ARC

18

STATE OF NEW HAMPSHIRE
DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH SERVICES

Lori A. Weaver
Commissioner

Patricia M. Tilley
Director

29 HAZEN DRIVE, CONCORD, NH 03301
603-271-4501 1-800-852-3345 Ext. 4501
Fax: 603-271-4827 TDD Access: 1-800-735-2964 www.dhhs.nh.gov

December 5, 2023

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

REQUESTED ACTION

Authorize the Department of Health and Human Services, Division of Public Health Services, to enter into a **Retroactive, Sole Source** contract with Trustees of Dartmouth College (VC#177157), Hanover, NH, in the amount of $500,000 for the Merrimack, New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study as appropriated in New Hampshire House Bill 2 (HB2), with the option to renew for up to two (2) additional years, effective retroactive to July 1, 2023, upon Governor and Council approval through June 30, 2025. 100% General Funds.

Funds are available in the following account for State Fiscal Years 2024 and 2025, with the authority to adjust budget line items within the price limitation and encumbrances between state fiscal years through the Budget Office, if needed and justified.

05-95-90-900510-5466 HEALTH AND SOCIAL SERVICES, DEPARTMENT OF HEALTH AND HUMAN SERVICES: DIVISION OF PUBLIC HEALTH. BUREAU OF INFORMATICS, NH KIDNEY CANCER SURVEY 100% General Funds

State Fiscal Year	Class / Account	Class Title	Job Number	Total Amount
2024	102-500731	Contracts for Prog Svcs	90005466	$300,000
2025	102-500731	Contracts for Prog Svcs	90005466	$200,000
			Total	**$500,000**

EXPLANATION

New Hampshire House Bill 2 (HB2), effective July 1, 2023, appropriated funding to the Department to conduct the Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study. This request is **Retroactive** due to the urgency of the Phase 3 Feasibility Study due to statistically higher rates of Kidney Cancer in the Merrimack area and the time limited funding. Designing and carrying out a feasibility study is a lengthy and involved process with steps that introduce unavoidable opportunities for delays such as obtaining Institutional Review Board approval, privacy and data security protections, participant recruitment and providing adequate opportunities for community engagement in the design process. The limited timeframe of fund availability and the urgency of the public interest in progress on this effort necessitate that the vendor works as quickly as possible to ensure that results are obtained by the funding end date of June 30, 2025.

This request is **Sole Source** because the Contractor is the only vendor able to provide the necessary services. The Contractor has been operating and maintaining the NH State Cancer Registry since 1985 and has established a well-developed cancer data reporting and analysis mechanism. The Contractor is the only National Cancer Institute designated Comprehensive Cancer Center in New Hampshire, allowing for ample resources, including academic researchers, to complete this project in a successful manner. If another Contractor were to be selected, it would affect the timely design, approval, and execution of Phase 3 and place undue burden on the NH State Cancer Registry, the state, and the new Contractor to fully design and operationalize the Phase 3.

The purpose of this request is for the Contractor to complete the Phase 3 Feasibility Study to evaluate potential exposures that may contribute to the excess number of kidney cancer described in the Cancer Incidence Report of Merrimack, NH. The Contractor will identify any next steps, including whether an epidemiological study (Phase 4) is warranted. The Contractor will also identify appropriate cancer(s) of interest, area(s) of interest, environmental exposure(s) of interest, and health outcomes for inclusion in the study if warranted.

The Department will monitor services by:

- Participating on the Steering Committee.
- Reviewing quarterly progress reports.
- Reviewing key data and metrics collected for the study.
- Reviewing Phase 3 results.

As referenced in Exhibit A Revisions to Standard Contract Revisions of the attached contract, the parties have the option to extend the agreement for up to two (2) additional years, contingent upon satisfactory delivery of services, available funding, agreement of the parties, and Governor and Council approval.

Should the Governor and Council not authorize this request the Department will not have sufficient time to conduct a study during this state biennium and no further investigation into possible exposures related to kidney cancer in Merrimack will occur.

Area served: The study will serve residents of Merrimack, NH and may also include towns surrounding Merrimack, NH. The exact area of study will be determined during the initial phase of the study.

Respectfully submitted,

Lori A. Weaver
Commissioner

FORM NUMBER P-37 (version 2/23/2023)

Subject: Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study

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 New Hampshire Department of Health and Human Services		1.2 State Agency Address 129 Pleasant Street Concord, NH 03301-3857	
1.3 Contractor Name Trustees of Dartmouth College		1.4 Contractor Address 63 South Main Street, Suite 301 Hanover, NH 03755	
1.5 Contractor Phone Number (603)646-3007	1.6 Account Unit and Class 05-95-90-900510-5466	1.7 Completion Date June 30, 2025	1.8 Price Limitation $500,000
1.9 Contracting Officer for State Agency Robert W. Moore, Director		1.10 State Agency Telephone Number (603) 271-9631	
1.11 Contractor Signature DocuSigned by: Jill M. Mortali F740380A29C0415... Date: 12/5/2023		1.12 Name and Title of Contractor Signatory Jill M. Mortali Director, Office of Sponsored Projects	
1.13 State Agency Signature DocuSigned by: Patricia M. Tilley 646FB36F5BFD4C8... Date: 12/5/2023		1.14 Name and Title of State Agency Signatory Patricia M. Tilley Director	
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: DocuSigned by: Robyn Guarino 748734844941460... On: 12/6/2023			
1.17 Approval by the Governor and Executive Council *(if applicable)* G&C Item number: G&C Meeting Date:			

Contractor Initials DS JMM
Date 12/5/2023

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, 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.

3.3 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. 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 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, 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 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. 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.

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 The State's liability under this Agreement shall be limited to monetary damages not to exceed the total fees paid. The Contractor agrees that it has an adequate remedy at law for any breach of this Agreement by the State and hereby waives any right to specific performance or other equitable remedies against the State.

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 and the Governor's order on Respect and Civility in the Workplace, Executive order 2020-01. 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 age, sex, sexual orientation, race, color, marital status, physical or mental disability, religious creed, national origin, gender identity, or gender expression, and will take affirmative action to prevent such discrimination, unless exempt by state or federal law. The Contractor shall ensure any subcontractors comply with these nondiscrimination requirements.

6.3 No payments or transfers of value by Contractor or its representatives in connection with this Agreement have or shall be made which have the purpose or effect of public or commercial bribery, or acceptance of or acquiescence in extortion, kickbacks, or other unlawful or improper means of obtaining business.

6.4. 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 this Agreement and all rules, regulations and orders pertaining to 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 The Contracting Officer specified in block 1.9, or any successor, shall be the State's point of contact pertaining to this Agreement.

DS

Contractor Initials JMM

Date 12/5/2023

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) calendar days from the date of the notice; and if the Event of Default is not timely cured, terminate this Agreement, effective two (2) calendar 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.

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) calendar 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) calendar 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. In addition, at the State's discretion, the Contractor shall, within fifteen (15) calendar days of notice of early termination, develop and submit to the State a transition plan for Services under the Agreement.

10. PROPERTY OWNERSHIP/DISCLOSURE.

10.1 As used in this Agreement, the word "Property" shall mean all data, 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 Disclosure of data, information and other records shall be governed by N.H. RSA chapter 91-A and/or other applicable law. Disclosure 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 Contractor shall provide the State written notice at least fifteen (15) calendar days before any proposed assignment, delegation, or other transfer of any interest in this Agreement. No such assignment, delegation, or other transfer shall be effective without the written consent of the State.

12.2 For purposes of paragraph 12, 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.

12.3 None of the Services shall be subcontracted by the Contractor without prior written notice and consent of the State.

12.4 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. The Contractor shall indemnify, defend, and hold harmless the State, its officers, and employees from and against all actions, claims, damages, demands, judgments, fines, liabilities, losses, and other expenses, including, without limitation, reasonable attorneys' fees, arising out of or relating to this Agreement directly or indirectly arising from death, personal injury, property damage, intellectual property infringement, or other claims asserted against the State, its officers, or employees caused by the acts or omissions of negligence, reckless or willful misconduct, or fraud by the Contractor, its employees, agents, or subcontractors. 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 State's sovereign immunity, which immunity is hereby reserved to the State. This covenant in paragraph 13 shall survive the termination of this Agreement.

DS

Contractor Initials JMM

Date 12/5/2023

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 any successor, a certificate(s) of insurance for all insurance required under this Agreement. At the request of the Contracting Officer, or any successor, the Contractor shall provide certificate(s) of insurance for all renewal(s) of insurance required under this Agreement. 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 any 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. WAIVER OF BREACH. A State's failure to enforce its rights with respect to any single or continuing breach of this Agreement shall not act as a waiver of the right of the State to later enforce any such rights or to enforce any other or any subsequent breach.

17. 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.

18. 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.

19. CHOICE OF LAW AND FORUM.

19.1 This Agreement shall be governed, interpreted and construed in accordance with the laws of the State of New Hampshire except where the Federal supremacy clause requires otherwise. 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.

19.2 Any actions arising out of this Agreement, including the breach or alleged breach thereof, may not be submitted to binding arbitration, but must, instead, be brought and maintained in the Merrimack County Superior Court of New Hampshire which shall have exclusive jurisdiction thereof.

20. CONFLICTING TERMS. In the event of a conflict between the terms of this P-37 form (as modified in EXHIBIT A) and any other portion of this Agreement including any attachments thereto, the terms of the P-37 (as modified in EXHIBIT A) shall control.

21. THIRD PARTIES. This Agreement is being entered into for the sole benefit of the parties hereto, and nothing herein, express or implied, is intended to or will confer any legal or equitable right, benefit, or remedy of any nature upon any other person.

22. 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.

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

24. FURTHER ASSURANCES. The Contractor, along with its agents and affiliates, shall, at its own cost and expense, execute any additional documents and take such further actions as may be reasonably required to carry out the provisions of this Agreement and give effect to the transactions contemplated hereby.

25. 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.

26. 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.

DS

Contractor Initials JMM

Date 12/5/2023

New Hampshire Department of Health and Human Services
Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study
EXHIBIT A

Revisions to Standard Agreement Provisions

1. Revisions to Form P-37, General Provisions

1.1. Paragraph 3, Subparagraph 3.1, Effective Date/Completion of Services, is amended as follows:

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, this Agreement, and all obligations of the parties hereunder, shall become effective retroactive to July 1, 2023 upon Governor and Council approval ("Effective Date").

1.2. Paragraph 3, Effective Date/Completion of Services, is amended by adding subparagraph 3.3 as follows:

3.3. The parties may extend the Agreement for up to two (2) additional years from the Completion Date, contingent upon satisfactory delivery of services, available funding, agreement of the parties, and approval of the Governor and Executive Council.

1.3. Paragraph 5, Contract Price/Price Limitation/Payment, is amended by modifying subparagraph 5.4 to read:

5.4. To the fullest extent permitted by law, the maximum aggregate liability of the Department for any claims arising from, or in any way related to, this Agreement shall not exceed the Price Limitation. In addition, Contractor agrees that in no event will the Department, together with its officials, agents, and employees, be liable for any indirect, incidental, special, or consequential damages, including, without limitation, lost profits, even if the Department had been advised, knew, or should have known of the possibility of such damages. The terms and conditions of this Paragraph 5.4 shall survive the termination of this Agreement.

1.4. Paragraph 6, Compliance by Contractor with Laws and Regulations/Equal Employment Opportunity, is amended by modifying subparagraph 6.4 to read:

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

1.5. Paragraph 12, Assignment/Delegation/Subcontracts, is amended by adding subparagraph 12.5 as follows:

12.5. Subcontractors are subject to the same contractual conditions as the Contractor and the Contractor is responsible to ensure subcontractor compliance with those conditions. The Contractor shall have written agreements with all subcontractors, specifying the work to be performed,

and if applicable, a Business Associate Agreement in accordance with the Health Insurance Portability and Accountability Act. Written agreements shall specify how corrective action shall be managed. The Contractor shall manage the subcontractor's performance on an ongoing basis and take corrective action as necessary. The Contractor shall annually provide the State with a list of all subcontractors provided for under this Agreement and notify the State of any inadequate subcontractor performance.

New Hampshire Department of Health and Human Services
Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study

EXHIBIT B

Scope of Services

1. Statement of Work

1.1. The Contractor must complete a New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study for the town of Merrimack to understand potential exposures that may contribute to the excess of kidney cancer described in the Cancer Incidence Report of Merrimack, NH[1] and identify any next steps, including whether an epidemiological study (Phase 4) is warranted to further investigate kidney cancer or other cancers as feasible. The purpose of Phase 3 is to gather more information to determine whether the kidney cancer cases relate to a common cause.

1.2. The Contractor must ensure the final Feasibility Study and related reports are available to the Department.

1.3. The Contractor must assemble and convene three (3) participatory boards and/or committees: the Feasibility Study Steering Committee, the Community Advisory Board, and the Scientific Advisory Board.

1.3.1. The Feasibility Study Steering Committee must include representatives from the Contractor and the Department. The Contractor must ensure that members provide general project oversight to ensure that work plan timelines and deliverable milestones are met.

