The State of New Hampshire
NHDES
Department of Environmental Services
Robert R. Scott, Commissioner

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May 26, 2021

His Excellency, Governor Christopher T. Sununu
and the Honorable Council
State House
Concord, New Hampshire 03301

REQUESTED ACTION

Authorize the New Hampshire Department of Environmental Services (NHDES) to enter into a contract with Normandeau Associates, Inc. (NAI), (VC# 174189 R001), Bedford, NH in the amount of $254,067 to conduct protected instream flow studies on the Ashuelot and Isinglass Rivers, effective upon Governor and Council approval through September 30, 2023. 100% General Funds.

Funding is available in the following accounts with the authority to adjust encumbrances in each of the state fiscal years through the Budget Office, if needed and justified. Funding for FY 2022 and 2023 are contingent upon continuing appropriation and availability of funds.

	FY 2021	FY 2022	FY 2023
03-44-44-442010-1518-102-500731	$ 43,325	$ 113,500	$ 97,242

Dept. of Environmental Services, Lakes-Rivers Management, Contracts for Program Services

EXPLANATION

Under this contract, Normandeau Associates, Inc. (NAI) will conduct tasks to complete instream flow studies for the upper and lower Ashuelot and the Isinglass designated rivers. The contract implements RSA 483, which requires protected instream flows on all of the State's Designated Rivers. These two studies will be conducted to determine protected instream flows on the Ashuelot and Isinglass Designated Rivers, document the results, and support NHDES during the public review process.

NAI will conduct field and computer assessments of the river conditions including dimensions, flow velocities, and habitat conditions. Using these assessments combined with daily stream flow records, NAI will apply computer models to determine stream flows necessary to support habitat conditions. Protected instream flows will be documented with these assessments and model results for public review and comment.

After publishing a request for proposals (RFP), NHDES received three qualified submittals. NAI was selected by the review team as having the best combination of staff experience, approach and price. NAI was selected by a five-person review team consisting of experienced NHDES personnel who independently

scored and ranked the proposals in terms of staff qualifications and experience, adequacy of approach, overall project understanding, total cost, and study completion times. NAI demonstrated their staff's ability to conduct these studies and their clear understanding of the work to be done. They also had the lowest proposed cost for the Ashuelot study. See Attachment A for a description of the selection process.

This contract has been approved by the Office of the Attorney General as to form, substance and execution.

We respectfully request your approval.

Robert R. Scott
Commissioner

Notice: This agreement and all of its attachments shall become public upon submission to Governor and Executive Council for approval. Any information that is private, confidential or proprietary must be clearly identified to the agency and agreed to in writing prior to signing the contract.

AGREEMENT

The State of New Hampshire and the Contractor hereby mutually agree as follows:

GENERAL PROVISIONS

1. IDENTIFICATION.

1.1 State Agency Name NH Department of Environmental Services		1.2 State Agency Address 29 Hazen Drive, PO Box 95 Concord, NH 03302-0095	
1.3 Contractor Name Normandeau Associates, Inc.		1.4 Contractor Address 25 Nashua Road Bedford NH 03110	
1.5 Contractor Phone Number (603) 472-5191	1.6 Account Number 03-44-44-442010-1518-102-500731	1.7 Completion Date September 30, 2023	1.8 Price Limitation $254,067
1.9 Contracting Officer for State Agency Wayne Ives, Instream Flow Specialist		1.10 State Agency Telephone Number 603-271 -3548	
1.11 Contractor Signature Date: 5/5/2021		1.12 Name and Title of Contractor Signatory	
1.13 State Agency Signature Date: 5/27/21		1.14 Name and Title of State Agency Signatory Robert R Scott Commissioner, NH DES	
1.15 Approval by the N.H. Department of Administration, Division of Personnel *(if applicable)* By:		Director, On:	
1.16 Approval by the Attorney General (Form, Substance and Execution) *(if applicable)* By:		On: 6/1/2021	
1.17 Approval by the Governor and Executive Council *(if applicable)* G&C Item number:		G&C Meeting Date:	

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Date 5/5/21

2. SERVICES TO BE PERFORMED. The State of New Hampshire, acting through the agency identified in block 1.1 ("State"), engages contractor identified in block 1.3 ("Contractor") to perform, and the Contractor shall perform, the work or sale of goods, or both, identified and more particularly described in the attached EXHIBIT B which is incorporated herein by reference ("Services").

3. EFFECTIVE DATE/COMPLETION OF SERVICES.

3.1 Notwithstanding any provision of this Agreement to the contrary, and subject to the approval of the Governor and Executive Council of the State of New Hampshire, if applicable, this Agreement, and all obligations of the parties hereunder, shall become effective on the date the Governor and Executive Council approve this Agreement as indicated in block 1.17, unless no such approval is required, in which case the Agreement shall become effective on the date the Agreement is signed by the State Agency as shown in block 1.13 ("Effective Date").

3.2 If the Contractor commences the Services prior to the Effective Date, all Services performed by the Contractor prior to the Effective Date shall be performed at the sole risk of the Contractor, and in the event that this Agreement does not become effective, the State shall have no liability to the Contractor, including without limitation, any obligation to pay the Contractor for any costs incurred or Services performed. Contractor must complete all Services by the Completion Date specified in block 1.7.

4. CONDITIONAL NATURE OF AGREEMENT.

Notwithstanding any provision of this Agreement to the contrary, all obligations of the State hereunder, including, without limitation, the continuance of payments hereunder, are contingent upon the availability and continued appropriation of funds affected by any state or federal legislative or executive action that reduces, eliminates or otherwise modifies the appropriation or availability of funding for this Agreement and the Scope for Services provided in EXHIBIT B, in whole or in part. In no event shall the State be liable for any payments hereunder in excess of such available appropriated funds. In the event of a reduction or termination of appropriated funds, the State shall have the right to withhold payment until such funds become available, if ever, and shall have the right to reduce or terminate the Services under this Agreement immediately upon giving the Contractor notice of such reduction or termination. The State shall not be required to transfer funds from any other account or source to the Account identified in block 1.6 in the event funds in that Account are reduced or unavailable.

5. CONTRACT PRICE/PRICE LIMITATION/ PAYMENT.

5.1 The contract price, method of payment, and terms of payment are identified and more particularly described in EXHIBIT C which is incorporated herein by reference.

5.2 The payment by the State of the contract price shall be the only and the complete reimbursement to the Contractor for all expenses, of whatever nature incurred by the Contractor in the performance hereof, and shall be the only and the complete compensation to the Contractor for the Services. The State shall have no liability to the Contractor other than the contract price.

5.3 The State reserves the right to offset from any amounts otherwise payable to the Contractor under this Agreement those liquidated amounts required or permitted by N.H. RSA 80:7 through RSA 80:7-c or any other provision of law.

5.4 Notwithstanding any provision in this Agreement to the contrary, and notwithstanding unexpected circumstances, in no event shall the total of all payments authorized, or actually made hereunder, exceed the Price Limitation set forth in block 1.8.

6. COMPLIANCE BY CONTRACTOR WITH LAWS AND REGULATIONS/ EQUAL EMPLOYMENT OPPORTUNITY.

6.1 In connection with the performance of the Services, the Contractor shall comply with all applicable statutes, laws, regulations, and orders of federal, state, county or municipal authorities which impose any obligation or duty upon the Contractor, including, but not limited to, civil rights and equal employment opportunity laws. In addition, if this Agreement is funded in any part by monies of the United States, the Contractor shall comply with all federal executive orders, rules, regulations and statutes, and with any rules, regulations and guidelines as the State or the United States issue to implement these regulations. The Contractor shall also comply with all applicable intellectual property laws.

6.2 During the term of this Agreement, the Contractor shall not discriminate against employees or applicants for employment because of race, color, religion, creed, age, sex, handicap, sexual orientation, or national origin and will take affirmative action to prevent such discrimination.

6.3. The Contractor agrees to permit the State or United States access to any of the Contractor's books, records and accounts for the purpose of ascertaining compliance with all rules, regulations and orders, and the covenants, terms and conditions of this Agreement.

7. PERSONNEL.

7.1 The Contractor shall at its own expense provide all personnel necessary to perform the Services. The Contractor warrants that all personnel engaged in the Services shall be qualified to perform the Services, and shall be properly licensed and otherwise authorized to do so under all applicable laws.

7.2 Unless otherwise authorized in writing, during the term of this Agreement, and for a period of six (6) months after the Completion Date in block 1.7, the Contractor shall not hire, and shall not permit any subcontractor or other person, firm or corporation with whom it is engaged in a combined effort to perform the Services to hire, any person who is a State employee or official, who is materially involved in the procurement, administration or performance of this Agreement. This provision shall survive termination of this Agreement.

7.3 The Contracting Officer specified in block 1.9, or his or her successor, shall be the State's representative. In the event of any dispute concerning the interpretation of this Agreement, the Contracting Officer's decision shall be final for the State.

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8. EVENT OF DEFAULT/REMEDIES.

8.1 Any one or more of the following acts or omissions of the Contractor shall constitute an event of default hereunder ("Event of Default"):

8.1.1 failure to perform the Services satisfactorily or on schedule;

8.1.2 failure to submit any report required hereunder; and/or

8.1.3 failure to perform any other covenant, term or condition of this Agreement.

8.2 Upon the occurrence of any Event of Default, the State may take any one, or more, or all, of the following actions:

8.2.1 give the Contractor a written notice specifying the Event of Default and requiring it to be remedied within, in the absence of a greater or lesser specification of time, thirty (30) days from the date of the notice; and if the Event of Default is not timely cured, terminate this Agreement, effective two (2) days after giving the Contractor notice of termination;

8.2.2 give the Contractor a written notice specifying the Event of Default and suspending all payments to be made under this Agreement and ordering that the portion of the contract price which would otherwise accrue to the Contractor during the period from the date of such notice until such time as the State determines that the Contractor has cured the Event of Default shall never be paid to the Contractor;

8.2.3 give the Contractor a written notice specifying the Event of Default and set off against any other obligations the State may owe to the Contractor any damages the State suffers by reason of any Event of Default; and/or

8.2.4 give the Contractor a written notice specifying the Event of Default, treat the Agreement as breached, terminate the Agreement and pursue any of its remedies at law or in equity, or both.

8.3. No failure by the State to enforce any provisions hereof after any Event of Default shall be deemed a waiver of its rights with regard to that Event of Default, or any subsequent Event of Default. No express failure to enforce any Event of Default shall be deemed a waiver of the right of the State to enforce each and all of the provisions hereof upon any further or other Event of Default on the part of the Contractor.

