Town of Sudbury

Community Preservation Committee

Flynn Building
278 Old Sudbury Road
Sudbury, MA 01776
978-639-3387
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cpc@sudbury.ma.us

www.sudbury.ma.us/cpc

PROJECT SUBMISSION FORM

Applicant: Jeff Winston, President HBPA

Submission Date: 10/7/2022

Group or Committee Affiliation (if any): Hop Brook Protection Association

Applicant Address:

Box 707, Sudbury, MA 01776

Purpose (please select all that apply):

X Open Space & Recreation

___ Community Housing

X Historic Resource

Applicant Email & Phone Number:

jeff@hopbrook.org 978-443-2589

Project Manager Email & Phone Number: jeff@hopbrook.org 978-443-2589

Project Name: Watershed Based Plan, Restoring water quality in Hop Brook

Project Description: See attached.

Costs:

Fiscal Year	Total Project Cost	CPC Funds Requested	Other Funding Sources (Amount and Source)
2024	78,600	78,600	0
2025			
2026			
2027			
2028			
Total			

How does this project meet the General Criteria and Category Specific Criteria for Community Preservation Committee projects (see attached)?

See attached.

Does this project fall within the jurisdiction or interest of other Town Boards, Committees, Commissions, or Departments? If so, please list the boards, committees, commissions, or departments, whether applications and/or presentations have been made, and what input or recommendations have been given.

See attached.

For Community Preservation Committee Use:

Form Received On: 10-7-22

Project Presented to CPC On: _____

Reviewed By: R Patient

Determination: _____

Project Name: Watershed Based Plan: Restoring water quality in Hop Brook

Categories: Open Space & Recreation, Historic Resource

Background: Hop Brook is the largest tributary of the Sudbury River, and drains more than half of the land area of Sudbury. Dozens of homes, recreational and historical areas, Town wells and Town property are along this waterway and associated ponds. Until the 1970s, Hop Brook was a major recreational and natural asset - with multiple locations for swimming ,fishing, ice skating and canoeing, and supported a diverse ecosystem with many species of birds and fish. Recorded Sudbury history features activities along Hop Brook since the 1700s, including fishing, saw and grain mills, canoeing, and swimming. However, nutrient pollution – primarily from the Marlborough Easterly wastewater treatment plant - has caused severe degradation of water quality, and overgrowth of invasive plants and toxic algae. As a result, the Hop Brook waterway and associated ponds become very unpleasant in the summer, are no longer attractive for recreational use, and require increasingly intensive management to reduce unwanted plants. More detail on the causes and consequences of nutrient pollution in Hop Brook is available upon request.

Goal of the project: Our goal is to restore water quality in the Hop Brook watershed, and thus reclaim an important recreational and historical asset for all Sudbury citizens. We have collected extensive data on sources and variations in pollutant levels throughout Hop Brook, and have collaborated extensively with scientists at OARS (Organization for the Assabet, Sudbury and Concord Rivers) to better understand how these pollutants, especially phosphorus, created the current situation. OARS has completed an in-depth evaluation that is available upon request.

A watershed-based plan (WBP) is the first step in assembling and evaluating the existing data with the purpose of determining what approaches are most likely to successfully restore acceptable water quality. A well-developed WBP is also necessary to obtain Federal (Section 319) and state grant funding for specific remediation strategies (such as the ones recommended by the WBP). Framingham, Westboro, Andover and other towns have used their WBPs to successfully obtain government funding that ultimately led to pollution reduction and improved water quality (examples can be provided upon request).

The Hop Brook Protection Association, in partnership with the Sudbury Conservation Coordinator and OARS, is well-prepared to successfully manage the process to produce an optimal WBP. Over the past three years, we have developed and managed a successful program to reduce invasive water chestnut plants, and have partnered with OARS and our Conservation Commission to obtain two grants that supported water quality sampling and community education.

However, our research shows that there are many other options for the next steps, each with varying return on investment. To ensure that we take the right actions, we need expert consultation to develop a concrete plan that HBPA and our community partners can then execute with high confidence of good results.

Progress so far: We identified five organizations who have expertise in developing watershed-based plans, have a track record of developing WBPs in New England, and are familiar with the types and sources of pollutants that we have in Hop Brook. We asked them to provide a scope of services and quote in response to our RFP for developing a WBP. Three well-regarded consulting firms responded in September (2022), all from well-regarded

consulting firms (GeoSyntec, SWCA, CEI). We are currently reviewing them and plan to meet with vendors next month. We plan to select a vendor before we meet with the CPC in January.

The plan development is expensive, the information can be technically very deep, and we (HBPA) are non-expert volunteers. So, we have enlisted OARS as a partner in order to ensure that the WBP development process produces optimal results. They will assist with vendor choice, and after the choice is made, they will attend meetings, review documents, and engage with the chosen vendor. We chose to work with OARS because of their high level of expertise, their excellent reputation, and their prior experience with our ponds and leading water quality improvement projects in the Sudbury, Concord, and Assabet rivers.

Also, our existing CPC grant for water chestnut removal has an unused balance of ~$80K. We currently estimate our remaining costs at ~$40K, and expect to return the remaining funds to CPC at the end of the grant period.

We, and the vendors, understand that work cannot begin until after approval at 2024 Town Meeting.

Our approach and proposal:

- have the support and endorsement of Lori Capone (Conservation Coordinator). We intend to present to ConComm and other stakeholder organizations with the goal of enlisting their support before we meet with you. The project is primarily under the jurisdiction of ConComm.

- are instrumental to the preservation of the essential character of the town (specifically, the preservation of the Hop Brook Watershed and Ponds as recreational waterways).

- preserve resources that would otherwise be threatened by pollution and decay (the Hop Brook Watershed and Ponds).

  have as their primary purpose insuring that any further funds spent on remediation are used in the most efficient and advantageous way possible. (That's why we're asking the experts).

- will help preserve and utilize Town assets (as the Town, and Sudbury conservation groups, are the largest landowners abutting the Hop Brook and its ponds).

- serve a significant number of residents (many dozens of abutters, as well as trail-walkers, canoers, and visitors to the Wayside Inn).

- expand the range of recreational opportunities (by providing attractive recreational waterways for the public) .

As the purpose of the WBP is no more than to engage experts to research, generate, assess, and rank action recommendations, we do not foresee any objections from any parties.

Also:

- The current Open Space and Recreation Plan calls for remediation of Hop Brook as a priority to restore a prime recreational asset (p33).

- The recently completed Town Master Plan specifically calls for a "watershed approach to water resource planning and management" (p42) and cites the increasing importance of these water resources to the economic, social and environmental health of the region. Action Items C2 (implement strategies in the Ponds and waterways master plan) and C3 (participate in regional planning and management efforts in the SuAsCo basin) address local water quality issues in Hop Brook.

- The most recent Sudbury Ponds and Waterways Committee Master plan identifies restoration of water quality in the Hop Brook watershed as a top priority.

Quotes: The attached quotes show that the WBP can be developed expeditiously and within budget. Since the purpose of the project is to get expert advice, we are unaware of any alternatives to hiring professionals for the evaluation. Also, after consultation with OARS, we are unaware of other funding mechanisms that would support our current approach. The quotes contain examples of similar project proposals in other communities, including project scope and cost.

Our current funding request is sufficient to cover the highest quote, funding for OARS, and margin for adjustment of the vendor quotes and/or further sampling or research that is ultimately required. As a result of our vendor discussions this fall we hope to propose a slightly reduced amount when we meet with the CPC.

Cost Breakdown:

Quote for WBP Plan preparation (highest quote):	$66,300
Quote for OARS Support:	7,300
Margin for additional work:	5,000
Total (not-to-exceed):	**$78,600**

The WBP quotes are included in the package. The OARS quote is attached.

A WBP is the universally recommended next step in pond remediation, restoring a significant historical asset to the unpolluted state that it was in for all the years prior to the 1970s. We hope CPC will support our efforts in this regard.

-HBPA Board of Directors

Rick Booth,
Glenn Pransky,
Chris Moran,
Lori Moran,
Elyse Rayney,
Terry Snyder,
Jeff Winston,
Kathy Winston

OARS
FOR THE ASSABET SUDBURY & CONCORD RIVERS
23 Bradford Street · Concord, MA 01742
978 · 369 · 3956
office@oars3rivers.org
www.oars3rivers.org

September 29, 2022

Jeff Winston
Hop Brook Protection Association
Sudbury, MA

Dear Jeff,

We agree to provide services to the Hop Brook Protection Association outlined below on a contractual basis for the amount of $7,300 (seven thousand three hundred) to support the preparation of a Watershed Based Plan (WBP) for Hop Brook, Sudbury. The services to be provided during the period 2022-2024 are:

1. Review and give input on WBP Proposals
2. Join meetings with vendors
3. Join vendor selection meeting
4. Participate in bi-monthly vendor meetings (est. at 8)
5. Review vendor input
6. Additional small data if needed (site visits re: flow, DO, etc.)
7. Follow-up discussions on implementation of WBP results

Please don't hesitate to contact me if you have any questions.

Yours sincerely,

Alison Field-Juma
Executive Director

289 Great Road, Suite 202
Acton, Massachusetts 01720
(978) 263-9588
www.geosyntec.com

Geosyntec consultants

September 7, 2022

Hop Brook Protection Association
Attention: Board of Directors
P.O. Box 707
Sudbury, Massachusetts 01776

Subject: Proposal to Develop a Watershed Based Plan (WBP) for the Hop Brook Watershed, Sudbury, MA

Dear Board of Directors,

Geosyntec Consultants, Inc. (Geosyntec) is pleased to provide this proposal to the Hop Brook Protection Association (HBPA) in response to its Request for Proposals (RFP) dated July 20, 2022, to develop a watershed-based plan (WBP) for the Hop Brook watershed in Sudbury, Massachusetts, and the subsequent response to questions dated August 3, 2022. Geosyntec is well qualified to meet the requirements of the RFP and develop a WBP for improving water quality in the Hop Brook watershed with a goal of achieving Class B water quality. As highlighted throughout our proposal, Geosyntec brings the following unique qualifications to support the HBPA on this project:

- **Extensive Massachusetts experience on nine-element WBPs**. We have completed over 25 nine-element WBPs within Massachusetts in recent years.
- **Experience working with and collaborating on innovation projects with the Massachusetts Department of Environmental Protection (MassDEP)**. Since 2002, Geosyntec has worked with MassDEP on NPS pollution assessments, plans, and manuals.
- **Designed the MassDEP's interactive, web-based, WBP tool** to help users develop WBPs that meet the nine elements required by the United States Environmental Protection Agency.
- **Local project leadership team and presence.** Our project manager, Julia Keay, P.E., and project director, Renee Bourdeau, P.E., are both based in Massachusetts and are available to start on this project right away.
- **Success in securing Section 319 project funding**. Our local practitioners have helped many of our clients secure Section 319 grants for water quality implementation projects.

If you have any questions, please do not hesitate to contact Julia Keay at 978-206-5719.

Julia Keay, P.E. (MA)
Project Engineer

Christopher Greene, P.E. (MA, ME, NJ)
Senior Principal

Proposal For:

Developing a Watershed Based Plan for the Hop Brook Watershed, Sudbury MA

September 7, 2022

Prepared by:

Geosyntec consultants

289 Great Road, Suite 202
Acton, Massachusetts 01720
(978) 263-9588

Prepared for:

HOP BROOK PROTECTION ASSOCIATION

P.O. Box 707
Sudbury, Massachusetts 01776

Table of Contents

Attachments:

A. Project Team Resumes

B. Detailed Pricing

C. Sample Insurance Certificate

Introduction

Geosyntec Consultants, Inc. (Geosyntec) is pleased to provide this proposal to the Hop Brook Protection Association (HBPA) in response to its Request for Proposals (RFP) dated July 20, 2022, and the subsequent response to questions dated August 3, 2022, to develop a watershed-based plan (WBP) for the Hop Brook watershed in Sudbury, Massachusetts. Geosyntec is well qualified to meet the requirements of the RFP and develop a WBP for improving water quality in the Hop Brook watershed with a goal of achieving Class B water quality. Geosyntec is a regional and national leader in planning and implementing watershed management. As highlighted throughout this proposal, we have extensive experience developing (United States Environmental Protection Agency (EPA) nine-element watershed management plans for waterbodies throughout Massachusetts and beyond.

As highlighted throughout our proposal, Geosyntec brings the following unique qualifications to support the HBPA on this project:

- **Extensive Massachusetts experience on nine-element WBPs.** We have completed over 25 nine-element WBPs within Massachusetts in recent years on a broad range of nonpoint source (NPS) issues. We have developed nutrient control strategies for a variety of watersheds (urban, rural, agricultural, coastal, etc.) and reviewed innovative best management practices (BMPs).

Extensive Experience Developing Nine-Element WBPs in Massachusetts

Geosyntec has developed nine-element WBPs for watersheds throughout in Massachusetts, including Malden River (Malden), Unquity Brook (Milton), Monatiquot River (Braintree), Quaboag-Quacumquasit Ponds (Sturbridge), and Westport River (Westport). Other watersheds include East Branch North River (Colrain), Hamilton Reservoir (Holland), Hinsdale Brook (Greenfield), Mill River (Amherst), and Moose Meadow Brook (Montgomery).

- **Experience working with and collaborating on innovation projects with the Massachusetts Department of Environmental Protection (MassDEP).** Since 2002, Geosyntec has worked with MassDEP on NPS pollution assessments, plans, and manuals, including supporting updates to the Department's NPS Management Plan (2014–2019) and developing the clean water toolkit—a graphical visualization of land-use-based scenarios that provides guidance on selecting appropriate mitigation measures, including stormwater practices.
- **Designed the MassDEP's interactive, web-based, WBP tool** to help users develop WBPs that meet the nine elements required by the United States Environmental Protection Agency (USEPA). The tool includes complex statewide data management routines based on nested watersheds and includes 303(d) water quality reports, land-use-based pollution loading estimates, and other information. These data are paired with a scripted geospatial analysis to enable users to select any nested watershed in the state to generate results, including statistics and prepackaged maps. We also provided statewide training on this tool to participants from municipalities, consulting firms, state and local agencies, and others. Geosyntec has unique access to the data supporting the tool that will be used to support the development of the Hop Brook WBP.
- **Local project leadership team and presence.** Our project manager, Julia Keay, P.E., is based in Massachusetts and has over 10 years of water resources engineering experience. Ms. Keay has led the development of over fifteen WBPs in recent years. Our proposed project director and technical advisor, Renee Bourdeau, P.E., has 16 years of experience in watershed and municipal planning and is based out of Massachusetts. Ms. Bourdeau, P.E., has led the development of over 30 WBPs. Both are available to start right away on this project. In addition, Geosyntec's Acton, Massachusetts office is located 30 minutes from the Hop Brook watershed and staff are available from this office to assist with this project.

- **Success in securing Section 319 project funding.** Our local practitioners have helped many of our clients secure Section 319 grants for water quality implementation projects. Our practitioners bring this successful grant-winning experience to HBPA to support future 319 grant applications for priority projects. For example, Renee Bourdeau recently secured a 319 grant for the Town of Groton, MA and Town of Exeter, NH.

Section 319 Project Funding Success Examples

1) **Cobbett's Pond Improvement Association - four phases of Section 319 grant funding**
2) **The Town of Groton, Massachusetts - secured their first grant for stormwater improvement**
3) **The Town of Exeter, New Hampshire - secured Section 319 grant for a regional subsurface infiltration facility (Montgomery).**

The remainder of this proposal is organized to align with the RFP's required information and includes our understanding and approach to the scope of work, qualifications and key personnel, project cost, as well as insurance and indemnification.

Project Understanding and Approach

Current Understanding of Hop Brook Watershed

Hop Brook is the largest tributary to the Sudbury River (approximately 9.4 miles long) and has a watershed area of approximately 24 square miles. The watershed includes the municipalities of Sudbury, Framingham, Marlborough, Hudson, and Wayland, Massachusetts. Major streams in the watershed include Hop Brook, Dudley Brook, Run Brook, Landham Brook, Wash Brook and three unnamed tributaries. There are four major ponds along Hop Brook, which include (from downstream to upstream) Stearns Mill Pond, Carding Mill Pond, Grist Mill Pond, and Hager Pond.

Our goal is to efficiently and effectively execute the outlined scope of work for developing a comprehensive nine-element WBP that includes quantification of the sources of TP in the Hop Brook watershed, load reduction goals, and identifies a suite of potential pollutant load reduction management strategies. The detailed scope of work and cost estimate are described below.

Hop Brook (MA82A-05 and MA82A-06) is identified as a category 5 water body on the Massachusetts 2018/2020 Integrated List of Waters (303(d)) list due to Total Phosphorus (TP), Dissolved Oxygen (DO), Escherichia coli (*E. coli*), nutrient/eutrophication biological indicators, algae, water chestnut, turbidity, benthic macroinvertebrates, and DO supersaturation. The listed sources of these impairments include municipal point discharges (discharges from municipal separate storm sewer systems (MS4s)), dam or impoundments, introduction of non-native organisms, and unknown sources.

Additional stream segments that are impaired in the Hop Brook watershed include three unnamed tributaries (MA82A-15, MA82A-16, and MA82A-17). These unnamed tributaries are impaired for algae, DO, TP, and total suspended solids (TSS) from MS4 discharges and unknown sources. Unnamed tributary (MA82A-15) is also impaired for ambient bioassays – chronic aquatic toxicity. Unnamed tributary (MA82A-16) is also impaired for DO supersaturation and high pH; dams and impoundments are another source of the impairments. Unnamed tributary (MA82A-17) is also impaired for DO supersaturation; dams and impounds are also another source of impairments.

Three of the four major ponds along Hop Brook are listed on the 303(d) list and include Carding Mill Pond (MA82015), Grist Mill Pond (MA82055), and Hager Pond (MA82056). Carding Mill Pond, Grist Mill Pond, and Hager Pond are impaired for TP, algae, curly-leaf pondweed, DO supersaturation, nutrient/eutrophication biological indicators, and water chestnut from MS4 discharges, introduction of non-native organisms, and unknown sources. Carding Mill Pond is also impaired for aquatic plants (macrophytes). Grist Mill Pond is also impaired for fecal coliform. Hager Pond is also impaired for turbidity. Additionally, the Concord River basin, which includes the Hop Brook watershed, has a draft pathogen total maximum daily load (TMDL).

We understand that the HBPA and OARS, Inc. have been monitoring water quality along Hop Brook for the past 30 years and have recently begun monitoring water quality at additional sites along Hop Brook to map TP concentrations and to determine why Hop Brook has some of the highest TP levels in the Sudbury River watershed.

Approach to Scope of Work

Geosyntec understands that the WBP resulting from this project will need to be embraced and implemented by the HBPA and potentially other stakeholders in the Hop Brook watershed to be successful. Because of this, collaboration between Geosyntec and HBPA will be critical to the success of the WBP. We will communicate frequently with HBPA via email and phone and will hold bimonthly meetings to provide an update on project progress, which will include an agenda and meeting notes.

Geosyntec's approach to performing the requested scope of services in the RFP is to perform the work in three phases. The three phases of work are organized to address each of the nine elements (elements A—I) of an EPA and MassDEP-compliant WBP. The three phases of work and the corresponding scope of service RFP task numbers are as follows:

- Phase 1 - Review Existing Technical Information and Watershed Field Survey (RFP Task 1)
- Phase 2 - Develop Nine WBP Elements
  - Phase 2.1 - WBP Elements A and B (Water Quality Goals and Pollutant Loading) (RFP Tasks 2, 3, 10)
  - Phase 2.2 - WBP Element C (Identification of Site-Specific Pollutant Reduction Strategies) (RFP Tasks 4, 5)
  - Phase 2.3 - WBP Element D, E, F, G (Technical and Financial Assistance Needed, Public Information and Education, Implementation Schedule, and Measurable Milestones) (RFP Tasks 6, 7, 8)
  - Phase 2.4 - WBP Element H, I (Criteria to Measure Progress/Monitoring Plan) (RFP Task 9)
- Phase 3 - Watershed-Based Plan (WBP) Report (RFP Task 11)

Geosyntec will use the WBP Tool (http://prj.geosyntec.com/prjMADEPWBP/Home) as a resource throughout the three phases of the project and for helping to address the nine WBP elements (e.g., pollutant loading, management strategy pollutant loading reduction information, hotspot maps, watershed figures, etc.). Interim deliverables associated with each phase below will be provided to the HBPA and for review before finalizing for incorporation into the WBP (Phase 3).

Phase 1: Review Existing Technical Information and Watershed Field Survey (RFP Tasks 1)

Geosyntec will request, from HBPA, all of the relevant documentation (which is listed in the RFP) and any additional available information, which may include:

- Additional water quality monitoring data for the watershed;
- Reports or assessments that have been performed in the watershed;
- Septic system surveys conducted for properties adjacent to the ponds;
- Details on any completed, on-going, or planned stormwater management strategies in the watershed;
- Modeling/calculations that have been performed to estimate pollutant loading to receiving waters within the watershed;
- Relevant photographs, drawings and/or maps;
- Bathymetric surveys for the ponds;
- Documentation of known flooding areas; and
- Known specific problem areas or issues that would be beneficial to focus on in the WBP.

Geosyntec will then review the data gathered, in addition to available sources (e.g., from the MassDEP WBP tool and the MassDEP Water Quality Database). As part of this phase, a one-day field survey will be performed to gain familiarization with the watershed. The field survey will be performed by Julia Keay and Emma Williamson and will be completed in a 10-hour day including travel time. Our team will prepare a PowerPoint presentation to summarize the literature/data review and watershed survey. The information will be presented at a 1.5-hour kickoff meeting, either in person or virtual, with HBPA and any additional stakeholders that HBPA wishes to include. We will also present the project scope, schedule, and areas where HBPA/stakeholder input will be critical. Our hope is that through active collaboration, we will learn from the HBPA and stakeholders' experience such as what potential management solutions are feasible and where there may be problem locations that are not apparent in the data. Our budget estimate for this phase is based on 6 hours to review water quality data and up to 10 hours

to review the remaining files. It is assumed that files will be organized, complete, in digital format and transferred in a timely manner.

Anticipated Phase 1 Deliverables:

1. PowerPoint presentation that includes our initial findings based upon review of existing information, field investigation, planned additional evaluations (i.e., lake model, loadings model, etc.) and potential constraints and solutions for HBPA to begin considering, to guide discussion at the kickoff meeting
2. Kickoff meeting agenda and meeting minutes

Phase 2: Develop WBP Elements

Phase 2.1 Elements A and B (Water Quality Goals and Pollutant Loading) (RFP Tasks 2, 3, 10)

Phase 2.1 includes calculations and modeling activities requested in Tasks 2, 3, and 10 of the RFP. The information from these activities will be used to support WBP Elements A and B (Water Quality Goals and Pollutant Loading).

Watershed Management Plan and Stormwater Improvements for Mirror Lake, Tuftonboro

"Our projects involved a high level of on-going collaboration between MLPA and Geosyntec Consultants. The leadership and advice provided by Geosyntec's professional staff was extremely timely, of a high quality, creative and adaptive to our changing needs. The overall experience has been excellent."

Dusty Davies, President
Mirror Lake Protective Association

Geosyntec will work with the HBPA to develop water quality goals (in concentration units) for Hop Brook and each of the four ponds along Hop Brook. Based on the watershed impairments and the background information included in the RFP, water quality goals for Hop Brook and the four ponds are expected to be focused on TP and are anticipated to be based on the EPA Gold Book criteria (since there is no Massachusetts Surface Water Quality Standard for TP). It is expected that efforts to reduce TP will result in improvements to the other listed impairments in the Hop Brook watershed. A water quality concentration goal for *E. coli*. will also be included for Hop Brook and is anticipated to be based on the Massachusetts Surface Water Quality Standards for Class B waterbodies.

A pollutant loading model will be created for Hop Brook as well as each of the four ponds along Hop Brook as requested in Task 3 of the RFP. The methodology used for modeling the nonpoint source loading to the waterbodies will be the same methodology used by the MassDEP WBP Tool (http://prj.geosyntec.com/prjMADEPWBP/Home). Additional sources (not included in the MassDEP WBP tool modeling methodology) such as point sources and internal loading of the ponds will be estimated using literature coefficients and/or available data. The assumptions and limitations of the chosen internal loading estimation method and the point source loading estimation methods will be clearly stated along with recommendations for collection of additional data to provide for a more robust estimate. The pollutant loading estimate will be focused on TP; It is expected that efforts to reduce TP loading will also result in improvements to *E. coli* and other impairments in the Hop Brook watershed.

Based on the established TP water quality goal, the TP reduction needed to meet the water quality goal for Hop Brook and each of the four ponds will be estimated in mass per year (RFP Task 2). By subtracting the water quality goal (in mass per year) from the baseline TP load, the pollutant load reduction needed will be estimated. This analysis will also consider climate change factors and provide recommendations on adaptive management. It is understood (based on response from HBPA to a Geosyntec question) that the term “TMDL” in the RFP Task 2 and elsewhere is referring to the water quality goals (in concentration and loading units).

A memorandum will be prepared to summarize the goal setting, modeling methodology, the TP load by source (e.g., septic system, atmospheric, internal, stormwater runoff, etc.), and recommended steps to be taken to adapt

to ongoing climate change to maintain pollutant loading reduction achievement as requested in Task 10 of the RFP. Geosyntec (Julia Keay and Emma Williamson) will participate in one 1-hour meeting (in person or virtual) with HBPA to discuss the water quality goal setting and pollutant loading modeling methodology. We have assumed one round of comments for the interim and final memorandum.

Anticipated Phase 2.1 Deliverables:

1. Memorandum summarizing the modeling methodology and results
2. Attendance at one meeting to discuss goal setting and pollutant loading modeling methodology

Bioretention cell installed as part of a grant implementation project.

Phase 2.2 Element C (Identification of Site-Specific Pollutant Reduction Strategies) (RFP Tasks 4, 5)

Phase 2.2 includes identification of site-specific reduction strategies and calculates estimated load reductions and/or impacts and supporting field reconnaissance to support Tasks 4 and 5 of the RFP. The information from these activities will be used to support WBP Element C (Identification of Site-Specific Pollutant Reduction Strategies).

Bioretention cell constructed as part of watershed-based plan BMP recommendations.

Geosyntec will identify site-specific pollutant reduction strategies that could be implemented to achieve the water quality load reduction goals in the ponds and in the brook. These will include structural and non-structural management actions to reduce pollutant loading to Hop Brook and the four ponds.

Geosyntec will perform the following steps to identify, incorporate, and prioritize up to fifteen site-specific pollutant reduction strategies:

- **Identify Potential Structural Management Strategy Implementation Locations:** Geosyntec will conduct a desktop review of project information, including HBPA/stakeholder input on watershed pollutant sources (from Phase 1), WBP tool pollutant-load modeling results, the hot spot maps available through the WBP tool, and other watershed GIS information (e.g., stormwater network, parcel boundary information, public properties, soils, etc.). The purpose of the desktop review is to identify potential opportunities and constraints to focus field reconnaissance efforts and identify locations with greater potential for feasible and implementable solutions to reduce pollutant loads to Hop Brook.
- **Field Reconnaissance of Potential Structural Management Strategy Implementation Locations**: Geosyntec will then perform one day of field reconnaissance to evaluate the selected potential implementation locations, gauge feasibility, and identify potential concept ideas. During field reconnaissance, Geosyntec will also assess identified locations for space constraints, potential accessibility issues, presence of mature vegetation that may cause conflicts (e.g., roots), potential utility conflicts, site-specific drainage patterns, and other factors that may cause issues during design, construction, or long-term maintenance. Site specific data will be collected using electronic data forms linked to ArcGIS base maps. We assumed that the field reconnaissance will include a field day equal to 10 hours including travel time. We have assumed Julia Keay and Emma Williamson, from Geosyntec, will conduct the field reconnaissance.
- **Non-structural Management Strategies:** For non-structural management actions, the critical areas in which those actions should be implemented will be identified via the desktop review as well as possibly

the field reconnaissance described above. Common non-structural approaches for reducing pollution sources within the watershed may include voluntary fertilizer reductions, street sweeping, catch basin cleaning, infrastructure operation and maintenance, residential-scale stormwater management initiatives, salt reduction practices, and other innovative ideas.

- **Prioritize Strategy Concepts:** Geosyntec will perform a priority ranking of the fifteen strategies. The ranking will be based on site-specific factors included estimated load reduction, impact on pond macrophyte overgrowth/eutrophication, strengths and weaknesses of the strategy, feasibility, cost, public education and outreach potential, operation and maintenance considerations, and technical assistance required to identify a prioritized list of strategies for implementation. Additional ranking criteria may also be included based on input from the HBPA.

- **Develop Pollutant Reduction Strategy Concepts:** Based on the priority ranking, Geosyntec will use the MassDEP WBP tool to help develop three more detailed concepts for the top three strategies. This information will be presented in one-page fact sheets for each concept that includes a site description, including definition of the problem, a brief description of the proposed strategy, annotated site photographs with conceptual design details, and a discussion of potential conflicts such as property ownership, operation and maintenance requirements, and general permitting constraints. The fact sheet will also include planning-level cost estimates, load reduction estimates, and sizing information (i.e., footprint area, drainage area, etc.). For any nonstructural strategies, the conceptual design would include a framework for these programs if selected as one of the top three priority strategies. The level of detail in these concepts will be suitable for a competitive Section 319 grant application to secure funding for final design, permitting, and implementation. The HBPA will be provided an opportunity to review the fact sheets. We assume one round of comments for the interim and final fact sheets.

Silver Lake (Wilmington, Massachusetts) LID Demonstration Project

"DCR is sincerely grateful to Geosyntec for your contributions to many critical components of the Silver Lake Targeted Watershed Grant project. I particularly appreciate the exemplary commitment and professionalism you and your staff showed throughout the grant period…"

John P. Murray, Acting Commissioner
Massachusetts Department of Conservation and Recreation

- **Alternatives Analysis for Achieving Long-Term Macrophyte Control:** As requested in Task 4 of the RFP, a separate alternatives analysis will also be conducted for achieving macrophyte control without continued chemical treatment of the four ponds; this analysis will be informed by the pollutant loading modeling as well as available documentation and data. Alternatives may include physical methods, such as raking and weed harvesting; structural or nonstructural strategies adjacent to the ponds or brook; or other methods. We will also consider climate-change impacts (e.g., increased precipitation intensity, droughts, and increase in invasive species, etc.) for this analysis. The limitations of the analysis will be clearly stated along with recommendations for collection of additional data to provide for a more robust estimate. This alternatives analysis will be presented in a memorandum. We assume one round of comments for the interim and final memorandum.

Geosyntec (Julia Keay and Emma Williamson) will also participate in a one 1-hour meeting (in person or virtual) with HBPA to discuss the desktop review, field reconnaissance, and potential management strategy implementation locations and prioritization methodology.

Anticipated Phase 2.2 Deliverables:

1. Attendance at one meeting to discuss desktop review, field reconnaissance, potential management strategy implementation locations and prioritization methodology
2. Three interim and final 1-page fact sheets for top three prioritized management strategy concepts

3. Interim and final memorandum summarizing the macrophyte control without continued chemical treatment alternatives analysis

Phase 2.3 Element D, E, F, G (Technical and Financial Assistance Needed, Public Information and Education, Implementation Schedule and Measurable Milestones) (RFP Tasks 6, 7, 8)

Phase 2.3 includes identification of possible funding sources, a public information plan and development of an implementation schedule as described in Tasks 6, 7, and 8 of the RFP. The information from these activities will be used to support WBP Elements D, E, F, G (Technical and Financial Assistance Needed, Public Information and Education, Implementation Schedule and Measurable Milestones).

Geosyntec will assist HBPA in developing a table of technical and financial assistance needed to implement the WBP elements; this will include the technical and financial assistance to implement the management strategies identified, implementation of public information and education, as well as implementation of the monitoring plan. This will include identifying possible sources of funding that can be used to support implementation of the WBP elements. Geosyntec will also develop the public information and education plan (based on feedback from HBPA) as well as the implementation schedule and measurable milestones for the elements of the WBP. Geosyntec (assumed Julia Keay and Emma Williamson) will participate in one 1-hour meeting (in person or virtual) with HBPA to discuss the Element D—G content. The HBPA will be provided an opportunity to review the content. We assume one round of comments for the interim and final content.

North Inlet Tributary Assessment (Rust Pond); Cobbett's Pond Watershed Restoration Plan

"Clearly, these applications stand apart from many others due to your fine work on these projects. I hope to see you and your firm partnering with other groups in the state in the future to create similar watershed-based plans. Thanks for the great work as always."

Steve Landry, Watershed Assistance Section Supervisor, New Hampshire Department of Environmental Services

Anticipated Phase 2.3 Deliverables:

1. Attendance at one meeting to discuss technical and financial assistance needed, public information and education plan, and implementation schedule/measurable milestones
2. Table for technical and financial assistance needed, public information and education plan, and implementation schedule/measurable milestones for inclusion in the WBP (Elements D, E, F & G)

Phase 2.4 Element H, I (Criteria to Measure Progress/Monitoring Plan) (RFP Task 9)

Phase 2.4 includes developing a monitoring program as described in Task 9 of the RFP. The information from this activity will be used to support WBP Elements H and I (Criteria to Measure Progress/Monitoring Plan)

Geosyntec will assist HBPA in developing a water quality monitoring plan to evaluate the effectiveness of WBP implementation efforts. Using the information collected in Phase 1 and 2.2 and informed by the modeling output (Phase 2.1), our team will provide recommendations for how water quality and management measure success in Hop Brook watershed can be measured. This will also include recommendations on in-pond monitoring (such as deep-hole and water-column sampling) to support the evaluation of macrophyte control methods in the ponds. The HBPA will be provided an opportunity to review the monitoring plan. We assume one round of comments for the interim and final monitoring plan.

Anticipated Phase 2.4 Deliverables:

1. Attendance at one virtual meeting to discuss monitoring plan
2. Technical content for monitoring plan for inclusion in the WBP (Elements H & I)

Phase 3: Watershed-Based Plan (WBP) Report (RFP Task 11)

The deliverables from Phase 1 and 2 will be compiled and organized to create a comprehensive EPA- and MassDEP-compliant Hop Brook WBP Report that meets the EPA-required nine elements and positions the HBPA and possibly other stakeholders in the watershed to secure future Section 319 funding (and possibly other grant funding). An interim and final WBP will be prepared, with review by the HBPA. We have assumed one round of comments for the interim and final WBP.

A PowerPoint presentation will be prepared, and the final WBP will be presented to the HBPA, Conservation Commission, and other interested parties/stakeholders at two separate public meetings.

The final WBP will meet MassDEP's provisional review checklist for WBPs as well as the detailed review and rating sheet for WBPs (which Geosyntec created for MassDEP), which are found online at http://prj.geosyntec.com/prjMADEPWBP_Files/Files/WBP_Provisional_Review_Checklist.pdf and http://prj.geosyntec.com/prjMADEPWBP_Files/Files/WBP_Review_Criteria.pdf, respectively. The final WBP will be submitted to MassDEP for review, comment, and acceptance via the WBP tool. Geosyntec has assumed that we will respond to one round of comments from MassDEP.

Phase 3 Deliverables:

1. Interim and Final Hop Brook WBP Report
2. Presentation of final WBP at two public meetings
3. PowerPoint presentation of the final Hop Brook WBP

Required Information

Geosyntec will require the following site-specific information to complete the Hop Brook WBP Report:

- The documentation from HBPA listed in the RFP, which includes:
  - Water sampling results at various locations along Hop Brook taken during the past 30 years. This includes data on seasonal and flow-based variations, and contributions from storm runoff and tributaries
  - Reports by the Organization for the Assabet Sudbury and Concord Rivers (OARS) on water quality in the SuAsCo watershed that discuss impairment in Hop Brook
  - Discharge records and water quality monitoring from the Easterly Wastewater Treatment Plant
  - Pond surveys conducted by Solitude and Water and Wetlands as part of the water chestnut remediation program
  - Sediment sampling and evaluation of a potential pond dredging program directed by the Army Corps of Engineers
  - Reports evaluating specific pond remediation strategies
  - Town of Sudbury Watershed description
  - Drone video recordings and photos
  - Results of simultaneous flow and phosphorus sampling (to be conducted in summer 2022)
- Additional available information, which may include:
  - Additional water quality monitoring data for the watershed

- Reports or assessments that have been performed in the watershed
- Septic system surveys conducted for properties adjacent to the ponds
- Details on any completed, on-going, or planned stormwater management strategies in the watershed
- Modeling/calculations that have been performed to estimate pollutant loading to receiving waters within the watershed;
- Relevant photographs, drawings and/or maps
- Bathymetric surveys for the ponds
- Documentation of known flooding areas
- Known specific problem areas or issues that would be beneficial to focus on in the WBP

- Information gathered by Geosyntec from the initial field survey (Phase 1) and field reconnaissance visit (Phase 2.2)

Schedule

The proposed project schedule is shown below in Table 1.