1.3.1.1. The Steering Committee's responsibilities may include but are not limited to:

1.3.1.1.1. Advising and identifying relevant de-identified, aggregated data for the Scientific Advisory Board;

1.3.1.1.2. Identifying and engaging members of the community to participate in the Community Advisory Board; and

1.3.1.1.3. Identifying and engaging relevant experts to participate in the Scientific Advisory Board.

1.3.2. The Community Advisory Board must include but not be limited to representatives from the communities of interest from the Phase 3 Feasibility Study. The Contractor must ensure that the Board provides community input into the feasibility study design, completion, and communication of results to the general public. The Board must represent the needs of the current and/or previous residents of the Phase 3 Feasibility Study's area of interest which may include but not

[1] https://www.dhhs.nh.gov/sites/g/files/ehbemt476/files/inline-documents/sonh/cancer-incident-report-merrimack-nh-january2023.pdf

be limited to Merrimack, NH, as determined by the Case Definition described in Section 1.3.3.2.1. below.

1.3.2.1. The Community Advisory Board's responsibilities include but are not limited to:

1.3.2.1.1. Advising on how to conduct outreach to current and/or previous residents of the Area of Interest for participation in the Phase 3 Feasibility Study; and

1.3.2.1.2. Providing recommendations that the Steering Committee could use for the development of a written Phase 3 Feasibility Study Report.

1.3.3. The Scientific Advisory Board must include but not be limited to representatives from the Contractor, the Department, and relevant subject matter experts from additional outside agencies or organizations. The Contractor must ensure that the Board provides expert input for the feasibility study design, and completion.

1.3.3.1. The Contractor must ensure that study design is presented to the Scientific Advisory Board prior to seeking any Institutional Review Board (IRB) approval or exemption.

1.3.3.2. The Scientific Advisory Board's responsibilities include providing guidance on:

1.3.3.2.1. Creating a Case Definition based on the review of preliminary de-identified and aggregated data analyzed during Phase 2 of the investigation interpreting additional data analyses conducted by the Department that evaluate:

1.3.3.2.1.1. Cancer(s) of interest;

1.3.3.2.1.2. Geographical and or geospatial descriptors;

1.3.3.2.1.3. Demographic descriptors;

1.3.3.2.1.4. Latency Period: time from environmental exposure to diagnosis; and

1.3.3.2.1.5. Environmental exposure(s) of interest.

1.3.3.3. Establishing a Phase 3 Feasibility Study working hypothesis.

1.3.3.4. Designing the Phase 3 Feasibility Study and incorporating feedback from the Community Advisory Board and Steering Committee that includes but is not limited to:

1.3.3.4.1. Participant recruitment;

1.3.3.4.2. Biospecimen collection; and

1.3.3.4.3. Biospecimen storage.

1.3.3.5. Implementing phase 3 in accordance with 1.3.3.4.

1.4. The Contractor must conduct Community Engagement Studio sessions to facilitate input from community and patient stakeholders to enhance research design, implementation, and dissemination. Participants in these sessions should include but are not limited to participants that represent patients with kidney cancer or other cancer(s) of interest, the patient caregivers, and current or previous residents of Merrimack, NH and other areas of interest.

1.5. The Contractor must present the results of Phase 3 to groups that include but are not limited to:

1.5.1. The Steering Committee;

1.5.2. The Scientific Advisory Board;

1.5.3. The Community Advisory Board;

1.5.4. Legislative Committees and Commissions; and

1.5.5. Additional stakeholder groups as identified by the Department and mutually agreed upon by the Contractor.

1.6. The Contractor must identify relevant funding opportunities for a proposed Phase 4 Epidemiological Study if the Phase 3 results indicate that a Phase 4 is warranted.

1.7. The Contractor must participate in meetings with the Department on a quarterly basis, or as otherwise upon request by the Department.

1.8. Reporting

1.8.1. The Contractor must submit quarterly progress reports to the Department to ensure that Phase 3 is meeting progress milestones which include, but are not limited to:

1.8.1.1. Steering Committee, Scientific Advisory Board and Community Advisory Board meeting minutes;

1.8.1.2. Summaries of Community Engagement Studios, survey responses, or evaluation of aggregate results;

1.8.1.3. Case Definition;

1.8.1.4. Study Design;

1.8.1.5. Institutional Review Board approval status, and after approval, compliance with IRB approval, and applicable state

and federal laws;

1.8.1.6. Final report summarizing feasibility study results and recommendations relative to a Phase 4 Epidemiological Study;

1.8.1.7. Report providing potential funding sources identified for Phase 4 if necessary and suggested plan to pursue relevant funding if applicable; and

1.8.1.8. Feedback or responses from the community.

1.8.2. Upon request, the Contractor must provide other key data and metrics collected for the study to the Department in a format specified by the Department if allowed by the IRB approved data sharing protocols.

1.9. Confidential Data

1.9.1. The Contractor must meet all information security and privacy requirements as set by the Department and in accordance with the Department's Information Security Requirements Exhibit D as referenced below where applicable within IRB and research protocols.

1.9.2. The Contractor must ensure any individuals involved in delivering services through the contract sign an attestation agreeing to access, view, store, and discuss Confidential Data in accordance with federal and state laws and regulations and the Department's Information Security Requirements Exhibit D. The Contractor must ensure said individuals have a justifiable business need to access confidential data. The Contractor must provide attestations upon Department request.

1.10. Privacy Impact Assessment

1.10.1. Upon request, the Contractor must allow and assist the Department in conducting a Privacy Impact Assessment (PIA) of its system(s)/application(s)/web portal(s)/website(s) or Department system(s)/application(s)/web portal(s)/website(s) hosted by the Contractor, if Personally Identifiable Information (PII) is collected, used, accessed, shared, or stored. To conduct the PIA the Contractor must provide the Department access to applicable systems and documentation sufficient to allow the Department to assess, at minimum, the following:

1.10.1.1. How PII is gathered and stored;

1.10.1.2. Who will have access to PII;

1.10.1.3. How PII will be used in the system;

1.10.1.4. How individual consent will be achieved and revoked; and

1.10.1.5. Privacy practices.

1.10.2. The Department may conduct follow-up PIAs in the event there are either significant process changes or new technologies impacting the collection, processing or storage of PII.

1.11. Department Owned Devices, Systems and Network Usage

1.11.1. If Contractor End Users, defined in the Department's Information Security Requirements Exhibit D that is incorporated into this Agreement, are authorized by the Department's Information Security Office to use a Department issued device (e.g. computer, tablet, mobile telephone) or access the Department network in the fulfilment of this Agreement, each End User must:

1.11.1.1. Sign and abide by applicable Department and New Hampshire Department of Information Technology (NH DoIT) use agreements, policies, standards, procedures and guidelines, and complete applicable trainings as required;

1.11.1.2. Use the information that they have permission to access solely for conducting official Department business and agree that all other use or access is strictly forbidden including, but not limited, to personal or other private and non-Department use, and that at no time shall they access or attempt to access information without having the express authority of the Department to do so;

1.11.1.3. Not access or attempt to access information in a manner inconsistent with the approved policies, procedures, and/or agreement relating to system entry/access;

1.11.1.4. Not copy, share, distribute, sub-license, modify, reverse engineer, rent, or sell software licensed, developed, or being evaluated by the Department, and at all times must use utmost care to protect and keep such software strictly confidential in accordance with the license or any other agreement executed by the Department;

1.11.1.5. Only use equipment, software, or subscription(s) authorized by the Department's Information Security Office or designee;

1.11.1.6. Not install non-standard software on any Department equipment unless authorized by the Department's Information Security Office or designee;

1.11.1.7. Agree that email and other electronic communication messages created, sent, and received on a Department-issued email system are the property of the Department of New Hampshire and to be used for business purposes only. Email is defined as "internal email systems" or "Department-funded email systems."

1.11.1.8. Agree that use of email must follow Department and NH DoIT policies, standards, and/or guidelines; and

1.11.1.9. Agree when utilizing the Department's email system:

1.11.1.9.1. To only use a Department email address assigned to them with a "@ affiliate.DHHS.NH.Gov".

1.11.1.9.2. Include in the signature lines information identifying the End User as a non-Department workforce member; and

1.11.1.9.3. Ensure the following confidentiality notice is embedded underneath the signature line:

CONFIDENTIALITY NOTICE: "This message may contain information that is privileged and confidential and is intended only for the use of the individual(s) to whom it is addressed. If you receive this message in error, please notify the sender immediately and delete this electronic message and any attachments from your system. Thank you for your cooperation."

1.11.1.10. Contractor End Users with a Department issued email, access or potential access to Confidential Data, and/or a workspace in a Department building/facility, must:

1.11.1.10.1. Complete the Department's Annual Information Security & Compliance Awareness Training prior to accessing, viewing, handling, hearing, or transmitting Department Data or Confidential Data.

1.11.1.10.2. Sign the Department's Business Use and Confidentiality Agreement and Asset Use Agreement, and the NH

DoIT Department wide Computer Use Agreement upon execution of the Agreement and annually thereafter.

1.11.1.10.3. Only access the Department's intranet to view the Department's Policies and Procedures and Information Security webpages.

1.11.1.11. Contractor agrees, if any End User is found to be in violation of any of the above terms and conditions, said End User may face removal from the Agreement, and/or criminal and/or civil prosecution, if the act constitutes a violation of law.

1.11.1.12. Contractor agrees to notify the Department a minimum of three business days prior to any upcoming transfers or terminations of End Users who possess Department credentials and/or badges or who have system privileges. If End Users who possess Department credentials and/or badges or who have system privileges resign or are dismissed without advance notice, the Contractor agrees to notify the Department's Information Security Office or designee immediately.

1.11.2. Workspace Requirement

1.11.2.1. If applicable, the Department will work with Contractor to determine requirements for providing necessary workspace and State equipment for its End Users.

1.12. Contract End-of-Life Transition Services

1.12.1. General Requirements

1.12.1.1. If applicable, upon termination or expiration of the Agreement the parties agree to cooperate in good faith to effectuate a smooth secure transition of the Services from the Contractor to the Department and, if applicable, the Contractor engaged by the Department to assume the Services previously performed by the Contractor for this section the new Contractor shall be known as "Recipient"). Ninety (90) days prior to the end-of the contract or unless otherwise specified by the Department, the Contractor must begin working with the Department and if applicable, the new Recipient to develop a Data Transition Plan (DTP). The Department shall provide the DTP template to the Contractor.

1.12.1.2. Human subject related confidential data collected through this study will be obtained in accordance with the Contractor's research protocols, and under IRB requirements/oversight and Common Rule Compliance (45 CFR 46).

1.12.1.3. Consent will be required for eligible study participants to be enrolled in the study. Once appropriate consent is received the Contractor maintains all research data and biological samples pursuant to the consent and until a date of destruction mutually agreed upon by the Contractor and the Department. For eligible participants who do not consent / move forward in the study, all associated data will be destroyed by the Contractor. At the conclusion of the study, a de-identified dataset must be provided to the Department.

1.12.1.4. All the biospecimen data collected under this Agreement shall be retained by the Contractor at their discretion according to the consent of each individual participant.

1.12.1.5. The Contractor must use reasonable efforts to assist the Recipient, in connection with the transition from the performance of Services by the Contractor and its End Users to the performance of such Services. This may include assistance with the secure transfer of records (electronic and hard copy), transition of historical data (electronic and hard copy), the transition of any such Service from the hardware, software, network and telecommunications equipment and internet-related information technology infrastructure ("Internal IT Systems") of Contractor to the Internal IT Systems of the Recipient and cooperation with and assistance to any third-party consultants engaged by Recipient in connection with the Transition Services.

1.12.1.6. If a system, database, hardware, software, and/or software licenses (Tools) was created to manage, track, and/or store Department Data in relationship to this contract said Tools will be inventoried and returned to the Department, along with the inventory document, once transition of Department Data is complete.

1.12.1.7. The internal planning of the Transition Services by the Contractor and its End Users shall be provided to the Department and if applicable the Recipient in a timely

manner. Any such Transition Services shall be deemed to be Services for purposes of this Agreement.

1.12.1.8. Should the data Transition extend beyond the end of the Agreement, the Contractor agrees that the Information Security Requirements, and if applicable, the Department's Business Associate Agreement terms and conditions remain in effect until the Data Transition is accepted as complete by the Department.

1.12.1.9. In the event where the Contractor has comingled Department Data and the destruction or Transition of said data is not feasible, the Department and Contractor will jointly evaluate regulatory and professional standards for retention requirements prior to destruction, refer to the terms and conditions of the Department's DHHS Information Security Requirements Exhibit.

1.12.2. Completion of Transition Services

1.12.2.1. Each service or Transition phase shall be deemed completed (and the Transition process finalized) at the end of 15 business days after the product, resulting from the Service, is delivered to the Department and/or the Recipient in accordance with the mutually agreed upon Transition plan, unless within said 15 business day term the Contractor notifies the Department of an issue requiring additional time to complete said product.

1.12.2.2. Once all parties agree the data has been migrated the Contractor will have 30 days to destroy the data per the terms and conditions of the Department's Information Security Requirements Exhibit.

1.12.3. Disagreement over Transition Services Results

1.12.3.1. In the event the Department is not satisfied with the results of the Transition Service, the Department shall notify the Contractor, in writing, stating the reason for the lack of satisfaction within 15 business days of the final product or at any time during the data Transition process. The Parties shall discuss the actions to be taken to resolve the disagreement or issue. If an agreement is not reached, at any time the Department shall be entitled to initiate actions in accordance with the Agreement.

2. Exhibits Incorporated

2.1. The Contractor must manage all confidential data related to this Agreement in accordance with the terms of Exhibit D, DHHS Information Security Requirements.

