TO: Selectboard, Town of Wilmington

FROM: Scott A. Tucker, Town Manager

DATE: January 24, 2024

RE: Dam Maintenance Proposals – Recommendation

I have included the two proposals that the town received related to our request for qualifications, which were reviewed by Highway Superintendent Marshall Dix and me. Both firms, MSK and GZA are well qualified, presentations were made via a zoom platform, and their proposals list many projects similar in nature under their supervision. Both proposals were well received and project costs were requested.

GZA gave a lump sum total of $28,900 to include a kick-off meeting and site visit, topographic survey of dam, H&H (hydrologic and hydraulic)analysis, and phase II report and conceptual repairs.

MSK gave a base price for engineering services of $12,000, for site reconnaissance and limited topographic survey, recommendations for concrete repairs, seepage repairs, grading of crest of dam, and upstream rip-rap, permit feasibility/review requirements and operation & maintenance report. There were specific exclusions listed. However, with additional questions posed, there is an add of $8,500, for H&H analyses to determine the spillway design flood (SDF) the degree of overtopping and best practices for erosion protection, for a total of $20,500.

MSK Engineering from Bennington, Vermont is recommended.

Town of Wilmington, Vermont – Dam Maintenance Proposals

The Town of Wilmington is seeking requests for qualifications to develop appropriate studies, analyses and remedial repair recommendations, for a Lake Raponda Dam Maintenance Program, to meet State of Vermont dam safety recommendations. The prospective engineer should: 1. Be a Vermont licensed professional engineer; 2. Be experienced in the design and investigation of dams; 3. Possess a knowledge of Vermont dam statutes, rules, and permitting requirements, and; 4. Have specific experience in the potential problem area(s), such as hydrology, hydraulics, structural or geotechnical engineering, and repair design. Please submit technical qualifications, experience with similar projects, reputation with existing clients and any other factors pertaining to the specific project. The town manager will select the most qualified firms to make brief presentations outlining a cost-effective and innovative approach to the problem, described as "low hazard potential," and overall "poor" dam condition.

Proposals will be evaluated by the Town based on firm experience and reputation, understanding of Town requirements, and price. The Town reserves the right, where it may serve in the Town's best interest, to request additional information or clarification from proposers. The firm selected will be invited to develop a scope of work with a reasonable price. If an agreement cannot be reached, the Town will go to the second-ranked engineer.

The engineering firm or engineer eventually awarded the job must provide proof of a full spectrum of general liability insurance and worker's compensation coverage.

The Town reserves the right to accept or reject any and all proposals, in whole or in part, with or without cause; to waive any informalities, formalities, and technicalities in the process. The Town of Wilmington is an Equal Opportunity Provider and Employer; selection shall be made without regard to race, color, sex, age, religion, national origin, sexual orientation, or political affiliation.

The deadline for receipt of proposals by the Town is 4:00 p.m., Friday, September 1, 2023. Proposals may be submitted by mail/other shipping services, in person, or by e-mail attachment to the appropriate address below.

Jessica DeFrancesco, Administrative Assistant
2 East Main Street, 2nd Floor,
P.O. Box 217,
Wilmington, VT 05363
jdefrancesco@wilmingtonvt.us
FAX: (802) 464-8477

To set-up a time to view the dam, please contact Jessica DeFrancesco jdefrancesco@wilmingtonvt.us at Wilmington Town Offices: (802) 464-8591, x 123.

MSK ENGINEERS

150 Depot Street | Bennington, VT 05201
603.315.4811 | www.mskeng.com | info@mskeng.com
Licensed in VT, MA, ME, NY, NH, CO

10 November 2023
MSK No. 1528-001

Town of Wilmington
Mr. Scott Tucker, Town Manager
2 East Main Street, 2nd Floor
PO Box 217
Wilmington, VT 05363
stucker@wilmingtonvt.us

Re: Proposal for Developing a Maintenance Program for Lake Raponda Dam
Wilmington, VT

Dear Scott:

As requested, MSK Engineers (MSK) is pleased to provide you with our proposal for developing a maintenance program for Lake Raponda Dam. This proposal is based on our initial site visit with you, our review of the October 1, 2021 VT Department of Environmental Conservation (DEC) Dam Safety Program (DSP) "Dam Safety Inspection Report", and our email correspondence with Mr. Benjamin Green of the VTDEC-DSP.

Specific findings and recommendations provided in the "Dam Safety Inspection Report" included the following:

- Only 1 foot of freeboard to the lowest non-overflow portion of dam crest.
- Maintenance to include signage, clearing of vegetation to within 15 feet of dam and spillway appurtenances, and monitoring the downstream concrete cutoff wall and area of seepage.
- Repair minor spillway concrete cracking and deterioration.
- Perform an updated hydrologic and hydraulic analysis and dam breach to determine the SDF impoundment level and amount of dam overtopping, if any, including confirmation of the hazard classification[(1)].
- Evaluate the need for overtopping protection of the dam and abutment areas[(1)].
- Develop an operation and maintenance manual.
- Repair / rehabilitate the dam to bring it up to current DSP standards[(1)].

[(1)] As was discussed during our October 18, 2023 interview, a breach analysis would need to be performed initially in order to determine the downstream hazard classification and hence the spillway design flood. Once these tasks are completed, then modifications to the dam can be evaluated to meet DSP freeboard, spillway sizing, and/or overtopping protection standards.

Currently there is only about 1 foot of freeboard between the spillway crest and the top of the dam crest whereas the DSP requires a minimum of 3 feet. Note that the breach analysis can be performed by the VTDEC-DSP upon request by the Town of Wilmington. Once the breach analysis determines the downstream hazard classification, MSK can at that time provide your office with a scope and fees for performing the hydrologic and hydraulic analysis necessary to determine if spillway modifications and dam overtopping protection will be required. Until these tasks are completed, our scope of service included herein will include only maintenance and repair tasks at this time.

SCOPE OF SERVICES

Task 1: **Site Reconnaissance and Limited Topographic Survey**
The purpose of this task will be to perform a site reconnaissance and survey to document those areas that will require repair and/or maintenance as follows:

- Deteriorated / missing portion of spillway concrete
- Seepage under left end of spillway
- Cracks in spillway and downstream concrete dam wall
- Unevenness of crest of dam
- Vegetation with 15 feet of dam and spillway
- Seepage at downstream side of juncture of dam wall and spillway
- Upstream slope riprap conditions

A limited topographic survey will be performed relative to the dam and spillway in order to document existing conditions from which various measurements can be obtained for estimating purposes. Various spot grades and dimensions will be obtained. A conceptual-level drawing will be prepared that will identify the above-referenced conditions.

Task 2: **Concrete Repairs**
MSK will provide recommendations for concrete repairs to generally include replacement of the missing spillway concrete section and deteriorated concrete surface areas and cracks in the spillway and downstream dam wall. Sketch drawings with technical specification notes for materials to be used and application procedures will be provided.

Task 3: **Seepage Repairs**
Seepage has been documented at the downstream junction of the dam wall and spillway, and under the spillway at the left end area. MSK will provide recommendations for controlling seepage at these two areas as follows:

- Seepage downstream of the junction of the dam wall and spillway – MSK will perform two hand probes within the wet seepage area at this location to obtain representative soil samples for laboratory gradation testing in order to design a filter system drainage blanket that will allow seepage to continue but stop the migration of any soil particles that could result in a "piping" failure of soils at this location thus potentially jeopardizing the stability of the dam. A sketch of the filter system drainage blanket will be developed along with material specification and installation notes.
- Seepage under the left end of the concrete spillway – MSK will develop a plan for grouting this seepage area between the bottom of the concrete spillway and top of underlying foundation bedrock. A sketch of the area to be grouted and will be prepared with grout specification notes and general application procedures.

Task 4: **Grading of Crest of Dam**
It will be necessary to regrade the top of dam to establish a level consistent crest elevation to prevent channelized flow during periods of overtopping that could lead to erosion and scour. A grading plan will be prepared based on our limited topographic survey with embankment fill placement and compaction and subgrade preparation notes including loam and seed requirements.

Task 5: **Upstream Rip Rap**
The existing upstream riprap condition will be assessed along with the need for areas to be infilled with additional riprap as necessary. A sketch will be developed showing those areas where riprap infilling is recommended along with riprap and underlying filter material requirement notes.

Task 6: **Permit Feasibility/Review Requirements**
MSK proposes to perform a permits/regulatory feasibility review to determine those regulatory permits/approvals that may be required for these maintenance items. Specifically, MSK proposes to contact the appropriate State of Vermont agencies to discuss with them the proposed repairs and to obtain guidance as to what permits/approvals they will require. We anticipate exploring the project-specific requirements for the below-referenced permits/approvals:

- VTDEC "Application to Construct or Alter a Dam" pursuant to 10 V.S.A. Chapter 43, requires a permit, or dam order, for construction, alteration or removal of dams impounding more than 500,000 cubic feet of any liquid. The volume of liquid includes any accumulated sediments, as measured to the top of the non-overflow part of the structure, i.e., including freeboard. Permitting for non-hydroelectric dams is administered by the Dam Safety Section.

- Vermont Wetlands Permit - This permit may be required for activity within a Class I or II wetland or buffer zone which is not exempt or considered an allowed use under the Vermont Wetland Rules. In order to obtain a permit, an applicant must demonstrate that the proposed impact cannot be relocated outside the wetland or buffer zone and that the activity will not lower the quality of the wetlands protected functions and values.

- Act 250 Land Use Permit - If the proposed project area is subject to an existing Act 250 Land Use Permit, an amendment application will likely be necessary for construction or improvement activities on site. If there is no Act 250 Land Use Permit series on record for the subject site and the project is located on more than 10 acres of land, a Jurisdictional Opinion from the Natural Resources Board may be advisable to confirm whether a permit is required for dam construction or improvements.

- Local (Municipal) Approval - The project may be subject to review by the local zoning administrator and/or the Development Review Board.

- Archeological/Historic Review - Additional review of archeological or historical resources may be required for local or Act 250 approval. Review may require the engagement of an independent historical preservation consultant or archeologist.

MSK will endeavor to determine those permits/approvals and their requirements that will be necessary after we determine the extent of the repairs/improvements proposed herein. We have established a budgetary amount at this time for investigating and identifying those permits and approvals that will be required. Once we have determined the permit/approval requirements, we will provide your office with a budget for performing any additional studies and preparing these permits and securing approvals.

Task 7: **Operation and Maintenance Program Report**
Our findings and recommendations from Tasks 1 through 6 will be summarized in a written document for your use and which can also be submitted to the VTDEC-DSP for their records. The report will include the following:

- Limited topographic survey sketch of existing conditions that identifies area requiring repairs / modifications
- Design sketches and specification notes for concrete repairs, seepage control, dam crest grading and riprap enhancement
- Operation and maintenance tasks to be followed after repairs are completed

EXCLUSIONS

The following services are not currently included in our proposal:

- Performance of detailed topographic survey and property boundary survey
- Breach analyses
- Hydrologic and hydraulic analyses
- Wetlands delineation
- Preparation of Town, State or Federal permits
- Preparation of construction-phase design drawings, specifications, and contract documents
- Performance of construction-phase administration, inspection, and testing services
- Attendance at in-person meetings

PROJECT BUDGET

Based on our project understanding and the above-referenced scope of services, MSK will perform the above-referenced engineering services for the not to exceed budget amount of $12,000. Monthly invoicing will be based on the category of personnel utilized at their respective billing rates in accordance with the attached Standard Hourly Rates.

PROJECT SCHEDULE

Upon receipt of a Town of Wilmington Purchase Order, MSK will schedule the field work enumerated in Task 1. The field measurements will need to be completed prior to the onset of a significant snow cover. Upon completion of Task 1 activities, we would anticipate completing the remaining tasks by April 1, 2023.

CLOSING

We appreciate this opportunity and are looking forward to working with you on this project. Please do not hesitate to contact the undersigned if you have any questions regarding this proposal.

Sincerely,

Charles E. Teale, PE, Senior Engineer
MSK Engineers
cteale@mskeng.com

Jason Dolmetsch, PE, President
MSK Engineers
jdolmetsch@mskeng.com

Consultant's Standard Hourly Rates

A. *Standard Hourly Rates:*

A. Standard Hourly Rates are set forth in this Appendix 1 and include salaries and wages paid to personnel in each billing class plus the cost of customary and statutory benefits, general and administrative overhead, non-project operating costs, and operating margin or profit.

B. The Standard Hourly Rates apply only as specified in Paragraphs 2.01, 2.02, and 2.03, and are subject to annual review and adjustment.

Job Description	Billing Rate – Per Hour
Principal Engineer	$270.00
Licensed Engineer I	$150.00
Licensed Engineer II	$190.00
Licensed Engineer III	$215.00
Licensed Engineer IV	$240.00
Licensed Surveyor	$160.00
Surveyor	$130.00
Engineer I	$95.00
Engineer II	$105.00
Engineer III	$120.00
Engineer IV	$140.00
Technician I	$70.00
Technician II	$90.00
Technician III	$105.00
Technician IV	$120.00
Technician V	$140.00
Technician VI	$190.00

B. *Expenses:*

Subconsultant & Vendor Expenses:
Subconsultants @ cost plus 8% Outside Vendors @ cost plus 8%

Administrative Expenses:
Postage & Shipping @ Cost
Other Administrative Expenses @ Cost

Reproductions (provided in-house):
8.5 x 11 one-sided copy @ $0.08/each
8.5 x 11 two-sided copy @ $0.12/each
24 x 36 print @ $5.00/each
36 x 48 print @ $8.00/each
Mylar or Vellum plots @ $15.00/each

Travel Related Expenses:
Auto Travel (to include fuel & service charges): N/A
Other Travel (to include air fares, rentals, tolls, etc.): N/A
Meals & Lodging: N/A

From: Charles Teale <cteale@mskeng.com>
Sent: Wednesday, January 10, 2024 12:35 PM
To: Scott Tucker <stucker@wilmingtonvt.us>
Cc: Jason dolmetsch <jdolmetsch@mskeng.com>
Subject: RE: Lake Raponda Dam (ID 246.01) - Downstream Hazard Considerations

Good morning Scott:

With respect to your below questions we offer the following responses and attendant costs:

1. We believe that at this time that performance of a detailed topographic survey and property boundary survey is not generally warranted as the anticipated repairs can be designed and executed with a limited topographic survey. Also please note that our limited topographic survey will have on it superimposed the adjacent property boundaries based on the Assessor's office maps which should be adequate.

   Costs for a detailed topographic survey, and property boundary research and survey with field staking of property lines for private property, town property and nearby state property would be as follows:
   - Detailed topographic survey: $3,200
   - Property boundary research and survey of the dam abutting property boundaries: $5,800
   - Property boundary research and survey of the State owned parcel across Lake Raponda Road, if deemed necessary: $5,100

2. Currently the dam is classified as a "low" hazard structure which is required to safely pass the 100-year storm event. Our thought process was to request that the VT DEC Dam Safety Program (DSP) perform the simplified dam breach and inundation mapping of the project using the commercially available DSS-Wise software which they would do free of charge. If their analysis confirmed that the dam is indeed classified as a "low" hazard structure, then the hydrologic and hydraulic (H&H) analyses could be performed to determine the spillway design flood (SDF), the degree of overtopping and best practices for erosion protection.

   Costs for these services would be as follows:
   - Using the DSS-Wise software, perform a dam breach analysis with downstream inundation mapping: $4,500
   - Using HydroCAD software, determine the SDF impoundment level for the 100-year storm: $2,200
   - Provide design recommendations for overtopping protection, as necessary: $1,800

3. Costs for attending neighborhood meetings that may last up to 2± hours (including preparation, travel time and mileage from Bennington) would be: $1,000/meeting

Please let me know if you have any questions or require any clarification.

Sincerely,

Eric

Charles E. Teale, PE, LSP
Sr. Engineer | MSK Engineers
M: 603-315-4811
O: 803-613-7574
E: cteale@mskeng.com
A: 150 Depot Street | Bennington, VT 05201
W:www.mskeng.com

MSK
ENGINEERS

From: Scott Tucker <stucker@wilmingtonvt.us>
Sent: Wednesday, January 3, 2024 10:17 AM
To: Charles Teale <cteale@mskeng.com>
Subject: RE: Lake Raponda Dam (ID 246.01) - Downstream Hazard Considerations

Good morning Charles,

Happy New Year! I am in my final analysis of the proposals submitted. I have a couple of questions related to your budget submission:

1. Task 1 includes a limited topographic survey - why is this MSK's suggested approach, rather than a detailed topographic survey and property boundary survey? If performing a detailed topographic survey and property boundary survey, what is that cost? $_____.

2. The state dam inspection report recommends performing a hydrologic and hydraulic analysis and dam breach to determine SDF impoundment level and amount of dam overtopping protection of the dam and abutment areas. Why is this recommendation not included and what is that cost? $_____.

3. What is the estimated cost for an in-person neighborhood meeting, approx. 2-hours? $_____.

Many thanks for your assistance.

Best, Scott

Scott A. Tucker
Wilmington Town Manager

From: Scott Tucker
Sent: Wednesday, December 6, 2023 5:07 PM

From: Derek Schipper <Derek.Schipper@gza.com>
Sent: Friday, October 27, 2023 11:41 AM
To: Scott Tucker <stucker@wilmingtonvt.us>
Cc: Chad Cox <chad.cox@gza.com>
Subject: RE: GZA - Lake Raponda Dam Proposal

Hi Scott,

GZA has developed the following LUMP SUM budget for the scope of work outlined in our previously provided proposal to perform a Phase II evaluation of Lake Raponda Dam.

Task 1 – Kick-off Meeting and Site Visit: $3,400
Task 2 – Topo Survey of Dam: $6,500
Task 3 – H&H Analyses: $6,500
Task 4 – Phase II Report and Conceptual Repairs: $12,500
Lump Sum Total: $28,900

You also expressed interest in GZA participating in meetings with the lake abutters to discuss our findings. We would propose an additional allowance of $1,500 for meetings which would be conducted virtually.

The schedule will be weather dependent. The site visit and survey should be performed with minimal snow cover. If we can get the site visit and survey performed before heavy snow, the remaining tasks could follow shortly thereafter.

Provided we have a notice to proceed before winter conditions, we would propose the following schedule:

Task 1 – Kick-off Meeting and Site Visit: within 2 weeks from NTP
Task 2 – Topo Survey of Dam: within 4 weeks from NTP
Task 3 – H&H Analyses: 4 to 6 weeks after topo survey
Task 4 – Phase II Report and Conceptual Repairs: 8 to 10 weeks after topo survey

If it works better for the Town's budget, we could break the work out over fiscal years (i.e. Task 1-2 – field assignments FY24 and the study tasks FY25). We are flexible.

I hope this is sufficient information for you at this time. Please feel free to call me if you have any questions.

Thanks again.

Derek

From: Scott Tucker <stucker@wilmingtonvt.us>
Sent: Wednesday, October 25, 2023 4:21 PM
To: Derek Schipper <Derek.Schipper@gza.com>
Subject: [EXTERNAL] RE: GZA - Lake Raponda Dam Proposal

FIRM QUALIFICATIONS

Proposal for Lake Raponda Dam

Dam State ID 246.01

LOCATION:
Lake Raponda
Wilmington, VT

PREPARED FOR:
Town of Wilmington
Jessica DeFrancesco
2 East Main Street, 2nd Floor
Wilmington VT 05363
jdefrancesco@wilmingtonvt.us
(802) 464-8591, x 123

PREPARED BY:
MSK Engineers
Charles E. Teale
150 Depot Street
Bennington, VT 05201
cteale@mskeng.com
(603) 315-4811

SUBMITTED: September 01 2023

MSK ENGINEERS

BENNINGTON – MONTPELIER – BURLINGTON
PO Box 139 | 150 Depot St | Bennington, VT 05201
802.447.1402 | www.mskeng.com
Licensed in CO, CT, MA, NY, VT

August 30, 2023

Jessica DeFrancesco, Town of Wilmington
2 East Main Street, 2nd Floor
Wilmington VT 05363
jdefrancesco@wilmingtonvt.us

Re: Qualifications for Lake Raponda Dam Maintenance

Dear Jessica,

MSK Engineers is pleased to offer this statement of consulting engineering qualifications in response to the Town's Dam Maintenance RFQ dated August 8, 2023. With almost half a century of staff experience providing municipal design and support services throughout the Northeast and New York, MSK has the staff, experience, and expertise to be a valuable resource for the Lake Raponda project.

In our capacity as civil engineering consultants, MSK has performed a wide range of services required in the design, inspection and repair of dams and appurtenant structures. Our multidisciplinary professionals are experienced in the various aspects of dam engineering including field inspections and geologic reconnaissance, seismological investigations; drilling and sampling; laboratory testing; analysis and design; computer modeling; hydrology and hydraulics, soil and rock instrumentation, preparation of construction plans and specifications, construction monitoring and forensic evaluations.

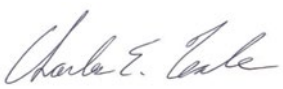
Our two Senior Engineers, Mr. Charles E. Teale, P.E., and Mr. Peter M. Heynen, P.E. individually have over 40+ years of varied dam engineering experience (including over 100+ dam projects located within New England and New York) as enumerated herein. Leading this effort will be Mr. Teale, who brings to this project extensive experience in the inspection, evaluation, design, construction and rehabilitation of existing and proposed earth, rock, and concrete dams, including appurtenant hydraulic structures. He has experience with the state of Vermont Department of Environmental Conservation Dam Safety Program, regarding all regulatory aspects of dam analysis and design, inspection, and permitting, and he is also a federal energy regulatory commission (FERC) approved consultant for hydropower dams.

Our office headquarters (located in the historic former Bennington train station) are located only 25 miles away, west of Lake Raponda. With our proximity to and deep knowledge of Wilmington and these surrounding regions, our team is excited for the opportunity to support the Town in all current and future endeavors related to this and other projects.

Included in this package, please find our company background, project understanding, relevant experience, and the credentials of our dedicated team. We are eager to apply our expertise and passion to the Lake Raponda maintenance efforts as we continue to support Vermont in maintaining safe and healthy communities.

Should you have any questions, require clarifications or additional information, please do not hesitate to contact us. Thank you for considering MSK.

Best,



Charles Teale, P.E., Senior Engineer
MSK Engineers

Jason Dolmetsch, P.E., President
MSK Engineers

Bennington Ninja Path Project, 2016-present

02 ABOUT US

MSK Engineers is a Vermont-based multidisciplinary civil engineering consulting firm that has offered professional services within the public, nonprofit, and private sectors for over 30 years. We specialize in supporting our clients throughout all stages of the infrastructure development process that accompany revitalization and redevelopment. Our areas of expertise include:

- Geotechnical Engineering
- Dams
- Construction Administration
- Environmental Remediation
- Site Civil
- Permitting & Planning
- Stormwater & Wastewater
- Survey & Mapping
- Transportation & Traffic
- Water Systems

Firm History

We were founded in 1993 as a small, locally focused firm providing high-quality civil engineering, survey, and construction administration services out of offices in Bennington and Shaftsbury, Vermont. In 2014, the company moved into the historic Bennington Station building, a former rail depot built at the turn of the twentieth century. In 2015, civil engineer (now owner and president) Jason Dolmetsch bought the practice after 17 years with the company and guided growth sparked by several major municipal water system projects in the Bennington region. Today, our growing team of professionals continues to offer a range of technical consulting services to clients throughout Vermont, the Northeast, New York, and Colorado.

Still headquartered in Bennington, we support a highly collaborative work environment for staff with multiple offices in Vermont, including Montpelier, Burlington, and Rutland. We invest in the development of our people to maximize the value we bring to clients through vision, specialized knowledge, and custom solutions. Our staff bring decades of experience, and our junior staff are regularly mentored and trained across each division, allowing us to provide consistent, high-quality results.

Through our innovative technical solutions and civic engagement, we embrace a people-centered approach to managing our business. A civil engineer by training, Jason has long been interested in the role of creativity in engineering services, believing the best engineering consultants provide more than just technical skill; they also cultivate an understanding of clients' long-term vision and develop projects to help clients realize this vision. In keeping with this philosophy, MSK strives to develop new leaders in the engineering profession who can not only solve pressing client problems but also cultivate new opportunities for community investment, growth, and

transformation. Our mission: *To advance the infrastructure that helps communities thrive by keeping people safe, healthy, and connected.*

Partnership

Our portfolio of projects reflects our commitment to safeguarding public health, public trust, and enhancing the vibrancy of our towns and surrounding regions where it is needed most. Our engineers have successfully taken on major municipal water system expansions, institutional wastewater system tie-ins, and stormwater site plans across scales, from residences to college and hospital campuses, as well as site development for multimillion-dollar urban redevelopment efforts, school properties, and affordable housing projects.

We actively seek projects that assist disadvantaged populations, and we are intimately familiar with the unique challenges that rural communities face. Some recent and relevant dam engineering projects that Mr. Teale and Mr. Hayden have been involved with at MSK as well as previous firms include:

- Emergency Action Plan (EAP) for the Southern VT Orchards Dam (Bennington VT)
- Stability analyses for the Moscow Mills Hydroelectric Dam (Stowe VT)
- Geotechnical engineering for Block Pond Dam (Stowe VT)
- Subsurface investigation, stability analyses/combination pond dam (Rutland VT)

Our Services

Civil, Environmental, & Geotechnical Engineering
Staff in our growing environmental and geotechnical engineering divisions bring decades of experience on challenging projects. Our senior environmental engineer, Patrick Smart, P.E., has worked on wastewater and mine remediation design and construction projects nationally and internationally.

Our senior geotechnical engineer, Peter Heynen, P.E., ran a successful geotechnical and environmental engineering firm in the greater NYC area for many years, and led major geotechnical investigations for new high-rise developments in NYC and beyond. His engineering experience is both broad and deep, and includes geotechnical engineering services for hundreds of buildings, bridges, and other structures; dam investigation, design, and construction administration and observation for earth and concrete dams; environmental investigations, including groundwater modeling; environmental audits (Phase I and II ESAs, CARs, and RAPs); laboratory testing; test boring inspection; construction inspection and operations; and forensic investigation of major structural failures involving highways, dams, and construction cofferdams.

Mr. Heynen draws on his 50+ years of experience to mentor our engineering professionals, guide practice development, and provide business insights. Three key phrases illustrate Peter's people-first, collaborative, and positive approach:

> ***"****Do the right thing."* Peter is committed to meeting the engineering code of ethics to the highest standard and putting people and safety at the heart of all engineering work.
>
> *"Everyone has to win."* For more than five decades, Peter has shaped projects around the belief that clients are best served when projects deliver benefits to clients, design consultants, and construction professionals alike.
>
> *"Keep smiling****."*** Peter embodies an upbeat, can-do attitude and inspires our staff to take on new challenges with spirit and energy.

A recent addition to the MSK team, Charles Teale, P.E., L.S.P. has extensive expertise in subsoil investigations and foundation design including field investigations for geotechnical and dam projects which have included slope stability analysis and design, detailed dam investigation studies, vertical and horizontal bearing capacity analysis for both shallow and deep foundation systems, ground improvement methods, seepage analysis and subdrainage design, implementation of geotechnical problems by solution on computers, soil laboratory testing, testing of soil improvement methods and field inspections and testing. Prepared numerous analyses and designs for new dams and repairs to existing dams.

He was the FERC approved Independent Consultant for the first Part 12 inspection of the Congon Dam in Montville, Connecticut, the second, third, and fourth Part 12 inspections of the Sebec Dam in Sebec, Maine, and the first and second Part 12 inspections for the Pittsfield Dam in Pittsfield, New Hampshire. Mr. Teale has been involved with over I00 dam engineering projects. These projects have varied extensively in size and complexity and have included stone masonry, concrete, earth embankment, and arch dams. Services have covered all aspects of impoundment structure projects and related appurtenant structures. He has 40 years of demonstrable dam engineering experience which includes dams located in Connecticut, New Hampshire, Rhode Island, Massachusetts, Vermont, and New York.

Both our environmental and geotechnical divisions add depth and value to our expanding portfolio of work. Our junior staff regularly cross-train across each technical division, allowing MSK to provide consistent, high-quality, and innovative service to our clients.

