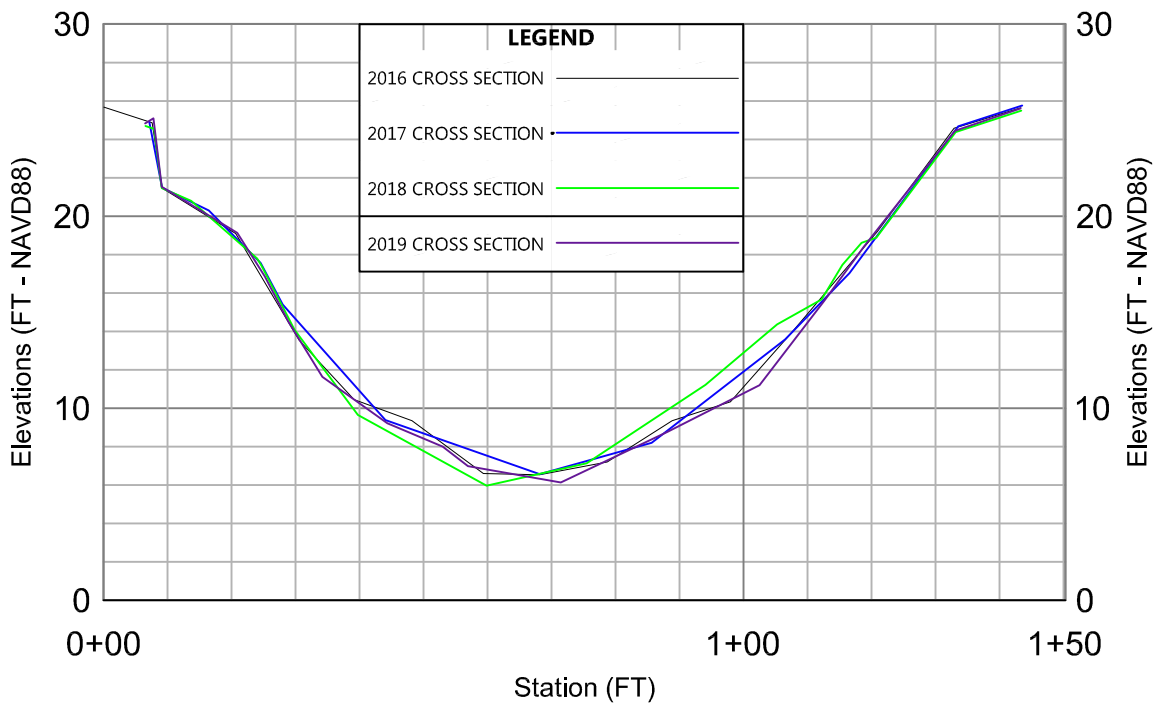
2019 Monitoring Cross-Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 4

10/8/2019



Cross Section 5



Cross Sectional Elevation data obtained by VHB Survey, September 2019

Horizontal Scale: 1" = 30'
Vertical Scale: 1" = 10'



2019 Monitoring Cross-Sections
Great Dam Removal and
Exeter River Restoration
Exeter, New Hampshire

Figure 5

10/8/2019

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 1

January 2017 As-Built			October 2017 Monitoring		
Easting	Northing	Point Elevation	Easting	Northing	Point Elevation
1176881.32	176432.91	4.00 *	1176881.36	176434.78	5.61
1176935.43	176572.03	-3.43	1176880.16	176435.74	-0.18
1176936.28	176574.42	-3.67	1176885.52	176455.58	-2.97
1176937.37	176577.69	-3.67	1176891.70	176479.30	-3.21
1176938.74	176581.69	-3.34	1176899.09	176500.38	-3.64
1176940.13	176585.19	-3.47	1176905.88	176519.39	-3.16
1176941.88	176589.43	-3.40	1176910.51	176532.66	-2.19
1176943.22	176593.15	-3.36	1176914.71	176545.91	-3.07
1176945.32	176597.77	-2.45	1176923.04	176566.15	-3.38
1176947.56	176604.03	-1.70	1176928.94	176580.76	-4.02
1176949.04	176607.93	-1.58	1176934.68	176596.23	-3.29
1176950.70	176612.26	-1.13	1176940.19	176608.56	-1.66
1176952.79	176617.36	-0.92	1176944.47	176621.36	-0.56
1176954.54	176621.52	-0.57	1176952.53	176638.83	0.21
1176956.25	176626.04	-0.41	1176958.43	176653.43	-0.85
1176957.84	176630.41	-0.11	1176965.17	176668.55	-2.11
1176959.56	176635.20	0.22	1176980.27	176703.65	-2.20
1176961.24	176639.38	0.08	1176992.91	176734.31	-2.46
1176962.93	176643.94	0.21	1177002.61	176755.04	1.47
1176964.55	176647.77	0.21	1177008.97	176767.35	9.63
1176966.35	176652.30	0.06	1177015.38	176779.26	10.54
1176968.41	176657.38	-0.51			
1176970.32	176663.02	-1.26			
1176973.28	176670.34	-2.00			
1176976.49	176679.91	-2.26			
1176998.91	176736.46	-1.81			
1177002.04	176744.46	-0.68			
1177015.29	176779.26	10.58			