2.2. The Contractor must use and disclose Protected Health Information in compliance with the Standards for Privacy of Individually Identifiable Health Information (Privacy Rule) (45 CFR Parts 160 and 164) under the Health Insurance Portability and Accountability Act (HIPAA) of 1996 or Common Rule (45 CFR 46) Compliance, whichever is applicable, and in accordance with the attached Exhibit E, Business Associate Agreement, which has been executed by the parties.

3. Additional Terms

3.1. Impacts Resulting from Court Orders or Legislative Changes

3.1.1. The Contractor agrees that, to the extent future state or federal legislation or court orders may have an impact on the Services described herein, the State has the right to modify Service priorities and expenditure requirements under this Agreement so as to achieve compliance therewith.

3.2. Federal Civil Rights Laws Compliance: Culturally and Linguistically Appropriate Programs and Services

3.2.1. The Contractor must submit, within ten (10) days of the Agreement Effective Date, a detailed description of the communication access and language assistance services to be provided to ensure meaningful access to programs and/or services to individuals with limited English proficiency; individuals who are deaf or have hearing loss; individuals who are blind or have low vision; and individuals who have speech challenges.

3.3. Credits and Copyright Ownership

3.3.1. All documents, notices, press releases, research reports and other materials prepared during or resulting from the performance of the services of the Agreement must include the following statement, "The preparation of this (report, document etc.) was financed under an Contract with the State of New Hampshire, Department of Health and Human Services, with funds provided in part by the State of New Hampshire and/or such other funding sources as were available or required, e.g., the United States Department of Health and Human Services."

3.3.2. All materials produced or purchased under the Agreement must have

prior approval from the Department before printing, production, distribution or use. Three months prior to the completion date of the Agreement, the Department will collaborate with the Contractor to determine what, if any, materials the Contractor will be authorized to use after the completion date.

3.3.3. The Department must retain copyright ownership for any and all original materials produced, including, but not limited to:

3.3.3.1. Brochures.

3.3.3.2. Resource directories.

3.3.3.3. Protocols or guidelines.

3.3.3.4. Posters.

3.3.3.5. Reports.

4. Records

4.1. The Contractor must keep records that include, but are not limited to:

4.1.1. Books, records, documents and other electronic or physical data evidencing and reflecting all costs and other expenses incurred by the Contractor in the performance of the Contract, and all income received or collected by the Contractor.

4.1.2. All records must be maintained in accordance with accounting procedures and practices, which sufficiently and properly reflect all such costs and expenses, and which are acceptable to the Department, and to include, without limitation, all ledgers, books, records, and original evidence of costs such as purchase requisitions and orders, vouchers, requisitions for materials, inventories, valuations of in-kind contributions, labor time cards, payrolls, and other records requested or required by the Department.

4.1.3. Medical records on each patient/recipient of services with consent granted.

4.2. During the term of this Agreement and the period for retention hereunder, the Department, and any of their designated representatives must have access to all reports and records maintained pursuant to the Agreement for purposes of audit, examination, excerpts and transcripts.

4.3. If, upon review of the Final Expenditure Report the Department must disallow any expenses claimed by the Contractor as costs hereunder, the Department retains the right, at its discretion, to deduct the amount of such expenses as are disallowed or to recover such sums from the Contractor.

New Hampshire Department of Health and Human Services
Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study

EXHIBIT C

Payment Terms

1. This Agreement is funded by:
   1.1. 100% General funds.
2. For the purposes of this Agreement the Department has identified:
   2.1. The Contractor as a Contractor, based on criteria in 2 CFR 200.331.
3. Payment shall be on a cost reimbursement basis for actual expenditures incurred in the fulfillment of this Agreement, and shall be in accordance with the approved line items, as specified in Exhibits C-1, Budget through C-2, Budget.
4. The Contractor shall submit an invoice with supporting documentation to the Department no later than the thirtieth (30th) working day of the month following the month in which the services were provided. The Contractor shall ensure each invoice:
   4.1. Includes the Contractor's Vendor Number issued upon registering with New Hampshire Department of Administrative Services.
   4.2. Is submitted in a form that is provided by or otherwise acceptable to the Department.
   4.3. Identifies and requests payment for allowable costs incurred in the previous month.
   4.4. Includes supporting documentation of allowable costs with each invoice that may include, but are not limited to, time sheets, payroll records, receipts for purchases, and proof of expenditures, as applicable.
   4.5. Is completed, dated and returned to the Department with the supporting documentation for allowable expenses to initiate payment.
   4.6. Is assigned an electronic signature, includes supporting documentation, and is emailed to DPHSContractBilling@dhhs.nh.gov or mailed to:

   Financial Manager
   Department of Health and Human Services
   129 Pleasant Street
   Concord, NH 03301
5. The Department shall make payments to the Contractor within thirty (30) days of receipt of each invoice and supporting documentation for authorized expenses, subsequent to approval of the submitted invoice.

EXHIBIT C

6. The final invoice and supporting documentation for authorized expenses shall be due to the Department no later than forty (40) days after the contract completion date specified in Form P-37, General Provisions Block 1.7 Completion Date.

7. Notwithstanding Paragraph 17 of the General Provisions Form P-37, changes limited to adjusting amounts within the price limitation and adjusting encumbrances between State Fiscal Years and budget class lines through the Budget Office may be made by written agreement of both parties, without obtaining approval of the Governor and Executive Council, if needed and justified.

8. Audits

   8.1. The Contractor must email an annual audit to dhhs.act@dhhs.nh.gov if any of the following conditions exist:

      8.1.1. Condition A - The Contractor expended $750,000 or more in federal funds received as a subrecipient pursuant to 2 CFR Part 200, during the most recently completed fiscal year.

      8.1.2. Condition B - The Contractor is subject to audit pursuant to the requirements of NH RSA 7:28, III-b, pertaining to charitable organizations receiving support of $1,000,000 or more.

      8.1.3. Condition C - The Contractor is a public company and required by Security and Exchange Commission (SEC) regulations to submit an annual financial audit.

   8.2. If Condition A exists, the Contractor shall submit an annual Single Audit performed by an independent Certified Public Accountant (CPA) to dhhs.act@dhhs.nh.gov within 120 days after the close of the Contractor's fiscal year, conducted in accordance with the requirements of 2 CFR Part 200, Subpart F of the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal awards.

      8.2.1. The Contractor shall submit a copy of any Single Audit findings and any associated corrective action plans. The Contractor shall submit quarterly progress reports on the status of implementation of the corrective action plan.

   8.3. If Condition B or Condition C exists, the Contractor shall submit an annual financial audit performed by an independent CPA within 120 days after the close of the Contractor's fiscal year.

8.4. Any Contractor that receives an amount equal to or greater than $250,000 from the Department during a single fiscal year, regardless of the funding source, may be required, at a minimum, to submit annual financial audits performed by an independent CPA if the Department's risk assessment determination indicates the Contractor is high-risk.

8.5. In addition to, and not in any way in limitation of obligations of the Agreement, it is understood and agreed by the Contractor that the Contractor shall be held liable for any state or federal audit exceptions and shall return to the Department all payments made under the Agreement to which exception has been taken, or which have been disallowed because of such an exception.

Exhibit C-1 Budget

New Hampshire Department of Health and Human Services		
Contractor Name:	Trustees of Dartmouth College	
Budget Request for:	Merrimack New Hampshire Kidney Cancer Inci	
Budget Period	7/1/23 - 6/30/24	
Indirect Cost Rate (if applicable)	0.1	
Line Item	**Program Cost - Funded by DHHS**	**Program Cost - Contractor Share/ Match**
1. Salary & Wages	$126,742	$0
2. Fringe Benefits	$44,360	$0
3. Consultants	$0	$0
4. Equipment Indirect cost rate cannot be applied to equipment costs per 2 CFR 200.1 and Appendix IV to 2 CFR 200.	$2,000	$0
5.(a) Supplies - Educational	$0	$0
5.(b) Supplies - Lab	$397	$0
5.(c) Supplies - Pharmacy	$0	$0
5.(d) Supplies - Medical	$100	$0
5.(e) Supplies Office	$1,000	$0
6. Travel	$1,000	$0
7. Software	$250	$0
8. (a) Other - Marketing/ Communications	$5,000	$0
8. (b) Other - Education and Training	$0	$0
8. (c) Other - Other (specify below)	$0	$0
Other (please specify)	$1,000	$0
Other (please specify)	$0	$0
Other (please specify)	$0	$0
Other (please specify)	$0	$0
9. Subrecipient Contracts	$90,878	$0
Total Direct Costs	$272,727	$0
Total Indirect Costs	$27,273	$0
TOTAL	$300,000	$0

Contractor: DS _____

Date: 12/5/2023

Exhibit C-2 Budget

New Hampshire Department of Health and Human Services		
Contractor Name:	Trustees of Dartmouth College	
Budget Request for:	Merrimack New Hampshire Kidney Cancer Inci	
Budget Period	7/1/24 - 6/30/25	
Indirect Cost Rate (if applicable)	0.1	
Line Item	**Program Cost - Funded by DHHS**	**Program Cost - Contractor Share/ Match**
1. Salary & Wages	$125,383	$0
2. Fringe Benefits	$43,884	$0
3. Consultants	$0	$0
4. Equipment Indirect cost rate cannot be applied to equipment costs per 2 CFR 200.1 and Appendix IV to 2 CFR 200.	$0	$0
5.(a) Supplies - Educational	$0	$0
5.(b) Supplies - Lab	$100	$0
5.(c) Supplies - Pharmacy	$0	$0
5.(d) Supplies - Medical	$100	$0
5.(e) Supplies Office	$232	$0
6. Travel	$300	$0
7. Software	$20	$0
8. (a) Other - Marketing/ Communications	$5,000	$0
8. (b) Other - Education and Training	$0	$0
8. (c) Other - Other (specify below)	$0	$0
Other (please specify)	$100	$0
Other (please specify)	$0	$0
Other (please specify)	$0	$0
Other (please specify)	$0	$0
9. Subrecipient Contracts	$6,699	$0
Total Direct Costs	$181,818	$0
Total Indirect Costs	$18,182	$0
TOTAL	$200,000	$0

Contractor: DS

SS-2024-DPHS-08-KIDNE-01

Date: 12/5/2023

New Hampshire Department of Health and Human Services

Exhibit D

DHHS Information Security Requirements

A. Definitions

The following terms may be reflected and have the described meaning in this document:

1. "Breach" means the loss of control, compromise, unauthorized disclosure, unauthorized acquisition, unauthorized access, or any similar term referring to situations where persons other than authorized users and for an other than authorized purpose have access or potential access to personally identifiable information, whether physical or electronic. With regard to Protected Health Information, " Breach" shall have the same meaning as the term "Breach" in section 164.402 of Title 45, Code of Federal Regulations.

2. "Computer Security Incident" shall have the same meaning "Computer Security Incident" in section two (2) of NIST Publication 800-61, Computer Security Incident Handling Guide, National Institute of Standards and Technology, U.S. Department of Commerce.

3. "Confidential Information" or "Confidential Data" means all confidential information disclosed by one party to the other such as all medical, health, financial, public assistance benefits and personal information including without limitation, Substance Abuse Treatment Records, Case Records, Protected Health Information and Personally Identifiable Information.

   Confidential Information also includes any and all information owned or managed by the State of NH - created, received from or on behalf of the Department of Health and Human Services (DHHS) or accessed in the course of performing contracted services - of which collection, disclosure, protection, and disposition is governed by state or federal law or regulation. This information includes, but is not limited to Protected Health Information (PHI), Personal Information (PI), Personal Financial Information (PFI), Federal Tax Information (FTI), Social Security Numbers (SSN), Payment Card Industry (PCI), and or other sensitive and confidential information.

4. "End User" means any person or entity (e.g., contractor, contractor's employee, business associate, subcontractor, other downstream user, etc.) that receives DHHS data or derivative data in accordance with the terms of this Contract.

5. "HIPAA" means the Health Insurance Portability and Accountability Act of 1996 and the regulations promulgated thereunder.

6. "Incident" means an act that potentially violates an explicit or implied security policy, which includes attempts (either failed or successful) to gain unauthorized access to a system or its data, unwanted disruption or denial of service, the unauthorized use of a system for the processing or storage of data; and changes to system hardware, firmware, or software characteristics without the owner's knowledge, instruction, or consent. Incidents include the loss of data through theft or device misplacement, loss

Contractor Initials DS

Date 12/5/2023

or misplacement of hardcopy documents, and misrouting of physical or electronic mail, all of which may have the potential to put the data at risk of unauthorized access, use, disclosure, modification or destruction.

7. "Open Wireless Network" means any network or segment of a network that is not designated by the State of New Hampshire's Department of Information Technology or delegate as a protected network (designed, tested, and approved, by means of the State, to transmit) will be considered an open network and not adequately secure for the transmission of unencrypted PI, PFI, PHI or confidential DHHS data.

8. "Personal Information" (or "PI") means information which can be used to distinguish or trace an individual's identity, such as their name, social security number, personal information as defined in New Hampshire RSA 359-C:19, biometric records, etc., alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc.

9. "Privacy Rule" shall mean the Standards for Privacy of Individually Identifiable Health Information at 45 C.F.R. Parts 160 and 164, promulgated under HIPAA by the United States Department of Health and Human Services.

10. "Protected Health Information" (or "PHI") has the same meaning as provided in the definition of "Protected Health Information" in the HIPAA Privacy Rule at 45 C.F.R. § 160.103.