Financial Management and Planning
MSK has helped clients develop phased capital improvement plans, assisted with the identification of and successful application for funding sources, and developed creative, effective funding arrangements, all areas of expertise for Mr. Dolmetsch. We have also assisted municipal clients with the financial management of construction escrow accounts, a service overseen by Stephanie Mulligan, our finance director, who con- tributes her 15-plus years of experience in accounting for institutions and businesses.

Water Systems
MSK has paved the way for transformational water infrastructure improvements, helping public officials to envision and enact major water line extensions in rural areas and tackle lead service line removal. We have managed more than $40 million in complex water system financing, design, and construction administration.

Wastewater Systems
MSK has experience managing wastewater infrastructure projects from project inception through construction. Our senior environmental engineer Patrick Smart, P.E. has designed, operated, and constructed wastewater treatment systems for environmental remediation projects and industrial clients, using physical, chemical, and biological processes to treat water quality components typically associated with municipal wastewater.

Lead Service Line Inventory and Identification
MSK has led the way in Vermont on lead service line identification, inventory, and replacement. We are the only engineering firm in Vermont that has direct project experience focused on lead service line identification and replacement for a Vermont community. (The federal Revised Lead and Copper Rule is a new public drinking water regulation that will require public water systems to develop lead service line inventories and maps, conduct public outreach, and prepare lead service line replacement plans.)


River Road retaining wall, Bennington VT

Transportation
MSK has completed a variety of mixed-use path projects, including VTrans Municipal Assistance Bureau projects, in communities throughout southern Vermont. We have also designed and overseen the construction of roadway reconstruction and realignment

In-House Survey
MSK's growing in-house licensed survey team—headed by Eamon Mulligan, L.L.S., who has more than a decade of professional surveying experience—allows us to provide responsive, timely client service before, during, and after the construction phase.

Permitting & Regulatory Assistance
MSK's senior permitting specialist, Abby Chaloux, is a key player in MSK's daily and weekly planning activities, giving her a comprehensive and constantly up-to-date understanding of MSK's projects and permitting priorities. She brings to this work her decade-long background in real estate law and contracts, which allows her to act as a valuable resource for our survey team on questions about a variety of property-related legal matters. She also supports our engineering team on questions of compliance and stays current on permitting requirements as they change over time. Staff engineer Andrew Rodriguez, P.E., also plays a critical role in regulatory compliance through his focus on stormwater-related per- mitting, including SWPPPs. Through careful planning and a deep knowledge of permitting, including Act 250, Abby and Andrew keep client projects on time and on budget.

Construction Administration
Staff engineer Nicholas Ratzer develops contract documents and provides guidance and oversight of construction administration and inspection activities across many sites. Mr. Ratzer is responsible for construction administration and inspection on a 4-year, $25 million water line expansion project for the Town of Bennington, managing effective communication with the public, contractors, the municipality, and colleagues while meticulously tracking quantities and ensuring that the construction documents and permitting compliance requirements are implemented at every stage.

03 PROJECT UNDERSTANDING

On August 23, 2023, we, MSK Engineers, visited the dam and met with Mr. Scott Tucker, Town Manager, to discuss project particulars and perform a preliminary reconnaissance of the dam, spillway, and downstream areas. Additionally, we have reviewed the State of Vermont Department of Environmental Conservation, Dam Safety Program (DSP) "Dam Safety Inspection Report" dated October 1, 2021, and have corresponded with the author, Mr. Benjamin Green, PE.

The dam is currently listed by the Dam Safety Inspection Report as a Low Hazard Potential defined as where dam failure or mis-operation results in no probable loss of human life and low economic and environmental losses. However, the Dam Safety Inspection Report recommends that a dam breach analysis be performed in order to confirm this hazard classification. All Vermont low hazard classified dams are required to safely pass the 100-year storm even with 1.5-feet of freeboard between the maximum flood impoundment level and the top of the dam, as well as 3-feet of freeboard between the principal spillway crest and the top of the dam. Currently there is only 1± foot of freeboard between the principal spillway crest and the top of the dam.

The existing dam consists of a 120± foot long by 3± foot high earth embankment with a downstream concrete cutoff wall. The crest of the dam is 10± feet in width with rip rap along the upstream slope. Although the dam foundation conditions have not been confirmed, our observations suggest that the dam and downstream concrete cutoff wall are likely founded on bedrock. The principal spillway consists of a concrete broad crested weir founded on bedrock. Historically, a dam is reported to have existed at the site since circa mid-1800's with the current dam having been constructed between the 1930's and the 1950's. Additionally the dam may have been worked on in the 1960's.

Upstream side of dam looking north

Broad crested spillway looking south

Lake Raponda Dam has a reported drainage area of 0.96 square miles with a normal surface area of 116 acres. Normal storage to principal spillway crest is 115 acre-feet with a maximum storage volume of 230 acre-feet to the top of the dam.

As indicated previously, the spillway is founded on bedrock and the dam and downstream cutoff walls are also likely founded on bedrock. Exposed bedrock was observed upstream and downstream of the spillway and downstream of the dam embankment. Submerged bedrock was also observed just upstream of several portions of the dam.

Submerged exposed bedrock upstream of dam, looking west

Downstream spillway channel looking south

Numerous homes and seasonal camps are located along the shoreline of Lake Raponda. A public boat launch area exists just upstream from the east end of the dam along Lake Raponda Road.

The "Dam Safety Inspection Report" indicates that seepage is occurring downstream from the west end of the dam at the juncture with the spillway. Our observations indicate that this seepage is likely exiting through joint sets in the bedrock and/or at the downstream cutoff wall / bedrock interface. Currently the spillway design flood (SDF) elevation resulting from the 100-year storm is unknown. Therefore, the potential for overtopping of the dam during the 100-year storm event is currently not known.

Seepage at west end of dam

Specific recommendations provided in the "Dam Safety Inspection Report" that will need to be investigated include the following:

- Maintenance to include signage, clearing of vegetation to within 15 feet of dam and spillway appurtenances, and monitor the downstream concrete cutoff wall and area of seepage.
- Repair minor spillway concrete cracking and deterioration.
- Perform an updated hydrologic and hydraulic analysis and dam breach to determine the SDF impoundment level and amount of dam overtopping, if any, including confirmation of the hazard classification.
- Evaluate the need for overtopping protection of the dam and abutment areas.
- Develop an operation and maintenance manual.
- Repair / rehabilitate the dam to bring it up to current DSP standards.

Therefore, based on our preliminary site observations, review of the DSP Dam Safety Inspection Report and the Town of Wilmington RFQ, and our discussions with Mr. Scott Tucker, Town Manager, MSK anticipates that the following engineering-related tasks will likely be required:

- Perform a breach analysis with inundation mapping to confirm or refute the current Low downstream hazard classification.
- Perform hydrologic and hydraulic analyses to determine the SDF which will provide the basis for repairs / upgrades to the dam and spillway.
- Investigate the seepage at the west end of the dam and provide recommendations for monitoring and controlling the seepage.
- Develop a methodology for repairing existing concrete.
- Investigate ways to either increase spillway capacity and/or provide overtopping protection for the dam if the SDF cannot be accommodated by the existing spillway configuration.
- Prepare an engineering report that presents our findings and conclusions for bringing the dam and spillway into compliance with DSP standards including conceptual=level drawings and construction cost estimates.

04 RELEVANT EXPERIENCE

A relevant project listing is presented below, followed by selected project write-ups. In these qualifications, MSK presents the collective experience of Mr. Teale and Mr. Heynen, who have collaborated over the past 40 years in multiple capacities. This list presents consulting engineering projects performed across partnerships with SLR International Corp.(SLR), Milone & MacBroom, Inc.(MMI) and HTE Northeast, Inc. (HTE) prior to joining MSK.

See **Appendix 01** for our comprehensive listing of dam experience.

HTE/MMI/SLR

- **Massabesic Lake Dam | Manchester, NH**

2018-2022

Preparation of EAP, underwater inspections, analysis, and design of site safety improvement including repairs to embankment, spillway, canal dikes, construction administration and inspection/testing of soil and concrete for this a 27-foot high by 500-foot-long water supply high hazard dam for the City of Manchester.

- **Doors Pond Dam | Manchester, NH**

2010-2012

Provided geotechnical engineering and construction inspection and testing services to the City of Manchester for overtopping protection and increased stability for this high hazard 9-foot high by 125-foot-long stone masonry dam. Designed repairs to the westerly earthen dike.

- **Millville Lake Dam | Salem, NH**

2014-2016

Rehabilitation design of left concrete spillway and downstream spillway training wall for this high hazard dam that is 25-foot high by 550-foot long including construction inspection and testing. Currently engaged in design of post-tensioned rock anchors to increase stability and articulated concrete block mats of non-overflow section overtopping protection.

MMI/SLR

- **Fallkill Dam | Unionville, NY**

2020-2023

Analysis and design of post-tensioned rock anchors for this a 21-foot high by 220-foot-long dam to increase stability, earth dike improvements, and repairs to low level outlet including stone masonry re-pointing, and environmentally impacted sediment management. Construction completion is expected by end of 2023.

- **Calef Pond Dam | Auburn, NH**

2021-2022

Various maintenance and repairs including increasing hydraulic capacity of existing spillway with new low-level outlet for this 6-foot high by 25-foot-long earth embankment including construction inspection and testing.

- **Cranberry Pond Dam | Alstead, NH**

2020-2022

Reconstruction of a 9-foot-high by 215-foot-long earth embankment dam with a new principal drop inlet spillway and an auxiliary spillway including construction inspection and testing.

- **Silver Lake Hydroelectric Project, Goshen Dam | Goshen, VT**

2019-2023

Provided geotechnical engineering services to The Turner Group which included test borings and geotechnical reports for the new 50-foot-high gated concrete intake tower, stability analyses for temporary crane pad foundation platforms, downstream channel riprap protection, and interpretation of piezometer readings at this high hazard dam. FERC jurisdiction.

- **Jenny Pond Dam | Plymouth, MA**

2019-2021

Provided geotechnical engineering services which included test borings and seepage analyses for this 12-foot high by 160-foot-long earth embankment dam.

- **Reservoir Pond Dam, Dorchester, NH**

2018-2023

Reconstruction of a 15-foot high by 200-foot-long stone masonry and earth embankment dam with repairs to the existing principal spillway and long-term monitoring of settlements and translation including construction inspection and testing scheduled to be completed by the end of 2023.

- **Boulder Hill Pond Dam, Munson, MA**

2019-2021

Performance of stability analyses with additional downstream buttress riprap and design of principal spillway concrete overlay for this significant hazard 16-foot high by 120-foot-long dam including construction inspection and testing.

HTE

- **Lower Beach Pond Dam | Tuftonboro, NH**

2017-2018

Designed a replacement earth embankment dam with steel sheet pile cutoff wall, downstream filter blankets for this 10-foot high by 250-foot-long structure. Performed construction inspections and testing.

- **Jackson Mills Hydroelectric Project | Nashua, NH**

2019-2022

Provided geotechnical engineering services to The Turner Group which included test borings and geotechnical report for installation of post-tensioned rock anchors to increase stability including construction inspection and testing of rock anchors. FERC jurisdiction.

- **Marston Finn Dam | Windham, NH**

2015-2021

Performed subsurface explorations, stability analyses and designed a replacement labyrinth spillway for this old mill dam that is 14-feet high by 193-feet long with rock anchors to increase stability. The new labyrinth spillway is currently the largest in New Hampshire. Performed construction inspections and testing.

- **Sanborn Pond Dam | Loudon, NH**

2011-2016

Rehabilitation design and analysis of right side of historic high hazard stone masonry grist mill dam that is 15-foot high by 300-foot long including new interior cutoff wall and slip lining of low level outlet pipe including construction inspection and testing.

- **Swains Pond Dam | Barrington, NH**

1998-2000

Prepared design drawings for new slide gate and pressure grouting of embankment voids to reduce seepage for this 18-foot high by 250-foot-long stone embankment dam. Performed construction testing and inspection.

- **Pine Island Pond Dam | Manchester, NH**

1986-1987

Performed subsurface explorations, stability analyses and designed collapsible flashboards across the principal spillway, enhanced non-overflow section stability and a replacement slide gate. Performed construction inspections and testing.

- **Mill Pond Dam | North Hampton, NH**

2019-2023

Rehabilitation design and analysis of multi-level spillway configuration and stability enhancements for this historic stone masonry that is 15-foot high by 200-foot long including new upstream cutoff walls and triple slide gate low level outlet system including construction inspection and testing. Currently engaged in design of repairs to the left downstream spillway training wall.

- **Pittsfield Hydroelectric Dam | Pittsfield, NH**

1997-2002

Performed subsurface explorations through the ogee spillway with piezometer installations to measure uplift pressures with attendant stability analyses, and designed repairs to the spillway and non-overflow section with capping of the inlet to the penstock for this high hazard 32-foot high by 200-foot-long dam including construction inspection and testing of rock anchors. FERC jurisdiction.

- **Robbins Pond Dam | Rindge, NH**

2007-2011

Reconstruction of a 6-foot high by 500-foot-long earth embankment dam with a new drop inlet spillway and box culvert outlet including construction inspection and testing.

- **Wheeler Reservoir Dam | Salem, NH**

2003-2009

Design of principal spillway concrete overlay, collapsible flashboards, and non-overflow concrete section repairs for this high hazard dam that is 54-foot high by 480-foot long including construction inspection and testing.

- **New Wilton Reservoir Dam | Wilton, NH**

2016-2018

Prepared conceptual design level drawings for increasing the stability of this 24-foot high by 123-foot-long earth embankment dam.

- **Pearly Pond Dam | Rindge, NH**

1998-2002

Performed design and analysis of an upstream cutoff wall and grouting of voids for this 7-foot-high by 110-foot-long earth embankment dam including construction inspection and testing.

- **Alton Dam Preliminary Redesign | Alton, NH**

2000-2002

Performed expert witness services during litigation on behalf of the owner after the dam failed. Also prepared three conceptual dam replacement designs for this high hazard earth embankment dam.

HTE/MMI

- **Bowers Pond Dam and Harris Pond Dike | Nashua, NH**

2019-2021

Provided geotechnical engineering services to The Turner Group which included test boring and seepage and stability analyses. FERC jurisdiction.

- **Turning Mill Pond Dam | Canterbury, NH**

2015-2021

Reconstruction of a 12-foot high by 150-foot-long earth embankment dam with a new principal drop inlet spillway and repairs to an existing auxiliary spillway including construction inspection and testing.

- **Swains Pond Dam | Barrington, NH**

1998-2000

Prepared design drawings for new slide gate and pressure grouting of embankment voids to reduce seepage for this 18-foot high by 250-foot-long stone embankment dam. Performed construction testing and inspection.

- **Whites Pond Dam | Pittsfield, NH**

2017-2019

Rehabilitation design and analysis for this 30-foot high by 150-foot-long roadway embankment dam, spillway, and articulated concrete block mats for dike overtopping protection including construction inspection and testing.

05 REFERENCES

1) Thomas S. Burack, Esq, former NHDES Commissioner | Reservoir Pond Dam, Dorchester, NH
Sheehan Phinney Bass & Green, P.A.
1000 Elm Street
Suite #1700
Manchester, NH 03101
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2) David G. Miller, PE, Deputy Director, Water Supply | Massabesic Lake Dam, Manchester, NH
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3) Gerard R. Blanchette, P.E., LEED AP | Goshen Hydroelectric Dam, Hancock, VT & Harris Pond Dam, Nashua, NH
Sr. Project Executive ~ Principal
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603-228-1122 ext 120
gblanchette@ttgae.com

APPENDIX 01

Relevant Dam Projects

(This is a fully representative list of consulting engineering services performed by Mr. Teale and Mr. Heynen prior to MSK)

REPRESENTATIVE LISTING OF DAM PROJECTS

Key to Firms:

HTE = Heynen Teale Engineers
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OWNER AND LOCATION	PROJECT DESCRIPTION	TOPOGRAPHIC SURVEY	SUBSURFACE EXPLORATIONS	HYDROLOGIC ANALYSES	HYDRAULIC ANALYSES	STABILITY ANALYSES	UNDERWATER INSPECTIONS	ENGINEERING REPORTS	DESIGN PLANS AND SPECIFICATIONS	BREACH ANALYSES	EMERGENCY ACTION PLANS	OPERATIONS & MAINTENANCE PLANS	CONSTRUCTION INSPECTION	EROSION AND SEDIMENT CONTROL PLANS	Participating Firm(s)			
															HTE	MMI	SLR	MSK
CALEF POND DAM AUBURN, NEW HAMPSHIRE	25' LONG BY 6' HIGH CONCRETE AND EARTH EMBANKMENT DAM								■			■	■	■		■		
CRANBERRY POND DAM ALSTEAD, NEW HAMPSHIRE	215' LONG BY 8.8' HIGH EARTH EMBANKMNET DAM												■			■		
RICHARDSON POND DAM BARRINGTON, NEW HAMPSHIRE	130' LONG BY 8' HIGH EARTH EMBANKMENT DAM	■		■	■			■								■		
SWAINS POND DAM BARRINGTON, NEW HAMPSHIRE	250' LONG BY 18' HIGH STONE MASONRY WITH EARTH FILL	■					■	■	■				■	■	■			
KAMEN GEOTHERMAL POND DAM BEDFORD, NEW HAMPSHIRE	380' LONG BY 35' HIGH EARTH EMBANKMENT DAM	■						■	■	■			■	■	■			
LYSCAR'S POND DAM BEDFORD, NEW HAMPSHIRE	250' LONG BY 23' HIGH EARTH EMBANKMENT DAM							■							■			
TURNING MILL POND DAM CANTERBURRY, NEW HAMPSHIRE	150' LONG BY 12' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■			■		■	■			
OSCAR YOUNG DAM DEERING, NEW HAMPSHIRE	100' LONG EMERGENCY SPILLWAY	■		■	■	■		■	■			■		■	■			
RESERVOIR POND DAM DORCHESTER, NEW HAMPSHIRE	200' LONG BY 15' HIGH STONE MASONRY DAM	■		■	■			■	■							■	■	
COLCORD'S MILL POND DAM EXETER, NEW HAMPSHIRE	185' LONG BY 7' HIGH EARTH EMBANKMENT WITH TIMBER SPILLWAY	■		■	■		■	■	■						■			
TORY PINES DAM FRANCESTOWN, NEW HAMPSHIRE	175' LONG BY 21' HIGH EARTH EMBANKMENT DAM	■							■				■		■			
COBBLE MOUNTAIN DAM GILFORD, NEW HAMPSHIRE	128' LONG BY 19' HIGH STEEL SHEET PILE DAM					■				■						■	■	
SAWYER LAKE DAM GILMANTON, NEW HAMPSHIRE	450' LONG BY 19' HIGH EARTH EMBANKMENT WITH CONCRETE SPILLWAY			■	■						■				■			
SPECTACLE POND DAM HEBRON, NEW HAMPSHIRE	200' LONG BY 12' HIGH EARTH EMBANKMENT DAM	■						■			■				■			
HAYDEN MILL POND DAM HOLLIS, NEW HAMPSHIRE	175' LONG BY 16' HIGH STONE MASONRY AND EARTH EMBANKMENT							■							■			
WITCH BROOK DAM HOLLIS, NEW HAMPSHIRE	35' LONG BY 8' HIGH NEW CONCRETE CHANNEL	■			■				■						■			

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MSK = MSK Engineers

OWNER AND LOCATION	PROJECT DESCRIPTION	TOPOGRAPHIC SURVEY	SUBSURFACE EXPLORATIONS	HYDROLOGIC ANALYSES	HYDRAULIC ANALYSES	STABILITY ANALYSES	UNDERWATER INSPECTIONS	ENGINEERING REPORTS	PLANS AND SPECIFICATIONS	BREACH ANALYSES	EMERGENCY ACTION PLANS	OPERATIONS & MAINTENANCE PLANS	CONSTRUCTION INSPECTION	EROSION AND SEDIMENT CONTROL PLANS	Participating Firm(s)			
															HTE	MMI	SLR	MSK
LEDOUX POND DAM HOOKSETT, NEW HAMPSHIRE	12' HIGH BY 175' LONG EARTH EMBANKMENT DAM HOOKSETT, NEW HAMPSHIRE	■						■	■				■			■		
MARKET BASKET DETENTION DAMS HOOKSETT, NEW HAMPSHIRE	TWO EARTH EMBANKMENT DAMS OF 575' LONG BY 18' HIGH AND 230' LONG BY 16' HIGH		■			■		■					■		■			
HOPKINGTON HYDROELECTRIC FACILITY HOPKINGTON, NEW HAMPSHIRE	POWER HOUSE AND TAIL RACE						■	■							■			
CENTURY VILLAGE DAM LONDONDERRY, NEW HAMPSHIRE	88' LONG BY 13' HIGH NEW CONCRETE SPILLWAY WITH 100' LONG EARTH EMBANKMENT		■		■	■		■	■						■			
KENDALL POND DAM LONDONDERRY, NEW HAMPSHIRE	20' LONG BY 11' HIGH NEW CONCRETE EMERGENCY SPILLWAY		■	■	■	■		■	■			■	■		■			
WINDING BROOK POND DAM LONDONDERRRY, NEW HAMPSHIRE	140' LONG BY 8' HIGH EARTH EMBANKMENT DAM WITH CONCRETE DROP INLET SPILLWAY							■							■			
SANBORN POND DAM LOUDON, NEW HAMPSHIRE	300' LONG BY 15' HIGH STONE MASONRY DAM	■		■	■			■	■	■	■	■		■	■	■	■	
BELAMY RESERVOIR DAM MADBURY, NEW HAMPSHIRE	600' LONG BY 26' HIGH CONCRETE DAM						■								■			
DORR'S POND DAM MANCHESTER, NEW HAMPSHIRE	170' LONG BY 10' HIGH STONE MASONRY DAM		■			■		■					■		■	■	■	
MASSABESIC LAKE DAM MANCHESTER, NEW HAMPSHIRE	500' LONG BY 27' HIGH CONCRETE STONE MASONRY DAM (3 EAP UPDATES AND ASSESSMENT REPORT)	■		■	■		■	■	■	■	■	■	■	■	■	■	■	
PINE ISLAND POND DAM MANCHESTER, NEW HAMPSHIRE	67' LONG BY 17' HIGH EXISTING STONE MASONRY SPILLWAY	■	■		■	■	■	■	■		■	■	■		■			
SPARTAN POND DAM MERRIMACK, NEW HAMPSHIRE	55' LONG BY 8' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■					■	■			
JACKSON FALLS DAM NASHUA, NEW HAMPSHIRE	140' LONG BY 30' STONE MASONRY DAM		■					■					■		■			
WILDCAT POND DAM NEW IPSWICH, NEW HAMPSHIRE	450' LONG BY 16' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■			■			■			
MILL POND DAM NORTH HAMPTON, NEW HAMPSHIRE	200' LONG STONE MASONRY AND CONCRETE DAM	■		■	■			■					■	■	■	■	■	
PITTSFIELD HYDROELECTRIC DAM PITTSFIELD, NEW HAMPSHIRE	200' LONG BY 32' HIGH CONCRETE DAM	■	■	■	■	■		■	■		■				■			

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															HTE	MMI	SLR	MSK
WHITES POND DAM PITTSFIELD, NEW HAMPSHIRE	150' LONG BY 30' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■	■		■	■	■	■			
YMCA CAMP TAKODAH SEWAGE LAGOON DAMS RICHMOND, NEW HAMPSHIRE	350' LONG BY 12' HIGH EARTH EMBANKMENT DAM	■		■				■	■						■			
MILL POND DAM RINDGE, NEW HAMPSHIRE	20' LONG BY 18' HIGH STONE MASONRY SPILLWAY AND 200' LONG BY 25' HIGH EARTH EMBANKMENT DAM	■		■	■			■								■	■	
PEARLY POND DAM RINDGE, NEW HAMPSHIRE	75' LONG BY 8' HIGH STONE MASONRY DAM	■		■	■			■	■			■			■			
ROBBINS POND DAM RINDGE, NEW HAMPSHIRE	500' LONG BY 7' HIGH EARTH EMBANKMENT DAM		■	■	■			■	■	■		■	■	■	■			
UPPER DAMON RESERVOIR DAM RINDGE, NEW HAMPSHIRE	300' LONG BY 12' HIGH STONE MASONRY DAM	■		■	■			■	■			■			■			
BURKE POND DAM RYE BEACH, NEW HAMPSHIRE	80' LONG BY 5' HIGH STONE MASONRY AND CONCRETE DAM	■		■	■				■					■		■		
MILLVILLE LAKE DAM SALEM, NEW HAMPSHIRE	550' LONG BY 25' HIGH CONCRETE DAM	■	■	■	■	■		■	■			■	■	■	■	■	■	
TAYLOR RESERVOIR DAM SALEM, NEW HAMPSHIRE	350' LONG BY 20' HIGH CONCRETE DAM	■						■						■	■			
WHEELER DAM SALEM, NEW HAMPSHIRE	550' LONG BY 55' HIGH CONCRETE DAM	■		■	■	■	■	■	■				■	■	■			
BAYARD HENRY DAM SANBORNTON, NEW HAMPSHIRE	100' LONG BY 12' HIGH CONCRETE AND STONE MASONRY DAM	■		■	■	■		■							■			
PIONEER LAKE DAM STODDARD, NEW HAMPSHIRE	275' LONG BY 17' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■			■		■	■			
CHINA MILLS DAM SUNCOOK, NEW HAMPSHIRE	200' LONG BY 35' HIGH CONCRETE DAM FISH PASSAGE						■	■							■			
LOWER BEACH POND DAM TUFTONBORO, NEW HAMPSHIRE	250' LONG BY 10' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■	■		■	■	■	■			
HILLSBOROUGH MILLS DAM WILTON, NEW HAMPSHIRE	200' LONG BY 23' HIGH EXISTING STONE MASONRY SPILLWAY WITH 150' CONCRETE SPILLWAY				■										■			
NEW WILTON DAM WILTON, NEW HAMPSHIRE	175' LONG BY 35' HIGH EARTH EMBANKMENT DAM	■		■	■			■							■			

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															HTE	MMI	SLR	MSK
SWAN LAKE DAM OXFORD, CONNECTICUT	270' LONG BY 16' HIGH EARTH EMBANKMENT DAMS WITH 60' EMERGENCY SPILLWAY	■		■	■			■	■						■			
ROGERS DAM ROGERS, CONNECTICUT	600' LONG BY 25' HIGH STONE FILLED TIMBER CRIB DAM					■	■	■							■			
FAIRY LAKE DAM SALEM, CONNECTICUT	550' LONG BY 23' HIGH EARTH EMBANKMENT WITH EMERGENCY SPILLWAY	■			■			■	■						■			
PAPER MILL POND DAM VERNON, CONNECTICUT	25' LONG BY 17' HIGH CONCRETE SPILLWAY WITH SLUICEWAY				■			■			■	■			■			
WRIGHT'S POND DAM WESTBROOK, CONNECTICUT	80' LONG BY 15' HIGH EXISTING STONE MASONRY SPILLWAY WITH 23' HIGH EARTH EMBANKMENT	■	■	■	■	■	■	■	■				■		■			
CEDAR SWAMP DAM WOLCOTT, CONNECTICUT	375' LONG BY 18' HIGH EXISTING EARTH EMBANKMENT DAM	■					■	■	■				■		■			
CHESTNUT HILL DAM WOLCOTT, CONNECTICUT	350' LONG BY 45' HIGH EARTH EMBANKMENT WITH A 5' LONG BY 8' HIGH CONCRETE SPILLWAY			■							■	■	■		■			
WOODTICK RESERVOIR DAM WOLCOTT, CONNECTICUT	125' LONG BY 43' HIGH EXISTING SPILLWAY WITH 25' HIGH BY 1050'		■			■	■	■							■			
WITCHES WOOD DAM WOODSTOCK VALLEY, CONNECTICUT	800' LONG BY 20' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■				■		■			
BEAVER POND DAM BEDFORD, NEW YORK	250' LONG BY 12' HIGH STONE MASONRY DAM	■						■	■						■			
CARMEL LAKE DAM CARMEL, NEW YORK	50' LONG BY 22' HIGH EXISTING CONCRETE SPILLWAY WITH 250' LONG EARTH EMBANKMENT	■					■	■	■						■			
SAGAMORE DAM CARMEL, NEW YORK	45' LONG BY 20' HIGH EXISTING CONCRETE SPILLWAY WITH 250' LONG BY 20' HIGH EARTH EMBANKMENT	■	■	■	■	■	■	■	■				■	■	■			
PERKINS ESTATE POND DAM COLD SPRING, NEW YORK	250' LONG BY 30' HIGH EARTH EMBANKMENT DAM						■	■							■			
SLEEPY HOLLOW DAM COXSACKIE, NEW YORK	600' LONG BY 75' HIGH EARTH EMBANKMENT DAM						■								■			