Table 1: Project Schedule

Phase	2023							2024					
	June	July	August	September	October	November	December	January	February	March	April	May	June
Town Approval Received (Work Begins - June 1, 2023)													
1. Review Existing Technical Information and Watershed Field Survey (RFP Task 1)													
One-day Field Investigation													
Deliverable: 1. 1.5-Hour Kickoff meeting agenda and meeting minutes	✓												
Deliverable: 2. PowerPoint presentation	✓												
2. Develop WBP Elements													
2.1 Elements A and B (Water Quality Goals and Pollutant Loading) (RFP Tasks 2, 3, 10)													
Deliverable: 1. Memorandum summarizing the modeling methodology and results		✓											
Deliverable: 2. 1-Hour meeting		✓											
2.2 Element C (Identification of Site-Specific Pollutant Reduction Strategies) (RFP Tasks 4, 5)													
Deliverable: 1. 1-Hour meeting			✓										
One-day Field Investigation													
Deliverable: 2. Three 1-page fact sheets for top three management strategy concepts					✓								
Deliverable: 3. Macrophyte control memorandum					✓								
2.3 Element D, E, F, G (Technical and Financial Assistance Needed, Public Information and Education, Implementation Schedule, and Measurable Milestones) (RFP Tasks 6, 7, 8)													
Deliverable: 1. 1-Hour meeting						✓							
Deliverable: 2. Content for Element D, E, F, G						✓							
2.4 Element H, I (Criteria to Measure Progress/Monitoring Plan) (RFP Task 9)													
Deliverable: 1. 1-Hour meeting							✓						
Deliverable: 2. Technical content for monitoring plan							✓						
3. Watershed-based Plan (WBP) Report (RFP Task 11)													
Deliverable: 1. Interim Hop Brook WBP							✓						
Deliverable: 2. Final Hop Brook WBP										✓			
Deliverable: 3. Presentation at 2 Public Hearings										✓			
Deliverable: 4. Powerpoint Presentation										✓			

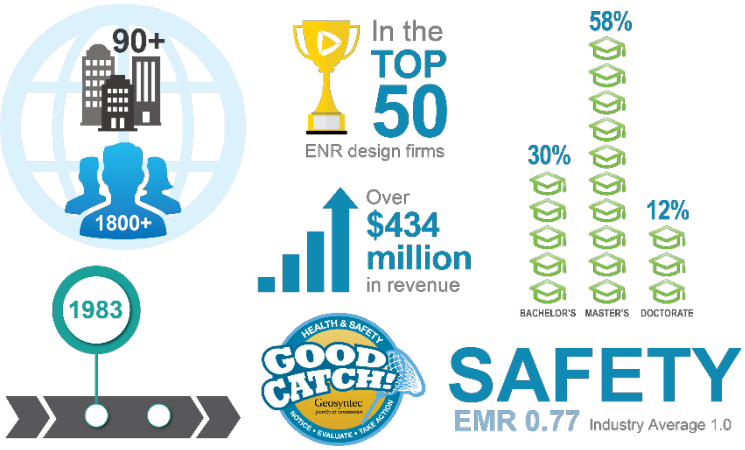
✓ Key deliverable or milestone

Hours by Phase and Personnel

Phase	Total Hours	Personnel
1: Review Existing Technical Information and Watershed Field Survey (RFP Task 1)	55	Julia Keay, Emma Williamson, Renee Bourdeau, Emily Campbell
2: Develop WBP Elements (RFP Tasks 2 through 10)	189	Julia Keay, Emma Williamson, Alex Carnes, Renee Bourdeau, Emily Campbell, Daniel Bourdeau
3: Watershed-based Plan (WBP) Report (RFP Task 11)	87	Julia Keay, Emma Williamson, Renee Bourdeau, Emily Campbell

Qualifications and Personnel

Figure 1: Geosyntec at a Glance



Geosyntec is a multidisciplinary consulting and environmental engineering firm with a mission to work with clients to solve their challenging issues involving the environment, natural resources, and civil infrastructure. In addition to being leaders in watershed management planning and NPS identification and mitigation, Geosyntec practitioners are experts in tracking nutrient sources and harmful cyanobacteria blooms (HCBs). We have served as a member of the Interstate Technology and Regulatory Council (ITRC) team developing guidance to address HCBs nationwide. We have authored and implemented multiple nutrient source tracking projects using advanced isotope analyses to identify the sources of nutrients (human, nonhuman, animal, natural background, etc.) including an illicit discharge detection and elimination (IDDE) study (including phosphorus) for the Boston Water and Sewer Commission (BWSC).

Summary of Capabilities and Experience

Nine-Element Watershed Based Plans

We have completed more than 70 WBPs throughout the Northeast, including the recent USEPA Merit Award-Winning Water Integration Plan for the Squamscott-Exeter Rivers (WISE) project

Geosyntec is an industry leader in developing nine-element WBPs to meet USEPA NPS grant guidelines. Geosyntec has developed WBPs that include strategies to manage developed and undeveloped watersheds and stormwater runoff from public and private properties (see our project examples below). We successfully plan, design, and implement stormwater and other NPS pollution controls to ensure that such controls are cost-effective, achieve desired benefits for the community, and comply with evolving local, state, and federal regulations. All our plans balance funding and prioritization to implement integrated water resource management programs, and many of them incorporate green infrastructure stormwater management for nutrient control. Not only do we know how to develop WBPs, but we also know how to communicate the environmental and economic benefits of proposed controls, as well as their uncertainties, building acceptance and support from elected officials, government agencies, and community stakeholders.

Water Quality Monitoring

Geosyntec has extensive experience developing water quality monitoring programs, quality assurance project plans, and sampling analysis plans, as well as managing sampling data, using modeling and geographic information system (GIS) to create visual interpretations of conditions, analyze data, and communicate plans, methods, results, and conclusions in clear understandable and audience-appropriate deliverables. We have worked with local and state agencies on special study NPS sampling programs for Boston, Philadelphia, San Francisco Bay area, Denver, St. Louis, Atlanta, and over a dozen Southern Californian cities and counties (Ventura County, North Santa Monica Bay, Santa Monica Bay Beach Cities, etc.). These studies were implemented to inform NPS pollutant loading and develop total maximum daily loads (TMDL) (in Atlanta), modify an existing TMDL (in Southern California), and inform TMDL implementation (in Boston). Geosyntec also is experienced in developing quality assurance project plans to support NPS and assess receiving water quality related to developing water quality-based effluent limits, site-specific criteria, metals translators, and water effects ratios for metals. In addition, we developed a WBP for the Winnicut River in Greenland, New Hampshire. That

watershed included a river with multiple ponds requiring a unique approach to water quality and pollutant-load modeling.

Geosyntec routinely conducts rigorous statistical analysis of water-quality-monitoring data, including data mining and interpretation and discernment of special and temporal trends. We present these often-complex results clearly to make sure they are understandable by public stakeholders, managers, and elected officials, and so that they may be translated into management actions. We manage the Water Environment Research Foundation's International BMP Database, which houses field-monitoring data from over 500 BMP monitoring studies since 1994 (Stormwater (wef.org)). We developed a web mapping tool and a statistical reporting interface for this database, and we conduct periodic statistical evaluations of the data and summarize the findings for public reporting. We write guidance manuals and lead webinars on water quality monitoring; recently we created a statewide industrial stormwater manual for the California Stormwater Quality Association, as well as a report for the American Society of Civil Engineers (ASCE) titled Pathogens in Urban Stormwater Systems.

Public Education and Outreach

Benefit to HBPA:
Geosyntec has public education and outreach experts and in-house graphic capabilities to address any environmental outreach project that HBPA may need.

Geosyntec has significant experience at presenting complex project information to the public, both in public meetings and through developing of a wide variety of print and electronic outreach materials related to water resources. While traditionally a provider of technical engineering and scientific services, we also know the value outreach and engagement services bring and have learned from experience that mutually beneficial outcomes are best obtained when communication professionals work alongside technical experts to engage the public and other stakeholders. Our in-house team of communications specialists offers extensive experience developing engaging content via a wide variety of media. We also have experience developing websites, software applications, and other digital products, all of which helps our clients identify and reach the right audiences with the right messages to deliver meaningful interactive experiences. Our graphic designers are communicators first. They believe that design is useless if it is not grounded in a clear understanding of audience, purpose, and message. Geosyntec has developed a wide variety of public outreach and education materials related to water resources, planning management and restoration. Our staff includes excellent technical writers, technical editors, and professional graphic designers.

Project Team

This section includes our project team organization chart (Figure 2), which presents the key individuals assigned to this project by work assignment. Following the organization chart is Table 2, which demonstrates our team's relevant expertise and their responsibilities on this project. Resumes for these individuals are provided in Attachment A. We have assembled a strong local team that allows us to get started right away and attend local meetings as needed. Our senior technical staff are supported by a team of junior, midlevel, and senior professionals including engineers, scientists, and geologists.

Figure 2: Project Team Organization Chart[1]

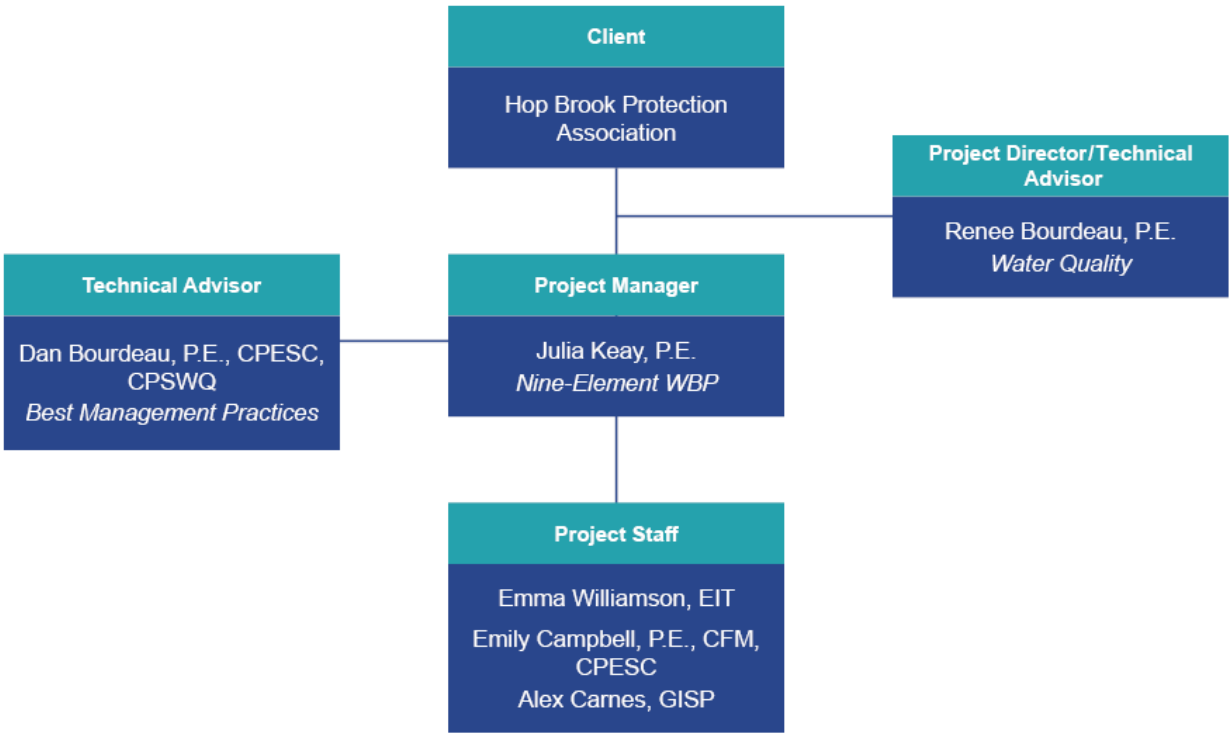
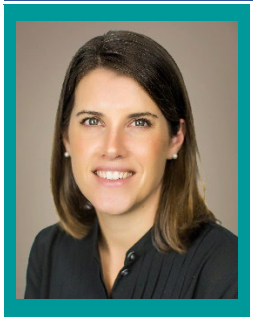


Table 2: Geosyntec Staff Biographies

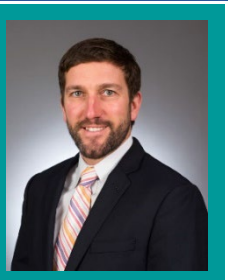
Renee Bourdeau, P.E. (NH) | Project Director/Technical Advisor: Water Quality	
	Renee is a professionally licensed civil and environmental engineer. She has 16 years of experience in watershed and municipal planning, land use master planning, environmental permitting, design of stormwater management controls with a focus on LID and green infrastructure techniques. She has also assisted clients in developing integrated plans to assist them in meeting their National Pollutant Discharge Elimination System (NPDES) regulatory obligations. Her experience also includes a wide range of ecological and biological assessments, including wetland delineation, vegetation surveys, water-quality sampling, macroinvertebrates, amphibians/reptiles, fish sampling, and bird identification. She has particular expertise in HydroCAD and USEPA Storm Water Management Model (SWMM) hydrologic and hydraulic stormwater modeling and GIS.

1 The states in which these individuals are licensed in are provided in Attachment A – Resumes.

Julia Keay, P.E. (MA) | Project Manager/Technical Advisor: Nine-Element WBP

Julia Keay is a professionally licensed Civil Engineer who specializes in water resources engineering, water resources planning, hydrology, hydraulics, and environmental sciences. Her experience includes design of stormwater management systems with a focus in green infrastructure and LID; hydrologic and hydraulic modeling; linear optimization modeling; preparation of engineering designs and specifications; watershed-based planning; watershed stakeholder engagement; environmental permitting; use of GIS; litigation support; and project management. Julia has been a part of the Massachusetts Statewide Watershed Based Plans project team since 2014 and has been the project manager since 2019. Julia worked on the initial development of the WBP tool and as project manager, Julia has worked closely with MassDEP and Section 319 grantees across Massachusetts to complete over 20 MassDEP-accepted nine element watershed-based plans. Julia's project management in recent years also included completing updates to the WBP tool, presenting workshops on the WBP tool, and providing WBP tool user technical support.

Dan Bourdeau, P.E. (MA, NH, NJ, NY, ME), CPESC, CPSWQ | Technical Advisor: BMP



Dan is a Registered Professional Engineer experienced in civil and water resource engineering. As a water resources engineer, he has been trained in water and wastewater treatment process design, hydrologic processes, hydraulics, water-quality modeling and analysis and BMP design. He has expertise in stormwater management including stormwater planning, NPDES programs, MS4 programs, NPS pollutant load modeling, stormwater BMP prioritization and design specifically with retrofit structural practices, water-quality monitoring, and hydrologic and hydraulic modeling. Dan also has extensive experience in developing phased erosion and sediment control plans for large construction sites. He has developed, managed, and conducted surface water quality and hydraulic monitoring programs, including urban NPS pollutant catchment investigations. He also helps clients with developing nine-element WBPs throughout New England. His current responsibilities include project management, stormwater planning, development of stormwater management designs, phased erosion and sediment control plans, and hosting of training workshops.

Emma Williamson | Project Staff

Emma is an engineer-in-training with experience in civil and water resources engineering. She has been trained in engineering hydrology, water resources engineering, and fluid dynamics. She has experience with surface water, drinking water, and sanitary sewer modeling, water and sewer main design, and water quality analysis. She has worked on numerous WBPs and other watershed studies in both Massachusetts and New Hampshire, including conducting field investigations in Groton and Malden, Massachusetts.

Emily Campbell, P.E. (IL), CFM, CPESC | Project Staff

Emily is a Professional Engineer (in Illinois), a Certified Floodplain Manager, and a Certified Professional in Erosion and Sediment Control. She is also knowledgeable in wetland science, including restoration, delineation, and biogeochemical processing of pollutants within wetlands and other green infrastructure.

Alex Carnes, GISP | Project Staff

Mr. Carnes has seven years of experience as a Geographic Information Systems and remote sensing specialist. Solving client problems in a team environment, he provides geospatial support for numerous projects throughout the United States. He has worked primarily with ESRI's ArcGIS Desktop software for vector data processing, visualization, and figure generation, and IDRISI Selva for remote sensing image analysis and interpretation. In addition, he has multiple years of experience with web mapping technology (ArcGIS Online and ArcGIS Server) open-source GIS programs (e.g., Quantum GIS) and configuring mobile data collection applications (Survey123/Collector for ArcGIS). Mr. Carnes is also proficient mining large relational databases (Microsoft Access, SQL Server) for relevant geospatial information. He has applied his skills to topics including but not limited to groundwater and soil remediation, water and natural resources, epidemiology, and climate change.

Past Experience Examples

Table 3 (below) highlights projects that demonstrate our team's ability to successfully undertake the scope of work described in the RFP. Additional details for these projects follow the chart.

Table 3: Relevant Experience Matrix

Projects	Nine-Element WBP	Pollutant Reduction Strategies	Field Investigation & Water Quality Sampling	Stormwater BMP Design	Public Outreach & Stakeholder Engagement
Multiple Massachusetts WBPs Multiple Massachusetts Watersheds[2]	✓	✓	✓		✓
Identify Non-Point Sources of Pollution and a Mitigation Plan for Knops Pond/Lost Lake Groton, Massachusetts	✓	✓	✓	✓	✓
Water Integration Planning for Three Coastal New Hampshire Towns Exeter, Stratham, and Newfields, New Hampshire	✓	✓		✓	
Urban Water Quality Boston, Massachusetts		✓	✓		
Watershed and Stormwater Management at Long Lake Littleton, Massachusetts		✓	✓	✓	
Mirror Lake Watershed Management Plan and Low-Impact Development Stormwater Improvements Tuftonboro and Wolfeboro, New Hampshire		✓	✓	✓	
Massachusetts NPS Management Plan Massachusetts (Statewide)		✓			✓

[2] Geosyntec has developed WBPs for multiple watersheds, including (but not limited to) Malden River (Malden), Unquity Brook (Milton), Monatiquot River (Braintree), Quaboag-Quacumquasit Ponds (Sturbridge), and Westport River (Westport). Other watersheds include East Branch North River (Colrain), Hamilton Reservoir (Holland), Hinsdale Brook (Greenfield), Mill River (Amherst), and Moose Meadow Brook (Montgomery).

Projects	Nine-Element WBP	Pollutant Reduction Strategies	Field Investigation & Water Quality Sampling	Stormwater BMP Design	Public Outreach & Stakeholder Engagement
Massachusetts Clean Water Toolkit Massachusetts (Statewide)		✓		✓	✓
Massachusetts Best Management Practices Guidance Manual Massachusetts (Statewide)		✓		✓	
Lake Cochituate Watershed and Stormwater Mapping and Planning Natick, Massachusetts		✓		✓	

Multiple Massachusetts WBPs

Relevant Scope

- ✓ Nine Element WBP
- ✓ Pollutant Reduction Strategies
- ✓ Field Investigation and Water Quality Sampling
- ✓ Public Outreach and Stakeholder Engagement

In 2015, MassDEP selected Geosyntec to develop a web-based tool for WBPs in Massachusetts. Geosyntec developed an innovative watershed-planning tool at the crossroads of science, engineering, public policy, and public education (WBP Tool). The interactive web-based tool helps users develop WBPs that meet the nine elements required by USEPA. View the WBP Tool at http://prj.geosyntec.com/MassDEPWBP. A completed WBP is a prerequisite for communities or local organizations that wish to apply for federal grant funding for watershed restoration projects under Section 319 of the Clean Water Act. Geosyntec's web-based tool instantly provides the building blocks of a WBP for thousands of riverine, lake, and coastal watersheds across Massachusetts by simply selecting a watershed by name or clicking a location on a map. We continue to support Section 319 grantees with the development of WBPs using the established tool, with funding provided by MassDEP. Geosyntec supports MassDEP by preparing WBPs for various watersheds throughout the Commonwealth with Section 319 funded projects. Examples include the watersheds of Malden River (Malden), Unquity Brook (Milton), Monatiquot River (Braintree), Quaboag-Quacumquasit Ponds (Sturbridge), and Westport River (Westport). Other watersheds include East Branch North River (Colrain), Hamilton Reservoir (Holland), Hinsdale Brook (Greenfield), Mill River (Amherst), and Moose Meadow Brook (Montgomery).

Identify Non-Point Sources of Pollution and a Mitigation Plan for Knops Pond/Lost Lake, Groton, Massachusetts

Relevant Scope

- ✓ Nine-Element WBP
- ✓ Pollutant Reduction Strategies
- ✓ Field Investigation and Water Quality Sampling
- ✓ Stormwater BMP Design
- ✓ Public Outreach and Stakeholder Engagement

Geosyntec was retained by the Great Ponds Advisory Committee (GPAC) and the Groton Lakes Association (GLA) to evaluate nutrient loading and potential mitigation actions to protect beneficial uses of Lost Lake/Knops Pond. The project includes performing a lake watershed assessment to identify specific non-point sources of nutrients within the subwatersheds draining to the main lake inlets. Geosyntec also conducted NPS nutrient loading and mitigation option investigations, mitigation option evaluation, and developed a nine-element WBP. With preparation of this plan, GPAC and GLA can apply for funding under Section 319 to implement NPS-reduction projects within their watershed to improve water quality in Knops Pond/Lost Lake.

Water Integration Planning for Three Coastal New Hampshire Towns, Exeter, Stratham, and Newfields, New Hampshire

Relevant Scope

- ✓ Nine-Element WBP
- ✓ Pollutant Reduction Strategies
- ✓ Stormwater BMP Design

A consortium of three coastal New Hampshire towns experiencing increased urbanization retained Geosyntec to lead a team to develop the foundation for a water-integration plan for the Squamscott-Exeter (WISE) project. The plan aims to help these communities meet new, more stringent wastewater and stormwater permit requirements, improve water quality in the Squamscott River and Great Bay, and support the economic viability of participating communities. The plan evaluates and manages water quality and climate impacts within and across municipal boundaries. Under advisement from USEPA, Geosyntec developed continuous simulation pollutant-load watershed models and BMP performance models. We applied modeling results to quantify the economic and performance advantages of municipal collaboration and integration of water resource planning. The plan also provides the three communities with necessary information to make long-term financial commitments and planning decisions. **The WISE project was awarded a 2016 USEPA merit award**.

Urban Water Quality Project, Boston, Massachusetts

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Field Investigation and Water Quality Sampling

In response to BWSC's Consent Decree activities, USEPA cited their 2012 New England Bacteria Source Tracking Protocol, which emphasizes chemical-based sewage indicators, including pharmaceuticals and personal care products, and requested that BWSC explore such advanced parameters. In response, BWSC retained us to evaluate whether and where bacteria in BWSC's municipal separate storm sewer system (MS4) outfalls and interconnections are due to human (versus nonhuman) sources and to evaluate ongoing IDDE program effectiveness. Geosyntec designed and implemented an award-winning, hypothesis-driven study that assessed (1) bacteria and nutrient sources to and within BWSC's MS4, (2) spatial and temporal patterns of these pollutants, and (3) the reliability of conventional and USEPA-recommended IDDE indicators. By leveraging our deep experience with microbial source tracking, we cost-effectively developed a robust work plan for BWSC, conducted field investigations and water quality sampling, while also incorporating the latest and most proven analytical tools such as droplet digital quantitative polymerase chain reaction (PCR) for human and nonhuman DNA markers, as well as other novel but exploratory tools such as community DNA analysis.

Watershed and Stormwater Management at Long Lake, Littleton, Massachusetts

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Field Investigation and Water Quality Sampling
- ✓ Stormwater BMP Design

Geosyntec was selected by the Town of Littleton to design innovative watershed-based approaches to managing stormwater inputs to Long Lake. Using low-impact development (LID) stormwater techniques (bioswales, bioretention cells, rain barrels, constructed wetlands, lawn care education, etc.), we designed a comprehensive retrofit program to reduce sediment and nutrient loading to the lake. We also provided designs, permitting, and construction oversight for daylighting of a stream that previously discharged to the pond via a culvert adjacent to the town beach. Since the design was completed, we have worked with the Town on post-construction long-term operation and maintenance (which has not been conducted for nearly two decades), permitting for

maintenance of the stormwater features, development of a comprehensive invasive species management plan, contractor request for proposal, and engineers estimate of cost.

Mirror Lake Watershed Management Plan and LID Stormwater Improvements Tuftonboro and Wolfeboro, New Hampshire

Relevant Scope

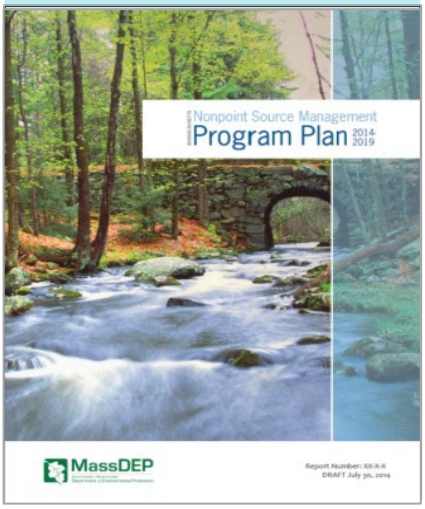
- ✓ Pollutant Reduction Strategies
- ✓ Field Investigation and Water Quality Sampling
- ✓ Stormwater BMP Design

Geosyntec developed a comprehensive lake watershed management plan for Mirror Lake in Tuftonboro and Wolfeboro, New Hampshire. Mirror Lake has experienced declining water quality and is on the New Hampshire List of Impaired Waters due to nuisance cyanobacteria blooms. Phase 1 of this project included developing a phosphorus-loading model and establishing a strategy to manage phosphorus to significantly reduce cyanobacteria blooms. The project also involved sediment sampling, vegetation survey, stormwater engineering and development of public outreach materials. Phase 2 of the project involved design, permitting and construction oversight of LID stormwater improvements, including bioretention, sand filters, and bioswales.

Massachusetts Nonpoint Source Management Plan – Statewide

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Public Outreach and Stakeholder Engagement



The Massachusetts NPS Management Program Plan (NPS Plan) presents a strategy for preventing, controlling, and reducing NPS pollution to protect and improve the quality of Massachusetts water bodies.

Geosyntec developed an update to the NPS Plan, working in close collaboration with MassDEP staff, to reflect the current priorities of the Massachusetts NPS Program, USEPA program guidelines, funding levels, and staff resources for the period of 2014 to 2019. This update significantly streamlined the previous five-volume NPS Plan, creating a concise one-volume document. The updated plan details programs and initiatives to improve coordination with partner programs and opportunities to leverage funding for NPS pollution projects through interagency collaboration and program structure. Geosyntec also helped to develop approaches to improve internal coordination among MassDEP programs and external stakeholders and agencies, ranging from agricultural, urban, and coastal to federal, state, and local partners. The NPS Plan can be viewed at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/npsmp.pdf

Massachusetts Clean Water Toolkit – Statewide

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Stormwater and BMP Design
- ✓ Public Outreach and Stakeholder Engagement

On behalf of the MassDEP, Geosyntec developed an interactive Massachusetts Clean Water Tool Kit, which serves as the Commonwealth's primary public education resource related to NPS pollution. The toolkit includes 159 BMP fact sheets and 6 interactive scenarios that allow users to explore BMPs in a variety of detailed landscapes that are typical to Massachusetts, including urban, residential, agricultural, roads, construction, and shoreline restoration. To view the Clean Water Toolkit, go to http://prj.geosyntec.com/npsmanual

Stormwater Best Management Practices Guidance Manual – Statewide

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Stormwater and BMP Design

For the BWSC, Geosyntec developed a *Stormwater Best Management Practices Guidance* document. This manual identifies a suite of BMPs to address the range of known pollutant discharges, including general information, sizing requirements, critical design parameters, and BMPs that are scalable to match site-specific discharge volumes and pollutant loads within the BWSC's Municipal Separate Storm Water System. The manual emphasizes structural BMPs incorporating green infrastructure and LID techniques and is intended for use by BWSC during site plan review of development projects and when designing capital improvements. The manual contains information on BMP selection, BMP fact sheets, a BMP selection matrix, and a technical guidance section that focuses on LID techniques, urban stormwater pollutants, Massachusetts stormwater standards, and BMP design and sizing techniques.

Lake Cochituate Watershed and Stormwater Mapping and Planning Natick, Massachusetts

Relevant Scope

- ✓ Pollutant Reduction Strategies
- ✓ Stormwater and BMP Design

Geosyntec developed a watershed and stormwater mapping and planning document that recommended design concepts and associated costs for strategies to reduce pollution into the lake. This included micro-watershed mapping at the outfall level for 28 outfalls and characterizing and ranking the micro-watersheds using land use estimates, percent impervious surface, and pollutant loading estimates. The project also included preparing conceptual level retrofit stormwater BMP design proposals for each of the outfalls in the project areas.

References

Below are clients we have conducted similar work for and would be pleased if you contacted as a reference for our work. These projects are described in more detail above.

Table 4: Client References

Client	Contact Information	Nature of Work
MassDEP	Meghan Selby MassDEP - Watershed Planning Program 8 New Bond Street Worcester, MA 01606 Meghan.selby@mass.gov 617-418-9666	Massachusetts statewide WBPs
Great Ponds Advisory Committee / Groton Lakes Association	Alexander Woodle 20 Highland Road Groton, MA 01450 978-732-3224	Identify Non-Point Sources of pollution and a mitigation plan for Knops Pond/Lost Lake

Project Cost

The total estimated hours and cost for completion with a breakdown by task for the project is provided below in Table 5. A more detailed breakdown of the pricing is provided in Attachment B.

Table 5: Project Pricing

Phase	Total Hours	Total Budget
1: Review Existing Technical Information and Watershed Field Survey (RFP Task 1)	55	$10,500
2: Develop WBP Elements (RFP Tasks 2-10)	189	$39,700
3: Watershed-based Plan (WBP) Report (RFP Task 11)	87	$15,100
TOTAL	**331**	**$65,300**

Consultants Insurance and Indemnification

To the fullest extent permitted by law, the Parties shall indemnify and hold harmless each other (and each of their respective officers, directors, shareholders, partners, employees, and representatives) from and against all claims, demands, causes of actions, suits, based upon or arising from allegations of illness, injuries to persons, destruction of or damage to property, costs, expenses and all reasonable expenses, legal or otherwise, to the extent arising out of the indemnifying Party's negligent acts or omissions. In addition, the Parties shall indemnify, defend, and hold harmless the other party against all loss, cost, expense, royalties, claims for damages or liability in law or in equity, including without limitation, attorney fees, court costs, and other litigation expenses that may at any time arise or be set up for any infringement (or alleged infringement) of any patent, copyright, trade secret, or other proprietary right of any person or entity in consequence of the use by indemnifying Party of any documents or materials.

A sample insurance certificate is provided in Attachment C.

Attachment A:

Project Team Resumes

Renee Bourdeau, P.E.

Geosyntec consultants

Specialties:

- Green infrastructure design
- Integrated planning for wastewater & stormwater
- Watershed planning
- Nutrient control planning
- Stormwater master planning
- Climate adaptation planning & mitigation

Education:

- M.S., Water Resources and Civil Engineering, University of New Hampshire, Durham, New Hampshire, 2010
- B.S., Environmental Science, Plattsburgh State University of New York, Plattsburgh, New York 2004

Professional Registration:

- Professional Engineer, New Hampshire, No. 15092

Career Summary

Renee is a professionally licensed civil and environmental engineer. She has 16 years of experience in watershed and municipal planning, land use master planning, environmental permitting, design of stormwater management controls with a focus on low impact development (LID) and green infrastructure (GI) techniques. Her focus is providing expert support to clients in nutrient control planning and Clean Water Act implementation and compliance. Her work is rooted in assisting municipalities, watershed groups and private clients in determine the sources of pollution within the watershed and developing strategies and solutions to reduce pollution and improve water quality.

Dover Waterfront Development, *Dover, NH.* Technical and environmental permitting lead on the redevelopment of a vacant remediation site into a parcel to be sold for future commercial/residential development, park to be owned by the city and a series of roads and associated utility infrastructure. Design elements included a living shoreline, bank stabilization and green infrastructure. Environmental permitting efforts including wetlands, Alteration of Terrain and Army Corp of Engineers.

Burlington Integrated Plan, *Burlington, VT.* Technical lead in the development of a Phosphorus Control Plan (PCP) and Integrated Plan for the City of Burlington Vermont. The PCP evaluated various sources of phosphorus from the City to the MS4 system as well as to Lake Champlain. The Integrated Plan looked at all of the City's Clean Water Act regulatory obligations and prioritized the most cost-effective strategies for phosphorous load reductions. As part of the Integrated Planning process, Renee worked with the regulatory agencies (VT ANR and EPA) to establish an appropriate timeline, suite of reduction strategies and load reductions for each of the strategies.

Phosphorus Control Plan, *Essex Junction, VT.* Technical lead in the development of a Phosphorus Control Plan (PCP) for the Town of Essex Junction to assist them in meeting with MS4 Permit and Lake Champlain Phosphorous TMDL regulatory compliance.

Country Pond Phosphorus Control Plan, *Kingston and Newton, NH.* Project Manager and technical lead for the development of a Phosphorus Control Plan (PCP) for the Towns of Kingston and Newton to meet their MS4 Permit and Phosphorous TMDL regulatory obligation. Development of plan includes watershed scale modeling and selection of site scale green infrastructure for phosphorous reduction.

Sunrise Lake Phosphorus Control Plan, *Middleboro, NH.* Project Manager and technical lead for the development of a Phosphorus Control Plan (PCP) for the Town of Middleboro to meet their Phosphorous TMDL regulatory obligation. Development of plan includes watershed scale modeling and selection of site scale green infrastructure for phosphorous reduction.

Stormwater Municipal Planning, Pease Development Authority, *Portsmouth, NH.* Project Manager assisting Pease Development Authority (PDA) in the implementation of a Consent Decree between PDA and USEPA Region 1. Tasks include development of public education materials, illicit discharge detection and elimination plan, construction and post-construction controls and writing land development ordinances/regulations.

Merrymeeting River Watershed Based Plan, *New Durham and Alton, NH.* Project Manager for the development of watershed based plan for Gregg Lake. Tasks include conceptual designs for four structural stormwater treatment practices, cost estimates for the treatment practices, pollutant load reduction estimates and participation in public meetings with stakeholders.

Spofford Lake Watershed Based Plan, Spofford Lake Association, *Chesterfield, NH.* Project Manager for the development of watershed based plan for Spofford Lake. Tasks include field reconnaissance to identify a suite of pollutant load reduction strategies, cost estimates for the reduction strategies and pollutant load reduction estimates.

Nippo Lake Watershed Based Plan, *Brentwood, NH.* Project Manager to assist the Nippo Lake Improvement Association and NHDES for development of a Watershed Based Plan for Nippo Lake. Tasks included field reconnaissance to identify a suite of pollutant load reduction strategies for stormwater and septic systems.

Wastewater and Stormwater Nitrogen Control Plan, *Town of Exeter, NH.* Project Manager and technical lead on the assisting the Town in the development of Nitrogen Control Plan to meeting their NPDES Wastewater Discharge Permit Administrative Order of Consent (AOC). Activities include quantifying the baseline nitrogen load from the Town to the receiving waters from both point and non-point sources, evaluation of nitrogen reduction strategies to reduce non-point and stormwater loads, prioritizing these strategies based on the greatest load reduction for the investment and creation of an implementation plan. Responsibilities also include outreach and education of local officials and negotiations with EPA and NHDES.

Winnicut River Watershed Based Plan, New Hampshire Rivers Council. Project Manager and technical lead for the Wright-Pierce & Geosyntec Consultants team on the development of a watershed based plan for the Winnicut River in seacoast New Hampshire. This watershed based plan will be the first developed in the state with a freshwater and tidal influence. Tasks included development of water quality goals, estimating current and future loads to the receiving water, and suite of pollutant load reduction strategies for stormwater and septic systems.

Draft Integrated Wastewater and Stormwater Permit, *Durham, NH.* Technical lead assisting the Town of Durham in negotiating an Integrated Wastewater and Stormwater National Pollution Discharge Elimination System (NPDES) permit including the development of a long-term nutrient control plan to reduce pollutant load from non-point sources.

Water Integration for Squamscott Exeter (WISE) Preliminary Integrated Plan. Project manager and technical lead for a research project to evaluate how multiple jurisdictions can use US EPA's new integrated planning policy for wastewater and stormwater to fulfill Nitrogen Control Plan requirements, overlapping municipal separate storm sewer (MS4) requirements, and water reclamation facility (WRF) capacity needs. The report estimated that an integrated planning approach provided 50% cost avoidance from traditional wastewater and MS4 permitting for the Towns of Exeter, Newfields, and Stratham, NH.

Indian Head Heights Stormwater Report, *Town of Framingham, MA.* Technical lead in the design of stormwater management controls to mitigate the impacts from the Indian Head Heights Water Tank project in Framingham, MA. The stormwater design included reduced pavement widths, design of treatment swales and basins to reduce peak flows and volumes due to increased impervious cover at the site.

Mirror Lake Implementation Project, Mirror Lake Protective Association, *Wolfeboro/Tuftonboro, New Hampshire.* Design Engineer for the nine (9) resource improvements in the Mirror Lake Watershed. These features included rain gardens; bioretention cells; culvert replacement; and outlet protection. Responsibilities included developing conceptual design plans; preparing construction design plans and specifications; preparing bid documents and construction oversight.

Rust Pond Stormwater Improvements, Town of Wolfeboro, *Wolfeboro, New Hampshire.* Design Engineer for the conceptual design for several resource improvements in the Rust Pond Watershed. These features included stream restoration, bioretention; hydrodynamic separators; sediment trap; and boat ramp improvements. Responsibilities included developing conceptual design plans; preparation of cost estimates; and load reductions.

Cobbett's Pond Stormwater Improvements, Cobbett's Pond Improvement Association, *Windham, New Hampshire.* Design Engineer for the design for several resource improvements in the Cobbett's Pond Watershed. These features included rain gardens, vegetated water quality swales and associated stormwater management structures. Responsibilities included developing conceptual design plans; preparing construction design plans and specifications; and preparing bid documents.

Mass DER Tidal Geodatabase, *Massachusetts statewide.*

Gregg Lake Watershed Based Plan, *Antrim, NH.* Project Manager for development of watershed based plan for Gregg Lake. Tasks include conceptual designs for up to ten structural stormwater treatment practices, cost estimates for the treatment practices and pollutant load reduction estimates.

Spofford Lake Watershed Based Plan, Spofford Lake Association, *Chesterfield, NH.* Project Manager for the development of watershed based plan for Spofford Lake. Tasks include field reconnaissance to identify a suite of pollutant load reduction strategies, cost estimates for the reduction strategies and pollutant load reduction estimates.

Julia M. Keay, P.E., CPESC

Geosyntec consultants

Specialties:

- water resources engineering
- stormwater management
- data analysis
- water resources planning
- green infrastructure design

Education:

- M.S., Civil Engineering, University of Massachusetts, Amherst, Massachusetts, 2013
- B.S., Environmental Sciences, University of Massachusetts, Amherst, Massachusetts, 2007

Professional Registration:

- Professional Engineer (PE) No. 57037 (Massachusetts)
- Certified Professional in Erosion and Sediment Control (CPESC) No. 7705

Career Summary

Ms. Keay is a water resources engineer specializing in the design and modeling of stormwater management systems. Ms. Keay is trained in water resources engineering, water resources systems analysis, watershed management, water resources planning, hydrology, hydraulics and environmental sciences. Her experience includes hydrologic and hydraulic modeling; linear optimization modeling; preparation of engineering designs and specifications; watershed-based planning; permitting compliance; use of Geographic Information Systems (GIS); and litigation support.

Massachusetts Statewide Watershed-Based Plans, Massachusetts Department of Environmental Protection. Ms. Keay is currently project managing development of numerous watershed-based plans (WBPs) with partner organizations throughout Massachusetts using the web-based statewide WBP tool that Geosyntec developed. Ms. Keay was also part of the team responsible for developing this interactive web-based tool at the crossroads of science, engineering, public policy, and public education, which helps users develop WBPs that meet the nine elements required by the U.S. Environmental Protection Agency (USEPA). Ms. Keay's responsibilities included modeling, guidance module writing and design for each of the required nine elements, GIS, database organization and coordination.

Drainage Mapping Updates, *Town of Exeter, New Hampshire.* Ms. Keay served as project manager for this project, which involved updating a SWMM model for two design storm scenarios based on updated storm sewer infrastructure information and revising the 10-year design storm event drainage maps for the Town of Exeter.

Catchment Delineations, *Framingham, MA.* Ms. Keay served as project management for this project, which involved MS4-related data collection; 2016 Massachusetts Small MS4 General Permit compliance review of system mapping; outfall catchment delineation and mapping; reporting and presentation of findings.