11. "Security Rule" shall mean the Security Standards for the Protection of Electronic Protected Health Information at 45 C.F.R. Part 164, Subpart C, and amendments thereto.

12. "Unsecured Protected Health Information" means Protected Health Information that is not secured by a technology standard that renders Protected Health Information unusable, unreadable, or indecipherable to unauthorized individuals and is developed or endorsed by a standards developing organization that is accredited by the American National Standards Institute.

I. RESPONSIBILITIES OF DHHS AND THE CONTRACTOR

A. Business Use and Disclosure of Confidential Information.

1. The Contractor must not use, disclose, maintain or transmit Confidential Information except as reasonably necessary as outlined under this Contract. Further, Contractor, including but not limited to all its directors, officers, employees and agents, must not use, disclose, maintain or transmit PHI in any manner that would constitute a violation of the Privacy and Security Rule.

Contractor Initials DS

Date 12/5/2023

2. The Contractor must not disclose any Confidential Information in response to a request for disclosure on the basis that it is required by law, in response to a subpoena, etc., without first notifying DHHS so that DHHS has an opportunity to consent or object to the disclosure.
3. If DHHS notifies the Contractor that DHHS has agreed to be bound by additional restrictions over and above those uses or disclosures or security safeguards of PHI pursuant to the Privacy and Security Rule, the Contractor must be bound by such additional restrictions and must not disclose PHI in violation of such additional restrictions and must abide by any additional security safeguards.
4. The Contractor agrees that DHHS Data or derivative there from disclosed to an End User must only be used pursuant to the terms of this Contract.
5. The Contractor agrees DHHS Data obtained under this Contract may not be used for any other purposes that are not indicated in this Contract.
6. The Contractor agrees to grant access to the data to the authorized representatives of DHHS for the purpose of inspecting to confirm compliance with the terms of this Contract.

II. METHODS OF SECURE TRANSMISSION OF DATA

1. Application Encryption. If End User is transmitting DHHS data containing Confidential Data between applications, the Contractor attests the applications have been evaluated by an expert knowledgeable in cyber security and that said application's encryption capabilities ensure secure transmission via the internet.
2. Computer Disks and Portable Storage Devices. End User may not use computer disks or portable storage devices, such as a thumb drive, as a method of transmitting DHHS data.
3. Encrypted Email. End User may only employ email to transmit Confidential Data if email is encrypted and being sent to and being received by email addresses of persons authorized to receive such information.
4. Encrypted Web Site. If End User is employing the Web to transmit Confidential Data, the secure socket layers (SSL) must be used and the web site must be secure. SSL encrypts data transmitted via a Web site.
5. File Hosting Services, also known as File Sharing Sites. End User may not use file hosting services, such as Dropbox or Google Cloud Storage, to transmit Confidential Data.
6. Ground Mail Service. End User may only transmit Confidential Data via *certified* ground mail within the continental U.S. and when sent to a named individual.
7. Laptops and PDA. If End User is employing portable devices to transmit Confidential Data said devices must be encrypted and password-protected.

8. Open Wireless Networks. End User may not transmit Confidential Data via an open wireless network. End User must employ a virtual private network (VPN) when remotely transmitting via an open wireless network.
9. Remote User Communication. If End User is employing remote communication to access or transmit Confidential Data, a virtual private network (VPN) must be installed on the End User's mobile device(s) or laptop from which information will be transmitted or accessed.
10. SSH File Transfer Protocol (SFTP), also known as Secure File Transfer Protocol. If End User is employing an SFTP to transmit Confidential Data, End User will structure the Folder and access privileges to prevent inappropriate disclosure of information. SFTP folders and sub-folders used for transmitting Confidential Data will be coded for 24-hour auto-deletion cycle (i.e. Confidential Data will be deleted every 24 hours).
11. Wireless Devices. If End User is transmitting Confidential Data via wireless devices, all data must be encrypted to prevent inappropriate disclosure of information.

III. RETENTION AND DISPOSITION OF IDENTIFIABLE RECORDS

The Contractor will only retain the data and any derivative of the data for the duration of this Contract. After such time, the Contractor will have 30 days to destroy the data and any derivative in whatever form it may exist, unless, otherwise required by law or permitted under this Contract. To this end, the parties must:

A. Retention

1. The Contractor agrees it will not store, transfer or process data collected in connection with the services rendered under this Contract outside of the United States. This physical location requirement shall also apply in the implementation of cloud computing, cloud service or cloud storage capabilities, and includes backup data and Disaster Recovery locations.
2. The Contractor agrees to ensure proper security monitoring capabilities are in place to detect potential security events that can impact State of NH systems and/or Department confidential information for contractor provided systems.
3. The Contractor agrees to provide security awareness and education for its End Users in support of protecting Department confidential information.
4. The Contractor agrees to retain all electronic and hard copies of Confidential Data in a secure location and identified in section IV. A.2
5. The Contractor agrees Confidential Data stored in a Cloud must be in a FedRAMP/HITECH compliant solution and comply with all applicable statutes and regulations regarding the privacy and security. All servers and devices must have currently-supported and hardened operating systems, the latest anti-viral, antihacker, anti-spam, anti-spyware, and anti-malware utilities. The environment, as a whole, must have aggressive intrusion-detection and firewall protection.

Contractor Initials DS

Date 12/5/2023

6. The Contractor agrees to and ensures its complete cooperation with the State's Chief Information Officer in the detection of any security vulnerability of the hosting infrastructure.

B. Disposition

1. If the Contractor will maintain any Confidential Information on its systems (or its sub-contractor systems), the Contractor will maintain a documented process for securely disposing of such data upon request or contract termination; and will obtain written certification for any State of New Hampshire data destroyed by the Contractor or any subcontractors as a part of ongoing, emergency, and or disaster recovery operations. When no longer in use, electronic media containing State of New Hampshire data shall be rendered unrecoverable via a secure wipe program in accordance with industry-accepted standards for secure deletion and media sanitization, or otherwise physically destroying the media (for example, degaussing) as described in NIST Special Publication 800-88, Rev 1, Guidelines for Media Sanitization, National Institute of Standards and Technology, U. S. Department of Commerce. The Contractor will document and certify in writing at time of the data destruction, and will provide written certification to the Department upon request. The written certification will include all details necessary to demonstrate data has been properly destroyed and validated. Where applicable, regulatory and professional standards for retention requirements will be jointly evaluated by the State and Contractor prior to destruction.
2. Unless otherwise specified, within thirty (30) days of the termination of this Contract, Contractor agrees to destroy all hard copies of Confidential Data using a secure method such as shredding.
3. Unless otherwise specified, within thirty (30) days of the termination of this Contract, Contractor agrees to completely destroy all electronic Confidential Data by means of data erasure, also known as secure data wiping.

IV. PROCEDURES FOR SECURITY

A. Contractor agrees to safeguard the DHHS Data received under this Contract, and any derivative data or files, as follows:

1. The Contractor will maintain proper security controls to protect Department confidential information collected, processed, managed, and/or stored in the delivery of contracted services.
2. The Contractor will maintain policies and procedures to protect Department confidential information throughout the information lifecycle, where applicable, (from creation, transformation, use, storage and secure destruction) regardless of the media used to store the data (i.e., tape, disk, paper, etc.).

Contractor Initials DS

Date 12/5/2023

3. The Contractor will maintain appropriate authentication and access controls to contractor systems that collect, transmit, or store Department confidential information where applicable.

4. The Contractor will ensure proper security monitoring capabilities are in place to detect potential security events that can impact State of NH systems and/or Department confidential information for contractor provided systems.

5. The Contractor will provide regular security awareness and education for its End Users in support of protecting Department confidential information.

6. If the Contractor will be sub-contracting any core functions of the engagement supporting the services for State of New Hampshire, the Contractor will maintain a program of an internal process or processes that defines specific security expectations, and monitoring compliance to security requirements that at a minimum match those for the Contractor, including breach notification requirements.

7. The Contractor will work with the Department to sign and comply with all applicable State of New Hampshire and Department system access and authorization policies and procedures, systems access forms, and computer use agreements as part of obtaining and maintaining access to any Department system(s). Agreements will be completed and signed by the Contractor and any applicable sub-contractors prior to system access being authorized.

8. If the Department determines the Contractor is a Business Associate pursuant to 45 CFR 160.103, the Contractor will execute a HIPAA Business Associate Agreement (BAA) with the Department and is responsible for maintaining compliance with the agreement.

9. The Contractor will work with the Department at its request to complete a System Management Survey. The purpose of the survey is to enable the Department and Contractor to monitor for any changes in risks, threats, and vulnerabilities that may occur over the life of the Contractor engagement. The survey will be completed annually, or an alternate time frame at the Departments discretion with agreement by the Contractor, or the Department may request the survey be completed when the scope of the engagement between the Department and the Contractor changes.

10. The Contractor will not store, knowingly or unknowingly, any State of New Hampshire or Department data offshore or outside the boundaries of the United States unless prior express written consent is obtained from the Information Security Office leadership member within the Department.

11. Data Security Breach Liability. In the event of any security breach Contractor shall make efforts to investigate the causes of the breach, promptly take measures to prevent

Contractor Initials DS

Date 12/5/2023

future breach and minimize any damage or loss resulting from the breach. The State shall recover from the Contractor all costs of response and recovery from

the breach, including but not limited to: credit monitoring services, mailing costs and costs associated with website and telephone call center services necessary due to the breach.

12. Contractor must, comply with all applicable statutes and regulations regarding the privacy and security of Confidential Information, and must in all other respects maintain the privacy and security of PI and PHI at a level and scope that is not less than the level and scope of requirements applicable to federal agencies, including, but not limited to, provisions of the Privacy Act of 1974 (5 U.S.C. § 552a), DHHS Privacy Act Regulations (45 C.F.R. §5b), HIPAA Privacy and Security Rules (45 C.F.R. Parts 160 and 164) that govern protections for individually identifiable health information and as applicable under State law.

13. Contractor agrees to establish and maintain appropriate administrative, technical, and physical safeguards to protect the confidentiality of the Confidential Data and to prevent unauthorized use or access to it. The safeguards must provide a level and scope of security that is not less than the level and scope of security requirements established by the State of New Hampshire, Department of Information Technology. Refer to Vendor Resources/Procurement at https://www.nh.gov/doit/vendor/index.htm for the Department of Information Technology policies, guidelines, standards, and procurement information relating to vendors.

14. Contractor agrees to maintain a documented breach notification and incident response process. The Contractor will notify the State's Privacy Officer and the State's Security Officer of any security breach immediately, at the email addresses provided in Section VI. This includes a confidential information breach, computer security incident, or suspected breach which affects or includes any State of New Hampshire systems that connect to the State of New Hampshire network.

15. Contractor must restrict access to the Confidential Data obtained under this Contract to only those authorized End Users who need such DHHS Data to perform their official duties in connection with purposes identified in this Contract.

16. The Contractor must ensure that all End Users:
    a. comply with such safeguards as referenced in Section IV A. above, implemented to protect Confidential Information that is furnished by DHHS under this Contract from loss, theft or inadvertent disclosure.
    b. safeguard this information at all times.
    c. ensure that laptops and other electronic devices/media containing PHI, PI, or PFI are encrypted and password-protected.

Contractor Initials DS

Date 12/5/2023

d. send emails containing Confidential Information only if encrypted and being sent to and being received by email addresses of persons authorized to receive such information.

e. limit disclosure of the Confidential Information to the extent permitted by law.

f. Confidential Information received under this Contract and individually identifiable data derived from DHHS Data, must be stored in an area that is physically and technologically secure from access by unauthorized persons during duty hours as well as non-duty hours (e.g., door locks, card keys, biometric identifiers, etc.).

g. only authorized End Users may transmit the Confidential Data, including any derivative files containing personally identifiable information, and in all cases, such data must be encrypted at all times when in transit, at rest, or when stored on portable media as required in section IV above.

h. in all other instances Confidential Data must be maintained, used and disclosed using appropriate safeguards, as determined by a risk-based assessment of the circumstances involved.

i. understand that their user credentials (user name and password) must not be shared with anyone. End Users will keep their credential information secure. This applies to credentials used to access the site directly or indirectly through a third party application.

Contractor is responsible for oversight and compliance of their End Users. DHHS reserves the right to conduct onsite inspections to monitor compliance with this Contract, including the privacy and security requirements provided in herein, HIPAA, and other applicable laws and Federal regulations until such time the Confidential Data is disposed of in accordance with this Contract.

V. LOSS REPORTING

The Contractor must notify the State's Privacy Officer and Security Officer of any Security Incidents and Breaches immediately, at the email addresses provided in Section VI.

The Contractor must further handle and report Incidents and Breaches involving PHI in accordance with the agency's documented Incident Handling and Breach Notification procedures and in accordance with 42 C.F.R. §§ 431.300 - 306. In addition to, and notwithstanding, Contractor's compliance with all applicable obligations and procedures, Contractor's procedures must also address how the Contractor will:

1. Identify Incidents;
2. Determine if personally identifiable information is involved in Incidents;
3. Report suspected or confirmed Incidents as required in this Exhibit or P-37;

Contractor Initials DS

Date 12/5/2023

4. Identify and convene a core response group to determine the risk level of Incidents and determine risk-based responses to Incidents; and
5. Determine whether Breach notification is required, and, if so, identify appropriate Breach notification methods, timing, source, and contents from among different options, and bear costs associated with the Breach notice as well as any mitigation measures.