REPRESENTATIVE LISTING OF DAM PROJECTS

Key to Firms:

HTE = Heynen Teale Engineers
MMI = Milone & Macbroom
SLR = SLR Consulting
MSK = MSK Engineers

OWNER AND LOCATION	PROJECT DESCRIPTION	TOPOGRAPHIC SURVEY	SUBSURFACE EXPLORATIONS	HYDROLOGIC ANALYSES	HYDRAULIC ANALYSES	STABILITY ANALYSES	UNDERWATER INSPECTIONS	ENGINEERING REPORTS	PLANS AND SPECIFICATIONS	BREACH ANALYSES	EMERGENCY ACTION PLANS	OPERATIONS & MAINTENANCE PLANS	CONSTRUCTION INSPECTION	EROSION AND SEDIMENT CONTROL PLANS	Participating Firm(s)			
															HTE	MMI	SLR	MSK
CHAZY LAKE DAM DANNEMORA, NEW YORK	2,300' LONG BY 30' HIGH EARTH EMBANKMENT AND DIKE		■	■	■	■		■	■						■			
SNOW LAKE DAM INDIAN LAKE, NEW YORK	150' LONG BY 27' HIGH CONCRETE SPILLWAY	■			■	■	■	■	■						■			
SIMMONS POND DAM LEWISBORO, NEW YORK	30' LONG BY 8' HIGH REINFORCED CONCRETE DAM	■		■	■	■		■	■				■		■			
TARA LAKE DAM MILLWOOD, NEW YORK	175' LONG BY 15' HIGH EARTH EMBANKMENT DAM	■						■	■						■			
LAKE KINDEROGEN DAM MOUNT PLEASANT, NEW YORK	150' LONG BY 15' HIGH STONE MASONRY DAM	■						■	■				■		■			
MOUNT PLEASANT DAM MOUNT PLEASANT, NEW YORK	75' LONG BY 15' HIGH EARTH EMBANKMENT DAM		■		■				■				■		■			
BURMAN'S POND DAM PATTERSON, NEW YORK	120' LONG BY 9' HIGH EARTH EMBANKMENT DAM	■		■	■	■	■	■					■	■	■	■		
PRIMROSE POND DAM PUTNAM, NEW YORK	150' LONG BY 9' HIGH EARTH EMBANKMENT		■		■				■				■		■			
ROARING BROOK DAM PUTNAM VALLEY, NEW YORK	550' LONG BY 37' HIGH EARTH EMBANKMENT DAM AND CONCRETE SPILLWAY				■		■	■	■						■			
SHENOROCK DAM SOMERS, NEW YORK	150' LONG BY 22' HIGH EARTH EMBANKMENT DAM	■		■	■	■		■							■			
TRUESDALE LAKE DAM SOUTH SALEM, NEW YORK	175' LONG BY 18' HIGH EARTH AND STONE MASONRY DAM	■		■	■			■	■					■	■			
FURNACE POND DAM UNION VALE, NEW YORK	18' HIGH BY 80' LONG STONE MASONRY SPILLWAY AND 275' LONG EARTH EMBANKMENT DIKE	■		■	■	■		■		■						■		
LAWRENCE HYDROELECTRIC FACILITY LAWRENCE, MASSACHUSETTS	2,000' LONG BY 38' HIGH STONE MASONRY DAM						■	■							■			
BOULDER HILL POND DAM MONSON, MASSACHUSETTS	120' LONG BY 15.5' HIGH CONCRETE GRAVITY DAM			■	■	■		■	■			■	■	■		■		

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PARADISE POND DAM NORTHAMPTON, MASSACHUSETTS	190' LONG BY 23' HIGH EXISTING STONE MASONRY SPILLWAY WITH NEW ROCK ANCHORS		■			■	■	■	■				■		■			
JENNEY POND DAM PLYMOUTH, MASSACHUSETTS	160' LONG BY 12' HIGH STONE MASONRY AND EARTHFILL DAM	■	■	■	■	■		■								■	■	
SAWMILL (RUSSELL) POND DAM PLYMOUTH, MASSACHUSETTS	110' LONG BY 10' HIGH EARTH EMBANKMENT DAM	■		■	■			■	■	■	■	■	■	■		■	■	
SOUTH BARRE MILL POND DAM SOUTH BARRE, MASSACHUSETTS	275' LONG BY 35' HIGH EXISTING STONE MASONRY SPILLWAY			■	■			■			■				■			
SEBEC HYDRO PROJECT SEBEC, MAINE	320' LONG BY 18' HIGH EXISTING STONE MASONRY AND CONCRETE SPILLWAY					■		■							■			
NATICK POND DAM WEST WARWICK, RHODE ISLAND	180' LONG BY 38' HIGH EXISTING STONE MASONRY SPILLWAY	■		■	■	■	■	■	■		■				■			
ST. ALBANS LOWER RESERVOIR DAM ST. ALBANS, VERMONT	30' HIGH BY 350' LONG EARTH EMBANKMENT DAM		■			■									■			
FALKILL RESERVOIR DAM UNIONVILLE, NEW YORK	21' HIGH BY 75' LONG STONE MASONRY SPILLWAY	■		■	■	■		■								■	■	
PEEKSKILL LAKE DAM PEEKSKILL, NEW YORK	22' HIGH BY 65' LONG CONCRETE OGEE SPILLWAY	■				■										■		
ASHUELOT PAPER CO. DAM WINCHESTER, NEW HAMPSHIRE	325' LONG BY 32' HIGH CONCRETE GRAVITY HYDROELECTRIC DAM				■	■	■	■							■			
MARSTON-FINN CONSERVATION DAM WINDHAM, NEW HAMPSHIRE	181' LONG BY 10.2' HIGH CONCRETE DAM W/ 5.5-CYCLE LABYRINTH WEIR	■	■	■	■	■	■	■	■			■	■	■	■	■		
FROG POND DAM WILTON, NEW HAMPSHIRE	190' LONG BY 15' HIGH EARTH EMBANKMENT DAM	■		■	■	■		■	■	■	■					■	■	
WARNER ELECTRIC POND DAM BRISTOL, CONNECTICUT	150' LONG BY 15' HIGH EARTH EMBANKMENT DAM			■	■				■						■			
LEE'S LOWER POND DAM DANBURY, CONNECTICUT	185' LONG BY 8' HIGH CONCRETE DAM WITH STONE MASONRY SPILLWAY	■					■	■	■				■		■			
THOMAS PROPERTY DAM EAST HADDAM, CONNECTICUT	150' LONG BY 25' HIGH STONE MASONRY SPILLWAY							■							■			

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TAMARACK COUNTRY CLUB DAM GREENWICH, CONNECTICUT	250' LONG BY 15' HIGH EARTH EMBANKMENT DAM		■	■	■	■		■							■			
BUSHY POND DAM IVORY, CONNECTICUT	200' LONG BY 25' HIGH EARTH EMBANKMENT							■							■			
OLD DANIEL'S DAM KILLINGLY, CONNECTICUT	90' LONG BY 27' HIGH EXISTING STONE MASONRY SPILLWAY	■						■	■						■			
KILLINGWORTH DAM KILLINGWORTH, CONNECTICUT	75' LONG BY 25' HIGH NEW EARTH EMBANKMENT DAM		■	■	■	■		■	■						■			
LARKIN POND DAM MIDDLEBURY, CONNECTICUT	200' LONG BY 22' HIGH EARTH EMBANKMENT DAM								■				■		■			
SPERRY POND DAM MIDDLEBURY, CONNECTICUT	550' LONG BY 8' HIGH EARTH EMBANKMENT DAM	■						■	■				■		■			
BESECK LAKE DAM MIDDLEFIELD, CONNECTICUT	166' LONG BY 40' HIGH EXISTING STONE MASONRY ARCH SPILLWAY	■	■			■	■	■	■			■		■	■			
CONGDON DAM MONTVILLE, CONNECTICUT	150' LONG BY 35' HIGH STONE FACED EARTH EMBANKMENT DAM WITH 60' PENSTOCK	■		■	■	■	■	■			■	■			■			
COLLINS POND DAM NEW CANAAN, CONNECTICUT	260' LONG BY 12' HIGH STONE MASONRY DAM							■							■			
WALKER POND DAM NEW CANAAN, CONNECTICUT	80' LONG BY 8' HIGH CONCRETE DAM	■		■	■	■	■	■							■			
SAMP MORTAR RESERVOIR DAM FAIRFIELD, CONNECTICUT	320' LONG BY 29' HIGH CONCRETE GRAVITY DAM							■	■		■				■	■	■	■
PINEWOOD LAKE DAM TRUMBULL, CONNECTICUT	210' LONG BY 22' HIGH STONE MASONRTY AND EARTH EMBANKMENT DAM										■							■
ALEXANDER EWING DAM MILLBROOK, CONNECTICUT	600' LONG BY 17' HIGH EARTH EMBANKMENT DAM	■							■			■	■			■	■	■
GOSHEN HYDROELECTRIC DAM HANCOCK, VERMONT	60' HIGH BY 232' LONG EARTH EMBANKMENT DAM		■			■		■								■	■	
SOUTHERN VERMONT ORCHARDS DAM BENNINGTON, VERMONT	440' LONG BY 17' HIGH EARTH EMBANKMENT DAM										■							■

APPENDIX 02

Team Resumes

Charles E. Teale, P.E., LSP
Senior Engineer

CHARLES E. TEALE is a recent addition to our MSK team, bringing with him 40 years of demonstrable dam engineering experience working on over 100+ dams throughout New England and New York.

Charles has extensive expertise in subsoil investigations and foundation design including field investigations for geotechnical and dam projects which have included slope stability analysis and design, detailed dam investigation studies, vertical and horizontal bearing capacity analysis for both shallow and deep foundation systems, ground improvement methods, seepage analysis and subdrainage design, implementation of geotechnical problems by solution on computers, soil laboratory testing, testing of soil improvement methods and field inspections and testing.

Contact
(603) 315-4811
cteale@mskeng.com

Experience
4 months w/MSK, 40 years w/ other firms

Certificates
- Registered Professional Engineer, CT, MA, ME, NH, VT
- Licensed Site Professional, MA
- NH-DES Certified Asbestos Disposal Site Worker

Education
- Professional Degree of Engineer in Civil Engineering, *George Washington U.*

- ME Civil Engineering
Rensselaer Polytechnic Institute

- BS Civil Engineering
Clarkson College of Technology

Dams:

Fallkill Dam Improvements
Poughkeepsie, NY
- Project engineer for these improvements.
- Brought back up to current safety standards.
- Evaluated alternative and designed improvements to the spillways.

Furnace Pond Dam Analysis
Union Vale, NY
- Once again project engineer.
- Conducting engineering assessment.
- Reported recommendations for the dam's repair.

Bayside Seawall Replacement
Northport, ME
- Geotechnical Engineer- In- Charge.
- Provided summary report discussing the subsurface conditions.
- Provided design and construction recommendations.

Russell Pond Dam
Plymouth, MA
- Phase II engineering.
- Completion of dam created with correct spillway measurements.
- Structural design checked.
- An armored downstream surface designed to remedy these issues.

Boulder Hill Pond Dam
Monson, MA
- Dam found in poor condition, with seepage and stability issues.
- Hydraulic and hydrologic analysis performed.
- Suggested additional repairs.

Massabesic Lake Dam
Manchester, NH
- Project manager for this dam assessment project.
- Used GIS mapping to prepare the dam for a 100-year storm.
- River Analysis System (RAS) version 4.0.

Lower Beach Pond Dam
Tuftonboro, NH
- Designed replacement earth embankment.
- Reduced seepage and maintained stability.

Wheeler Reservoir Dam
Salem, NY
- Salem's Town Water Supply reservoir was a high hazard dam, with a severely dilapidated structure.
- After a redesign, the internal drainage was aided, reinforced the concrete.

Dean Kamen Geothermal Pond Dam
Bedford, NH
- Modified large embankment structure to improve its stability.

Charles E. Teale, P.E., LSP
Senior Engineer

MSK

Jackson Falls Dam
Nashua, NH
- Increased dam stability, including testing rock anchors.
- Construction phase inspection.
- Fitted dam with a spillway.

Dorrs Pond Dam
Manchester, NH
- Performed analysis of insufficient spillway, regardless of previous armored structures attempting to prevent washout.
- Additional evaluations leading to proper protection downstream and of overflow.

Cornelis Dam
Wolcott, CT
- Dam was constructed in 1917
- Phase II study conducted by Mr. Teale.
- Various methods of increasing the dams overflow capacity.
- Prepared emergency: Maintenance, Operation, and action plans.

Churchtown Reservoir Dam
Hudson, NY
- Evaluation of structure and stability of a 55-foot-high concrete gravity dam.
- Drilled five test borings.
- Recommended installation of toe drains as well as a concrete rehabilitation project.

Pinewood Lake Dam
Trumbull, CT
- Structure with earth embankment, originally constructed in 1890 with several additions since then. This dam was tested for better safety and construction options, and emergency action plan created.

Converse Lake Dam
Greenwich, CT
- Studies performed.
- Determined viable methods of restoring existing outlet facilities.

Moekel Pond Dam
Windham, NH
Historic dam
- Found to be incapable of withstanding a hundred-year storm event.
- Constructions to the structure were configured to preserve as much of the original as possible.
- 6-cycle labyrinth spillway add on (largest to date in NH).

Moose Creek Dam
Clearfield, PE
- Geotechnical engineering services provided.
- 85-foot-high embankment structure.

Mine Lake Dam
West Point, NY
- Located at West Point Military Academy.
- Rock coring and seepage analysis were performed.

Montclair Dam
Reston, VA
- Geotechnical and Hydraulic analysis.
- Investigation of adequacy of embankment dam.

Hitchcock Lake Dam
Wolcott, CT

- This dam was constructed with soil backfill and a retaining wall, with an 18-inch low outlet pipe controlling the lake's level. Overall stability reinforcement needed.

Swan Lake Dam
Oxford, CT

- Constructed over 100 years ago, this dam is 16-foot-high and 325-foot-long structure. Phase II investigation was performed to determine the discharge and seepage. It was recommended that the dam be raised.

Peter Heynen, P.E.
Senior Engineer – Geotechnical

PETER HEYNEN, P.E. a trusted advisor for MSK, joined our team in 2019, bringing with him more than half a century of experience in engineering and construction. Mr. Heynen has worked on geotechnical and ground stabilization projects; groundwater modeling; groundwater and soil remediation investigations; environmental audits and Phase I and II environmental site assessments, contamination assessment reports, and remediation action plans; bridge engineering services; and forensic analysis of structural failures in structures including dams and highways.

Contact
860-614-2378
pheynen@mskeng.com

Experience
5 with MSK, 52 with other firms

Certificates
- Registered Professional Engineer
CT, FL, NY

Education
- BS, Civil Engineering
New England College
Henniker, NH

- AS, Architecture
Wentworth Institute of Technology
Boston, MA

- Graduate Studies, Geotechnical Engineering
University Of Connecticut-Storrs

Dams & Hydropower:

| Russell Pond Dam
Plymouth, MA

- Oversaw the Phase II engineering of this approximately 110-foot-long earth embankment dam. The upstream side of the dam consists of stone and mortar walls to the left and right of the drop inlet spillway. The vegetated upstream slope is at a 2.5H:1V inclination and the overgrown downstream slope is at about 2H:1V. The minimum crest width of the earth embankment, over which is located a gravel surfaced access way, is about 14 feet. The maximum structural height of the dam is 10± feet, and the maximum hydraulic height of the dam is 6.5± feet based on the elevation of the top of the stop logs. The spillway, located on the right side of the dam, consists of a 6-foot-long stop-log-controlled concrete drop inlet with a trash rack at the inlet. Overtopping of the earth embankment crest would likely cause erosion of the downstream slope and could result in a breach of the dam. An armored downstream surface was designed as the preferred rehabilitation approach.

| Boulder Hill Pond Dam
Monson, MA

- Oversaw the design of a ballast system of strategically placed riprap dead weight to counteract driving hydrostatic forces in order to increase the factor of safety against sliding and overturning. The 15.5-foot-high concrete dam was in poor condition with efflorescence and seepage through the downstream side. With a storage capacity of about 40 acre-feet and a drainage area of about 1 mile, the 100-year inflow design storm is 161 cubic feet per second. The existing spillways have the capacity to safely pass the spillway design flood (SDF), however, the stability of the concrete dam is questionable. Additional repairs will be necessary to the low level outlet pipe.

| Dam Inspection
Cromwell, CT

- Performed investigation and inspection of a dam, made recommendations for repair, and made recommendations for the dredging of the pond and disposal of exhausted dredge soils.

| Dam Inspection and Repair
Millbrook, NY

- Inspection and repair of 5 earth embankment dams in Millbrook, New York. Provided observation and documentation of the repair of the dams.

| Lake Beseck Dam
Middlefield, CT

- Performed explorations through the crest of the 35-foot-high masonry arch structure, design drawings for installation of an upstream low permeable barrier, and construction inspection services.

Millbrook Dams
Millbrook, NY
- Design and construction services for the construction of three new dams in Millbrook, New York. The dams are earth embankments approximately 17' in height and have a total length of 2,500'. Total project area is approximately 16 acres.

Approximately 130,000 cubic yards of soil was either excavated or placed to construct the dams.

Tree Dams at 409 Overlook Road
Millbrook, NY
- Value engineering and redesign of 3 earth embankment dams. Construction administration and oversight of the construction of the 3 dams at 409 Overlook Road. Made recommendations to improve the project and also saved over $5,000,000 in construction costs.

Lake Beseck Dam
Middlefield, CT
- Performed explorations through the crest of the 35-foot-high masonry arch structure, design drawings for installation of an upstream low permeable barrier, and construction inspection services.

Dam
Rochester, NY
- Performed sector gate failure investigation for a $4.5-million project for Rochester Gas and Electric.

Bell Shop Pond Dam
Higganum, CT
- Performed inspection, investigation, survey, recommendation, and final design

Pinewood Lakes
Trumbull, CT
- Performed dam failure update, dam break analysis, remedial design, installation, and observation for slope protection.

Investigation of Two Dams
Chappaqua, NY
- Remedial repair of both dams and final design
- Construction observation.

Turner Pond Dam
Hamden, CT
- Performed survey, construction observation, and as-builts.

Rochester Gas and Electric- Station 5
Rochester, NY
- Performed dam inspection and prepared inspection report, engineering plans and specifications for rehabilitating the 100-foot- long and 17-foot-high sector gate. Rehabilitation consisted of new steel and concrete construction with mechanical modifications.

Bell Shop Pond Dam
Higganum, CT
- Performed dam inspection, topographic survey, hydrologic analysis, and hydraulic analysis. Prepared inspection report, engineering plans, and specifications for repairing the 115-foot-long and 21-foot-high stone masonry dam. The 150-year-old dam has a 36-foot hydraulic head. Performed a feasibility study to determine the capacity and assessed FERC requirements for producing electricity.

Pine Island Pond Dam
Manchester, MA
- Performed topographic survey, subsurface explorations, hydraulic analysis, stability analysis, and underwater inspections for existing masonry spillway. Prepared engineering report plans and specifications, emergency action plan, operation and maintenance plan, and performed construction inspection and testing for a 67-foot-long by 17-foot-high stone masonry spillway.

Peter Heynen, P.E.
Senior Engineer – Geotechnical

MSK

HYDRAULIC PROJECTS:

| Sebec Hydro Project
Sebec, ME
- Performed independent consultant inspection in accordance with FERC guidelines for the Swift River Company of Boston, Massachusetts. The 320-foot-long and 17-foot-high run of the river dam is a wood crib design with concrete and stone masonry abutments and a 327-square-mile drainage.

| Carmel Lake Dam
Carmel, NY
- Performed topographic survey and underwater inspections and prepare engineering report and plans and specifications for the 50-foot-long and 22-foot-high existing concrete spillway with 250-foot-long earth embankment.

| Sagamore Dam
Carmel, NY
- Performed topographic survey, subsurface explorations, hydrologic analysis, hydraulic analysis, stability analysis, and underwater inspections for the 45-foot-long by 20-foot-high existing concrete spillway with a 250-foot-long by 20-foot-high earth embankment. Prepared engineering report, engineering plans, and specifications. Performed construction inspection and testing.

| Besek Lake Dam
Middlefield, CT
- Performed topographic survey, subsurface explorations, stability analysis, and underwater inspections. Prepared engineering report, engineering plans, specifications, and operation and maintenance plan for the 166-foot-long by 40-foot-high existing stone masonry arch spillway.

| Natick Pond Dam
West Warwick, RI
- Performed topographic survey, hydrologic analysis, hydraulic analysis, stability analysis, and underwater inspections. Prepared engineering report, plans, and specifications, and emergency action plan for a 180-foot-long by 38-foot-high existing stone masonry spillway.

| Lee's Lower Pond Dam
Danbury, CT
- Performed topographic survey and underwater inspections for a 185-foot-long by 8-foot-high concrete dam with stone masonry spillway. Prepared an engineering report, engineering plans, and specifications. Also performed construction inspection and testing.

| Swan Lake Dam
Oxford, CT
- Performed topographic survey, hydrologic analysis, and hydraulic analysis for a 270-foot-long by 16-foot-high earth embankment dam with a 60-foot-long emergency spillway. Prepared engineering report, engineering plans, and specifications.

| Paper Mill Pond Dam
Vernon, CT
- Performed hydraulic analysis for a 25-foot-long by 17-foot-high concrete spillway with sluiceway. Prepared engineering report, emergency action plan, and operation and maintenance plan.

| Killingworth Dam
Killingworth, CT
- Performed subsurface explorations, hydrologic analysis, hydraulic analysis, and stability analysis. Prepared engineering report, engineering plans, and specifications for a 75-foot-long by 25-foot-high new earth embankment dam.

Cedar Swamp Dam
Wolcott, CT
- Performed topographic survey and underwater inspections. Prepared engineering report, engineering plans, and specifications. Performed construction inspection and testing for 375-foot-long by 18-foot-high existing earth embankment dam.

Wright's Pond Dam
Westbrook, CT
- Performed topographic survey, subsurface explorations, hydrologic analysis, hydraulic analysis, stability analysis, and underwater inspections for a 80-foot-long by 15-foot-high existing stone masonry spillway with a 23-foot-high earth embankment. Prepared engineering report, engineering plans, and specifications. Performed construction inspection and testing.

Chestnut Hill Dam
Wolcott, CT
- Performed hydrologic analysis for a 350-foot-long by 45-foot-high earth embankment with a 5-foot-high by 8-foot-wide concrete spillway. Prepared emergency action plan and operation and maintenance plan. Performed construction inspection and testing.

Witches Wood Dam
Woodstock Valley, CT
- Performed topographic survey, hydrologic analysis, and hydraulic analysis for a 800-foot-long by 20-foot-high earth embankment dam. Prepared engineering report, engineering plans, and specifications and performed construction inspection and testing.

Woodtick Reservoir Dam
Wolcott, CT
- Performed subsurface explorations, stability analysis, and underwater inspections and prepared engineering report for a 125-foot-long by 43-feet-high existing dam with a 25-foot-high by 1050-foot-long spillway.

Bushy Pond Dam
Ivory, CT
- Performed inspection and prepared engineering report for a 200-foot-long by 25-foot-high earth embankment.

Thomas Property Dam
East Haddam, CT
- Performed inspection and prepared engineering report for a 1500-foot-long by 25-foot-high stone masonry spillway.

Congdon Dam
Montville, CT
- Performed topographic survey, hydrologic analysis, hydraulic analysis, stability analysis, and underwater inspections. Prepared engineering report, emergency action plan, and operation and maintenance plan for a 150-foot-long by 35-foot-high stone-faced earth embankment dam with a 60-foot penstock.

Snow Lake Dam
Indian Lake, NY
- Performed topographic survey hydraulic analysis, stability analysis, and underwater inspections for a 150-foot-long by 27-foot-high concrete spillway. Prepared engineering report, engineering plans, and specifications.

Sperry Pond Dam
Middlebury, CT
- Performed topographic survey for a 550–foot-long by 8-feet-high earth embankment dam. Prepared engineering report, engineering plans, and specifications and performed construction inspection and testing.

Rogers Dam
Rogers, CT
- Performed stability analysis and underwater inspections and prepared engineering report for a 600-foot-long by 25-foot-high stone-filled timber crib dam.

Walker Pond Dam
New Canaan, CT
- Performed topographic survey, hydrologic analysis, hydraulic analysis, stability analysis, and underwater inspections, and prepared engineering report for a 80-foot-long by 8-foot-high concrete dam.

Beaver Pond Dam
Bedford, NY
- Performed topographic survey for a 250-foot-long by 12-foot-high stone masonry dam. Prepared engineering report, engineering plans, and specifications.

LEVEES:

New Haven Levee
New Haven, CT
- Inspection of levee system in New Haven for the Army Corps of Engineers.

New London Levee
New London, CT
- Investigation, and inspection of the levee system for the City of New London.

Stamford Hurricane Protection Barrier
Stamford, CT
- Managed the evaluation of the 2-mile-long hurricane and shore protection system in Stamford, Connecticut. The system includes earth embankments, I- and T-walls, and a navigation gate. The project consisted of providing documentation that the system meets the design criteria specified in accordance with 44 CFR Section 65.10 of the National Flood Insurance Program and a third-party review of a development project built on a federally protected hurricane protection and flood control system off the Long Island Sound.
- The project involved working closely with the Unites States Army Corps of Engineers (USACE). Responsibilities included the review of historical and development design documents, developing a subsurface exploration program, implementing a laboratory testing program, embankment stability and seepage evaluations, settlement evaluations, floodwall and sheet pile evaluations, freeboard evaluation, evaluation of new construction to the hurricane barrier, and preparing documents for the accreditation of the system in accordance with Title 44, Section 65.10 of the Federal Code of Regulations.

Kyle Mallory
Staff Engineer

KYLE MALLORY, a geotechnical engineer-in-training, joined MSK in 2020. As a member of our geotechnical engineering team, he has worked on a variety of geotechnical projects in both VT and CT. Prior to joining MSK, Kyle spent 4 years at the Greater Boston office of a national engineering firm, where he developed expertise in geotechnical instrumentation and vibration monitoring to ensure soil stability and the structural integrity of features on and near construction sites. He has worked on projects involving rail, airports, buried utilities, stormwater infrastructure, and commercial buildings in diverse settings, from downtown Boston to small New England cities.

Contact
802-753-8934
kmallory@mskeng.com

Experience
3 with MSK, 5 with other firms

Education
- BS, Civil Engineering
Concentrations in Structural & Geotechnical Engineering
University of New Hampshire
Durham, NH

Certifications
- Engineer-in-Training
OSHA 40-hour Hazardous Waste &

- Emergency Response Training
OSHA 10–Hour Construction Safety Health Training

- National Safety Council Training for CPR, AED, & First Aid

DAMS

| Southern Vermont Orchard Dam
Bennington, VT

- Performed an emergency action plan for the Southern Vermont Orchard Dam which consists of a 440-foot long by 17-foot-high earth embankment. In 2023, the Vermont Department of Environmental Conservation, VT DEEC, evaluated the hazard potential classification and concluded that the Southern Vermont Orchard Dam met the definition of a significant hazard dam based on the inundation of a principal arterial.

| Samp Mortar Reservoir Dam
Fairfield, NJ

- Performed inspection of the dam. Performed design, construction administration and oversite of the replacement of the repair of the 30-inch low level outlet valve and both the upper and lower trash rack systems.
- Performed an inspection and developed an emergency action plan of the 320-foot long 29-foot-high concrete gravity dam following the requirements for a high hazard dam in Connecticut.

| Pinewood Lake Dam
Trumbull, CT

- Performed an inspection and developed an emergency action plan of the 320-foot long 22-foot-high stone masonry and earth embankment dam following the requirements for a high hazard dam in Connecticut.

| Millbrook Dams
Millbrook, VT

- Performed inspection of the eight dams and prepared inspection reports.
- Performed existing conditions survey, design, construction administration, and oversite of the re- placement of the drop inlet and low-level outlet at the Alexander Ewing Dam.