Portsmouth Gaseous Diffusion Plant Decontamination & Decommissioning Project (PORTS), Confidential Client, *Piketon, Ohio.* Ms. Keay was a member of a team responsible for designing site-wide stormwater management best management practices (BMPs) for various phases of construction of an approximately 360-acre landfill site. Ms. Keay conducted hydrologic and hydraulic modeling using HydroCAD, SWMM and HY-8 software and was actively involved in creating calculation and drawing packages.

Stormwater Peer Review Services, Bernardston Conservation Commission, *Massachusetts.* Ms. Keay served as project manager of a third-party review of a stormwater management system design for a proposed 23-acre solar farm development. The project entailed document review of a wetlands permit application, design drawings and stormwater calculations for compliance with the Massachusetts Stormwater Standards; and preparation of technical memoranda with findings.

Ms. Keay presented the peer review findings at a conservation commission public meeting and worked collaboratively with the client and applicant to address deficiencies in the application package.

Water Integration for Squamscott-Exeter (WISE), University of New Hampshire, *Exeter, Stratham, and Newfields, New Hampshire.* Ms. Keay conducted various technical tasks for the development of an Integrated Municipal Stormwater and Wastewater Plan for meeting new, more stringent state and federal wastewater and stormwater permit requirements in the Exeter/Squamscott River watershed. This included codeveloping an optimization model for evaluating the optimal combination of management measures in the Squamscott-Exeter Watershed within the towns of Newfields, Exeter and Stratham (i.e., the combination of different BMP types, which achieved a target nitrogen load reduction within the watershed with the minimum possible monetary capital cost).

BMP Design, Cobbett's Pond Association*, Windham, New Hampshire*. Ms. Keay served as assistant project manager for design and permitting of stormwater improvement at a site within the Cobbett's Pond watershed within Windham's municipal stormwater system. Improvements included stream and wetland restoration. Her responsibilities included preparing construction level design plans and specifications and assistant managing the project.

Municipal Solid Waste Landfill, Crossroads Landfill, Waste Management Disposal Services of Maine, *Norridgewock, Maine.* Ms. Keay was responsible for designing a permanent stormwater system for the landfill closure, which included HydroCAD modeling, construction drawing updates and a detailed calculation package

Industri-Plex Superfund Site*, Woburn, Massachusetts.* Ms. Keay created a detailed water balance model and calculation package of existing and proposed wetlands, which were part of a wetland/surface water mitigation plan. The model was used to illustrate that the proposed wetland mitigation was expected to achieve sufficient soil saturation for supporting wetland vegetation.

Orrington Industrial Site Remediation, Confidential Client, *Orrington, Maine*. In this major industrial site decommission project, Ms. Keay developed a detailed HEC-RAS model and calculation package, which was part of the corrective measures implementation plan for the site.

Rochester MS4 Support, *Rochester, New Hampshire.* Ms. Keay was responsible for drafting the Year 1 Stormwater Management Program (SWMP), the Year 2 SWMP, and the Year 2 Annual Report, prior to internal senior review and subsequent submittal to the City of Rochester.

Rochester Stormwater Program Assessment, *Rochester, New Hampshire.* Ms. Keay co-created a BMP optimization model for watershed nutrient control planning. The purpose of the model was to help inform an optimal combination of stormwater management strategies to meet nutrient control targets within the City of Rochester.

Dan Bourdeau, P.E., CPESC, CPSWQ

Geosyntec consultants

Specialties:

- Water resources engineering
- Stormwater management
- Erosion and sediment control
- Civil engineering

Education:

- M.S., Environmental Engineering, University of Massachusetts (Amherst), 2004
- B.S., Civil Engineering, University of Massachusetts (Dartmouth), 2002

Professional Registration:

- Registered Professional Engineer: Massachusetts No. 47558; New Hampshire No. 12882; New Jersey No. GE 48897; Maine No. 13309; New York No. 096987
- Certified Professional in Erosion and Sediment Control (CPESC) No. 3586
- Certified Professional in Surface Water Quality (CPSWQ) No. 0331

Career Summary

Mr. Bourdeau has over 18 years of experience in water resource engineering. He has unique experience assisting clients with retrofit stormwater management programs from site selection through monitoring phases including BMP modelling and optimization, BMP design, and construction administration. He also has expertise in stormwater design, specifically with retrofit green infrastructure practices including bioretention facilities, biofilters, and constructed treatment wetlands. He has extensive experience in land use pollutant loading modelling, nutrient control planning, and watershed planning. Mr. Bourdeau has developed and managed several watershed-based plans (WBPs) for a variety of receiving waters from lakes and ponds with phosphorus being the limiting nutrient to coastal estuary systems.

Stormwater Services and MS4 Support, *Rochester, New Hampshire.* Mr. Bourdeau is the Project Manager for an ongoing contract with the City of Rochester for stormwater support services including MS4 permit compliance support. He led the development of a nutrient control plan to quantify nutrient load export and develop optimization strategies to reduce nutrient loads from the City. Tasks included evaluating the current land uses for the City and developing nutrient load estimates, evaluating structural and non-structural stormwater BMPs for nutrient reduction, and creating optimization scenarios to evaluate life cycle costs and probability of permit compliance under future MS4 permits. He has been responsible for providing the city with MS4 permit support including stormwater ordinance and planning regulations development, stormwater master planning, permit compliance program development, internal MS4 audit support, and permit resource allocation. He has also provided technical assistance to the City to evaluate a proposal by USEPA for a nonpoint source general permit framework.

Integrated Planning for Squamscott-Exeter Watershed (WISE), NERRS Science Collaborative, *Rockingham County, New Hampshire.* Mr. Bourdeau served as technical advisor for this 2016 US EPA Merit Award recipient project. The project involved development of a water quality and BMP performance model for three communities in southeastern New Hampshire. The model analyzes nitrogen and other pollutant loads from various land cover types as well as the treatment performance of a wide range of BMPs. The model results are incorporated into a wider nitrogen budget for the region and will be used to inform stakeholders of the costs associated with varying levels of storm water management.

Lake Sunapee Monte Carlo Water Quality and Land Use Planning Analysis, *Sunapee, New Hampshire.* Mr. Bourdeau served as Lead Engineer for the development of a water quality model for the Lake Sunapee watershed using a Monte Carlo simulation. The model assessed potential impacts of future development on lake water quality. The model incorporated a future build-out scenario and a land used-based pollutant loading model using available event mean concentration data.

Winnicut River Watershed-Based Plan, *New Hampshire.* Mr. Bourdeau served as Project Manager for the development of a "nine-element" WBP for the Winnicut River on behalf of the New Hampshire Rivers Council. The Winnicut River has both freshwater and estuarine segments and is tributary to the impaired Great Bay Estuary. WBP development will include analysis of historical data, water quality goal setting, modeling to project future pollutant loads, and field evaluation and prioritization of opportunities to reduce pollutant loads.

Cobbett's Pond Watershed Restoration Plan, *Windham, New Hampshire.* Mr. Bourdeau served as Project Manager for the development of a comprehensive watershed restoration plan for Cobbett's Pond, including in-lake water quality monitoring, aquatic vegetation survey, pollutant load modeling, and development of public outreach materials. He also served as Lead Engineer for the implementation of the watershed management plan recommendations including the design, permitting, and construction oversight of stormwater improvement at several sites within the Cobbett's Pond watershed within Windham's municipal stormwater system. Improvements included stream restoration, flow-through constructed wetlands, bioretention facilities, and vegetated water quality swales. His responsibilities included preparing construction level design plans and specifications, preparing bid documents, cost estimates, and performing construction management.

Green Infrastructure for Sustainable Coastal Communities, *Coastal New Hampshire.* Mr. Bourdeau served as Project Manager and Lead Engineer for the design of several GI practices including bioretention cells, rain gardens, and a subsurface flow gravel wetland. Responsibilities under this grant project included project management, preparing design drawings and specifications, working with contractors and public works to implement retrofit GI practices, and public outreach and training.

Pawtuckaway Lake Watershed-Based Plan, *Nottingham, New Hampshire.* Mr. Bourdeau assisted with a watershed reconnaissance project to identify potential areas of non-point source pollution. He also developed low-impact development retrofit designs at several of the identified sites within the watershed for use in 319 Grant applications.

Mirror Lake Watershed Management Plan, *Wolfeboro, New Hampshire.* Mr. Bourdeau led the development of a comprehensive watershed management plan for Mirror Lake, including in-lake water and sediment quality monitoring, aquatic vegetation survey, pollutant load modeling, engineering and construction oversight of stormwater improvement designs, and the development of public outreach materials.

Rust Pond Watershed Assessment and Stormwater Improvements, *Tuftonboro, New Hampshire.* Mr. Bourdeau served as Project Manager for the development of a management plan to reduce sediment and nutrient loading to Rust Pond from two subwatershed areas. This project involved pollutant load modeling, watershed assessment, conceptual and final design of stormwater best management practices, and public outreach.

Emma Williamson, EIT

Geosyntec consultants

Specialties:

- Water resources engineering
- Hydrology
- Water modeling

Education:

- M.S. Civil Engineering, Lehigh University, Bethlehem, PA, 2019
- B.S. Civil Engineering, Lehigh University, Bethlehem, PA, 2019

Career Summary

Emma Williamson is an engineer-in-training with experience in civil and water resources engineering. She has been trained in engineering hydrology, water resources engineering, and fluid dynamics. She has experience with surface water, drinking water, and sanitary sewer modeling, water and sewer main design, and water quality analysis.

Goldthwait Marsh Study, *Town of Marblehead, Massachusetts*. Emma Williamson assessed salt marsh health by analyzing water level and salinity data taken from drain structures that receive both stormwater and tidal flow. Her responsibilities included designing and implementing water level and salinity monitoring, conducting a site survey, and recommending best practices for marsh health.

Illicit Discharge Detection and Elimination (IDDE) Study, *Town of Marblehead, Massachusetts.* Emma Williamson conducted an IDDE study to ensure that stormwater discharges met requirements. Her responsibilities included reviewing as-built drawings and historical reports, testing water quality from drain manholes and catch basins, and prioritizing areas for study.

Stormwater Outfall Sampling, *City of Salem, Massachusetts.* Emma Williamson located and sampled stormwater outfalls for a variety of contaminants and other water quality indicators for both wet and dry weather.

Infiltration and Inflow Study, *Town of Marblehead, Massachusetts.* Emma Williamson analyzed town-wide sanitary sewer flow data to estimate infiltration and inflow volumes to prioritize areas for future investigation and rehabilitation. Her responsibilities included planning and implementing a four month long sanitary sewer flow metering program during the high groundwater season, analyzing flow data in EPA's SSOAP Toolbox, writing Python codes to pre- and post-process the flow data, review as-built drawings and historical reports, and create a rehabilitation plan to address areas with excess inflow and/or infiltration rates.

InfoSewer Sanitary Sewer Model, *Town of Marblehead, Massachusetts.* Emma Williamson aided with the development of a town-wide sanitary sewer model using as-built drawings, tie-cards, ArcGIS shapefiles and maps in order to determine probable surcharge locations or locations prone to backup.

Human Impacts on Streamflow Study, *Lehigh University, Bethlehem, PA.* Emma Williamson characterized 700 watersheds using streamflow signatures (programmed with MATLAB from USGS data) and climatological, geological, and land use attributes from EPA StreamCat, National Hydrography Dataset, and other sources; developed a methodology to comparatively analyze natural and urban watersheds over the northeastern United States; and investigated the impact of urbanization on streamflow using regression analysis.

Water Main and Water Storage Tank Rehabilitation, *Massachusetts.* Emma Williamson designed multiple water mains and water storage tank rehabilitation projects. Responsibilities included reviewing as-built plans, writing specifications, drafting designs in AutoCAD, preparing cost estimates, and conducting site visits.

Emily Campbell, P.E., CFM, CPESC

Geosyntec consultants

Specialties:

- Hydraulics and hydrology
- Stormwater management
- Wetlands and floodplains
- NPDES permit compliance

Education:

- M.S., Biosystems Engineering, Michigan State University, E. Lansing, Michigan, 2014
- B.S., Biosystems Engineering, Michigan State University, E. Lansing, Michigan, 2012

Professional Registration:

- Professional Engineer, State of Illinois, License No. 062.070122, 2017
- Certified Floodplain Manager, Assoc. of State Floodplain Managers, No. IL-18-00830, 2018
- Certified Professional in Erosion Sediment Control, Envirocert Int., No. 8039, 2018

Career Summary

Ms. Campbell is a Professional Engineer (in Illinois), a Certified Floodplain Manager, and a Certified Professional in Erosion and Sediment Control. Emily is also knowledgeable in wetland science, including restoration, delineation, and biogeochemical processing of pollutants within wetlands and other green infrastructure.

Hydrology and Hydraulics

Grand Park Hydrologic and Hydraulic Assessment - Technical Lead, *OLIN, Clarksville, IN.* Geosyntec served as a technical advisor to OLIN for the proposed Grand Park, a 632-acre property located along the Ohio River in Indiana. The property frequently floods and has numerous hydrological features, including wetlands, creeks, ponds, and historical flow control devices. Geosyntec was hired by OLIN to help the project team understand how the hydrology would affect park uses and to envision ways to leverage the hydrological features for recreational purposes. OLIN was also concerned about continual degradation along the Ohio River shoreline and within incised streams located on the property. Geosyntec's work informed OLIN regarding the programming of recreational facilities, open space management, and water quality considerations for the park. Geosyntec provided concept layouts and storybooks to illustrate the frequency, duration, and location of anticipated flooding and stream restoration concepts and river flow deflection devices to limit erosive forces on the stream bed and river banks.

Watershed Management Plan Development, *Moultonborough Bay and Winter Harbor, Lake Winnipesaukee, New Hampshire.* Performed analysis to determine current and future build-out phosphorus loading for two watersheds contributing to Lake Winnipesaukee. Will lead or assist in BMP reductions modeling, BMP design, and the development of bid documents. A Watershed Management Plan (WMP) will be produced as a result of the project, and a public meeting will be held to present the WMP to stakeholders.

Hydrologic Modeling Support, *Akron, OH.* Ms. Campbell assisted on the development of an HEC-HMS model. The model was developed to provide hydrology data for a water quality model for the City of Akron. Ms. Campbell used GIS desktop analysis and BASINS to inform the parameters for the Cuyahoga River subwatersheds and the Little Cuyahoga subwatersheds within the model. She also provided technical support for updating and adding data to the model.

Ottawa River Feasibility Study, Hydraulic Modeling, *City of Lima, OH.* Emily is working on a project to establish the highest attainable aquatic life uses in the Ottawa River within and downstream of the City of Lima. She is using monitoring and survey data to create a hydraulic model to simulate dam removal for aquatic life attainment. She used survey data to build a 3D surface in Civil 3D and create cross sections in HEC-RAS.

Stream Restoration and Basin Retrofit, Hydraulic and Hydrologic Modeling, *St. Peters, MO.* Geosyntec was hired by the City of Peters, MO to provide design for several stormwater projects throughout the City. Project manager for multiple stormwater project sites including a stream restoration and three basin retrofits. Performed hydraulic and hydrologic modeling to support the design, including scour analysis.

Coordinated with Geosyntec's ecological subcontractor on the development of vegetation plans for each project area. Assisted on the development of technical design drawings and specifications used for bid. Provided an engineering estimate of probable cost. Assisted on sediment and erosion control design. Performed quantity calculations for use in the bid document. Utilized Civil 3D, ArcGIS and SWMM to support design.

Rain Garden Data Management and Analysis, *Boone County, MO.* Ms. Campbell processed raw water level data for six rain gardens for an eight-month monitoring period. She analyzed about two million measurements for gaps and errors, and summarized the data in graphs and tables for further analysis of rain garden performance. She corrected the level data for barometric pressure and also summarized climate monitoring data.

Integrated Plan Development*, City of Columbia, Columbia, MO*. Performed cost analysis for stormwater management and erosion control improvements in the City of Columbia, Missouri including runoff treatment with structural BMPs, stream erosion restoration, Illicit Discharge Detection and Elimination (IDDE) in waterways, MS4 program enhancement, and erosion control inspections at construction sites. Assisted in analysis for a financial capability study within the City for stormwater and sewer rates. Summarized results for the client with figures and graphics created from ArcGIS and Tableau

Riparian Reforestation for the Ottawa River within the City of Lima, OH, *City of Lima, OH.* As Project Manager, working with multiple city departments and restoration contractors on a Supplemental Environmental Project (SEP), currently in the fourth year of implementation. The SEP is part of a Consent Decree from USEPA Region 5. Assists the City in implementation of the SEP, including the development of the restoration plan, obtaining and overseeing contractors, adaptive management, and representing the SEP to USEPA. Led development of a restoration plan, including performance criteria, seed mix selection, tree planting plan, and long-term management plan. Led bid document development, pre-bid meeting, contractor selection, and kickoff meeting. Perform recommendations and approvals for yearly management plans, including corrective actions. Contractor oversight through field visits and monitoring report review.

Central Baptist Green Infrastructure Design, *Metropolitan St. Louis Sewer District (MSD), St. Louis, Missouri.* MSD's Project Clear Rainscaping Large Scale Grants Program funded Geosyntec's design and engineering services to develop detailed BMP design drawings and supporting calculations for the implementation of the stormwater management features to the existing combined sewer infrastructure. Facilitated a watershed-based approach for evaluating the use of bioretention cells and tree trenches to capture and treat stormwater runoff to reduce the volume of runoff and improve water quality. Assisted in the design of bioretention cells and tree trenches and evaluating the proposed flow into the downstream storm sewer network.

Agricultural BMP and Sediment Transport Modeling, *Pigeon River/River Raisin Watersheds, Michigan.* Utilized Soil and Water Assessment Tool (SWAT) and ArcGIS to model the effect of different agricultural Best Management Practices (BMPs) on receiving water quality in the Pigeon River and River Raisin Watersheds. The project assessed the spatial placement of agricultural BMPs throughout the watersheds to best allocate funding resources.

Fox River Water Quality Model Update, *Fox River Study Group (FRSG), Illinois.* Assisting engineer on the refinement of a water quality model for 98 miles of Fox River. The FRSG is a diverse coalition of stakeholders working together to assess water quality in the Fox River watershed. As part of that effort, the FRSG is implementing a long-term, phased work plan to eliminate water quality impairments due to nuisance algae, low dissolved oxygen (DO), diel DO swings, and high phosphorus concentrations. Collected and pre-processed timeseries datasets to update the HSPF model to include more spatial resolution and information from recent years. The model will be used to assess the alternatives such as dam removal, nutrient load reduction for improving the water quality in Fox River.

Alexander Carnes, GISP

Geosyntec consultants

Specialties:

- geographic information systems
- remote sensing and image interpretation
- relational databases

Education:

- M.A., Geographic Information Science for Development and Environment, Clark University, Worcester, Massachusetts, 2011
- B.A., Geography, University of Connecticut, Storrs, Connecticut, 2009

Career Summary

Mr. Carnes has ten years of experience as a Geographic Information Systems specialist. Solving client problems in a team environment, he provides geospatial support for numerous projects throughout the United States. He has worked primarily with ESRI's ArcGIS Desktop and ArcGIS Pro software for vector data processing, visualization, and figure generation. His other focus areas include web mapping development (ArcGIS Online, ArcGIS Server, and Geocortex) and configuring mobile data collection applications (ArcGIS Field Maps, Survey123 for ArcGIS) for internal and external clients and teams. Additionally, Mr. Carnes has provided value-added insights for clients utilizing IDRISI Selva to analyze and interpret remotely sensed imagery. Mr. Carnes is also proficient mining large relational databases (Microsoft Access, SQL Server) for relevant geospatial and laboratory information. He has applied his skills to topics including but not limited to groundwater, soil, and sediment remediation, water and natural resources, asset management, epidemiology, and climate change.

Tidal Atlas Geodatabase, *MassDER*. Mr. Carnes developed a geodatabase and user guide for the tidal atlas project. The scope of work involved compiling a primary database of tidal structures along the coast of Massachusetts from various source atlases and other disparate data sources. Mr. Carnes coordinated with database professionals to QC the database and ensure a smooth conversion to a geodatabase format for the client. Mr. Carnes developed relationship classes with the geodatabase allowing the client to access original source atlas information. In addition, Mr. Carnes assisted with outreach to other organizations to acquire datasets to expand the geodatabase further in future scopes of work.

State-Wide Tide Gate Assessment Project*, Massachusetts Bays Program, Massachusetts.* Mr. Carnes played a key role for several tasks in the state-wide tide gate assessment project. First, he coordinated with team members to maintain a master tide gate inventory database and provided comprehensive FGDC metadata as part of the final submission to Mass Bays. Secondly, he was responsible for delineating the zones of tidal influence around each location as input to the ArcToolbox created in another phase of the project. Mr. Carnes was responsible for troubleshooting and running the ArcToolbox and provided technical guidance to junior staff in developing an interactive GeoCortex web viewer for displaying and querying the output inundation results and affected infrastructure.

Town of Framingham Catchment Delineations, *Town of Framingham, Massachusetts.* Mr. Carnes served as project manager of the Framingham catchment geodatabase project. Mr. Carnes coordinated with GIS Managers to determine catchment areas to 473 city owned outfalls. Mr. Carnes used Spatial Analyst tools to automate catchment outlines for most of the outfalls. However, a subset of outfalls required detailed as-built plan review and/or field verification to confirm system configurations to support the catchment outlines. Mr. Carnes developed a field data collection application in Collector for ArcGIS allowing an internal team to efficiently take field observations and photos on their phones.

Mr. Carnes also provided detailed instructions within the app to ensure the most thorough data capture. Mr. Carnes utilized this data to modify catchments as needed, and submitted a final catchment geodatabase, field geodatabase, and summary documentation to the client for use in MS4 compliance efforts.

Rochester MS4 Support, *City of Rochester, New Hampshire* Mr. Carnes has been providing the City of Rochester, New Hampshire with ongoing GIS support. His primary contributions have been to perform catchment delineations to city outfalls and stormwater BMPs using ArcGIS toolboxes, and to provide GIS-based statistics to support outfall prioritization for system vulnerability factors (such as, but not limited to: age of infrastructure, drainage to impaired waterbodies, and density of hazardous waste sites). Additionally, he has developed several field data collection applications for outfall, manhole, and catch basin investigations using ArcGIS Field Maps, Survey123 for ArcGIS, and ArcGIS Online. Mr. Carnes has coordinated with multiple internal and external field staff in developing and publishing the forms, training stuff on using them in the field, and retrieving and using the collected data post-field event in both online and desktop applications.

Pennichuck Water Works SWPP, *Pennichuck Water Works*. Mr. Carnes served as the primary GIS analyst for the Pennichuck Water Works Source Water Protection Plan. Mr. Carnes coordinated multiple internal staff to compile datasets from numerous agencies to build a comprehensive web-GIS for the client. In addition, he supported the risk assessment work by providing numerous desktop-GIS based distance calculations using geoprocessing and Spatial Analyst workflows for 6,000+ sites in Southern New Hampshire near the Merrimack River. Mr. Carnes built upon the desktop analysis by adding custom workflows to the existing webmap, allowing the client to compute metrics for a potential spill throughout the entire contributing area, as opposed to a finite number of sites in the desktop analysis.

Watershed Based-Plan Hotspot Analysis, *MassDEP*. Mr. Carnes was the primary GIS lead for the hotspot analysis add-on scope for Massachusetts Watershed based plans. He conducted a statewide parcel ranking via desktop GIS for over 2 million parcels in the State of Massachusetts, which identified high priority parcels for best management practices (BMP) to achieve pollutant load reductions and water quality goals. The analysis utilized many publicly available datasets such as parcel use, environmental justice areas, hydrologic soil groups, slope, impervious surfaces, and surface water body proximity in tandem with a scoring and weighting methodology to rank all parcels with a score from 0-100. Upon the completion of the parcel ranking, Mr. Carnes coordinated with internal staff to update the MWBP website with the new hotspot methodology and information, which included watershed specific maps and parcel scoring results for all 3000+ watersheds in the MWBP study.

Watershed Based Plan Interactive Tool, MassDEP. Mr. Carnes participated in the map selection interface for Massachusetts Watershed Based Plans (WBP), a tool to be used by practitioners statewide for selecting watersheds and providing information about the implementation of projects satisfying WBP's required elements. He published multiple web map services to Geosyntec's ArcGIS server representing ponds, rivers, streams, and their corresponding nested watersheds. To derive updated pond watersheds, he worked with a team of professionals to redefine the watershed boundaries based on outlets/pour points (as opposed to river based) using a digital elevation model (DEM) and Arc Hydro/Spatial Analyst tools within ArcGIS. Mr. Carnes then created two JavaScript maps using the published web map services and wrote custom code to pass pond, river and stream IDs to their corresponding watershed boundaries for symbolization within the web map. IDs were also passed from the map to an information box allowing the user to review the selected watershed prior to reviewing additional details or adding information on subsequent screens.

Attachment B:

Detailed Pricing

Attachment B - Detailed Pricing

Phase	Task Description	Hours/Rate	Geosyntec														Total Hours	ODC	Total Effort (includes 3% comm. Fee)
		Renee Bourdeau		Dan Bourdeau		Julia Keay		Alex Carnes		Emma Williamson		Other Staff							
		Senior Professional		Principal		Project Professional		Professional		Senior Staff		Staff		Administrative					
		$235.00	Labor	$255.00	Labor	$208.00	Labor	$185.00	Labor	$164.00	Labor	$140.00	Labor	$78.00	Labor				
**	General PM and Coordination	4	$ 940.00		$ -	15	$ 3,120.00	0	$ -	6	$ 984.00	0	$ -	6	$ 468.00		31		$ 5,677.36
1	1.0 Review Existing Technical Information and Watershed Field Survey (RFP Task 1)																		
	Data request, review info, and summarize		$ -		$ -	6	$ 1,248.00		$ -	10	$ 1,640.00		$ -		$ -		16		$ 2,974.64
	One-day Field Survey		$ -		$ -	10	$ 2,080.00		$ -	10	$ 1,640.00		$ -		$ -		20	$ 234.00	$ 4,065.60
	Deliverable: 1.1 Kickoff meeting agenda and meeting minutes		$ -		$ -	4	$ 832.00		$ -	6	$ 984.00		$ -		$ -		10		$ 1,870.48
	Deliverable: 2.2 PowerPoint presentation		$ -		$ -	1	$ 208.00		$ -	3	$ 492.00		$ -		$ -		4		$ 721.00
2	2.0 Develop WBP Elements																		
	2.1 Elements A and B (Water Quality Goals and Pollutant Loading) (RFP Tasks 2, 3, 10)																		
	Deliverable: 1. Memorandum summarizing the modeling methodology and results	2	$ 470.00		$ -	4	$ 832.00	12	$ 2,220.00	8	$ 1,312.00		$ -		$ -		26		$ 4,979.02
	Pollutant Loading Modeling					2	$ 416.00	12	$ 2,220.00	12	$ 1,968.00								$ 4,742.12
	Deliverable: 2.3 Meeting		$ -		$ -	3	$ 624.00		$ -	4	$ 656.00	8	$ 1,120.00		$ -		15		$ 2,472.00
	2.2 Element C (Identification of Site-Specific Pollutant Reduction Strategies) (RFP Tasks 4, 5)																		
	Deliverable: 1. Meeting		$ -		$ -	2	$ 416.00		$ -	4	$ 656.00	4	$ 560.00		$ -		10		$ 1,680.96
	One-day Field Reconnaisance		$ -		$ -	10	$ 2,080.00	4	$ 740.00	5	$ 820.00		$ -		$ -		19	$ 234.00	$ 3,983.20
	Prioritization					2	$ 416.00			4	$ 656.00						6		$ 1,104.16
	Deliverable: 2.3 Three 1-page fact sheets for top three management strategy concepts		$ -	4	$ 1,020.00	12	$ 2,496.00		$ -	12	$ 1,968.00	8	$ 1,120.00		$ -		36		$ 6,802.12
	Deliverable: 3. Macrophyte control memorandum	2	$ 470.00		$ -	2	$ 416.00		$ -	12	$ 1,968.00				$ -		16		$ 2,939.62
	2.3 Element D, E, F, G (Technical and Financial Assistance Needed, Public Information and Education, Implementation Schedule, and Measurable Milestones) (RFP Tasks 6, 7, 8)																		
	Deliverable: 1. Meeting		$ -		$ -	2	$ 416.00		$ -	4	$ 656.00		$ -		$ -		6		$ 1,104.16
	Deliverable: 2.3 Content for Element D, E, F, G		$ -		$ -	2	$ 416.00		$ -	12	$ 1,968.00		$ -		$ -		14		$ 2,455.52
	2.4 Element H, I (Criteria to Measure Progress/Monitoring Plan) (RFP Task 9)																		
	Deliverable: 1. Meeting		$ -		$ -	2	$ 416.00		$ -	4	$ 656.00		$ -		$ -		6		$ 1,104.16
	Deliverable: 2. Technical content for monitoring plan		$ -		$ -	4	$ 832.00		$ -	12	$ 1,968.00		$ -		$ -		16		$ 2,884.00
3	3. Watershed-based Plan (WBP) Report (RFP Task 11)																		
	Deliverable: 1. Interim Hop Brook WBP	2	$ 470.00		$ -	6	$ 1,248.00		$ -	12	$ 1,968.00	10	$ 1,400.00		$ -		30		$ 5,238.58
	Deliverable: 2. Final Hop Brook WBP		$ -		$ -	2	$ 416.00		$ -	6	$ 984.00	6	$ 840.00		$ -		14		$ 2,307.20
	Deliverable: 3. Presentation at 2 Public Hearings	1	$ 235.00		$ -	6	$ 1,248.00		$ -	6	$ 984.00	16	$ 2,240.00		$ -		29		$ 4,848.21
	Deliverable: 4. Powerpoint Presentation	1	$ 235.00		$ -	2	$ 416.00		$ -	4	$ 656.00		$ -		$ -		7		$ 1,346.21
	TOTALS	12	$2,820.00	4	$1,020.00	99	$20,592.00	28	$5,180.00	156	$25,584.00	52	$7,280.00	6	$468.00		331	468	$65,300.32

check	$ 65,300.32

Attachment C:

Sample Insurance Certificate

Client#: 25361 GEOSCONS

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 3/24/2022

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 any rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Carly Underwood	
Greyling Ins. Brokerage/EPIC 3780 Mansell Road, Suite 370 Alpharetta, GA 30022	PHONE (A/C, No, Ext): 770.670.5324	FAX (A/C, No):
	E-MAIL ADDRESS: carly.underwood@greyling.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : National Union Fire Ins. Co.	19445
INSURED Geosyntec Consultants, Inc. 900 Broken Sound Parkway NW, Suite 200 Boca Raton, FL 33487	INSURER B : Aspen American Insurance Company	43460
	INSURER C : Allied World Assurance Company (U.S.)	19489
	INSURER D : New Hampshire Ins. Co.	23841
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER: 22-23** **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 INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			GL5268179	04/01/2022	04/01/2023	EACH OCCURRENCE	$1,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$500,000
							MED EXP (Any one person)	$25,000
							PERSONAL & ADV INJURY	$1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$2,000,000
	POLICY X PRO-JECT X LOC						PRODUCTS - COMP/OP AGG	$2,000,000
	OTHER:							$
A	AUTOMOBILE LIABILITY			CA4489673	04/01/2022	04/01/2023	COMBINED SINGLE LIMIT (Ea accident)	$2,000,000
	X ANY AUTO			(AOS)			BODILY INJURY (Per person)	$
A	OWNED AUTOS ONLY / SCHEDULED AUTOS			CA4489674	04/01/2022	04/01/2023	BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY			(MA)			PROPERTY DAMAGE (Per accident)	$
								$
B	UMBRELLA LIAB X OCCUR			CX005GA22	04/01/2022	04/01/2023	EACH OCCURRENCE	$5,000,000
	X EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$5,000,000
	DED X RETENTION $0							$
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			WC015893709	04/01/2022	04/01/2023	X PER STATUTE / OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N: N	N / A		(AOS)			E.L. EACH ACCIDENT	$1,000,000
A	(Mandatory in NH)			WC015893710			E.L. DISEASE - EA EMPLOYEE	$1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below			(CA)			E.L. DISEASE - POLICY LIMIT	$1,000,000
C	Prof Liab (PL)/ Contr. Poll (CPL)			03122723	04/01/2022	04/01/2023	Each Act $5,000,000 Aggregate $5,000,000	

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

CERTIFICATE HOLDER

Sample Certificate

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.

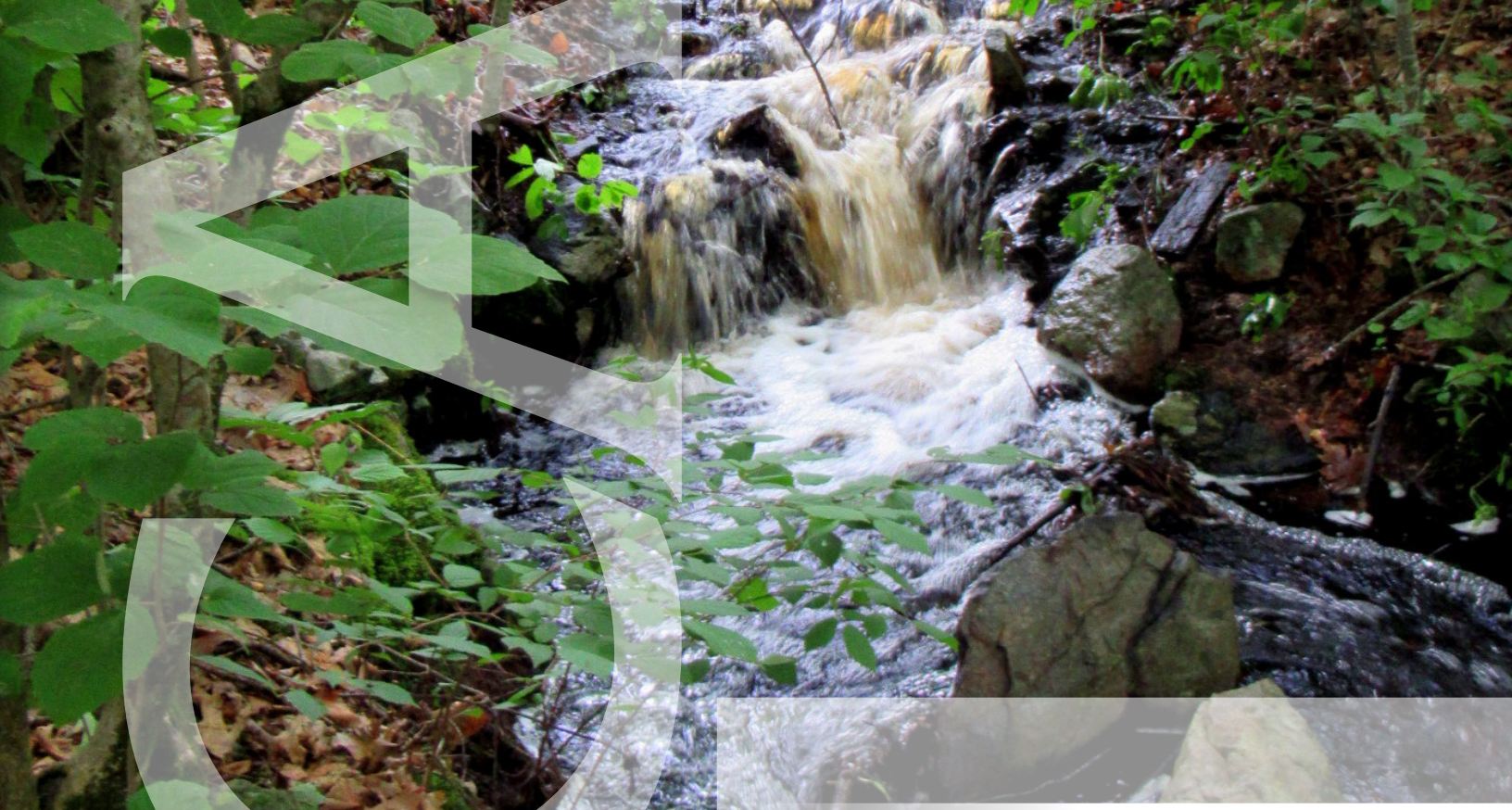
AUTHORIZED REPRESENTATIVE

Geosyntec consultants

engineers | scientists | innovators

Offices in Principal Cities of the United States and Select International Locations

geosyntec.com



SEPTEMBER 12, 2022

Proposal to Develop a Watershed Based Plan for the Hop Brook Watershed Sudbury Massachusetts

SUBMITTED TO

Jeff Winston
Hop Brook Protection Association
Attn: Board of Directors
Sudbury, Massachusetts 01776
Via email: hbpa@hopbrook.org

SUBMITTED BY

SWCA Environmental Consultants
15 Research Drive
Amherst, Massachusetts 01002

SWCA®
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

September 12, 2022

Jeff Winston
Hop Brook Protection Association
Attn: Board of Directors
Sudbury, Massachusetts 01776
Via email: hbpa@hopbrook.org

Re: Proposal to Develop a Watershed-Based Plan for the Hop Brook Watershed, Sudbury Massachusetts

Dear Mr. Winston:

SWCA Environmental Consultants (SWCA) is pleased to provide the Hop Brook Protection Association (HBPA) our proposal to assist in developing a watershed plan for the Hop Brook Watershed. We understand that this plan will serve as a blueprint for prioritizing goals, outlining feasible mitigation strategies, and guiding future efforts to manage and maintain watershed health. Our focus is on developing practical solutions that will attract participation, guide planning, and set the stage for funding acquisition. The project goal is to achieve successful nonpoint-source pollution load reductions and move toward meeting water quality beneficial use requirements. The SWCA team will provide HBPA with the following benefits:

- **Interdisciplinary Water Resources Expertise:** The SWCA team provides expertise in watershed planning, aquatic ecology, restoration engineering, land use planning, stakeholder engagement, and funding acquisition. Equally important, our staff have practical, site-based experience in water quality sampling and ecosystem assessment, and in implementing watershed restoration to improve water quality. We work frequently on watershed-scale projects to assess current conditions, identify stressors, and to develop management recommendations and planning documents to guide future management.

- **Synthesizing Landowner Knowledge with Scientific and Regulatory Information:** The SWCA team includes professionals who have an in-depth understanding of issues that directly affect the Hop Brook Watershed stakeholders. Also, SWCA uses a balanced approach when engaging with stakeholders so that they understand the data gathering and analysis process, are informed about potential solutions, and recognize the economic, social, and environmental benefits of a management plan. We are also very knowledgeable about the science behind watershed planning, capable of meeting regulatory requirements, and cognizant of the need to bridge the trust gap between regulators and stakeholders.

The SWCA team is excited about this opportunity to help HBPA pursue watershed restoration and water quality improvements in a collaborative manner and position the Hop Brook Watershed for Clean Water Act Section 319 funding support. If you have any questions about this proposal, please reach out to me at chase.bernier@swca.com or (508) 232-6668.