Incidents and/or Breaches that implicate PI must be addressed and reported, as applicable, in accordance with NH RSA 359-C:20.

VI. PERSONS TO CONTACT

A. DHHS Privacy Officer:

DHHSPrivacyOfficer@dhhs.nh.gov B.

DHHS Security Officer:

DHHSInformationSecurityOffice@dhhs.nh.gov

BUSINESS ASSOCIATE AGREEMENT

The Contractor identified in Section 1.3 of the General Provisions of the Agreement (Form P-37) ("Agreement"), and any of its agents who receive use or have access to protected health information (PHI), as defined herein, shall be referred to as the "Business Associate." The State of New Hampshire, Department of Health and Human Services, "Department" shall be referred to as the "Covered Entity," The Contractor and the Department are collectively referred to as "the parties."

The parties agree, to comply with the Health Insurance Portability and Accountability Act, Public Law 104-191, the Standards for Privacy and Security of Individually Identifiable Health Information, 45 CFR Parts 160, 162, and 164 (HIPAA), provisions of the HITECH Act, Title XIII, Subtitle D, Parts 1&2 of the American Recovery and Reinvestment Act of 2009, 42 USC 17934, et sec., applicable to business associates, and as applicable, to be bound by the provisions of the Confidentiality of Substance Use Disorder Patient Records, 42 USC s. 290 dd-2, 42 CFR Part 2, (Part 2), as any of these laws and regulations may be amended from time to time.

(1) Definitions

a. The following terms shall have the same meaning as defined in HIPAA, the HITECH Act, and Part 2, as they may be amended from time to time:

"Breach," "Designated Record Set," "Data Aggregation," Designated Record Set," "Health Care Operations," "HITECH Act," "Individual," "Privacy Rule," "Required by law," "Security Rule," and "Secretary."

b. Business Associate Agreement, (BAA) means the Business Associate Agreement that includes privacy and confidentiality requirements of the Business Associate working with PHI and as applicable, Part 2 record(s) on behalf of the Covered Entity under the Agreement.

c. "Constructively Identifiable," means there is a reasonable basis to believe that the information could be used, alone or in combination with other reasonably available information, by an anticipated recipient to identify an individual who is a subject of the information.

d. "Protected Health Information" ("PHI") as used in the Agreement and the BAA, means protected health information defined in HIPAA 45 CFR 160.103, limited to the information created, received, or used by Business Associate from or on behalf of Covered Entity, and includes any Part 2 records, if applicable, as defined below.

e. "Part 2 record" means any patient "Record," relating to a "Patient," and "Patient Identifying Information," as defined in 42 CFR Part 2.11.

f. "Unsecured Protected Health Information" means protected health information that is not secured by a technology standard that renders protected health information unusable, unreadable, or indecipherable to unauthorized individuals and is developed or endorsed by a standards developing organization that is accredited by the American National Standards Institute.

(2) Business Associate Use and Disclosure of Protected Health Information

a. Business Associate shall not use, disclose, maintain, store, or transmit Protected Health Information (PHI) except as reasonably necessary to provide the services outlined under the Agreement. Further, Business Associate, including but not

limited to all its directors, officers, employees, and agents, shall protect any PHI as required by HIPPA and 42 CFR Part 2, and not use, disclose, maintain, store, or transmit PHI in any manner that would constitute a violation of HIPAA or 42 CFR Part 2.

b. Business Associate may use or disclose PHI, as applicable:

I. For the proper management and administration of the Business Associate;

II. As required by law, according to the terms set forth in paragraph c. and d. below;

III. According to the HIPAA minimum necessary standard;

IV. For data aggregation purposes for the health care operations of the Covered Entity; and

V. Data that is de-identified or aggregated and remains constructively identifiable may not be used for any purpose outside the performance of the Agreement.

c. To the extent Business Associate is permitted under the BAA or the Agreement to disclose PHI to any third party or subcontractor prior to making any disclosure, the Business Associate must obtain, a business associate agreement or other agreement with the third party or subcontractor, that complies with HIPAA and ensures that all requirements and restrictions placed on the Business Associate as part of this BAA with the Covered Entity, are included in those business associate agreements with the third party or subcontractor.

d. The Business Associate shall not, disclose any PHI in response to a request or demand for disclosure, such as by a subpoena or court order, on the basis that it is required by law, without first notifying Covered Entity so that Covered Entity can determine how to best protect the PHI. If Covered Entity objects to the disclosure, the Business Associate agrees to refrain from disclosing the PHI and shall cooperate with the Covered Entity in any effort the Covered Entity undertakes to contest the request for disclosure, subpoena, or other legal process. If applicable relating to Part 2 records, the Business Associate shall resist any efforts to access part 2 records in any judicial proceeding.

(3) Obligations and Activities of Business Associate

a. Business Associate shall implement appropriate safeguards to prevent unauthorized use or disclosure of all PHI in accordance with HIPAA Privacy Rule and Security Rule with regard to electronic PHI, and Part 2, as applicable.

b. The Business Associate shall immediately notify the Covered Entity's Privacy Officer at the following email address, DHHSPrivacyOfficer@dhhs.nh.gov after the Business Associate has determined that any use or disclosure not provided for by its contract, including any known or suspected privacy or security incident or breach has occurred potentially exposing or compromising the PHI. This includes inadvertent or accidental uses or disclosures or breaches of unsecured protected health information.

c. In the event of a breach, the Business Associate shall comply with the terms of this Business Associate Agreement, all applicable state and federal laws and regulations and any additional requirements of the Agreement.

d. The Business Associate shall perform a risk assessment, based on the information available at the time it becomes aware of any known or suspected privacy or

security breach as described above and communicate the risk assessment to the Covered Entity. The risk assessment shall include, but not be limited to:

I. The nature and extent of the protected health information involved, including the types of identifiers and the likelihood of re-identification;

II. The unauthorized person who accessed, used, disclosed, or received the protected health information;

III. Whether the protected health information was actually acquired or viewed; and

IV. How the risk of loss of confidentiality to the protected health information has been mitigated.

e. The Business Associate shall complete a risk assessment report at the conclusion of its incident or breach investigation and provide the findings in a written report to the Covered Entity as soon as practicable after the conclusion of the Business Associate's investigation.

f. Business Associate shall make available all of its internal policies and procedures, books and records relating to the use and disclosure of PHI received from, or created or received by the Business Associate on behalf of Covered Entity to the US Secretary of Health and Human Services for purposes of determining the Business Associate's and the Covered Entity's compliance with HIPAA and the Privacy and Security Rule, and Part 2, if applicable.

g. Business Associate shall require all of its business associates that receive, use or have access to PHI under the BAA to agree in writing to adhere to the same restrictions and conditions on the use and disclosure of PHI contained herein.

h. Within ten (10) business days of receipt of a written request from Covered Entity, Business Associate shall make available during normal business hours at its offices all records, books, agreements, policies and procedures relating to the use and disclosure of PHI to the Covered Entity, for purposes of enabling Covered Entity to determine Business Associate's compliance with the terms of the BAA and the Agreement.

i. Within ten (10) business days of receiving a written request from Covered Entity, Business Associate shall provide access to PHI in a Designated Record Set to the Covered Entity, or as directed by Covered Entity, to an individual in order to meet the requirements under 45 CFR Section 164.524.

j. Within ten (10) business days of receiving a written request from Covered Entity for an amendment of PHI or a record about an individual contained in a Designated Record Set, the Business Associate shall make such PHI available to Covered Entity for amendment and incorporate any such amendment to enable Covered Entity to fulfill its obligations under 45 CFR Section 164.526.

k. Business Associate shall document any disclosures of PHI and information related to any disclosures as would be required for Covered Entity to respond to a request by an individual for an accounting of disclosures of PHI in accordance with 45 CFR Section 164.528.

l. Within ten (10) business days of receiving a written request from Covered Entity for a request for an accounting of disclosures of PHI, Business Associate shall make available to Covered Entity such information as Covered Entity may require to fulfill its obligations to provide an accounting of disclosures with respect to PHI in

accordance with 45 CFR Section 164.528.

m. In the event any individual requests access to, amendment of, or accounting of PHI directly from the Business Associate, the Business Associate shall within five (5) business days forward such request to Covered Entity. Covered Entity shall have the responsibility of responding to forwarded requests. However, if forwarding the individual's request to Covered Entity would cause Covered Entity or the Business Associate to violate HIPAA and the Privacy and Security Rule, the Business Associate shall instead respond to the individual's request as required by such law and notify Covered Entity of such response as soon as practicable.

n. Within thirty (30) business days of termination of the Agreement, for any reason, the Business Associate shall return or destroy, as specified by Covered Entity, all PHI received from or created or received by the Business Associate in connection with the Agreement, and shall not retain any copies or back-ups of such PHI in any form or platform.

VI. If return or destruction is not feasible, or the disposition of the PHI has been otherwise agreed to in the Agreement, or if retention is governed by state or federal law, Business Associate shall continue to extend the protections of the Agreement, to such PHI and limit further uses and disclosures of such PHI to those purposes that make the return or destruction infeasible for as long as the Business Associate maintains such PHI. If Covered Entity, in its sole discretion, requires that the Business Associate destroy any or all PHI, the Business Associate shall certify to Covered Entity that the PHI has been destroyed.

(4) Obligations of Covered Entity

a. Covered Entity shall post a current version of the Notice of the Privacy Practices on the Covered Entity's website:

https://www.dhhs.nh.gov/oos/hipaa/publications.htm in accordance with 45 CFR Section 164.520.

b. Covered Entity shall promptly notify Business Associate of any changes in, or revocation of permission provided to Covered Entity by individuals whose PHI may be used or disclosed by Business Associate under this BAA, pursuant to 45 CFR Section 164.506 or 45 CFR Section 164.508.

c. Covered entity shall promptly notify Business Associate of any restrictions on the use or disclosure of PHI that Covered Entity has agreed to in accordance with 45 CFR 164.522, to the extent that such restriction may affect Business Associate's use or disclosure of PHI.

(5) Termination of Agreement for Cause

a. In addition to the General Provisions (P-37) of the Agreement, the Covered Entity may immediately terminate the Agreement upon Covered Entity's knowledge of a material breach by Business Associate of the Business Associate Agreement. The Covered Entity may either immediately terminate the Agreement or provide an opportunity for Business Associate to cure the alleged breach within a timeframe specified by Covered Entity.

(6) Miscellaneous

a. Definitions, Laws, and Regulatory References. All laws and regulations used,

herein, shall refer to those laws and regulations as amended from time to time. A reference in the Agreement, as amended to include this Business Associate Agreement, to a Section in HIPAA or 42 Part 2, means the Section as in effect or as amended.

b. **Change in law** - Covered Entity and Business Associate agree to take such action as is necessary from time to time for the Covered Entity and/or Business Associate to comply with the changes in the requirements of HIPAA, 42 CFR Part 2 other applicable federal and state law.

c. **Data Ownership** - The Business Associate acknowledges that it has no ownership rights with respect to the PHI provided by or created on behalf of Covered Entity.

d. **Interpretation** - The parties agree that any ambiguity in the BAA and the Agreement shall be resolved to permit Covered Entity and the Business Associate to comply with HIPAA and 42 CFR Part 2.

e. **Segregation** - If any term or condition of this BAA or the application thereof to any person(s) or circumstance is held invalid, such invalidity shall not affect other terms or conditions which can be given effect without the invalid term or condition; to this end the terms and conditions of this BAA are declared severable.

f. **Survival** - Provisions in this BAA regarding the use and disclosure of PHI, return or destruction of PHI, extensions of the protections of the BAA in section (3) g. and (3) n.l., and the defense and indemnification provisions of the General Provisions (P-37) of the Agreement, shall survive the termination of the BAA.

IN WITNESS WHEREOF, the parties hereto have duly executed this Business Associate Agreement.

Department of Health and Human Services	Trustees of Dartmouth College
The State	Name of the Contractor
DocuSigned by: Patricia M. Tilley 940FB38F5BFB4C8...	DocuSigned by: Jill M. Mortali F740380A29C0415...
Signature of Authorized Representative	Signature of Authorized Representative
Patricia M. Tilley	Jill M. Mortali
Name of Authorized Representative	Name of Authorized Representative
Director	Director, Office of Sponsored Projects
Title of Authorized Representative	Title of Authorized Representative
12/5/2023	12/5/2023
Date	Date

State of New Hampshire

Department of State

CERTIFICATE

I, David M. Scanlan, Secretary of State of the State of New Hampshire, do hereby certify that TRUSTEES OF DARTMOUTH COLLEGE a New Hampshire State Chartered (Legislative) formed to transact business in New Hampshire on December 13, 1769. I further certify that it has paid the fees required by law and has not dissolved.

Business ID: **66740**

Certificate Number: **0006350990**

IN TESTIMONY WHEREOF,

I hereto set my hand and cause to be affixed the Seal of the State of New Hampshire, this 29th day of November A.D. 2023.

David M. Scanlan

Secretary of State

DARTMOUTH

Board of Trustees

Hanover, New Hampshire, 03755

CERTIFICATE

I, Laura H. Hercod, hereby certify that I am Assistant Clerk of Trustees of Dartmouth College, a corporation created by Royal Charter and existing under the laws of the State of New Hampshire; that as Assistant Clerk I have custody of the records of meetings of the Board of Trustees of said corporation; and that at a meeting of said Board duly called and held on the 9th day of April, 2011 at which a quorum was present and acting throughout, the following vote was adopted:

> VOTED: To approve the Signature and Requisition Authority Policy, effective July 1, 2011 or such earlier date as the Executive Vice President/Chief Financial Officer shall determine. The provisions of the Signature and Requisition Authority Policy shall take precedence over any previous inconsistent vote of the Board of Trustees.