9. TERMINATION.

9.1 Notwithstanding paragraph 8, the State may, at its sole discretion, terminate the Agreement for any reason, in whole or in part, by thirty (30) days written notice to the Contractor that the State is exercising its option to terminate the Agreement.

9.2 In the event of an early termination of this Agreement for any reason other than the completion of the Services, the Contractor shall, at the State's discretion, deliver to the Contracting Officer, not later than fifteen (15) days after the date of termination, a report ("Termination Report") describing in detail all Services performed, and the contract price earned, to and including the date of termination. The form, subject matter, content, and number of copies of the Termination Report shall be identical to those of any Final Report described in the attached EXHIBIT B. In addition, at the State's discretion, the Contractor shall, within 15 days of notice of early termination, develop and submit to the State a Transition Plan for services under the Agreement.

10. DATA/ACCESS/CONFIDENTIALITY/ PRESERVATION.

10.1 As used in this Agreement, the word "data" shall mean all information and things developed or obtained during the performance of, or acquired or developed by reason of, this Agreement, including, but not limited to, all studies, reports, files, formulae, surveys, maps, charts, sound recordings, video recordings, pictorial reproductions, drawings, analyses, graphic representations, computer programs, computer printouts, notes, letters, memoranda, papers, and documents, all whether finished or unfinished.

10.2 All data and any property which has been received from the State or purchased with funds provided for that purpose under this Agreement, shall be the property of the State, and shall be returned to the State upon demand or upon termination of this Agreement for any reason.

10.3 Confidentiality of data shall be governed by N.H. RSA chapter 91-A or other existing law. Disclosure of data requires prior written approval of the State.

11. CONTRACTOR'S RELATION TO THE STATE. In the performance of this Agreement the Contractor is in all respects an independent contractor, and is neither an agent nor an employee of the State. Neither the Contractor nor any of its officers, employees, agents or members shall have authority to bind the State or receive any benefits, workers' compensation or other emoluments provided by the State to its employees.

12. ASSIGNMENT/DELEGATION/SUBCONTRACTS.

12.1 The Contractor shall not assign, or otherwise transfer any interest in this Agreement without the prior written notice, which shall be provided to the State at least fifteen (15) days prior to the assignment, and a written consent of the State. For purposes of this paragraph, a Change of Control shall constitute assignment. "Change of Control" means (a) merger, consolidation, or a transaction or series of related transactions in which a third party, together with its affiliates, becomes the direct or indirect owner of fifty percent (50%) or more of the voting shares or similar equity interests, or combined voting power of the Contractor, or (b) the sale of all or substantially all of the assets of the Contractor.

12.2 None of the Services shall be subcontracted by the Contractor without prior written notice and consent of the State. The State is entitled to copies of all subcontracts and assignment agreements and shall not be bound by any provisions contained in a subcontract or an assignment agreement to which it is not a party.

13. INDEMNIFICATION. Unless otherwise exempted by law, the Contractor shall indemnify and hold harmless the State, its officers and employees, from and against any and all claims, liabilities and costs for any personal injury or property damages, patent or copyright infringement, or other claims asserted against the State, its officers or employees, which arise out of (or which may be claimed to arise out of) the acts or omission of the

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Contractor, or subcontractors, including but not limited to the negligence, reckless or intentional conduct. The State shall not be liable for any costs incurred by the Contractor arising under this paragraph 13. Notwithstanding the foregoing, nothing herein contained shall be deemed to constitute a waiver of the sovereign immunity of the State, which immunity is hereby reserved to the State. This covenant in paragraph 13 shall survive the termination of this Agreement.

14. INSURANCE.

14.1 The Contractor shall, at its sole expense, obtain and continuously maintain in force, and shall require any subcontractor or assignee to obtain and maintain in force, the following insurance:

14.1.1 commercial general liability insurance against all claims of bodily injury, death or property damage, in amounts of not less than $1,000,000 per occurrence and $2,000,000 aggregate or excess; and

14.1.2 special cause of loss coverage form covering all property subject to subparagraph 10.2 herein, in an amount not less than 80% of the whole replacement value of the property.

14.2 The policies described in subparagraph 14.1 herein shall be on policy forms and endorsements approved for use in the State of New Hampshire by the N.H. Department of Insurance, and issued by insurers licensed in the State of New Hampshire.

14.3 The Contractor shall furnish to the Contracting Officer identified in block 1.9, or his or her successor, a certificate(s) of insurance for all insurance required under this Agreement. Contractor shall also furnish to the Contracting Officer identified in block 1.9, or his or her successor, certificate(s) of insurance for all renewal(s) of insurance required under this Agreement no later than ten (10) days prior to the expiration date of each insurance policy. The certificate(s) of insurance and any renewals thereof shall be attached and are incorporated herein by reference.

15. WORKERS' COMPENSATION.

15.1 By signing this agreement, the Contractor agrees, certifies and warrants that the Contractor is in compliance with or exempt from, the requirements of N.H. RSA chapter 281-A *("Workers' Compensation").*

15.2 To the extent the Contractor is subject to the requirements of N.H. RSA chapter 281-A, Contractor shall maintain, and require any subcontractor or assignee to secure and maintain, payment of Workers' Compensation in connection with activities which the person proposes to undertake pursuant to this Agreement. The Contractor shall furnish the Contracting Officer identified in block 1.9, or his or her successor, proof of Workers' Compensation in the manner described in N.H. RSA chapter 281-A and any applicable renewal(s) thereof, which shall be attached and are incorporated herein by reference. The State shall not be responsible for payment of any Workers' Compensation premiums or for any other claim or benefit for Contractor, or any subcontractor or employee of Contractor, which might arise under applicable State of New Hampshire Workers' Compensation laws in connection with the performance of the Services under this Agreement.

16. NOTICE. Any notice by a party hereto to the other party shall be deemed to have been duly delivered or given at the time of mailing by certified mail, postage prepaid, in a United States Post Office addressed to the parties at the addresses given in blocks 1.2 and 1.4, herein.

17. AMENDMENT. This Agreement may be amended, waived or discharged only by an instrument in writing signed by the parties hereto and only after approval of such amendment, waiver or discharge by the Governor and Executive Council of the State of New Hampshire unless no such approval is required under the circumstances pursuant to State law, rule or policy.

18. CHOICE OF LAW AND FORUM. This Agreement shall be governed, interpreted and construed in accordance with the laws of the State of New Hampshire, and is binding upon and inures to the benefit of the parties and their respective successors and assigns. The wording used in this Agreement is the wording chosen by the parties to express their mutual intent, and no rule of construction shall be applied against or in favor of any party. Any actions arising out of this Agreement shall be brought and maintained in New Hampshire Superior Court which shall have exclusive jurisdiction thereof.

19. CONFLICTING TERMS. In the event of a conflict between the terms of this P-37 form (as modified in EXHIBIT A) and/or attachments and amendment thereof, the terms of the P-37 (as modified in EXHIBIT A) shall control.

20. THIRD PARTIES. The parties hereto do not intend to benefit any third parties and this Agreement shall not be construed to confer any such benefit.

21. HEADINGS. The headings throughout the Agreement are for reference purposes only, and the words contained therein shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of this Agreement.

22. SPECIAL PROVISIONS. Additional or modifying provisions set forth in the attached EXHIBIT A are incorporated herein by reference.

23. SEVERABILITY. In the event any of the provisions of this Agreement are held by a court of competent jurisdiction to be contrary to any state or federal law, the remaining provisions of this Agreement will remain in full force and effect.

24. ENTIRE AGREEMENT. This Agreement, which may be executed in a number of counterparts, each of which shall be deemed an original, constitutes the entire agreement and understanding between the parties, and supersedes all prior agreements and understandings with respect to the subject matter hereof.

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Exhibit A
Special Terms and Conditions

None.

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Exhibit B -- Scope of Work
Protected Instream Flow Studies for the Ashuelot Designated River

Project Goal:
The goals of the project are to perform Protected Instream Flow Studies on the Ashuelot River and to provide recommendations for the Protected Instream Flows.

Summary of Scope of Work:
The Protected Instream Flow Studies will be performed on the Ashuelot Designated River. The primary tasks include: Task 1) completion of a Protected Entity Identification and River Survey; Task 2) development of Protected Instream Flow Criteria; and Task 3) completion of a public process by participating in a public information meeting, public hearing, and providing comment responses with a final report.

During Task 1 Protected Entity Identification and River Survey, all instream public uses and designated uses for the Ashuelot River will be identified. These use will be assessed for their protected instream flow criteria during Task 2. Task 3 will include a draft report of the findings for each river for public review. This task will be completed by submittal of a revised final report for each river, and data transmittal to NHDES. The final report will provide the NHDES Commissioner with the scientific basis to issue a complete and fully defensible decision in order to establish protected instream flows as required in Env-Wq 1904.05.

Deliverables:
The project tasks below summarize the work plan in Normandeau Associates, Inc.'s proposal dated February 22, 2021, as amended by Addendum 1 dated April 22, 20121. The proposal and addendum describe the details of each task and subtask. The Addendum contains the final Work Scope, Budget and Schedule.

Task I. Protected Entity Identification and River Survey
Flow-dependent protected entities associated with the Ashuelot River watershed will be identified by a multi-stage process including: a) literature review of existing state, federal, and local documentation on watershed attributes; b) personal communication with state biologists and managers familiar with each watershed; and c) site-specific surveys of each designated river segment.

1.1 Reconnaissance Level Surveys
A full-length river survey will also be conducted at a reconnaissance level to assess the presence/absence of public and designated uses, and to identify any RTE species or likely habitat.

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1.2 Fisheries Assessment

1.2.1 Identification of Flow-dependent Rare, Threatened, or Endangered (RTE) Fish Species and Selection of Target Fish Species

Selected fish species will then be targeted for inclusion in the fish habitat model.

1.2.2 Study Area Stratification, Study Site Selection, and Habitat Mapping

The long lengths of the river segments will require subsampling to delineate stream reaches long enough to provide a proportional availability and range of mesohabitat types for study site selection. Four or five mesohabitat units will be randomly selected within each study site in approximate proportion to that reaches availability for placement of cross-sectional transects for fish habitat modeling

1.2.3 Transect Selection

One transect will be placed in each selected mesohabitat unit, such that 15 to 16 transects will be placed within each of the two Ashuelot segments

1.3 Riparian Vegetation and Wildlife Assessment

1.3.1 Identification of Flow-dependent Rare, Threatened, or Endangered (RTE) Wildlife, RTE Vegetation, and Natural/Ecological Communities

Normandeau will conduct a desktop study to identify rare, threatened, or endangered (RTE) wildlife, RTE vegetation, exemplary natural communities, and other wetland/ floodplain and riparian habitats.