Sincerely,

P. Chase Bernier, CWB, PWS, CERP
Natural Resources Team Lead

TABLE OF CONTENTS

PROJECT UNDERSTANDING

Watershed plans are intended to help local communities, watershed organizations, and agencies operating within the watershed to develop a roadmap for securing Clean Water Act Section 319 funding to address water quality impairments. Watershed plans are most critical for impaired or threatened watersheds such as the Hop Brook Watershed. Our past experience in similar watershed planning efforts have proven that successful planning:

- identifies and targets specific areas of concern,
- organizes stakeholders,
- develops practical opportunities for water quality improvements, and
- diversifies solutions to broaden partnership support and leverage resources to achieve greater impact.

Due to algae, benthic macroinvertebrates, dissolved oxygen, Escherichia coli (E. coli), nutrient/eutrophication biological indicators, total phosphorus and turbidity impairments, Hop Brook was listed on the 2018/2020 Massachusetts 303(d) list of waters requiring a Total Maximum Daily Load ([TMDL], Source). The water chestnut (*Trapa natans*), and other invasive aquatic plants, have also been identified as issues in Hop Brook. The Marlborough Easterly Wastewater Treatment Plant started discharging wastewater in 1973, and despite reductions on discharge from the wastewater treatment plant in 2015, and current permit compliance, issues stemming from sedimentation and phosphorus loading are still persistent. As part of the 2020 OARS water quality study along Hop Brook, sampling identified high levels of phosphorus downstream of Carding Mill Pond. It was determined that Carding Mill Pond is likely a sink for phosphorus that has been stored in the pond's sediments over time (OARS 2020).

APPROACH TO PROJECT COMPLETION

Our plan will compile and update water quality information and provide specific recommendations and project budgets as part of an implementation plan (Objective 4) to include in a final watershed plan that include all 9 elements of a watershed-based plan as defined by the U.S. Environmental Protection Agency (EPA). The project goals identified by HBPA are to:

- Characterize the watershed
- Calculate TMDL for critical pollutants
- Prepare a pollutant loading model
- Identify pollutant load reduction strategies and associated load reductions
- Identify funding sources
- Build partnerships with the public
- Design an Implementation Program
- Design an ongoing monitoring program
- Prepare Watershed Plan

Our approach to achieving these objectives recognizes that the development of the Hop Brook Watershed Plan requires sound science, identification of environmental issues, and stakeholder outreach. Our team understands the importance of the nine-element plan to the EPA as a roadmap for achieving reductions in pollutant loading, and to the HBPA, given that a nine-element plan is required to qualify for Clean Water Act Section 319 restoration funding. A brief description of the approach for each of the elements of the nine-element plan is included below in Table 2.

Table 1. The Various Elements of the EPA Nine-Element plan and a General Approach to Completing Each Element

ELEMENT	APPROACH
Identify causes and sources of pollution	We will build from previous watershed documents, incorporate new data, and synthesize data in a meaningful way to understand pollutant sources and associated risks (Objective 2).
Estimate pollutant loading and expected load reductions	Prepare an EPA Pollutant Load Estimation Tool (PLET) model to estimate runoff, nutrient loading, and sediment delivery based on the watershed's land uses and management practices. The PLET model will be calibrated using HBPA-collected data, and then used to identify opportunities for nutrient load reduction Best Management Practices (BMPs) throughout the watershed. (Objective 3).
Estimate load reductions from management measures	Using the PLET model, we will assist in calculating a phosphorus TMDL for Hop Brook for planning purposes and development of the implementation program (Objective 3).
Estimate amounts of technical and financial assistance	We will rely on the implementation of similar projects in the region to develop a range of anticipated costs to implement each element of the plan. We will engage agency staff (Natural Resources Conservation Service [NRCS], Division of Wildlife Resources, Division of Water Quality) for technical support and will work with HBPA to explore multiple options for leveraging resources for both technical and financials project needs.
Develop educational outreach program	During the stakeholder and local agency engagement (Objective 1), we will discuss specific water quality impairments, regulatory requirements, new available data and analysis, and the benefits of implementing water quality improvement projects and management strategies. Specific projects developed in the implementation plan will include educational elements, and opportunities to promote watershed stewards and public involvement opportunities will be pursued to promote the adoption of BMPs.
Develop a schedule for implementation	The schedule for implementation will be developed based on the feasibility of implementing projects, support from project partners and specific program opportunities, the estimated time available to complete implementation of plan elements, and grant cycles for specific funding opportunities. Sufficient detail will be included in the schedule so that individual steps can be tracked and reviewed.
Describe the interim, measurable milestones	Milestones will be developed to ensure the implementation program stays on track and to measure progress towards achieving water quality improvements and Class B water quality. Short-term, mid-term, and long-term milestones will be included in the implementation schedule to ensure that funding is pursued and obtained, projects are planned and implemented, and progress and results are measured via monitoring of indicators.
Identify indicators to measure progress	We will develop a suite of indicators, including a TMDL for phosphorus (Objective 3), that measure water quality benefits and inform project success. Unique indicators will be developed based on specific BMPs and management strategies identified in the implementation plan.
Develop a monitoring component	We will engage with agency staff (NRCS and the Massachusetts Department of Environmental Protection [MassDEP]) to develop a plan for continued monitoring of water quality (and other metrics of watershed health) within the watershed.

SWCA Environmental Consultants' (SWCA's) project team can perform the services described in this proposal and can complete the project by June 1, 2024. With our team already in place, we can begin immediately, pending negotiation of the final scope of work and notice to proceed. The SWCA team is flexible and can adjust the proposed approach based on recommendations from HBPA or other considerations that may arise prior to or during the development of the final work plan. Following the outline of work elements and deliverables provided in the Request for Proposals, SWCA presents the following approach.

OBJECTIVE 1. BUILD PARTNERSHIPS WITH THE PUBLIC

TASK 1: STAKEHOLDER INVOLVEMENT

A critical first step in the process of addressing nonpoint source pollution in the Hop Brook Watershed will be to identify and convene key stakeholders at the resident, watershed, local, county, state, and federal levels. From our experience with watershed plans, involving key stakeholders at the onset of the watershed plan is critical to the long-

term success of the plan. A first step in engaging stakeholders will be to hold an informational meeting to introduce the planning effort, hear initial input from interested stakeholders on areas of concern, and identify individuals to participate in an advisory committee. Feedback from this initial meeting will help to inform the public information plan (Objective 4) that will engage the community in the implementation of the final watershed-based plan and recommendations. SWCA's Stakeholder Involvement Specialist Meg Perry will encourage participation from a diverse set of perspectives and will encourage all participants to provide input during the initial meeting.

OBJECTIVE 2. CHARACTERIZE THE WATERSHED

TASK 1: FINALIZE THE SCOPE OF THE WATERSHED PLAN

Watershed planning can be somewhat variable and broad in scope, depending on the objectives of the planning effort. The SWCA team will work with the HBPA to develop a written description of the scope of the watershed planning effort. While the watershed area of focus has already defined, HBPA will provide input on the list of threats, specific parameters of interest, the time period of interest, and other details aimed at narrowing the focus of the planning effort. This written description will help to prepare the goals and objectives for the watershed plan, including desired outcomes and remediation interventions.

Our experience with similar planning efforts has demonstrated the importance of taking time early in the process to clearly define the scope of the effort. By narrowing and clarifying the focus of the planning effort, the process of developing the nine-element plan will have a greater level of focus which will improve the likelihood of future success with funding and project or plan implementation.

TASK 2: WATERSHED CHARACTERIZATION

The SWCA team is familiar with the various documents related to watershed planning that have been developed over the years for portions of the Hop Brook Watershed. These documents (including the 2014 Dredging Feasibility Study, OARS 2020–2021 Water Quality Report, 2020 OARS Water Quality Study, and the 2020 Aquatic Plant Management) include a vast amount of information related to watershed characterization, water quality data, data gaps, pollutant sources, and areas of concern. However, none of these efforts have included all nine elements that are required by the EPA for comprehensive watershed plans.

Data Collection

Building on familiarity with these existing watershed documents, data provided from the HBPA, and compiling and analyzing water quality data, Water Quality Scientist Arianna Disser would complete desktop data collection and analysis for the site and watershed characteristics. Ms. Disser would compile relevant information about the watershed such as land use, climate, vegetation, and seasonal variations in pollutant loading.

By incorporating existing data from the HBPA, other existing documents on Hop Brook, and other publicly available data sources, the SWCA team will compile a database of watershed data for review and analysis. Ms. Disser and Hydrologist Josh Allen both have experience compiling and analyzing water quality data for watershed projects. The completed water quality database will largely be developed and available for use in this watershed characterization objective. Ms. Disser and Mr. Allen will work with SWCA geographic information system (GIS) specialists to compile relevant spatial data sets to support the integration of water quality data analysis with land use, point sources of pollution, landownership, and other relevant spatial data. Using this compiled spatial data, SWCA will efficiently develop maps to support stakeholder engagement and for inclusion into the watershed plan (Objective 5), as well as spatially identify data gaps or hot spots of pollutant loading.

Field Survey

Following initial data collection and synthesis, SWCA Project Manager Chase Bernier and Biologist Jessana Goldsnider will complete a field survey, visiting the Hop Brook Watershed for up to 2 days, to confirm the watershed characterization and become more familiar with the project area. This field survey will help the project team familiarize themselves with the watershed and include any relevant information into the final plan (Objective 5).

OBJECTIVE 3. CALCULATE TMDL FOR CRITICAL POLLUTANTS

TASK 1: PREPARE A POLLUTANT LOADING MODEL

Using the compiled data and understanding gained during the field visit, SWCA will calculate a TMDL for phosphorus in the watershed. Utilizing the EPA's recently released PLET, SWCA will prepare a model that will help to estimate runoff, nutrient loading (including nitrogen, phosphorus, and 5-day biological oxygen demand), and sediment delivery based on various land uses and management practices for the Hop Brook Watershed. The PLET model will be calibrated using the water quality data provided by the HBPA.

Once complete, SWCA will use the PLET model to identify opportunities for nutrient and sediment load reduction throughout the watershed. The PLET model has an integrated BMP calculator which calculates the aggregate BMP efficiency of combinations of multiple BMPs that can then be applied to the model. The calculator can be used to represent BMPs both in series and parallel.

TASK 2: CALCULATE TMDL

SWCA will assist the HBPA in calculating a phosphorus TMDL for Hop Brook. Using the PLET model from Task 1, SWCA will estimate the loading capacity for Hop Brook and identify all contributing sources of phosphorus (point and nonpoint). Once identified, all sources will be allocated a portion of the allowable load that will include a reduction in their loading to help improve the water quality in Hop Brook.

SWCA assumes that this calculation to estimate a phosphorus TMDL for Hop Brook will be used as a planning tool for the development of the implementation program and does not include any coordination with or approval by the agencies.

OBJECTIVE 4. DESIGN AN IMPLEMENTATION PROGRAM

TASK 1: SITE-SPECIFIC POLLUTANT REDUCTION STRATEGIES

Our approach to preparing the implementation program for the Hop Brook Watershed will largely be guided by results from Objectives 2 and 3, as well as the *EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (EPA Handbook), existing watershed documents, and input from stakeholders and agency staff. The overall roadmap for achieving load reductions in the various section and ponds of the Hop Brook Watershed will be developed and overseen by SWCA Implementation Strategy Lead Daren Pait by referencing the EPA Handbook (and the nine-element plan and BMPs and strategies for pollutant loading), using his experience developing stakeholder and science-driven implementation plans and restoration projects, and obtaining funding for project implementation. Site specific pollutant reduction strategies will be developed using existing data and known BMPs relevant to specific sites and issues identified throughout the watershed during Objective 2. These suggested strategies will be listed in the watershed plan. Under Objective 4, we will also identify potential sources of funding for implementation of the plan.

The knowledge and information gathered in Objective 3 will set the stage for developing the implementation program, that will be incorporated into the final plan (Objective 5) and will outline the proposed watershed strategies to achieve

load reductions in the watershed and describe the individual projects and initiatives (e.g., action items) to be completed in the watershed over the next 10 years. Each activity will align with one of the watershed objectives (Objective 2, Task 1) and will include a measurable indicator of progress and a target outcome to ensure implementation activities are achievable, financially and technically sound, and measurable.

Our approach to completing the other elements of the implementation program will involve creating an outline and a detailed roadmap for implementing management actions to achieve load reductions in conjunction with agency staff (NRCS and MassDEP). Our experience has shown that developing coordinated agency partnerships are critical, where each management measure (BMP implementation project) is championed by an individual partner whose commitment helps drive implementation.

OBJECTIVE 5. PREPARE WATERSHED PLAN

TASK 1: DRAFT WATERSHED PLAN

Our approach to producing the Hop Brook Watershed Plan will be to update and combine the various documents associated with the deliverables from Objectives 1 to 4 into a concise and organized watershed plan. In drafting and compiling the content of the watershed plan, our core team of Chase Bernier, Josh Allen, and Arianna Disser will work with Technical Editor Linda Tucker Burfitt in integrating the content of the plan and in providing technical editing to ensure consistency and improve readability. Additionally, GIS Specialist Lori Johnson will help develop maps and figures to present data and spatial information effectively in the plan. Once the draft plan has been completed, it will be shared with the advisory committee for their review and comments. The SWCA team will make changes as necessary to develop an advisory committee-approved draft for public comment.

TASK 2: INTERIM PLAN MEETINGS

Under the direction of Stakeholder Involvement Specialist Meg Perry, the SWCA team will organize, publicize, and hold up to two meetings to discuss the interim plan. The public meetings will serve as an opportunity to describe the various components of the watershed plan to the public and provide the opportunity for members of the public to ask questions and submit comments. The SWCA team will document and compile all public comments into an appendix to the watershed plan and make suggested changes to the plan as appropriate, resulting in a final plan for delivery to the HBPA within 3 months of completion of the interim report.

ASSUMPTIONS

In preparing the scope and cost estimate for this project, SWCA assumes the following:

- SWCA will meet with the HBPA bi-monthly for progress updates. During these meetings, SWCA will provide HBPA with regular progress reports on the watershed-based plan including an inventory of all activities completed and reviewed documentation. HBPA will be available at these meetings to answer any questions SWCA may have about the watershed.
- SWCA will not collect any new field data as part of this watershed plan but will rely on water quality data and watershed data collected and/or provided by the HBPA and other publicly available data.
- The SWCA team will provide a list of funding sources that could be pursued to help implement projects and will include this list in the final watershed plan.
- SWCA will be provided safe and sufficient access to the site as needed; HBPA will coordinate land access.
- All deliverables will be electronic, no hardcopies will be required beyond those described.
- All meetings will be held virtually; no in-person meetings will be held.

- This scope does not include additional surveys, investigations, reports, permitting, meetings, or coordination not described. SWCA is prepared to provide those services via an approved change order.

PROPOSED SCHEDULE

Table 2. SWCA's Estimated Timeline

Objectives	Deliverable/Milestone Description	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	Stakeholder Meeting no. 1													
2	Finalize scope of watershed planning effort													
	Field assessment													
	Watershed characterization													
3	Calculate TMDL for critical pollutants													
	Prepare pollutant loading model													
4	Develop site-specific pollutant reduction strategies to meet goals, including indicators/targets													
	Develop management strategies to meet goals/achieve reductions													
	Design implementation program (Elements 4–9 of the plan)													
5	Prepare interim plan													
	Facilitate public meetings and summarize feedback													
	Finalize watershed plan													

ESTIMATED HOURS

Table 3. SWCA Staff Estimated Hours

Objective	Task	Arianna Disser	Chase Bernier	Meg Perry	Mary Huisenga	Josh Allen	Alexa Baratucci	Daren Pait	Lori Johnson	Linda Tucker Burfitt	Totals
1	1	15	20	15		5	–	–	–	–	55
	Total	**15**	**20**	**15**	**0**	**5**	**5**	**0**	**0**	**0**	**60**
2	1	5	5	2		5	–	–	–	1	18
	2	25	15	5		5	–	–	6	–	56
	Total	**30**	**20**	**7**	**0**	**10**	**0**	**0**	**6**	**1**	**74**
3	1	5	2	2		10	40	–	–	–	59
	2	15	4	–		10	20	–	–	–	49
	Total	**20**	**6**	**2**	**0**	**20**	**60**	**0**	**0**	**0**	**108**
4	1	25	10	10		2	2	4	–	–	53
	Total	**25**	**10**	**10**	**0**	**2**	**2**	**4**	**0**	**0**	**53**
5	1	25	10	15		10	25	–	3	15	106
	2	10	6	6		0	0	–	-	–	159

	Total	35	16	21	0	10	25	0	3	15	265
Total		125	72	55	0	47	92	4	9	16	420

COST

Table 4. SWCA's Estimated Cost

TASK	ESTIMATED COST
Objective 1:	$10,394.94
Objective 2:	$11,540.52
Objective 3:	$7,654.96
Objective 4:	$7,473.68
Objective 5:	$10,793.01
Total Cost:	**$47,857.11**

SWCA OVERVIEW

SWCA is an environmental consulting firm of scientists, planners, and technical specialists who have been providing comprehensive environmental planning, regulatory compliance, and water resources management services to local government and businesses across the United States for 4 decades. ***With local offices in Southborough and Amherst,*** our team has practical experience living, recreating, and working in the Hop Brook Watershed and is capable of meeting the needs of the HBPA through the duration of the project.

UNIQUE AND SPECIALIZED EXPERTISE OF OUR TEAM

We have built our reputation not only on sound science, but also the ability to communicate data and findings in formats for audiences ranging from resource managers to the general public. The team members we have dedicated to this project are specialists in water quality analysis, hydrology and hydrogeology, and environmental planning. Our interdisciplinary team has broad experience in watershed planning and the local knowledge to efficiently execute the project. We have the unique expertise to analyze existing data, identify data gaps to better characterize pollutant sources, and apply this knowledge to develop specific management strategies and the framework for watershed planning and project implementation. Our reports are engaging, visually pleasing, and easily understood by the layperson. We accomplish this through the use of award-winning story maps, spatial data viewers, visual simulation modeling, and concept design renderings. We clearly articulate the water quality issues, potential solutions, and the benefits to be realized with collaborative planning and partnership support. SWCA's team is enthusiastic about guiding the HBPA forward by building on previous and existing studies and projects to create the necessary watershed implementation plan that will ultimately lead to a healthier watershed.

KEY STAFF

SWCA Natural Resources Team Chase Bernier will be the project manager and point of contact for this contract, with assistance from Water Resource Subject Matter Expert Mary Huisenga, Water Resources Support Specialist Arianna Disser, and Hydrologists Daren Pait and Josh Allen. The following personnel will be available to HBPA for the project. Resumes for all key staff are provided in Appendix A. All personnel are immediately available to begin work upon receiving a notice to proceed.

Table 5. Key Personnel.

CHASE BERNIER, CWB, PWS, CERP	TITLE: PROJECT MANAGER	TOTAL YEARS OF EXPERIENCE: 16

Education

B.T., Wildlife Management; State University of New York at Cobleskill; 2005

A.A.S., Fisheries and Wildlife Technologies; State University of New York at Cobleskill; 2004

Training and Expertise

Certified Wildlife Biologist; Wildlife Society; 2014; Professional Wetland Scientist No. 3110; Society of Wetland Scientists; 2019; Certified Ecological Restoration Practitioner No. 400; Society for Ecological Restoration; 2020

Experience

Mr. Bernier is a Professional Wetland Scientist, Certified Wildlife Biologist, and Certified Ecological Restoration Practitioner with over 15 years of consulting experience working on projects throughout the United States. He has extensive experience with a broad range of wetland science disciplines including delineations; functions and services evaluations, habitat mapping and baseline studies; compensatory mitigation design, permitting, construction, and monitoring; restoration; and federal, state, and local permitting.

MARY HUISENGA, M.A.	TITLE: SUBJECT-MATTER-EXPERT	TOTAL YEARS OF EXPERIENCE: 13

Education

M.A., Geography; University of Colorado, Boulder; 2012

B.S., Environmental Science; m: Biology; University of Iowa; 2005

Training and Expertise

Water quality monitoring, pollution source identification, surface water monitoring, data management and analysis, water resources management, groundwater characterization

Experience

Ms. Huisenga is a natural resources project manager and provides managerial and technical support in environmental resource tasks, with a focus on water resources. As a watershed scientist, Ms. Huisenga specializes in water resource management and sediment studies, restoration ecology, climate adaptation, and permitting. She has managed projects for city, state, and federal agencies. Her project experience includes water quality monitoring, researching effects of environmental disturbance and water management on water quality, and watershed assessments. With extensive experience in water resources, she has managed watershed evaluation projects, led stakeholder engagement, and provided hearing testimony. Additionally, Ms. Huisenga has provided technical support for natural resource damage assessments and restoration planning and monitoring and provides technical review of documents and database management.

DAREN PAIT, P.E.	TITLE: HYDROLOGIST	TOTAL YEARS OF EXPERIENCE: 22

Education

B.S., Environmental Engineering; North Carolina State University; 2000

Training and Expertise

Water quality best management practice (BMP) design, natural channel design, watershed management planning and modeling

Experience

Mr. Pait is SWCA's nationwide leader of water resources engineering and has 22 years of experience in surface water and environmental engineering. His experience includes watershed management planning and modeling, hydraulic flood modeling/floodplain mapping, flood mitigation design, and water quality BMP design. Mr. Pait is a licensed engineer in Utah and has also been the design engineer for more than 135,000 linear feet of stream channel stabilization and restoration projects, 33 acres of riparian wetland mitigation projects, and more than 30 acres of lake and pond retrofit projects.

JOSH ALLEN, P.E., CFM	TITLE: HYDROLOGIST	TOTAL YEARS OF EXPERIENCE: 14

Education

B.S., Biological Engineering, Environmental Concentration; North Carolina State University; 2008

Training and Expertise

Water quality BMP design, natural channel design, watershed management planning and modeling

Experience

Mr. Allen has more than 13 years of experience working on ecological restoration, stormwater management, hydraulic flood modeling/floodplain mapping, flood mitigation design, and water quality related projects across the country. He has spent much of his career in North and South Carolina serving both private- and public-sector clients. He now serves as a senior ecological restoration engineer for SWCA, where he works on a wide variety of projects, including stream and wetland restoration, coastal restoration and resiliency planning, and mitigation banking projects. His attention to detail and management skills enable him to provide effective design solutions and successful projects for both internal and external clients. He regularly coordinates with multiple team members in order to see projects to completion and exceed the client's expectations.

ARIANNA DISSER, B.S.	TITLE: WATER RESOURCES SUPPORT SPECIALIST	TOTAL YEARS OF EXPERIENCE: 4

Education

B.S., Environmental Science; Southern New Hampshire University; 2019

Training and Expertise

Water quality monitoring, data management and analysis, water quality monitoring equipment operation and maintenance, quality assurance/quality control

Experience

Ms. Disser is a project manager and water quality specialist with 4 years of experience conducting water resource studies and environmental investigations. She has played a key role on the SWCA team for numerous water resources projects in Utah and the Intermountain West and was a lead contributor to both the Pot Creek and Heber Valley nine-element watershed plans completed by SWCA. Ms. Disser was one of the primary authors on both plans and was involved in data synthesis and analysis as well as with the creation of the implementation plan.

MEG PERRY, M.E.M.	TITLE: STAKEHOLDER INVOLVEMENT SPECIALIST	TOTAL YEARS OF EXPERIENCE: 11

Education

M.E.M., Ecosystem Science and Conservation; Nicholas School of the Environment, Duke University; 2014

B.A., Biology; Swarthmore College, Swarthmore, Pennsylvania; 2008

Training and Expertise

Stakeholder engagement, facilitation and mediation, public involvement, large-scale and long-term analysis and planning, environmental conflict resolution and collaborative problem-solving, multiparty consensus building processes, qualitative and quantitative data collection

Experience

Ms. Perry is a professional facilitator and stakeholder engagement expert specializing in collaborative approaches to complex environmental problem solving and integrating science and human interests in pursuit of actionable agreements and solutions. She has designed and facilitated stakeholder input structures and processes for a variety of environmental decision-making and planning efforts, including water management and in-stream habitat construction with the U.S. Army Corps of Engineers. She has also facilitated climate resilience and ecological restoration planning for local watershed groups to set the stage for restoration projects. Ms. Perry has graduate-level training in environmental policy and economics, ecology, and watershed management and river science.

LINDA TUCKER BURFITT	TITLE: TECHNICAL EDITOR	TOTAL YEARS OF EXPERIENCE: 20

Education

B.A., Communications; University of Windsor; 2000

Training and Expertise

Technical editing, technical writing, formatting in Microsoft Word, coordination of multiauthor writing projects, quality assurance, quality control of document content and presentation

Experience

Ms. Tucker Burfitt is an assistant managing editor and technical publications specialist at SWCA's Salt Lake City office. She has led technical editing efforts for several large, multi-authored reports such as the Wasatch County Groundwater Study, Summit County Septic Analysis, and river comprehensive management plans. Ms. Tucker Burfitt has been a professional technical editor at SWCA since 2008 and brings to the table a strong background in natural resources, especially forestry and wildlife. She is part of SWCA's award-winning, in-house publications team of professional editors, writers, and formatters. Ms. Tucker Burfitt's ability to edit and format large and small reports for content, organization, clarity, consistency, and grammar enhances the quality of documents created by SWCA's resource specialists.

LORI JOHNSON, M.S.	TITLE: GIS SPECIALIST	TOTAL YEARS OF EXPERIENCE: 16

Education

M.S., Geographic Information Science; Clark University; Massachusetts; 2012

M.S., Conservation Biology; Antioch University New England; New Hampshire; 2009

B.S., Biology; State University of New York at Albany; New York; 1995

Training and Expertise

GIS; cartography/map design; GPS technology; remote sensing

Experience

Ms. Johnson is an ecologist with 15 years of experience in the New England region. She supervises GIS and GPS in the Amherst office, conducts GIS analyses, and develops mapping deliverables for technical reports. She has created detailed lands use and natural resources maps for public and private clients.

RELEVANT PROJECT EXPERIENCE

The SWCA team has a rich history of successfully completing watershed planning projects that involve stakeholder engagement, watershed management and characterization, management strategies, and implementation. Many of these projects required an evaluation of current and future water quality issues facing each watershed and an investigation into the sources of water quality impairments. Additionally, most of the projects involved significant public involvement, consideration of diverse land uses and pollutant pathways, and development of management goals and objectives. Summaries of the work completed as part of each project are provided in Table 6.

Table 6. SWCA's Relevant Project Experience

PROJECT NAME/CLIENT	PROJECT DESCRIPTION
Pot Creek Watershed Plan Uinta Conservation District	SWCA developed a EPA nine-element watershed plan for the Pot Creek Watershed. The plan serves as a blueprint for prioritizing goals, outlining feasible mitigation strategies, and guiding future efforts to manage and maintain watershed health. The plan will also be used to identify specific funding opportunities to implement the plan and address the root causes of water quality impairments.
Heber Valley Watershed Plan Wasatch Conservation District	SWCA developed a watershed plan for the Heber Valley watershed to address water quality problems by identifying potential contributing sources of pollution and prioritizing restoration and protection strategies. SWCA engaged stakeholders by forming an advisory committee to help steer the development of the plan including the development of goals, identification of projects, and development of an implementation plan and schedule. We also generated project concepts that will include cost estimates and load reductions as part of the implementation plan.
Provo River Watershed Water Quality Analysis Central Utah Water Conservancy District	SWCA is working with the Central Utah Water Conservancy District to help improve water quality in Provo River watershed. The purpose of the Provo River Watershed Water Quality Analysis project is to compile existing relevant information in the watershed, develop data-driven approaches to identify problem areas, and make recommendations for water quality improvement. The scope of work includes developing an online story map to help educate stakeholders of the causes of water quality impairments. The project also includes developing a list of proposed stormwater management facilities within the watershed to show potential improvements in water quality.
Watershed Sediment Management Plan Denver Water	SWCA developed a watershed sediment management plan to reduce sediment loading to one of the reservoirs in the Denver Water watershed. The purpose of the plan was to develop the framework for watershed restoration and the implementation of sediment load reduction projects. The final plan described the watershed and sediment loading issues and provided an adaptive approach to select and implement projects to address sediment in the watershed, with focus on identified areas of concern.
Green and Colorado River, Bear River, Bear Lake, Jordan, and Great Salt Lake Comprehensive Management Plans Utah Division of Forestry, Fire, and State Lands	SWCA created the Great Salt Lake, Jordan River, Bear River, Bear Lake, and Green and Colorado Rivers comprehensive management plans for the Utah Division of Forestry, Fire and State Lands. Through the process, SWCA developed goals, objectives, and BMPs to maintain or enhance water quality, recreation, fish and wildlife habitat, navigation, and aquatic beauty. Adjacent landownership and land use, and agricultural, commercial, and recreational use of the waterbodies were considered in the development of management goals and objectives. SWCA developed and implemented a successful public engagement plan to stimulate stakeholder participation, incorporate stakeholder input into the plans, and develop clear and consistent management recommendations. SWCA facilitated a series of open houses and stakeholder meetings, including meetings with county and municipal governments, to generate an in-depth understanding of the resource issues most important to each group. Water quality concerns in each of the waterbodies were documented and an analysis of existing data was used to inform future management strategies in the plans. The final plans were incorporated into award-winning web-based Esri Story Maps.

SVCA

APPENDIX A

Resumes

SWCA | Resume

P. CHASE BERNIER, CWB, PWS, CERP, PROJECT MANAGER

Mr. Bernier is a natural resources team lead with SWCA based out of our Amherst office. He holds degrees in Fisheries and Wildlife Technologies and Wildlife Management and is a Certified Wildlife Biologist (CWB), Professional Wetland Scientist (PWS), and Certified Ecological Restoration Practitioner (CERP). Mr. Bernier has over 16 years of consulting experience and has worked on projects throughout the United States and abroad, including projects in Central and South America and New Zealand. Mr. Bernier has prepared and provided third-party reviews of National Environmental Policy Act documents related to natural resources across the United States. Mr. Bernier has presented at numerous professional conferences and workshops on a variety of ecological topics, including wetlands and wildlife. Mr. Bernier also worked with the Massachusetts Association of Conservation Commissions in the development of Unit 202: Protecting Wildlife Habitat for their Fundamentals for Conservation Commissioners Certificate Training Program.

YEARS OF EXPERIENCE

16

EDUCATION

B.T., Wildlife Management; State University of New York at Cobleskill; 2005

A.A.S., Fisheries and Wildlife Technologies; State University of New York at Cobleskill; 2004

REGISTRATIONS / CERTIFICATIONS

Certified Wildlife Biologist; Wildlife Society; 2014

Professional Wetland Scientist No. 3110; Society of Wetland Scientists; 2019

Certified Ecological Restoration Practitioner No. 400; Society for Ecological Restoration; 2020

TRAINING

Operation and Maintenance Plan Turtle Training, MassWildlife Natural Heritage & Endangered Species Program; East Longmeadow; 2017

10-hour Construction Safety; ClickSafety (online); 2016

40-hour HAZWOPER Certified; Poughkeepsie, New York; 2009

8-hour HAZWOPER Refresher; J2M Consulting Assoc., LLC; Virtual; 2021

MEMBERSHIPS

Board Member, The Wildlife Society; 2002

SELECTED PROJECT EXPERIENCE (* denotes project experience prior to SWCA)

***Manton Pond Dam Fish Passage; Woonasquatucket River Watershed Council; Johnston, Rhode Island.** Mr. Bernier assisted with the design of a fish ladder to provide fish passage at the Manton Pond Dam on the Woonasquatucket River for diadromous fish species including river herring (*Alosa pseudoharengus* and *A. aestivalis*) and American eel (*Anguilla rostrata*). As part of this project, Mr. Bernier delineated the aquatic resources in the vicinity of the dam and completed wetlands functional assessment and wildlife habitat assessment. Mr. Bernier assisted with the evaluation of different fish passage design alternatives and completed the environmental permitting for the proposed project. *Role: Wildlife Biologist.*

J-1 Pipeline Modifications; Confidential Client; Middlesex County, Massachusetts. The project included several proposed upgrades and improvements along the existing J-1 pipeline and included resource area delineations, permitting, restoration, and monitoring. *Role*: *Task Manager. Responsible for delineation; permitting; design, implementation, and monitoring of compensatory mitigation plan for impacts to wetlands, Riverfront Area, and restoration of ±500-linear feet of perennial stream bank. Completed all permitting under the Massachusetts Wetlands Protection, U.S. Endangered Species Act, Clean Water Act Section 404, and maintenance notifications.*

***Line 3419 Electric Transmission Improvements; Confidential Client; Hampden County, Massachusetts.** This project involved multiple upgrades and improvements along a ±12-mile section of an existing electric transmission right-of-way (ROW). This project required resource area delineations, functions and values assessments, habitat evaluations, rare species surveys, environmental permitting, and construction monitoring *Role: Senior Ecologist. Responsible for all aspects of wetland delineations, habitat evaluations, functions and services assessments, and rare species surveys. The project also required permitting under the Massachusetts Wetlands Protection Act and Clean Water Act Sections 401 and 404.*

***Acushnet Sawmill Ecological Restoration Project; Buzzards Bay Coalition; Acushnet, Massachusetts**. This project included the restoration of a ±19-acre mosaic of degraded habitats of a previous sawmill operation including forested wetlands, streams, a pond, grasslands, and upland forest. Stream restoration included bank stabilization, channel restoration, and reconnecting and restoring the adjacent wetland and floodplain of ±1,500-linear feet of the Acushnet River and an adjacent tributary. *Role: Wildlife Biologist. Responsible for baseline evaluation, design, permitting, and construction oversight. Completed all aspects of permitting under Massachusetts Environmental Policy Act, Clean Water Act Sections 401 and 404, Rivers and Harbors Act Section 10, Massachusetts Wetlands Protection Act, and Massachusetts Chapter 91. Completed a wetland delineation and functional assessment, a wildlife habitat assessment, and provided construction oversight.*

MEMBERSHIPS (CONTINUED)

Member, Society of Wetland Scientists; 2010

Member, Society for Ecological Restoration; 2019

Member, Massachusetts Association of Conservation Commissions; 2016

Member, Association of Massachusetts Wetland Scientists; 2016

***Commercial Solar Feasibility Studies; ZPT Energy Solutions; Hampshire, Franklin, and Middlesex Counties, Massachusetts.** This project consisted of evaluating multiple properties for the potential to support commercial ground-mounted solar array developments. Over ±237 acres across numerous parcels and municipalities were evaluated. *Role: Senior Ecologist. Responsible for directing and leading all efforts to identify regulated resources areas including delineation of wetlands and watercourses, identification of unique features, and other information that could be critical to site development.*

Blackburn & Union Privileges; Woodard & Curran, Inc.; Walpole, Massachusetts. The project included a total of three separate locations with various wetland and riparian habitats. Each site was monitored twice per year, with summary reports submitted to the U.S. Environmental Protection Agency. *Role: Project Manager. Responsible for a 5-year monitoring plan of numerous wetland restoration sites as part of a remediated Superfund project in support of required compensatory mitigation.*

Ecological Restoration Design and Planning for Horse Farm; Owen Hughes & Mary Hughes; Canton, Norfolk County, Massachusetts. This project consisted of the restoration of ±30,000 square feet of impacted wetland habitat to a functioning forested wetland system that had been impacted via fill for nearly 50 years. *Role: Project Manager. Responsible for overseeing and directing the wetland restoration including the removal of historic fill, ensuring proper hydrology was achieved and proper soil characteristics were established, planting and seeding the area with native species, monitoring the area for success, and developing and implementing corrective actions. He was also responsible for approving all field changes, monitoring construction, and assisting the landowner and contractor with the technical aspects of the restoration.*

Northbridge/Sutton New Gas Main; Confidential Client; Worcester County, Massachusetts. The project proposed a new ±13,500-linear-foot 12-inch natural gas distribution pipeline in Northbridge and Sutton and included resource area delineations, permitting, and construction monitoring. *Role: Project Manager. Directed and oversaw the delineation of regulated resource areas as well as completing Requests for Determinations of Applicability under the Massachusetts Wetlands Protection Act and municipal Bylaws.*

***Pawtuxet Falls Dam Removal; Natural Resources Conservation Service; Cranston and Warwick, Rhode Island**. This project removed a concrete dam spillway and restored ±4.5 miles of upstream river and wetland restoration. *Role: Wetland Scientist. Responsible for assisting with engineering design and permitting, evaluation of contaminated sediment transport and exposure, evaluation of wetland impacts, river restoration evaluation and design, and fish/eel passage evaluation and design. Permitting included Clean Water Act Sections 401 and 404, and Rhode Island Department of Environmental Management Application to Alter a Wetland.*

***Hudson International Business Center; Confidential Client; Montgomery, New York.** This project proposed the construction of 1 million square feet of industrial warehouse. *Role: Wetland Scientist. Responsible for permitting under Clean Water Act Sections 401 and 404, New York Article 24 Freshwater Wetlands and Article 15 Protection of Waters, and review under State Environmental Quality Review Act. He also designed a ±6.85-acre wetland mitigation plan, completed a breeding bird and herpetofauna survey; conducted rare species surveys, and prepared a Habitat Management Plan.*

***393 Line; Confidential Client; Berkshire County, Massachusetts.** This project proposed multiple maintenance and improvement projects along an existing electric transmission ROW requiring extensive resource area delineations, habitat evaluations, permitting, and construction monitoring. *Role: Senior Ecological Scientist. Oversaw and directed wetland delineations, functions and services assessments, wildlife habitat evaluations, rare species investigations, and construction monitoring for a ±15-mile section of ROW. He was also responsible for vernal pool surveys, Detailed Wildlife Habitat Evaluations, evaluating potential wetland and stream mitigation opportunities, and assessing rare species habitat.*

***Northern Virginia Stream Restoration Bank; Confidential Client; Reston, Virginia**. This project included the design and construction of a ±29-mile stream restoration bank of highly degraded urban stream channels impacted from steep, actively eroding banks that threatened adjacent buildings and infrastructure. The project required extensive in-field surveys of stream channel profiles, cross-sections, pebble counts, sediment transport, wetlands, habitat, and trees. *Role: Project Scientist. Responsible for in-field baseline conditions surveys including stream channel profile and cross-section surveys, topographic surveys, tree identification and locations, sediment transport studies, and construction oversight. Stream restoration methodology followed the Natural Channel Design techniques established by Rosgen.*

MARY HUISENGA, M.A., SUBJECT MATTER EXPERT

Ms. Huisenga is senior natural resource team lead and provides managerial and technical support in water resource and ecological tasks. Ms. Huisenga is a watershed scientist with expertise in water resource management and sediment studies, restoration ecology, climate adaptation, and permitting. She has managed projects for city, state, and federal agencies. Her project experience includes water quality monitoring, researching effects of environmental disturbance and water management on sediment transport and water quality, algal production studies, and mixing zones studies. With extensive experience in water resource studies, she has managed watershed evaluation projects, led stakeholder engagement, and provided hearing testimony. Additionally, Ms. Huisenga has provided technical support for natural resource damage assessments, creating habitat equivalency analyses, restoration planning and monitoring, technical review of documents, and database management.