GEOTECHNICAL

| Southern VT Medical Center (SVMC) Campus Improvements
Bennington, VT

- Performed geotechnical investigations to support the design of a waterline, building addition, and building connecter for a medical center.
- Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer.
- Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density.

| SVMC Cancer Center
Bennington, VT

- Performed geotechnical investigations to support the design of a building addition for a cancer center. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation and pavement design.

| SVMC Cafe Expansion
Bennington, VT

- Performed geotechnical investigations to support the design of a building addition for a cafe. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation design.

| Depot Street Development
Bennington, VT

- Performed geotechnical investigations to support the design of a new building for commercial and residential development. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation and pavement design.

| Bennington Elementary Elevator Addition
Bennington, VT

- Performed geotechnical investigations to support the design of a building addition for an elevator shaft. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Observed and documented test pit explorations. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation design of a proposed elevator shaft.

| Bennington Elementary 108 Northside Drive
Bennington, VT

- Performed geotechnical investigations to support the design of a building addition for a commercial development. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation and pavement design.

| Highland Ave
Manchester, VT

- Performed geotechnical investigations to support the design of a building addition for a condominium building. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density. Provided recommendations pertaining to foundation and pavement design.

| Salt Ash Ledges Boulder Wall
Plymouth, VT

- Performed hand excavation, survey, and visual observations relating to an investigation of an existing boulder wall and adjacent slope. Provided engineering recommendations to stabilize the existing boulder wall in addition to a proposed design.

| Salt Ash Roadway Investigation
Plymouth, VT

- Performed a series of test pit explorations to observe, classify, and document subsurface conditions below approximately five miles of existing gravel roads. Provided an engineering report containing the conditions encountered.

| Ocean State Job Lot

Bennington, VT

- Performed geotechnical investigations to support the design of a new loading dock for commercial plaza tenant. Conducted standard penetration tests using hollow stem augers, a split spoon sampler, and an auto hammer. Classified soils to identify characteristics and used the data collected during the penetration test to determine ground density.

| Northside Drive Self-Storage Facility

Bennington, VT

- Performed geotechnical investigations for a proposed self-storage facility. Conducted standard penetration tests. Classified soils and analyzed field data to determine ground density.

| Hoosick Falls Self-Storage Facility

Hoosick Falls, NY

- Performed geotechnical investigations for a proposed self-storage facility. Conducted standard penetration tests. Classified soils and analyzed field data to determine ground density.

SURVEY

| Alexander Ewing Dam

Millbrook, NY

- Assisted with survey of existing conditions of dam and surrounding features required for design of a low-level outlet replacement. Survey consisted of locating existing structures as well as elevations of inlet and outlet structures.

| Chester Knoll Housing Development

Bennington, VT

- Assisted with survey of existing conditions of proposed development location and surrounding features required for design of residential housing. Survey consisted of locating existing structures, elevations, and ground topography.

| Lake Paran Village

Shaftsbury, VT

- Assisted with survey of road and parking lot grading prior to placement of asphalt. Survey consisted of checking contractor layout and grading using existing controls.

PRIOR EXPERIENCE

DEEP FOUNDATION

| Wynn Boston Harbor Construction Project

Everett, MA

- Field Engineer for all geotechnical scope associated with a mass excavation and building construction project. Responsible for managing installation and testing of mini-piles, tiebacks, rock anchors, driven precast concrete piles; and general construction oversight. Developed installation and testing logs, reviewed and interpreted installation and testing data.

Kyle Mallory
Staff Engineer

GEOTECHNICAL

| Belmont Municipal Light Department - 115 kV HPFF Pipe Installation
Belmont & Cambridge, MA

- Field engineer for all geotechnical scope associated with an open cut and micro-tunnel utility conduit project. Responsible for managing installation and monitoring of all geotechnical instrumentation, subsurface explorations, construction oversight. Developed submittals, reviewed and interpreted instrumentation data.

| Wynn Boston Harbor Construction Project
Everett, MA

- Field engineer for all geotechnical scope associated with a mass excavation and building construction project. Responsible for geotechnical instrumentation monitoring and general construction oversight. Developed submittals, reviewed and interpreted instrumentation data

| Raytheon Co. Foundation Engineering Project
Andover, MA

- Field engineer for all geotechnical scope associated with excavation and backfilling for all foundations. Responsible for inspecting and observing all excavation activities as well as backfill and compaction. Developed submittals.

| Metro North Railroad Bridge Over Atlantic Street
Stamford, CT

- Field engineer for the installation and monitoring of an Automated Total Station system to monitor the existing railroad tracks, railroad bridge, retaining walls, and train station platforms. These structures were monitored full time during the construction of new tie-back supported retaining walls and during the replacement of the existing bridge's jump spans. The monitoring system consisted of two AMTS units and 150 prisms. Monitoring data was made available in real time using a project specific website.

| City of Northampton Drainage Relocation
Northampton, MA

- Field engineer for the installation and monitoring of an Automated Total Station system to monitor the existing Amtrak railroad tracks during the installation of a sheet pile support of excavation for the relocation of a large-diameter city drainage line. The monitoring system included one AMTS unit and 100 optical prisms. Monitoring data was made available in real time using a project specific website. Also performed vibration monitoring, Pre- and Post-Construction Surveys, and installed crack gages on the existing building's foundations

| Port PL-6 Stormwater Tank Project
Cambridge, MA

- Field engineer for all geotechnical scope associated with a pipe jacking scope involving a support of excavation as well as a secant pile shaft. Responsible for monitoring of all geotechnical instrumentation including inclinometers and extensometers. Developed submittals, reviewed, and interpreted instrumentation data

STRUCTURAL ENGINEERING

| Logan Airport Terminal C Renovation Project
Boston, MA

- Monitoring loadcell readings associated with temporary shoring of overhead concrete beams. Responsible for continuously monitoring loadcell readouts and recording data during demolition operations. Developed datasheets for submittal.

| Canton Mountain Wind Farm Installation Project
Canton, ME

- Field Engineer responsible for rock anchor testing scope associated with installing a windfarm on top of Canton Mountain. Observed, recorded, and analyzed rock anchor testing data. Developed testing logs for submittal.

| Coppersmith Village

Boston, MA

- Field Engineer responsible for demolition observation and vibration monitoring during demolition activities. Developed submittals and analyzed vibration data.

| Port PL-6 Stormwater Tank Project

Cambridge, Massachusetts

- Field Engineer responsible for installation automated tiltmeters on sheet pile walls as well as strain gauge monitors on multiple struts and braces located inside of the excavation.

VIBRATION MONITORING & PRECONSTRUCTION SURVEY

| Belmont Municipal Light Department - 115 kV HPFF Pipe Installation

Belmont & Cambridge, MA

- Field Engineer for all vibration monitoring scope associated with an open cut and micro-tunnel utility conduit project. Developed submittals, reviewed, and interpreted instrumentation data.

| Port PL-6 Stormwater Tank Project

Cambridge, MA

- Performed pre-construction surveys using video and still photographs both interior and exterior of multiple residences in the vicinity of the construction of an underground stormwater storage tank in addition to sections of the MBTA Redline Tunnel to record existing conditions. structures surrounding the proposed academic building to be constructed.

| Woods Hole Ferry Terminal Renovation Project

Woods Hole, MA

- Installed two automated vibration monitors adjacent to construction operations related to the renovation of the ferry terminal.

| Taylor Square Fire Station Renovation Project

Cambridge, MA

- Installed two automated vibration monitors in relation to drilled mini-pile installation in the vicinity of a residential area.

| Worcester Polytechnic Institute

Worcester, MA

- Performed preconstruction surveys using still photographs both interior and exterior of the historic as well as modern structures surrounding the proposed academic building to be constructed.

Jason Dolmetsch, P.E.
President

JASON DOLMETSCH, P.E., a civil engineer by training and profession, stepped into his role as MSK's president following more than 15 years of engineering and project management experience, including the design, permitting, and construction observation of water, stormwater, transportation, and wastewater infrastructure projects. Jay maintains key client relationships, cultivates new opportunities, and supports the quality of our work and the professional development of MSK's staff with ongoing technical guidance and mentorship.

As a professional committed to building vibrant communities, Jason is an active and involved community member. He serves on a variety of local and regional boards and strategic groups, including the VT Business Roundtable and the Flynn Theater. He lives with his family in White Creek, NY.

Contact
(802) 284-4722
jdolmetsch@mskeng.com

Experience
26 with this firm

Education
BS, Civil Engineering
Rensselaer Polytechnic Institute
Troy, NY

Licensure
Registered Professional Engineer
Vermont | New York | Connecticut

Water Systems

| Lead Service Line Replacement Project
Bennington, VT

- Responsible for initial project development. Engineer of record for mapping conducted under initial grant and for mapping, testing, and outreach under subsequent project development grants. Provides overall project leadership and guidance.

| Municipal Water Line Extension
Bennington, VT

- Provided company leadership and oversight on a $25MM municipal water line expansion project as the prime consultant for the Town of Bennington. Work supervised includes engineering design services, surveying, and construction administration; provided primary leadership in project development as well as client management, client service, and client communications across two phases of the multiyear project.

| Northside Drive Improvements
Bennington, VT

- Wrote a preliminary engineering report to assess project feasibility, developed conceptual and final engineering designs incorporating project phasing over 5 seasons
- Oversaw all bidding and conducted construction administration for all phases.

| South End Water Line Upgrades
Bennington, VT

- Conducted initial feasibility study, developed financing solutions, completed all phases of design, obtained all necessary permits, and carried out construction administration for phases 1 and 2; provides oversight and guidance for current construction.

| Post-Irene Reconstruction
Bennington, VT

- Reconstructed the intake valve at the town's surface water supply; designed and observed construction of an aerial water line crossing and 600 linear feet of new water main following the blowout of 2 sections during Tropical Storm Irene; coordinated with FEMA and assisted client with complete reimbursement for all emergency engineering and construction work.

Jason Dolmetsch, P.E.
President

Wastewater Systems

| Bank Street Pump Station
Bennington, VT
- Designed new pump station. Managed client coordination, permitting process, and construction administration.

| Corey Drive Pump Station
Bennington, VT
- Designed updated pump station and rerouted wastewater line for improved residential access. Managed client coordination and permitting.

| Southern Vermont College Line Extension
Bennington, VT
- Designed, obtained wastewater permits, managed bidding for, and oversaw construction of approximately 3,000 linear feet of replacement wastewater line.

| Manchester Knoll Sewer Line Repair
Manchester, VT
- Oversaw the design and permitting for 234 linear ft of replacement wastewater line.

| Freight Yard
Cambridge, NY
- Assisted with the application for and management of a $200,000 Environmental Facilities Corporation grant the Community Partnership received for an 8,000 GPD decentralized system installed at the freight yard.

| Hoosac School Community Wastewater System
Hoosick Falls, NY
- Designed single-pass, sand-filter, direct-discharge community wastewater system with UV disinfection treating 6,500 GPD. Oversaw construction.

Stormwater Management

| Town Garage Stormwater Scoping Study
Castleton, VT
- Provided client management and provided overall project leadership for stormwater scoping study.

| Shaftsbury Town Garage
Shaftsbury, VT
- Developed project budget and conceptual designs and oversaw design development, including site grading and utility connections, for a new transfer station, a highway garage, a salt shed, a pole barn for municipal equipment storage, a salt/sand pile, a parking lot, and a fuel storage site.
- Obtained multiple permits and conducted percolation tests for a new wastewater system.
- Developed site stormwater master plan.

| SVMC Campus Improvements
Bennington, VT
- Provided stormwater site balancing to manage an additional 0.28 acres of impervious surface and associated stormwater runoff produced by a new central heating building and parking area serving SVMC's main campus.

| Monument View Apartments
Bennington, VT

- Oversaw site development and stormwater infrastructure redesign for affordable housing infill development project.
- Provided permitting services, including stormwater discharge permitting and Act 250 review.
- Participated in public permitting hearings.

| Lake Paran Village
Shaftsbury, VT

- Led project development for a $7.2 million affordable housing project adding 22 units on 6.5 acres, of which 1.8 acres will be permanently preserved.
- Assisted client through the permitting process and Act 250 review.
- Oversaw the design of site access and circulation for pedestrians and vehicles, utility connections, and stormwater management.

| Southern Vermont College
Bennington, VT

- Developed and oversaw construction of stormwater master plan associated with new campus dormitory.
- Managed all stormwater permitting.

GEOTECHNICAL

| Water Street Road Rehabilitation
Village of North Bennington, VT

- Provided lead engineering services on a collapsed stone wall abutting Route 67A and inside the flood zone of Paran Creek in North Bennington, Vermont. Utilized ground-penetrating radar to assess subsurface conditions subtending the roadway and failed wall. Determined that wall bulging, and collapse was caused by the transport of fine sediments and the subsequent development of subsurface voids, which increased the load of Route 67A on the wall. Completed a slope stability assessment and developed two alternatives—stabilization with soil nails and site regrading to a 3:1 slope—and the chosen solution, the construction of a keyed-in, boulder-stacked wall. Contracted with a third party to conduct floodplain impact analysis of the proposed solution, which showed that no residential properties would be impacted by the anticipated 100-year floodway increase of 0.1 feet. Presented floodplain impacts to the North Bennington Development Review Board and received approval for construction. Oversaw construction administration services.

| Proposed Waste Soils Embankment, Route 279
Bennington, VT

- As the lead consultant on the design and construction of a municipal water system expansion in the Town of Bennington, developed a soil disposal proposal for PFOA-contaminated soils removed during water line installation on behalf of the Town of Bennington. The proposal would have significantly reduced the town's waste soil removal and remediation costs, and resolved regulatory difficulties related to transportation of these soils out of the area, through the construction of an embankment that would have stored 20,000 cubic yards of waste soils on a public right-of-way adjacent to Route 279 in Bennington, a volume representing almost 40 percent of the total waste soil generated by the waterline project. To assess project feasibility, contracted with geotechnical engineers to conduct a stability analysis along the right-of-way's existing embankment. Successfully completed a NEPA Environmental Impact Statement for the proposed soil disposal and storage plan. Conducted public meetings and provided education to the public to address public health concerns. Worked with VTrans to secure agency support for proposals.

Jason Dolmetsch, P.E.
President

MSK

TRANSPORTATION:

* = VTRANS MUNICIPAL ASSISTANCE BUREAU PROJECTS

| Roadway Realignment Scoping Study

*Whitingham, VT **

- Oversaw project management and providing project leadership for VTrans Municipal Assistance Bureau scoping study in a flood-prone village center in Whitingham, VT.

| Franklin Lane Woonerf

*Bennington, VT **

- Collaborated on a VTrans Municipal Assistance Bureau scoping study for a "shared street" in a public right-of-way currently functioning as a parking lot access road. Developed a design for a plaza area with lighting upgrades, new signage, and surface improvements to the roadway.

| Benmont Active Transportation Corridor

*Bennington, VT **

- Oversaw the design of new active transportation corridor. Worked within the limits of the existing right-of-way to (1) create bike/pedestrian access without seeking easements and (2) add parking to southern portion of the existing right-of-way. Oversaw design of interventions to increase vegetative buffers between the path and the road and additional green space to improve stormwater infiltration. Developed conceptual and alternative designs.

| Kocher Drive Mixed-Use Path

*Bennington, VT **

- Completed conceptual design. Assisted the client with right-of-way development in the VTrans limited access highway area. Obtained state and local permits for impacts within the Furnace Brook floodplain.

| Ninja Mixed-Used Path

*Bennington, VT **

- Collaborated on a scoping study and developed conceptual and final design documents for 2.12-mile shared-use path. Coordinated applications for river corridor and floodplain construction permits. Worked with subconsultant and state officials to develop corridor management line. Responsible for the final design and permitting of the town construction portion of the Ninja Path between Bennington College entrance and Hannaford Plaza. Oversaw the categorical exclusion process for a temporary pathway through the Route 279 VTrans right-of-way. Worked with VTrans to design intersection modifications at a high-crash intersection.

| Willowbrook–Applegate Pedestrian Path

*Bennington, VT **

- Collaborated on a VTrans Municipal Assistance Bureau scoping study and contributed to the conceptual design for new pedestrian pathway. Developed a new right-of-way through wetlands in collaboration with county officials. Assisted with wetlands permitting process. Coordinated with U.S. Army Corps and Vermont Agency of Natural Resources. Developed a final path alignment that meets US DOJ 2010 ADA standards for accessible design, as well as state regulations for safe and energy-efficient lighting.

Kyle Mallory
Staff Engineer

VIBRATION MONITORING & PRECONSTRUCTION SURVEY:

| Belmont Municipal Light Department - 115 kV HPFF Pipe Installation
Belmont & Cambridge, MA

- Field Engineer for all vibration monitoring scope associated with an open cut and micro-tunnel utility conduit project. Developed submittals, reviewed, and interpreted instrumentation data.

| Port PL-6 Stormwater Tank Project
Cambridge, MA

- Performed pre-construction surveys using video and still photographs both interior and exterior of multiple residences in the vicinity of the construction of an underground stormwater storage tank in addition to sections of the MBTA Redline Tunnel to record existing conditions. structures surrounding the proposed academic building to be constructed.

| Woods Hole Ferry Terminal Renovation Project
Woods Hole, MA

- Installed two automated vibration monitors adjacent to construction operations related to the renovation of the ferry terminal.

| Taylor Square Fire Station Renovation Project
Cambridge, MA

- Installed two automated vibration monitors in relation to drilled mini-pile installation in the vicinity of a residential area.

| Worcester Polytechnic Institute
Worcester, MA

- Performed preconstruction surveys using still photographs both interior and exterior of the historic as well as modern structures surrounding the proposed academic building to be constructed.

Abby Chaloux
Senior Technician, Contracts & Permitting

ABBY joined MSK in 2016, bringing her decade-long experience in residential and commercial property transaction. As a project manager and permitting specialist, she successfully manages the permitting process on both the local and state levels. Her attention to detail and strong communication skills have proven her to be an effective link between design, regulatory, and construction teams.

Abby is a key player in MSK's daily and weekly planning activities, giving her a comprehensive and constantly up-to-date understanding of MSK's projects and permitting priorities. Abby supports our engineering team on questions of compliance and stays current on permitting requirements as they change over time. Through careful planning and a deep knowledge of permitting, including Act 250, Abby keeps client projects on time and on budget.

Outside of the office, Abby serves as a justice of the peace and a member of the Board of Civil Authority for the Town of Shaftsbury, and she stays busy as the mother of two awesome sons.

Contact
(802) 432-9083
achaloux@mskeng.com

Experience
7 with MSK, 10 with other firms

Education
BA, Hobart and William Smith Colleges
Geneva, NY

Water Systems:

| Bennington Municipal Water Line Extension
Bennington, VT

- Led water system permitting efforts for an 8-mile-long extension of the Town of Bennington's municipal waterline to remediate PFOA contamination in approximately 165 private wells in the northwest corner of town.
- Coordinated with the Town of Bennington and the Regional Floodplain Manager for the Department of Environmental Conservation to permit construction within the Fluvial Erosion Hazard Overlay District (FEH) and Special Flood Hazard Area.
- Responsible for assembling the permit application materials for a Stream Alteration Permit for three (3) stream crossings affected by water main installation.
- Prepared accompanying application to the Army Corps of Engineers for the temporary diversion of a small stream during construction.
- Coordinated with University of Vermont for an Archaeological Resource Assessment for the areas impacted by construction.
- Legal and regulatory coordination:
    - Reviewed plans with surveyor for water main and service line placement to determine required easements from private landowners for all 9 contracts in 3-year, $25 million project.
    - Coordinated with attorney to complete title searches of the subject properties and assisted in preparation of easement documents.
    - Assisted in coordinating with private landowners and the Town of Bennington to execute easement deeds.
    - Prepared landowner construction agreements for property access by Town contractor and construction observation crews.
    - Prepared VTrans State Highway Access and Work Permits for work on Routes 279, 67A, and 7A.

| Lead Service Line Replacement Project
Bennington, VT

- Assisted the municipality with more than $11 million in loan applications.
- Assisted the survey team with research in the Bennington Land Records for deed and site plan information for approximately 400 properties in the downtown Bennington area to support survey and design activities for lead service line replacement.

| Corey Drive Pump Station
Bennington, VT

- Wastewater Project Permitting: Assisted in coordination with the Town of Bennington's attorney to determine Town's easement and access to existing pump station prior to preparation of permit application for the development of a sewer line connection to serve 14 residential units.
- Review of existing permit series for site and preparation of permit application for project, including confirmation of design flows for existing residences. Coordination with client and Agency of Natural Resources on permit submission and review.

HOUSING & LOCAL DEVELOPMENT:

| Putnam Block Redevelopment
Bennington, VT

- Assembled a permit package to the Town of Bennington for the redevelopment of a historic block of buildings in downtown Bennington, Vermont. (*A portion of the site lies within the 100-year floodplain, and an approval from the Development Board was required for improvements within the Flood Overlay District. Coordination with the Vermont Department of Conservation River Corridor and Floodplain Protection Program was required to approve proposed mitigation measures for the project.)*
- Assisted with the preparation of the applications and permit renewals for the 3-9020 Stormwater Construction General Permit and 3-9015 Stormwater Operational Permit for sitework.
- Conducted a project review with the Act 250 District Coordinator to ensure the project was exempt from land-use permitting requirements.

| Lake Paran Village Wastewater Line Extension
North Bennington, VT

- Assisted in coordination with the Town of Bennington for extension of main pipe to serve project adding 22 new units of affordable housing adjacent to the Village of North Bennington.
- Assisted with request and procurement of allocation for sewer service.
- Worked with architects to determine bedroom count and calculate design flow.
- Prepared permit application and coordinated with client and VT Agency of Natural Resources on permit submission and review

| Northeastern Baptist College Multifamily
Bennington, VT

- Partnered with Goldstone Architects in the design, permitting and construction administration of a multi-family housing development (10-20 duplexes) on an undeveloped lot in Bennington, Vermont. Project included feasibility studies, preliminary and conceptual design phase documents, boundary survey, design development, and construction administration and submission of permit applications.
- Provided technical criteria, written descriptions, and design data in filing applications for permits from or approvals of governmental authorities having jurisdiction to review or approve the final design; assisted client in consultations with such authorities; and revise the Drawings and Specifications in response to directives from such authorities, as appropriate.
- Permits required for this project included Local, Wastewater and Potable Water Supply, Water Supply Permit to Construct, Act 250, Stormwater Construction General (3-9020), Wetlands, Stormwater Operational (3-9015).

| Subdivision of Centers for Living and Rehabilitation, Southwestern Vermont Health Care Corporation
Bennington, VT

- Coordinated with survey and attorney for client on permitting requirements for the subdivision of a 5.75-acre parcel from the main hospital campus; reviewed ALTA survey for clarity and accuracy.

| Tri-state Federal Credit Union
Bennington, VT

- Prepared permitting documents for the construction of a bank branch on undeveloped lot on Washington Avenue in Bennington, Vermont, located in the Flood Hazard Overlay (FHO) District.
- Coordinated with the Regional Floodplain Manager for the Department of Environmental Conservation to confirm the building design would not be impacted by a major flood event.
- Applied for a local permit from the Town of Bennington Development Review Board for the construction within the FHO District.

TRANSPORTATION:

| Kocher Drive Mixed-Use Path
Bennington, VT

- Assisted with the preparation of permits related to the construction of a pedestrian and bike pathway linking two major commercial roadways in Bennington.
- Worked with the MSK design team to submit plans and accompanying permit applications for a Stormwater 3-9020 Construction General Permit (VT), a Stream Alteration Permit (VT), and a U.S. Army Corps of Engineers Permit for the extension of an existing box culvert in a streamway along Kocher Drive.
- Prepared application to the Town of Bennington for the construction of the pathway within the Town's Flood Hazard Overlay District.

| Ninja Mixed-Use Path
Bennington, VT

- Assisted with the preparation of permits related to the construction of the first leg of a pedestrian and bike pathway running from the entrance of Bennington College to a nearby shopping center.
- Worked with the MSK design team to submit plans and accompanying full permit application to the Act 250 District Coordinator on behalf of the Town of Bennington and the private landowner for the multi-use 12-foot-wide pathway.

| Willowbrook Housing–Applegate Pedestrian Path
Bennington, VT

- Helped prepare an VT Individual Wetlands Impact Permit and Army Corps of Engineers VT General Permit for the construction of a 480-linear-foot multiuse path composed of a hard-pack gravel surface and two boardwalk sections linking two housing developments in the Town of Bennington.

APPENDIX 03

Certificate of Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 05/02/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Kate Mahar	
The Richards Group 48 Harris Place PO Box 820 Brattleboro VT 05302	PHONE (A/C, No, Ext): (802) 254-6016	FAX (A/C, No): (802) 254-7110
	E-MAIL ADDRESS: kmahar@therichardsgrp.com	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
M S & K INC PO BOX 139 BENNINGTON VT 05201-0139	INSURER A : MMG Insurance Co	15997
	INSURER B : MEMIC Indemnity Company	11030
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** CL234651350 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC [ ] OTHER:	Y		BP13299545	04/01/2023	04/01/2024	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A	AUTOMOBILE LIABILITY [ ] ANY AUTO [ ] OWNED AUTOS ONLY [X] SCHEDULED AUTOS [X] HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY			KA13299641	04/01/2023	04/01/2024	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	[X] UMBRELLA LIAB [X] OCCUR [ ] EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [X] RETENTION $ 10,000			KU13315591	04/01/2023	04/01/2024	EACH OCCURRENCE AGGREGATE	$ 5,000,000 $
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y / N [ ] If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		3102807083	04/01/2023	04/01/2024	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Certificate Holder is Additional Insured as respects General Liability, when required by written contract or agreement, and subject to the terms, conditions and limits as specified in the policy.

CERTIFICATE HOLDER

Vermont Agency of Natural Resources Dept of Environmental
1 National Life Drive
David Bldg 3rd Floor
Montpelier, VT 05620

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Kate Mahar

Thank You!

MSK ENGINEERS

Known for excellence. Built on trust.

Qualifications and Scope of Work for

Lake Raponda Dam
VT State ID: 246.01
Phase II Evaluation
and Alternatives Designs

September 1, 2023

Submitted to:

Town of Wilmington, Vermont

GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue | Norwood, MA 02062
781-278-3300

30 Offices Nationwide
www.gza.com

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*****VIA EMAIL*****

September 1, 2023
RFP No. 01.P000405.24

Town of Wilmington, Vermont
2 East Street, 2nd Floor
P.O. Box 217
Wilmington, VT 05363

Attn: Jessica DeFrancesco, Administrative Assistant

Re: Requests for Qualifications - Phase II Evaluation and Alternatives Designs
Lake Raponda Dam
Wilmington, VT

Dear Ms. DeFrancesco,

In accordance with the Town of Wilmington, Vermont Request for Qualifications (RFQ), GZA GeoEnvironmental, Inc. (GZA) is pleased to submit the following Qualifications and proposed scope of work to perform a Phase II Evaluation and Alternatives Designs for the Lake Raponda Dam.

GZA brings a wide range of technical expertise having worked on dam projects throughout the Northeast region for more than 50 years. We will draw primarily upon the talents of our engineers and scientists in GZA's Dam Engineering Center of Excellence in Norwood, Massachusetts office; however, we also have personnel in other offices throughout New England that are available, which will allow us also to draw from technical staff as needed to successfully complete the work of this project.