1.3.2 Riparian Transect Locations and Survey

Five to seven riparian transects along the Ashuelot River are planned. Transect surveys will take place periodically during the year.

1.4 Recreation Assessment

A list of all the water access points, calm-water activity reaches, and rapid-water activity reaches will be created and the flows associated with boating activities will be determined, for each boating activity type, during each activity season.

Task II. Protected Instream Flow Criteria Development

A variety of models will be utilized to assess the protected flow criteria, including the flow: habitat relationships for fish and mussels, the flow requirements for aquatic-dependent plant and wildlife species, and a detailed description of the local hydrology.

2.1 Fish Habitat Assessment

Determine the relationship between streamflow and habitat suitability using 1-D or 2-D hydraulic modeling.

2.1.1 Hydraulic Field Data Collection

Target calibration flows for each identified reach will be selected. Physical habitat and hydraulic parameters will be measured and substrate and cover information will be recorded.

2.1.2 Development of Habitat Suitability Criteria (HSC)

HSC will be developed. Bioperiods will be used to focus assessment of protected flows.

2.1.3 Determination of Protected Instream Flows - Hydraulic Habitat Modeling

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Results from the hydraulic model of flow versus habitat relationships will be the basis for determining protected instream flows.

2.2 Riparian Vegetation and Wildlife Flow Assessments
Flow-discharge relationship will be used to map the extent of inundation.

2.3 Recreational Boating
Flows associated with boating activities will be determined, for each boating activity type, during each activity season to determine the instream flows associated with all boating activities.

2.4 Hydrologic Model
Flow records shall be developed which approximate the systems under 'natural' conditions by accounting for all influences due to human activity.

2.5 Development of Draft Report
Normandeau will follow the NHDES publication guidelines. Reports will meet the Americans with Disabilities Act (ADA) 508 requirements and Web Content Accessibility Guidelines (WCAG) AAA standards.

2.6 Safety
Normandeau will develop and implement a site-specific health and safety plan for this project, developed by Normandeau's Health and Safety Officer.

2.7 Quality Assurance
Normandeau will implement Quality Assurance (QA) program for this project that meets or exceeds the guidance criteria of the US Environmental Protection Agency and is consistent with the intent of federal regulations (10 CFR 50).

2.8 Data Transfer to NHDES
All data used to make determinations of the protected instream flow criteria including measurements collected and data used during the assessment will be provided to NHDES using a NHDES-approved data format.

Task III. Protected Instream Flow Public Hearing and Final Report
3.1 Public Information Meeting and Hearing
Normandeau will provide the Protected Instream Flow report at least 30 days prior to the date of the information meeting. Normandeau will attend, present, and answer questions at the public information meeting and the public hearing.

3.2 Development of Final Report
Normandeau staff with coordinate with the NHDES to review and determine responses to the comments and make necessary revisions. The report will contain recommended protected instream flows and the responses to comments.

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Exhibit C
Scope of Services

Exhibit C
Method of Payment and Contract Price

The State shall pay to the Contractor the total reimbursable program costs in accordance with the following requirements.

The Contractor, Normandeau Associates, Inc. will undertake the services presented in the table of tasks below. Payments shall be made based upon percent completion of specific tasks described in Exhibit B. The completion of tasks has been developed based on the predicted availability of funds but is subject to change based on the actual availability of funds. The total reimbursement for the full scope of Ashuelot study work shall not exceed $254,067.

Normandeau Associates, Inc., will bill NHDES monthly for time and materials based on the task percent completed, less 10% holdback until the completion of the project. Project completion will be met by NHDES's receipt and approval of the final report and receipt and approval of the project data sets. All services shall be performed to the satisfaction of NHDES before payment will be made.

No match is required.

Tasks and prices for the Ashuelot River upper and lower protected instream flow studies

Task 1 - Protected Entity Identification and River Survey	$ 68,032
Task 2 - Protected Instream Flow Criteria Development	$ 153,611
Task 3 - Protected Instream Flow Public Hearing and Final Report	$ 32,424
	$ 254,067

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NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

CERTIFICATE

I, Curtis L. Thalken, Chief Executive Officer of the Normandeau Associates, Inc., do
(Printed Name of Certifying Officer) (Office) (Grantee)
hereby certify that: (l) I am the duly elected Chief Executive Officer; (2) at the meeting held on
(Office)
7/7/2020, the Organization voted to accept DES funds and to enter into a contract with the Department of Environmental Services; (3) the Organization further authorized the Chief Executive Officer to execute any documents which may be necessary for this contract;
(Office)
(4) this authorization has not been revoked, annulled, or amended in any manner whatsoever, and remains in full force and effect as of the date hereof; and (5) the following person has been appointed to and now occupies the office indicated in (3) above:

John G. Mokas
(Printed name of officer authorized to sign)

IN WITNESS WHEREOF, I have hereunto set my hand as the Chief Executive Officer of
(Office of Certifying Officer)
the Organization, this 5th day of May.

Curtis L. Thalken
(Signature of Certifying Officer)

STATE OF NEW HAMPSHIRE
County of Hillsborough, New Hampshire
On this the 5th day of May, before me MARIA B. ADAMS
(Notary Public)
the undersigned officer, personally appeared Curtis L. Thalken who acknowledged
(Printed Name of Certifying Officer)
him/herself to be the Chief Executive Officer of the Organization being authorized so to do,
(Office)
executed the foregoing instrument for the purpose therein contained.

In witness whereof, I have set my hand and official seal.

Maria B. Adams
(Notary Public Signature)

Commission Expiration Date:
(Seal)

State of New Hampshire

Department of State

CERTIFICATE

I, William M. Gardner, Secretary of State of the State of New Hampshire, do hereby certify that NORMANDEAU ASSOCIATES, INC. is a New Hampshire Profit Corporation registered to transact business in New Hampshire on August 26, 1983. I further certify that all fees and documents required by the Secretary of State's office have been received and is in good standing as far as this office is concerned.

Business ID: **72458**

Certificate Number: **0005342429**

IN TESTIMONY WHEREOF,

I hereto set my hand and cause to be affixed the Seal of the State of New Hampshire, this 7th day of April A.D. 2021.

William M. Gardner

Secretary of State

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 05/05/2021

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: Margaret Mirisola	
MS Peltier Insurance Services LLC 3 Allied Drive Suite 303 Dedham MA 02026	PHONE (A/C, No, Ext): (857) 287-3500	FAX (A/C, No): (857) 220-3011
	E-MAIL ADDRESS: margaret@peltierinsurance.com	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Normandeau Associates Inc 25 Nashua Road Bedford NH 03110	INSURER A: Travelers Indemnity Company of America	25668
	INSURER B: The Phoenix Insurance Company	25623
	INSURER C: Travelers Property Casualty Company of America	36161
	INSURER D: Pennsylvania Manufacturers Assocociation	12262
	INSURER E: Berkley Insurance Company	32603
	INSURER F: Markel International Insurance Company LTD	10744

COVERAGES **CERTIFICATE NUMBER:** 20-21 Master FULL FORM **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 [ ] LOC [ ] OTHER:		Y	6306J480312	06/30/2020	06/30/2021	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG [ ]	$ 1,000,000 $ 1,000,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000 $
B	AUTOMOBILE LIABILITY [ ] ANY AUTO [ ] OWNED AUTOS ONLY [X] SCHEDULED AUTOS [X] HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY [ ]		Y	8101N513284	06/30/2020	06/30/2021	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) [ ]	$ 1,000,000 $ $ $ $
C	[X] UMBRELLA LIAB [X] OCCUR EXCESS LIAB [ ] CLAIMS-MADE [ ] DED [X] RETENTION $ 25,000		Y	ZOB14R9438520ND	06/30/2020	06/30/2021	EACH OCCURRENCE AGGREGATE [ ]	$ 9,000,000 $ 9,000,000 $
D	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	Y	0903260Y	06/30/2020	06/30/2021	[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
E	Professional / Pollution Liability Retro date 2/11/1987			CCP2029405-11	06/30/2020	06/30/2021	Per Occurence General Aggregate Deductible	$3,000,000 $6,000,000 $25,000

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

Insurer C - Hull & P&I Policy #ZOH14R9424418ND Eff: 6/30/2020 - 6/30/2021 $1,000,000 P&I $5,000 Ded
Insurer F - Maritime Employers Liability Policy #B19062006020 Eff: 6/30/2020 - 6/30/2021 $1,000,000/$1,000,000 each occ/gen agg
Insurer G - American Longshore Mutual Association - US Longshore & Harbor WC Act - Policy #ALMA0179304 Eff: 6/30/2020 - 6/30/2021

NAI # 2021-08-008 – Agreement Form Number P-37 Dated 5/4/2021 - A waiver of subrogation shall apply per the written contract and where allowed by law.

CERTIFICATE HOLDER

NH Department of Environmental Services
29 Hazen Drive
PO Box 95
Concord MA 03302-0095

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

Addendum 1

Normandeau Associates, Inc.

Response to Request for Qualifications

and Proposals for Protected Instream Flow Studies

for the Ashuelot and Isinglass Designated Rivers

February 22, 2021

Final Work Scope, Budget and Schedule

April 22, 2021

Prepared For
New Hampshire Department of Environmental Services
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Concord, New Hampshire 03301

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Addendum 1: Scope of Work

Protected Instream Flow Studies for the Ashuelot and Isinglass Designated Rivers

Introduction

New Hampshire's designated river watersheds contain a multitude of environmental attributes of high intrinsic value, including both terrestrial and aquatic habitats. Protection, management and, where necessary, restoration of such habitats are all critical to the maintenance of wildlife and fish species that are dependent upon these habitats. The state of New Hampshire identified and defined important instream public uses as "...including, but not limited to: navigation; recreation; fishing; storage; conservation; maintenance and enhancement of aquatic and fish life; fish and wildlife habitat; wildlife; the protection of water quality and public health; pollution abatement; aesthetic beauty; and hydroelectric energy production."

The EPA's Clean Water Act (CWA) described designated uses relevant to the Ashuelot River as : "(a) Swimming and other recreation in and on the water, meaning.....swimming, wading, boating of all types, fishing...and similar activities; (b) Fish consumption.....(c) Shellfish consumption (not applicable).... (d) Aquatic life integrity, meaning the surface water can support aquatic life, including a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of the region; (e) Wildlife meaning the surface water can provide habitat capable of supporting any life stage or activity of undomesticated fauna on a regular or periodic basis and (f) Potential drinking water supply...".