YEARS OF EXPERIENCE

13

EXPERTISE

Safe Drinking Water Act and Clean Water Act compliance

Water quality research and monitoring

Federal, state, and county permitting

Impacts from land use and wastewater effluent to surface water (physical, chemical, biological)

Habitat and resource equivalency analysis

Natural Resource Damage Assessments

EDUCATION

M.A., Geography; University of Colorado, Boulder; 2012

B.S., Environmental Science; m: Biology; University of Iowa; 2005

SELECTED PROJECT EXPERIENCE (∗ denotes project experience prior to SWCA)

Urban Lakes Guidance; City of Fort Collins; Fort Collins, Colorado. SWCA developed an urban lakes management guidance document in 2021 and is supporting policy development in 2022 to assist the City of Fort Collins in managing urban lake water quality within their growth management area in response to drought, changing climate variables, and increasing population pressures. SWCA led project development, coordination with subject matter experts and external stakeholders, and community engagement to compile technical and community feedback for development of the guidance document aimed at improving and maintaining urban lake water quality. *Role: Project Manager.*

Watershed Sediment Management Plan; Denver Water; Denver Water Watershed. SWCA developed a Watershed Sediment Management Plan to reduce sediment loading to one of the watershed's reservoirs. The purpose of the plan was to develop the framework for watershed restoration and the implementation of sediment load reduction projects. The final plan described the watershed and sediment loading issues and provided an adaptive approach to select and implement a project to address sediment in the watershed, with focus on identified areas of concern. *Role: Project Manager.*

Denver Water Fire Response Plan; City and County of Denver; Codington County, Colorado. SWCA conducted a post-fire assessment to determine risk for post-fire impacts, with a focus on sediment, to downstream waterbodies. SWCA performed both a drone flight and ground truthing to determine the burn severity and high-risk areas for debris flows and sediment mobilization, providing recommendations for mitigation efforts and future monitoring of the burn area. *Role: Project Manager*.

Watershed Sediment Assessments (multiple task orders); City and County of Denver; Jefferson County, Colorado. SWCA supported Denver Water in identifying high-risk areas for sediment input and quantified sediment inputs and transports to Strontia Spring Reservoir by conducting a Watershed Assessment of River Stability and Sediment Supply. *Role: Project Manager.*

Kawaikoi Diversion Modification Project Applicable Monitoring and Assessment Plan; Joule Group, LLC; Honolulu City and County, Hawaii. Assisted client in developing water quality Applicable Monitoring and Assessment Plans. This plan identifies best management practices to implement, a water quality monitoring program and Best Management Practice assessment plan to protect water quality in state waters from project work. *Role: Technical Lead and Writer.*

Gateway South Transmission Project Local and State Permitting Support; PacifiCorp; Carbon and Sweetwater Counties, Wyoming. SWCA developed the permit application for the Industrial Siting Act state of Wyoming permit for the Gateway South Transmission Project to assess project impacts on environmental and socioeconomic resources. Ms. Huisenga managed the application development and stakeholder informational process. She also testified at hearing to successfully obtain the permit. *Role: Project Manager and Expert Witness.*

Rail Tie Wind Third Party Environmental Impact Statement (EIS); ConnectGen Operating, LLC; Albany County, Wyoming. SWCA is serving as the third party National Environmental Policy Act consultant for this EIS associated with a 500-megawatt wind farm encompassing approximately 30,000 acres in Wyoming. Ms. Huisenga reviewed the water resource impacts assessment for the EIS. *Role: Technical Lead for Water Resources*.

TransWest Express Wyoming Industrial Siting Council Permit 109; TransWest Express, LLC; Multiple Counties, Wyoming. Ms. Huisenga served as primary author for the Section 109 permit application to the Wyoming Industrial Siting Council, including the informational meeting materials. She coordinated internal resources to complete the application and related informational meeting materials per the Wyoming Industrial Siting Council Rules and Regulations and the Statutes. She worked with the client to finalize template project language to maintain consistency with Wyoming county permits. *Role: Lead Author*.

TransWest Express Permitting Support; TransWest Express, LLC; Multiple States. SWCA is providing support services to TransWest Express, LLC, for the development of the 850-mile TransWest Express Transmission Line Project from south-central Wyoming to Las Vegas, Nevada. Ms. Huisenga served as primary author for portions of the Plan of Development. *Role: Author*.

***Centralized Waste Treatment Oil and Gas Impacts; U.S. Environmental Protection Agency (EPA); Various Locations.** Performed literature review and data analysis for a technical report summarizing the impacts of effluent from centralized waste treatment facilities treating oil and gas wastewater to receiving surface waters. *Role: Assistant Project Manager.*

***316(a) Demonstration Studies, Thermal Model Analysis; EPA; Various Locations.** Analyzed thermal models for applicability in 316(a) demonstration studies to help the agency update guidance documents for point source wastewater dischargers. *Role: Analyst.*

***Water Utility Climate Alliance Flexible and Adaptive Regulations; Water Utility Climate Alliance ; Various Locations.** Supported client in identifying and understanding climate and regulatory challenges to the Water Utility Climate Alliance utilities. *Role: Analyst.*

***Early Restoration and Restoration Planning: Deepwater Horizon Oil Spill; National Oceanic and Atmospheric Administration; Gulf of Mexico.** Provided technical support to compile a database for a marsh restoration meta-analysis. *Role: Analyst.*

***Louisiana Avian Damage Assessment; State of Louisiana; Louisiana.** Worked with Louisiana state biologists and publicly available datasets to calculate the change in bird colony abundance in Louisiana bird habitats affected by the *Deepwater Horizon* oil spill. *Role: Analyst.*

***The Nature Conservancy – Modeling Climate Risks for Bristol Bay Salmonids; The Nature Conservancy; Pacific Northwest; Alaska.** Completed a literature review on the effects of copper toxicity and stream temperature on salmonids. *Role: Analyst.*

***Florida Deepwater Horizon Restoration Florida Fish and Wildlife Service; Florida.** Provided National Environmental Policy Act support for restoration projects in Florida resulting from Deepwater Horizon oil spill early restoration funds. *Role: Analyst.*

***Water Treatment Technology Costs and Case Studies; EPA; Various Locations.** Analyzed case studies for water supply treatment technologies to provide cost data and technical specifications to models created for the EPA. *Role: Analyst.*

***pH and Ammonia Toxicity in Rivers of the Colorado Plains; University of Colorado; Colorado.** Performed field and laboratory work to evaluate the effects of temperature and metabolic processes, with a particular focus on algae, pH, and ammonia toxicity in streams influenced by wastewater effluent *Role: Field and Laboratory Manager.*

***Deepwater Horizon Oil Spill; National Oceanic and Atmospheric Administration; Louisiana and Gulf of Mexico.** Supported trustees in natural resource damage assessments for the Deepwater Horizon oil spill, including toxicity studies, damage calculations, and restoration analyses. *Role: Analyst.*

***Algal Production of Little Gaynor Lake; Boulder County; Boulder County, Colorado.** Investigated the source of algal production and the resulting physical effects on the biogeochemistry of the lake water. *Role: Field and Laboratory Manager.*

***Grand Lake Transparency Study; Grand County; Grand Lake, Colorado.** Led the implementation of field and laboratory studies to assess the effects of a water supply management system on water quality, algal production, and transparency of a natural alpine lake. *Role: Field and Laboratory Manager.*

DAREN PAIT, P.E., CFM, HYDROLOGIST

Mr. Pait has 22 years of experience in infrastructure resilience planning and design, watershed management planning, natural system engineering, and flood mitigation planning and design. His experience includes watershed management planning for water quality and quantity, infrastructure assessments and stabilization design (roadway and utility), lake retrofits, Best Management Practice retrofits, natural channel design, floodplain design, stormwater wetland design, living shoreline design, hydraulic flood modeling/floodplain mapping, flood mitigation planning and design, and stream/shoreline stability assessments. He has been the design engineer for more than 175,000 linear feet of stream channel stabilization and restoration projects, 33 acres of riparian wetland mitigation projects, 2,000 acres of non-riparian wetland mitigation, 20 stormwater management facility retrofits, and more than 30 acres of lake and pond retrofit projects for Total Maximum Daily Load compliance.

YEARS OF EXPERIENCE

22

EXPERTISE

Watershed Management Plans

Water Quality Best Management Practice design

Nutrient bank establishment

Surface water retrofits for water quality

Natural channel design

Wetland and living shoreline design

Stream/shoreline stability assessments

Flood mitigation design

EDUCATION

B.S., Environmental Engineering; North Carolina State University, 2000

REGISTRATIONS / CERTIFICATIONS

Professional Engineer; North Carolina, South Carolina, Virginia, Florida, Colorado, and Utah

Certified Floodplain Manager

SELECTED PROJECT EXPERIENCE (* denotes project experience prior to SWCA)

Watershed Management Plan, Back River/Riverdale (Subwatershed 10); Hampton, Virginia. Developed a watershed study for the Riverdale section of Hampton at the headwaters of Back River. The study area was approximately 1,100 acres. The project involved collecting data on the existing stormwater conveyance systems, researching areas of flooding, conducting hydraulic and hydrologic modeling, and identifying areas of flooding. The project also included developing flood control recommendations and water quality improvements in the watershed to meet Total Maximum Daily Load requirements for the river, project management, hydraulic modeling, and development of concept designs for proposed improvements. *Role: Project Manager.*

***Indirect and Cumulative Impacts Analysis for Water Quality; North Carolina Department of Transportation – Goldsboro US-70 Bypass; Wayne County, North Carolina.** Performed stormwater technical assistance for this water quality impact analysis for a 60 square mile watershed associated with the construction of the US-70 Bypass (R-2554). The purpose of the analysis was to assess the anticipated nutrient, sediment, and runoff volume changes that could result from potential induced development resulting from the future roadway's existence. The proposed bypass is a four-lane divided, new location, full control access freeway approximately 21 miles in length. A land use impact analysis was completed for the existing conditions, future build scenario conditions, and future no-build scenario. Using the predicted land use changes models were completed for the water quality and quantity impacts that would result from induced development. BasinSim 1.0 was utilized to model nitrogen, phosphorus, sediment loading, and peak flow changes. The watershed contains three 303d listed streams and five 14-digit HUC watersheds of concern. *Role: Project Engineer.*

***Streambank Stabilization and Infrastructure Protection; Charlotte Water (Water and Wastewater Utility); Charlotte, North Carolina.** Mr. Pait provided design services for the Charlotte-Mecklenburg Utilities Department (Charlotte Water). He completed design on 3,000 linear feet of stream stabilization projects at six separate sites where channel bank erosion is threatening the stability of sanitary sewer lines. In some instances, channels that have a drainage area of 34 square miles are being relocated away from 54-inch-diameter gravity sewer lines. Relocating channels this large requires extensive knowledge of Federal Emergency Management Agency permitting and understanding how to modify floodways and floodplains. In addition to the six projects for which design has been completed, seven sites are currently in the assessment and design phase. *Role: Project Engineer.*

***Stoney Creek Stream and Wetland Restoration; City of Goldsboro, North Carolina.** Mr. Pait prepared and coordinated submittal of a Clean Water Management Trust Fund application to restore approximately 18,000 feet of Stoney Creek and provide integrated stormwater management practices. The project included the design of a wetland slough system to mimic relic ox-bow channels that provide floodplain storage during large storm events. This resulted in lowering floodplain elevations and improving water quality. The City of Goldsboro was awarded a $2 million grant to design and construct the project. Professional services also included construction observation assistance services during construction. *Role: Project Engineer.*

***Potomac River Living Shoreline – Windmill Hill; City of Alexandria; Alexandria, Virginia.** Mr. Pait assisted with design for a living shoreline to replace 1,100 linear feet of collapsing concrete bulkhead along the Potomac River in Alexandria, Virginia. The project also included the restoration of 240 linear feet of perennial/tidal stream channel. The design is being completed for the City of Alexandria as part of a larger improvement to Windmill Hill Park. The living shoreline and its associated low marsh and high marsh wetlands will be visible from an observation pier and walking trail. In addition to improving the appearance of the park, this project will provide the City of Alexandria with 4.5 pounds per year of phosphorous removal credit, 75 pounds per year of nitrogen removal credit, and 5,700 pounds per year of total suspended solids removal. Design was completed in the summer of 2016 and construction was completed in 2019. *Role: Project Engineer.*

***Annual Stream Mitigation Monitoring; North Carolina Department of Transportation; Greensboro, Statesville and Cary, North Carolina.** Mr. Pait provided annual stream monitoring services for the North Carolina Department of Transportation as part of an annual services on-call contract. He monitored nine separate stream mitigation sites located in Statesville, Greensboro, and Cary, North Carolina. The scope of work included full stream channel profile surveys, permanent cross-section surveys, photo-documentation of channel conditions at permanent photo points and preparation of a separate annual monitoring report for each site. He was also tasked with reviewing as-built surveys after construction of the sites and establishing Year 0 monitoring setup. The total length of stream being monitored for all nine of the sites is 7,639 linear feet. These sites are in different years of completion, however, there are currently no delays on credit releases. *Role: Project Manager.*

JOSHUA C. ALLEN, B.S., P.E., CFM, HYDROLOGIST

Mr. Allen has more than 14 years of experience working on ecological restoration, stormwater management, hydraulic flood modeling/floodplain mapping, flood mitigation design, and water-quality–related projects across the country. He serves as a principal ecological restoration engineer for SWCA, where he works on a wide variety of projects, including stream and wetland restoration, coastal restoration and resiliency planning, and mitigation banking projects. His attention to detail and management skills enables him to provide effective design solutions and successful projects for both internal and external clients. He regularly coordinates with multiple team members to see projects to completion and exceed the client's expectations.

YEARS OF EXPERIENCE

14

EDUCATION

B.S., Biological Engineering, Environmental Concentration; North Carolina State University, Raleigh, North Carolina; 2008

REGISTRATIONS / CERTIFICATIONS

National No. 58868; National Council of Examiners for Engineering and Surveying

Professional Engineer; North Carolina, Maryland, South Carolina, Texas, Virginia, Florida, Washington, Idaho, Michigan, West Virginia

Certified Floodplain Manager, North Carolina No. NC-14-0529

TRAINING

Wildland Hydrology Level IV - River Restoration and Natural Channel Design; 2019

Wildland Hydrology Level III - River Assessment and Monitoring; 2018

Wildland Hydrology Level II - River Morphology and Applications; 2012

Wildland Hydrology Level I - Applied Fluvial Morphology, 360Training; 2011

SELECTED PROJECT EXPERIENCE

Harrison Lake Dam Removal and Stream Restoration; City of Harrison; Arkansas. SWCA partnered with The Nature Conservancy to serve the City of Harrison for the removal of the low-head concrete dam associated with Harrison Lake and the restoration of the approximately 4,000 feet of channel for Crooked Creek through the lakebed. The high sediment load from the receiving watershed is currently being trapped by Harrison Lake, resulting in shallow water depths, decreased water quality, and increased temperature. The project will restore the appropriate dimension, pattern, and profile of Crooked Creek, restore the aquatic and riparian habitat, improve water quality, and re-connect the floodplain in an effort to restore the functional attributes that support the physical, chemical, and biological characteristics of the stream. *Role: Stream Restoration Design Lead.*

Edgecomb Creek Stream Restoration; NorthPoint Development; Snohomish County, Washington. The restoration of Edgecomb Creek provided several improvements in stream ecological functions over the existing degraded stream channel. The majority of the existing stream channel consists of excavated linear ditches in agricultural fields that lack substantial native riparian trees and shrubs, meanders, cobbles or sorting, riffle or pool structures, large woody debris, or floodplain connectivity. The restored stream channel consists of a meandering channel connected to side channels and wetland habitats within a riparian corridor containing native forest, shrub, and emergent plant communities. The mainstem and side channels were enhanced with large woody debris, small woody debris, streambed gravels, and pool and riffle creations. Fish accessibility to the site and upstream reaches of Edgecomb Creek were improved by the replacement or removal of culverts that currently act as partial fish passage barriers. *Role: Stream Restoration Design Lead.*

NC-24 Resilience and Living Shoreline Design; North Carolina Department of Transportation; Town of Swansboro, North Carolina. SWCA is the lead designer for three separate marsh restoration, stormwater treatment, sidewalk rehab and living shoreline projects along the NC-24 causeway located just southeast of Swansboro, North Carolina. These three areas experience frequent flooding/overtopping, and the hurricanes in 2018 caused extensive erosion along the existing sidewalk and riprapped causeway. A diverse partnership between the North Carolina Department of Transportation, the North Carolina Coastal Federation, and Carteret Community College was formed for the submittal of a National Fish and Wildlife Foundation grant requesting $1.6M as a 50% match for design and construction of the shoreline protection and resiliency project. The current design includes converting and enhancing approximately 2,000 feet of hardened shoreline to living shorelines with the restoration and creation of 2 acres of tidal marsh along the causeway. The existing sidewalk will be stabilized and will allow for pedestrians to view the marsh, oyster reef, and living shoreline system as they walk along the top of the bank. *Role: Lead Design Engineer.*

Patton Creek Stream Restoration; American Conservation Experience (ACE); Blaine County, Idaho. SWCA is supporting ACE for the design and permitting of the restoration of Patton Creek, located on the Stevenson Wetland Reserve Program conservation easement property in Blaine County, Idaho. The project includes rerouting Patton Creek to bypass the existing impoundment utilizing a Priority One restoration approach. A diversion will be included at the upstream end of the project to provide the ability to divert water back to the impoundment for irrigation. By restoring Patton Creek, SWCA and ACE seek to improve the health and function of riparian and stream habitat while restoring natural hydrologic function, sediment transport, and reducing water temperature within the Silver Creek drainage area. *Role: Lead Design Engineer.*

Schwartz Creek Floodplain Restoration; ACE; Latah County, Idaho. SWCA is supporting ACE for the design and permitting of the restoration of the floodplain for Schwartz Creek, located on the Snyder-Swetik Wetland Reserve Program conservation easement property in Latah County, Idaho. The project includes creating secondary floodplain channels, restoring hydrology and wetland characteristics to a portion of the floodplain for Schwartz Creek. The project will also include the stabilization of the eroding streambanks for the project reach. By restoring the floodplain for Schwartz Creek, SWCA and ACE seek to restore floodplain connectivity to convert existing agricultural field to a wet meadow habitat, improve and increase aquatic and beaver habitat, restore hydrology to the project site, reduce velocity and shear stress in Schwartz Creek, and reduce bank erosion along Schwartz Creek. *Role: Lead Design Engineer*

Lower Bois d'Arc Reservoir Stream Mitigation Design; Resource Environmental Solutions, LLC; Harris County, Texas. The mitigation plan includes the enhancement, restoration, and creation of approximately 80 miles of streams and 9,000 acres of wetlands. Through a watershed approach to mitigation, on-site mitigation would be provided at the proposed reservoir site, and near-site mitigation would be provided on the nearly 15,000-acre Riverby Ranch and the 1,900-acre Upper Bois d'Arc Creek Mitigation Site. The project includes a geomorphic investigation of reference reach systems, as well as the existing conditions and degree of impairment for ephemeral, intermittent, and perennial streams within the project area. Design elements include re-meandering the channel, defining a low-flow channel and bankfull bench, and grading the bank. Design of in-channel structures includes augmented riffles and pools, large-wood toe stabilization, boulder, and log grade control structures, rootwads, j-hooks, and point bars. The Modified East Texas Hydrogeomorphic Method was used to assess the functions of forested wetlands, and the Rapid Geomorphic Assessment tool was used to assess stream quality. *Role: Wetland Restoration Designer.*

Confidential Creek Mitigation Bank; Confidential Client; South Carolina. The site includes the restoration, enhancement, and preservation of over 40,000 linear feet of stream channel and restoration of the adjacent riparian floodplain. An existing levee exists along the banks of the creek throughout much of the site, and the proposed design will remove portions of this levee to allow the creek to access the floodplain more frequently. Additionally, some sections of stream on-site will be restored with a Priority 1 restoration approach, which will return the level of groundwater to be closer to the historic valley elevation, thus enhancing adjacent wetlands and vernal pools. *Role: Stream Restoration Designer*

Davidson Solar Farm Stabilization Plan; Longroad Energy; Davidson County, North Carolina. SWCA is supporting Longroad Energy to stabilize existing areas of erosion as necessary at the Davidson County Solar Farm in Davidson County, North Carolina. SWCA prepared a stabilization plan for the site to stabilize and armor areas of concentrated flow and re-distribute runoff across the site to reduce areas of concentrated flow. The stabilization plan also includes a re-vegetation plan that will help to stabilize the site using native vegetation and pollinators. *Role: Project Manager.*

Various Solar Facilities – Flood Hazard Analysis; Various Clients; Various Locations. SWCA was contracted to perform analyses on the potential flooding risks to infrastructure at several proposed solar power facility sites across the country. The sites are typically several thousands of acres in size. The analyses included development of a 2-dimensional hydraulic model to model rainfall and quantify hydraulic forces acting on the site during different storm events as well as analyze any risks caused by flooding of nearby streams and rivers. Risks were based on non-erosive thresholds developed for flood depths, velocities, and shear forces. SWCA compiled flood hazard analysis reports for each site that discuss results and site recommendations. *Role: Lead Engineer.*

ARIANNA DISSER, B.S., WATER RESOURCES SUPPORT SPECIALIST

Ms. Disser is a water resources scientist based out of SWCA's Salt Lake City office. She supports numerous water resource projects in Utah by leading the field efforts for water quality sampling, managing and completing data analysis on water quality data, and preparing reports. Ms. Disser has expertise in conducting maintenance and calibration on a wide variety of water quality sampling equipment. Additionally, she is experienced in water sample collection and handling procedures for surface water and groundwater. Ms. Disser currently leads stormwater data collection efforts for the Utah Department of Transportation (UDOT), where she manages instrumentation, collection of water quality samples, and the project database and data analysis.

YEARS OF EXPERIENCE

4

EXPERTISE

Water quality monitoring

Data management and analysis

Water quality monitoring equipment operation and maintenance

Quality assurance/quality control

Utah Pollutant Discharge Elimination System permit compliance

National Environmental Policy Act compliance

EDUCATION

B.S., Environmental Science; Southern New Hampshire University; 2019

SELECTED PROJECT EXPERIENCE

Wet Weather Monitoring; UDOT; Utah. SWCA is monitoring stormwater runoff from various UDOT facilities, preparing a year-end report quantifying pollutant loads from UDOT facilities, and describing methods of stormwater samples collection as mandated by UDOT's National Pollutant Discharge Elimination System/MS4 permit. *Role: Field Manager. Responsible for maintenance and operation of automatic samplers and flow meters, coordinating storm sampling, preparing flow-weighted composite samples following storm events, and preparing the annual report.*

Wasatch County Health Department Groundwater Quality Management; Wasatch County, Utah. SWCA evaluated the groundwater aquifer that serves as the drinking water supply for Wasatch County in response to a concern that rapid growth within the county could put groundwater quality at risk of degradation. As part of the study, SWCA summarized the existing conditions, synthesized research that has been performed in the watershed, created an SAP, collected water quality samples, and modeled the groundwater system to evaluate potential threats from future development, with a specific focus in developing septic system density recommendations for Wasatch County. The SWCA team worked closely with the Wasatch County Health Department to compile existing information and identify specific groundwater wells where water quality samples could be collected. *Role: Water Quality Technician. Collected groundwater and surface water samples according to standard operating procedures, performed water quality multi-parameter probe calibration and maintenance, and conducted data management for the project.*

National Vision Permit Compliance, National Vision, Inc.; Salt Lake City, Utah. National Vision, Inc. was issued an industrial wastewater discharge permit from Salt Lake City Department of Public Utilities to discharge pre-treated wastewater to the city's sanitary sewer system. SWCA is supporting National Vision by conducting water quality monitoring and reporting to satisfy wastewater discharge permit requirements. *Role: Project Manager. Collecting wastewater samples, conducting data management for the project, performing water quality multi-parameter probe calibration and maintenance, and preparing quarterly compliance reports.*

Yellowstone Diversion Surrender of License Application; Moon Lake Electric Association, Inc.; Altamont, Duchesne County, Utah. SWCA is supporting Moon Lake Electric Association through the decommissioning process of a small hydroelectric facility in Utah's Ashley National Forest. SWCA has guided Moon Lake Electric Association through the Federal Energy Regulatory Commission surrender of license application, performed all the required surveys, and prepared all application documents. These efforts included biological and cultural resources field surveys, a wetland delineation, National Environmental Policy Act analysis, a historic properties treatment plan, a dam removal and restoration plan, and a restoration design for the stream area inundated by the dam. SWCA also outlined a conceptual restoration plan for the Yellowstone River and associated riparian area and uplands. *Role: Biological Technician. Assisted with onsite survey work and researched and prepared regulatory applications and documents, including a Section 401 Water Quality Certification and a Clean Water Act Section 404 pre-construction notification for a Nationwide Permit.*

Provo River Watershed Water Quality Analysis; Central Utah Water Conservancy District; Orem, Utah County, Utah. SWCA is compiling existing relevant information in the watershed, developing data-driven approaches to identify problem areas, and making recommendations for water quality improvement. The data, information, and annual consecutive updates are developed within the context of an Esri online story map where watershed water quality analyses are displayed in an interactive, web-based format. *Role: Biological Technician.*

MEG PERRY, M.E.M., STAKEHOLDER INVOLVEMENT SPECIALIST

Ms. Perry is a project manager and facilitator who specializes in watershed planning and management. She has led and supported a variety of environmental decision-making and planning processes on large river systems throughout the United States including the Green and Colorado Rivers in Utah, Hudson River in New York, and the Missouri River Basin. She also has experience with watershed planning consistent with the Environmental Protection Agency's 319 Grant program, flood resilience planning, and stream and wetland restoration projects. She was worked on water issues for mining companies, state and local governments, U.S. Army Corps of Engineers (USACE), Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service (USFWS). She also has graduate level training in water resource planning and management, aquatic ecology, conservation biology, river science, environmental policy, environmental economics, and decision science.

YEARS OF EXPERIENCE

11

EXPERTISE

Facilitation and stakeholder engagement

Multi-party consensus building and collaborative problem solving

Long term and large-scale planning

Survey design and public comment analysis

Coastal and freshwater ecosystems science and restoration

Climate risk and vulnerability assessment

Threatened and endangered species management

Project Management

EDUCATION

M.E.M., Ecosystem Science and Conservation and Community Based Environmental Management; Nicholas School of Environment; Duke University, Durham, NC, 2014

B.A., Biology; Swarthmore College; Swarthmore, Pennsylvania, 2008

TRAINING

Project Management, PSMJ, 2021

Collaboration with Native Nations and Tribal Consultation, National Center for Environmental Conflict Resolution, Tucson, AZ, 2019

SELECTED PROJECT EXPERIENCE (* denotes project experience prior to SWCA)

Carmel River Floodplain Restoration Stakeholder Engagement; McBain Associates and California State Coastal Conservancy; California. SWCA is currently providing environmental services to model, design, and permit restoration of an approximately 1-mile reach of the Carmel River in the Rancho Cañada Unit, Palo Corona Regional Park. SWCA is collaborating with McBain Associates and a 20-person technical advisory committee for holistic habitat restoration of 190 acres of former golf course to provide vital linkage from Palo Corona to Big Sur. *Role: Facilitator. Ms. Perry serves as lead facilitator for virtual stakeholder meetings and coaches the client on best practices for stakeholder engagement.*

Resilient Coastal Communities Program Risk Assessment and Project Prioritization; NC Division of Coastal Management; North Carolina. SWCA is providing coastal resiliency planning technical assistance to four counties and municipalities. In cooperation with Community Action Teams in each community, SWCA is conducting community engagement, a risk and vulnerability assessment focused on flooding, and planning, project identification, and prioritization. The final product of this process is a Resilience Strategy for each community that includes a risk and vulnerability assessment report and prioritized resilience project portfolio. *Role: Project Manager and Lead Facilitator. Ms. Perry manages all aspects of the project and facilitates the Community Action Teams and public meetings.*

Pot Creek Watershed Plan, Uintah Conservation District; Utah. SWCA is developing a watershed plan for Pot Creek that includes the EPA's 9 watershed plan elements. *Role: Stakeholder Engagement Specialist. Supports facilitation of the Watershed Plan Advisory Committee, coaches the client on best practices for stakeholder engagement.*

Colorado and Green Rivers Resource Management Plan; Utah Division of Forestry, Fire and State Lands; Utah. SWCA was contracted in November 2020 by the Utah Division of Forestry, Fire and State Lands (FFSL) to develop a recreation resource management plan (RMP) for sovereign land sections of the Colorado and Green Rivers. SWCA is leading a two-year data collection and analysis effort with our teaming partner, the Utah State University Institute of Outdoor Recreation and Tourism. The resulting dataset, along with stakeholder input from a public involvement process, will result in a better understanding of recreational uses and conflicts on these sovereign land river segments. SWCA will then work with FFSL to develop management goals and objectives for the RMP that address and reduce recreation conflicts. The RMP will provide

consistent direction for FFSL's recreation decisions and clarity for the public using the rivers. *Role: Public Involvement Specialist. Lead facilitator for public meetings, managing public noticing, coaching FFSL team on best practices for stakeholder engagement and collaborative planning.*

Twin Metals Minnesota EIS; BLM; Minnesota. SWCA is leading development of the EIS and managing public involvement in the NEPA process for the proposed Twin Metals Mine. *Role: Public Involvement Lead. Development and implementation of the Public Participation Plan including meeting support, public outreach, coaching the compliance teams on best practices for stakeholder engagement, and documenting public input; facilitation of Interdisciplinary Team meetings.*

***Missouri River Recovery Implementation Committee; National Center for Environmental Conflict Resolution; Missouri River Basin, Multiple States.** Established by Congress, the seventy-member multi-stakeholder Committee offers advice to the USACE and the USFWS on the implementation of recovery actions for endangered species on the Missouri River. *Role: Facilitator. Facilitated webinars, calls, and meetings, and supported the work of multiple work groups including as facilitator for the Tribal Interests Work Group and Communications Work Group. She also managed the use of remote and collaborative technology (e.g., Adobe Connect); preparation of written materials; and cloud-based information storage and management for calls, webinars, and in-person meetings.*

***Salmon Gold; RESOLVE; Alaska, Yukon Territory, and British Columbia.** RESOLVE's Salmon Gold initiative convenes government, conservation, mining, and community partners and leverages innovative funding sources such as technology and jewelry companies to support habitat restoration in streams impacted by historical placer mining. *Role: Lead Facilitator and Project Manager. Supported collaborative development of a quantification tool for stream restoration with the BLM and other agency partners, facilitated an in-region mining innovation forum, managed the project budget and contractors, and contributed to outreach and fundraising efforts.*

***Water Resources Grantmaking Strategy and Outreach; Confidential Foundation; US and Canada.** RESOLVE developed and implemented an outreach strategy to identify potential grantee-partners for the foundation, with a focus on conservation groups in US and Canada working on water issues. *Role: Facilitator and project manager. Contributed to development of the outreach plan, led outreach to potential grantee-partners, managed solicitation of expressions of interest, and conducted first-round review of grantee-partner applicants.*

***Hudson River Comprehensive Restoration Plan Steering Committee and Facilitated Goal and Objective Development; TNC & Partners Restoring the Hudson; Hudson River, New York.** This effort included a series workshops in which technical expert teams developed goals and objectives for twelve target ecosystem characteristics for the Hudson River Estuary, which formed the foundation for the Hudson River Comprehensive Restoration Plan. A Steering Committee was charged with guiding development of the Comprehensive Restoration Plan and reaching agreement on how participating organizations would coordinate to implement the plan. *Role: Lead facilitator: Facilitated steering committee calls and meetings and all management team and expert team calls, co-facilitated five expert workshops, developed call and workshop agendas and summary documentation, coordinated review and compilation of the twelve technical teams' draft and final reports, and supported the drafting and review process for the Comprehensive Restoration Plan.*

***Cape Fear 2050 Strategic Planning; Nicholas Institute for Environmental Policy Solutions; Durham, North Carolina.** In cooperation with the Nicholas Institute for Environmental Policy Solutions, Ms. Perry designed, coordinated, and facilitated a strategic planning workshop exploring future economic development and environmental change scenarios with policy and management experts in the Cape Fear River basin of North Carolina. *Role: Lead facilitator. Conducted pre-workshop scoping interviews, designed, and facilitated the workshop, and prepared the workshop report.*

***Organizational Assessment; Roanoke River Partners, Hamilton, North Carolina.** Conducted independent organizational assessment for a local ecotourism organization focused on sustainable economic development for use by the incoming Executive Director. *Role. Project Lead. Planned and conducted interviews, developed participatory indicators of program success and community engagement in cooperation with board of directors, developed final report for the Executive Director.*

LINDA TUCKER BURFITT, B.A., TECHNICAL EDITOR

Ms. Tucker Burfitt is an assistant managing editor and National Environmental Policy Act (NEPA) publications specialist. Linda brings to SWCA a strong background in natural resources, especially forestry and wildlife resources, coupled with a background in communications. She is the document editing lead of many NEPA publications.

Ms. Tucker Burfitt's ability to edit and format large and small reports for content, organization, clarity, consistency, and grammar enhances the quality of documents created by SWCA's resource specialists. Ms. Tucker Burfitt provides outstanding service to report authors and clients alike, meeting budgets and deadlines. She has an excellent sense of how to prioritize editing and formatting details to improve a document no matter how tight the constraints.

YEARS OF EXPERIENCE

20

EXPERTISE

Natural resources

Technical editing and writing

Formatting in Microsoft Word

Coordination of multi-author writing projects

Multi-author writing processes and style-instruction sheets

Quality assurance and quality control of document content and presentation

Document coordination, preparation, and compilation

EDUCATION

B.A., Communications; University of Windsor, Windsor, Ontario; June 2000

A.F., Forestry; Sir Sandford Fleming College; Lindsay, Ontario; June 2003

A.S., Ecosystem Management; Sir Sandford Fleming College; Lindsay, Ontario; June 2002

TRAINING

Comprehensive NEPA course; SWCA; 2012

SELECTED PROJECT EXPERIENCE

South Fork Wind Farm EIS; Bureau of Ocean Energy Management (BOEM); New York. SWCA is the third-party NEPA consultant preparing an EIS for an offshore wind farm. The EIS is being developed to conform with the page limit and timeline guidance of Executive Order 13807 (One Federal Decision) and Department of the Interior Secretarial Order 3355. To date, SWCA has led pre-planning and impact analysis efforts, assisted BOEM with public scoping meetings and comment management, assisted BOEM in conducting consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA), prepared the Draft EIS and Draft Biological Assessments, and conducted the virtual public hearings on the Draft EIS. *Role: Project Technical Editor.*

Recreational Use and Nutrient Reduction Restoration Plan/Environmental Assessment; Coastal Protection and Restoration Authority; Baton Rouge, Louisiana. SWCA was responsible for the development of the Restoration Plan/Environmental Assessment for the Recreational Use Restoration and Nutrient Reduction from Non-Point Sources for the State of Louisiana. SWCA assisted the Louisiana Coastal Protection and Restoration Authority and Louisiana Trustee Implementation Group in restoration planning associated with the Deepwater Horizon oil spill. The project complied with NEPA and the Oil Pollution Control Act. *Role: Lead Editor. Responsible for editing, formatting, and publishing the draft and final documents.*

Alkali Creek Reservoir EIS; Wyoming Water Development Commission; Hyattville, Bighorn County, Wyoming. SWCA prepared an EIS evaluating the potential effects of the impoundment of Alkali Creek to create an 8,000-acre-foot reservoir to supplement late-season irrigation. SWCA developed the EIS for this project and conducted biological and cultural resources surveys to inform the impacts analysis. SWCA's team coordinated closely with the Bureau of Land Management (BLM), U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the Wyoming Department of Environmental Quality to address water quality effects and mitigation strategies. *Role: Lead Editor. Responsible for editing, formatting, and publishing the draft and final documents.*

Texas Clean Energy Project; Summit Texas Clean Energy, LLC; Ector County, Texas. SWCA prepared a third-party NEPA EIS for the construction and operation of the Texas Clean Energy Project, a first-of-its-kind project meant to demonstrate the commercial viability of a coal-based polygeneration plant in combination with carbon dioxide capture and sequestration through enhanced oil recovery. *Role: Technical Writer and Editor. Responsible for editing, formatting, and publishing the draft and final EISs.*

Wyoming Pipeline Corridor Initiative EIS; Wyoming Department of Administration and Information; Sheridan, Wyoming. SWCA is assisting the BLM in preparing an EIS that addresses the issues and analyzes a range of alternatives for the Wyoming Pipeline Corridor Initiative on behalf of the State of Wyoming. *Role: Lead Editor. Responsible for editing, formatting, and publishing the draft and forthcoming final documents.*

Lookout Pass EIS; Confidential Client; Wallace, Shoshone County, Idaho. SWCA prepared an EIS for a proposed ski area expansion within National Forest lands along the Idaho and Montana border. SWCA developed the proposed action and purpose and need, completed public scoping, and defined the project scope. SWCA prepared the EIS under the direction of the U.S. Forest Service. *Role: Technical Writer and Editor.*

Alton Coal Tract Lease by Application EIS; Alton Coal Development, LLC; Alton, Kane County, Utah. As a third-party contractor, SWCA assisted the BLM in completing the EIS and record of decision (ROD) for the proposed Alton Coal lease tract encompassing approximately 3,600 acres in southern Utah. The lease tract includes federally owned and private surface while all coal reserves within the tract are federal. Significant issues include potential impacts to greater sage-grouse, air quality, night sky, cultural resources, water resources, and transportation. *Role: Technical Editor. Facilitated the publication of the draft, supplemental draft, and final EIS and ROD, including making final edits and formats to the document and working with the printer.*

Uintah Basin Natural Gas Development EIS; Badlands Energy, Inc; Duchesne and Uintah Counties, Utah. SWCA assisted the BLM in writing an EIS and ROD for the proposed drilling of approximately 1,500 deep natural gas wells. The project included wells, pipelines, roads, and associated ancillary facilities and encompassed approximately 236,000 acres of BLM, state, and private land in eastern Utah. The draft EIS was published in late 2010, the final EIS was published in spring of 2012, and the ROD was published in June 2012. *Role: Technical Writer and Editor. Responsible for formatting, assisting in editing, and publishing the draft and final EISs and the ROD.*

Green and Colorado River Comprehensive Management Plans (CMPs); Utah Forestry, Fire and State Lands (FFSL); Garfield, Grand, Kane, San Juan, Emery, Uintah, and Wayne Counties, Utah. SWCA and several teaming partners completed CMPs for the Green and Colorado Rivers. The CMPs establish a management vision for the rivers, supported by specific goals and objectives to maintain or enhance navigation, fish and wildlife habitat, and aquatic beauty. *Role: Publications Lead.*

Bear River CMP; Utah Forestry, Fire and State Lands; Box Elder and Cache Counties, Utah. SWCA and several teaming partners drafted the first Bear River CMP for FFSL lands. The CMP establishes a management vision for the Bear River, supported by specific goals and objectives to maintain or enhance navigation, fish and wildlife habitat, and aquatic beauty. *Role: Publications Lead.*

Great Salt Lake CMP; FFSL; Salt Lake County, Utah. SWCA assisted in the revision of the Great Salt Lake CMP, incorporating recent scientific research on Great Salt Lake and public input on water quality and quantity issues related to Utah's unique water body throughout the planning process. New components of the plan include a resource matrix showing impacts to multiple resources at varying lake levels. SWCA also assisted with analyzing and responding to 900 substantive public comments. *Role: Technical Writer and Editor. Responsible for editing, formatting, and publishing the draft and final plans.*

Moab and Monticello Resource Management Plans (RMPs)/EISs; BLM; Moab, Monticello, Grand, and San Juan Counties, Utah. SWCA was retained by the BLM Moab and Monticello Field Offices to assist in the revision of their existing RMPs and associated EISs, which included public lands and federal mineral estate lands. As part of the project, SWCA developed a public scoping strategy for which the BLM received the Public Affairs Golden Spike Award from the Public Relations Society. *Role: Technical Writer and Editor. Responsible for formatting and coordinating the publication of the final RMPs/EISs.*

BLM Vernal RMP/EIS; BLM; Vernal, Multiple Counties, Utah. SWCA was selected by the BLM to revise the RMP for the Vernal Field Office. SWCA resources specialists assisted the BLM with all phases and tasks of the RMPs/EISs, including development of mineral potential and socioeconomic baseline reports, development of alternatives, preparation of the draft and final EISs, and comment response. *Role: Technical Writer and Editor. Responsible for formatting and publishing the final RMP/EIS.*

LORI JOHNSON, M.S., GIS SPECIALIST

Ms. Johnson is a Geospatial Scientist with over 15 years of professional experience with a variety of GIS methods including aerial photograph interpretation, land cover mapping, remote sensing, GPS technology. Her responsibilities include managing GIS activities in the Amherst office, setting standards for mapping deliverables, managing spatial databases, conducting GIS analyses, and creating maps for technical reports. She also conducts field projects and permitting related to rare species and develops technical reports.