I further certify that said Board voted to adopt amendments to the Signature and Requisition Authority Policy on March 3, 2012 (effective January 1, 2012), September 22, 2013, January 2, 2014, March 8, 2014, November 8, 2014, September 17, 2016, March 4, 2017, November 4, 2017, November 3, 2018, åJanuary 21, 2022, and March 3, 2023 (effective January 11, 2023), and that pursuant to authority granted in the policy, amendments by the Executive Vice President and the Provost were made August 7, 2015 (effective July 1, 2015), as amended on September 17, 2016, April 10, 2017, October 13, 2017, and as further amended on October 18, 2018, October 29, 2019, March 3, 2020, April 13, 2021, and June 15, 2022 (effective March 1, 2022). The document is available on Dartmouth's website at:
https://policies.dartmouth.edu/policy/signature-and-requisition-authority-policy

I further certify that said vote remains in full force and effect as of the date hereof and is not contrary to any provision of the Charter of said corporation.

I further certify that said vote has not been amended or repealed and remains in full force and effect as of the date of the contract/contract amendment to which this certificate is attached. This authority was **valid thirty (30) days prior to and remains valid for thirty (30) days** from the date of this Certificate of Authority. I further certify that it is understood that the State of New Hampshire will rely on this certificate as evidence that the person(s) listed above currently occupy the position(s) indicated and that they have full authority to bind the corporation. To the extent that there are any limits on the authority of any listed individual to bind the corporation in contracts with the State of New Hampshire, all such limitations are expressly stated herein.

I further certify that attached hereto is a true and correct copy of the Introduction and the Sponsored Activities Administration and Intellectual Property Transactions section (Appendix G) of the said Signature and Requisition Authority Policy.

I further certify that the following persons were appointed to the positions opposite their respective names and continue to serve in said positions as of the dates shown:

David Kotz	Provost	July 1, 2021
Dean Madden	Vice Provost for Research	July 1, 2017
Dianne Ingalls	Controller	July 1, 2020
Jill Mortali	Director, Office of Sponsored Projects	September 15, 2008
Stephanie Morgan	Senior Grants Associate	January 1, 2020
Renee Brown	Senior Grants Associate	January 1, 2020
Colleen Sullivan	Senior Grants Associate	September 1, 2022

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the corporation this 30 day of November, 2023

Laura H. Hercod

Laura H. Hercod, Assistant Clerk
Trustees of Dartmouth College

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
12/06/2023

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

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

PRODUCER Marsh USA LLC 1717 Arch Street Philadelphia, PA 19103-2797 CN101609587-DART-GAWUP-23-	**CONTACT NAME:** **PHONE (A/C, No, Ext):** **FAX (A/C, No):** **E-MAIL ADDRESS:**

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Pinnacle Consortium of Higher Ed VT RRRG	11980
INSURER B : Safety National Casualty Corporation	15105
INSURER C : N/A	N/A
INSURER D : N/A	N/A
INSURER E : N/A	N/A
INSURER F : N/A	N/A

INSURED
TRUSTEES OF DARTMOUTH COLLEGE
ATTN: TINA LEVENGOOD
6012 NORTH FAIRBANKS
8 CEMETERY LANE
HANOVER, NH 03755

COVERAGES

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			PCHE2023-03	07/01/2023	07/01/2024	EACH OCCURRENCE	$ 5,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 5,000,000
							MED EXP (Any one person)	$ 5,000
							PERSONAL & ADV INJURY	$ 5,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 10,000,000
	X POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$ 5,000,000
	OTHER:							$
B	AUTOMOBILE LIABILITY			CA6675686	07/01/2023	07/01/2024	COMBINED SINGLE LIMIT (Ea accident)	$ 2,000,000
	X ANY AUTO			SELF-INSURED FOR			BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS			PHYSICAL DAMAGE			BODILY INJURY (Per accident)	$
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$
	DED RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						PER STATUTE OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)		N / A				E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

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

Evidence of Insurance

CERTIFICATE HOLDER

State of NH
Department of Health and Human Services
129 Pleasant Street
Concord, NH 03301-3857

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

Marsh USA LLC

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 12/04/2023

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

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

PRODUCER Marsh USA LLC 1717 Arch Street Philadelphia, PA 19103-2797	CONTACT NAME: PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
CN101609587-DART-GAWUP-23-	INSURER A : N/A	N/A
INSURED TRUSTEES OF DARTMOUTH COLLEGE ATTN: TINA LEVENGOOD 6012 NORTH FAIRBANKS 8 CEMETERY LANE HANOVER, NH 03755	INSURER B : N/A	N/A
	INSURER C : N/A	N/A
	INSURER D : Midwest Employers Casualty Company	23612
	INSURER E : National Fire Insurance of Hartford	20478
	INSURER F : Transportation Insurance Co	20494

COVERAGES

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	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$
	☐ OTHER:							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	☐ UMBRELLA LIAB ☐ OCCUR						EACH OCCURRENCE	$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
E F 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		6024204717 (AOS) 6024204720 (CA) EWC008364 (NH) "Below SIR Applies" SIR: $1,000,000	07/01/2023 07/01/2023 07/01/2023	07/01/2024 07/01/2024 07/01/2025	X PER STATUTE ☐ OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000

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

CERTIFICATE HOLDER

State of NH
Department of Health and Human Services
129 Pleasant Street
Concord, NH 03301-3857

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

Marsh USA LLC

Dartmouth
GEISEL SCHOOL OF
MEDICINE

Our Mission

We address the world's health problems through research and discovery, the evaluation and improvement of systems of healthcare, and the education of the best future physicians and scientists.

Our Vision

- to be the medical school that sets the standard for educating physicians, scientists, and teachers who will act in concert to improve health locally and globally;
- to build a diverse and inclusive community in order to enrich learning, foster innovation and tackle the most vexing challenges in health care;
- to generate and disseminate new knowledge through research and education that leads to new and more effective therapies and to systematic improvement of health care delivery.

https://geiselmed.dartmouth.edu/about/mission/

Dartmouth
GEISEL SCHOOL OF
MEDICINE | DEPARTMENT of EPIDEMIOLOGY

About Us

The Department of Epidemiology at Geisel School of Medicine and Dartmouth College is driven to excel in the discovery of disease etiology and progression. Our faculty rely on rigorously constructed hypothesis-driven clinical trials and population-based research and apply state-of-the-art and novel methods and technologies to advance the field of epidemiology and impact human health and disease.

At our core is a commitment to highly interdisciplinary research programs with a translational emphasis. Our faculty's expertise spans diverse areas in molecular-genetic epidemiology, epigenetics, nutritional and chemoprevention research, cancer etiology, environmental epidemiology, pharmacoepidemiology, women's and children's health, diseases of aging, global health, medical imaging, disease and screening registries, and epidemiologic methods.

Research

The Department of Epidemiology at Geisel School of Medicine and Dartmouth College is driven to excel in the discovery of disease etiology and progression.

Academics

Faculty in the department lead and participate in teaching courses for medical, graduate, and undergraduate students while mentoring epidemiology-focused PhD students.

Faculty

At our core is a commitment to highly interdisciplinary research programs with a translational emphasis. Our faculty's expertise spans diverse areas such as molecular-genetic epidemiology, epigenetics, nutritional and chemoprevention research, cancer etiology, and environmental epidemiology.

Research

The Department of Epidemiology at Geisel School of Medicine and Dartmouth College is driven to excel in the discovery of disease etiology and progression.

Department of Epidemiology

Geisel School of Medicine at Dartmouth
1 Medical Center Drive
Williamson Translational Research Building, 7th Floor
Lebanon, NH 03756

Learn more about our Center for Biomedical Research Excellence (COBRE) here

Learn more about our Children's Center and Environmental Contaminants and Health Outcomes (ECHO) here

TRUSTEES OF DARTMOUTH COLLEGE

Financial Statements

2022 - 2023

Report of Independent Auditors

To the Board of Trustees of Dartmouth College

Opinion

We have audited the accompanying consolidated financial statements of Trustees of Dartmouth College and its subsidiaries ("Dartmouth"), which comprise the consolidated statements of financial position as of June 30, 2023 and 2022 and the related consolidated statements of activities for the year ended June 30, 2023, of expenses and of cash flows for the years ended June 30, 2023 and 2022, including the related notes (collectively referred to as the "consolidated financial statements").

In our opinion, the accompanying consolidated financial statements present fairly, in all material respects, the financial position of Dartmouth as of June 30, 2023 and 2022, the changes in its net assets for the year ended June 30, 2023, its expenses and its cash flows for the years ended June 30, 2023 and 2022 in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinion

We conducted our audit in accordance with auditing standards generally accepted in the United States of America (US GAAS). Our responsibilities under those standards are further described in the Auditors' Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are required to be independent of Dartmouth and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Other Matter

We previously audited the consolidated statement of financial position as of June 30, 2022, and the related consolidated statements of activities, of expenses and of cash flows for the year then ended (the statement of activities is not presented herein), and in our report dated October 31, 2022, we expressed an unmodified opinion on those consolidated financial statements. In our opinion, the information set forth in the accompanying summarized financial information for the year ended June 30, 2022 is consistent, in all material respects, with the audited consolidated financial statements from which it has been derived.

Responsibilities of Management for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about Dartmouth's ability to continue as a going concern for one year after the date the consolidated financial statements are issued.

Auditors' Responsibilities for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with US GAAS will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the consolidated financial statements.

In performing an audit in accordance with US GAAS, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of Dartmouth's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the consolidated financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about Dartmouth's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control-related matters that we identified during the audit.

PricewaterhouseCoopers LLP

Boston, Massachusetts
October 26, 2023

Trustees of Dartmouth College

Consolidated Statements of Financial Position

As of June 30, 2023 and June 30, 2022
(in thousands)

	2023	2022
Assets		
Cash and cash equivalents	$ 597,900	$ 384,595
Receivables and other assets, net	218,699	133,421
Pledges receivable, net	466,908	421,289
Investments	9,122,079	9,289,233
Land, buildings, equipment, and construction in progress, net	1,258,003	1,216,681
Total assets	$ 11,663,589	$ 11,445,219
Liabilities		
Accounts payable and other liabilities	$ 228,403	$ 162,920
Deferred revenues and deposits	43,357	41,518
Liability for split-interest agreements	43,685	44,929
Employment and retirement benefits	306,025	288,189
Bonds, mortgages, and notes payable, net	985,809	998,206
Interest rate swap liabilities	67,814	107,700
Conditional asset retirement obligations	24,775	24,239
Government advances for student loans	7,363	8,261
Total liabilities	1,707,231	1,675,962
Net Assets		
Without donor restrictions	2,962,442	2,716,236
With donor restrictions	6,993,916	7,053,021
Total net assets	9,956,358	9,769,257
Total liabilities and net assets	$ 11,663,589	$ 11,445,219

See accompanying notes to the consolidated financial statements.

Consolidated Statement of Activities

For the year ended June 30, 2023, with summarized financial information for the year ended June 30, 2022
(in thousands)

	Without donor restrictions	With donor restrictions	Total 2023	Total 2022
Endowment Activities				
Gifts	$ 69	$ 120,488	$ 120,557	$ 122,280
Net investment return	24,384	86,238	110,622	(269,234)
Distributed for spending	(88,276)	(307,538)	(395,814)	(335,601)
Other changes	(7,288)	(3,147)	(10,435)	(14,038)
Amounts transferred from other funds, net	22,089	17,362	39,451	78,146
Change in net assets from endowment activities	(49,022)	(86,597)	(135,619)	(418,447)
Operating Activities				
Revenues and other support				
Tuition and fees, net of scholarships of $218,821 in 2023 and $204,768 in 2022	238,959	-	238,959	252,544
Sponsored research grants and contracts	173,804	-	173,804	169,436
Dartmouth College Fund and other gifts	84,865	23,644	108,509	105,119
Distributed endowment investment return	378,525	14,810	393,335	333,329
Other operating income	382,880	3,875	386,755	56,828
Auxiliaries	93,008	-	93,008	90,135
Net assets released from restrictions	20,287	(20,287)	-	-
Total revenues and other support	1,372,328	22,042	1,394,370	1,007,391
Expenses				
Academic and student programs	780,550	-	780,550	616,068
Sponsored programs	117,372	-	117,372	113,784
General institutional services	124,405	-	124,405	108,587
Auxiliaries	104,077	-	104,077	97,440
Total expenses	1,126,404	-	1,126,404	935,879
Change in net assets from operating activities	245,924	22,042	267,966	71,512
Non-operating Activities				
Gifts	-	52,974	52,974	59,883
Distributed endowment investment return	683	1,796	2,479	2,272
Revenue and other non-operating changes, net	6,977	10,136	17,113	(8,655)
Non-operating expenses	(15,978)	(3,795)	(19,773)	(24,325)
Other components of net periodic benefit cost	1,893		1,893	2,043
Increase in outstanding pledges, net	-	45,619	45,619	49,746
Pension and postretirement benefit related changes other than net periodic benefit cost	(18,515)	-	(18,515)	7,868
Change in unrealized gain related to interest rate swap agreements	39,886	-	39,886	97,206
Net assets released from restrictions	55,724	(55,724)	-	-
Amounts transferred to endowment, net	(21,360)	(18,091)	(39,451)	(78,146)
Net change in split-interest agreements	(6)	(27,465)	(27,471)	(34,840)
Change in net assets from non-operating activities	49,304	5,450	54,754	73,052
Change in net assets	246,206	(59,105)	187,101	(273,883)
Net Assets, beginning of year	2,716,236	7,053,021	9,769,257	10,043,140
Net Assets, end of year	$ 2,962,442	$ 6,993,916	$ 9,956,358	$ 9,769,257

See accompanying notes to the consolidated financial statements.