During Task 1 Protected Entity Identification and River Survey, all instream public uses and designated uses (collectively called "Protected Entities") for the Ashuelot and Isinglass Rivers will be fully identified and addressed. This work will be integrated with the flow criteria analysis developed during Task 2 and public input from Task 3 to complete the study. The final report will provide the NHDES Commissioner with the scientific basis to issue a complete and fully defensible decision in order to establish protected instream flows as required in Env-Wq 1904.05.

Task I. Protected Entity Identification and River Survey

As described below, the flow-dependent protected entities associated with the Ashuelot River and Isinglass River watersheds will be identified by a multi-stage process including: a) literature review of existing state, federal, and local documentation on watershed attributes; b) personal communication with state biologists and managers familiar with each watershed; and c) site-specific surveys of each designated river segment.

1.1 Reconnaissance Level Surveys

Normandeau's will perform a reconnaissance-level survey of the entire lengths of the Ashuelot and Isinglass segments, as described below.

To assess the presence/absence of instream and public designated uses, including fish, BMI, wildlife, vegetation, and recreational use, the majority of each river segment will be traversed on foot or by boat, with limited exceptions, including some marshes and other stillwater habitats, and known whitewater reaches. Marsh habitats would require significant added effort, equipment, and costs to navigate, whereas in most cases it can be confidently assumed that designated uses through the length of the marshes would be constant - although note that marshes known or likely to support protected plants, wildlife, or exemplary natural communities may be surveyed in full. Stretches of high gradient whitewater reaches could similarly be assumed to support aquatic uses as well as boating uses without the necessity of visually inspecting the full lengths of difficult or hazardous locations. In like manner, the upper Ashuelot contains some lengthy reaches of remote channel alternating between low gradient, high gradient, and marsh habitats that will be surveyed at various intervals and the presence of designated uses will be inferred to the intervening, non-surveyed lengths.

In more accessible but non-floatable locations, the river channels will be walked in their entirety to document/verify public and designated uses and the presence or habitat for RTE species, and likewise floatable stretches will be inspected in whole. The river survey will also be used to validate or modify the boundaries of map-determined channel types (low gradient, high gradient, and stillwater). Although this expanded river survey will not include mapping of all mesohabitat units throughout each segment, a subsampling method will be employed to produce a description of the types, lengths, and distributions of mesohabitat types outside of the intensively mapped study reaches. Mesohabitat units will be thus mapped at one-quarter mile intervals, producing a list of about 100 to 120 mesohabitat units in each of the Ashuelot segments, and 50-54 units in the Isinglass segment. The expanded river survey will be used in part to assess the representativeness of selected study reaches, and to compare the assessments of public and designated used between the full survey versus the sub-sampled study reaches described below. Overall, it is expected that in-water surveys will account for approximately 71% by length of the upper Ashuelot River, 91% of the lower Ashuelot River, and 85% of the Isinglass River.

1.2 Fisheries Assessment

1.2.1 Identification of Flow-dependent Rare, Threatened, or Endangered (RTE) Fish Species and Selection of Target Fish Species

No federally listed RTE fish species are expected to occur in the Ashuelot River, however the state and federally endangered dwarf wedgemussel (*Alasmidonta heterodon*) is known to occur in the upper 15 miles of the lower Ashuelot segment (NHFG 2015). A variety of fish species do fall under State RTE designations, including American eel (*Anguilla rostrata*), brook trout

(*Salvelinus fontinalis*), and banded sunfish (*Enneacanthus obesus*) as species of concern (SC) and/or species of greatest conservation need (SGCN) in the upper Ashuelot segment, with American eel and brook trout also listed for the lower Ashuelot segment. In addition to American eel, brook trout, and banded sunfish, the Isinglass River is also listed for bridle shiner (*Notropis bifrenatus*), swamp darter (*Etheostoma fusiforme*), and redfin pickerel (*Esox americanus*) as SGCN, and spottail shiner (*N. hudsonius*) as a state threatened species. According to the NH Wildlife Action Plan (NHFG 2015), several other mussel species are also listed as SGCN in the lower Ashuelot segment. It should be noted that brook trout are known or expected to occur in several tributaries to both streams. Anadromous species state-listed as SC/SGCN are also present in the Connecticut River below the Ashuelot River mouth, and could potentially immigrate into the lower reaches of the Ashuelot River, including sea lamprey (*Petromyzon marinus*) and American shad (*Alosa sapidissima*). Information on these and other state-listed species is available in the New Hampshire Wildlife Action Plan.

The incremental hydraulic model described below will link predicted distributions of water depths, water velocities, and other habitat parameters with biological criteria representing the habitat selectivity of target fish species. These biological habitat criteria, termed Habitat Suitability Criteria (HSC), exert profound influence on the estimation of flow: habitat relationships (see Section 2.1.2 for HSC). Ian Jowett, a noted international expert on instream flow assessments in New Zealand, and the main author of the System for Environmental Flow Analysis, or SEFA, stated the following warning to SEFA users: "*Habitat suitability criteria are the most important part of habitat modeling and have more influence on results than any other part of the procedure. Thus, it is important that the suitability criteria are appropriate; otherwise the results will be erroneous*", Jowett et al. 2014.

Fortunately, Target Fish Community assessments (TFC) have been conducted on both watersheds, which provides recommendations on what fish species would be expected to occur in these rivers given minimal human impact. For example, blacknose dace (*Rhinichthys atratulus*), longnose dace (*R. cataractae*), common shiner (*Luxilus cornutus*), fallfish (*Semotilus corporalis*), and white sucker (*Catostomus commersoni*) are species expected to comprise a majority of the fish community in the both reaches of the Ashuelot River and in the Isinglass River (Gomez and Sullivan 2018a, b).

Normandeau proposes to select target fish species in collaboration with participating agency biologists and river managers, and with emphasis on the results of the TFC, but with modifications based on a number of factors. For example, selection of a species for flow assessment may be due to a) status of a species under the ESA or NH species of concern program (e.g., dwarf wedgemussel, brook trout), b) the likelihood of future presence or absence of a species given protected flows (e.g., the cessation of the Atlantic salmon program makes restoration of this species to many New Hampshire rivers highly uncertain), c) the relative importance of a species due to recreational or esthetic values (e.g. any trout species),

d) a species' unique or rigorous habitat preferences (e.g., fluvial specialist species such as trout, longnose dace, fallfish), etc.

Selected fish species will then be targeted either as an individual species, with HSC developed solely for that fish, or as a member of a habitat guild. Habitat guilds could take several forms, but would be expected to consist of species groups with general preferences for combinations of either deep or shallow water and fast or slow water (e.g., shallow/slow, deep/fast, etc.). Assignment into habitat guilds would be based on literature-based habitat preference information.

As noted above, final decisions on target species, composition of habitat guilds, and HSC representing each, would be made in collaboration with study participants. Normandeau would develop a proposed list with associated HSC and present the candidate HSC for review, discussion, and modification at one or more planning meetings. Also note that Normandeau was the prime contractor for the TransCanada relicensing studies for the Wilder, Bellows Falls, and Vernon dams, and as part of that process a suite of HSC were developed using site-specific data as well as literature-based research through a collaborative process with NH and Vermont agency and NGO participants. Those agency-approved HSC will be available for potential use in this study, for target species common to both studies.

For the purposes of this proposal, Normandeau will assume HSC will be developed for 3 or 4 individual species, and for 4 habitat guilds.

1.2.2 Study Area Stratification, Study Site Selection, and Habitat Mapping

This proposal and associated cost estimate is based on a multi-level stratification design, consisting of 1) stream segments, 2) stream channel types, 3) stream reaches, and 4) mesohabitat units. A stream segment is the basic subdivision of a study area; stream segments were previously delineated as part of the Target Fish Community (TFC) assessments. The Ashuelot River TFC divided the stream into an upper and lower segment at the Surry Mountain Dam and Reservoir (TFC ref), with each segment extending approximately 30-34 miles. The Isinglass River was treated as a single segment (TFC ref) approximately 16 miles in length. Because each stream segment consisted of an alternating series of changing habitat characteristics, further stream delineation was necessary to describe the variation in channel morphologies, and to select study sites representative of each river.

Stream channel types were delineated into three categories based largely on channel gradient and substrate composition, as: 1) stillwater channels, 2) low gradient channels, and 3) high gradient channels. Stillwater channels include reservoir, pond, and marsh habitats. These channel types are relatively insensitive to flow changes (except at flood flow levels), and may be artificially influenced by dam management and/or beaver activities. Stillwater habitats will be assessed for riparian and wildlife values, but are unsuitable for fish habitat modeling. Low gradient channels are mostly composed of flatwater habitat types such as runs, glides, and pools, with few riffles and have substrates predominantly made up of fines and gravel with

minimal boulder or bedrock habitat. High gradient channels possess alternating riffle/run/pool habitats with cobble, boulder, and bedrock substrates. These channel types were identified for this proposal using GIS-derived stream profile plots and Google Earth imagery, and the delineations will be verified during the initial river survey. Low gradient and high gradient channels will exhibit changes in wetted area, water depths, and water velocity patterns as flow changes. These channel types are also expected to be inhabited by the more flow-dependent and riverine species groups, and consequently low gradient and high gradient channels will be the focus of the fish habitat modeling.

The long lengths of the upper and lower Ashuelot segments and the Isinglass segment will require subsampling to effectively assess habitat availability and representativeness, allow for randomization procedures, avoid inaccessible and/or private holdings, and selection of study sites. To accomplish this each channel type will be delineated into shorter stream reaches. Stream reaches in the lower Ashuelot segment will be one mile in length, whereas stream reaches in the smaller channels in the upper Ashuelot and the Isinglass segments will be one-half mile in length. These stream reaches are long enough to provide a proportional availability and range of mesohabitat types for study site selection and transect weighting purposes. As described in Task 1.1, a full-length river survey will also be conducted at a reconnaissance level to assess the presence/absence of public and designated uses, and to identify any RTE species or likely habitat.

Three to four stream reaches will be selected at random from each channel type in each stream segment to represent instream flow study sites. Note that prior to random selection all stream reaches that are inaccessible due to private holdings (without permission to trespass) will be excluded from selection. Likewise all stream reaches that are too remote to access with the necessary instream flow equipment (e.g., some areas of the upper Ashuelot) will be excluded from selection in order to maximize the efficiency of data collection efforts. Each randomly selected stream reach will represent instream flow study sites and will be mapped according to mesohabitat type. Mesohabitat type definitions will be determined in collaboration with NHDES and will be verified during the initial stream channel verification survey, but will likely include riffle, run, glide, and pool habitat types. Four or five mesohabitat units will be randomly selected within each study site in approximate proportion to that reaches availability for placement of cross-sectional transects for fish habitat modeling using one-dimensional (1D) hydraulic models (e.g., PHABSIM, SEFA).