YEARS OF EXPERIENCE

15

EXPERTISE

Geographic Information Systems (GIS)

GPS Technology

Wildlife and Botanical Surveys

Rare Species Ecology

Technical Communications

EDUCATION

M.S., Geographic Information Science; Clark University; 2012

M.S., Conservation Biology; Antioch University New England; 2009

B.S., Biology; State University of New York at Albany; 1995

ADDITIONAL TRAINING

Using ArcGIS to Author Metadata, UNH Cooperative Extension; 2016

Using Marxan Software for Conservation Planning, Conservation International; 2012

SELECTED PROJECT EXPERIENCE

Utility Structure Replacement and Wetland Protection Plans; Western Massachusetts Electric Company; Massachusetts. Wetland delineations and work plans were developed along work areas and access routes within powerline rights-of-way for the replacement of 55 utility structures. *Role: GIS Analyst. Mapped wetland delineation results, sensitive resources, protected zones, suggested access routes, and Stormwater Pollution Prevention Plans to inform construction work.*

Invasive and Rare Plant Species Mapping; Westfield River Watershed; Glenn Motzkin; Massachusetts. Project involved surveys conducted along the Westfield River and tributaries for rare and invasive plant species. A technical report of the results was developed for the Westfield River Watershed Association to be used in invasive species management planning. *Role: GIS Analyst. Created GIS maps depicting the locations of rare and invasive plant species in the Westfield River Watershed for the technical report.*

Solar Critical Issues Analysis; Multiple Clients; Throughout Eastern United States. Comprehensive site assessments conducted for multiple solar development companies to evaluate project feasibility and site capacity. *Role: Project Manager/GIS Specialist/Ecologist. Conducted over 125 detailed analyses including a review of zoning and environmental regulations, sensitive resources, and physical site characteristics. Produced written report and detailed GIS figures to demonstrate site constraints and buildable areas.*

Invasive and Rare Plant Species Mapping; Westfield River Watershed; Glenn Motzkin; Massachusetts. Surveys conducted along the Westfield River and tributaries for rare and invasive plant species. A technical report of the results was developed for the Westfield River Watershed Association to be used in invasive species management planning. *Role: GIS Analyst. Created GIS maps depicting the locations of rare and invasive plant species in the Westfield River Watershed for the technical report.*

Bear Swamp Relicensing Studies; HDR, Inc.; Berkshire and Franklin Counties, Massachusetts. Ecological studies required as part of FERC relicensing of a hydroelectric dam on the Deerfield River operated by Brookfield Renewable Energy, including baseline study of terrestrial wildlife and botanical resources and state-listed rare plants baseline study. *Role: GIS Analyst / Ecologist. Mapped natural communities, rare and invasive plant populations, and surveyed for rare odonates within the 1,500-acre project area. Documented new populations of state-listed plants and mapped priority natural communities. Completed detailed vegetation plots to characterize natural communities. Developed technical reports and GIS maps.*

Natural Resource Mapping; Connecticut River; FirstLight Power Resources; Massachusetts and Vermont. Environmental studies required as part of FERC relicensing of a hydroelectric dam on the Connecticut River operated by FirstLight Power Resources. *Role: GIS Analyst. Created detailed land use and natural resource maps for a 20-mile stretch of the Connecticut River Turners Falls Impoundment.*

Wetland Delineation Mapping; Multiple Clients; Throughout Massachusetts. Wetland delineations were conducted for proposed renewable energy projects and transmission line maintenance work. *Role: GIS Specialist. Created GIS maps of delineated resource areas and regulatory buffers for reporting.*

Environmental Resource Maps; Eversource Energy; New England. Extensive permitting support was provided for wetlands and rare species. *Role: GIS Specialist. Developed map books for linear projects including delineated wetlands, sensitive cultural and environmental areas, access roads, and construction impact areas.*

Project Review Maps; Eversource Energy; Throughout Massachusetts. Preliminary project review support was provided to assist with identifying the expected permitting requirements for proposed utility maintenance projects. *Role: GIS Specialist. Prepared maps depicting all publicly available environmental resource, cultural resource, and hazardous waste data. and wetland delineation data, when available.*

Pipeline Replacement Project; Confidential Client; Massachusetts. Environmental surveys and permitting associated with gas pipeline replacement project. *Role: GIS Manager. Developed environmental resource maps to support permitting.*

Wetland Mitigation for Pipeline Activities; Confidential Client; Massachusetts. Wetland monitoring and restoration following pipeline replacement activities. *GIS Manager. Developed environmental resource maps to support permitting compliance reporting.*

Stevenson Dam Rare Plant Monitoring; Fuss & O'Neill, Inc.; Monroe County, Connecticut. Rare plant surveys and monitoring to inform new road and bridge designs near the Stevenson Dam crossing the Housatonic River. *Role: GIS Manager. Assisted with botanical surveys to assess project impacts. The survey team developed a list of 320 plant species including two rare species, as well as common and invasive plants. Generated report maps of survey results.*

Heroes Tunnel Rare Species Surveys; Fuss & O'Neill, Inc.; New Haven, Connecticut. Rare plant, reptile, and bat surveys to support project impact assessment for the Heroes Tunnel Project. *Role: Ecologist. Conduct visual surveys for target plant and animal species. Documented state-listed plant and turtle species included two species new to the project area. Generated report maps of survey results.*

JESS GOLDSNIDER, B.A., BIOLOGIST

Ms. Goldsnider is a Natural Resource Project Manager for the SWCA Amherst office where she is responsible for writing and coordinating applications for a variety of permits. Ms. Goldsnider comes from a diverse environmental background. Most recently, she worked on assisting the project development and permitting of utility-scale wind and solar projects. Her focus was stakeholder engagement, real estate management, permitting support, screening sites for environmental concerns, and maintaining digital mapping databases. Ms. Goldsnider has also spent time working in the field on a wetland restoration project, trail maintenance, park attendance surveys and invasive vegetation management. She also worked with the Connecticut Department of Environmental Protection as a seasonal employee and assisted with multiple state land use initiatives.

YEARS OF EXPERIENCE

5

EXPERTISE

Permitting

Stakeholder engagement

Site screening for project suitability,

Land acquisition

Stakeholder engagement including landowners, public officials, contractors, and government agencies

Regulatory agency coordination

Invasive plant removal

Wetland restoration

State land use

Land development

EDUCATION

B.A., Environmental Studies; University of Connecticut; 2016

REGISTRATIONS / CERTIFICATIONS

Adult First Aid/CPR/AED Certified, Massachusetts No. 00IN43A; American Red Cross

MEMBERSHIPS

Member, Association of Massachusetts Wetland Scientists

Member, New England Women in Energy and the Environment

SELECTED PROJECT EXPERIENCE (∗ denotes project experience prior to SWCA)

Boglisch Farm Wetland Mitigation Improvements; Eversource Energy Service Co.; Agawam, Hampden County, Massachusetts. SWCA assisted with alterations and improvements to a wetland mitigation area associated with the Greater Springfield Reliability Project transmission line project in Agawam, Massachusetts. *Role: Field Technician. Assisted the senior biologist by recording data in a wetland invasive species monitoring project.*

CT-32 TRRP Wetland Reflagging; Eversource; Energy Service Co.; Hartford County, Connecticut. SWCA has been providing Eversource with siting and permitting services in Massachusetts, Connecticut, and New Hampshire since 2021 for multiple transmission lines. *Role: Field Technician. Assisted with wetland reflagging.*

708 Freetown Fall River Off Highway Motorcycle Trail Loop; Massachusetts Department of Conservation and Recreation; Massachusetts. SWCA is currently working on a project for the Department of Conservation and Recreation (DCR) in the Freetown/Fall River State Forest. SWCA conducted field investigations to assess the conditions of existing hiking trails and reviewed routes of potential "new" trails to determine if they would be suitable for conversion to off-road motorcycle trails. SWCA has assisted DCR in identifying constraints, limitations, and potential impacts along the proposed trails. The investigations involved review of state and local wetlands in proximity, coordination and communication with local off-road motorcycle groups, and site/route review with Massachusetts Natural Heritage and Endangered Species Program personnel. SWCA has led stakeholder engagement discussions with the various stakeholder groups. Detailed GIS mapping has been developed by SWCA to properly convey to all parties the findings of the field investigations and the proposed trail segments. Once stakeholder discussion has concluded SWCA will assist DCR with trail design and state permitting to allow the construction of the off-road motorcycle trails to occur. *Role: Biologist and Stakeholder Engagement Specialist. Conducted wetland investigations, wetland trail assessments, and wetland delineations. Coordinated with the Natural Heritage and Endangered Species Program for stakeholder engagement meetings and provided permitting support.*

Post Construction Monitoring; Confidential Client; Multiple Counties, Multiple States. SWCA is providing post construction compliance monitoring for a Connecticut expansion project in Connecticut, Massachusetts, and New York. *Role: Biologist and Field Technician. Conducted well and wetland monitoring and mapped invasive plant populations. Helped author the restoration plan investigation.*

Loomis Communities Pond Management; The Loomis Communities, Inc.; South Hadley, Hampshire County, Massachusetts. SWCA is assisting the client in filing for licenses to apply herbicides, herbicide/algaecide treatments, and phoslock or PhosClear treatments. *Role: Biologist. Wrote the Notice of Intent in accordance with the Massachusetts Wetlands Protection Act for the project.*

Warren Wright Road Delineation; Benjamin Surner; Belchertown, Hampshire County, Massachusetts. SWCA conducted a wetland delineation and a rare species habitat assessment for Warren Wright Road in Belchertown, Massachusetts. *Role: Environmental Technician. Assisted senior wetlands scientist by plotting GPS coordinates for the delineation.*

Orchards Golf Course Pond Dredging; Orchards Golf, LLC; South Hadley, Hampshire County, Massachusetts. SWCA provided design, permitting, and ecological restoration services at two ponds located on the Orchards Golf Course in South Hadley, Massachusetts. Services provided included preparation of a sediment management plan, Notice of Intent and 401 for dredging, operations, and maintenance plan for future work. *Role: Biologist. Assisted in writing associated permits including Notice of Intent and 401 Water Quality Certification.*

Confidential Bridge Project; Confidential Client; Maine. SWCA is providing environmental compliance monitoring for a confidential oil and gas project in Maine. Services include restoration and invasive species monitoring and the completion of a Stormwater Pollution Prevention Plan. *Role: Biologist. Created a permit book for the project with an associated spreadsheet that listed the conditions of each permit and agency consultation.*

***Statewide Comprehensive Outdoor Recreation Plan (SCORP); Connecticut Department of Energy and Environmental Protection; Connecticut.** The Connecticut Department of Energy and Environmental Protection was seeking a seasonal resource assistant. One project in need of assistance was the SCORP. This plan is updated and submitted to the National Park Service's Land and Water Conservation Fund every couple of years to apply for, and ideally obtain, federal funding for the state's conservation and recreation goals. Part of this initiative included working as survey technician in several state parks to collect attendance data to advocate for where and how funds would be best allocated. *Role: Seasonal Environmental Resource Assistance. Worked as a seasonal employee on a variety of state land use and public involvement initiatives. Assisted in the early research, coordination, stakeholder engagement and drafting of the SCORP, survey technician in several state parks to collect attendance data, inventoried and archived historical state park files, attended public outreach events and agency meetings.*

APPENDIX B

Insurance Certification

Client#: 1520486 SWCAINC

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 7/27/2022

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 any rights to the certificate holder in lieu of such endorsement(s).

PRODUCER USI Insurance Services, LLC 2375 E.Camelback Rd. Suite 250 Phoenix, AZ 85016	CONTACT NAME: Misty Klemme PHONE (A/C, No, Ext): 602-749-4112 FAX (A/C, No): E-MAIL ADDRESS: misty.klemme@usi.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Greenwich Insurance Company	22322
INSURED SWCA, Incorporated dba SWCA Environmental Consultants 20 East Thomas Road Suite 1700 Phoenix, AZ 85012	INSURER B : XL Specialty Insurance Company	37885
	INSURER C : Steadfast Insurance Company	26387
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES CERTIFICATE NUMBER: 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 INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY	X	X	GEC001910417	07/26/2022	07/26/2023	EACH OCCURRENCE	$1,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$300,000
	X BI/PD Ded: 10,000						MED EXP (Any one person)	$10,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PERSONAL & ADV INJURY	$1,000,000
	POLICY X PRO-JECT LOC						GENERAL AGGREGATE	$2,000,000
	OTHER:						PRODUCTS - COMP/OP AGG	$2,000,000
								$
A	AUTOMOBILE LIABILITY	X	X	AEC001910217	07/26/2022	07/26/2023	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
B	UMBRELLA LIAB X OCCUR	X	X	UEC001910317	07/26/2022	07/26/2023	EACH OCCURRENCE	$5,000,000
	X EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$
	DED X RETENTION $10,000							$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N		X	WEC001910617	07/26/2022	07/26/2023	X PER STATUTE / OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N	N / A					E.L. EACH ACCIDENT	$1,000,000
	(Mandatory in NH)						E.L. DISEASE - EA EMPLOYEE	$1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - POLICY LIMIT	$1,000,000
C	Enviro. Liab Prof Contractors Poll Claims Made			PEC992416900	07/26/2022	07/26/2023	$15,000,000 Each Claim $15,000,000 Each Agg. $100,000 Ded.	

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

Professional Liability and Contractors Pollution Retro Date: 02/28/1990 - Policy Aggregate $5,000,000/$5,000,000; Professional and Job site Retro Date: 02/28/1990 $2,000,000/$2,000,000

*Various Other Coverages/Limits Retro Dates Apply.

The General Liability, Automobile Liability, Umbrella/Excess Liability and Pollution Liability policies (See Attached Descriptions)

CERTIFICATE HOLDER	CANCELLATION
SWCA Incorporated 20 E Thomas Suite 1700 Phoenix, AZ 85012	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

Proposal:
August 30, 2022

Hop Brook Watershed Based Plan

Prepared for:

Hop Brook Protection Association
Attn: Board of Directors
Sudbury, MA 01776

Contents

1. Cover Letter

Comprehensive Environmental Inc. (CEI) is pleased to submit this proposal to the Hop Brook Protection Association (HBPA) for development of a Watershed Based Plan (WBP) for Hop Brook and its associated ponds. We believe this project is well-suited to CEI's strengths in watershed planning, lake and pond management, water quality modeling, and water resources engineering.

CEI is an award-winning civil engineering and environmental services firm with offices in New Hampshire, Massachusetts, and Connecticut. A project team from our office in Bolton, MA will provide services for the Hop Brook WBP.

Founded in 1987, CEI is an employee-owned corporation serving municipal and private clients throughout the Northeast. CEI is employee-owned with a technical staff of approximately 35, including professional water resources scientists, hydrologists, engineers, Certified Floodplain Managers, Professional Geologists, Certified Lake Managers, drinking water facility operators, and technical staff expert in GIS, CADD, and MicroStation. CEI's awards and honors include:

- Named one of the **Best Environmental Services and Civil Engineering Firms to Work for Nationwide** annually since 2010.
- Recognized as **Top Woman Led Company in NH** by Business NH Magazine.
- **Engineering Excellence Award** Finalist by the American Council of Engineering Companies (multiple projects).
- **Construction Management Association of America Public Project of the Year Award** for CEI's design-build role for the Norumbega Covered Storage Project in Weston, MA.
- U.S. EPA New England Design Professional Winner of the **Stormwater Design Competition.**

Contact Information: Contact information for CEI's proposed Project Manager is provided below:

Robert M. Hartzel, Principal
508.281.520 / rhartzel@ceiengineers.com
41 Main Street, Bolton, MA 01740

Robert M. Hartzel, Principal — 8/302022 Date

Why Choose CEI?

CEI will provide the HBPA with a project team that has decades of experience in watershed assessment, restoration, engineering, and ecology, including significant local experience with Massachusetts. We are excited about this opportunity to collaborate with the HPBA as partners in developing a long-term plan for the future of Hop Brook and its associated ponds.

Technical Excellence

CEI is a trusted watershed planning and engineering partner for New England state agencies. Our recent projects include the ongoing development of an updated *Massachusetts Stormwater Handbook* and related modeling support, the *Massachusetts Nonpoint Source Pollution Grant Guidebook*, the *New Hampshire Stormwater Manual* (currently being updated by CEI), and the ongoing *New Hampshire Clean Watersheds Needs Assessment*. CEI's proposed project manager led the development of the *Massachusetts Watershed Based Plans* web-based tool, a statewide watershed planning tool that provides "9-element" watershed plans for over 5,000 watersheds, the first of its type in the country.

Local Company / Local Knowledge

We know Massachusetts watersheds. In addition to the broad-scale projects mentioned above, our project team has completed many successful watershed-specific assessment and restoration projects in Massachusetts and throughout New England, including **EPA-approved nine-element watershed plans** for major river basins, small tributaries, and lakes. *Please see Section 5 for project summaries.*

Collaborative Approach to Watershed Planning

Collaboration between consultant, the HBPA, and other project stakeholders is critical to the success of this project and is a core principle in our approach to watershed planning. The challenges facing Hop Brook are not simply technical questions to be answered with science and engineering. Although these aspects provide the foundation for a watershed plan, the plan must also carefully consider local social, economic, and political factors if it is to be successfully adopted and implemented by the community. Getting local stakeholder input throughout the watershed planning process is key to developing a full understanding of the local concerns and serves as an important reality check for proposed actions.

What Our Clients Are Saying

CEI developed our watershed management program and recently completed a watershed-wide restoration plan…their expertise has proven invaluable to us in protecting our drinking water supply.

Donald Ware, P.E., Chief Operating Officer
Pennichuck Water

Having worked with CEI for nearly 15 years on everything from stormwater engineering, to NPDES compliance and hazardous/solid waste projects, we have come to rely on their staff to provide comprehensive, reliable and cost-effective support to our department. We highly recommend them.

Municipal DPW Director

CEI's expertise in culvert engineering and flood management has helped us work through a major culvert replacement project. CEI staff have been extremely responsive…we recommend them to anyone looking for superior and cost-effective engineering projects

CEI Client and DPW Director

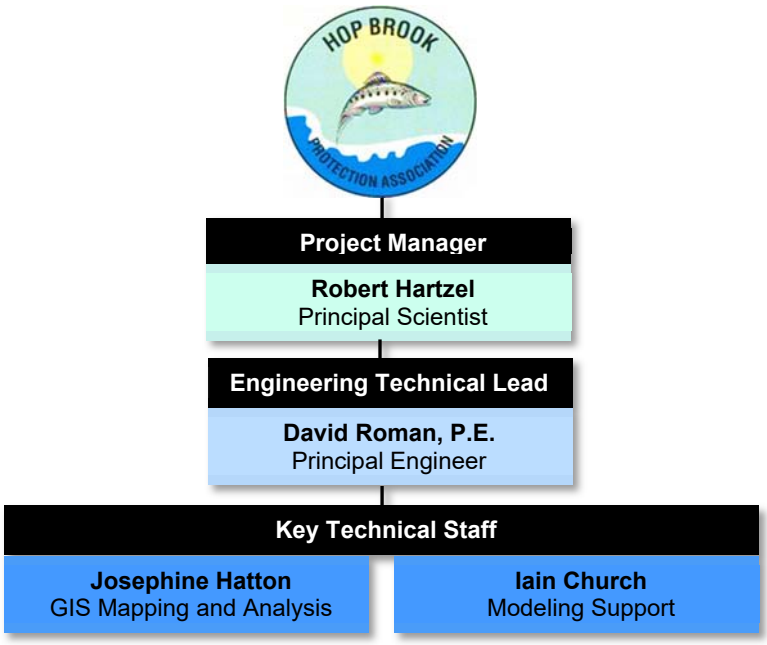
Our town beach was closed to swimming for over 10 years. CEI completed a water quality assessment and bacteria source investigation that found the sources of the problem.

They provided excellent recommendations and helped us implement them. Our swimming beach is now open again thanks to CEI.

Town Official and CEI Client

2. Project Team

A project organizational chart including key project staff is provided below, followed by a brief summary of staff qualifications. Staff resumes are provided as Appendix A.



Robert Hartzel, CLM, CPESC (Principal Scientist, Project Manager)

Mr. Hartzel leads CEI's Ecological Services practice and has over 25 years of experience leading water resources, watershed assessment, wetland, and ecological restoration projects. Mr. Hartzel provides expertise in aquatic and wetland ecology as they relate to limnological investigations, wetland delineation, stream bioassessment, wildlife habitat investigations, and environmental permitting. He has conducted numerous watershed-scale assessment, planning, water quality data analysis, and restoration projects throughout New England. On behalf of MassDEP, Mr. Hartzel led development of the *Massachusetts Watershed-Based Plans* tool, the first statewide, web-based watershed planning tool of its kind in the country. He has extensive experience in aquatic vegetation assessments and vegetation/algae control plans for lakes and ponds, and previously served as Lakes and Pond Program Coordinator for the Massachusetts Department of Conservation and Recreation.

David Roman, P.E., CFM, CPESC (Principal Engineer)

Mr. Roman is a registered professional engineer in Massachusetts and has over twelve years of experience in water resources engineering. He specializes in all aspects of watershed management and assessments. His relevant experience includes water quality assessments and flow monitoring; hydrologic, hydraulic, and water quality modeling; field data collection and GIS development; data analysis and visualizations; and BMP sizing and design. He has completed over a dozen nine element Watershed Based Plans for an array of waterbodies/watersheds ranging in size from kettle holes to rivers that span dozens of communities. He previously worked with the City of Framingham as technical lead for a stormwater master planning effort that included the Hop Brook watershed. Outcomes of the planning effort included estimates of annual average pollutant loads entering Hop Brook Watershed based on pollutant load modeling and an accompanying suite of recommendations to reduce future pollutant loading.

Josephine Hatton (Technical Lead - GIS)

Ms. Hatton is a GIS Specialist with a wide variety of experience analyzing and evaluating land use, environmental resource and infrastructure data. Her GIS support includes the analysis of demographic, cadastral, and natural resource data from a wide range of sources. She integrates this data and conducts geospatial or statistical analysis and develops maps, tables, databases and data libraries for clients. Her experience includes developing advanced mapping and geodata applications for a wide range of water resources projects, including watershed planning, water supply asset management projects, and stormwater infrastructure mapping.

Iain Church (Staff Scientist – Modeling Support)

Mr. Church is a CEI Staff Scientist with experience in watershed modeling throughout New Hampshire and Massachusetts. He has served as staff scientist for numerous projects assisting with both field assessment and watershed restoration and management plan development. Additionally, he has experience in EPA NPDES MS4 permit compliance including Stormwater Management Program (SWMP), Illicit Discharge Detection and Elimination (IDDE), and Phosphorus Control Plans (PCP). He has provided a wide array of ArcGIS services including load calculations, data integration, database management and QA/QC.

3. Scope of Work

The following tasks are included in the scope of services, intended to thoroughly address the nine components of a Watershed-Based Plan as described by the EPA.

1. Watershed Overview

A kickoff meeting (teleconference) will be held with the CEI project team, members of the HBPA, and other stakeholders to discuss details of the project including known problem areas (e.g., historical flooding, erosion, algal blooms, etc.). Prior to the kickoff meeting, a data request will be issued for all relevant documentation and past watershed studies. Following the kickoff meeting, one (1) day of field reconnaissance will be performed to gain familiarity with the watershed and its key features. A draft overview description of the Hop Brook watershed will then be prepared, including:

- Description of the watershed's location, extent, and key features.
- Description of current land uses, possible pollutant sources, known problem areas, and desired outcomes of remediation interventions.
- Summary available water quality data, including seasonal variations.

***Task 1 Deliverables*:**

- *Kickoff meeting minutes*
- *Draft overview description of Hop Brook (to be finalized under Task 11)*

2. Develop Pollutant Loading/Response Model

The **Lake Loading Response Model** (LLRM) will be used to evaluate the potential sources of pollutants and drivers of plant overgrowth along the Hop Brook mainstem under existing conditions. The focus will be on phosphorus since it is the limiting nutrient in a freshwater system and excess amounts can cause severe algae growth. LLRM is a widely used model for pollutant load reduction modeling of rivers and lakes, and is used by EPA Region 1 and New England state environmental agencies. CEI has recently used LLRM for water quality modeling in development of recent watershed-based plans for the Turkey River (NH), Bantam Lake (CT), and Partridge Lake (*see Section 5 for project descriptions*). The LLRM model will be developed as follows:

- **Compile Input Data**. Precipitation data will be obtained from the nearest weather station with a period of record of at least 15-20 years. Contributing subwatersheds will be delineated using the USGS StreamStats program. Land use data will be obtained from MassGIS then assigned to match the 14 LLRM land use categories. Initial phosphorus export coefficients will be assigned to each land use category based on LLRM default values. Potential sources of point (i.e., WWTP), septic loading, and internal loading will be calculated based on available data obtained during **Task 1**.
- **Calibrate model**. Once model input data are compiled, preliminary model outputs will be calibrated to available data obtained during **Task 1**. Potential calibration adjustments include flow and nutrient attenuation factors, land-use export coefficients, and septic and waterfowl coefficients. Calibration will be performed as feasible based on available tributary and in-pond phosphorus monitoring data. In-pond phosphorus predictions will be obtained from algorithms included the LLRM model. The algorithm that best fits the unique characteristics of each pond will

be used. LLRM includes eight different commonly used in-lake total phosphorus prediction algorithms (e.g., Nurnberg, Vollenweider, Jones-Bachmann, Reckhow, etc.).

- **Perform Model Runs**: The calibrated model will be used to estimate the following.
    - Phosphorus loading from key sources, including: each delineated subwatershed, the WWTP, septic systems, and aerial deposition.
    - In-pond internal loading at four (4) ponds located in the watershed (Hager Pond, Grist Mill Pond, Carding Mill Pond, and Stearns Millpond).
    - In-pond phosphorus concentrations at the four ponds listed above.
    - Predicted phosphorus concentrations at the outlet of each delineated subwatershed.

***Task 2 Deliverables*:**

- *Draft condition model results (writeup to be finalized under Task 11)*

3. Calculate Pollutant Load Targets

- A load reduction analysis will be performed to determine the phosphorus load reductions needed to achieve the goals of Class B water quality and to identify the characteristics of the ponds required to achieve acceptable levels of macrophyte and algae growth.

> ***Notes of Water Quality Targets:***
>
> Although Class B waters do not have established numeric total phosphorus (TP) criteria in Massachusetts, CEI will work with the HBPA to establish long-term numeric water quality targets for Hop Brook and its ponds. These targets will be based on:
>
> - a review of current TP guidelines for freshwater streams (e.g., EPA Gold Book standard)
> - numeric TP criteria established by other states for similar stream types (e.g., Vermont numeric standards for Class B medium-gradient streams)
> - commonly accepted trophic response thresholds for lakes/ponds (e.g., TP threshold of 25 µg/L for eutrophic category)

- The model will then be iteratively run and evaluated at five (5) locations to identify the incremental load reductions needed to meet water quality goals – i.e., the four (4) ponds and the outlet to the Sudbury River
- The output will be a series of five (5) plots indicating the predicted TP load vs. predicted TP concentration relative to existing conditions, WQ goals, and needed reductions.

***Task 3 Deliverables*:**

- *Draft Load reduction analysis results (to be finalized under Task 11)*

4. Identify Pollutant Reduction and Macrophyte Control Strategies

4.1 Phosphorus Load Reduction Strategies

CEI will conduct an assessment of potential site-specific pollutant reduction actions that could be implemented to achieve the water quality goals established under Task 3 for Hop Brook and its ponds.

These potential strategies will include green infrastructure approaches, stormwater management improvements, institutional practices (e.g., street sweeping, enhanced catch basin cleaning), and other potentially feasible solutions that are identified during the project (e.g., phosphorus inactivation systems).

To develop the list of potential actions, CEI perform the following sub-tasks:

- CEI will conduct watershed reconnaissance field investigations to identify appropriate and effective locations for structural Best Management Practices (BMPs) and other opportunities reduce phosphorus loading from the Hop Brook watershed.
- Prior to the field reconnaissance, CEI will identify potential improvement areas through a preliminary desktop analysis and a review of existing data furnished by the watershed towns and available information from published sources such as the MassMapper GIS clearinghouse. CEI will also work with HBPA and project partners to identify locally-known areas of concern for BMP implementation. For budgeting purposes, we have assumed one day of field assessment conducted by a two-person field team consisting of a Massachusetts-licensed Professional Engineer (P.E.) and a supporting staff engineer.
- For the watershed assessment, site specific information such as the approximate BMP drainage area, primary soil type, and confirmation of land uses will be collected to allow for the calculation of pollutant load reduction estimates associated with the BMP.
- For each potential action site, CEI will identify potential logistical constraints that could influence the sizing or function of the recommended BMP, as well as potential permitting considerations (proximity to wetland resource areas, etc.).
- In addition to a summary of potential improvement sites and actions as described under Task 5, CEI will prepare a map showing the location of all sites. Additional supporting information regarding site locations (e.g., street address, parcel ID, estimated BMP sizing and boundaries, etc.) will be provided as described under Task 5.
- Up to 20 potential improvement sites or pollutant reduction actions will be considered.

2. Macrophyte Control Strategies

CEI will provide an analysis of alternatives for achieving long-term macrophyte control without continual chemical treatment. For this analysis, CEI will review all available information regarding the macrophyte control history of Hop Brook and its ponds, including:

- target species
- frequency and type of past control efforts
- records of changes to the macrophyte assemblage over the period of record

CEI's analysis of macrophyte control strategies will include all feasible non-chemical strategies, including various mechanical removal techniques, dredging, drawdown, biological control, and other non-chemical methods that are permittable in Massachusetts as described in the *Generic Environmental Impact Report (GEIR) on Eutrophication and Plant Management in Massachusetts*.

We anticipate that the best strategy (or combination of strategies) may vary for specific sections of the Hop Brook system, depending on the target species for control, bathymetry, flushing rate, existing water level control structures, etc. For example, the most effective approach for control of water chestnut (an annual which propagates primarily by seed) will be different than control of milfoil that can have significant spread via fragmentation and vegetative propagules. As such, CEI's macrophyte control recommendations will be informed to the extent possible by available site-specific information.

Notes on Macrophyte Control:

When assessing macrophyte control in a system with elevated TP levels such as Hop Brook and its ponds, it is important to consider the relationship between macrophytes and algae:

- Unless TP levels are reduced significantly, it is possible that broad-scale macrophyte control could inadvertently result in increased algal abundance.
- In general, freshwater systems with limited macrophyte communities tend to have higher algal abundance and more frequent occurrences of nuisance algal blooms. Many studies have shown that shallow ponds commonly exist in one of two alternative stable states: either a **clear-water, macrophyte-dominated state** or a **turbid-water, algae-dominated state**. Turbidity generally increases with increasing nutrient concentration, primarily due to increased algal abundance.
- Biotic interactions related to the abundance of submersed macrophytes, fish and zooplankton have a very strong influence in determining overall algal abundance and availability of nutrients in the water column. CEI will consider these interactions when preparing macrophyte control recommendations fort the Hop Brook system.

***Task 4 Deliverables*:**

- Summary of phosphorus load reduction strategies and macrophyte control strategies, provided as a section of the WBP report.
- GIS locus map showing the locations of all potential action sites identified under Task 4.

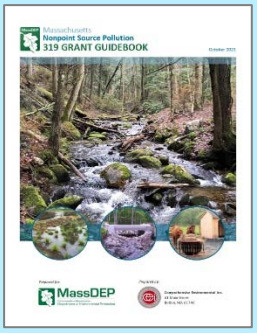
5. Prioritize Implementation Actions For each potential action identified under Task 4, CEI will estimate phosphorus load reduction (where applicable) and/or impact on pond macrophyte overgrowth and eutrophication. CEI will assess the pros and cons of each action, feasibility, estimated cost, and technical, community and other support required to implement the strategy. All action items will be summarized in a table which includes these features and a priority ranking for implementation.

For the top 3 ranked strategies, CEI will provide more detailed information suitable for a Section 319 grant application. This information will include conceptual plans which include the following:

- Annotated site photographs
- Description of existing and proposed site conditions (e.g., land uses/land cover, existing issues and anticipated improvements, potential site constraints such as tree roots or nearby utilities, property ownership, site access, nearby septic systems or drinking water wells, etc.)
- Map or aerial photo showing the approximate proposed BMP location(s)
- Estimated BMP sizing (e.g., 200 square foot bioretention area)
- Estimated pollutant removal quantities for target pollutant(s)
- Schematic /drawing of typical BMP design features (e.g., plan view and/or cross section)
- Soils information (*for infiltration BMPs)*
- Anticipated permits and related issues, such as proximity to wetlands, Outstanding Resource Waters (ORWs), Areas of Critical Environmental Concern (ACECs), rare species habitat, etc.

Notes BMP Conceptual Designs:

When developing the Massachusetts Nonpoint Source Pollution 319 Grant Guidebook for MassDEP, CEI prepared guidance on BMP conceptual designs based on our extensive project experience with Section 319 grants in Massachusetts and throughout New England. Examples of our BMP conceptual plans can be viewed via the project links in Section 5, or through the example on pages 28 and 29 in the link above (*adapted from CEI's Bantam Lake Watershed Based Plan*).



We anticipate that development of the prioritized action list will follow a format similar to the one in the *2021TurkeyRiver Watershed Restoration and Management Plan* (see following page), with revisions based on collaboration with the HBPA. This format was developed by CEI's proposed project manager in collaboration with the New Hampshire Rivers Council.