*Elevation obtained from original VHB Survey January 26, 2012

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 1

October 2018 Monitoring

September 2019 Monitoring

Easting	Northing	Point Elevation		Easting	Northing	Point Elevation
1177014.02	176775.15	10.48	3770	1177015.36	176778.91	10.60
1177008.87	176767.40	9.76	3771	1177011.46	176769.14	9.77
1177003.99	176756.53	2.15	3772	1177004.13	176749.98	0.46
1177002.38	176750.68	0.34	3773	1176998.75	176735.82	-2.14
1176997.41	176737.06	-2.04	3744	1176987.56	176706.98	-2.19
1176987.10	176712.22	-2.38	3745	1176974.86	176674.52	-2.05
1176976.08	176686.40	-2.20	3746	1176967.52	176655.38	-0.34
1176967.43	176667.45	-1.99	3747	1176959.10	176633.88	0.09
1176959.93	176649.83	-0.21	3748	1176943.47	176593.43	-3.07
1176952.77	176631.12	-0.10	3749	1176937.19	176577.35	-3.76
1176946.75	176617.28	-0.76	3750	1176925.18	176546.18	-3.03
1176938.77	176596.08	-2.93	3751	1176922.21	176538.63	-2.32
1176933.11	176579.72	-3.57	3752	1176917.11	176525.16	-2.05
1176929.24	176563.65	-3.13	3753	1176912.55	176513.88	-3.44
1176923.20	176544.56	-2.76	3754	1176905.40	176495.05	-3.77
1176921.05	176538.92	-2.33	3755	1176895.90	176470.53	-3.06
1176915.92	176526.46	-1.94	3756	1176888.55	176452.04	-2.88
1176909.72	176515.93	-3.32	3757	1176882.29	176435.22	0.08
1176903.66	176497.29	-3.63	3758	1176882.03	176434.77	5.52
1176897.03	176479.86	-3.22	3759	1176881.37	176433.19	7.06
1176891.31	176462.78	-3.21				
1176887.08	176450.77	-2.53				
1176882.00	176435.46	0.63				
1176882.06	176434.44	5.76				
1176881.43	176433.25	7.42				

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 2

January 2017 As-Built

Easting	Northing	Point Elevation
1177534.01	176149.61	21.51
1177534.87	176150.10	21.34
1177536.63	176151.11	20.73
1177539.82	176152.95	19.64
1177541.75	176154.06	18.95
1177541.93	176154.16	18.91
1177543.20	176154.90	18.38
1177551.17	176159.48	15.75
1177552.21	176160.08	15.36
1177557.50	176163.12	15.64
1177558.30	176163.58	15.46
1177559.04	176164.01	15.42
1177561.80	176165.60	15.12
1177576.84	176174.25	14.88
1177577.14	176174.42	14.86
1177577.49	176174.62	14.84
1177581.63	176177.00	14.55
1177583.94	176178.34	15.13
1177588.25	176180.82	13.39
1177588.29	176180.84	13.40
1177590.90	176182.34	13.87
1177594.37	176184.34	14.47
1177596.11	176185.34	14.64
1177598.14	176186.51	15.20
1177605.81	176190.92	17.31
1177606.50	176191.32	17.50
1177614.52	176195.93	19.72
1177614.73	176196.05	19.77
1177614.97	176196.19	19.85
1177615.79	176196.67	20.64

October 2017 Monitoring

Easting	Northing	Point Elevation
1177536.10	176151.05	20.55
1177544.03	176155.72	17.72
1177555.58	176162.81	14.83
1177566.11	176168.94	14.87
1177574.14	176173.66	15.17

October 2017 Monitoring

Easting	Northing	Point Elevation
1177581.09	176176.79	14.95
1177584.65	176178.85	14.25
1177588.03	176181.40	13.28
1177594.36	176184.05	14.12
1177600.81	176188.53	15.64
1177614.57	176196.07	19.44
1177615.67	176196.49	21.30