Consolidated Statement of Expenses

For the year ended June 30, 2023
(in thousands)

	Academic & Student Programs	Sponsored Programs	General Institutional Services				Auxiliaries	Total Operating Expenses	Non-Operating Expenses	Total Expenses
			Administrative Support	Facilities Operation & Maintenance	Development	Total				
Salaries and wages	$ 292,846	$ 57,243	$ 34,194	$ 23,471	$ 29,172	$ 86,837	$ 16,357	$ 453,283	$ -	$ 453,283
Employee benefits	85,042	16,623	9,930	6,816	8,471	25,217	4,750	131,632	-	131,632
Fellowships and student support	20,069	4,699	-	-	-	-	-	24,768	-	24,768
Materials, equipment, and supplies	44,007	8,685	9,063	5,199	2,314	16,576	20,576	89,844	311	90,155
Purchased services	165,178	26,912	13,045	9,152	6,258	28,455	11,591	232,136	1,157	233,293
Utilities, taxes, and occupancy	1,394	93	0	31,821	69	31,890	11,944	45,321	106	45,427
Depreciation and amortization	54,678	-	1,359	3,316	541	5,216	14,283	74,177	-	74,177
Lodging, travel, and similar costs	25,881	2,721	1,249	99	2,036	3,384	147	32,133	2	32,135
Interest	-	-	-	28,990	-	28,990	1,409	30,399	8,544	38,943
Other expenses	6,765	396	3,267	919	684	4,870	680	12,711	9,653	22,364
	695,860	117,372	72,107	109,783	49,545	231,435	81,737	1,126,404	19,773	1,146,177
Facilities operation & maintenance	84,690	-	1,916	(109,783)	837	(107,030)	22,340	-	-	-
Total expenses for FY23	$ 780,550	$ 117,372	$ 74,023	$ -	$ 50,382	$ 124,405	$ 104,077	$ 1,126,404	$ 19,773	$ 1,146,177

See accompanying notes to the consolidated financial statements.

Consolidated Statement of Expenses

For the year ended June 30, 2022
(in thousands)

	Academic & Student Programs	Sponsored Programs	General Institutional Services				Auxiliaries	Total Operating Expenses	Non-Operating Expenses	Total Expenses
			Administrative Support	Facilities Operation & Maintenance	Development	Total				
Salaries and wages	$ 268,673	$ 53,498	$ 31,285	$ 21,682	$ 26,363	$ 79,330	$ 17,009	$ 418,510	$ -	$ 418,510
Employee benefits	78,829	15,715	9,162	6,361	7,735	23,258	4,990	122,792	(2,043)	120,749
Fellowships and student support	15,851	3,686	-	-	-	-	-	19,537		19,537
Materials, equipment, and supplies	38,707	9,543	7,940	2,997	1,416	12,353	18,608	79,211	302	79,513
Purchased services	66,307	29,561	12,358	7,261	3,747	23,366	9,828	129,062	1,207	130,269
Utilities, taxes, and occupancy	1,609	50	-	31,699	27	31,726	9,601	42,986	118	43,104
Depreciation and amortization	47,102	0	1,214	2,514	528	4,256	13,252	64,610	-	64,610
Lodging, travel, and similar costs	17,293	1,353	651	39	878	1,568	237	20,451	1	20,452
Interest	5	-	-	28,194	-	28,194	1,408	29,607	9,845	39,452
Other expenses	4,611	378	2,122	858	533	3,513	611	9,113	12,852	21,965
	538,987	113,784	64,732	101,605	41,227	207,564	75,544	935,879	22,282	958,161
Facilities operation & maintenance	77,081	-	1,773	(101,605)	855	(98,977)	21,896	-	-	-
Total expenses for FY22	$ 616,068	$ 113,784	$ 66,505	$ -	$ 42,082	$ 108,587	$ 97,440	$ 935,879	$ 22,282	$ 958,161

See accompanying notes to the consolidated financial statements.

Consolidated Statements of Cash Flows

For the years ended June 30, 2023 and June 30, 2022
(in thousands)

	2023	2022
Cash flows from operating activities		
Total change in net assets	$ 187,101	$ (273,883)
Adjustments to reconcile total change in net assets to net cash used in operating activities:		
Depreciation and amortization	72,946	62,711
Change in estimated value of interest rate swap agreements	(39,886)	(97,206)
Change in estimated pension and post-retirement benefit obligation	6,468	(30,615)
Net change in split-interest liability	(1,244)	(9,486)
Change in pledges receivable, net	(45,619)	(49,746)
Other non-cash transactions	827	1,054
Contributed securities	(46,866)	(58,424)
Contributions, investment income, and other changes restricted for long-term investment	(182,428)	(213,147)
Net realized (gains) losses and changes in net unrealized (gains) losses	(92,449)	420,755
Changes in operating assets and liabilities:		
Receivables and other assets, net	(89,751)	32,516
Accounts payable and other liabilities	63,222	13,991
Deferred revenues and deposits	1,839	(6,313)
Employment related obligations	11,368	919
Net cash used in operating activities	(154,472)	(206,874)
Cash flows from investing activities		
Student loans granted	(4,004)	(3,411)
Student loans repaid	8,301	6,747
Purchases of land, buildings, and equipment	(112,711)	(121,555)
Purchases of investments	(3,848,241)	(7,451,391)
Sales and maturities of investments	4,171,206	7,662,394
Net cash provided by investing activities	214,551	92,784
Cash flows from financing activities		
Repayment of debt	(11,641)	(11,456)
Contributions, investment income, and other changes restricted for long-term investment in:		
Facilities	30,761	25,533
Endowment, life income, and similar funds	151,667	187,614
Finance lease principal payments	(167)	(164)
Changes in government advances for student loans	(898)	(1,804)
Net cash provided by financing activities	169,722	199,723
Net change in cash and cash equivalents	229,801	85,633
Cash and cash equivalents, beginning of year	404,351	318,718
Cash and cash equivalents, end of year	$ 634,152	$ 404,351
Supplemental information on cash and cash equivalents:		
Cash and cash equivalents as shown in the Statement of Financial Position	$ 597,900	$ 384,595
Cash and cash equivalents included in Investments	36,252	19,756
Cash and cash equivalents as shown on the Statement of Cash Flows	$ 634,152	$ 404,351
Supplemental disclosure of cash flow information		
Cash paid for interest	$ 39,547	$ 42,136
Accounts payable related building and equipment additions	$ 2,561	$ 1,290
Fair value of securities received	$ 101,043	$ 257,629

See accompanying notes to the consolidated financial statements.

A. Summary of Significant Accounting Policies

Description of Organization

Trustees of Dartmouth College (Dartmouth) is a private, nonprofit, co-educational, nonsectarian institution of higher education with approximately 4,500 undergraduate and 2,300 graduate students. Established in 1769, Dartmouth includes the four-year undergraduate college, with graduate schools of business, engineering, medicine, and arts and sciences.

Basis of Presentation

The accompanying consolidated financial statements have been prepared on the accrual basis. Dartmouth's consolidated financial statements include the accounts of its wholly owned subsidiaries and financially controlled entities including real estate corporations which own property in the Hanover, NH area.

In accordance with accounting principles generally accepted in the United States of America and with the provisions of the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 958, Not-for-Profit Entities, Dartmouth classifies its net assets into two categories according to donor restrictions; net assets without donor restrictions and net assets with donor restrictions.

Net assets without donor restrictions include all resources that are not subject to donor restrictions and therefore may be used for any purpose in furtherance of Dartmouth's mission. Under the authority of Dartmouth's management and Board of Trustees, in order to support Dartmouth's strategic initiatives, all or a portion of net assets without donor restrictions may be set aside in segregated Dartmouth-designated reserve accounts and earmarked for use in future years by specific departments, divisions or schools to cover program costs or contingencies. These Dartmouth-designated net assets include funds designated for operating initiatives, facilities, and long-term quasi-endowment. In the case of quasi-endowment funds designated for long-term investment by Dartmouth, investment return that has been appropriated by Dartmouth's Board of Trustees is presented as an increase in net assets without donor restrictions in either operating or non-operating activities, depending upon Dartmouth's intended use of the funds. The purposes for which Dartmouth-designated net assets are earmarked may be changed under the authority of Dartmouth's management or Board of Trustees. The use of designated net assets is at the discretion of the responsible department. All operating expenses are recorded as a reduction of net assets without donor restrictions.

Net assets with donor restrictions carry donor restrictions on the expenditure or other use of contributed funds. These restrictions may expire either because of the passage of time or because actions are taken to fulfill the restrictions, or they may never lapse, thus requiring that the net assets be retained permanently. Net assets with donor restrictions include unexpended endowment return, unexpended restricted use gifts, term endowment funds, loan funds, certain uncollected pledges, life income and similar funds, and the original principal of endowment gifts. Donor-restricted resources intended for capital projects are released from their restrictions and presented as net assets without donor restrictions when the related asset is placed in service. Donor restricted endowment distribution and donor-restricted gifts which are received, and either spent or deemed spent within the same fiscal year, are reported as net assets without donor restrictions. Investment return from endowment activities that has been appropriated by Dartmouth's Board of Trustees is presented as an increase in operating or non-operating activities according to the restricted nature of the donor's intended use of the funds.

Comparative Financial Information

The 2023 consolidated financial statements are presented with certain prior-year comparative information summarized in total but not by net asset class. Such information does not include sufficient detail to constitute a presentation in conformity with GAAP. Accordingly, such information should be read in conjunction with Dartmouth's consolidated financial statements for the year ended June 30, 2022, from which the summarized information was derived. Certain prior year amounts have been reclassified to conform to the fiscal year 2023 presentation.

Use of Estimates

The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. The most significant estimates in these consolidated

financial statements are the fair value of investments, interest rate swap agreements, and pension and retirement medical benefit obligations. Actual results could differ materially from these estimates, particularly during periods of investment and/or interest rate volatility.

Recent Accounting Pronouncements
In fiscal year 2023, Dartmouth adopted ASU 2020-04, *Reference Rate Reform*, which provides guidance to ease the burden in accounting for reference rate reform on financial reporting. The adoption of this standard did not have a significant impact on Dartmouth's financial statements.

In fiscal year 2022, Dartmouth adopted ASU 2018-15, *Intangibles – Goodwill and Other – Internal-Use Software*, which provides guidance for capitalizing implementation costs for a cloud computing arrangement. The adoption of this standard did not have a significant impact on Dartmouth's financial statements.

In fiscal year 2022, Dartmouth adopted ASU 2020-07, *Not-for-Profit Entities (Topic 958): Presentation and Disclosures by Not-for-Profit Entities for Contributed Nonfinancial Assets*, which provides guidance for the presentation and disclosure of gifts-in-kind. The adoption of this standard did not have a significant impact on Dartmouth's financial statements.

Consolidated Statement of Activities
Operating activities presented in the Consolidated Statement of Activities consist of revenues earned, investment income, endowment net investment return appropriated by Dartmouth's Board of Trustees, and expenses incurred in conducting Dartmouth's programs and services. Auxiliary enterprises, primarily the operation of residence halls, dining services, and recreational facilities, are included in operating activities. Expenses such as development, public affairs, and central services and administration are reported as general institutional services. Depreciation and facilities operations and maintenance expenses are allocated to functional classifications of expenses based on the square footage of each building. Amortization expense of capitalized information technology costs is allocated to the functional classification that the technology supports. Interest expense is allocated to functional classifications of expenses based on the use of each building that has been debt financed. Employee benefits expense is allocated based on salary and wage expense.

Non-operating activities presented in the Consolidated Statement of Activities consist of gifts for facilities projects, split interest agreements, and gifts whose purpose has not yet been finalized, grants, investment income, other earnings, and endowment investment return appropriated by Dartmouth's Board of Trustees for loan programs and the construction, purchase or sale of capital assets, non-capitalizable construction in progress, net change in life income and similar split-interest agreements, the net change in pledges receivable, the net change in the estimated value of interest rate swap agreements, and retirement medical benefit changes other than service cost.

Endowment activities presented in the Consolidated Statement of Activities consist of gifts that are restricted by donors to invest in perpetuity, amounts designated by Dartmouth's management and Board of Trustees for long-term investment, the net investment return on these invested funds, and the annual distribution of an amount appropriated by Dartmouth's Board of Trustees to support operating and non-operating activities. Other endowment activities include increases in endowment net assets from certain matured split-interest agreements.

Endowment and non-operating activities also include transfers of net assets that occur when donors change the restrictions on certain gifts or when Dartmouth changes the designation of funds without donor restrictions.