In order to address the RFQ and the recommendations within previous dam inspection reports prepared by the Vermont Dam Safety Program, GZA proposes to perform a Phase II evaluation of the dam. We understand that repairing dams is a financial burden for municipalities. We have therefore developed a scope of work that we feel will provide a suitable evaluation of the dam's hydraulic capacity and structural integrity and provide modification recommendations that are appropriate to the scale of the dam and the budgetary constraints of the Town.

The RFQ does not request a project budget; therefore, GZA has not provided a budget for the proposed scope of work at this time. We look forward to the opportunity to discuss our project approach further with the Town. Once a scope of work is agreed upon, GZA would be pleased to provide a budget.

Thank you for the opportunity to submit this proposal. We look forward to the chance to work with you on another project to improve the Town's assets. If you have any questions, please contact Derek Schipper at derek.schipper@gza.com or 781-278-5792.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Derek J. Schipper, P.E.
Project Manager / Senior Consultant

Chad W. Cox, P.E.[MA]
Consultant/Reviewer

TABLE OF CONTENTS

Page No.

1.0 PROJECT UNDERSTANDING

GZA's understanding of the proposed project is based on a request for qualifications (RFQ) prepared by the Town of Wilmington, VT and previously performed Dam Safety Inspection Reports available through the State of Vermont Dam Inventory website.

The history documentation of the dam is limited; however, it is estimated that the Lake Raponda Dam was constructed around the mid 1800's and was reconstructed to its current configuration between 1930's and 1950's. The main purpose of this dam is for recreational uses, such as swimming, boating, and fishing. Lake Raponda Dam is currently classified as a "Low-Hazard" per the VT DSP.

Lake Raponda Dam is a 120-foot-long concrete and earthen dam with a concrete wall for the downstream face. The dam is approximately 3-feet-tall, and the top of the embankment is 10-feet-wide. The upstream slope is an approximate 3H:1V slope. The principal spillway is near the left end of the dam and consists of an uncontrolled rectangular weir. The dam does not appear to have a low-level outlet. Lake Raponda Dam has an overall dam safety condition rating of POOR, due to the deterioration of the downstream concrete wall.

Although no hydrologic and hydraulic analyses are known to exist for the dam, the dam has been observed by the State to only have one foot of freeboard at the lowest portion of the non-overflow section of the dam under normal pool conditions, which is less than the required State standard of a minimum of 3 feet of freeboard under normal pool conditions. This means that under the State guidelines that the dam is not hydraulically adequate.

2.0 EXECUTIVE SUMMARY OF GENERAL QUALIFICATIONS

GZA GeoEnvironmental, Inc. (GZA) is a multidisciplinary consulting firm offering services in the fields of geotechnical, water resources, civil, and environmental engineering, hazardous waste assessment and remediation, and construction design-related services. GZA was founded in 1964 and is now privately owned by our Principals and Key Staff.

GZA maintains a strong service base and expertise in our original specialty of geotechnical engineering. Over the years our engineering capacity has broadened to general civil engineering services with an emphasis in water resources, environmental, geo-structural engineering and site civil applications, such as solid waste engineering, stormwater management, site design, lake & river restoration, and **dam engineering**. GZA has extensive expertise and experience in all aspects of dam engineering, river hydrology, wetland science, and river restoration. We have been the engineer-of-record on numerous dam rehabilitation projects throughout New England. GZA has over 25 qualified engineers and environmental scientists with relevant experience in dam safety engineering and stream restoration.

3.0 PAST PERFORMANCE ON SIMILAR PROJECTS

GZA's core areas of competency are those which are necessary for a successful dam rehabilitation project. We have highly qualified engineers, hydrologists, environmental scientists, and permitting specialists who have worked on numerous dam projects. **We are presently performing an evaluation of 7 high hazard dams in the State of Vermont for the VTDEC Dam Safety Program.** GZA is very familiar with successfully executing dam safety engineering, investigatory and design assignments for public sector clients. GZA has been involved with improvements to dams ranging from the very smallest to those among the largest in the Northeast. GZA's strength is our ability to apply a full range of engineering skills to our projects and our experience knowing the appropriate approach for a given structure.

GZA is fully capable of bringing to bear the latest in modern computer engineering modeling software for dam analysis and design. Our engineers utilize modelling software from the US Army Corps of Engineers and others to examine and design the hydrology of a dam's watershed and the hydraulics of the spillways and outlets. We can also utilize geotechnical software in conjunction with subsurface investigations to examine slope and structural stability of a dam and seepage both through and under the dam. However, we understand that the application of such sophisticated

techniques is neither necessary nor desirable in many cases. **For smaller dams, experience-based prescriptive design is often the appropriate approach to selecting a repair strategy.** The key is a thorough understanding of the nature and source of the actual dam safety deficiencies. Using this approach, we can then focus on the site-specific issues which are necessary to develop a constructible and cost-efficient rehabilitation project. Such issues include details like permitting concerns, site access, appropriate contractor staging areas, use of readily available and local materials, and construction details which do not require specialized sub-contractors.

GZA has wide experience in applying this approach to dam repair projects for both public and private clients. We have worked on virtually all the types of dams which are common in New England.

A table of selected project references is presented in the following page, which provides an overview of our experience, with more details included in **Appendix A:**

4.0 OUR APPROACH TO PROJECT DESIGN

According to the most recent DSP inspection report, the dam is in poor condition primarily due to the following:

- Inappropriate woody vegetation on the dam and within 15 feet of the dam;
- Unprotected upstream slope, susceptible to erosion;
- Low areas along the top of dam; and
- Deterioration of concrete in the spillway and cutoff wall.

Although H&H analyses are not known to have been performed for this dam, the dam does not meet the Vermont standard of 3 feet of freeboard under normal pool conditions. GZA's approach to H&H analyses will be to estimate of the dam overtops during the 100-year flood. If so, GZA will present conceptual rehabilitation options to raise the top of the dam or to provide overtopping protection.

5.0 PROJECT TEAM ORGANIZATION AND STAFFING

We have assembled a highly qualified team for this project. GZA uses its full combined civil, geotechnical, water resources and environmental skills in the area of dam engineering. All the key personnel listed below have experience working on numerous dam projects throughout New England.

DEREK J. SCHIPPER, P.E. – SENIOR CONSULTANT/PROJECT MANAGER

Derek J. Schipper, P.E. (VT, NH, MA, CT) will be the overall Project Manager for the work. Mr. Schipper brings over 20 years of geotechnical experience relative to dam engineering and design, as well as geotechnical and site/civil engineering particularly as it relates to dams and remedial dam construction. His extensive field experience includes quality control of construction for a variety of projects with geotechnical and environmental aspects. (**VT-licensed Professional Engineer No. 124808**)

CHAD W. COX, P.E. – PRINCIPAL-IN-CHARGE

Chad Cox, P.E.(MA) will provide QA/QC review services. Chad is a Senior Principal at GZA with over 30 years of geotechnical experience relative to dam engineering and design, as well as geotechnical and site/civil engineering. His dam experience extends the full range from inspection to final design and construction. He is the former leader of GZA's Dams/Water Resources Group and is recognized as one of the Northeast's leading dam safety engineering practitioners. (MA-licensed Professional Engineer No. 45856)

KEVIN FINN, P.E. - LEAD DAM SAFETY ENGINEER

Kevin Finn, P.E.$^{(VT)}$ is a Senior Project Manager with experience in various civil-structural engineering aspects of hydroelectric dams and other types of power generating facilities. He is experienced in the evaluation, design, geotechnical field studies, engineering, rehabilitation, and construction of hydroelectric and fossil fuel power facilities. Kevin is an NCEES-certified Professional Engineer licensed in ten states and is a certified Project Management Professional (PMP). He is active in the United States Society on Dams (USSD) and has co-authored and presented numerous technical papers. (**VT-licensed Professional Engineer No. 135562**)

JOEL BILODEAU, P.H. – LEAD WATER RESOURCES ENGINEER

A **Brandon Vermont** native, Joel Bilodeau has over 16 years of civil engineering experience related to hydroelectric projects with an emphasis on hydraulics and hydrologic analyses and modeling. He has extensive experience with one-, two-, and three-dimensional hydrodynamic modeling packages as well as having supported the development of several physical models for both spillway designs and recreational flow release structures. Joel has experience in Federal Energy Regulatory Commission (FERC) Part 12 dam safety-related work includes dam failure and hazard analysis, determination of spillway adequacy, determination of probable maximum precipitation (PMP) and probable maximum flood (PMF) for determination of the inflow design flood (IDF), and preparation of inundation maps and emergency action plans (EAPs).

LEXUS PATTERSHALL, E.I.T.

Lexus Pattershall is a **University of Vermont** graduate and a dam engineer in Dams and Water Resources Group at GZA. Her passion for dam work began at UVM where she specialized in dam design and rehabilitation in her senior design classes. She aided remediation efforts at the **Moscow Mill in Stowe, Vermont**. Her team addressed ongoing sedimentation issues after Hurricane Irene while managing historical, budgeting, and environmental limitations. She joined GZA early July of 2022 and has been incorporated into a variety of dam work, such as Phase I Dam Safety Inspections/Reports, Part 12D Safety Inspection Reports, and Potential Failure Modes Analysis (PFMA) Reports.

Resumes for key project team members are included in **Appendix B.**

6.0 SCOPE OF WORK

In order to address the RFQ and the recommendations within previous dam inspection reports prepared by the Vermont Dam Safety Program, GZA proposes to perform a Phase II evaluation of the dam. We understand that repairing dams is a financial burden for municipalities. We have therefore developed a scope of work that we feel will provide a suitable evaluation of the dam's hydraulic capacity and structural integrity and provide modification recommendations to the dam as needed and as appropriate for the size of dam and the Town's budget.

TASK 1: KICK-OFF MEETING/SITE VISIT

Upon notice to proceed, GZA project team members will contact the Town to discuss various technical and project management issues including:

- Client's concerns, objectives, and preferences;
- Pertinent existing data needs;
- Present overview of proposed engineering approach and methods;
- Provide overview of project schedule (i.e., key milestones, timing of deliverables, etc.);
- Engineering report formats and contents;
- Project liaison; and
- Project administration, invoicing procedures, etc.

A two-person team headed by a Vermont licensed professional engineer will make a one-day visit to the dam site and meet with Town representatives. GZA staff will visually observe and assess existing conditions and will complete our standard format field dam inspection summary checklist, which will be used to record observed deficiencies. For documentation purposes, color digital photographs will be taken, and a sketch with pertinent approximate dimensions will be prepared for the dam. We do not plan to view underwater structures, make field measurements to confirm information presented in prior inspection reports, conduct subsurface investigations, or remove vegetation to allow observation. It is likely that upstream portions of the dam will be obscured by water and thus will limit our ability to visually inspect the upstream side of the dam. During our inspection, we will conduct manual soil probes to check for potential soft ground and we will take limited manual surficial soil samples (below topsoil layer) for visual classification. Our observations will be summarized in our summary report (Task 4).

TASK 2: TOPOGRAPHIC SURVEY OF THE DAM

GZA will subcontract with a land surveyor registered in the State of Vermont to perform a topographic survey of Lake Raponda Dam. The survey will be limited to the water line, 15 feet to the left and right of the abutments, approximately 15 feet beyond the downstream toe, and about 50 feet of the downstream channel. The spillway training walls and crest will be included.

Where appropriate, publicly available LiDAR data will be used to supplement and link together topographic data obtained directly at the site for the purpose of preparing an overall site plan for use in establishing access routes, property corners, and general resource areas.

The topographic survey will be referenced to the Vermont State Plane Coordinate System, and NAVD88 vertical datum. GZA will include approximate property boundaries collected from publicly available parcel information but will not include a legal property boundary survey.

TASK 3: HYDRAULIC AND HYDROLOGIC ANALYSIS

The existing DSP inspection report indicates that the spillway design flood (SDF) for low hazard dams is the 100-year flood. GZA will prepare a new hydrology model for the purpose of assessing the inflow hydrograph for the SDF. Inflow hydrographs will be prepared through the use of the USACE HEC-HMS computer program. Model parameters will be developed by reference to existing information and use of publicly available data such as soil maps and watershed delineation tools through the USGS StreamStats web application. The spillway adequacy will include storm events using design rainfall depth estimates obtained from National Oceanic and Atmospheric Administration (NOAA)

Atlas 14 for New England and New York. The inflow hydrograph will be routed through the impoundment / spillway system at the dam.

Using the inflow data and hydraulic model developed as described above, GZA will estimate the adequacy of the dam's spillway to pass the SDF without overtopping. Spillway discharge capacity will be estimated by the HEC-HMS model. The SDF hydrograph will be routed through the system to assess available minimum freeboard at the peak of the flood. In the event that the existing spillway is not sufficient to pass the design flood flows, GZA will develop up to three conceptual alternatives intended to address the inadequate spillway capacity (if necessary). Alternatives may include, but are not limited to: embankment overtopping protection, raising the dam, or modifications to the existing spillway. GZA will use the H&H model developed as described above to assess the effectiveness and feasibility of each concept.

The results of this analysis (existing and proposed conditions) will be discussed in the H&H section of the Phase II Evaluation Report. Model results including peak inflow and discharge rates, free board or overtopping depth, percent of SDF flow passed will be presented in tabular form, and model input parameters will be summarized. The model input and output for existing conditions will be included in hard copy and electronic format as appendices to the Phase II Evaluation Report.

TASK 4: PHASE II SUMMARY REPORT – CONCPEPTUAL REPAIR ALTERNATIVES

GZA will prepare the Phase II Evaluation and Alternatives Designs report based on the findings in Tasks 1 through 3. GZA will submit the draft report for one (1) round of review by the Town before proceeding to submit final hard copies.

The report will present the deliverables from all tasks, including:

- An existing condition topographical survey and base map.
- Results of hydrological and hydraulic analysis, which will include hydraulic capacity assessment of the existing conditions and design alternatives during SDF.
- Presentation of conceptual designs with sketches/drawings alternatives to address deficiencies.
- Engineer's opinion of probable cost and conceptual timeline for each alternative broken down by design, permitting and construction.
- Environmental permits identified as requirement for each design, and the estimated corresponding timeframes and permitting fees.

We will submit a Draft report to you for comment prior to finalizing our report. Our final deliverable will consist of an electronic (.pdf) version of the final inspection report, stamped by a Vermont Registered Professional Engineer

7.0 SCHEDULE

GZA is prepared to perform the kick-off meeting and perform the site visit within two weeks of notice to proceed. The site visit will need to be conducted prior to winter conditions to allow for suitable observation. The survey work, H&H analyses and report preparation will be submitted within 8 weeks of the dam inspection.

8.0 CONCLUSION

GZA appreciates the opportunity to submit this RFQ. We look forward to the discussing our project approach further with the Town. If requested, we would be happy to provide the Town with our hourly rates, budget estimate, and standard contractual terms and conditions.

APPENDIX A - RELEVENT PROJECT DESCRIPTIONS

PROJECT PROFILE

McAdams Dam
Private Client
Barnard, VT

Project Highlights

- New dam to replace inadequate existing structure.
- GZA designed dam and oversaw construction.
- GZA conducted subsurface evaluations and hydrologic/hydraulic analysis.
- Project included embankment, masonry-faced concrete spillway, and high-flow bypass system.

A private landowner in Barnard, Vermont wished to replace an old and inadequate pond dam with a new, modern dam that matched the visual and architectural aesthetic of the site and surrounding buildings. GZA conducted subsurface explorations at the site, including borings and test pits, to assess foundations conditions, evaluate seepage potential, and identify embankment borrow sources. Geologic challenges at the site included highly fractured bedrock which raised the possibility of excessive seepage, including into a nearby basement. GZA also performed detailed hydrology and hydraulics studies for the dam site to assess the spillway design flood and assist with the design of the new spillway.

GZA developed conceptual designs and worked with the client's architect to match the appearance of adjacent proposed buildings while at the same time meeting appropriate dam safety standards. The final design included a 20-foot high compacted earthfill embankment constructed from local glacial till and provided with a granular soil filter toe. The spillway was designed as a reinforced concrete structure on bedrock with steel anchors drilled and grouted into bedrock to improve sliding stability. Stone masonry facing was provided on the visible faces of the spillway and training walls to create an historic appearance. A clay blanket was placed and compacted on the pond bank in the vicinity of the adjunct house to limit seepage that might enter the basement of the structure.

GZA was provided construction oversight and embankment compaction testing. The dam was completed on time and on budget.

PROJECT PROFILE

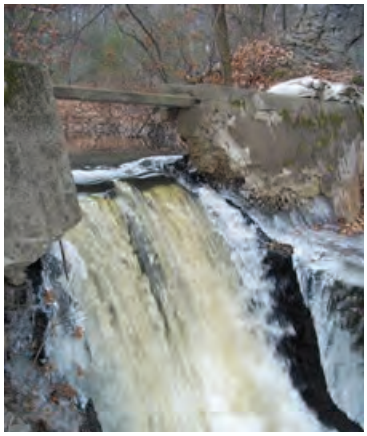
Hemlock Gorge Spillway Dike Rehabilitation Investigation, Design, Permitting, and Construction Services

Newton, MA

Project Highlights

- Dam safety inspection
- Subsurface investigations
- Gravity stability analyses
- Hydrologic and hydraulic analyses
- Replacement dike design
- Permitting and public outreach
- Construction-phase services

The Massachusetts Department of Conservation and Recreation (DCR) owns and operates the Hemlock Gorge Spillway Dike. The dam was built in the 1904 in the Hemlock Gorge area on the Charles River and is a companion structure to the Metropolitan Circular Dam. The Dike closes off a side channel of the Charles River on the east side of the gorge and discharges to a raceway channel that flows under Route 9.



The dike was found to be in a state of advanced deterioration when GZA performed a Phase I inspection in 2006. GZA was called upon to perform several subsequent follow-up inspections over the next several years, ultimately leading to the dike being declared as in "Unsafe" condition. When a sink hole was found downstream of the structure in 2009, DCR engaged GZA to design and implement an interim repair.

In the fall of 2011, the DCR decided to proceed with permanent repairs to the structure. GZA embarked on a rapid program to design and permit a repair program for the dam. GZA prepared an H&H analysis, completed two test borings, and executed a structural analysis to design a replacement structure for the dike. Plans and specifications were rapidly prepared and permit applications were submitted to all relevant agencies, including the USACE, MEPA, DEP, Conservation Commission, and MHC. Attention to historic and cultural resources issues was particularly important due to the designation of the area surrounding the dike as a National Register listed area.

The design of the replacement dike includes post-tensioned tie-down anchors to provide additional stability for the concrete gravity section. The sluiceway section includes aluminum stop logs and a slide gate controlled low level outlet is provided. Patterned concrete has been designed to provide for a historically sympathetic appearance to the new concrete raceway channel training walls, and a complete plantings mitigation plan was developed to replace trees lost during construction.

PROJECT PROFILE

Centennial Dam Design

Dedham, MA

View of primary spillway of the Centennial Dam

Project Highlights

- Successfully provided several aspects of GZA's engineering and scientific services including hydrology/hydraulics, wetland assessment, geotechnical and civil engineering
- Phase II investigations
- Final design
- Permitting

The Massachusetts Department of Conservation and Recreation (DCR) contacted GZA to provide engineering design services for the Centennial Dam in Dedham, Massachusetts. The dam formerly known as the United Waste Company day is a 20.5 foot high earthen embankment/masonry gravity structure located on Mother Brook. The dam is located within a large former mill building complex which now houses condominiums and apartments. The dam has been determined to be in poor condition and is in need of rehabilitation.

In 1998, GZA assessed the dam and provided conceptual-level design recommendation to address some deficiencies. In 2005, GZA performed an emergency site visit in response to additional seepage. Additionally in 2005 GZA performed a Phase I Inspection. GZA then retained to provide a more detailed level of Phase II Investigations, ultimately leading to permitting, final design and bid assistance. The project scope includes:

- Failure Mode Analysis (FMA)
- Subsurface exploration
- Geotechnical evaluations using SLOPE/W and SEEP/w models
- Spillway capacity analysis
- Refinement of previous hydrologic/hydraulic (H&H) analysis and confirm existing spillway capacity to the spillway design flood (SDF)
- Flood operations and maintenance plan
- Pre-feasibility study for the installation of hydropower generation on site
- Permitting and bidding assistance

PROJECT PROFILE

Otis Reservoir Dam Rehabilitation Project Investigation, Design, Permitting and Construction Services

Otis, MA

The Massachusetts Department of Conservation and Recreation (DCR) owns and operates the Otis Reservoir Dam in the Otis, Massachusetts. The dam was built in the 1866 by the Farmington River Water Power Company. The dam was used to release water to Farmington River during dry weather to increase river flows which were relied upon for hydropower for various industries downstream in Massachusetts and Connecticut. The dam is an earthen embankment with a downstream stone masonry wall. The dam had a 38-foot wide stone masonry primary spillway at its left abutment. The dam also has a downstream reinforced concrete outlet tower that was added to the dam in 1984. The dam has a maximum structural height of about 31.5 feet and is about 630 feet long.

Based on inspections conducted by GZA in 2006, the dam was found to be in Poor condition, with multiple identified deficiencies. Deficiencies included inadequate spillway capacity to pass the Spillway Design Flood (SDF), erodible emergency spillway, no upstream control on the low-level outlet pipe, deteriorating masonry and leakage at the primary spillway, and leakage in the downstream stone masonry wall.

In 2007, GZA was been engaged by the DCR to complete final deficiency investigations at the dam and then to prepare permit applications and final designs for a major rehabilitation program. This program began with collection of basic field data including topographic survey, bathymetry, wetland resources delineation, and subsurface investigations. Using the data, GZA performed detailed hydrologic and hydraulic analyses to evaluate the hydraulic capacity of the existing spillway. GZA also performed seepage and slope stability analyses for the embankment section of the dam and gravity stability analyses for the downstream stone masonry wall.

GZA utilized FERC-developed techniques to perform a Potential Failure Mode Analyses (PFMA) for the dam in conjunction with the DCR to develop an enhanced

Project Highlights

- Dam safety inspection
- Subsurface investigations
- Seepage and slope stability analyses
- Hydrologic and hydraulic analyses
- PFMA exercise
- New spillway design
- Permitting and public outreach
- Construction-phase services

dcr

Otis Reservoir Dam Rehabilitation Project
Investigation, Design, Permitting and Construction Services
Otis, MA

understanding of the risk exposure associated with the dam. Using this information, GZA prepared an Alternatives Analysis which examined multiple options for repair, as well as the "dam breach" option. GZA recommended the construction of a new primary spillway with a hydraulically operated crest gate and upstream stoplog bays. Other rehabilitation improvements included raising the embankment crest by 3 feet, flattening portions of the downstream slope, installing a new toe drain, adding an upstream slide gate in the outlet tower and a new bridge over the spillway.

GZA directed the project team in a significant permitting and public outreach program as part of this project. The dam is highly visible and is utilized by an active lake association. Otis Reservoir is the largest, non-water supply fresh water body in the Commonwealth of Massachusetts. Outreach involved meetings with Town officials and the Lake Association. Local, state, and Federal permit applications were also prepared by the project team. All permits were successfully obtained, and the project document advertised for bid in 2010. The project was awarded, and Phase 1 of the work began after October 2010. The project work was divided into two phases to accommodate project funding constraints and to avoid the busy summer recreation season. Phase I was successfully completed in June 2011. Phase I included the construction of the new concrete spillway and stoplog structure, embankment improvements, new gatehouse foundation, toe drain installation and a new precast concrete bridge. Phase II of the work was conducted underwater and included the installation of the hydraulic crest gate and the construction of the new gatehouse.

PROJECT PROFILE

Ponkapoag Pond Dam Rehabilitation Project

Canton, MA

Project Highlights

- Successfully provided several aspects of GZA's engineering and scientific services including hydrology/hydraulics, wetland and aquatic habitat assessment, and civil engineering
- Prepared contract plans and specifications
- Prepared permit applications and oversaw successful permitting process leading to local, state, and Federal approval
- Assisted owner in obtaining multiple bids. Low bid within project budget.
- Provided construction-phase engineering services

The Massachusetts Department of Conservation and Recreation retained GZA to provide engineering and natural resource environmental services for the complete rehabilitation of the Ponkapoag Pond Dam. The dam is located in Canton within the DCR's Blue Hills Reservation. The dam is earthfill embankment of intermediate size and significant hazard. The dam impounds the sizeable Ponkapoag Pond, which is part of the Fowl Meadow and Ponkapoag Bog Area of Critical Environmental Concern (ACEC). The pond and dam site are also reported to contain habitat for several rare and endangered species.

Ponkapoag Pond contains Chamaecyparis thyoides, the Atlantic white cedar. The Atlantic white cedar requires the pond surface elevations to fluctuate throughout the year. The final design of the dam took into account the need for changing pond surface elevation, while still supplying the downstream wetlands with a constant inflow of water.

GZA performed a Phase I inspection and a Phase II engineering evaluations on the dam, and delineated wetlands and assessed the rare species habitat for the ACEC. Working with DCR and other stakeholders, GZA developed a conceptual rehabilitation design and then prepared final engineering designs and technical specifications. GZA prepared applications for all applicable local, state, and Federal permits and coordinated a stakeholder outreach program to gather input from the environmental and regulatory community. Ultimately, all permits were issued and the project was successfully bid under Massachusetts Public Contracting laws. GZA provided engineering assistance to the DCR during construction. The project was successfully completed in the spring of 2009 and stood the test of the major flooding that occurred in the spring of 2010.

Major features of the rehabilitation design included: 1) Stability improvements to an embankment partially built over a peat foundation; 2) Completely new primary spillway, secondary spillway, and water control chamber; 3) Preservation, restoration, and replication of sensitive wetland and rare species areas; 4) All construction without dewatering of pond.

Wetland/vernal pool replacement site

PROJECT PROFILE

Morey's Bridge Dam Reconstruction

Taunton, MA

Previous overflow weir (left) and gate structure (right) before replacement

Project Highlights

- Successfully provided several aspects of GZA's engineering and scientific services including hydrology/hydraulics, geotechnical, civil, structural, and construction-phase engineering
- Worked closely with multiple project partners, including MassDOT, DCR Office of Dam Safety, MassDEP, the City of Taunton, and other local stakeholders
- Conducted work at an expedited schedule in accordance with MassDOT's Accelerated Bridge Program
- Designed fish and eel passage facilities

The Massachusetts Department of Transportation (MassDOT), through Fay, Spofford, and Thorndike (FST), retained GZA to provide engineering services in support of the reconstruction of the Morey's Bridge Dam. The dam is an approximately 10-foot high earthen embankment dam that also serves to support the Bay Street Bridge, a heavily used two lane roadway in the City of Taunton.

The dam serves to control and partially impound the waters of Lake Sabbatia, a natural Great Pond. The privately-owned Morey's Bridge Dam had fallen into disrepair. The gates used to control its level were in poor condition and had to be removed for safety reasons. As a result, lake levels dropped such that Lake residents installed their own cofferdam to restore lake levels. Unfortunately, the lake level resulted in frequent nuisance flooding of some lake properties. In conjunction with the replacement of the Bay Street Bridge under the Accelerated Bridge Program (ABP), the Commonwealth of Massachusetts decided to reconstruct the dam, which the Office of Dam Safety had declared to in "unsafe" condition.

GZA's scope of work included: (a) hydrologic and hydraulic analyses, (b) geotechnical analyses, (c) subsurface explorations, (d) preliminary and final design of dam safety improvements, and (e) permitting assistance. Our design includes the proposed stabilization / modification of the existing earthen embankment, recommendations for secant pile bridge abutment foundations, and design of a separate spillway, control structure, and appurtenant structures to allow the dam to safely pass the regulatory spillway design flood.

Removal of previous unsafe bridge and dam reconstruction

Denil fish ladder at reconstructed spillway

Morey's Bridge Dam Reconstruction

Taunton, MA

An important component to the dam and spillway design is to also allow for the regulation of lake levels, which will be accomplished through the installation of a stoplog outlet or crest gate, to be designed by GZA. As part of our hydrologic and hydraulic analysis, GZA worked closely with representatives of NOAA and USFWS to develop recommendations for spillway channel modifications and fishway construction that will enhance anadromous fish access to Lake Sabbatia.