BMP Priority Ranking

L = Low	M = Medium	H = High

** For cost factors, lower cost = higher priority*

Turkey River Watershed - Structural BMP Scoring and Prioritization Summary

Area ID	Location	Existing Issues	Proposed Improvements	Estimated Load Reduction			Construction Cost ($)	Engineering Cost ($)	Capital Cost Range		Ranking Factors / Scoring					Score	Site Priority
				TP (lb/yr)	TN (lb/yr)	TSS (ton/yr)					TP Removal	Capital Cost	Waterbody Proximity	Imp. Complexity	Public Visibility		
1	Turee Pond Boat Launch on Falcon Way	Eroding parking area near boat launch.	Pave boat ramp and parking area and install tree box filter.	0.22	1.64	0.06	$65,000	$26,000	$72,800	$109,200	M	L	H	M	H	65	Medium
2	Bow Parks and Rec Dept. Building Parking Lot	Eroding sandy slope and runoff discharge from parking lot into Bow Town Pond .	Stabilize/armor eroding slope (appx. 2,200 sf), repave parking lot, install series of 3 treebox filters, and improve vegetated buffer.	1.50	6.50	1.18	$195,000	$78,000	$218,400	$327,600	H	L	H	L	H	70	High
3	Grappone Toyota/Service Center	Gully erosion along bank at access point to Turkey River.	Stabilize eroding bank (appx. 600 sf) with native vegetation plantings and bio-stabilization techniques.	1.00	2.00	1.10	$15,000	$6,000	$16,800	$25,200	H	M	H	H	M	85	High
4a	St. Paul's School	Narrow buffer adjacent to Library Pond.	Enhance buffer along the shoreline with double row of shrub plantings (appx. 2,000 sf). Stabilize walking path upgradient of narrow buffer with pea gravel.	-	-	-	$23,000	$9,200	$25,760	$38,640	L	M	H	M	M	60	Medium
4b		Unstabilized bank and narrow buffer adjacent to Library Pond.	Stabilize appx. 700 sf area using biostabilization techniques.	0.20	0.60	0.40	$7,000	$2,800	$7,840	$11,760	M	H	H	H	M	85	High
4c		Narrow buffer along appx. 100 ft of shoreline receives runoff from paved Rectory Rd.	Enhance buffer along the shoreline with double row of shrub plantings (appx. 2,100 sf)	0.70	1.30	0.80	$12,000	$4,800	$13,440	$20,160	M	H	H	M	M	75	High
4d		An unpaved footpath discharges directly into southern side of Library Pond.	Install waterbars to redirect runoff away from Pond and reduce erosion. Enhance appx. 375 sf buffer area with woody plantings.	1.55	4.10	1.73	$16,000	$6,400	$17,920	$26,880	H	M	M	H	M	75	High
5	Crumpacker Boathouse	Eroding dirt road and minimal buffer adjacent to Little Turkey Pond.	Install waterbars to direct runoff away from Pond and reduce erosion. Enhance 2,100 sf buffer with double row of shrubs/trees.	0.12	0.90	0.0	$21,000	$8,400	$23,520	$35,280	L	M	M	M	M	50	Low
6	Hampton Inn Rear Parking Lot	N/A - opportunistic implementation area.	Install appx. 1,000 sf infiltration basin or rain garden in center of the parking lot.	0.31	2.60	0.04	$27,000	$10,800	$30,240	$45,360	M	M	L	L	L	40	Low
7	Concord District Court	Minimal buffer along Bow Brook. Areas of erosion observed at culvert.	Develop a 20-ft “no-mow” zone along appx. 1,000 ft of Bow Brook. Stabilize eroding area near culvert with riprap (appx. 500 sf)	-	-	-	$6,000	$2,400	$6,720	$10,080	L	H	H	H	M	80	High
8	Concord High School Parking Lot	N/A - opportunistic implementation area.	Install infiltration trench (appx. 80 ft long) along western edge of parking lot.	0.96	8.70	0.11	$28,000	$11,200	$31,360	$47,040	H	M	M	L	M	60	Medium
9	Footpath Along Interstate-89	Runoff from concrete foot bridge enters Little Turkey Pond.	Install infiltration steps to slow runoff velocity and promote infiltration. Armor downgradient shoreline to prevent erosion.	0.056	0.44	0.01	$13,000	$5,200	$14,560	$21,840	L	H	M	L	L	50	Low
10	Currier Road Culvert near Whittier Pond	Areas of erosion adjacent to culvert headwall and road shoulder. Sediment buildup downstream of culvert.	Armor headwall slopes to limit erosion. Install depressed riprap forebay and lined riprap channel downstream of culvert to prevent further erosion.	-	-	-	$13,000	$5,200	$14,560	$21,840	L	H	M	L	L	50	Low
11	Boutwell Mill Brook	Runoff from the roadway and parking area enter Boutwell Mill Brook.	Stabilize side of Farrington Corner Road with riprap. Install treebox filter to collect runoff from unpaved parking area.	0.16	1.47	0.03	$27,000	$10,800	$30,240	$45,360	L	M	H	L	L	50	Low
12	Jewett Road Culvert Over One Stack Brook	Erosion of headwall embankment caused by runoff from road.	Install riprap along headwall and wingwall embankment areas to limit erosion caused by surface runoff.	-	-	-	$5,000	$2,000	$5,600	$8,400	L	H	H	M	L	65	Medium
13	Grapevine Road Culvert Over Bela Brook	Unstabilized area and erosion directly adjacent to Bela Brook from Grapevine Rd.	Stabilize existing area with riprap. Create small riprap lined energy dissipation area (110 sf) around existing catch basin.	0.06	0.11	0.07	$9,000	$3,600	$10,080	$15,120	L	H	M	H	L	65	Medium
14	Page Road Culvert Over White Brook	Roadside erosion of sandy soils on the southern side of Page Road.	Armor area surrounding culvert inlet and outlet, including embankment, to prevent erosion. Establish vegetated buffer along roadway (appx. 150 ft) consisting of shrubs and hearty grasses.	0.34	0.68	0.40	$18,000	$7,200	$20,160	$30,240	M	M	H	M	L	60	Medium
15	Turkey River Near Chen Yang Li Restaurant	Embankment adjacent to Turkey River is getting undercut from parking lot runoff.	Stabilize embankment with gabion wall (appx. 10 ft tall by 100 ft long). Enhance stream buffer with native woody plantings (appx. 2,800 sf).	-	-	-	$86,000	$34,400	$96,320	$144,480	L	L	M	L	L	35	Low
16	Abbot-Downing School	N/A - opportunistic implementation area.	Armor unpaved footpath with gravel to limit erosion. Direct runoff from upgradient parking area to approx. 300 sf raingarden.	0.20	1.68	0.03	$22,000	$8,800	$24,640	$36,960	M	M	M	L	H	55	Low
			TOTALS	**7.4**	**32.7**	**6.0**	**$608,000**	**$243,200**	**$680,960**	**- $1,021,440**							

6. Identify Funding Sources

CEI will identify possible sources of funding (Federal, State, local, and private) that may support implementation actions identified in the WBP. This section of the WBP will include a summary of potential funding sources and key information such:

- program eligibility requirements
- program funding priorities
- typical funding amounts
- key dates for grant funding cycles
- program web links

Task 7: Public Information Plan

CEI will work with the HBPA to determine the types of types of public education and outreach efforts that could most feasibly be implemented to engage the community in the selection, design, and implementation of WPB recommendations. Based on feedback from the HPBA with regard to anticipated funding, existing outreach tools (e.g., HPBA website, social media accounts, etc.), volunteer labor, municipal support, and other factors related to public outreach efforts, CEI will develop a Public Information Plan that will meet the requirements of WBP Element E.

Task 8: Implementation Schedule

CEI will develop a WBP implementation schedule for all actions identified in the plan as feasible and most likely to contribute to achieving (1) the water quality goals established under Task 3 for Hop Brook and its ponds. CEI will also develop a list of interim measures that can be used to evaluate the of progress WBP implementation towards achieving desired water quality.

The WBP will also include a schedule and process for "adaptive management" review of the WBP to determine if revisions in the strategy should be considered.

Task 9: Evaluation Criteria and Monitoring Program

CEI will collaborate with HPBA to develop a recommended evaluation and monitoring program that could be feasibly implemented to evaluate the effectiveness of the watershed improvements approach over time. This section of the WBP will address WBP Elements H and I, which are defines as follows:

Element H: Criteria used to determine (1) if loading reductions are being achieved over time and (2) if progress is being made toward attaining water quality goals. Element H asks "***how will you know if you are making progress towards water quality goals?***" The criteria established to track progress can be direct measurements (e.g., TP concentrations) or indirect indicators of load reduction (e.g., number of advisories related to cyanobacteria blooms).

Element I: A monitoring component to evaluate the effectiveness of implementation efforts over time, as measured against the Element H criteria. Element I asks "***how, when, and where will you conduct monitoring?***"

- CEI will consider the type and scale of monitoring that is feasible with proposed resources. This will consider the lab cost for each parameter and focus on getting the most useful data for each dollar and labor hour:

    - A **watershed-scale monitoring program** can be used to evaluate the collective effectiveness of all management measure implemented within the watershed.
    - **Site-specific monitoring** for individual management measures. (e.g., pre-construction and post-construction monitoring downgradient of a new management measure) is typically much more labor intensive and not recommended unless that type of monitoring is particularly relevant to a project.

- CEI will provide monitoring recommendations for direct measurements, such as data collected with field equipment or samples sent to a lab. This will include a list of parameters, sampling locations, sampling frequency, and timing (e.g., monthly from April to October each year).

Task 10: Climate Change Adaptation

CEI will describe steps that are recommended to adapt to ongoing climate change in order to achieve and maintain the water quality goals established under Task 3.

Task 11: Preliminary and Final Report

CEI will present a preliminary report to the HBPA, Sudbury Conservation Commission, and other interested parties, collect additional input and incorporate comments into a final version of the report.

- **Draft WBP:** Based on successful completion of the tasks described above, CEI will develop and submit a preliminary draft report and to the HBPA, Sudbury Conservation Commission, and other interested parties for review.
- **Final WBP:** CEI will incorporate comments received on the Draft WBP from the stakeholders listed above. In the event that any review comments are in conflict, CEI will work with the HBPA to determine the appropriate revision or response to comments. Once all revisions have been incorporated, CEI will prepare and submit the Final WBP to the HBPA. Three hard copies of the Final WBP will be submitted by CEI to HBPA along with an electronic (PDF) version.

Task 12: Communications and Reporting:

- CEI will provide regular reports on progress in developing the WBP, which will be submitted for review with invoices. As stated in the RFP, we anticipate that the HBPA will be available to answer questions and provide access to Hop Brook.
- CEI will meet regularly (at least bi-monthly) with HBPA to discuss project progress. For budgeting purposes, we assume that most of these meetings will be hosted by CEI virtually via Zoom. An inventory of all activities and reviewed documentation will be provided by the consultant.
- CEI will provide an interim (draft) WBP to the HBPA within 9 months of agreement to being work, and the final WBP will be provided within 3 months of the interim report.
- CEI will present the findings of the WBP report to the HBPA, Conservation Commission, and other interested parties at a public venue, in up to 2 separate meetings. CEI will prepare a PowerPoint presentation for these meetings.

4. Schedule and Cost Estimate

The below table provides the anticipated schedule, anticipated labor hours, and lump sum cost estimate by task. The proposed schedule is based on a project start date of June 1, 2023, as stated in the RFP. Key deadlines will include the following:

- Interim Report: March 1, 2024
- Final report: June 1, 2024

Task	2023							2024						Estimated Hours	Estimated Cost
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun		
Task 1: Watershed Overview	→													50	$8,000
Task 2: Pollutant Loading Response Model		→												88	$11,000
Task 3: Calculate Pollutant Load Targets				→										44	$6,500
Task 4: Pollutant Reduction and Macrophyte Control Strategies				→										49	$7,500
Task 5: Prioritize Implementation Actions					→									54	$7,500
Task 6: Identify Funding Sources							→							8	$1,000
Task 7: Public information Plan							→							4	$1,000
Task 8: Implementation Schedule							→							3	$750
Task 9: Evaluation Criteria and Monitoring Program							→							6	$1,500
Task 10: Climate Change Adaptation							→							5	$1,000
Task 11: Preliminary and Final Report									→					70	$11,500
Task 12: Communications and Reporting	→													26	$5,500
												Totals:		**407**	**$62,750**

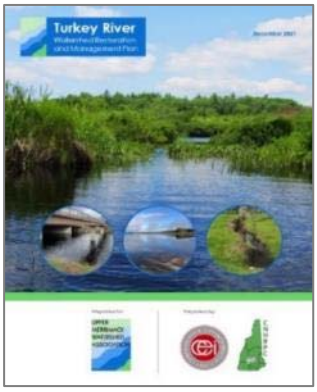
5. Representative Project Summaries

Development of Watershed Based Management and Restoration Plans

Massachusetts Watershed Based Plans

On behalf of MassDEP, CEI's Bob Hartzel led development of a web-based tool for Massachusetts Watershed-Based Plans (WBPs). This tool helps users develop WBPs for thousands of watersheds in Massachusetts. Maps, data, and modeling for each watershed provide useful information for preparing a WBP and for other planning efforts. This information includes data on 303d-list impairments, water quality standards for the selected water body, and load reduction targets based on state standards or other relevant guidelines such as the USEPA "Gold Book" guidance. Additional information to complete the WBP is developed through a series of guided exercises and technical resources.

Turkey River Watershed Management and Restoration Plan



On behalf of the Upper Merrimack Watershed Association, CEI developed a 9-element watershed management plan for the Turkey River in 2021. The goal of this plan was to reduce NPS pollutant loads with a focus on total phosphorus (TP). Tasks included TP load goal-setting based on state water quality standards and a review of national numeric TP criteria for similar low-gradient warm-water streams. CEI conducted pollutant load modeling using LLRM, and field evaluation of opportunities to reduce NPS pollutant loads. CEI also prioritized culverts in the watershed for improvements based on four key culvert metrics which represent physical condition, in-stream habitat, stream geomorphic condition, and flood risk.
Report link: Turkey River Watershed Management and Restoration Plan

Stormwater Master Planning in Hop Brook Watershed (Framingham, MA)

CEI's David Roman worked as technical lead on a stormwater master planning effort in the Hop Brook watershed (i.e., Landham Brook). Project tasks included: 1) field data collection and stormwater infrastructure condition assessment; 2) developed watershed scale hydrologic and hydraulic model of the stormwater system and identified areas of flooding concern; 3) performed a water quality assessment and pollutant load modeling; and 4) developed a prioritized capital improvement plan based on results from condition, flooding, and water quality assessments. Outcomes of this project included estimates of annual average pollutant loads leaving entering downstream portions of the Hop Brook Watershed and a suite of recommendations to reduce future pollutant loading.

Partridge Lake Watershed Based Plan

CEI was selected by the Town of Littleton, NH and the Partridge Lake Property Owners Association to develop a watershed restoration plan for Partridge Lake, which has been impaired by recurring cyanobacteria blooms. This project included water quality goal setting, phosphorus loading analysis using the Lake Loading Response Model (LLRM), watershed field assessment to identify nutrient loading reduction sites, analysis of in-lake phosphorus control options, and prioritization of management actions.

Bantam Lake Nutrient TMDL Modeling

CEI was selected by USEPA Region 1 to conduct lake and watershed modeling in support of establishing a nutrient Total Maximum Daily Load for Bantam Lake, the largest natural lake in Connecticut. Modeling included use of the Lake Loading Response Model (LLRM) and BATHTUB models. The validated model was used to calculate nutrient loading capacity and the nutrient load reductions needed to meet water quality targets for Bantam Lake. CEI also conducted training of USEPA and CTDEEP staff on general limnology concepts and use of LLRM and BATHTUB. Report link: Bantam Lake Nutrient TMDL Modeling Report

Bantam Lake Watershed Based Plan

On behalf of USEPA Region 1, CEI developed a "nine-element" watershed-based plan for Bantam Lake, the largest natural lake in Connecticut. This plan identifies actions to reduce nutrient loading and harmful algal bloom formation. This plan builds off CEI's previous lake and watershed modeling project using BATHUB and the Lake Loading Response Model (LLRM) to calculate nutrient loading capacity and the nutrient load reductions needed to meet water quality targets for Bantam Lake. Plan development tasks include the identification of causes and sources of pollution through field and desktop assessments, the development of protocols for field and modeling investigations, development and prioritization of recommended actions to reduce pollutant loads, pollutant reduction optimization modeling using the EPA Opti-Tool, and public education and outreach. Report link: Bantam Lake Watershed Based Plan

Londonderry Water Resource Management and Protection Plan

CEI was selected by the Town of Londonderry, NH to develop the Londonderry Water Resources Management and Protection Plan. This plan provides the Town with an inventory and description of surface and groundwater resources, identification of threats to these resources, an assessment of growth in water demand and future water needs over the next 20 years, and a review of potential revisions to town regulations to strengthen water resources protection. This plan was developed with input from municipal staff and included multiple stakeholder meetings and involvement from representatives from various town departments.

McQuesten Brook Geomorphic Assessment and Watershed Restoration Plan

For the New Hampshire Rivers Council, CEI prepared a Geomorphic Assessment and Watershed Restoration Plan for McQuesten Brook in Manchester/Bedford, NH. Despite chloride and dissolved oxygen impairments, the Brook's base flow and favorable in-stream temperatures have sustained a robust population of eastern brook trout. The geomorphic assessment and restoration plan were prepared in conformance with a "9-element" watershed-based plan and included: pollutant load modeling, groundwater recharge and pollutant reduction goals; and identification of BMPs throughout the watershed along with anticipated recharge, pollutant reduction and construction costs.

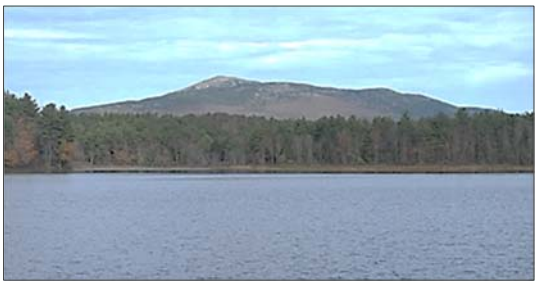
Mirror Lake Watershed Management Plan

CEI's Robert Hartzel led development of a comprehensive lake watershed management plan for Mirror Lake in Tuftonboro, NH. Mirror Lake has experienced declining water quality and is on the NH List of Impaired Waters due to cyanobacteria blooms. Phase 1 of this project included development of a phosphorus loading model and establishment of a phosphorus management strategy to significantly reduce cyanobacteria blooms. The project also involved sediment sampling, vegetation survey, stormwater engineering and development of public outreach materials. Phase 2 of the project involved design, permitting and construction oversight of Low Impact Development stormwater improvements, including bioretention, sand filters, and bioswales.

Winnicut River Watershed Management and Restoration Plan

On behalf of the New Hampshire Rivers Council, CEI's Bob Hartzel led development of a "nine-element" watershed plan for the Winnicut River, which has both freshwater and estuarine segments, and is tributary to the impaired Great Bay Estuary. Plan development included water quality goal setting based on New Hampshire water quality standards and a national-scale review of (1) numeric phosphorus criteria for similar Class B low-gradient warm-water streams, and (2) numeric nitrogen criteria for estuarine waters, with a focus on impaired New England estuaries with approved Total Maximum Daily Load (TMDLs). Other tasks included modeling to project future pollutant loads, and field evaluation and prioritization of opportunities to reduce pollutant loads.

Pearly Pond Watershed Restoration Plan, TMDL Modification, and BMP Implementation



CEI was hired to work with Franklin Pierce University (FPU) to complete a Watershed Management Plan and TMDL modification for Pearly Pond, a 191-acre pond in Rindge, NH. This Watershed Restoration Plan (WRP) identifies the actions and resources needed to restore the pond, focusing on phosphorus reduction, and lays out a foundation for obtaining future grant funds to complete the work. As part of this plan, CEI worked with NHDES to modify the existing TMDL. The major elements of this project included:

- Estimation of phosphorus loads under existing and buildout conditions using the LLRM Model.
- Development of a Site-Specific Project Plan (SSPP) to perform modeling of pollutant loads and reductions associated with the implementation of Best Management Practices (BMPs).
- Delineation of the watershed and subwatersheds using GIS data and field investigations
- Development of realistic water quality goals and associated phosphorus reductions needed.
- Watershed field investigations to identify potential sources of pollution to Pearly Pond
- Identification of structural and non-structural BMPs to reduce phosphorus concentrations.
- Preparation of a Watershed Restoration Plan with a quantitative Capital Improvement Plan.
- Modification of the existing phosphorus TMDL.

As part of the on-going watershed restoration efforts, FPU and PPA partnered again to seek s.319 grant funding for Phase I implementation of two of the highest priority BMP sites identified in the WRP. As a result, CEI assisted FPU and the PPA with design and permitting of two BMPs in 2017, one of which was constructed in the fall of 2017. This project included the design of iron-enhanced sand filters to treat effluent from a wetland that currently receives stormwater runoff from the FPU campus and that historically received wastewater discharge from the FPU WWTF. The filters were designed along an impassible eroded walking trail caused by a failed culvert and historic beaver activity. CEI included improvements to the walking trail, provided two stabilized spillways, two redundant filters and a culvert replacement with outlet control riser to minimize beaver activity. CEI assisted FPU in procuring a local contractor to construct the filters and spillways.

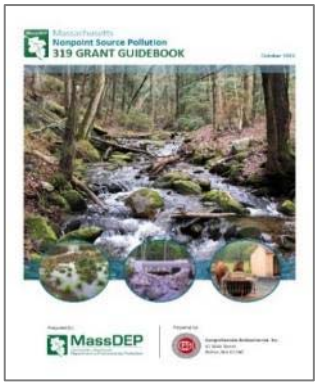
CEI also designed and permitted a second BMP location which includes two rain gardens and stabilization of an existing boat ramp. Porous pavers were selected for the boat ramp stabilization and those will be sandwiched by the two rain gardens to handle direct runoff at one of the public access points to Pearly Pond. Construction was completed by PPA and local volunteers over the summer of 2018.

Stewardship Plan for the Wild and Scenic Westfield River

CEI developed a ***Stewardship Plan for the Westfield River,*** which received a national Wild and Scenic River designation in 1993. The primary objectives of the Stewardship Plan are to review and assess existing projects, plans, and activities occurring in the watershed, develop and conduct an engaging planning process to identify, rank, and prioritize threats, opportunities, and actions to further protect the river and to encourage stewardship within the watershed. The outcome of this process is a written Stewardship Plan designed to help the Committee and its partner organizations to protect, conserve, and enhance water quality, aquatic and terrestrial habitat, and social and cultural uses of the river.

Massachusetts Nonpoint Source Pollution Grant Guidebook

On behalf of MassDEP, CEI developed the 2021 Massachusetts Nonpoint Source Pollution 319 Grant Guidebook. This guidebook assists Section 319 grant applicants from "concept to implementation" with information about (1) funding options to restore water bodies; (2) 319 grant program details (eligibility, project types, application process, etc.); and (3) how to develop a Watershed-Based Plan and develop a successful 319 grant application. This guidebook provides technical resources on topics including watershed field assessment and project site selection, guidelines for concept designs and final designs, permitting, contractor selection, and construction oversight.



Lake Auburn Watershed Management Plan

CEI completed a watershed management plan and diagnostic watershed study for the Lake Auburn Watershed Protection Commission (LAWPC). The LAWPC is collaboration between stakeholders in Lewiston and Auburn Maine charged with protecting the watershed of Lake Auburn, the principal drinking water supply reservoir for the communities of Lewiston and Auburn, Maine. Lake Auburn is approximately 2,300 acres in size and is the last waterbody in a chain of four large waterbodies that collect runoff from a 9,600-acre watershed. As part of the diagnostic watershed study completed in 2012, CEI completed watershed field surveys, evaluations and provided recommendations for Stormwater Best Management Practices located throughout the watershed to protect Lake Auburn from excessive nutrient loadings. CEI

based these recommendations on modeling efforts completed as part of the plan. CEI estimated nutrient and water budgets for Lake Auburn using the AVGWLF model software. This model was used to determine nutrient loadings from the watershed as an update to a watershed management plan that was completed in 2010. These recommendations included both non-structural and structural BMPs to protect the watershed from NPS pollution associated with a mix of urban, highway, residential and agricultural land uses. CEI is currently working with the LAWPC to implement high priority stormwater BMPs and infrastructure retrofits to capture and treat phosphorus and nitrogen loadings from the stormwater runoff to prevent elevated nutrient loadings and potential algal blooms in Lake Auburn and associated chain ponds. CEI prepared conceptual designs to capture floating sediments at a dam which spills into Lake Auburn from the upper watershed. CEI prepared concept designs for BMPs to utilize existing wetland areas to provide additional filtering and removal of nutrients that enter Lake Auburn via a large tributary. Additional conceptual BMPs include gravel road BMPs; sediment capturing BMPs for steep slopes, direct discharge elimination, re-direction and treatment for a busy four lane state highway; accidental spill containment and treatment BMPs for several roads located directly adjacent to the Lake; as well as many other treatment BMPs located throughout the upper watershed.

Ayer Ponds Watershed Management Plan

CEI's Robert Hartzel led water quality sampling, water quality modeling, aquatic vegetation assessments, and watershed investigations for six ponds in Ayer (Balch Pond, Grove Pond, Lower Long Pond, Pine Meadow Pond, Sandy Pond, and Flannagan Pond). These ponds exhibit a wide range of water quality and ecological conditions, public uses, and resource management challenges. The primary project objective was to establish an updated, scientific basis for the long-term management of the ponds. Specific project tasks included (1) water quality sampling (2) trophic response modeling to characterize each pond's response to changes in phosphorus loading, (3) assessment of each pond's plant community and recommendations for control of invasive species; (4) field investigations to identify stormwater best management practices, and (5) a human health risk assessment to evaluate risks from recreational exposure to Grove Pond water and sediment.

Baboosic Lake Watershed Management Plan and Implementation

CEI's Robert Hartzel led development of a comprehensive watershed management plan for Baboosic Lake. The Plan focused on development of (1) a trophic response model for the lake, (2) a recommended annual phosphorus loading reduction target to eliminate impairments related to cyanobacteria blooms, and (3) watershed management recommendations to achieve the target loading reduction.

In a subsequent project phase, CEI assisted the Baboosic Lake Association (BLA) with completing Phase 3 of their implementation plan. CEI worked closely with NHDES and the BLA to amend the original grant proposal to meet intended targets due to a private property access agreement falling through. CEI and the BLA quickly identified two alternate sites, obtained

permission, coordinated efforts and adjusted scopes to complete those projects within the two-year grant timeline. Work included design, permitting, bidding and construction of two stormwater BMP sites to treat associated NPS pollution and to repair erosion. One site was located in Merrimack, NH and included the stabilization of a gravel access road that had historically eroded for over 15 years, washing sediment and nutrient directly into the lake. The second site was located in Amherst, NH and the design included a combination of steep slope stabilization, roadway repair and infiltration devices to prevent a historic erosion issue from discharging sediment directly into the lake during storm events. BMPs included infiltration swales, trenches and steps. Stabilization techniques included erosion control mulch walkways, rubber razor runoff deflectors and gravel roadway grade improvements.

Wachusett Reservoir Projects

CEI has worked on behalf of the Massachusetts Department of Conservation and Recreation (DCR) on a variety of projects to assess and manage Wachusett Reservoir and its watershed. CEI developed a Wachusett Reservoir Direct Discharge Phase II Study to protect the water supply from polluted stormwater runoff and accidental spills that could enter storm drains. This project identified three target areas for improvements, developed a prioritization matrix for alternatives for each area, and developed cost estimates for design, permitting, and construction of each alternative. CEI also provided design and implementation for several stormwater BMPs, including a BMP for the Route 12/Route 140 causeway to provide spill containment and stormwater treatment. Other Wachusett Reservoir projects conducted by CEI staff in recent years on behalf of the Massachusetts Water Resources Authority include biological control of invasive Eurasian milfoil with the native milfoil weevil, and technical support for a project to control invasive aquatic species with diver-assisted suction harvesting.

Lake Wentworth and Crescent Lake: Watershed Restoration Plan and Conceptual BMPs

CEI's Emily DiFranco worked with the Lake Wentworth Foundation and the Town of Wolfeboro, NH to develop a watershed-based plan for Lake Wentworth and Crescent Lake. The project required working collaboratively with project partners, including a steering committee, volunteers, and town staff to analyze existing data, set water quality goals, and assess and prioritize watershed pollutant sources. Project tasks included organizing and conducting a door-to-door stormwater and septic system survey of the watershed, analysis of 29 years of water quality data, and a review of town land use ordinances.

CEI provided assistance with modeling efforts to estimate loadings and in-lake concentrations of phosphorus and chlorophyll-a. CEI provided feedback and QC/QA on the Lake Loading Response Model (ENSR-LLRM) model. CEI also selected sources of NPS pollution and recommended methods for load reduction. This included field work to locate potential BMP sites based on prioritization from model inputs and collection of existing GIS data and refinement of watershed maps to reflect data collected in the field.

CEI used this information for development of BMPs to reduce NPS pollution, identification of BMP implementation requirements and/or obstacles, and prioritization of BMPs based on feasibility, cost effectiveness and pollutant removal. CEI prepared maps and a BMP matrix for inclusion in the

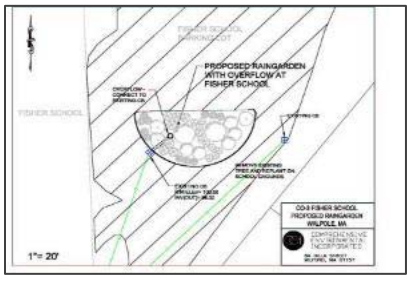
management plan. Based on the proposed BMPs, CEI prepared pollutant load reduction estimates for each proposed BMP using “Simple Method” load reduction model. CEI also developed a post-construction monitoring and sampling program to document the pollutant removal performance of the selected BMPs.

CEI completed conceptual and preliminary BMP designs with implementation costs for four of the highest priority sites identified in the management plan. CEI also assisted with the identification, planning, design and implementation of two shoreline buffer BMPs to be used as demonstration projects to educate lake residents on waterfront management. The project provided the town with engineering designs and cost estimates for addressing high priority pollutant sites, a long-term monitoring program, and a watershed-based management plan that enabled the town to apply for grants through the NHDES 319 program. CEI was subsequently hired by the town to implement many of the proposed stormwater BMPs.

Nashua River TMDL Implementation Phosphorus Modeling

CEI developed a watershed model to calculate pollutant loads for the Town of Clinton, MA to develop a Phosphorus Control Plan in response to a phosphorus TMDL for the Nashua River. The plan outlined the phosphorus loads to the waterbody, required reductions, and proposed structural and non-structural controls to meet load reductions. Utilizing watershed land use, impervious area, soils, and other data layers, baseline phosphorus loads were calculated using a CEI-developed stormwater model created in GIS. The model was created in Model Builder within ArcGIS 10.1 and used to delineate contributing land areas and assign the phosphorus export rates previously identified. The output was a database that contained total phosphorus loads which could be sorted by catchment area and/or land use type. This CEI-created watershed model to calculate pollutant loads has been used in other recent projects.

Clarks Pond/Cobbs Ponds Water Quality Sampling and Restoration



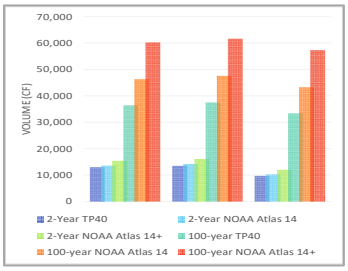
CEI worked with the Town of Walpole to design and engineer water quality improvements to Clark and Cobbs Ponds. Funded by DEP, CEI completed engineering designs, construction oversight and implementation of various stormwater Best Management Practices aimed to reduce nutrient and bacteria input to these 303(d) listed waterbodies. In addition to the stormwater engineering, CEI developed an EPA/DEP approved QAPP, conducted pre- and post-construction stormwater monitoring, developed an Operations and Maintenance Plan for BMPs, and assisted the Town with the required public outreach and education tasks.

Lake Massabesic Aquatic Vegetation Assessment and Management Plan

On behalf of Manchester Water Works, CEI conducted an inventory and mapping of aquatic vegetation within Lake Massabesic. Based on the findings of this summer 2018 investigation, CEI developed an aquatic vegetation management plan for the lake. Field work for this project included a focus on documenting the locations and potential growth zones for invasive, non-native species. The survey results will be compared to the baseline of invasive plant species mapped previously, along with current management techniques to determine the effectiveness of the existing program and if additional measures are warranted. CEI developed an aquatic vegetation monitoring report documenting past control efforts and

surveys, findings from the most recent survey, and any associated plant management recommendations, including protocols for rapid response to new areas of invasive species.

MassDEP Stormwater Handbook Update and Modeling Support



CEI is currently working with MassDEP to update the Massachusetts Stormwater Handbook to address increasing precipitation, provide greater consistency with the MS4 General Permit and to improve pollutant removal actions and TMDL compliance. Project tasks include: 1) providing updates to all sections and appendices of the Handbook; 2) working with MassDEP to respond to public comments; 3) providing add-on calculation tools to assist applicants when preparing Stormwater Reports; 4) developing stand-alone guidance for Conservations Commissions; and 5) performing outreach sessions and training on the revised Handbook.

As part of the Handbook update process, CEI was selected by MassDEP to perform stormwater and water quality modeling to support potential revisions to the Massachusetts Stormwater Standards. CEI performed the following tasks to accomplish this goal: 1) developed existing and proposed conditions site plans for three potential development scenarios; 2) designed stormwater treatment options for each scenario that incorporated LID and Environmentally Sensitive Site Design (ESSD) practice; 3) performed modeling and analysis using Autodesk's Storm and Sanitary Analysis (SSA) to evaluate the potential changes that may result from proposed Handbook revisions; 4) summarized results and provided recommendations.

Massachusetts Clean Water Toolkit

On behalf of MassDEP, CEI's Bob Hartzel led development of the interactive, web-based Massachusetts Clean Water Tool Kit, which serves as the state's primary public education resource related to BMPs to address water pollution. The Toolkit includes 10 sections focused on the major categories of NPS pollution, 127 BMP fact sheets which include both structural and non-structural practices, and a collection of "Interactive Scenarios" based on Massachusetts landscapes. The Interactive Scenarios allow users to explore ways to reduce pollution and improve water quality in a variety of highly detailed landscapes that are typical in Massachusetts, including residential, agricultural, urban, roads, construction, and shoreline restoration.

Massachusetts NPS Regional Coordinator Support:

CEI serves as part of the **NPS Regional Coordinator** (RC) teams for both Berkshire County and Franklin County, providing ongoing technical support to the Berkshire Regional Planning Commission (BRPC) and Franklin Regional Council of Governments (FRCOG). As part of these NPS Regional Coordinator (RC) teams, CEI provides a range of ecology and engineering services, including support in development of 9-element watershed-based plans, development of engineering conceptual designs, project cost estimation, and calculation of pollutant load reductions associated with management measures.

s.319 Watershed Assistance and NPS Implementation Grant Projects

CEI's engineers have successfully sited, designed and provided construction oversight for dozens of stormwater BMP projects in New England. Consisting of both structural and non-structural designs, CEI staff have also planned, designed and implemented many s319 funded projects. Below is a partial list of stormwater BMP projects where CEI staff has provided similar services.

Stormwater BMP Planning, Design, and Implementation	
Mast Landing and Rust Pond BMPs, Wolfeboro, NH	Manchaug Pond BMP Improvements, Phases I, II and III, Sutton/Douglas, MA (3 grants)
Baboosic Lake Stormwater BMPs, Amherst/Merrimack, NH	Pearly Pond Stormwater BMPs, Rindge, NH
Pennichuck Square BMP Redevelopment, Merrimack, NH	Contoocook River Stormwater Improvements, Peterborough, NH
Bass Island Stormwater Improvements, Manchester, NH	Roadway Stormwater BMPs, Wilton, NH
Celina Avenue Stormwater Improvements, Nashua, NH	Precourt Park Stormwater Improvements, Manchester, NH
Crystal Lake, Dorrs Pond, and Piscataquog River BMPs; Nashua, NH	Tinker Road/Everett Turnpike Stormwater Treatment, Nashua, NH
Stormwater Engineering & Construction at the Commons; Merrimack Village District	U.S. EPA Green Infrastructure Pilot Projects, Cape Cod, MA, Providence, RI
Wachusett Reservoir Stormwater Improvements, West Boylston, MA	Lake Attitash Stormwater Treatment Program – Phase I & II, Amesbury, MA
Oldham and Furnace Stormwater BMPs, Pembroke, MA	Spy Pond Stormwater BMPs, Arlington, MA
Windsor Reservoir BMPs, BRPC	Powow River BMPs, Amesbury, MA
Bedford Stormwater BMP Implementation, Bedford, MA	River Street Stormwater BMPs, Ludlow, MA
Connecticut River BMP Implementation, Hadley, MA	Lake Gardner Stormwater Improvements, Amesbury, MA
Lake Auburn Stormwater Improvements, Auburn, ME.	Stormwater Retrofit Improvement Project, Franklin, MA
Nutt Pond Watershed Improvements, Manchester, NH	James Brook Stormwater Improvements/LID, Groton, MA
Kingston Elementary School LID Retrofit Implementation Project, Kingston, MA/NSRWA	Onota Lake Preservation Project, Berkshire Regional Planning Commission
Oak Hill BMPs, Berkshire Regional Planning Commission	Clarks and Cobbs Pond Stormwater BMPs, Walpole, MA
Lake Singletary Stormwater Retrofits, Sutton, MA	Barnstable/Chatham BMPs, U.S. EPA

Stormwater BMP Design – Regional Pilot Projects, EPA Region 1

CEI was selected for an EPA Region 1 Blanket Purchase Agreement/On-Call (BPA) with the role of civil and environmental engineering. The BPA addresses Total Maximum Daily Load (TMDL) related issues and potential drinking water and wetlands issues. CEI's primary role has been to provide piloting of green infrastructure projects that will demonstrate these techniques and designs to municipalities so far in Providence, RI and on two Cape Cod, MA communities. CEI provided Systematic Project Planning, developed Site Specific Plans, field investigation, engineering BMP design, permitting and construction oversight as well as public education and outreach. BMPs have included various elements based on bio-infiltration and nitrogen treatment.

Mast Landing Stormwater BMP and LID Implementation

CEI was hired to work with the Town of Wolfeboro Department of Public Works to complete design, permitting, bidding and construction of improvements to the Mast Landing Parking Lot which provides access to Crescent Lake via public boat launch in Wolfeboro, NH. CEI built upon previous watershed planning efforts to develop conceptual stormwater improvements with a focus on pollutant reductions to Crescent Lake. Several recommendations were developed for the implementation of BMPs and these were combined with additional parking lot improvements identified by the Town of Wolfeboro and local stakeholders.

The project improved the substantial grade change between the upper and lower parking lots, repaired damaged pavement from poor subgrade conditions, optimized the parking layout for both cars and trucks with trailers, and implemented the identified stormwater BMPs to reduce the amount of pollutants from running off impervious surfaces directly into Crescent Lake. Improvements included full-depth pavement reclamation and installation of porous pavement in the lower parking lot to improve subsurface stabilization and a pavement overlay in the upper parking lot. The steep grade of Silver Street after the Cotton Valley Rail-Trail was reduced to help prevent vehicles and boat trailers from bottoming out when entering and exiting the lower parking lot. In addition to pavement overlay in the upper parking lot, new curbing was installed, two stormwater catch basins, a raingarden, and a concrete staircase with handrails to provide pedestrian access to the lower parking lot. This project included the installation of porous pavers and a grassed pavement temporary parking area with subdrain around the paved boat launch to mitigate the runoff pollutant load entering Crescent Lake. A BMP raingarden, buffer plantings and a grassed picnic area with infiltration stone subgrade were also installed along the remaining shoreline to provide vegetated cover, improve aesthetics and provide additional storage and treatment of parking lot runoff. Work also included the installation of a retaining wall, an ADA compliant sidewalk to the Cotton Valley Rail-Trail and two handicap spaces including one van and one car in the lower parking area. The project resulted in an expansion of the lower parking lot, reconfiguration of parking spaces to improve layout efficiency and traffic movements and the addition of both trailer and car parking spaces in both lots. Stormwater components and the associated benefits were highlighted through the development of educational signs that will be placed around the parking area.

Camp Bernadette LID Demonstration Project

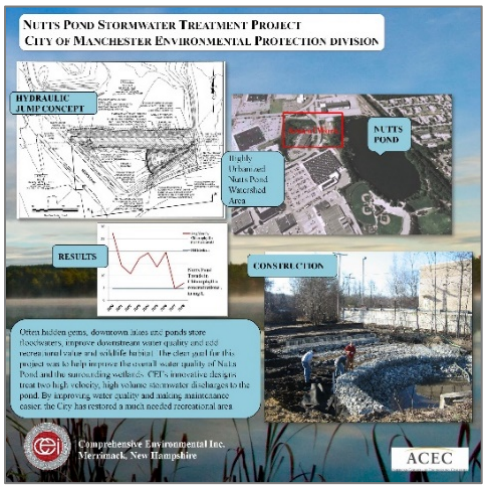
CEI was hired to work with the Town of Wolfeboro Planning Department and the Lake Wentworth Watershed Association to design and implement a highly visible lakeside LID demonstration project. The project is intended to act as a public outreach effort to educate on the use of LID techniques and the potential impacts associated with stormwater non- point source pollution on the lake. A busy summer girls camp run by Roman Catholic Diocese of Manchester known as Camp Bernadette was chosen for this effort. The site was identified as a high priority location for stormwater treatment in the Lake Wentworth Watershed Management Plan based on the amount of impervious surfaces and buildings located close to the lake and the lack of shoreland buffer across the site. The site

was also chosen as a demonstration site based on its heavy public usage and because the location is used by many local groups as an annual meeting location.