October 2018 Monitoring

Easting	Northing	Point Elevation
1177535.57	176150.54	20.78
1177538.49	176152.71	19.81
1177545.62	176157.15	17.20
1177553.02	176161.00	15.71
1177555.52	176162.19	15.14
1177557.59	176163.32	14.78
1177562.67	176167.16	14.53
1177569.86	176171.18	14.26
1177577.70	176175.69	14.81
1177583.62	176179.65	14.46
1177589.79	176181.91	13.44
1177596.33	176186.78	15.09
1177597.69	176187.11	14.93
1177603.29	176190.06	16.84
1177611.74	176194.69	18.39
1177615.85	176196.82	20.05
1177616.93	176196.99	20.39

September 2019 Monitoring

Easting	Northing	Point Elevation
1177534.42	176149.76	21.28
1177544.85	176155.79	17.46
1177552.09	176160.01	15.85
1177556.89	176162.78	14.57
1177571.58	176171.23	15.05
1177582.06	176177.26	14.43
1177587.65	176180.48	13.30
1177593.52	176183.86	14.29
1177603.01	176189.32	16.17
1177616.62	176197.16	20.21



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 3

January 2017 As-Built

Easting	Northing	Point Elevation
1177577.39	176113.16	18.56
1177577.54	176113.22	18.48
1177577.96	176113.38	18.28
1177588.76	176117.38	16.14
1177590.46	176118.01	15.65
1177595.52	176119.88	15.57
1177597.35	176120.56	15.53
1177598.67	176121.05	15.46
1177604.38	176123.17	15.06
1177604.90	176123.36	15.02
1177606.46	176123.94	15.13
1177608.95	176124.86	15.33
1177611.44	176125.78	15.47
1177613.00	176126.36	15.52
1177613.36	176126.49	15.54
1177619.28	176128.69	16.41
1177626.85	176131.49	17.37
1177628.99	176132.29	17.68
1177630.79	176132.95	18.00
1177631.37	176133.17	18.23
1177634.00	176134.14	19.00
1177636.16	176134.94	19.67
1177636.18	176134.95	19.67
1177637.15	176135.31	19.98

October 2017 Monitoring

Easting	Northing	Point Elevation
1177579.69	176114.14	17.69
1177589.79	176117.65	15.41
1177599.35	176121.38	14.65
1177605.79	176123.77	14.47
1177614.18	176126.85	14.89
1177624.08	176130.50	15.88
1177634.17	176134.23	19.44

October 2018 Monitoring

Easting	Northing	Point Elevation
1177579.58	176114.05	17.66
1177583.70	176115.54	16.86
1177588.24	176117.13	16.00
1177592.42	176117.92	15.30
1177601.55	176120.49	14.89
1177608.08	176122.36	14.77
1177615.49	176126.66	14.97
1177623.20	176129.44	16.18
1177624.56	176130.51	16.10
1177626.19	176131.73	17.07
1177635.34	176134.50	19.81
1177638.07	176135.11	20.28

September 2019 Monitoring

Easting	Northing	Point Elevation
1177578.15	176113.63	17.90
1177584.82	176115.80	16.68
1177589.83	176117.86	15.39
1177598.66	176120.88	14.88
1177607.07	176124.11	14.75
1177617.13	176127.88	15.20
1177622.27	176129.67	15.65
1177627.53	176132.08	17.15
1177634.68	176134.41	19.76
1177638.23	176135.86	20.20

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 4

January 2017 As-Built

Easting	Northing	Point Elevation
1177819.15	175499.10	29.71
1177821.71	175496.60	28.50
1177822.94	175495.10	21.86
1177829.16	175488.48	19.21
1177833.99	175483.31	16.91
1177839.40	175477.87	15.75
1177849.31	175468.81	14.52
1177845.54	175470.05	14.57
1177858.99	175457.16	15.19
1177870.37	175446.23	15.77
1177878.27	175436.44	15.90
1177886.60	175428.36	16.47
1177893.83	175420.53	19.12
1177902.68	175411.33	21.33
1177907.98	175406.66	22.36
1177909.43	175404.86	23.56
1177913.26	175400.89	24.09

October 2017 Monitoring

Easting	Northing	Point Elevation
1177819.28	175499.18	29.87
1177821.89	175496.87	28.59
1177823.43	175495.50	21.87
1177825.23	175492.74	21.05
1177833.73	175483.04	17.10
1177841.56	175473.60	14.86
1177851.66	175466.04	14.79
1177861.60	175460.19	15.38
1177864.53	175451.65	15.75
1177871.05	175444.06	15.89
1177880.21	175434.93	15.92
1177887.53	175427.48	16.81
1177891.89	175422.48	18.56
1177897.69	175416.54	20.28
1177906.87	175407.18	22.12
1177908.61	175405.28	23.16