In addition to providing dam engineering design services, GZA assisted MassDOT with project communication and outreach, and presented the project team's 25 percent design concepts in a public meeting with abutters of Lake Sabbatia and representatives of the City of Taunton.

GZA also provided bid administration assistance with respect to the dam component of the project and construction-phase engineering services. Construction was completed in late 2013. The Morey's Bridge Dam / Bay Street Bridge Replacement won a 2014 American Council of Engineering (ACEC) of Massachusetts Gold Award, and a 2014 Best Small Project – Under Budget Award from the Northeast Association of State Transportation Officials (NASTO)

GZA provided post-construction serviced to the owner, including O&M plan development, and permitting for an annual seasonal drawdown (for maintenance and invasive species control)

Spillway reinforcement (foreground) and secant pile training wall (background)

Outlet structure with seasonal eel ladder in place (center)

From left to right: Reconstructed fish ladder, outlet gates, stoplog bay, and reinforced concrete ogee spillway

PROJECT PROFILE

MA DCR Benedict Pond Dam Rehabilitation Project

Great Barrington, MA

Spillway, bridge, and low level outlet gate operator from left before, during, and after construction

Project Highlights

- Repair design and construction plans
- Permit applications
- Construction phase design services

Existing spillway, bridge, and low level outlet gate operator

The Massachusetts Department of Conservation and Recreation (DCR) retained GZA to provide design, permitting, and construction phase services for the rehabilitation of a small, low hazard dam in poor condition at the Beartown State Forest in Great Barrington, Massachusetts.

Built in the 1930s by the Civilian Conservation Corps, the concrete and earthen dam impounds Benedict Pond which is a popular camping and swimming site located along the Appalachian Trail. Several deficiencies have existed for many years on the structure including a severely deteriorated concrete cutoff wall along the upstream face, unwanted trees and vegetation on the earthen embankment, inoperable outlet works, and inoperable stop log system.

GZA first inspected the dam in 1999 and worked with the DCR to design repairs on of the concrete cutoff wall, to replace the low-level outlet works, to remove trees and regrade the earthen embankment and to make improvements to the park features on and abutting the dam, including design of a new walkway over the spillway. GZA prepared local, State, and Federal permit applications and facilitated the permit review process. Final construction plans, a construction estimate, project specifications, and bidding documents were all prepared by GZA.

The dam rehabilitation project went into a fast-track construction program. GZA provided construction phase services by reviewing contractor submittals, attending job meetings, managing environmental compliance, and providing technical advice and design services.

Spillway section under construction in 2012

PROJECT PROFILE

Site Reconnaissance and Conceptual Design for Russell Mill Pond Dam

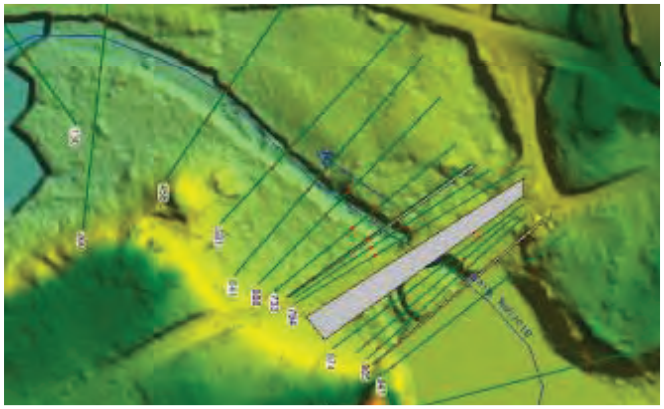
Dartmouth, MA

Project Highlights

- Completed bathymetric and topographic survey, and geomorphological and natural habitat investigations, sediment sampling and analysis
- Performed hydrologic and hydraulic analysis and fish passage evaluation for the existing condition and 4 design alternatives
- Developed conceptual drawings for the preferred alternative
- Developed Design Basis Technical Memorandum and cost estimate

The Massachusetts Department of Fish and Game's Division of Ecological Restoration (DER) contracted GZA in 2019 to conduct field studies and prepare conceptual engineering plans for removal of Russell Mill Pond Dam in Dartmouth, MA. This project was the first phase of the dam removal feasibility analysis and design project for the site and included data collection and evaluation that will support future final design for the removal and subsequent restoration of the Paskamenset / Slocums Rivers at the dam. GZA's services included the following:

- **Site Reconnaissance**: Visual site reconnaissance of the dam and vicinity by a GZA dam engineer and ecologist to assess the dam's primary and auxiliary spillway, construction access and layover area, fish ladder built downstream, bridge opening (3 culverts), weir and piers immediately downstream, geomorphology in the area, wetland and fisheries habitat.
- **Sediment Characterization**: General characterization of impounded sediments by collecting 2 field samples and performing laboratory testing. GZA also performed limited bathymetric survey including measuring the depth to top of sediment and sediment thickness probing.
- **Preliminary Hydrologic and Hydraulic Analysis**: Preliminary hydrologic statistical analysis using HEC-SSP and hydraulic modeling using HEC-RAS to assess the potential hydraulic effects of dam removal and 4 conceptual designs, including removing each of the spillways and removing barriers/limitations immediately downstream. GZA also modeled the existing fish ladder to conceptualize design conditions that will improve fish passage.
- **Conceptual (e.g., 10-percent level) Design Plans and Technical Report**: GZA prepared plans for removing the primary and auxiliary spillways, replacing culverts downstream, and removing existing weir and piers downstream of the bridge.



Hydraulic model developed in HEC-RAS and LiDAR data

Sediment sample collected for laboratory testing

PROJECT PROFILE

Site Reconnaissance and Conceptual Design for Church Manufacturing Co. Dam

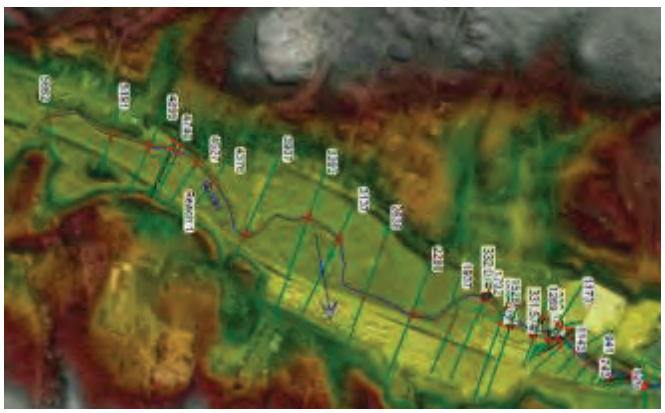
Monson, MA

Project Highlights

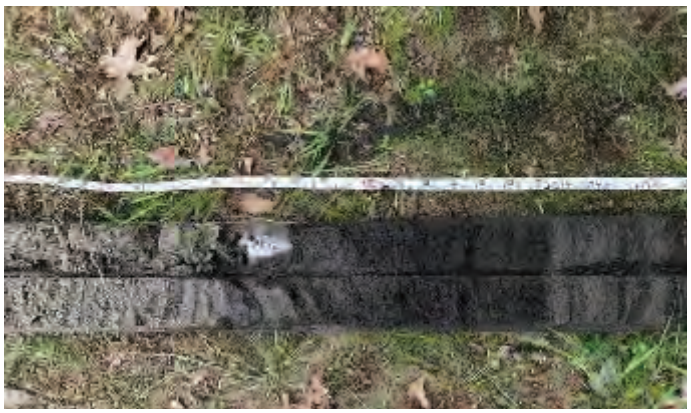
- Completed bathymetric and topographic survey, and geomorphological and natural habitat investigations
- Completed sediment sampling and analysis
- Performed hydrologic and hydraulic analysis and fish passage evaluation for the existing conditions, partial and complete dam removal alternative plans
- Developed conceptual drawings for the preferred alternative

The Massachusetts Department of Fish and Game's Division of Ecological Restoration (DER) contracted GZA in 2019 to conduct field studies and prepare a conceptual engineering plan for removal of Church Manufacturing Co. Dam. This project was the first phase in data collection and evaluation that will support future final design for the removal and subsequent restoration of the Chicopee Brook at the dam. GZA's services included the following:

- **Site Reconnaissance**: Visual site reconnaissance of the dam and vicinity by a GZA dam engineer and ecologist to assess the dam's structure, access through parking area, adjacent railroad embankment and commercial buildings, and wetland and fisheries habitat.
- **Sediment Characterization**: General characterization of impounded sediments by collecting 2 field samples and performing laboratory testing. GZA also performed limited bathymetric survey including measuring the depth to top of sediment and sediment thickness probing.
- **Preliminary Hydrologic and Hydraulic Analysis**: Preliminary hydrologic analysis using USGS StreamStats and hydraulic modeling using HEC-RAS to assess the potential hydraulic effects of complete and partial dam removal and conceptual design. GZA performed a limited fish passage evaluation to conceptualize design conditions that will improve fish passage.
- **Conceptual (e.g., 10-percent level) Design Plans and Technical Report**: The proposed channel condition would consist of removing the concrete and stone portions of the dam's spillway and reinforcing the embankment portion to the left and right of the dam such that the remaining channel has the capacity to safely pass, at minimum, the 100-year flood without significant re-impoundment in the area upstream of the former dam site.



Hydraulic model developed in HEC-RAS and LiDAR data



Sediment sample collected for laboratory testing

PROJECT PROFILE

Site Reconnaissance and Conceptual Design for Beaver Brook Dam

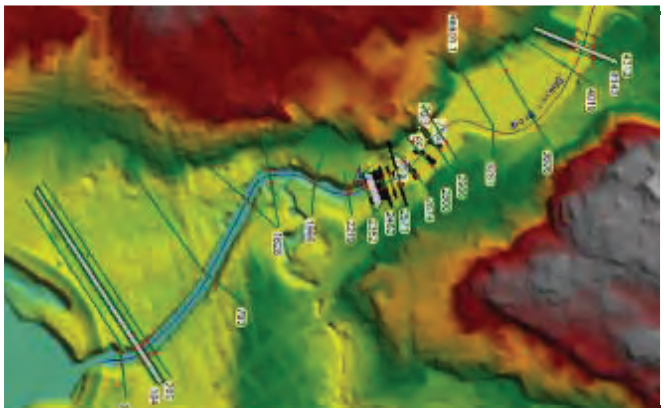
Dracut, MA

Project Highlights

- Completed bathymetric and topographic survey, and geomorphological and natural habitat investigations
- Completed sediment sampling and analysis
- Performed hydrologic and hydraulic analysis and fish passage evaluation for the existing and proposed scenario
- Developed conceptual drawings
- Developed Design Basis Technical Memorandum and cost estimate

The Massachusetts Department of Fish and Game's Division of Ecological Restoration (DER) contracted GZA in 2019 to conduct field studies and prepare a conceptual engineering plan for removal of Beaver Brook Dam. This project was the first phase in data collection and evaluation that will support future final design for the removal and subsequent restoration of the Beaver Brook at the dam. GZA's services included the following:

- **Site Reconnaissance**: Visual site reconnaissance of the dam and vicinity by a GZA dam engineer and ecologist to assess the dam's structure, construction access and layover area, adjacent buildings at both abutments, bridge opening immediately downstream of the dam, upstream bridge scour potential, river geomorphology, wetland and fisheries habitat.
- **Sediment Characterization**: General characterization of impounded sediments by collecting field samples and performing laboratory testing. GZA also performed limited bathymetric survey including measuring the depth to top of sediment and sediment thickness probing.
- **Preliminary Hydrologic and Hydraulic Analysis**: Preliminary hydrologic analysis using USGS StreamStats and hydraulic modeling using HEC-RAS to assess the potential hydraulic effects of dam removal and conceptual design. GZA performed a limited fish passage evaluation to conceptualize design conditions that will improve fish passage.
- **Conceptual (e.g., 10-percent level) Design Plans and Technical Report**: GZA prepared plans for a trapezoidal breach, removing the inoperable low-level outlet and leaving parts of left and right abutment intact, which would leave enough of a buttress in place to buttress the existing buildings at each dam abutment.



Hydraulic model developed in HEC-RAS and LiDAR data

Sediment sample collected for laboratory testing

PROJECT PROFILE

Allen Reservoir Dam
Phase II Dam Safety Evaluation

Walpole, MA

Project Highlights

- Demonstrates GZA's service to the Client in finding economical solutions
- Evaluated ongoing seepage issues in the dam embankment
- Evaluated past hydrologic analysis to verify appropriate results

Allen Reservoir Dam was constructed in 1980 as flood protection for the Town of Walpole, which had been seriously impacted by the storms of 1955. The dam is a 1500 foot-long and 21 foot-high zoned earth embankment structure. It was designed by the United States Soil Conservation Service (SCS) as one of a series of dams in Massachusetts constructed in response to the floods. Seepage at the toe of the dam has been an ongoing problem to the extent that wetlands have developed around the channel formed by the discharge.

Working under contract with the Town of Walpole, GZA has completed a Phase II dam safety evaluation in accordance with the Massachusetts Department of Conservation and Recreation Office of Dam Safety regulations (DCR-ODS). As part of the evaluation, test borings were undertaken to characterize the soil and assess its compliance with design specifications. Additionally, in-situ hydraulic conductivity tests were conducted in monitoring wells and open stand-pipe piezometers to evaluate embankment and drain characteristics that may contribute to the seepage.

As part of our detailed hydrologic and hydraulic analyses, GZA conducted an extensive file review of SCS's original design and construction documentation and determined that the functional and hydrological characteristics of the dam had been adequately examined and that the design maximum pool is appropriate. GZA subsequently conducted slope stability and seepage analysis using SLOPE/W, a limit equilibrium based computer code, and SEEP/W, a two-dimensional, finite element based seepage analysis package. As-built geometry and soil characteristics were combined to evaluate the phreatic surface in the embankment, which indicated that artesian pressures, originally noted during the pre-construction investigation, may be leading to the observed seepage flows. Potential for slope failure at normal and maximum pool, as well as during seismic events was evaluated and compared to dam safety regulations.

Allen Reservoir Dam
Phase II Dam Safety Evaluation
Walpole, MA

Our evaluation was summarized in a comprehensive Phase II Conceptual Design Report which included recommendations to address observed seepage issues. Corrective measures included:

- extensive clearing of over-grown vegetation in adherence to ODS' recent updated policy statement with respect to trees on earthen embankment dams;
- rehabilitation of the existing toe-drain; and
- installation of a drainage blanket.

After consensus was reached between interested parties, the project proceeded to the rehabilitation phase where GZA developed conceptual recommendations into a final plans and specifications package suitable for use in obtaining contract bids. GZA served as project engineer-of-record during subsequent remedial construction.

PROJECT PROFILE

Turner Pond Dam Rehabilitation Project
Investigation, Design, Permitting, & Construction Services

Walpole, MA

Project Highlights

- Dam safety inspection
- Subsurface investigations
- Embankment stability analyses
- Hydrologic and hydraulic analyses
- Overtopping protection design
- Permitting and public outreach
- Construction-phase services
- Emergency Action Planning
- Operations and maintenance

The Turner Pond Dam is owned and operated by the Town of Walpole, Massachusetts. The dam was built around 1800 for commercial purposes. It serves as the only ingress and egress to a neighborhood bordering Turner Pond. The impoundment is widely used in the winter for public ice skating.

The dam was found to be in a state of advanced deterioration when GZA performed a Phase I inspection in 2011 due to its significant overgrowth of trees, sloughing and erosion of slopes, observed seepage, and inability to pass the 100-year spillway design flood. The Town of Walpole retained GZA to design improvements to the dam that would allow it to be taken off the Office of Dam Safety's list of dams in poor condition.

Working with the Town and involved residents in 2015-2016, GZA developed a rehabilitation plan for the dam that included placement of riprap slope protection and turf reinforcing matting on the downstream slope. The combination of slope protection allows the dam to withstand overtopping during the SDF, eliminating the need to increase the size of the spillway to pass the flows. In addition, the rehabilitation included re-grading the dam and removing trees to improve slope stability; wetlands replication; and channel training.

GZA prepared plans and specifications for the work. In addition, permit applications were submitted to all relevant agencies, including the USACE, MEPA, DEP, Conservation Commission, and MHC. GZA also produced an application package for grant funding from the Executive office of Energy and Environmental Affairs, which provided the Town a vehicle for completing the project.

Working closely with the Town and the selected Contractor, GZA provided economical construction support services including bid phase services; part time observation of the work during critical segments and at defined milestones; submittal review; and project closeout. Subsequent to the successful construction, the Town selected GZA to complete an Emergency Action Plan and an Operations and Maintenance Manual for the Turner Pond Dam.

PROJECT PROFILE

Watershops Pond Dam Hydropower Resource Assessment

Springfield, MA

Watershops Pond Dam

Project Highlights

- Inspection and assessment of former hydropower penstock and powerhouse associated with the dam
- Development of new concept for hydropower project layout
- Calculation of power and annual energy production
- Assessment of environmental and other potential "fatal flaw" issues
- Preparation of cost estimates and financial pro forma
- Preparation and submission of FERC Preliminary Permit application to secure site development study rights for the City
- Assistance to the City with the successful submission of a HUD grant application which secured funding for project
- Sediment sampling and testing

GZA has long provided dam safety consulting services to the City of Springfield at City-owned dams. One such dam is the Watershops Pond Dam. In the late 18th century, the U.S. Federal government established the Springfield Armory and began producing muskets, with forging of metal and shaping of wooden stocks taking place at "the Watershops" on the Mill River. Watershops Pond Dam was constructed to power the works at the Armory.

While the hydropower functions of the dam ceased long ago, the potential to re-power the dam to provide the City with a source of clean energy was recognized. A new hydropower project would also represent an increase in distributed generation capacity which would add resiliency to the local electrical grid.

GZA was engaged by the City of Springfield to assess the potential for renewed hydroelectric generation potential at the Watershops Pond Dam on the Mill River. GZA visited the site and the former the powerhouse, which is located on private property. In order to avoid complex property issues, GZA proposed an alternative design involving the construction of a new freestanding powerhouse downstream of the dam. GZA prepared power and energy generation estimates and assessed preliminary financial returns for the project. As initially proposed, the project is estimated to be capable of generating up to 145 kW of power and 700 MW-hrs of energy annually.

Following the preparation and submission to the City of the resource assessment report, GZA recommended the City file for a FERC Preliminary Permit to secure the rights to further study development of the site. GZA prepared the Preliminary Permit application for the site on behalf of the City, which was accepted by FERC in 2016.

Watershops Pond

Toe of dam and site of proposed new powerhouse

PROJECT PROFILE

Silver Lake Containment Basin

Meriden and Berlin, CT

Project Highlights

- Site design
- Bid documents
- Sediment sampling and testing
- Construction phase services

The Silver Lake Project included the design and construction of two containment basins with a combined capacity of over 190,000 cubic yards. Also included were a flocculation basin with a 14,000 cubic yard volume, access roads and site security. The design allows for independent operation of each containment basin, accessibility to the lakefront, and also facilitates the application of polymers or other flocculating agents.

PROJECT PROFILE

Duck Pond and Aquatic Gardens Restoration-Forest Park

Springfield, MA

Pedestrian boardwalk along restored open-water feature

Project Highlights

- Permitting
- Dredging contract plan and specifications
- Landscape design
- Sediment sampling and testing
- Construction observation

This completed project represents a substantial segment of the ongoing restoration of Forest Park, the premier municipal park in Springfield, Massachusetts. The work included the rehabilitation and restoration of Duck Pond and the Aquatic Gardens portions of the Park, an Olmsted Park, by removing nuisance aquatic vegetation and accumulated sediments. In total, twelve ponds were dredged, removing 20,550 cubic yards of fine sand, silt, and clay. Excavated shoreline areas were established using bioengineering techniques wherever appropriate and PVC sheeting was utilized in many areas to create a striking and lasting transition from manicured lawn to open water. Plantings throughout the project were selected to complement the Victorian history of the original landscape, including the exotic Egyptian lotus, which was placed within the Aquatic Gardens.

Several paved vehicle travelways were converted to pedestrian trails, and three pedestrian bridges over Pecousic Brook were replaced with one covered bridge and two arched bridges, all featuring glu-lam construction. The park infrastructure was improved by providing additional parking spaces for cars and increasing the capacity of storm drainage facilities. The water feed system for ten of the landscaped ponds was completely replaced with a new piping configuration designed to allow complete flexibility in management of pond water levels. A decorative water fountain was installed within the restored Sea Pool, utilizing the available head from a small dam across Pecousic Brook, which supplies a constant source of pressurized water. A large gazebo was installed over the water in the Amphitheater Pond to allow enjoyment of one of five electrically powered multi-tiered fountains. Additionally, the grassed amphitheater was restored to allow safe and enjoyable use by the public during outdoor musical or theater events.

Excavation of sediments using conventional methods

Degraded shoreline before construction

Duck Pond and Aquatic Gardens Restoration
Forest Park
Springfield, MA

Local, State, and Federal environmental permits were obtained for all work prior to commencement of construction activities. Accumulated sediments were tested and found suitable for upland disposal. All work was performed from areas previously disturbed in the original creation of the park. Excavation was by conventional means, following dewatering of the ponds by gravity or pumped methods. Dredged material was dewatered on-site, and was either blended with sand and reused as topsoil, or otherwise disposed of on other park property. Much of the material was used as fill and final cover for the closure of the park stump dump.

The project was expanded in the fall of 1997 to include the site work for the restoration of the Barney Carriage House, the only structure remaining from the extensive estate of Everett Barney, one of the original park benefactors. This work included the construction of additional parking areas, cobblestone sitting walls, a second gazebo, extensive landscaping, and a large patron congregation area constructed of concrete pavers.

PROJECT PROFILE

Mahar Regional School Dam Rehabilitation Project
Design, Permitting, and Construction Services

Orange, MA

Project Highlights

- Dam safety inspection
- Embankment stability analyses
- Hydrologic and hydraulic analyses
- Permitting and public outreach
- Construction-phase services
- Emergency Action Planning
- Operations and maintenance

The Mahar Regional School Dam is owned and operated by Ralph C. Mahar Regional School District in Orange, Massachusetts. The dam was built in the mid-1950s for recreational purposes.

The dam was found to be in a state of advanced deterioration when GZA performed a Phase I inspection in 2009 due to its significant overgrowth of trees, sloughing and erosion of slopes and an inoperable low level outlet slide gate. The District retained GZA to design improvements to the dam that would allow it to be taken off the Office of Dam Safety's list of dams in poor condition.

The rehabilitation included re-grading the dam and removing trees to improve slope stability; improvements to the existing spillway; replacement of the existing low level outlet and repainting the spillway catwalk.

GZA prepared plans and specifications for the work. In addition, permit applications were submitted to all relevant agencies, including the USACE, MEPA, DEP, Conservation Commission, and MHC.

Working closely with the District and the selected Contractor, GZA provided economical construction support services including bid phase services; full time observation of the work; submittal review; and project closeout. Subsequent to the successful construction GZA prepared an Emergency Action Plan and an Operations and Maintenance Manual for the Mahar Regional School Dam.

PROJECT PROFILE

Bowen's Pond Dam Removal/Osgood Brook Restoration Project

Wendell, MA

Project Highlights

- Ecological resources assessment
- Hydrologic and hydraulic modeling
- Dam removal services
- Engineering design
- Environmental documentation and permitting

GZA was contracted by the Massachusetts Division of Ecological Restoration (DER) to complete a study of existing conditions and to prepare a Preliminary Design for the potential removal of Bowen's Pond Dam, a Low Hazard dam along Osgood Brook in Wendell, Massachusetts. Bowen's Pond is a 16-acre impoundment formed by the construction of Bowen's Pond Dam, a concrete and masonry structure with embankment sections. Osgood Brook is a Coldwater Fishery Resource and removal of the dam will assist in reducing heat stress on downstream reaches of the brook, improving dissolved oxygen levels, and restoring natural sediment movement pathways, and potentially restoring fish passage along a segment of the brook. Dam removal will also remove liability and future maintenance/repair costs for the owner.

Preliminary design work included:

- Review of existing documentation regarding the dam and pond
- Site reconnaissance
- Cultural resources assessment and standalone cultural resources report (with subconsultant PAL, Inc.)
- Supplemental topographic survey
- Limited bathymetric survey
- Wetland resource survey
- Sediment sampling and analytical testing (within the pond and upstream and downstream of the pond along Osgood Brook)
- Detailed hydrologic and hydraulic study of existing conditions, proposed conditions with a conceptual dam breach section, and examination of fish flows and varying seasonal flows
- Sediment assessment and management recommendations
- Preliminary design of a breach section and preparation of Preliminary Design Drawings
- Preliminary design memorandum
- Conceptual rendering preparation

Based on the results of the Preliminary Design Report, the Client and DER continued with the process toward dam removal, contracting GZA to provide Massachusetts Environmental Policy Act (MEPA) consulting services to assist with the preparation of an Expanded Environmental Notification Form (EENF) and Environmental Impact Report (EIR) waiver request. GZA prepared the Project EENF and assisted the Client and DER with responses to questions regarding the Project. The next step in the Project will be the preparation of a Single EIR (SEIR).

PROJECT PROFILE

Reconstruction of Main Greeting Road and Swan Pond Outlet City of Springfield Department of Parks, Buildings and Recreation Management- Forest Park

Springfield, MA

Project Highlights

- Environmental and ecological permitting (local, state and federal)
- Geotechnical engineering
- Site civil engineering
- Stormwater management & permitting
- Dredging design & permitting
- LSP services
- Public outreach
- Construction administration
- Environmental monitoring

Swan Pond is a 2-acre pond near the headwaters of Meadow Brook in Springfield, Massachusetts, within the city's 734-acre Forest Park. The Main Greeting Road into Forest Park crosses the earthen embankment that forms Swan Pond and is up to 45 feet in total height. The pond's spillway is a drop inlet structure on the upstream side the embankment which drains through a conduit extending under the embankment. Effectively, the Main Greeting Road embankment functions as a dam across Meadow Brook.

Challenge: In the summer of 2017, City crews noticed that the water level within Swan Pond was several feet higher than normal. GZA was called to investigate and based on observations at that time, informed the City that the conduit through the embankment was partially or even fully blocked. The City took immediate action, and the road was closed that evening, at a significant cost to the City, and reducing the public's access to Forest Park.

Solution: GZA quickly designed an emergency bypass pumping system for Meadow Brook, which was implemented while GZA performed an initial evaluation of the embankment, including exploratory soil borings, video inspection of the culvert and initial consultation s with regulators. GZA assisted the City in obtaining a $3 million grant from the State of Massachusetts Department of Energy and Environmental Affairs to pay for the design and construction of required emergency repairs to restore the conduit and embankment and safely support Main Greeting Road. Based on recommendations from GZA based on our experience and technical guidance from FEMA and the U.S. Army Corps of Engineers, the City elected for complete removal and replacement of the failed conduit, including full excavation of the 45-foot tall embankment, removal of the collapsed conduit (the original construction was found to mostly consist of brick masonry sidewalls and arched top, estimated to have been constructed in the late 1800's), and requiring over 120,000 cubic yards of excavation and embankment formation. GZA performed sediment sampling and analysis as well as natural resources assessments in support of permitting of work, including dredging and filling, in regulated area required to construct the repair in accordance with the dam safety regulations. As part of the project, GZA also designed an energy dissipater for the pond outlet to prevent down-stream erosion during high-flow conditions.

Benefit: The reconstructed embankment and outlet enhanced the natural beauty of the main public entrance to the Park and will provide a safe, maintainable, access the City's premier public park for years to come. Thanks to the City's early planning cooperation of local and state regulators, GZA's design and permitting efforts and diligent work of the Contractor, the conduit replacement project was completed on-time and on-budget and the road was re-opened to traffic in November 2019, just in time for the City's annual "Bright Nights at Forest Park" celebration, where 200,000 people each year enjoy a self-guided drive through a darkened Forest Park to enjoy an incredible display of holiday lights, and the main fundraiser for the Spirt of Springfield with proceeds benefiting numerous local charitable organizations.

APPENDIX B - PROJECT TEAM RESUMES

RESUME

Derek Schipper, P.E.