1.2.3 Transect Selection

One transect will be placed in each selected mesohabitat unit, initially using a random process to select the exact location, but final transect locations will be determined in collaboration with NHDES and other agency participants. If the random location is not deemed representative of the overall habitat unit or is not suitable for instream flow modeling (e.g., it crosses dense instream debris, has highly variable water surface elevations, is too hazardous under high flow conditions, etc.), the team may move the transect to a different location. Using the above

procedures, 15 to 16 transects will be placed within each of the two Ashuelot segments, and within the single Isinglass segment, for a total of 45 to 48 transects in both rivers. The above level of effort is similar to conclusions reached by Payne et al. (2004), who recommended that a range of 17-20 transects should be established per reach (or, per segment using the definitions in this proposal).

In addition to the level of effort described above, the stratified sampling design helps to ensure representativeness and statistical validity of the fish habitat modeling by using habitat stratification at the stream segment, channel type, stream reach, and mesohabitat levels, and randomization procedures to select the study sites, mesohabitat units, and transect locations

1.3 Riparian Vegetation and Wildlife Assessment

1.3.1 Identification of Flow-dependent Rare, Threatened, or Endangered (RTE) Wildlife, RTE Vegetation, and Natural/Ecological Communities

Normandeau will conduct a desktop study to identify rare, threatened, or endangered (RTE) wildlife, RTE vegetation, exemplary natural communities, and other wetland/ floodplain and riparian habitats within the river corridors. Normandeau will request a database search from the NH Natural Heritage Bureau (NHNHB); use the US Fish and Wildlife Service (USFWS) IPaC on-line screening tool for federally listed species and migratory birds; and consult the NH Restoration Mapper website, National Wetland Inventory maps, true color and color infra-red aerial photos, Nomination Reports, and other appropriate sources of information (local experts, on-line reports, etc.) for maps and records of these resources.

Some of this information is already available from the NHNHB lists of protected wildlife and species of concern or greatest conservation need within the municipalities, the Local River Advisory Committee websites, the 2018 Isinglass River Management Plan, and the 2006 Ashuelot River Management Plan. These documents note that rare wildlife that may occur along either of these rivers include ribbon snake (*Thamnophis suaritis*), northern leopard frog (*Lithobates pipiens*), Fowler's toad (*Bufo fowleri*), bank swallow (*Riparia riparia*), and wood turtle (*Glyptemys insculpta*); as well as wetland dependent species that may inhabit floodplain wetlands along these rivers, such as Blanding's and spotted turtles (*Emydoidea blandingii*, , *Clemmys guttata*), marsh wren (*Cistothorus palustris*), pied-billed grebe (*Podilymbus podiceps*), black duck (*Anas rubripes*) and sora (*Porzana Carolina*). Common loon (*Gavia immer*), bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) have been observed along the Isinglass corridor, and Small-footed bats (*Myotis leibii*) have been reported to roost in the riprap of Surry Mountain Dam on the Ashuelot River. Both rivers likely support several species of freshwater mussels, and the federally endangered dwarf wedgemussel has been recorded in the Ashuelot River in Keene and Swanzey.

Also noted in the available documents are records for rare plant species along the Isinglass corridor, some of which may be flow dependent, such as river bank quillwort (*Isoetes riparia*)

and Englemann's quillwort (*Isoetes engelmannii*). Black gum (*Nyssa sylvatica*)/red maple (*Acer rubrum*) and Northern New England Rich Mesic Forest types have also been identified as "exemplary natural communities", that occur within the Isinglass corridor (www.isinglassriver.us/about-the-river.html). The management report for the Ashuelot notes marsh horsetail (*Equisetum palustre*) and several species of pondweed are present. Other protected resources may be present, and other flow-dependent wildlife and natural communities, including wetlands, are certainly found along both river corridors.

Normandeau will then evaluate the identified riparian vegetation and wildlife resources for flow-dependent life stages (bioperiods), and eliminate non-flow dependent species and communities from the list. As there are few published Habitat Suitability Indices for the resources likely to be included on the list, flow dependency will be assessed based on landscape position and literature-based data on life cycle periods and habitat requirements, considering flow magnitude, timing, frequency and duration. The approximate locations of flow-dependent riparian species/communities will be mapped for use during field reconnaissance.

A wildlife biologist and botanist will conduct field reconnaissance surveys throughout each river segment (as noted under Task 1.1) in locations with property access to verify the presence of the listed flow-dependent vegetation and wildlife (and/or suitable habitat for them). The reconnaissance will include side excursions into floodplain communities and wetlands if appropriate. The list of flow-dependent resources will be confirmed or modifications (additions or deletions) made as appropriate, and the riparian resource maps will be updated with more detailed information.

1.3.2 Riparian Transect Locations and Survey

Approximate transect locations will be selected based on the riparian resource maps. As possible, transects will directly overlap RTE species/habitat locations, as well as representative wetland, riparian, and floodplain habitats within each project area, particularly any Exemplary Natural Communities that are identified.

Initially, three or four riparian transects along the Isinglass River, and five to seven riparian transects along the Ashuelot River are planned. Transects will span the channel and extend to the riparian corridor or floodplain community on one or both sides of the river. To the extent possible, biologist will select transects in multiple fish habitat reaches as identified by the fisheries biologists.

Biologists will confirm riparian transect locations in the field, mark these with stakes, and survey ground surface elevation, water level, and location at stations along each transect using RTK Leica GPS equipment. Stations (data points) along each transect will be located at RTE species locations, plant community boundaries, slope changes, and habitat features. Vegetation composition and structure and wildlife habitat features will be recorded in photos and on field data sheets. Normandeau will use available LiDAR and/or GIS data to map wetland and floodplain communities that extend beyond transects.

Subsequent transect surveys will take place periodically during the year, corresponding, as possible, to seasonal low flows, average flows and high flows. During these surveys, the biologist will document water elevation and extent of inundation with survey equipment and photos. USGS Gauge flow data corresponding with the time and date of the site visit will be recorded. As needed, seasonally appropriate visits to confirm plant species identification or wildlife habitat use will also take place.

Transects that intersect riparian RTE plants, RTE wildlife or exemplary natural communities are unlikely to be numerous enough for collection of statistically valid data. Establishing sufficient transects to obtain statistically valid data for more common flow-dependent communities, such as emergent wetlands or oxbows, is also problematic, as hydrologic connections to channel flows may be unique for each wetland. Beaver dams, natural levees, or groundwater may have as much or more influence on wetland inundation levels than streamflow. It is also expected, based on the pilot studies, that the protective flows for these riparian resources will be met by protective flows for fish species, which are generally more sensitive to seasonal low flows than wetland vegetation. For these reasons, Normandeau will not seek statistically-significant data using the FPT.

1.4 Recreation Assessment

Recreational boating is identified in both river nominations as being a significant use on the waterways. Both documents reveal that there are numerous access points – both public and private – which are used to launch non-motorized craft. Included within each river reach are stretches of river for flatwater paddling to even a handful of identified rapids, used by whitewater kayakers, best run in the spring when flows are high. More commonly, the rivers are used in their calmer sections during the summer and spring for more relaxed paddling.

Boating uses and access points will be assessed from many directions. Initially, publications will be scoured to determine well-documented sections of the rivers, and what purposes they are reported to serve. The Watershed management Plans are excellent starting points. In addition, the LRAC will be interviewed for their input on recreational uses. Alongside this, federal (for example USFS, USFWS, NPS), state (for example NH Division of Travel and Tourism Development), and local organizations (for example, boat rentals) will be contacted for input on recreational uses. Using the collective knowledge of published and local sources, a list of all the water access points, calm-water activity reaches, and rapid-water activity reaches will be created including all descriptive metadata (use range, flow ranges, quality of use, location confines, impairments, use frequency, etc.). The list will also be developed visually, with plots of the water uses and access points created to assist in subsequent validation and publication.

Following the initial inquiry, field reconnaissance shall commence along selected sections of each river to verify, discover, and further document each of the boating-related uses (including access). This shall be done, wherever possible, by paddling the rivers to obtain personal experience and further familiarize the team to the needs of boaters (see description of full river

survey under Task 1.1). Included in the field visits will be the attempt to quantify the operational use range, either directly or visually. This may include user accounts, recording measurements of relative water stages and depths, or other means of determining when the river section is possible to use for its stated boating purpose, and what the range may be.

Once all possible data has been collected with respect to boating uses along each river, to a degree where constraints may be firmly determined, the flows associated with boating activities may be determined, for each boating activity type, during each activity season. These flows may then be compared to the flow records relevant for each section, to determine the instream flows associated with all boating activities.

Alongside the boating recreation, inquiries shall be made about fishing. It would be expected that, as with the Souhegan and Lamprey, fishing is not especially a flow dependent activity at low flows, rather restrictions are at much higher flows.

Following the initial inquiry, field reconnaissance shall commence along the entirety of each river to verify, discover, and further document each of the boating-related uses (including access). This shall be done, wherever possible, by actually paddling the rivers to obtain personal experience and further familiarize the team to the needs of boaters. Included in the field visits will be the attempt to quantify the operational use range, either directly or visually. This may include user accounts, recording measurements of relative water stages and depths, or other means of determining when the river section is possible to use for its stated boating purpose, and what the range may be. See section 2.4 for additional information regarding the protected instream flows for recreation or navigational boating will be determined. Section 2.4 explains how a protected instream flow for recreation or navigational boating will be determined.

Task II. Protected Instream Flow Criteria Development

A variety of models will be utilized to assess the protected flow criteria, including the flow: habitat relationships for fish and mussels, the flow requirements for aquatic-dependent plant and wildlife species, and a detailed description of the local hydrology.

2.1 Fish Habitat Assessment

The preferred approach for determining the relationship between streamflow and habitat suitability is 1-D or 2-D hydraulic modeling in conjunction with depth, velocity, and substrate/cover criteria for target fish species and life stages. Most comparisons of the two modeling approaches have concluded there is little difference in habitat index results when applied to the same study sites (Waddle et al. 2000, Gard 2009, Gast and Riley 2013). Evaluation of aerial imagery for the Ashuelot and Isinglass rivers reveals that low gradient and high gradient channels in both streams are dominated by single-thread channels and do not possess the level of complexity that would justify the application and cost of a 2-D modeling approach. Although meadow and wetland habitats in the upper Ashuelot River and the Isinglass River exhibit meandering and occasional multi-thread channels, these stillwater channels and

beaver-associated ponding are insensitive to flow changes. Consequently, the simplicity and lower cost of using 1-D hydraulic models was deemed most appropriate and was selected for application in both the Ashuelot and Isinglass Designated Rivers.