CEI worked with several Camp representatives to identify problem areas and locate LID measures that would be compatible with camp operations. The design focused on handling stormwater from a steep paved access road and two large buildings located within 50 feet of the shoreline. Historic issues associated with stormwater included surface erosion on grassed areas adjacent to the paved access road caused by increased runoff velocities and very heavy foot traffic from campers; beach erosion caused by groundwater breakout associated with large impervious areas draining to shallow bedrock at the shoreline; localized flooding issues caused by clogged or failed underdrains; and untreated runoff that discharged directly to the lake from paved roadways and drainage swales.

Low impact designs for the project included the elimination of paved roadways and drainage swales; installation of pre-treatment devices to capture sediment; installation of infiltration trenches with liners and underdrains to intercept both surface and groundwater from upgradient impervious surfaces; and installation of several porous paver walkways with improved underdrain systems to minimize local flooding issues. These LID components all surround the main focal point design which included a large landscaped rain garden. The rain garden was designed with several access points, garden walking paths and sitting areas to promote foot traffic to the garden. The access was carefully coordinated to ensure that campers would utilize and be drawn to the rain garden rather than avoid it. The design employed the use of different landscape features and vegetation to hide drainage features and pre-treatment areas while highlighting the garden itself. A finally education component included the use of perimeter annual planting beds around the proposed garden walking paths to provide seasonal growing areas for campers to use and learn about horticulture as part of the camp education program. These seasonal beds are designed to be irrigated by several rain barrels that will collect roof runoff from waterfront buildings.

Nutt Pond Stormwater Improvements – Phase I



The City of Manchester Environmental Protection Division (EPD) and Supplemental Environmental Projects Program (SEPP) Committee have been actively working to improve the quality of Manchester's urban ponds, including Nutt Pond. Comprehensive Environmental Inc. (CEI) was hired in 2001 to assess the ponds and develop recommendations to improve the ponds.

The original drainage pipe, constructed within a berm, carried stormwater from large parking lot areas through an existing wetland and discharged directly into Nutts Pond. The existing wetland had been separated into two wetland areas by the existing 42" drainage pipe, causing one of the wetland areas to be stagnant and hydraulically cut off from surface water flows. CEI engineers employed the hydraulic jump to cause sediment to drop out into an offline, easily maintained basin. The basin was constructed adjacent to the 42" diameter drainage pipe and 12" sewer pipe that ran parallel to each other through a City Easement. The hydraulic "jump" was created by diverting flow from the 42" pipe into a length of downward angled pipe that discharged below the basin water level at supercritical flow dropping to subcritical flow rapidly, thus dropping sediment. The jump works during pipe-full conditions and during smaller first-flush storms. The maintenance basin retains the sediment that once went directly to Nutt Pond. This is a unique, small footprint design that has worked well in eliminating sediment from inlet flows.

The second design featured a stone filled gabion system at an eroded, high velocity stormwater discharge from a box culvert near wetlands of Nutt Pond. Gabion mattresses and baskets were used to create a stable level spreader/check dam and maintenance access pad for the forebay intended to handle large maintenance equipment. The forebay depth and diameter was designed based on the reach of the City of Manchester's DPW excavation and vactor equipment. The gabion check dam was constructed in a horseshoe shape around the mouth of the culvert to provide access to all sides of the forebay. The gabions stabilize the area during variable stormwater flows, act as retaining walls to support a riprap/crushed stone access way and convey non-eroding flows through the wetlands for additional treatment. Again, this is a unique design that was inexpensive yet effective in keeping sediment out of the wetlands and Nutt Pond. Prior to operations, the debris was removed from downgradient wetlands and 10,000 square feet of wetlands were restored.

Precourt Park Boat Access and LID Implementation

The City of Manchester Environmental Protection Division (EPD) and Supplemental Environmental Projects Program (SEPP) Committee have been actively working to improve the quality of Manchester's urban ponds, including Nutt Pond. CEI has worked in the Nutt Pond watershed between 2001 and 2016 to assess the pond, develop recommendations to improve water quality and to implement those recommendations.

Stormwater improvements at Precourt Park were conducted on an existing parking area that is used for very active soccer and baseball fields. Stormwater improvements included the installation of curbing, tree box filters, bioretention treatment gardens and a large porous pavement parking area located adjacent to Nutt Pond. Precourt Park improvements also include the stabilization and access improvements of an existing eroded gravel boat access to Nutt Pond. Stabilization methods included the installation of paved access apron, interlocking precast concrete boat ramp planks and riprap stone end protection for the ramp.

Old Oaken Bucket Pond Watershed LID Design and Implementation

CEI worked with the Town of Scituate Department of Public Works and Conservation Commission to design and construct multiple LID Stormwater Best Management Practices throughout the Old Oaken Bucket Pond Watershed. CEI constructed several LID BMPs within the watershed as part of a stormwater demonstration project. For this project, CEI also developed an EPA-approved QAPP for project water quality sampling. Since then, five additional sites were selected for funding for construction. They consist of raingardens, a backflow infiltration trench and leaching catch basins. This project showcases how LID based BMPs can be utilized by municipalities and retrofitted along existing roadways to help improve recharge, reduce runoff and improve the water quality of local water resources.

6. References

Project	Contact	Email / Phone Number
Winnicut River Watershed Restoration and Management Plan Turkey River Watershed Restoration and Management Plan	Michele Tremblay, President New Hampshire Rivers Council (*also President of Upper Merrimack Watershed Association*)	MLT@naturesource.net (603) 796-2615
Multiple s.319-funded grant projects for watershed planning and implementation (New Hampshire)	Steve Landry, NHDES Watershed Assistance Section Supervisor	Stephen.Landry@des.nh.gov 603-271-2969
Multiple s.319-funded grant projects for stormwater improvements grant support (Massachusetts)	Malcolm Harper, Massachusetts Nonpoint Source Program	malcolm.harper@state.ma.us 508-767-2792
Partridge Lake Watershed Restoration Plan	John Shultz, President Partridge Lake Property Owners Association	jschultz@phmeco.com
Bantam Lake TMDL Nutrient Model; Bantam Lake Watershed Based Plan	Mary Garren, USEPA Region 1 Steve Winnett, USEPA Region 1	Garren.mary@epa.gov (617) 918-1322 winnett.steven@epa.gov; 603-229-4588
Pennichuck Watershed Planning, Water Quality Assessments, and BMP Design (multiple projects)	Donald Ware, P.E., Chief Operating Officer, Pennichuck Water	donald.ware@pennichuck.com (603) 913-2330
Multiple river/stream ecological restoration projects in Massachusetts	Megan Sampson, Massachusetts Division of Ecological Restoration	megan.sampson@state.ma.us 617-626-1547
Londonderry Water Resources Management and Protection Plan	Amy Kizak, GIS Manager /Comprehensive Planner Town of Londonderry	AKizak@londonderrynh.org 603.432.1100 x128
Multiple projects involving watershed planning, assessment, BMP design, and public education/outreach	David G. Miller, P.E., Deputy Director of Water Supply, Manchester Water Works	dmiller@manchesternh.gov (603) 792-2851
Lake Wentworth and Crescent Lake: Watershed Restoration Plan/Conceptual BMPs	Mr. Jack O'Connell, Past President, Lake Wentworth Foundation	jackoc1@myfairpoint.com (781) 258-8029
Rust Pond Management Plan and Stormwater Improvements	David Ford, P.E., DPW Director Town of Wolfeboro	pwdirector@wolfeboronh.us 603-569- 8176
BMP design, permitting, implementation; and education/outreach for Lake Attitash, Powow River and Lake Gardner (multiple 319/604b projects).	Robert Desmarais, P.E., Director of Public Works, City of Amesbury, MA	rob@amesburyma.gov 978-388-8116
Pearly Pond Watershed Management Plan	Dr. Catherine Owen Koning, Ph.D., Professor of Environmental Science	koningc@franklinpierce.edu 603-899-4322

Appendix A:

Resumes

Robert Hartzel CLM

Principal

Mr. Hartzel has over 25 years of experience leading water resources, watershed assessment, wetland, and ecological restoration projects. Mr. Hartzel provides expertise in aquatic and wetland ecology as they relate to limnological investigations, wetland delineation, stream bioassessment, wildlife habitat investigations, and environmental permitting. Mr. Hartzel has served as project manager and technical lead for numerous stream biological, water quality and geomorphic assessments using methods including the USEPA Rapid Bioassessment Protocol (RBP), the Rapid Stream Assessment Technique (RSAT) and the Unified Stream Assessment (USA) method. Mr. Hartzel has extensive experience in aquatic vegetation assessments and vegetation/algae control plans for lakes and ponds throughout new England.

M.P.P., Public Policy, Environmental Specialization, Duke University

B.A., Economics, Providence College

Selected Project Experience

Massachusetts Statewide Watershed Based Plans. Project Manager for MassDEP project to develop a web-based tool for statewide Watershed-Based Plans (WBPs). The WBP website is an innovative watershed-planning tool at the crossroads of science, engineering, public policy, and public education. This interactive web-based tool helps users develop WBPs that meet the nine elements required by the U.S. Environmental Protection Agency (USEPA). A completed WBP is a prerequisite for communities or local organizations that wish to apply for federal grant funding for watershed restoration projects under Section 319 of the Clean Water Act.

Turkey River Watershed Management and Restoration Plan. Project Manager on behalf of the Upper Merrimack Watershed Association for development of a 9-element watershed plan for the Turkey River, a tributary to the Merrimack River. Plan development included water quality goal setting based on New Hampshire water quality standards, modeling to estimate future pollutant loads, and field evaluation and prioritization of opportunities to reduce pollutant loads.

Mirror Lake Watershed-Based Plan, Wolfeboro, New Hampshire. Project Manager for development of a comprehensive "9-element" watershed based plan for Mirror Lake, including in-lake water and sediment quality monitoring, aquatic vegetation survey, pollutant load modeling, engineering and construction oversight of stormwater improvement designs and development of public outreach materials.

Partridge Lake Watershed Restoration Plan, Littleton, New Hampshire. Project Manager for development of a watershed restoration plan for Partridge Lake, which has been impaired by recurring cyanobacteria blooms. The scope of work for this project included water quality analysis and goal setting, phosphorus loading analysis using the Lake Loading Response Model (LLRM), watershed field assessment to identify nutrient loading reduction sites, analysis of in-lake phosphorus control options, and prioritization of management actions.

Winnicut River Watershed-Based Plan, New Hampshire. Project Manager for the development of a "nine-element" watershed-based plan (WBP) for the Winnicut River on behalf of the New Hampshire Rivers Council. The Winnicut River has freshwater and estuarine segments, and is tributary to the impaired Great Bay Estuary. WBP development included data analysis, water quality goal setting, modeling to project future pollutant loads, and field evaluation and prioritization of opportunities to reduce pollutant loads.

Rust Pond Watershed Assessment and Stormwater Improvements, Tuftonboro, New Hampshire. Project Manager for development of a management plan to reduce sediment and nutrient loading to Rust Pond from two subwatershed areas. This project included pollutant load modeling, watershed assessment, design of stormwater best management practices, and public outreach. Mr. Hartzel also conducted an aquatic vegetation survey and developed a "*Field Guide to the Aquatic Plants of Rust Pond*."

Bantam Lake Nutrient TMDL Modeling and Watershed Based Plan, EPA Region 1. Project Manager for USEPA project to conduct modeling in support of establishing a nutrient Total Maximum Daily Load (TMDL) for Bantam Lake, the largest natural lake in Connecticut. Modeling included use of the Lake Loading Response Model (LLRM) and BATHTUB model to calculate nutrient loads and reductions needed to meet water quality targets. The modeling results were used in support of an associated project to develop a watershed-based plan for Bantam Lake, including field assessment of BMPs to reduce phosphorus loading and use of the EPA Opti-Tool to assess watershed-wide implementation options.

Cobbett's Pond Watershed Based Plan, Windham, New Hampshire. Project Manager for development of a comprehensive "9-element" watershed restoration plan for Cobbett's Pond (Windham, NH), including in-lake water quality monitoring, aquatic vegetation survey, pollutant load modeling, engineering and construction oversight of stormwater improvement designs and development of public outreach materials.

Pennichuck Water Supply Ponds – Water Quality and Invasive Species Monitoring, Merrimack, NH. Project Manager for (1) ongoing (annual) monitoring and assessment of surface and groundwater quality for the Pennichuck water supply ponds (Harris Pond, Bowers Pond, and Holts Pond) and their tributaries and (2) assessment of invasive species mapping and management recommendations for the ponds, with a focus on invasive variable milfoil and water chestnut.

Pawtuckaway Lake Watershed Based Plan, Nottingham, New Hampshire. Project Manager for development of a 9-element watershed management plan for Pawtuckaway Lake. The Plan focused on development of (1) a recommended annual phosphorus loading reduction target to eliminate impairments related to nuisance algae blooms, and (2) specific watershed management recommendations to achieve the target loading reduction.

Baboosic Lake Watershed-Based Plan, Amherst, New Hampshire. Project Manager for development of a watershed management plan for Baboosic Lake. The Plan focused on development of (1) a recommended annual phosphorus loading reduction target to eliminate impairments related to nuisance blue-green algae blooms, and (2) specific watershed management recommendations to achieve the target loading reduction.

Lake Massabesic Aquatic Vegetation Assessment and Management Plan, Manchester, NH. Project Manager for an inventory and mapping of aquatic vegetation within Lake Massabesic, and development of an aquatic vegetation management plan for the lake. Field work for this project included a focus on documenting the locations and potential growth zones for invasive, non-native species. The survey results were compared to a baseline of invasive plant species mapped previously, along with past management techniques to determine the need for additional measures. Prioritized recommendations for invasive species control were developed, including protocols for rapid response to new areas of growth.

Bailey Brook Watershed Assessment, Aquidneck Island, Rhode Island. Project Manager for assessment of the urbanized Bailey Brook watershed located within Newport, Middletown, and Portsmouth, RI. Mr. Hartzel conducted stream geomorphic assessments and biological inventories using the Unified Stream Assessment method and Rapid Bioassessment Protocol, and developed a prioritized action plan for water quality improvement. Other tasks included assessment of development encroachment into watershed protection zones, flooding issues, and stormwater management issues.

Blackstone River Watershed–Five Year Action Plan, *Massachusetts and Rhode Island.* Project Manager for a technical review of watershed conditions and development of a prioritized Five-Year Action Plan for the Blackstone River Watershed. The Action Plan was developed through a comprehensive analysis of existing information, collaboration with watershed stakeholders through a series of public forums, and prioritization of recommended actions based on cost and other factors.

Taunton River Watershed Five-Year Action Plan, Massachusetts. Project Manager for development of a Five-Year Action Plan for the Taunton River Watershed. The Action Plan was developed through a comprehensive analysis of existing information and collaboration with watershed stakeholders through a

series of public forums facilitated by Mr. Hartzel. Action items were prioritized according to planning categories such as water quality protection, wildlife habitat protection, recreation and access, open space/sustainable development, and public education.

Mount Hope/Narragansett Bay Watershed–Five Year Action Plan, Massachusetts and Rhode Island. Project Manager for technical review of watershed conditions and development of a prioritized Five-Year Action Plan for the Mount Hope/Narragansett Bay Watershed. The Action Plan was developed through a comprehensive analysis of existing information, collaboration with watershed stakeholders through a series of public forums, and prioritization of recommended actions based on cost and other factors.

South Coastal Watershed-Regional Open Space Plan, Massachusetts. Project Manager for development of a Regional Open Space Plan for Massachusetts' South Coastal watershed. Town open space plans were prepared in conformance with requirements of the MA Division of Conservation Services. These open space plans were combined into a comprehensive regional open space plan, providing a unique opportunity for watershed communities to work cooperatively towards prioritizing regional open space and recreational land acquisition and protection goals.

Exeter River Watershed Vulnerability Analysis, New Hampshire. Project Manager for assessment of the vulnerability of the Exeter River Watershed to water quality impacts. The primary goals of this project were to (1) forecast which subwatersheds are most vulnerable to future development; and (2) identify and rank subwatersheds that merit prompt watershed management planning. To provide an initial classification of subwatershed vulnerability, the watershed was assessed for impervious cover, land uses, habitat, and water quality parameters to develop an overall ranking of subwatershed vulnerability. Based on a field investigation of high priority areas. Conceptual plans were developed for storm water infrastructure improvements.

Nashoba Brook Watershed Low Impact Development Model, Massachusetts. Project Manager for development of a model to evaluate the relative suitability of developable parcels in the Nashoba Brook Watershed for LID stormwater management techniques. This model can be easily applied or adapted as a planning tool for other lake and river watersheds, and is based ranking factors including soils/geology, site proximity to a receiving water, stormwater infrastructure, impervious cover, and site proximity to public water supplies. For each parcel, the model evaluates the net benefits of LID compared to traditional stormwater management with regard to groundwater recharge and water quality. The model also estimates the cost of traditional stormwater techniques for each parcel, to allow for comparison to the LID scenarios.

Chicopee River Watershed Stream Assessments, Massachusetts. Project Manager for a comprehensive field assessment of fifteen streams using the Rapid Stream Assessment Technique (RSAT) methodology. Visual geomorphic assessments, biological monitoring, and water quality monitoring were conducted to evaluate streams for: (1) channel stability; (2) channel scouring/sediment deposition; (3) physical in-stream habitat; (4) water quality; (5) riparian habitat; and (6) biological indicators (macroinvertebrates).

Niles Pond Ecological Assessment and Management Plan, Gloucester, Massachusetts. Project Manager for development of a management plan for Niles Pond, which has experienced significant increases in floating-leaf and emergent vegetation in recent years, including a proliferation of invasive Common Reed that has reduced biodiversity and impaired habitat and recreational values. This project included development of a phosphorus loading budget, trophic status model, water quality monitoring, aquatic vegetation survey, and development of an aquatic vegetation management plan. The project also included concept-level designs for stormwater management improvements, with a focus on Low Impact Development techniques to promote infiltration and reduce direct discharge of stormwater to the pond.

Ayer Ponds Management Plan, Ayer, Massachusetts. Project Manager for water quality sampling, water quality modeling, aquatic vegetation assessments, and watershed investigations for six ponds in Ayer (Balch Pond, Grove Pond, Lower Long Pond, Pine Meadow Pond, Sandy Pond, and Flannagan Pond).

These interconnected ponds exhibit a wide range of water quality and ecological conditions, public uses, and resource management challenges. The primary project objective was to establish an updated, scientific basis for the long-term management of the ponds. Specific project tasks included (1) updated water quality sampling (2) trophic response modeling to characterize each pond's biological productivity and response to changes in phosphorus loading, (3) an assessment of each pond's plant community and recommendations for control of invasive species; (4) a field investigation to identify recommended best management practices for stormwater management, and (5) a human health risk assessment to evaluate potential risks from recreational exposure to Grove Pond water and sediment.

Wachusett Reservoir Invasive Species Management, West Boylston, Massachusetts. Project Manager for development of management recommendations for control of non-native aquatic species in the Stillwater Basin portion of the Wachusett Reservoir, a major water supply reservoir for the metroploitan Boston area. Mr. Hartzel also provided technical review of contractor bids for diver-assisted suction harvesting (DASH), and provided field inspection of DASH operations.

Dean Pond Beach Restoration Dredging and Aquatic Vegetation Control, Brimfield, Massachusetts. Project Manager for design, permitting and construction oversight of maintenance dredging of Dean Pond to restore a State Park swimming area that had become impaired by encroaching vegetation. Mr. Hartzel prepared all permit applications required for conventional wet excavation, including Section 404, 401 Water Quality Certification, and Massachusetts Wetlands Protection Act. The project was allowed for re-opening of the beach to public swimming for the first time in twelve years.

Blue Hills Pond Dredging, Milton, Massachusetts. Project Manager for dredging of Blue Hills Pond. The project involved permitting, pond dewatering and conventional excavation to restore depth, and design and installation of a sediment forebay at the inlet of an intermittent tributary. Project tasks also included a field evaluation and engineering recommendations to reduce sediment loading to the Pond from its watershed, including outdoor animal exhibits at the adjacent Trailside Museum. Invasive Purple Loosestrife and Common Reed growing around the pond shoreline were removed and these areas were re-planted with native shrubs and herbaceous wetland plants.

Barrett Pond Watershed Assessment, Leominster, Massachusetts**.** Project Manager for a 604(b) grant-funded pond assessment including water quality monitoring, pollutant load and trophic status modeling, biological monitoring, stormwater BMP designs, and development of public outreach materials. Barrett Pond has suffered persistent beach closures in recent years due to persistent algal blooms and associated poor water clarity. The watershed assessment included development of an annual phosphorus load reduction goal and recommendations to improve water quality and reduce nuisance algae.

Pillings Pond Nutrient Loading Model, Aquatic Vegetation Survey and Public Outreach, Lynnfield, Massachusetts. Project Manager for development of a nutrient loading model and assessment of sediment constituents in the Pond, which suffers severe and persistent summer cyanobacteria blooms. This project also included aquatic vegetation mapping, development of recommendations for control of non-native species, and development public education materials including a brochure and a "Field Guide to the Aquatic Plants of Pillings Pond."

Webster Lake Assessment and Management Plan, Webster, Massachusetts. Project Manager for a macrophyte and water quality assessment of 1,270-acre Webster Lake. These assessments provided baseline mapping of the macrophytes and assessed in-lake and tributary water quality to determine trophic status and potential impairments. Recommendations for watershed best management practices, nuisance plant control, and future monitoring were developed.

David Roman, PE, CFM, CPESC

Principal Engineer

Mr. Roman is a registered professional engineer in Massachusetts and has over twelve years of experience in water resources engineering. He specializes in all aspects of watershed management and assessments. His relevant experience includes water quality assessments and flow monitoring; hydrologic, hydraulic, and water quality modeling; field data collection and GIS development; data analysis and visualizations; and BMP sizing and design. He has completed over a dozen nine element Watershed Based Plans for an array of waterbodies/watersheds ranging in size from kettle holes to rivers that span dozens of communities. He has led multiple day programs to train EPA Region 1 and CT DEEP personnel on the use of the BATHTUB and LLRM water quality models. He is an experienced project manager and task lead with strong organizational and communication skills and regularly attends conferences to present project findings.

Selected Project Experience

Turkey River Watershed Based Plan. Technical lead on the modeling portion of the Turkey River Watershed Based Plan. The Lake Load Response (LLRM) model was used to estimate pollutant loading through the watershed, set water quality goals, and understanding potential impacts from future buildout.

Partridge Lake Watershed Based Plan. Technical lead on the modeling portion of the Partridge Lake Watershed Based Plan. The Lake Load Response (LLRM) model was used to estimate pollutant loading through the watershed, set water quality goals, and understanding potential impacts from future buildout. LLRM was also used to estimate in-lake nutrient concentrations and algal bloom probability.

Town Stormwater Master Plan and GIS Updates, *City of Framingham.* Mr. Roman was assistant project manager and technical lead for a stormwater master planning effort that included the **Hop Brook Watershed**: 1) Led field data collection and GIS integration effort. 2) Performed condition assessment. 3) Developed watershed scale hydrologic and hydraulic models of the stormwater system and identified areas of flooding concern. 3) Performed a water quality assessment including a pollutant loading analysis. 4) Developed a prioritized capital improvement plan based on results from condition, flooding, and water quality assessments.

Education

M.S., Environmental and Water Resources Engineering, Tufts University, 2010

B.S., Civil and Environmental Engineering, University of Rhode Island,

Professional Registrations and Service

Registered Professional Engineer, Massachusetts, No. 51121

Certified Floodplain Manager, No. US-15-08317

Certified Professional in Erosion and Sediment Control, No. 6702

Bantam Lake Nutrient TMDL Model, *US EPA Region 1*, Technical lead to develop a pollutant loading model for Bantam Lake to be used to inform a Statewide TMDL Modeling effort in Connecticut. Responsibilities included: 1) Collect and evaluate required data for modeling; 2) set water quality targets; 3) Build pollutant loading model using the Lake Load Response Model (LLRM); 4) Build in-lake water quality model using BATHTUB; 5) calibrate and validate the models to water quality modeling data; 6) perform nutrient load reduction analysis to determine required load reductions to meet water quality targets; 7) writeup findings in technical report.

Bantam Lake Watershed Based Plan and Opti-Tool Analysis, *US EPA Region 1*. Dave was technical lead for watershed investigations and pollutant load reduction analysis on a project to create a nine-element watershed based plan for Bantam Lake. Key tasks included: 1) created written recommendations for BMP implementation at over 20 strategic sites throughout the watershed; 2) performed an analysis using EPA's Opti-Tool to determine the lowest cost mixture of BMPs to achieve the highest potential pollutant load reductions; 3) facilitated a two-day training with US EPA and CTDEEP staff on EPA's Opti-Tool.

David Roman, PE, CFM, CPESC

Principal Engineer

Massachusetts Statewide Watershed Based Plans (Phase 2). Project Manager for MassDEP project to continue development of a web-based tool for statewide Watershed-Based Plans (WBPs). The project team initially built an interactive web-based tool to help users develop WBPs that meet the nine elements required by the U.S. Environmental Protection Agency. This tool allows users to complete a technically robust WBP very efficiently, and allows the state to focus more of its federal grant funding on watershed restoration efforts. Specific tasks as part of the second phase of this project included development of programmatic support tools to assist MassDEP in evaluating and ranking submitted WBPs, working with ten (10) organizations to develop WBPs using the tool, and implementation of tool enhancements to the tool such as expanded guidance on use of the BMP selector tool.

MassDEP Stormwater Handbook Updates, *MassDEP*. Project manager on a multi-year project to collaboratively work with MassDEP to update the Massachusetts Stormwater Handbook to address increasing precipitation, provide greater consistency with the MS4 General Permit and to improve pollutant removal actions and overall compliance with TMDLs.

Modeling for MassDEP Stormwater Handbook Updates, *MassDEP*. Mr. Roman was project manager and technical lead on a project to assist MassDEP with updates to the Stormwater Management Handbook. The Handbook was last updated in 2008. MassDEP is considering updating the handbook to include more stringent requirements, including increases in precipitation intensity and depth, pollutant removals, and recharge volume.

Massachusetts Nonpoint Source Pollution 319 Grant Guidebook, *MassDEP.* Dave was lead author on multiple chapters of the Massachusetts Nonpoint Source Pollution Guidebook. The intent of this guidebook is to provide applicants of s.319 projects with information on the Massachusetts Nonpoint Source Grant Program and how to obtain and implement grants. Primary contributions as lead author included: watershed field data collection and site visits; BMP identification, sizing, and costing; BMP design, and BMP construction.

Natick Green Infrastructure Design, *Natick, Massachusetts*. Project Manager to provide engineering and design of three green infrastructure sites in the Town of Natick to reduce pollutant loading to the Lake Cochituate Watershed. Designs were prepared for a bioretention cell, a raingarden, and a street-side bioretention bump out.

Lake Cochituate Watershed Based Plan, *Framingham, Massachusetts.* Mr. Roman served as Project Manager and technical lead to prepare a nine element Watershed-Based Plan (WBP) using the newly developed Massachusetts DEP web-based framework. Specific tasks included: watershed field assessment to identify potential BMP opportunities, development of phosphorus trophic response model, write nine element WBP including BMP recommendations and costing, public education and outreach, and monitoring recommendations.

Ayer Green Infrastructure Design, *Ayer, MA*. Project manager to provide engineering and design support services for two best management improvement sites. The project entailed performing sizing calculations and preparation of engineering plans and material specifications for construction of a hydrodynamic separator located adjacent to a pond and a bioretention cell located at a park. The purpose of the improvements was to provide local reductions in peak runoff and to improve water quality of the receiving waters.

Hardy Pond Watershed Assessment, *Waltham Conservation Commission.* Dave was project manager on a project to evaluate and recommend BMPs at four areas of interest in the Hardy Pond Watershed. Tasks included: 1) performed field visits to evaluate site conditions, 2) wrote a report with recommended BMP implementation locations and conceptual designs, cost estimates, and pollutant load reduction estimates; 3) presented findings to the Conservation Commission.

Massachusetts Municipal Vulnerability Program, *multiple communities.* Mr. Roman was Project Manager or technical lead to perform climate change and natural hazard vulnerability assessments for five communities as part of the Massachusetts Municipal Vulnerability Preparedness (MVP) program. This process included preparation for and facilitation of a community workshop using the Community Resilience Guide to identify hazards, vulnerabilities, strengths, and priority actions. Mr. Roman assisted the following five (5) communities as part of this program: Town of Stow, Groveland, Hadley, Lynnfield, and Dartmouth.

Iain Church
Staff Scientist

Mr. Church is a CEI Staff Scientist with experience in watershed modeling throughout New Hampshire and Massachusetts. He has served as staff scientist for numerous projects assisting with both field assessment and watershed restoration and management plan development. Additionally, he has experience in EPA NPDES MS4 permit compliance including Stormwater Management Program (SWMP), Illicit Discharge Detection and Elimination (IDDE), and Phosphorus Control Plans (PCP). He has provided a wide array of ArcGIS services including load calculations, data integration, database management and QA/QC.

Selected Project Experience

Staff Scientist, Watershed Restoration and Management Plan, Turkey River, NH. Mr. Church developed a Lake Loading Response Model (LLRM) to estimate nutrient loads currently contributed by different sources within each sub-watershed. The model was also used to estimate future nutrient loads based on planned developments in the area. Using this data, the locations of best management practices (BMPs) were determined that would maximize nutrient load reductions.

Staff Scientist, Watershed Restoration Plan, Partridge Lake, NH. Developed an LLRM model to evaluate sources of nutrient loads in the watershed. Results were compared to modeled predevelopment conditions to identify the largest source of phosphorus in the watershed. These findings were then used to develop a strategy to address water quality issues.

Education

B.S., Biology, Bridgewater State University, 2018

Professional Skills

GIS
Survey 123

Staff Scientist, Phosphorus Control and Identification Plans, Multiple MS4 Communities. Calculated nutrient load contributed by community's stormwater infrastructure to a nutrient impaired waterbody in accordance with the MS4 permit. Existing reduction opportunities in the form of structural and nonstructural stormwater best management practices were analyzed to develop nutrient reduction goals and set milestones for future reduction targets.

GIS Technician, Multiple MS4 Communities. Mr. Church has assisted over 20 municipalities with evaluating their Municipal Separate Storm Sewer Systems (MS4s) to comply with EPA's NPDES permit.

Staff Scientist, Street Sweeping Plans, Multiple NH MS4 Communities. Determined annual street sweeping frequencies needed to minimize pollution from stormwater runoff to surface waterbodies in accordance with the MS4 permit.

Staff Scientist, Catch Basin Cleaning Optimization Plans, Multiple MS4 Communities. Worked with municipalities to develop GIS-integrated tracking of catch basin cleanings and inspections. Collected data was then used to optimize cleaning schedules to ensure catch basin stayed less than 50 percent full and reduce sources of stormwater pollution, as described in the EPA's MS4 permit.

Staff Scientist, Municipal BMP Retrofit Analysis, Multiple MS4 Communities. Identified municipal properties with opportunities to increase stormwater treatment. Developed plans for stormwater BMPs and calculated nutrient load reductions achieved.

Field Scientist, Multiple MS4 Communities. Assisted as part of a field team with mapping stormwater drainage infrastructure such as outfalls, manholes, catch basins, interconnections, surface water discharge points, and stormwater Best Management Practices. Completed dry and wet weather sampling of select outfalls and manholes to ensure compliance with EPA's MS4 permit.

Staff Scientist, IDDE Prioritization and Ranking, Multiple New Hampshire MS4 Communities. Outfall catchment areas were delineated, assessed and priority ranked for the outfalls potential to have an illicit discharge. These rankings aided in the investigation and isolation of sources of existing illicit discharges.

Josephine Hatton
GIS Manager

Ms. Hatton has over twenty years of experience working with geospatial data in both natural and built environments. Since joining CEI, her role includes integrating natural, cadastral, and photogrammetric data from a variety of sources, developing geospatial or geostatistical analysis methodology, and creating maps, tables, databases and data libraries for clients. Her skills include assessing and developing material for watershed planning and analysis, water quality monitoring, and asset management.

Education
Master of Science Degree
Oceanography
University of Rhode Island

Bachelor's Degree
Geology
Middlebury College

Selected Project Experience

Bantam Lake Watershed Based Plan Addendum, Bantam Lake, CT. This EPA-led project aims to develop a WBPA for Bantam Lake that will also be used as a template for other impaired lakes across the state of Connecticut. The project involves collecting and coordinating a variety of data at many scales, including hydrology, elevation, impervious surfaces, and many others.

Londonderry Water Resource Management and Protection Plan, Londonderry, NH. CEI collected a range of data relating to land use, water resources and use, topography, geology, flood hazard zones, and other parameters to develop a watershed-based plan for management of town water resources going forward. The project also identified potential pollutant sources that may contaminate the town's water sources, both within the town itself and upstream in connected watersheds.

Hardy Pond Watershed Delineation, Waltham and Lexington, MA. The Hardy Pond Watershed Association contracted with CEI to delineate the watershed of Hardy Pond. CEI used high-resolution LiDAR data to identify the topographic watershed boundary and refined it to accommodate stormwater drainage infrastructure.

Lake Massabesic Watershed Spill Response Plan. Three towns bordering Lake Massabesic, southeastern New Hampshire, were included in a project to develop a hazardous spill response strategy for stormwater outfalls emptying into the lake. GIS and GPS data were gathered from the towns and from field work, and synthesized into a geodatabase and a comprehensive map of the area concerned. CEI identified critical outfalls that were most likely to transfer contaminants to the lake from spills within the watershed.

Pollutant Loading Analysis, Yarmouth, MA. The Town of Yarmouth contracted with CEI to conduct an analysis of the pollutant loads carried by stormwater flow at outfalls throughout the town. Some of these outfalls discharge stormwater to surface water bodies with known impairments or completed TMDLs. CEI compiled data on soils, land use, catchments, impervious areas, etc. and calculated the loads of several key pollutants that are discharged annually from each stormwater outfall.

Mill River Watershed Wetland Restoration, Taunton, MA. CEI undertook a high-resolution survey and ground-truthing project to assess current conditions and make recommendations for wetlands restoration efforts by The Nature Conservancy. High-resolution imagery acquired by drone was used to support mapping and conduct detailed assessments of the wetlands.

Inventory of Non-WMA-Regulated Wells, Northeastern MA. With the goal of identifying the causes of low flow in two major rivers, CEI collected well data and related parcel and land use data in the two

watersheds to estimate groundwater withdrawal by unregulated wells. A GIS-based image analysis method was developed to estimate irrigation by private wells.

Water Supply Ponds Storage Capacity and Sedimentation, Pennichuck Water Works, Nashua, NH. PWW wanted to quantify the observed sediment influx into public water supply ponds. CEI identified and investigated possible sediment sources based on land use, municipal road and bridge maintenance practices, new development, etc. GIS was used to calculate sediment volumes and migration over time in 3D space.

Onota Lake Vegetation Assessment, Pittsfield, MA. GIS work for this project included compiling maps of vegetation communities from field surveys.

Goodridge Brook Environmental Assessment, Lancaster, MA. GIS mapping based on field surveys of vernal pools hosting spotted salamander egg masses.

Pearly Pond Watershed Restoration Plan, Rindge, NH. CEI's objective in of this project was to identify and quantify the sources of pollutants which were causing harmful algal blooms in Pearly Pond.

Sustainable Water Management Initiative, Groton, MA. This CEI project involved a Sustainable Water Management Initiative (SWMI) grant that included (1) development of an alternative source study for the Town of Groton, and (2) evaluation of the town's existing mitigation measures to offset future water withdrawals.

NEPA Permitting Documentation, West Townsend and Avon, MA, and Walpole and Charlestown, NH. CEI worked with other consultants to compile and organize data for the necessary NEPA permitting for a highway project in Avon, and for a bridge replacement project in West Townsend, MA. CEI also cooperated with NHDOT to document a revised highway project between Walpole and Charlestown, NH for NEPA permitting.

Wachusett Reservoir Stormwater BMPs, West Boylston, MA. High-resolution sUAS imagery was used to model two stormwater BMPs, supporting assessments of their condition and maintenance requirements. The imagery was also used to provide detailed site topography.

Culvert Flood Mitigation, Sutton, MA. CEI surveyed a site of frequent roadway flooding by sUAS and developed an accurate, high-resolution topographic model of the area. The model surface and contours supported informed decisions by geotechnical engineers for the placement and capacity of a new culvert.

Stormwater BMP Retrofit, Yarmouth, MA. The Town of Yarmouth collaborated with CEI to evaluate existing stormwater BMPs for retrofit to protect against the effects of climate change (rising sea levels, storm surges, etc.). GIS data for hurricane surges, flood zones, elevation, and other parameters were integrated to identify the BMPs at greatest risk from climate change.

NPDES Phase II Stormwater Discharge Permit, multiple towns and cities, MA, NH, and CT. Collect and review stormwater infrastructure data and integrate into a GIS; map sewer system, outfalls, receiving waters, and other parameters that influence stormwater management. Research possible trouble spots and sources of pollutants. Compile all available qualitative stormwater management data, current and planned, in each individual community to help evaluate MS4 Permit needs and to draft annual reports and other documentation.

Water Distribution System Mapping, Kingston, MA. Assimilate data from outside sources to compile map of water distribution system. Map includes pump stations, hydrants, tanks, valves, and water resource districts, as well as water supply pipes identified by diameter.

Appendix B:

CEI Insurance Documentation

(Certificate of Liability Insurance)

COMPENV-02 VSANTOSUOSSO

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 1/24/2022

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:	
Ames & Gough 859 Willard Street Suite 320 Quincy, MA 02169	PHONE (A/C, No, Ext): (617) 328-6555	FAX (A/C, No): (617) 328-6888
	E-MAIL ADDRESS: boston@amesgough.com	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Comprehensive Environmental, Inc. 21 Depot Street Merrimack, NH 03054	INSURER A : Continental Casualty Company (CNA) A, XV	20443
	INSURER B : Allmerica Financial Benefit Insurance Company A,XV	41840
	INSURER C : National Fire Insurance Company of Hartford A(XV)	20478
	INSURER D : Beazley Syndicate 2623/623 at Lloyd's A+, XV	112862
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **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: POLICY X PRO-JECT X LOC OTHER:			5094978421	1/23/2022	1/23/2023	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 2,000,000 $ 300,000 $ 10,000 $ 2,000,000 $ 4,000,000 $ 4,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY			AWN8954774	11/16/2021	11/16/2022	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			5094979844	1/23/2022	1/23/2023	EACH OCCURRENCE AGGREGATE	$ 2,000,000 $ 2,000,000
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y / N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		5094978452	1/23/2022	1/23/2023	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
D	Professional Liab.			W2DCE0220201	1/23/2022	1/23/2023	Per Claim	2,000,000
D				W2DCE0220201	1/23/2022	1/23/2023	Aggregate	2,000,000

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

All Coverages are in accordance with the policy terms and conditions.

Evidence of Insurance.

CERTIFICATE HOLDER

Evidence of Insurance

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

Jared Maxwell