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 4

October 2018 Monitoring

Easting	Northing	Point Elevation
1177908.72	175405.29	24.18
1177908.47	175405.52	23.04
1177907.06	175406.73	22.16
1177899.44	175414.13	20.64
1177893.35	175419.90	19.12
1177889.52	175422.92	18.03
1177888.23	175424.41	17.75
1177884.44	175432.26	16.10
1177877.88	175440.29	15.91
1177872.48	175447.55	15.96
1177862.40	175452.94	15.86
1177855.92	175457.89	15.08
1177847.33	175463.87	14.85
1177841.46	175471.80	14.73
1177837.89	175481.41	16.59
1177835.56	175484.93	16.97
1177834.92	175485.33	17.71
1177832.99	175486.91	18.60
1177825.30	175493.26	21.14
1177823.13	175495.42	21.88
1177822.00	175496.02	27.71
1177819.31	175499.22	29.75
1177818.81	175499.55	31.54

September 2019 Monitoring

Easting	Northing	Point Elevation
1177908.52	175405.34	23.16
1177907.51	175406.87	22.30
1177897.82	175414.81	20.51
1177891.41	175421.49	18.82
1177887.66	175425.83	17.12
1177883.75	175430.73	16.19
1177879.04	175441.83	15.98
1177866.91	175449.33	16.00
1177862.29	175455.06	15.25
1177855.50	175462.56	15.14
1177849.08	175470.02	14.78
1177840.44	175479.05	15.94
1177836.06	175485.10	17.09
1177833.61	175487.19	18.47
1177824.20	175495.39	21.88
1177822.51	175496.88	28.39
1177819.29	175499.31	29.88

**Monitoring Cross Section Data
Exeter Great Dam**



Project: 52151.04 Exeter Dam Removal
Location: Exeter, New Hampshire

Computed by: NDR
Checked by: DWC

Cross Section 5

October 2018 Monitoring

January 2017 As-Built			Easting	Northing	Point Elevation
Easting	Northing	Point Elevation			
1178014.14	173520.78	25.65	1178014.07	173520.91	25.49
1178006.37	173513.74	24.57	1178006.57	173513.89	24.38
1177997.28	173505.98	19.21	1177997.74	173505.19	18.88
1177987.26	173497.05	13.92	1177996.17	173503.46	18.62
1177980.30	173490.52	10.33	1177994.30	173501.06	17.45
1177972.98	173485.01	9.36	1177991.69	173499.12	15.67
1177965.54	173478.12	7.19	1177987.43	173493.48	14.37
1177957.52	173471.19	6.53	1177977.94	173487.29	11.22
1177950.70	173465.67	6.61	1177962.91	173476.23	7.13
1177942.89	173457.71	9.35	1177950.07	173467.12	5.96
1177936.16	173451.62	10.45	1177939.12	173449.21	9.65
1177929.78	173445.85	13.54	1177930.52	173444.00	14.08
1177922.00	173439.70	19.09	1177925.18	173442.21	17.41
1177913.59	173431.89	21.47	1177924.88	173441.50	17.79
1177912.59	173430.70	24.87	1177917.48	173434.36	20.79
1177906.82	173425.82	25.67	1177913.68	173431.71	21.47
			1177912.59	173431.11	24.55
			1177911.99	173429.78	24.69
			1177911.58	173429.58	25.51

October 2017 Monitoring

Easting	Northing	Point Elevation
1177912.32	173430.28	24.92
1177913.63	173431.83	21.47
1177919.39	173436.36	20.29
1177925.51	173441.64	17.57
1177929.72	173442.08	15.39
1177941.43	173453.10	9.38
1177958.02	173470.70	6.56
1177972.28	173480.97	8.20
1177987.37	173495.40	13.58
1177994.57	173502.42	17.03
1178006.77	173514.32	24.68
1178014.15	173521.01	25.76

September 2019 Monitoring

Easting	Northing	Point Elevation
1177911.81	173429.86	24.83
1177912.83	173430.73	25.09
1177913.82	173431.56	21.53
1177922.57	173439.48	19.13
1177926.07	173441.97	16.86
1177929.40	173443.85	14.50
1177933.47	173447.24	11.63
1177940.45	173454.66	9.21
1177945.52	173461.96	8.00
1177952.79	173459.72	6.98
1177963.52	173469.46	6.14
1177974.90	173481.77	8.77
1177985.83	173491.13	11.19
1177991.65	173499.72	15.57
1177996.40	173503.81	18.44
1178006.97	173513.31	24.45
1178014.02	173520.85	25.61