2.1.1 Hydraulic Field Data Collection

As with any hydraulic and/or mesohabitat based models it is imperative that over the course of data collection there are no significant changes to the channel. Preferably data collection should take place during the late spring under a descending hydrograph.

Target calibration flows for each identified reach will be selected based upon natural hydrology from established stream gauging stations. The goal is to select flows which will allow hydraulic model extrapolation to at least the 90% and 10% unimpaired annual flow exceedance (AFE) values. Since stage-discharge rating curves can typically be extrapolated down 40% from the low calibration flow and up 250% from the high calibration flow, target low and high calibration flows should be in the range of the 80%-85% AFE and the 15%-20% AFE, respectively, depending on the slope of the AFE curve. These levels of flow are commonly present in normal water years, and neither too low to be rarely present or too high to be unsafe for data collection. Preferably, the middle target calibration flow should be roughly equidistant from the low and high flows on a logarithmic scale to obtain reliable transect rating curves for either 1D or 2D models.

Physical habitat and hydraulic parameters will be measured using a combination of standard techniques of the USFWS methodology (Trihey and Wegner 1981, Bovee 1997) and techniques outlined in this study plan. Hydraulic model data collection methods may vary somewhat between study reaches, depending on physical and channel conditions. For example, different velocity meters may be used in deep versus shallow water, in areas with or without aquatic vegetation, or where data collection at the target flow for a given transect is unsafe and either edge-only velocities are collected or a velocity set is obtained at a lower flow.

Surveying and Controls

All elevations will be surveyed by standard differential survey techniques using an auto-level, total station, or RTK GPS instrumentation. Headpin and tailpin elevations, water surface elevations (WSE), hydraulic controls, and above-water bed and bank elevations will be referenced to a temporary benchmark serving a single transect or transect cluster. Where reasonable (line of sight or single turning point), benchmarks will be tied together. At a minimum, all transects surveyed in a single mesohabitat unit will have a common datum. Transect locations will be fixed, to the accuracy level possible, using a handheld or RTK GPS equipment.

Water Surface Elevation-Discharge

Stage/discharge measurements will be obtained at no fewer than three discharges. Additional stage/discharge measurements may be collected at higher flows (possibly lower also) in order

to model habitat over a greater range of the flow frequency curve. When only a stage/discharge measurement is taken, discharge through the study site will be measured using manual velocity meters or a combination of an ADCP (described below) and manual velocity meters at a cross section suitable for accurate discharge determination.

Calibration Velocity Measurement

One velocity calibration set is to be collected at the high target flow for hydraulic modeling and simulation over the complete flow range. The calibration set may be obtained at a middle or even low flow if conditions are unsafe at the high flow. At transects and flows where depths are predominantly greater than 4.0 feet, velocity distributions would be most efficiently measured using an Acoustic Doppler Current Profiler (ADCP) mounted on a flotation device; although other methods may be used. In areas that can be successfully measured by wading, measurements will be taken using any calibrated digital, magnetic, or manual velocity meter mounted on standard USGS top-set wading rods. The standard method for determining mean column velocity will be a single measurement at six-tenths of the water depth in depths less than 2.5 feet, a two-tenths and eight-tenths measurement for depths between 2.5 feet and 4.0 feet, and all three depths where total depth exceeds 4.0 feet. Additional measurements at these three depths should be taken where the velocity distribution in the water column is abnormal and fewer points are not adequate to compute an accurate mean column water velocity.

To assure adequate characterization of micro habitat for all life stages (e.g. adult, fry, juvenile, and spawning), during manual velocity measurements, verticals along each transect will be purposefully placed to describe points where changes in substrate/cover, bed elevation, and velocity occur. The number of verticals will be adjusted in the field to accomplish micro habitat stratification as dictated by site-specific conditions, and will also be increased in stream margin areas where fry or juvenile fish habitat is present. The placement and number of verticals should be designed to limit discharge around any one vertical to no more than 10% of the total discharge. To meet this standard, more verticals can be placed by default in deep, fast sections using professional judgment and experience, or discharge can be calculated in the field at the time of data collection and more verticals added as needed.

Temporary staff gage levels located adjacent to the study site will be recorded at the beginning and end of each transect measurement to identify changes in discharge. Continuous recording level-loggers may be deployed in certain reaches to monitor changes in stage during the calibration measurements. A continuous record of stage is useful in modeling if flows do change during calibration measurements. In the event a noticeable fluctuation (>0.05') in stage occurs it may be necessary to re-measure discharge and WSL at one or more transects. Each cluster of transects should have at least one transect capable of accurately computing discharge, even if it has to be added for the purpose.

Substrate and Cover

Substrate and cover information is recorded at each vertical; actual substrate and cover descriptions will be determined during project scoping and in conjunction with HSC development. This process assures that the correct metrics are collected to match HSC for substrate and cover for individual species and life stages.

2.1.2 Development of Habitat Suitability Criteria (HSC)

As described in Task 1, HSC will be developed for targeted individual species as well as for habitat guilds (e.g., deep/slow, shallow/fast, etc.). Normandeau's instream flow specialists have developed site-specific or collaborative-based HSC for 58 species of fish, amphibians, or invertebrates in 16 states, territories, or provinces from 80 rivers or streams within the U.S., Canada, and the tropical Pacific. For this project, HSC will be developed for each river using an incremental methodology, as outlined below:

1. Locate existing HSC for target species and habitat guilds. Normandeau maintains an exhaustive database of HSC datasets representing over 50 species.
2. Document supporting data used to develop HSC, including strengths and weaknesses (e.g., sample sizes, sampling methodologies, validation, etc.).
3. Filter datasets to emphasize HSC developed from (or meant to represent) riverine habitats proximal to and/or similar in physical character to the Ashuelot or Isinglass Rivers (e.g., filter-out non-representative HSC).
4. For guild HSC, evaluate depth and velocity characteristics of individual species' habitat preferences for assignment into appropriate guild, using visual plot comparisons or (data permitting) multivariate habitat analysis.
5. Although this proposal does not include costs or procedures for developing site-specific HSC, a full HSC study for target species, or a transferability test of existing HSC, can be performed upon request. Normandeau has collected HSC transferability data from 6 river basins ranging from small coastal salmonid streams to large mainstem rivers in California's Central Valley and Idaho's Salmon River Basin; such studies generally followed procedures outlined in Thomas and Bovee (1993) and Groshens and Orth (1994).
6. Present potential HSC datasets along with supporting data and (if conducted) transferability results to HSC committee for review, discussion, and selection of final HSC for use in hydraulic modeling.
7. Draft and final reports will contain chapters on the methods and results of the HSC development process.

For target species assessed on an individual basis, HSC will be developed to represent specific life-stages, which will then be linked to that life-stages periodicity. Life-stages for resident, non-

migratory species typically include spawning, juvenile rearing, and adult rearing. Periodicity tables will be developed to link each species life-stage to calendar time periods, which will represent locally important bioperiods. These bioperiods will be used to focus assessment of protected flows. For example, brook trout and fallfish both have very specific spawning habitat requirements for depth, velocity, and substrate characteristics. However fallfish are a spring-spawning species and brook trout spawn during fall months. These individual periodicities in combination with prioritization of target species and life-stages will dictate which bioperiods are used to develop protected flows over the course of the year. As described above, such prioritization will be made in collaboration with participating agencies and NGO's.

2.1.3 Determination of Protected Instream Flows - Hydraulic Habitat Modeling (SEFA)

Results from the hydraulic model of flow versus habitat relationships will be the basis for determining protected instream flows. For 1-D applications in this study, the hydraulic models and habitat index simulations will be derived from the computer program SEFA (System for Environmental Flow Assessment, http://sefa.co.nz/). This program was developed jointly by originators of the primary models used in instream flow studies, Tom Payne (RHABSIM), Bob Milhous (PHABSIM), and Ian Jowett (RHYHABSIM) and merges and expands on the capabilities of these older software packages.

Hydraulic modeling procedures appropriate to the study site and level of data collection will be used for modeling water surface elevations and velocities across each cross-section. For water surface elevations, these procedures include: the development of stage-discharge rating curves using log-log regression, channel conveyance and/or step backwater models (WSP, HEC-RAS); direct comparison of results; and selection of the most appropriate and accurate method. If, for example, rating curves using log-log and channel conveyance methods are nearly identical, then log-log will be used to easily allow changes in simulated flows. But, if the two methods diverge and the transect is a riffle or run, the channel conveyance method should be selected for flow simulation. Water velocities will be simulated using the Manning's *n* method of velocity distribution across all transects, with calibrations generally consisting of correction of over- or under-simulated velocities at individual sample points (i.e. velocity adjustment factors or VAFs). Data file construction, calibration, simulation, reporting, review, and consultation will follow standard procedures and guidelines.

1D and 2D hydraulic models consist of sample points in the stream that include depth, mean column velocity and a channel index for substrate and/or cover. Habitat suitability values for depth, velocity and substrate and/or cover are multiplied to produce a combined suitability index (CSI) with a value of zero to one for each sample point. Because these samples are most often at irregular intervals they are "weighted" by the distance between points. The output of a PHABSIM model is weighted usable area (WUA) or area weighted suitability (AWS). Bovee (1982) defined WUA as: "The surface area of each cell is weighted by a suitability index, Ci,s, which reflects the relative preference of the species for the combination of structural and hydraulic characteristics found in the cell at a given discharge. This produces an index of the

habitat potential for the cell called the weighted usable area (WUA)." Over time many researchers and scientists began to refer to WUA as habitat area or microhabitat area. Williamson et al. (1993) noted that the multiplication of a dimensionless suitability value times an area produces an index, not an actual area. This concept resulted in a recent change expressing results as area weighted suitability (AWS) and stating it is not a measure of actual physical area but a measure of microhabitat availability (SEFA manual).

Mesohabitat types will be weighted and combined to develop a representation of hydraulic characteristics and fish habitat suitability for each reach or sub-reach. Mesohabitat weighting will be based on the relative proportion of each of the modeled mesohabitats within the reach or sub-reach. A final habitat index for each study site will be produced by combining hydraulic simulations over a range of flows with HSC for selected species and life stages.

The AWS habitat index versus discharge function is a static relationship between discharge and habitat that does not represent how often a specific flow/habitat relationship occurs. For this reason the index alone should not be considered the final result of a hydraulic habitat model. A more complete analysis is the habitat time series that integrates the habitat index versus flow function with hydrology of daily streamflow records provided by NHDES and Streamworks to provide a dynamic assessment of flow versus habitat (see Section 2.4). Habitat time series will be constructed for designated rearing and spawning bioperiods determined for each target fish species and life stage.