Senior Consultant

Summary of Experience

Mr. Schipper is a Senior Consultant with experience in various dam, earthwork, construction, landfill, forensic engineering, and subsurface exploration projects. He has worked on several geotechnical projects which include the evaluation of geotechnical engineering investigations and subsequent development of geotechnical engineering recommendations. His extensive field experience includes quality control of construction for a variety of projects with geotechnical and environmental aspects.

Education

B.S., 1995, Civil Engineering, University of Massachusetts Lowell
M.S., 2007, Civil Engineering – Geotechnical, University of Massachusetts – Lowell

Licenses & Registrations

Professional Engineer -
Massachusetts, #47577
Vermont, #018.0124808
Connecticut, #0035521
New Hampshire, #17155

Areas of Specialization

- Dam Engineering
- Civil Engineering
- Geotechnical Engineering
- Construction Monitoring
- Landfill Engineering
- Septic Design/Subsurface Investigations

Relevant Project Experience

DAM REMOVAL AND REHABILITATION

Project Manager, Independent Review Engineer - Molly's Falls Hydroelectric Facility, Marshfield, Vermont. GZA assisted the Vermont Public Utility Commission with technical review of the proposed dam rehabilitation of Marshfield Dam No. 6 at the Molly's Falls Hydroelectric Facility in Marshfield, Vermont. Our scope included technical review of the existing dam safety reports, rehabilitation design prepared by the dam owner's engineering consultants and the Emergency Action Plan.

Project Manager, Flowering Pond Dam, Newburyport, Massachusetts. Mr. Schipper was project manager for the rehabilitation of Flowering Pond Dam which is owned by the Massachusetts Department of Conservation and Recreation (DCR). The dam is located immediately upstream of the Merrimack River within the Maudslay State Park. Rehabilitation included: construction of a new cast-in-place concrete spillway, a new low-level outlet pipe and gate, reconstruction of the downstream masonry wall and reconstruction of the upstream slope. The top of the dam was completed with a walking path, a pedestrian bridge over the spillway and fencing. Mr. Schipper is prepared contract drawings and specifications for the project and oversaw construction.

Project Manager, Pine Acres Dam Rehabilitation, Hampton, Connecticut. Mr. Schipper was project manager for the rehabilitation of Pine Acres Dam during construction. The dam is owned by the Connecticut Department of Energy and Environmental Protection (CTDEEP). Rehabilitation included construction of a new cast-in-place auxiliary spillway, improvements to the primary spillway including a new slide gate and stop logs and regrading of the upstream and downstream slopes. Mr. Schipper reviewed contractor submittals, coordinated with CTDEEP, and oversaw construction.

Project Manager, Hemlock Gorge Spillway Dike Rehabilitation, Newton, Massachusetts. After multiple inspections found this ancillary dike on the Charles River to be in Unsafe condition, GZA assisted DCR with design and implementation of interim repairs to the structure. GZA then designed a complete replacement for the dike and developed project plans, specifications, contract documents, and permit applications under an expedited schedule. GZA design and permitting of the project was completed in approximately 3 months. The design included a new reinforced concrete structure with post-tensioned anchors. Project challenges included providing temporary water control on the Charles River, accommodating historic and cultural resources concerns, and mitigating impacts in an environmentally sensitive area.

Derek Schipper, P.E.

Senior Consultant

Project Manager, Centennial Dam Rehabilitation, Dedham, Massachusetts. Mr. Schipper was project manager for the rehabilitation of Centennial Dam which is owned by the Massachusetts Department of Conservation and Recreation (DCR). The high hazard dam is located along Mother Brook immediately upstream of residential structures. Rehabilitation included: reconstruction of the left downstream embankment, construction of a parapet wall to address potential overtopping, installation of a new low-level outlet slide gate, construction of a new auxiliary spillway, relining of existing outlet pipes and reconstruction of a failing downstream channel wall. Mr. Schipper is prepared contract drawings and specifications for the project.

Project Manager, Emergency Breaching of Sibley Reservoir Dam in Sutton, Massachusetts. In April of 2019, a depression ("sinkhole") was observed on the downstream slope of the dam above the low-level outlet pipe. The pipe had become damaged by the sinkhole and was no longer passing water. Therefore, the only means for the dam to pass incoming flow was by embankment seepage emerging from the downstream headwall. Under a Massachusetts Office of Dam Safety emergency order to breach the dam by the, GZA prepared expedited drawings, specifications and bidding documents in short order and the dam managers had a contractor engaged to perform the breach.

Project Manager, Emergency Breaching of Greenwood Lake Dam in Delaware, Ohio. GZA was under contract with the Salvation Army to design and permit the breaching of this high hazard dam. However, during flooding of May 2020, a sinkhole was observed along the road (U.S. Route 42) which forms the embankment portion of the dam. The road was closed by the Ohio DOT and efforts commenced to perform an emergency breaching. GZA worked closely with ODOT, the Ohio Dam Safety Office and other state agencies to develop a solution that addressed public safety while at the same time permanently breach the dam. By removing the upstream arch spillway, the impoundment was removed thus eliminating the potential for an uncontrolled release of water downstream. With the impoundment lowered and the spillway removed, ODOT addressed the second phase of the project which involved reconstruction of the roadway and replacement of the culvert.

Project Manager, Decommissioning of Whites Mill Pond Dam in Winchendon, Massachusetts. GZA was engaged to design and permit the project. GZA began the project by inspecting the dam and creating site plans that defined topography, bathymetry, and regulatory resource areas in and around the pond. GZA also modeled the hydrology and hydraulics of the river system, including assessment of post-breach flow depths and velocities for fish passage. GZA designed a breach configuration to match the expected natural river characteristics based on adjacent channel morphology. A wide overbank area was specified, and streambank stabilization was provided in-part via coir logs. An in-stream sediment management plan was developed assuming return of natural sediment transport and channel formation. After an extensive process, all permits were obtained. The project is now awaiting final grant funding prior to execution.

Project Manager, Mahar Regional School Dam, Dam Rehabilitation, Orange, Massachusetts. The Mahar Pond Dam is a small but significant hazard dam located on regional school property in the Town of Orange. GZA assisted the District with evaluating the pros and cons for both removal and rehabilitation of the dam. After careful consideration, the District has elected to rehabilitate the dam. GZA prepared plans, specifications and permits for the project. The project was successfully completed in May of 2016.

Project Manager, Blakes Pond Dam, Dam Rehabilitation, Mansfield, Massachusetts. GZA designed, permitted, and prepared bidding documentation for rehabilitation of Blakes Pond Dam which is part of the water supply system for the City of Attleboro, MA. The project involved replacing the existing steel sheet-pile dam with a new steel sheet-pile dam about 5 feet downstream. The new dam included a primary spillway and a new aluminum stop log bay. The stop log bay is accessed via a new steel pedestrian stairs/deck. The project also included reconstruction of the existing, adjacent earth dike and rehabilitation of an auxiliary spillway on the dike. GZA prepared plans, specifications and permits for the project. The project was successfully completed in June of 2018.

DAM INSPECTIONS

Project Manager, Massachusetts Department of Conservation and Recreation Follow-up Dam Inspections-Massachusetts (2009- present) Under a task order agreement with the DCR, GZA annually performs Phase I and Follow-up inspections for Massachusetts dams. The majority of which are owned by the DCR. Mr. Schipper has been project manager for these inspections since 2009. During this time, over 300 dam inspections have been completed by GZA.

Derek Schipper, P.E.

Senior Consultant

Project Manager, Phase I Inspection of Dams, Various Towns, Massachusetts. Mr. Schipper has performed numerous Phase I Dam Inspections for various municipalities in the Commonwealth of Massachusetts. The visual inspections were conducted in accordance with the Commonwealth of Massachusetts's regulations from the Office of Dam Safety. Mr. Schipper prepared or oversaw preparation of Phase I Inspection reports which included recommendations for repair, improvements, or further studies for each dam.

Project Manager, Phase I Dam Inspections, Aquarion Water Company, Various Towns, Connecticut, and New York. Mr. Schipper has performed numerous Phase I Dam Inspections for the Aquarion Water Company. Mr. Schipper prepared or oversaw preparation of Phase I Inspection reports which included recommendations for repair, improvements, or further studies for each dam.

Project Manager, Phase I Dam Inspections, Crane Paper Company, Dalton, Massachusetts. Mr. Schipper has performed Phase I Dam Inspections for five dams owned by the Crane Paper Company in Dalton, Massachusetts. The dams are located in series along the East Branch of the Housatonic River. The visual inspections were conducted in accordance with the Commonwealth of Massachusetts's regulations from the Office of Dam Safety. Mr. Schipper prepared or oversaw preparation of Phase I Inspection reports which included recommendations for repair, improvements, or further studies for each dam.

WATER CONTROL

Project Manager, Construction-Phase Water Control for the Hogansburg Dam Removal Project, Akwesasne, New York. GZA was engaged by the contractor tasked with the removal of the Hogansburg Dam on the St. Regis River in upstate New York. The former hydroelectric facility included a concrete ogee overflow section across the majority of the river. GZA prepared a phased water control plan which allowed the contractor to remove the dam in the dry while maintaining river flow. GZA designed an upstream rockfill cofferdam which incorporated an impervious membrane as the flow barrier. The cofferdam not only diverted flow but also served as a work platform for demolition equipment. Downstream backwater was controlled by a bulk sandbag cofferdam. Turbidity curtains and other best management practices were also incorporated into the water control plan to mitigate the potential for turbidity release during the project.

Project Manager, Construction-Phase Water Control for the Lewis Pond Remediation Project, Walpole, Massachusetts. GZA developed a construction-phase water control plan to facilitate the remediation of contaminated sediments under a pond associated with a Superfund site. GZA was engaged by the remediation contractor during the bid phase to develop a concept plan for sequentially diverting water around work areas to allow for the excavation of contaminated sediments from the pond bottom. Upon project award, GZA developed final designs and a water control submittal in accordance with the project specifications. Water control was achieved primarily through diversion within the pond area using linear rows of bulk sandbags and steel sheet piles. The water control submittal included HEC-RAS modeling of anticipated water depths and velocities during each phase of water diversion and sheet pile design calculations based on limited sub-surface explorations. GZA developed final designs and a water control submittal in accordance with the project specifications. Water control was achieved primarily through diversion within the pond area using linear rows of bulk sandbags and steel sheet piles. The water control submittal included HEC-RAS modeling of anticipated water depths and velocities during each phase of water diversion and sheet pile design calculations based on limited sub-surface explorations.

Project Manager, Construction-Phase Water Control for the Irish Dam Remediation Project, Shrewsbury, Massachusetts. GZA developed a construction-phase water control plan to facilitate the replacement of the bascule gate at the Irish Dam at the lower end of the Lake Quinsigamond system. The project design required the full removal and replacement of a long bascule gate. The water control specifications required the pond to be maintained at normal pool during the work and provision of a dry work area. GZA designed upstream and downstream cofferdams to isolate the work area and developed calculations to demonstrate that required flood flows could still pass the remaining fixed spillway without adverse impacts to the site or upstream.

Project Manager, Construction-Phase Water Control for the Muddy River Restoration and Flood Control Project, Boston, Massachusetts. Phase 1 of the USACE-designed restoration of the Muddy River in Boston involved the daylighting of a long stretch of river, as well as other channel and bank improvements. GZA worked with the construction contractor to design a construction-phase water control plan which allowed for simultaneous in-channel construction, maintenance of normal downstream flow, and the ability to pass potential flood flows. A hybrid system using both large pumps and temporary sheetpile diversion cofferdams was

Derek Schipper, P.E.

Senior Consultant

designed which allowed for staged channel construction in the dry. Portions of the channel were divided longitudinally using steel sheetpile which permitted construction on one side while maintaining flow on the other. GZA completed construction-phase subsurface investigations and prepared cofferdam designs. GZA also developed a HEC-RAS model of the river system that validated the water control plan and demonstrated compliance with the USACE specifications regarding allowable upstream water surface elevations. The system was tested several times by intense rainfall during construction and performed as intended.

GEOTECHNICAL ENGINEERING

Project Manager, Sunrise Senior Living Projects, Connecticut/Rhode Island/Massachusetts. Project manager for over 15 independent/assisted senior living complexes. Complexes typically include 3- to 4-story structures with an MSE retaining wall. GZA performed subsurface investigations and provided foundation, retaining wall and pavement design and construction recommendations for each of the projects.

Project Manager, University of Massachusetts Medical Center, Worcester, Massachusetts. Provided comprehensive geotechnical and environmental services for a new 7-story medical Office Building. Recommended spread footings after replacement of existing fill.

Project Manager, Chelsea Jewish Nursing Home, Chelsea, Massachusetts. Project manager for a proposed 6-story nursing home facility. The project involves construction of the proposed building within a small site with challenging geotechnical conditions including cuts and fills for a step foundation and significant dewatering controls.

Project Manager, New Seabury Properties, Mashpee, Massachusetts. Project manager for development of the Vineyard Reach and Sea Quarters residential subdivisions at New Seabury, Massachusetts. GZA's role involved subgrade preparation for the proposed high-profile, townhouse-style structures. Fills of up to 20 feet were required for the Vineyard Reach project. Moisture control of imported soil was a critical component to the placement of the fill.

Project Manager, CertainTeed Facility, Norwood, Massachusetts. Project manager for a pollution control facility at an existing plant. Subsurface conditions consisted of about 15 feet of fill underlain by buried organics underlain by granular soils. A drilled mini-pile foundation was recommended and installed.

Project Manager, Grafton Public Water Supply Tank, Grafton, Massachusetts. Project manager for a 1-million-gallon public water storage tank.

Project Manager, Walgreen's Worcester, Massachusetts. Project manager a permanent drilled soldier pile wall with precast concrete panels for a pharmaceutical store in an urban neighborhood.

Project Engineer, Super Stop & Shop, Hyannis, Massachusetts. This project consisted of the redevelopment of an existing, active shopping plaza to include a new supermarket. Mr. Schipper coordinated and observed a test pit and boring exploration program and prepared the geotechnical engineering report. Recommendations

Project Engineer, Barnstable County Correctional Facility, Otis Air National Guard Base, Bourne, Massachusetts. Mr. Schipper coordinated and observed a test pit and boring exploration program for the proposed correctional facility. GZA's scope included environmental and geotechnical work. Coordinated project activities with military personnel.

Project Engineer, Crash Fire Rescue Facility, Otis Air National Guard Base, Bourne, Massachusetts. Mr. Schipper coordinated and observed a test pit and boring exploration program for the proposed facility. GZA's scope included environmental and geotechnical work. Coordinated project activities with military personnel.

Field Engineer, Hampton Inn, Cambridge, Massachusetts. Full-time field engineer on the construction of a 7-story hotel with below grade parking. A challenging job due to different construction activities which included underpinning of a 5-story masonry building with jet grouted columns; soldier pile/lagging with tiebacks excavation support system; subgrade preparation for spread footings with subsequent backfill and compaction (with nuclear gauge for confirmation of required densities). Prepared weekly field reports summarizing construction activities.

Derek Schipper, P.E.

Senior Consultant

Field Engineer, Wellesley Gateway Project, Wellesley, Massachusetts. Field duties at a major "high exposure" medical office building/parking garage development included contaminated soil screening/segregation; observation of a relatively large excavation/replace action (up to 15-feet deep) involving the removal of unsuitable subgrade levels and subsequent replacement and compaction using a wide variety of on-site materials (crushed demolition/concrete debris, "clean" on-site and off-site fills; observation gas mitigation system (with vent pipe, VOC liner collection/ barrier system) including inspection of geomembrane liner installation, seaming and testing procedures and observation of backfill/compaction for building footings and utilities. Prepared weekly field reports summarizing construction activities.

Project/Field Engineer, Douglas High School, Douglas, Massachusetts. Project engineer for the site preparation phase of the new Douglas High School. Site preparation included the construction of 3:1 slopes (up to 30 feet high), detention basins and building subgrade using on-site soils and blastrock. Mr. Schipper monitored construction of a 400-linear-foot presplit rock face during the project.

Project/Field Engineer, Bird Landfill Closure, Walpole, Massachusetts. Involved in the design of the closure of an 8-acre, private landfill using AutoCad. Field duties included observations, testing and recommendations associated with the closure. Inspected geomembrane liner installation, seaming and testing procedures. Performed thickness checks of multiple layers of the cap system. Prepared final closure report documenting all construction activities for approval by the (MADEP). Also performed annual groundwater monitoring and sampling and prepare groundwater monitoring report for review of the (MADEP). Plotted groundwater contours using AutoCad.

Project/Field Engineer, Hydrogeologic Evaluation at Westford Middle School at Stony Brook Center, Westford, Massachusetts. Mr. Schipper conducted DEP-witnessed test pits and percolation tests for this 177-acres site, which, when completed, will house a 750-student middle school, town annex, and 15, three-bedroom housing units. The design flow for the wastewater treatment facility is 22,000 gpd. The project received DEP - Groundwater Discharge Permit approval in late-2001.

Publications and Presentations

Schipper, D.J. and Cox, C.W. "Water Control for Phase I of the Muddy River Flood Damage Reduction and Environmental Restoration Project, Brookline/Boston, MA" BSCES News. December 2016.

Schipper, D.J., Cox, C.W., and Gode-von Aesch, W.A. "Rehabilitation of the Hemlock Gorge Spillway Dike, Newton, MA" BSCES News. Jan. 2013.

Chad W. Cox, P.E.

Senior Principal/Civil Engineer

Summary of Experience

Mr. Cox has extensive experience in many aspects of civil engineering including dam safety and design, hydroelectric project development, water supply, transportation, and geotechnical construction. In addition, he is also well-versed in the permitting process which accompanies large civil works, having prepared permit applications required by the U.S. Army Corps of Engineers, EPA, NEPA, MEPA, and others as well as hydropower licensing documents for the Federal Energy Regulatory Commission. Mr. Cox has worked on numerous dams performing such tasks as inspection, deficiency evaluation, planning, hydraulic, structural, and geotechnical design, contract writing, contractor submittal review, and construction observation. Mr. Cox's hydropower experience extends the full range from resource evaluations to final design and construction. Before joining GZA, Mr. Cox was with The Benham Group where, in addition to working on dam projects, he was involved in highway planning and design. Mr. Cox served overseas with the Peace Corps for over two years as a water supply engineer. His duties included water system design and repair, extensive interaction with governmental and donor agency officials, and field visits into remote regions of the Himalayas. In 2005-2006, Mr. Cox proposed and facilitated a research trip for MIT graduate students to study water quality issues in Lake Yojoa in Honduras.

Education

B.S.E., 1992, Civil Engineering/Water Resources, Princeton University
M.Eng., 1999, Civil and Environmental Engineering, Massachusetts Institute of Technology

Licenses & Registrations

Professional Engineer – MA #45856

Areas of Specialization

- Dam Safety and Design
- Hydropower Engineering
- Water Resources Engineering
- Geotechnical Engineering

Relevant Project Experience

DAM SAFETY & DESIGN

Project Manager, McAdams Dam, Barnard, Vermont. A project to design and construct a new dam for a private landowner for the purpose of creating a lake for recreation and fire protection. Worked with Owner and Architect to develop a series of conceptual designs for dam. Utilized subsurface data from GZA drilling program to set location and alignment of dam. Designed masonry-face concrete spillway to pass typical flows. Design flood accommodated by spillway and stormwater by-pass pipeline. Spillway designed to mimic visual appearance of nearby old "mill dams." Designed adjacent earthfill embankment with toe drain to serve as primary water retaining structure. Designed program to blast and excavate highly fractured bedrock in abutment and replace with impervious fill material to act as seepage blanket. Prepared construction plans and limited specifications. Managed GZA's construction observation program & worked with contractor. Prepared completion report.

Principal-in-Charge, Hemlock Gorge Spillway Dike Rehabilitation, Newton, Massachusetts. After multiple inspections found this ancillary dike on the Charles River to be in Unsafe condition, GZA assisted DCR with design and implementation of interim repairs to the structure. GZA then designed a complete replacement for the dike and developed project plans, specifications, contract documents, and permit applications under an expedited schedule. GZA design and permitting of the project was completed in approximately 3 months. The design included a new reinforced concrete structure with post-tensioned anchors. Project challenges included providing temporary water control on the Charles River, accommodating historic and cultural resources concerns, and mitigating impacts in an environmentally sensitive area.

Principal-in-Charge /Project Manager, Upper Mystic Lake Dam Rehabilitation, Arlington/Medford, Massachusetts. A project to design and permit the rehabilitation

Chad W. Cox, P.E.

Senior Principal/Civil Engineer

of the DCR-owned Upper Mystic Lake Dam. The project included subsurface investigations, a deficiency verification program with slope stability analyses, preparation of an Emergency Action Plan, hydraulic analysis, conceptual design, permitting, and final design. The design addresses inadequate spillway capacity, insufficient slope stability, and potentially liquefiable soil conditions. Project features include two new bottom-hinged crest gates, a new ogee secondary spillway and conduits, a new composite sheetpile cutoff wall, reconstructed embankment portions, new riprap filter toe, a fish ladder, and the first permanent eelway structure in Massachusetts. Sheet pile cofferdams were designed to allow the project to proceed in two phases without a lake drawdown and without loss of spillway capacity at any time. Permits were obtained from MEPA, the USACE, MADEP, Office of Dam Safety, and two local conservation commissions. Construction has been successfully completed.

Project Manager, Ponkapoag Pond Dam Rehabilitation, Canton, Massachusetts. Managed the total project cycle for the rehabilitation of the DCR-owned Ponkapoag Pond Dam, with a scope of work including Phase I Inspection, Emergency Action Plan preparation, Phase II Engineering and Alternatives Analysis, Final Design, and Permit Application Preparation Project site presented a number of challenges due to location within an ACEC and presence of multiple endangered species in the pond and at the dam site. The final design included a new service spillway and water control system for the pond, as well as a side flow ogee secondary spillway. Embankment repairs addressed seepage concerns and the presence of a peat layer under a significant portion of the dam. The project was successfully completed and has already performed well under extreme flood conditions.

Project Manager, Unionville Pond Dam Expedited Interim Repairs, Holden, Massachusetts. A project to inspect the dam and design interim repairs to correct storm-induced damage to the structure. Deterioration to the CMP spillway conduits had led to a loss of material from the dam and the formation of a sinkhole in the road on top of the dam. GZA designed an interim repair project to line the existing conduits with large HDPE pipes and grout in place. Water and traffic control were key issues. Project was successfully implemented on time and under budget.

Project Manager, Dam Safety Emergency Response, Statewide Massachusetts. In October 2005 and again in March 2006, heavy rains cause emergency situations at many dams throughout Massachusetts. At the request of the Massachusetts Office of Dam Safety, Mr. Cox personally responded to the Upper Flint Pond Dam in Tyngsborough, MA to provide dam engineering advice to the incident commander during near-overtopping events. During the March 2006 event, Mr. Cox recommended, designed, and oversaw construction of an emergency bypass channel to help prevent overtopping of the dam. Following the October 2005 events, Mr. Cox managed GZA's efforts to rapidly inspect more than two dozen poor or unsafe conditions dams as part of the overall emergency inspection effort ordered by the Governor.

Senior Dam Engineer, Dam Safety Emergency Response, Freetown, Massachusetts. During the three major floods which occurred between late February and early April, 2010, Mr. Cox provide emergency assistance to the MADCR Office of Dam Safety in monitoring and stabilizing the three dams on the Assonet River in Freetown, MA. Two of these dams, Forge Pond Dam and Monument Pond Dam, had previously been judged as Unsafe by GZA and DCR. Mr. Cox spent several nights at the site monitoring conditions, coordinating with state and local officials, and directing sandbagging and other stabilization efforts. During two of the floods, the EAP was initiated and the downstream population at risk was evacuated. GZA recommended that Forge Pond Dam be breached on an expedited bases to address safety concerns and was then asked by DCR to provide engineering services for that project.

Independent Reviewer, Multiple CCW Impoundment Inspections, Nationwide. As part of the EPA effort to inspect coal combustion waste (CCW) impoundment structures in the wake of the 2008 failure of such a structure in Tennessee, GZA was engaged to inspect numerous coal ash dams and storage ponds throughout the US. Mr. Cox served as the independent quality control reviewer for numerous inspection reports produced by GZA.

Project Manager, DCR-Owned Dam Inspections, State-wide Massachusetts. A project to inspect 60 dams owned by the Commonwealth of Massachusetts throughout the State. Project included a very aggressive timeline for the submission of the inspection checklists, which was met by GZA. Mr. Cox managed a project team of more than a dozen GZA engineers who inspected multiple dams and produced Phase I Inspection Reports using the new format mandated by the Massachusetts Office of Dam Safety.

Chad W. Cox, P.E.

Senior Principal/Civil Engineer

Principal-in-Charge / Project Manager, Phase I Inspection and Follow-Up Inspections of Poor and Unsafe Dams, Statewide Massachusetts. Multiple projects to perform Phase I Dam Safety Inspections and 6-Month Follow-Up Inspections on multiple DCR and other dams throughout the Commonwealth. Follow-up inspections were performed on dams previously classified as in "Poor" or "Unsafe" condition. Where warranted, GZA made recommendations for immediate action judged necessary to protect the public safety.

Project Manager, Ponkapoag Pond Dam Inspection and EAP, Canton, Massachusetts. A project to produce a Phase I inspection of the dam. Based on the recommendations contained in the Phase I report, the Owner, the MA Dept. of Conservation and Recreation, commissioned GZA to produce a Phase II Engineering Evaluation Report. Mr. Cox managed this effort and was the principal author of the Phase II report, which included a set of concept-level rehabilitation plans. Also based GZA recommendations, DCR contracted with GZA to produce an Emergency Action Plan for the dam. The plan was produced and submitted to Canton Emergency Managers and MEMA.

Project Manager, Whitehall Reservoir Dam, Hopkinton, Massachusetts. Phase II inspection and investigations, including borings and hydraulic studies, at the failed Whitehall Reservoir Dam, which is managed by the Massachusetts Dept. of Conservation and Recreation. Developed conceptual alternatives for repair and presented to owner and various stakeholders. After achieving consensus on preferred alternative, completed and submitted multiple permit applications and attended public meetings in support of the applications. Completed final design plans and specifications for repairs and improvements to the dam and upstream cofferdam. Managed re-design efforts to respond to request from community to preserve historic gatehouse structure. Provided DCR with construction oversight services during project implementation and through project completion.

Project Manager, Buckley Dunton Lake Dam, Becket, Massachusetts. Inspection and rehabilitation of a failing dam owned by the Commonwealth of Massachusetts. The Department of Conservation and Recreation engaged GZA to provide inspection, designs, permit applications, and construction assistance for the expedited reconstruction of this dam in October Mountain State Park. Developed an innovative approach to repair design which is estimated to have saved the owner more than $160,000. Designed repairs, prepared technical specifications, and managed the permit application process. Provided construction-phase services during project implementation and through project completion. Prepared and presented paper detailing project at ASDSO national Dam Safety Conference.

Project Manager, Eleven Poor / Unsafe Dam Inspections, Southeastern Massachusetts. Inspection and condition verification of eleven dam previously found to be in "poor" or "unsafe" condition. The MA Office of Dam Safety engaged GZA to inspect and prepare inspection reports for dams of special concern. Dams were inspected on a rapid schedule and inspection reports prepared as per Office of Dam Safety Format.

Project Manager, Ashokan Dam Valuation Study, Ashokan, New York. A project undertaken for the NYC DEP to establish the current value of the Ashokan Dam (including the Olive Bridge Dam gravity structure and all earthfill dikes surrounding the reservoir) and ancillary structures for purposes of tax valuation. Managed the quantity estimate and condition assessment portion of the work which involved making independent estimates of the material quantities in the structures and assessing the current condition of each structure.

Project Manager, Arlington Reservoir Dam, Arlington, Massachusetts. A project to further investigate deficiencies at a municipal dam and develop conceptual solutions. Managed phase II investigations and conceptual design study on the Arlington Reservoir Dam and swimming area dike. Developed geotechnical investigation program. Analyzed seepage through and stability of embankment and dike. Developed conceptual designs for rehabilitation and wrote report presenting findings and options.