Appendix E

Representative Site Photographs



Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 1 – Downstream of Dam

Photo #1:



Description: Post-Construction, taken 9/21/2016

Photo #2:



Description: 1-year Monitoring, taken 10/25/2017

Photo #3:



Description: 2-year Monitoring, taken 5/16/2018



Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 2 – From Dam Towards Left Bank



Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 3 – From Dam Towards High Street





Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 4 – Looking Downstream


Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 5 – From High Street Looking Downstream

Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 6 – From Right Bank Looking Upstream



Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019

Photo Log Documentation – Photo Monitoring Locations #1-#7

Location 7 – Looking Upstream

Photo #1:		Photo #2:
		
Description: Post-Construction, taken 9/21/2016		Description: 1-year Monitoring, taken 10/25/2017
Photo #3:		
		
Description: 2-year Monitoring, taken 5/16/2018		Description: 3-year Monitoring, taken 5/17/2019



Appendix F

May 17, 2019 Site Meeting Minutes





Meeting Notes

Place: Great Dam / Founders Park
Pleasant Street
Exeter, New Hampshire

Time: 10:00am
Temp: 50° F
Weather: Rain, Cloudy

Date: May 17, 2019

Notes Taken by: David Cloutier

Project #: 52151.04

Re: Great Dam Removal
Fish Passage Monitoring Site Visit – Year 3

ATTENDEES

Paul Vlasich, Town of Exeter

Mike Dionne, NHFGD

David Cloutier, VHB

The Town of Exeter (the Town), NHFGD, NOAA, and VHB attended a meeting at the former Great Dam site at 10:00 AM on May 17, 2019. This meeting was the third scheduled yearly monitoring site visit to review post-dam removal fish passage. In accordance with Condition No. 36 of the NHDES Wetlands Permit No. 2015-00887, this site meeting was held during the spring anadromous fish migration season to perform a visual evaluation of fish passage conditions. Eric Hutchins (NOAA) was unable to attend the meeting due to scheduling conflicts.

Key discussion items and observations include the following:

Agenda

Item	Description	Status	Responsible
A	Fish passage observations during site meeting		
	– Fish were not observed swimming in the former Great Dam falls reach, or downstream through the String Bridge, during the site meeting.		
	– Mike Dionne reported that fish migration statewide has been very late this year (only 13k fish counted statewide by 5/16/2019, compared to 75k by mid-May on an average year). This is likely due to above-average flow rates and below-average water temperatures from rainy, cloudy spring weather suppressing fish migration upstream. Flows in the Exeter River have been above median levels for nearly the entire spring migration period, as recorded at USGS stream gage 01073587.		
	– Mike Dionne and Paul Vlasich had previously observed fish following along the inner side of the Right (East) channel, using the roughness of the bedrock outcrop for rest points.		
	– Stream banks and bedforms remain stable, with no significant changes from 2018; bank vegetation cover is still >75%, and non-vegetated areas consist of stable bedrock. Channel flow patterns do		

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	appear slightly different from 2018, but monitoring photos indicate that feature boulders have not moved – smaller cobbles/boulders may have shifted over the winter.		
	– Mike Dionne noted that the boulders placed in the Left (West) channel in 2017 were continuing to perform as intended, and were providing slower flow velocities and resting locations for upstream fish passage. He stated that at this time he did not observe any locations where further channel modifications would be needed.		
	– Based on visual observation, the project continues to meet the 8 monitoring success criteria outlined in the November 2017 Great Dam Monitoring Plan prepared by VHB		
B	Prior fish passage observations		
	– Mike Dionne reported that last week (May 6-May 12) fish were observed navigating through the former dam location. He noted that there were a few sunny days last week when water temperatures were conducive to alewife migration (13-14° C), but on the date of the 2019 site visit water temperatures were 9-10° C.		
	– Mike Dionne also reported that to date 24 river herring have been counted at Pickpocket Dam, confirming that fish are successfully navigating the former dam location and continuing upstream. Only 36 river herring were counted at Pickpocket Dam in 2018.		
	– Paul Vlasich reported observing fish navigating up through the former dam location on Thursday, May 9. He also reported observing “lots” of alewives in the river just below the String Bridge, but not further upstream, on Monday, May 6.		

Upcoming Schedule

- December 2019: Year 3 Annual Monitoring Report due
- April-May 2020: (If needed) Year 4 spring anadromous fish migration site meeting.