Initial habitat flow thresholds will be identified using a combination of habitat duration curves, standard statistics and Event Analysis to determine magnitude, duration and frequency of natural habitat flow events for each bioperiod, tools that are currently integrated into the SEFA time series module. After an initial threshold is identified Normandeau will use an iterative process that to help identify other potential threshold levels. For example if Normandeau determines that habitat levels begin to decline rapidly at 50% habitat exceedance, using an Event Analysis Normandeau can compare the number of separate and contiguous events at the 50% habitat value (AWS) to those that occur at 10% intervals of declining habitat. This assists in zeroing in on conditions where sudden change in habitat conditions may occur.

In an Event Analysis, different types of events can be analyzed. The first simply counts the number of times the event is met within each year and season. The meaning of the result will depend on the form of the data. For example, if the data are weekly samples the analysis reports the number of weekly samples that met the event criteria in each season and year. If the samples were collected daily, the reported result will be the number of days in each season and year that meet the event criteria. The second type of analysis counts the number of separate (contiguous) events, where the event criteria are met contiguously throughout the event. A separate event begins when the event criteria are triggered and ends when the variable falls outside the event criteria or the season ends. Thus if an event runs contiguously from one season to another or from one year to another, it is reported as two separate events. The season and start month can be adjusted to ensure that the season encompasses the events

considered critical. An event analysis uses an imported flow file. If an AWS relationship is also selected, the event analysis can be carried out on the AWS values that result from the AWS relationship being applied to the flow variable. Event analysis allows you to carry out a year by year, season by season, or bioperiod analysis of events. To do this you must specify the date/time variable and one or two variables that define the event. The Event Analysis tool also allows one to omit or include only those flows of interest. For example, the AWS versus flow curve for a life stage may have the same values at two different flows. If only interested in low flows Normandeau can specify a flow level not be exceeded.

Another tool that is integrated into SEFA and will be incorporated into the determination of protected flows is the UCUT analysis (Capra et al. 1995, Parasiewicz 2007). The reports referenced in the RFP indicated this tool was used in the two previous pilot studies on the Lamprey River and Souhegan River. Some reviewers of the previous pilot studies[1] were concerned that the UCUT analysis is somewhat arbitrary and subjective, particularly with respect to identifying inflection points in UCUT curves. However the process is relatively straightforward and would not require much in additional time and effort. Plus incorporating UCUT would maintain consistency between this study and previous pilot studies.

In practice, the actual determination of protected instream flows depends on judgement as well as on statistical frequencies. Basic biology must be used when deciding flow levels that are protective for target species and other species that occupy the same stream and habitat. The determination of protected flows for the pilot studies was based partly on the Natural Flow Paradigm, which assumes that aquatic species are supported by naturally varying flows to which they are adapted. To further describe the assessment of protected flows in the pilot studies, three flow magnitudes were specified for each bioperiod: common, critical, and rare, where: the **common flow** is the flow corresponding to the highest habitat magnitude above which the frequency of occurrence begins to decline significantly. The **critical flow** is the flow corresponding to the second to the lowest habitat magnitude. Critical flow magnitudes describe less habitat availability than that provided by the common flow, but this habitat magnitude is not unusual. The **rare flow** is the flow corresponding to the lowest of habitat magnitudes for which the frequency of occurrence increases significantly. Rare flow habitat availability is severely reduced and very uncommon.

Normandeau proposes to apply these same descriptors when identifying specific flows and ranges of flows necessary to support and protect aquatic habitat in the Ashuelot and Isinglass Rivers.

[1] Summary of the Instream Flow Council's Review of the Souhegan and Lamprey Instream Flow Pilot Studies - April 2010

2.2 Riparian Vegetation and Wildlife Flow Assessments

Where possible, the hydraulic habitat model will be used to assess low flow requirements for aquatic wildlife such as freshwater mussels, or semi-aquatic species with submergent life stages, but that modeling is not expected to extend beyond the bank full elevation to riparian or floodplain areas. Protective flows for riparian vegetation and non-aquatic wildlife will be determined using the floodplain transect method (FPT). FPT transects will extend beyond the bank full elevation and into adjacent floodplain, to cover vegetation and wildlife habitats not covered by aquatic modeling for fisheries/mussels. The floodplain transects will be established across the channel, banks, and on into the floodplain, across any oxbow pools, and potentially to the adjacent upland, and will be used to identify inundation extent and water depths. The FPT relates the elevation of plant communities and wildlife habitats along transects to the magnitude, frequency and duration of inundation of these resources at observed flows referenced to available USGS Gaging Station data, temporary staff gauge data, or level logger data on the river. This stage-discharge relationship allows correlation of flow with the flow-dependent bioperiods of the riparian resources identified in Task I.

The same flow-discharge relationship will be used to map the extent of inundation at selected flows in the vicinity of up to two flow-dependent riparian resources along each river corridor that might not have been surveyed by transects. At these selected locations, LiDAR topography would be used in lieu of ground survey to estimate inundation extents, Federal Emergency Management Agency (FEMA) maps and data will support floodplain identification, and resource landscape position would be based on reconnaissance and/or desktop information. The potential area of flow effect on flow-dependent habitats, such as floodplain marshes, would be estimated based on National Wetland Inventory mapping of similar wetlands along the river.

2.3 Recreational Boating

Once all possible data has been collected with respect to boating uses along each river, to a degree where constraints may be firmly determined, the flows associated with boating activities can be determined, for each boating activity type, during each activity season. These flows will then be compared to the flow records relevant for each section, to determine the instream flows associated with all boating activities.

2.4 Hydrologic Model

Two fundamental hydrologic datasets are necessary for this study: long-term average daily streamflow and instantaneous peak flows (2-year up to 100-year floods). The long-term daily flows may be transformed into flow duration curves for each river, which are basically the flow probability distributions. The long-term flows themselves assist in understanding not only frequency (probability) but habitat availability and the duration of time such habitat is available. The instantaneous peak flows are necessary to understand floodplain flooding and attendant habitat, flow-dependent characteristics. With the determination of long-term flow

records for each river, flow statistics may then be synthesized to support the development of the Protected Instream Flows (PISFs).

As stated in the RFP, a long-term flow record (at least 30 years, and perhaps up to 50 years) for each river shall be provided by NHDES, tied to an existing USGS gage, of which there exists one on each river. The QPPQ record extensions for these projects have been developed for the gaps in record for USGS 01157000 ASHUELOT RIVER NEAR GILSUM, NH and USGS 01072870 ISINGLASS R AT ROCHESTER NECK RD, NR DOVER, NH. These records shall be used as the basis to develop flows at any point along the entirety of each designated river. To be consistent, developing flows at other locations along the designated rivers will also use the QPPQ method, in which flows at other location are developed by first recalculating the general Pareto distribution parameters for the watershed to that location.

To begin, this study shall take the singular flow records for each river provided by NHDES. If no other information is provided by NHDES, we will only be able to use the FDC (as flow per unit area) uniformly along each river, which is equivalent to using a watershed area weighted FDC. However if NHDES provides the watershed data it used to compute the GPA probability distribution (QPPQ) parameters for the flow record it provides, then we can develop an FDC at other locations along the rivers with the QPPQ method. These parameters are: (SOIL - potential maximum moisture retention index (inches); PREC - 1950-1990 mean annual precipitation (inches per year); ELEV - mean watershed elevation (feet); ASPECT - watershed orientation in degrees relative to north; %LAKEPONDRES - the percentage of watershed area covered by lakes, ponds and reservoirs; %IMPERV - the percentage of watershed area covered by impervious cover; %HSC - the percentage of watershed area covered by USDA NRCS Hydrologic Soil Group C; CSLOPE - the slope of the main stream channel (feet/mile); and TEMP - the mean annual air temperature (°F).

The three sources and methods listed previously – USGS gaged flows, QPPQ predicted flows, and concurrent flow calibration – will result in a highly accurate and long-term set of flows at hydraulically-similar sections of each river, from which flows at any point along either river may be determined directly, or using a drainage area ratio. These flow records reflect the rivers as the currently exist, however, and may not be fully representative of 'natural' conditions. As PISFs aim to protect natural characteristics in addition to human uses[2], the current hydrology for each river shall be assessed to determine the departure from 'natural' conditions. If flow regimes in either river show large influences from human impacts, flow records shall be developed which approximate the systems under 'natural' conditions by accounting for all influences due to human activity. Here, the water use records for all users within and upstream of the designated reaches will be collected and compared to the initial long-term hydrograph

[2] PISF values are integral to the management of water within a river system, and aim to identify and protect flows required for both human uses and natural conditions, together referred to as Instream Public Uses, Outstanding Characteristics, and Resources (IPUOCR)

developed from USGS stream gage records. The two records will be compared to distinguish if water uses affected or were built into the long-term records in order to understand if the long-term records require modifications that account for water uses.

With the existing – and if appropriate the 'natural' – hydrology determined for each river in its entirety, flow statistics may then be deciphered using the long-term records. Each segment identified for each river for its purpose, characteristics, and/or use may then be able to identify what statistics are relevant, during what specified time period. Periods may be defined annually, and even seasonally – with the seasons able to fit a range of definitions; a season may be defined as the span of time an activity is possible (canoeing), it may define a natural need (spawning), and also per the definitions of seasons for water resources (by NHDES).

Registered water users along the designated rivers shall be documented via the state database. A review of water use per watershed area at the USGS gage compared to other locations along the river will be performed. If net water use (withdrawal minus return flow) per unit area differs by more than 15% in this comparison, the developed long-term hydrographs at other locations along the river from the gage, will be modified to accommodate the differences in water uses.

For the instantaneous flood peak flows, the previously identified USGS streamgages on each designated river shall be used to develop peak flows using Bulletin 17-C methods. These shall be compared to predictions by StreamStats. If StreamStats predicts within 15% of the Bulletin 17-C method, then StreamStats estimates shall be used along the designated river where necessary. Should StreamStats be outside of the 15% error, then the Bulletin 17-C method used and prorated by watershed area to develop peak flows at other locations along the designated rivers.

2.5 Development of Draft Report

Upon award contract, the project team will meet with agency staff to determine appropriate milestones and dates for meetings (roughly on a quarterly basis), and establish a communication method and schedule (such as weekly updates). The project team and agency staff will agree on a method and outline, and following pre-determined communication methods, will development the report.