Project Engineer, Great Pond and Upper Reservoir Dams, Braintree, Massachusetts. A project to investigate the state of two earthen water supply dams and develop conceptual alternatives for needed repairs. Analyzed the two dams, which are in series, for their response to 100-yr and ½ PMF floods using HEC-1 model. Developed rating curves for spillways under various flashboard configurations. Performed Incremental Damage Assessment using DAMBRK software in order to evaluate size of the Spillway Design

Chad W. Cox, P.E.

Senior Principal/Civil Engineer

Flood. Made conceptual recommendations, including cost estimates, for various remedial alternatives. Developed portions of EAP. Wrote dam operations & maintenance guide to be used by operations personnel.

Project Engineer, Risk Indexing for DEM-managed Dams in Massachusetts. A project to development a new method and associated computer model for prioritizing remedial actions at existing small embankment dams. Assisted with the testing of the computer model. Developed a prioritization list for ten dams for use by DEM Office of Dam Safety in requesting funding allocation. Wrote report and presented paper at ASDSO national conference.

Project Engineer, Rainbow Pond Dam, Walpole, Massachusetts. A project to study an earthfill dam and develop conceptual alternatives for repairs. Developed conceptual design for spillway improvement. Prepared quantity and cost estimates for various remedial alternatives.

Project Engineer, MDC Dam Inspections, Massachusetts. Participated in inspection of multiple Metropolitan District Commission dams in eastern Massachusetts.

Publications and Presentations

Andersen, G.R., Chouinard, L.E., Hover, W.H., Cox, C.W. "A Risk Indexing Tool for the Prioritization of Improvements to Inventories of Embankment Dams." ASCE Journal of Geotechnical and GeoEnvironmental Engineering, April 2001.

Andersen, G.R., Cox, C.W., Chouinard, L.E., Hover, W.H. "Prioritization of Ten Embankment Dams According to Their Physical Deficiencies." ASCE Journal of Geotechnical and GeoEnvironmental Engineering, April 2001.

Cox, C.W., "Dam Removal Projects in the Eastern United States." Proceedings of the 81st Annual Meeting of the International Commission on Large Dams. 2013

Cox, C.W., "Dam Owner Risk" Presentation at Environmental Business Council of New England program of Dam Owner Liability. June 5, 2013.

Cox, C.W., Ekholm, K. and Fay, C. "Assessing the Feasibility of a Conduit Hydropower Project – Details Matter" Presentation at the NEWWA Annual Conference. March, 2011.

Cox. C.W, P. Baril, W. Salomaa, and R. D. Clark. "A Possible Paradigm for Public Private Partnerships." Proceedings of the ASDSO National Conference, 2004.

Cox, C.W. Bjarngard, A.B., Hover, W.H. Investigations of Rock Foundation and Cyclopean Concrete at Gilboa Dam. Proceedings of Soil/Rock America Conference. 2003

Cox, C.W. and Leone, D.M., 2003. "Water Supply and Aquatic Habitat." Presentation to Clean Water Action Conference on Watershed Protection. , October, 2003.

Cox, C.W. and Leone, D.M., 2002. "Water Allocation Planning and Use." Presentation to Conference on Watershed Conservation 2002: Water Supply, Aquatic Ecosystems, and Planning, UMass Amherst. September, 2002.

Cox, C.W. "Incremental Risk Assessment Techniques for Choosing Inflow Design Floods at Dulce Lake Dam and Lower Mundo Lake Dam." Proceedings of ASDSO Western Regional Conference, pp. 173-182. 1997.

Hatem-Moussallem, M., Gaffney, Cox, & Batho. "Solutions to Water Scarcity in the Republic of Cyprus – A Proposal for Water Banking." MIT Dept. of Civil & Environmental Engineering Masters of Engineering Program, 1999.

Hersh, E. and Cox, C.W. "Dam Maintenance for Lake Management." Presentation to North American Lake Management Society National Conference – 2003. November, 2003.

Hover, W.H., Cox, C.W., Clark, R.D., Andersen, G.R., Chouinard, L.E. "Risk Indexing – A Technique for Prioritizing of Remedial Actions." Proceedings of ASDSO National Conference. 2000.

Hover, W.H., Cox, C.W. "Design, Permitting, and Construction of the Breaching of the Old Berkshire Mill Dam, Dalton, Massachusetts." Proceedings of the USSD National Conference, 2001.

Kevin Finn, P.E., PMP

Senior Project Manager

Summary of Experience

Mr. Finn is a Senior Project Manager with experience in various civil-structural engineering aspects of hydroelectric dams and other types of power generating facilities. He is experienced in the evaluation, design, geotechnical field studies, engineering, rehabilitation, and construction of hydroelectric and fossil fuel power facilities.

As Senior Project Manager, Mr. Finn provides staff oversight and support for active projects. His responsibilities involve the review and evaluation of data as part of dam safety inspections, preparation of pre-design investigation reports, assistance with bid specifications, geotechnical field studies, dam stability calculations and preparation of drawings. He is proficient in Staad, AutoCAD and AutoDesk Land Desktop, Seep/W, Dips, and other geotechnical joint mapping software, and Visual Basic.

Mr. Finn is an NCEES certified Professional Engineer licensed in ten states and is a certified Project Management Professional (PMP). He is active in the United States Society on Dams (USSD) and has co-authored and presented numerous technical papers.

Relevant Project Experience Prior to GZA

DAM SAFETY

Structural Engineer, Afobaka Dam, Suralco, Suriname. (2011-2020) Involved with various aspects of dam safety for this large concrete and embankment dam in South America. The main dam consists of a sloping clay core embankment section over one mile long with integral powerhouse and gated spillway section with five 35-foot-wide by 40-foot-tall Tainter Gates. The appurtenant water retaining structures included four main zoned embankment Saddle dams (50 to 90 feet tall and approximately 200 feet long) and 12 minor Saddle dams that cover a stretch of about 12.5 miles. Specific projects included:

Principal-in-Charge, providing field oversight and serving as task lead for assisting client with first documented full open gate testing at the project. Scope included performing Owner's Engineer services for their procurement of a segmented floating bulkhead system, providing in-country oversight for the deployment of the floating bulkhead system, and documenting the results of the full open gate testing **(2018-2020)**

Principal in Charge, Primary Reviewer and Task Lead for the development of engineering studies needed to supplement the available historic records on site and provide updated factors of safety for the project structures. Scope of the work included:

- Developing project record stress calculations and analyses for the project's Tainter Gates;
- Modeling seepage and slope stability for the saddle dams;
- Providing spillway deck rating for moving vehicle loading;
- Performing conceptual studies to mitigate and plan for potential dam breaches;
- Redeveloping and updating existing Emergency Action Planning inundation maps to model breach of main dam and each side of Saddle Dikes;

Education

B.S., Civil Engineering, Brown University, 2007
M.S., Structural Engineering, Northeastern University, 2012

Additional Education/Training:
Leveraging Potential Failure Mode Analyses (PFMAs) to Perform Semi-Qualitative Risk Analyses (SQRAs), USSD, 2002

Licenses & Registrations

Professional Engineer:
Massachusetts, 2012, #49858
Florida, 2018, #86187
Georgia, 2019, #PE044117
Illinois, 2017, #62.070075
Michigan, 2016, #6201064093
North Carolina, 2012 #039539
New York, 2012, #091474
Pennsylvania, 2023, #PE094239
Rhode Island, 2013, #10047
Tennessee, 2012, #116159
Texas, 2015, #120892
Vermont, 2023, #018.0135562

Professional Management Professional (PMP), 2017, #2050027

Memberships & Affiliations

- United States Society on Dams

Areas of Specialization

- Analysis and Design – Civil/Structural
- Dam Rehabilitation and Remediation
- Dam Safety
- Instrumentation and Monitoring
- Conceptual and Feasibility Studies

Kevin Finn, P.E., PMP

Senior Project Manager

- Conducting Supplemental Potential Failure Modes Analysis session, with core internal and external team from the 2011 study. **(2017);**
- Core team member for visual inspection of the project features, interview of operations team, and review of operations and maintenance procedures related to monitoring of dam safety **(2011 & 2017);**
- Participating in a Potential Failure Mode Analysis workshop modeled after the FERC process. Coordinated and documented the results of a dam safety inspection for the main dam (which includes over 1 mile of embankment dam), concrete intake section with integral powerhouse, and sixteen saddle dams. **(2011);**
- Developing and providing field support for a dam foundation drain improvement program to relieve uplift pressures. Drain cleaning program included pressure washing the drains, removing construction-era debris from the drains, and using rotary equipment to dislodge and remove calcite and efflorescence that had accumulated in the drains. **(2011-2014);**
- Completing a stability analysis (including foundation drain sensitivity analyses) for the concrete intake section of the dam. **(2012).**

DAM REHABILITATION AND REMEDIATION

Structural Engineer, Brookfield Renewable, Santeetlah Station Right and Left Side Slot Cuts, North Carolina. (2011-12, 2014-15) Onsite during two separate diamond wire saw cutting programs to reestablish a full width by approximately 80-foot-deep slot in the dam to relieve internal stresses due to alkali-aggregate reactivity (AAR). His responsibilities focused on modifying the instrumentation collection and evaluation systems to allow for real time monitoring of the behavior of the dam during the slot cut, and evaluating the movement, stress, seepage, inclination, and other measurements during the slot cutting. The two separate programs were performed on a round-the-clock basis for more than 2.5 weeks each.

Field Engineer and Construction Support, Brookfield Renewable, Chilhowee Station South Embankment Repairs, Tennessee. (2007-2009) Mr. Finn was involved in monitoring construction activities for the excavation, foundation preparation, and reconstruction of an 80-foot-tall high hazard rockfill embankment dam that had areas of considerable settlement and extensive sinkholes. Responsibilities included preparing contract documents, regulating quality control for on-site activities while providing extensive site inspections and preparing construction reports for the repair.

Project Manager, Brookfield Renewable, Schuylerville Dam Spillway Improvements, New York. (2012-2015) Lead engineering design work for modifications to the hydropower facility to allow it to safely pass the IDF water flow. Three-phased approach, which involves replacing partially demolishing two sections of the dam over separate construction cycles and replacing with timber flashboards and trippable stanchion systems, and raising a third section, to accommodate the IDF. Project design includes the installation of post tensioned rock anchors, steel walkways, and concrete overlays. First phase of construction has been completed.

Structural Engineer, Brookfield Renewable, Hannawa Falls Powerhouse Rebuild Project, New York. (2011-2013) Project included evaluating the existing conditions of the 100+ year old generating facility structural walls and water passages, and ultimate removal and replacement of the 200-foot by 30-foot downstream wall of the powerhouse. As the roof bears directly on the masonry walls, the design included hydraulically jacking the roof trusses off the existing walls to transfer their support to a new internal steel framing structure. Mr. Finn designed many aspects of the cofferdam system to dewater the tailrace work area, the internal steel framing system, and the instrumentation program that was instituted prior to construction to monitor the performance of the structure outside of the work area during construction.

Construction Support, Alcoa Power Generating Inc., Estreito Hydroelectric Project, Brazil. (2009-2011) Mr. Finn was involved in monitoring construction progress and activities to determine the budget and schedule implications of the work progress on site and the corresponding implications for the total project cost for the client. Responsibilities included monitoring weekly and monthly physical progress reports, budgetary data, and construction schedules, as well as providing translation support.

CONCEPTUAL AND FEASIBILITY STUDIES

Civil Engineer, Uniontown, Newburgh, and Overton Projects, Indiana, Kentucky, and Louisiana. (2009-2010) Involved in updating previous preliminary designs for the addition of run-of-river hydroelectric facilities to existing lock and dam structures.

Kevin Finn, P.E., PMP

Senior Project Manager

Responsibilities included generating cost estimates for excavations and support of excavation structures, drafting conceptual and design CAD drawings, and preparing summary reports for the design of the facilities.

Field Engineer and Design Engineer, Alcoa Hydro Development GPPG, Greenland Hydroelectric Project, Greenland. (2007-2013) Involved in determining the quality of rock along dam, tunnel, and canal alignments, overseeing on-site geophysical investigations, and monitoring geotechnical drilling for the preliminary design stages of a proposed hydropower project that would include numerous dams, tunnels, canals, two major reservoirs and a new power plant. Geotechnical responsibilities included directing about 1.5 km of soil and rock drilling, facilitating instrument installation in drill holes up to 450 m deep, overseeing geophysical subsurface investigations, assisting with geotechnical surveys, drafting reports on rock quality along civil works, analyzing topography and subsurface strata to identify optimal dam and tunnel alignments, preparing contract documents, and preparing various AutoCAD drawings. Civil/structural responsibilities included verifying the locations of proposed civil works and evaluating conceptual level designs for the proposed structures.

Publications and Presentations

"Automatic Data Acquisition System at Santeetlah Dam," (Kevin Finn, Alvin Diamond, Michael Sabad, Paul Shiers, Jesse Kropelnicki) presented at the 32nd Annual USSD Conference, New Orleans, Louisiana, April 2012.

"Cause of an Embankment Dam Sinkhole," (John Lyon, Ray Barham, Paul Shiers, Kevin Finn, Michael McCaffrey) presented at the 30th Annual USSD Conference, Sacramento, California, April 2010.

"Concrete Placement and Rehabilitation at the Hannawa Development," (Bryce Mochrie, Lee Talbot, Kevin Finn) presented at the 33rd Annual USSD Conference, Phoenix, Arizona, February 2013.

"Increasing the Flood Capacity of a 95-Year-Old Dam," (Kevin Finn, John Valley, Marc Buratto, Bryce Mochrie) presented at the 34th Annual USSD Conference, San Francisco, California, April 2014.

"Leak Sealing of Underwater Joint on Upstream Face of a Concrete Gravity Dam," (Kevin Finn, Jeff Auser, Matthew Johnson, Paul Shiers, Michael McCaffrey) presented at the 35th Annual USSD Conference, Louisville, Kentucky, April 2015.

"PFMA and Risk Management for a Large Unregulated Dam," (E. Ray Barham, Michael McCaffrey, Richard Tucker, Kevin Finn) presented at the 81st Annual ICOLD Conference, Seattle, Washington, August 2013.

"Powerhouse Rehabilitation – Hannawa Powerhouse Case Study," (Bryce Mochrie, Karen Counes, Lee Talbot, Dan Parker, Kevin Finn) presented at the Annual HVI Conference, Louisville, Kentucky, July 2012.

"Rebuilding an Embankment Dam at a Sinkhole," (John Lyon, Ray Barham, Paul Shiers, Kevin Finn, Bryce Mochrie) presented at the 30th Annual USSD Conference, Sacramento, California, April 2010.

"Rehabilitation Technologies to Respond to Changing Loading Conditions at a 114-Year-Old Structure," (Bryce Mochrie, Lee Talbot, Kevin Finn, Peter Bouchie) presented at the 34th Annual USSD Conference, San Francisco, California, April 2014.

"Remote Inspection of Draft Tube Slab," (Kevin Finn, Bryce Mochrie, Alexander Brey, Kareem Bynoe) presented at the Annual HVI Conference, Denver, Colorado, June 2013.

"Slot Cutting to Manage AAR Growth at Santeetlah Development," (Jesse Kropelnicki, Jeff Auser, Bryce Mochrie, Kevin Finn) presented at the Annual HVI Conference, Denver, Colorado, June 2013.

"Trippable Stanchion System to Increase IDF Discharge Capacity," (Kevin Finn, John Valley, Marc Buratto, Bryce Mochrie) presented at the Annual HVI Conference, Nashville, TN, July 2014.

Joel Bilodeau, PH

Senior Consultant

Summary of Experience

Mr. Bilodeau has over 16 years of civil engineering experience related to hydroelectric projects with an emphasis on hydraulics and hydrologic analyses and modeling. He has extensive experience with one-, two-, and three-dimensional hydrodynamic modeling packages as well as having supported the development of several physical models for both spillway designs and recreational flow release structures. Mr. Bilodeau has experience in Federal Energy Regulatory Commission (FERC) Part 12 dam safety-related work includes dam failure and hazard analysis, determination of spillway adequacy, determination of probable maximum precipitation (PMP) and probable maximum flood (PMF) for determination of the inflow design flood (IDF), and preparation of inundation maps and emergency action plans (EAPs). His experience in spillway remediation and design has included rock and soil erosion analysis by determining erosion thresholds relating to stream power and Erodibility Index. His expertise also includes development of site hydrology including unregulated inflow, flood-flow frequency analysis, river-channel and reservoir routing, and open-channel modeling and analysis. Mr. Bilodeau has served as lead engineer and hydraulic modeler for several projects related to the Nuclear Regulatory Commission's (NRC) 10 CFR 50.54(f) order for Fukushima Near-Term Task Force (NTTF) Recommendation 2.1. In addition, he has served as support engineer for several FERC re-licensing projects and has assisted in the evaluation, analysis and design of hydroelectric projects relating to feasibility studies for plant unit rehabilitation / replacement and increasing spillway capacities.

Relevant Project Experience

Cedar Cliff Hydroelectric Development, Spillway Design, Duke Energy, Near Tuckasegee, North Carolina. Lead hydraulic engineer/modeler for the remediation and spillway design to increase discharge capacity for the Development to safely pass the IDF. Responsibilities included 1-D and 2-D hydrologic and hydraulic modeling, active lead for all H&H tasks, development of CFD and Physical model boundary conditions, CFD and Physical model results review, and summary report development. Mr. Bilodeau also provided engineering oversight on behalf of client in conducting modeling facility witness tests and reviewing model results of the hydraulic performance of the spillway under various discharge events up to and including the PMF.

Great Falls Dearborn Hydroelectric Development, Compliance Flow Release Structure Design, Duke Energy, Great Falls, South Carolina. Lead hydraulic engineer/modeler for the design of the compliance flow release structures. Responsibilities included empirical based conceptual design, 2-D hydrologic and hydraulic modeling, reservoir operations modeling, active lead for all H&H tasks, development of CFD and Physical model boundary conditions, CFD and Physical model results review, and summary report development. Mr. Bilodeau also provided engineering oversight on behalf of client in conducting modeling facility witness tests and reviewing model results of the hydraulic performance of the spillway under various discharge events.

Western Hydro Division, Dam Break and Inundation Mapping, Southern California Edison, California. Lead Hydraulic Modeler for the analyses of the inundation resulting from the postulated breaches of 8 Extreme High Hazard and High Hazard Dams and their

Education

B.S., Hydrology, University of New Hampshire, 2005

Licenses & Registrations

Professional Hydrologist Designated by the American Institute of Hydrology, 2012, #12-H-4019

Certifications & Specialized Training

- Introductory Water & Environmental FLOW-3D Workshop, Flow Science, 2016
- Introduction of InfoWorks ICM, Innovyze, 2012
- 2D Modeling in InfoWorks ICM, Innovyze, 2012
- Water Management 2007: Improved Inflow Forecasts for Hydropower, Centre for Energy Advancement through Technological Innovation (CEATI), 2007
- Dam Failure Analysis Advanced Technical Seminar, Association of State Dam Safety Officials (ASDSO), 2006

Affiliations/Memberships

- Member, Association of State Dam Safety Officials

Areas of Specialization

- Hydraulic Engineering
- 2-D Hydrodynamic Modeling
- CFD Modeling
- Surface Water Hydrology
- Dam Safety and Design
- Dam Emergency Action Planning
- Hydropower Engineering
- Water Resources Engineering
- Reservoir Operations

Joel Bilodeau, PH

Senior Consultant

associated critical appurtenant structures in SCE's Western Hydro Division in the Sierra Nevada Mountains in central California. Work included 2-D HEC-RAS hydraulic model development for sequential failures of structures during both PMF and Fair Weather conditions, summary report development, and the development of input data for inundation maps using California Department of Water Resources Division of Safety of Dams methodologies. The final model extended nearly 400 miles covering an area from the Sierra Nevada Mountains to the Sacramento-San Joaquin River Delta.

Eastern Hydro Division, Dam Break and Inundation Mapping, Southern California Edison, California. Lead Hydraulic Modeler for the analyses of the inundation resulting from the postulated breaches of 10 dams and their critical appurtenant structures in SCE's Eastern Hydro Division in the Sierra Nevada Mountains in central California. Work included 2-D HEC-RAS hydraulic model development for sequential failures of structures during both PMF and Fair Weather conditions, summary report development, and the development of input data for inundation maps using California Department of Water Resources Division of Safety of Dams methodologies.

Keowee-Toxaway Project, Dam Break Study and EAP Inundation Map Update, Duke Energy, Seneca, South Carolina. Lead hydrology/hydraulics modeler responsible for the determination of downstream impacts due to the hypothetical failures of Jocassee Dam and Keowee Dam during Fair Weather and PMF conditions. Project elements included the development of a HEC-RAS Model for the Savannah River system (575 miles including tributaries) consisting of approximately 15,250 cross sections, including 11 dams and levees. Extensive LiDAR, digital ortho-imagery and other digital terrain data were used in developing the model. Project modeling and inundation map development has been completed and GIS-based EAP maps have been distributed to local county emergency management agencies.

Swinging Bridge Dam Project, Emergency Action Plan (EAP), Mongaup, New York, Mirant NY-GEN, LLC. Developed EAP interim flowchart and notification lists. Contacted local, state and federal organizations throughout the process and assisted in conduction the EAP tabletop and functional exercises. Developed dam failure scenarios using U.S. Army Corps of Engineers' HEC-1 software.

Mongaup River Hydro System, Probable Maximum Flood (PMF) Study, Mongaup, New York, Mirant NY-GEN, LLC. Assisted in the development of hydraulic models using BOSS International's HMR-52 and the U.S. Army Corps of Engineer's Hydrologic Modeling System (HEC-HMS) to calculate the PMF for the five dams included in the Mongaup River hydro system.

Mongaup River Hydro System, Inflow Design Flood (IDF Study), Mongaup, New York, Mirant NY-GEN, LLC. Performed incremental dam failure and hazard analyses for determination of the inflow design flood (IDF) for each of the five dams in the Mongaup River hydro system. Determined breach parameters for each of the five dams in accordance with FERC guidelines. Estimated potential downstream flooding resulting from various dam failure scenarios along 120 miles of the Delaware River under normal operating and flood conditions using HEC-RAS software. Performed hazard analyses and worked extensively with the development of inundation mapping.

Drum Spaulding Project, Probable Maximum Flood (PMF) Study, Sierra Nevada Mountain Range, Pacific Gas and Electric Company. Provided engineering support for the development of the PMF for selected reservoirs in the Upper Drum System. Assisted with the development of the HEC-1 model to determine the PMF utilizing the methodologies prescribed in HMR 59 and the "energy budget method," as recommended by FERC engineering guidelines.

Eel Weir Development, Incremental Dam Breach Analysis (IDBA), Ogdensburg, New York, Erie Boulevard Hydropower, L.P. Developed HEC-RAS model using ArcGIS and HEC-GeoRAS. Mr. Bilodeau performed incremental dam failure and hazard analyses for the Eel Weir development. Estimated potential d/s flooding resulting from dam failure conditions and performed hazard analyses.

Publications and Presentations

A. Strain, J. Bilodeau, 2018, Developing Hydraulic Design Criteria at Duke Energy's Cedar Cliff Hydroelectric Development, USSD 2018 Conference, Miami, Florida.

J. Bilodeau, D. Soucie, S. Taylor, 2010, Modeling Large Terrain Datasets for Flood Inundation Mapping, Canadian Dam Association (CDA) 2010 Annual Conference, Niagara Falls, Ontario.

RESUME

Lexus Pattershall, E.I.T.

Engineer II

Summary of Experience

Mrs. Pattershall completed her undergraduate degree in the Spring of 2022 at the University of Vermont (UVM) and passed her Fundamentals of Engineering (FE) exam. Her passion for dam work began at UVM where she specialized in dam design and rehabilitation in her senior design classes. She aided remediation efforts at the Moscow Mill in Stowe, Vermont. Her team addressed ongoing sedimentation issues after Hurricane Irene while managing historical, budgeting, and environmental limitations. She joined GZA early July of 2022 and has been incorporated into a variety of dam work, such as Phase I Dam Safety Inspections/Reports, Part 12D Safety Inspection Report, and Potential Failure Modes Analysis (PFMA) Report.

Education

Bachelor of Science, Environmental Engineering, University of Vermont, 2022.

Certification/Trainings

- FE Certificate, May 2022
- Troxler Training
- 10-hour OSHA Training

Relevant Project Experience at GZA

DAM SAFTEY – INSPECTIONS

Northampton Phase I Inspections / Evaluation Reports, Northampton, Massachusetts. These high hazard reservoirs are owned and operated by the City of Northampton. The Francis P. Ryan and the West Whately Reservoir Dams are both active public water supplies while the Lower Roberts Meadow, Middle Roberts Meadow, Mountain Street Reservoir Dam are inactive backup water supplies for the city of Northampton. Mrs. Pattershall has conducted five dam inspections under the supervision of Matthew Taylor, P.E. She has developed her technical writing skills by preparing the reports for these dams.

DAM SAFTEY – REPORTS

Piedmont Hydroelectric Project, Potential Failure Modes Analysis (PFMA) Report, Piedmont, South Carolina.

The Central Rivers Power, LLC. owns and operates Piedmont Project. The Piedmont project was reclassified from a low to a high hazard dam. This reclassification initiated the FERC 1st Part 12D Inspection. Mrs. Pattershall has helped prepare the report that outlines the detailed discussion of Potential Failure Modes of the Piedmont Project.

Piedmont Hydroelectric Project, FERC Part 12D Safety Inspection Report, Piedmont, South Carolina. Mrs. Pattershall has helped prepare the 1st Part 12D Inspection Report for the Piedmont Project. She has further developed an understanding of the FERC requirements and guidelines under the supervision of John DeLano, P.E.

Colburn Street Dam, Phase I Inspection Evaluation Report, Dedham, Massachusetts. Colburn Street Dam is owned and operated by the town of Dedham. Mrs. Pattershall has help to develop the dam safety inspection report for the town of Dedham under the supervision of Derek Schipper, P.E. This reservoir is a recreational impoundment.

Hopkinton Reservoir Dam, Phase I Inspection Evaluation Report, Ashland, Massachusetts. Hopkinton Reservoir is owned and operated by the Massachusetts Department of Conservation and Recreation. Mrs. Pattershall has helped develop the

Lexus Pattershall, E.I.T.

Engineer II

dam safety inspection report for the Hopkinton Reservoir Dam under the supervision of Christopher Baker, P.E. This reservoir formerly supplied drinking supplies but is not a recreation area for the town of Ashland.

Experience Prior to GZA

HYDROPOWER DAM DESIGN

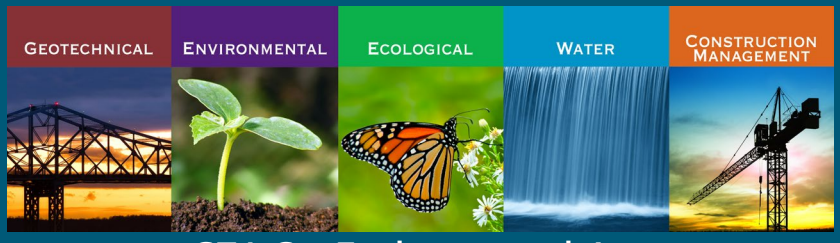
Student, Hydroelectric Power Production of Moscow Mill, Stowe, Vermont. Mrs. Pattershall worked on the damaged historical preservation site in collaboration with the Stowe Electric Department to restore hydropower after Irene. The group focused on how to mitigate and remove sediment to optimize power production. This project incorporated stakeholders' desires and needs, including working with the National Register of Historic Places (NRHP) to preserve the historic beauty. Challenges also included environmental protection of downstream wildlife and budgeting.

EARTH DAM DESIGN

Student, Slope Stability Modeling, Eagle Creek Valley, Vermont. Mrs. Pattershall iterated models using Slope/W and Seep/W for a preliminary dam model. These had to meet the requirements of the three phase conditions of end of construction, steady-state seepage, and rapid drawdown.

Skills

- **Software:** Microsoft Office (Word, Excel, PowerPoint, and Teams), GeoStudios, HEC-RAS, MAGNET, AutoCAD, and Adobe Premiere.
- **Lab Techniques:** ICP and Lachat machine.



GZA GeoEnvironmental, Inc.