When preparing draft and final documents submitted for this project, Normandeau will follow the NHDES publication guidelines provided to us by NHDES. Draft and final reports will meet the Americans with Disabilities Act (ADA) 508 requirements and Web Content Accessibility Guidelines (WCAG) AAA standards. Normandeau anticipates receiving a NHDES report number and electronic NHDES logo.

2.6 Safety

Normandeau will develop and implement a site-specific health and safety plan for this project, developed by Normandeau's Health and Safety Officer, with input from field biologists involved with this project. Elements of the safety plan will include identification of potential hazards, e.g., slip/fall injuries, heat or cold injuries, drowning, etc., and will clearly identify emergency contact numbers and the locations of the nearest emergency facilities. The safety plan will be reviewed by each employee involved with this project prior to initiation of field surveys.

2.7 Quality Assurance

Normandeau will implement Quality Assurance (QA) program for this project that meets or exceeds the guidance criteria of the US Environmental Protection Agency and is consistent with the intent of federal regulations (10 CFR 50), which require that QA be separated from operational and budgetary concerns.

2.8 Data Transfer to NHDES

All data used to make determinations of the protected instream flow criteria including measurements collected and data used during the assessment will be provided to NHDES. Using a NHDES-approved data format, Normandeau will provide the expected data sets using a secure data file transfer system.

Task III. Protected Instream Flow Public Hearing and Final Report

Normandeau expects routine and concise communication with NHDES as the project progresses regarding the assessments and communication of these assessments to the public by NHDES.

3.1 Public Information Meeting and Hearing

Normandeau will provide NHDES with four paper copies and an electronic copy (Word and PDF copy, if requested) of the Protected Instream Flow report at least 30 days prior to the date of the information meeting. Normandeau will attend, present, and answer questions at the public information meeting and the public hearing. The presentation will describe the protected instream flow criteria and its development.

3.2 Development of Final Report

After receiving compiled comments received by NHDES during the 30-day comment period, Normandeau staff with coordinate with the agency to review and determine responses to the comments. Normandeau will work with NHDES staff to make necessary revision to the Protected Instream Flow report and document responses to the comments. When developing the final report, Normandeau will follow the NHDES publication guidelines provided to us by NHDES. In addition to an introduction and background, full descriptions of methods and materials, results, and general discussion, the report will contain recommended protected instream flows and the responses to comments, for NHDES to establish a protected instream

flow criteria. Normandeau will submit four paper copies and an electric copy (word and PDF formats) of the final report to NHDES for approval. As noted above, draft and final reports will meet the Americans with Disabilities Act (ADA) 508 requirements and Web Content Accessibility Guidelines (WCAG) AAA standards. Normandeau anticipates receiving a NHDES report number and electronic NHDES logo.

Costing

The time and materials cost estimate below is based on a number of assumptions, including:

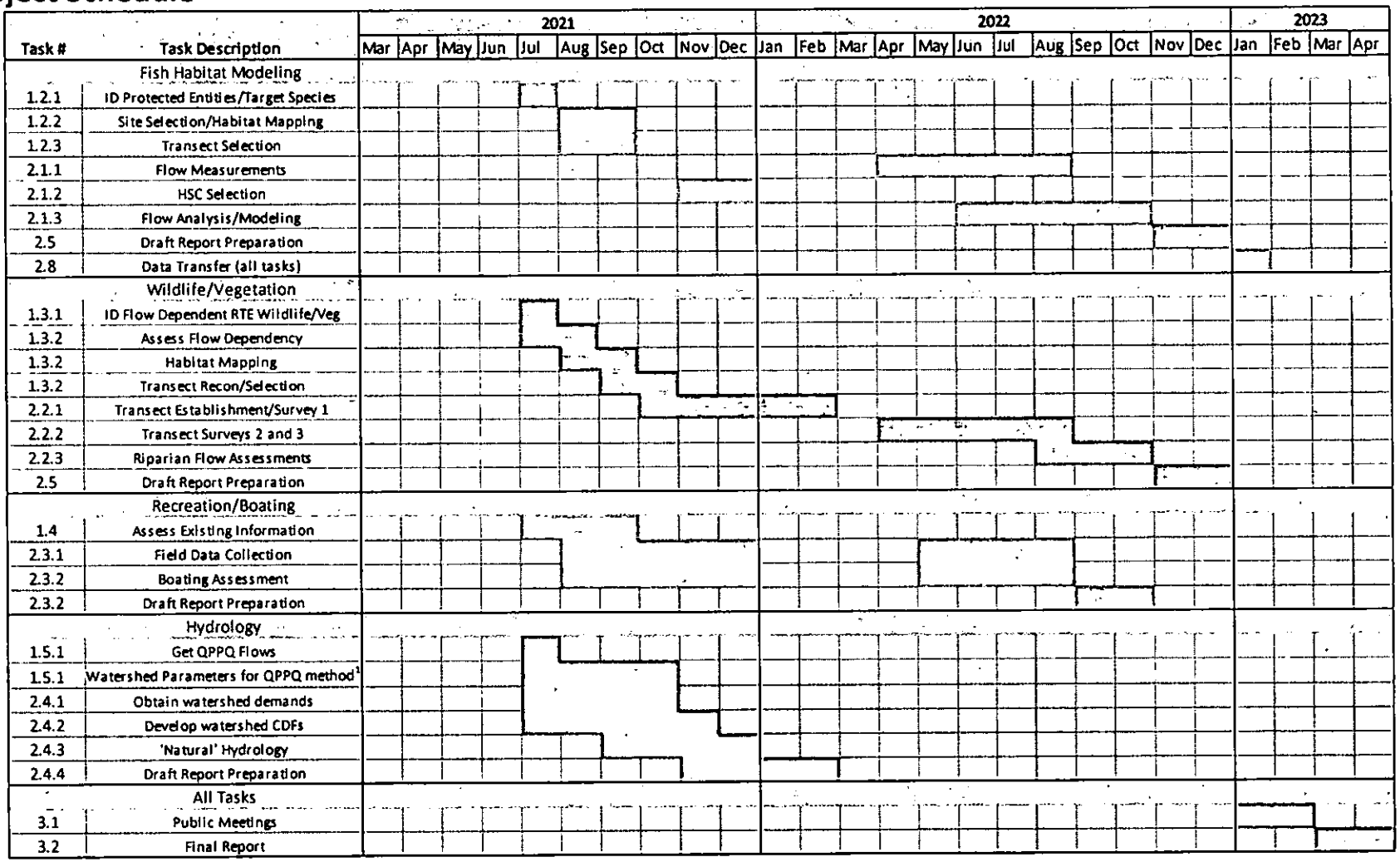
- No significant delays in field work or other tasks due to COVID-19 restrictions;
- All meetings are assumed to be virtual, additional costs for travel to in-person meetings can be provided upon request;
- No delays in field work or loss of equipment/monitoring sites due to extreme weather conditions (e.g., hurricanes, severe floods, severe droughts, etc.) or other acts of God;
- NHDES provides an access map and acquires trespass permissions from private landowners associated with selected study sites;
- Fish habitat modeling costs are based on a total of 16 transects in 4 study sites in the lower Ashuelot River segment, 16 transects in 4 study sites in the upper Ashuelot River segment, and 12 transects in 3 study sites in the Isinglass River;
- Fish habitat data will be collected at high, medium, and low flow levels at each transect;
- Loss of data due to major alterations in transect profiles from extreme weather events (as noted above) may require additional survey effort and associated funding to replace lost data;
- For the Wildlife and Vegetation tasks, 3-4 riparian transects will be placed along the Isinglass River, and 5-7 riparian transects will occur along the Ashuelot River;
- Where possible, riparian transects will be coordinated with fish transects;
- Desktop mapping resources and field reconnaissance will be used to supplement transect data in selected locations if additional protected resources are identified;
- Daily travel assumes COVID-protocols multiple personnel are allowed to travel together in a single vehicle

Task	Assessments	Lower Ashuelot	Upper Ashuelot	Isinglass
Task 1	Protected Entity Identification and River Survey *	$35,508	$32,524	$30,791
Task 2	Protected Instream Flow Criteria Development	$79,734	$73,877	$93,513
Task 3	Protected Instream Flow Public Hearing and Final Report	$16,212	$16,212	$29,018

* Task 1 costs increase from original budget to account for full river survey

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Project Schedule



1 - assumes flows available from NHDES by July 2021

Attachment A
Award Ranking

Ashuelot River Protected Instream Flow Study Proposal Rankings

Requests for Proposals to conduct instream flow studies on the Ashuelot River was posted online and distributed by targeted email on January 27, 2021. Proposals were accepted until 4:00 PM, on Monday, February 22, 2021. Firms were to be judged based on three criteria: Specialized Experience of the Project Team (30 Percent); Project Approach (50 Percent); and Project Cost (20 Percent).

NHDES received three proposals by that time, from Gomez and Sullivan Engineering (GSE), Biohabitats Inc., and Normandeau and Associates. NHDES reviewers agreed that each firm had sufficient credentials to be offered an opportunity to interview with the NHDES reviewers. Interviews were held virtually with each firm on March 18, 2021 for an hour and a half each.

Following review of the proposals, and interviews, the NHDES reviewers met on March 23, 2021 and after further input by each firm and further review, NHDES reviewers met again on April 6, 2021. The reviewers determined that Normandeau and Associates represented the best combination of staff experience, study approach and cost. Normandeau Associates was also the lowest cost proposal.

Scoring Summary

		Reviewer scores					
Firm	Criteria	Reviewer 1	Reviewer 2	Reviewer 3	Reviewer 4	Reviewer 5	TOTALS
Normandeau Bid amount $254,110	Specialized Expertise	27	24	28.5	27	27	
	Project Approach	37.5	37.5	35	45	42.5	
	Cost	20	20	20	18	19	
	TOTAL	84.5	81.5	83.5	90	88.5	**428**
Biohabitats Bid amount $267,074	Specialized Expertise	25.5	25.5	27	27	21	
	Project Approach	37.5	40	40	47.5	37.5	
	Cost	18	19	18	18	16	
	TOTAL	81	84.5	85	92.5	74.5	**417.5**
GSE Bid amount $457,390	Specialized Expertise	28.5	27	28.5	27	28.5	
	Project Approach	50	47.5	50	42.5	45	
	Cost	10	10	10	10	10	
	TOTAL	88.5	84.5	88.5	79.5	83.5	**424.5**

NHDES Watershed Management Review Team Members

Name	Title	Years of Experience
Ted Diers	Administrator, Watershed Management Bureau	10
Andrew Chapman	Biomonitoring Section	8
David Neils	Limnology Center Director	20
Joseph Schmidl	Instream Flow Environmentalist	1
Wayne Ives	Instream Flow Specialist	20