Cash and Cash Equivalents
Cash and cash equivalents are recorded at cost which approximates fair value and may include U.S. treasury funds, money market accounts, certificates of deposit, commercial paper, foreign currency, and liquid short-term investments with maturities of 90 days or less at the date of acquisition. Cash and short-term investments including U.S. treasury securities, money market funds, foreign currency, and other interest bearing vehicles held for investment purposes in the Endowment are reported as Investments on the Consolidated Statements of Financial Position.

Tuition and Fees and Student Scholarships

Tuition and fees revenue is recognized in the fiscal year in which substantially all of the academic program services are provided. Tuition and fees revenue from undergraduate enrollment represents approximately 65 and 66 percent of tuition and fees revenue for the years ended June 30, 2023 and 2022, respectively. Student scholarships provided by Dartmouth reduce the published price of tuition for students receiving these scholarships. In addition, Dartmouth acts as an agent for recipients of scholarships from other sponsors in the amounts of $4,364,000 and $9,155,000 for the years ended June 30, 2023 and 2022, respectively, which are not presented in the Consolidated Statement of Activities.

Dartmouth does not consider the financial need in the admission process for undergraduate applicants. All admitted undergraduate students are offered financial aid to fully meet their demonstrated need, which is defined using an institutional formula that determines the ability to pay based on the family's income and assets, along with many other factors. The full amount of demonstrated need is met with a financial aid award that includes a combination of employment eligibility and scholarships.

Sponsored Research Grants and Contracts

Sponsored research includes revenue from exchange and conditional non-exchange agreements with governments, foundations and private sources for research activities. Revenue from exchange agreements is recognized when performance obligations are met, and revenue from conditional non-exchange agreements is recognized as the related costs are incurred. Non-exchange agreements are considered conditional if the terms of the agreement include both a right of return/release and a barrier. These agreements become unconditional as barriers are met. As of June 30, 2023 and 2022, Dartmouth had unrecorded conditional sponsored research agreements of $80,497,000 and $92,942,000, respectively. Revenue from the reimbursement of facilities and administrative costs incurred by Dartmouth on U.S. government grants and contracts is based upon negotiated rates predetermined through June 30, 2025. Dartmouth recovered facilities and administrative costs of approximately $49,528,000 and $47,627,000 during the years ended June 30, 2023 and 2022, respectively.

Revenue from Auxiliaries

Auxiliary services furnish goods or services to students, faculty, staff and incidentally to the general public and charge a fee directly related to the cost of the goods or services provided. Auxiliary revenue includes revenues from student housing and dining facilities, revenues from recreational and hospitality operations, and other miscellaneous activities. Revenue from auxiliary operations is recognized as the goods are provided or services are rendered.

Taxes

Dartmouth is exempt from federal income taxes under Section 501(c)(3) of the U.S. Internal Revenue Code (the Code), except with regard to unrelated business income, which is taxed at corporate income tax rates. Dartmouth is also subject to state and local property tax on the value of dormitories and dining facilities in excess of $150,000, as well as on the value of its off-campus rental properties, commercial properties, and other real estate holdings to the extent they are not used or occupied for Dartmouth's tax-exempt purposes. Certain Dartmouth real estate entities are exempt from federal income tax under Sections 501(c)(2) and 501(c)(25) of the Code. As of June 30, 2023, tax years ended June 30, 2020 through June 30, 2022 remain open and are subject to federal and state taxing authority examination. Dartmouth believes it has taken no significant uncertain tax positions.

Dartmouth is subject to the unrelated business income tax (UBIT) on certain investments and operations, an excise tax on net investment income that is not subject to UBIT, and an excise tax on certain compensation. As of June 30, 2023, Dartmouth has accrued an estimated liability for unrelated business income taxes payable of $29,000, excise taxes payable of $2,492,000, and a deferred tax liability of $33,287,000. As of June 30, 2022, Dartmouth accrued an estimated tax liability for unrelated business income taxes payable of $244,780, excise taxes payable of $6,547,000 and a deferred tax liability of $41,621,000.

Affiliation with Dartmouth-Hitchcock Medical Center

Dartmouth, through the Geisel School of Medicine (Geisel), is a member of the Dartmouth-Hitchcock Medical Center (DHMC), a confederation of health care organizations intended to coordinate medical education and health care delivery for the residents of New Hampshire and Vermont. DHMC is a nonprofit, tax-exempt corporation organized under New Hampshire State Law. The other members of DHMC are: (i) Mary Hitchcock Memorial Hospital (MHMH), (ii) Dartmouth-Hitchcock Clinic (Clinic),

and (iii) Veterans Administration Medical Center of White River Junction, Vermont (VAMC). The staff of the Clinic serves as the primary resource for Geisel clinical faculty, with the Hitchcock Hospital and the VAMC acting as principal sites of clinical instruction for Geisel students. Each member of DHMC is a separately organized, governed, and operated institution, with Dartmouth having no ownership interest in any other member.

Certain costs, including salaries, facilities use (including construction planning and management, and facilities operation and maintenance), and direct and indirect research, incurred by Geisel and the other members of DHMC are shared among the members based on negotiated allocations of the costs on an annual or project specific basis. The members of DHMC, excluding the VAMC, are also parties to a Condominium Ownership Agreement that governs the ownership and operation of the DHMC facilities. During the years ended June 30, 2023 and 2022, Dartmouth paid approximately $13,700,000 and $12,400,000, respectively, and received approximately $13,500,000 and $11,600,000, respectively, in connection with these arrangements.

Insurance

Dartmouth maintains several insurance arrangements with the objective of providing the most cost effective and comprehensive coverage for most insurable risks. Both conventional and alternative insurance coverage approaches, including utilization of appropriate deductible or self-insured retention amounts, are in place to cover trustee errors and omissions and employment practices, crime bond, commercial general and automobile liability, fiduciary liability insurance, and property losses. Workers' compensation losses are covered by a self-insured retention and excess insurance program. Dartmouth currently participates in two risk retention groups that provide general liability and professional and medical malpractice liability insurance.

Dartmouth's annual premium payments for conventional insurance coverage are included in operating expenses. Estimated liabilities for losses under Dartmouth's deductible and/or self-insurance retention limits are reflected in the Consolidated Statements of Financial Position, which includes estimates for known losses and for losses incurred but not yet reported. Insurance reserves are based on actuarial analysis and/or estimates of historical loss experience, and while management believes that the reserves are adequate, the ultimate liabilities may be different than the amounts provided.

Gifts and Pledges Receivable

Total contributions to Dartmouth include gifts that are received and the net change in pledges receivable during a period. Gifts and pledges are recognized as increases in the appropriate category of net assets in the period the gift or pledge is received. The net change in total pledges is recorded as a net increase (decrease) in non-operating activities in the Consolidated Statement of Activities. Pledges are stated at the estimated present value of future cash flows, net of an allowance for uncollectible amounts. Contributions of securities are recorded at their estimated fair value at the date of gift when the fair value is readily determinable and material. Conditional promises to give are not recognized until the conditions on which they depend are substantially met.

Investments

For investments held directly by Dartmouth for which an active market with quoted prices exists, the market price of an identical security is used as fair value. Fair values for shares in listed commingled funds are based on the quoted market value or share prices reported as of the last business day of the fiscal year. Dartmouth's interest in certain other private commingled funds and private partnership interests are reported at the net asset value (NAV) as determined by the external fund manager. As permitted by GAAP, Dartmouth uses NAV as a practical expedient to estimate the fair value of Dartmouth's ownership interest, unless it is probable that all or a portion of the investment will be sold for an amount different from NAV. Dartmouth performs due diligence procedures related to these investments to support recognition at fair value at fiscal year-end. Because many of these investments are not readily marketable, the estimates of fair value involve assumptions and estimation methods which are uncertain, and therefore the estimates could differ from actual results. Certain other direct private equity investments are valued by Dartmouth based upon valuation information received from the relevant entity and/or external fund manager. Dartmouth evaluates the valuation methodology compared to industry standard valuation techniques, as well as unobservable inputs as part of the overall assessment of fair value.

Dartmouth has elected to measure certain equity securities without a readily determinable fair value that do not qualify to use NAV as a practical expedient at cost or donated value less impairment, adjusted for changes in observable prices. Dartmouth assesses these investments for impairment on an annual basis and considers both qualitative and quantitative factors that may

have a significant impact on the investee's fair value, including the financial condition, expected future cash flows and business outlook of the investee.

Directly held real estate is reflected at fair value in accordance with Dartmouth's valuation policy. Management estimates fair value for these properties using primarily inputs from independent third-party appraisals, which are updated annually.

Purchases and sales of securities are recorded on the trade date, and realized gains and losses are determined on the basis of the average cost of securities sold. Advance contributions to commingled fund investments and redemptions receivable from commingled fund are included within Investments as presented on the Consolidated Statements of Financial Position.

Total investment return (interest, dividends, rents, royalties, and net realized and changes in unrealized gains and losses) earned by Dartmouth's endowment investments is included in endowment activities on the Consolidated Statement of Activities, while the net investment return earned by the non-endowment investments is included in operating or non-operating activities, as appropriate, on the Consolidated Statement of Activities. Dividend income is recognized, net of applicable withholding taxes, on the ex-dividend date. Non-cash dividends are recorded at the fair value of the securities received on the date of distribution. Interest income and expenses are recorded net of applicable withholding taxes on the accrual basis of accounting. Dartmouth amortizes bond premiums and accretes bond discounts using the effective yield method. Fees charged by external investment managers are generally based on contractual percentages of the fair value of assets under management or on annual total investment return and are netted against investment return.

The asset allocation of Dartmouth's investment portfolio involves exposure to a diverse set of markets. The investments within these markets involve various risks such as price, interest rate, sovereign, currency, liquidity, and credit risks. Additionally, investments in real assets through commingled funds and direct real estate expose Dartmouth to a unique set of risks such as operational, environmental, and political risks. Dartmouth anticipates that the value and composition of its investments may, from time to time, fluctuate substantially in response to any or all of the risks described herein.

Endowment

Dartmouth's endowment consists of gifts with donor restrictions and net assets without donor restrictions designated by management and the Board of Trustees for long-term support of Dartmouth's activities, and the accumulated investment return on these gifts and designated net assets. Accumulated investment return consists of endowment net investment return that has not been appropriated by the Board of Trustees for expenditure to support Dartmouth's operating and non-operating activities. Generally, only a portion of accumulated net investment return is made available for spending each year in accordance with the Board of Trustees-approved endowment utilization policy and New Hampshire state law. However, certain endowment funds with donor restrictions do allow for the expenditure of principal, and Dartmouth-designated endowment funds are net assets without donor restrictions that may be re-designated for authorized expenditures.

Giving consideration to the New Hampshire Uniform Prudent Management of Institutional Funds Act (UPMIFA), Dartmouth classifies as net assets with donor restrictions the historical value of donor-restricted endowment funds, which includes (a) the original value of contributions donated to the endowment, (b) the original value of subsequent contributions, and (c) accumulations to the endowment made in accordance with the direction of the applicable donor gift instrument at the time the accumulation is added to the fund. Also included in net assets with donor restrictions is accumulated appreciation on donor-restricted endowment funds which are available for expenditure in a manner consistent with the standard of prudence prescribed by UPMIFA. Investment return on net assets with donor restrictions is presented as a change in net assets with donor restrictions in the Consolidated Statement of Activities. Deficiencies associated with funds where the value of the fund has fallen below the original value of the gift are also included in net assets with donor restrictions. With respect to underwater endowments the spending occurs only to the extent the fair value of the endowment funds is 80% of historical book value.

Endowment net assets without donor restrictions include Dartmouth funds and certain gifts from donors, and any accumulated investment return thereon, which may be expended; however, by trustee or management designation, these net assets may remain invested in the endowment for the long-term support of Dartmouth activities. Investment return on endowment net assets without donor restrictions and the annual distribution of a portion of accumulated investment return to operating and

non-operating activities are presented as changes in net assets without donor restrictions in the Consolidated Statement of Activities.

Split-Interest Agreements

Certain donors have established irrevocable split-interest agreements with Dartmouth, primarily charitable gift annuities, pooled life income funds, and irrevocable charitable remainder trusts, whereby the donated assets are invested and distributions are made to the donor and/or other beneficiaries in accordance with the agreement for a specified period of time, after which time the remaining assets and future investment return are retained by Dartmouth. At the discretion of the donor, Dartmouth may or may not serve as trustee for the split-interest agreement.

Dartmouth has recorded the estimated fair value of the investments associated with irrevocable split-interest agreements and an estimated liability, using a discount rate of 4.2% and 3.6% for June 30, 2023 and 2022, respectively, for the net present value of the future cash outflows to beneficiaries of the agreements for which Dartmouth serves as trustee. When Dartmouth is not the trustee of the assets associated with a split-interest agreement, a receivable for Dartmouth's beneficial interest is established when Dartmouth is notified of the trust's existence and when the third-party trustee has provided Dartmouth with sufficient reliable information to estimate the value of the receivable, which Dartmouth considers a Level 3 measurement. Dartmouth requests information regularly from third-party trustees for financial reporting purposes; however, these trustees are not obligated to provide Dartmouth with the information necessary to estimate fair value and record the asset. Dartmouth respects the privacy of donors and trustees in these limited instances. Dartmouth reports the net change in split-interest agreements as a non-operating change in net assets in the Consolidated Statement of Activities.

Land, Buildings, Equipment, and Construction in Progress

Land, buildings, equipment, and construction in progress are recorded at cost at the date of acquisition or, if acquired by gift, at the estimated fair value as of the date of the gift. Purchases, construction, and renovations of assets which exceed Dartmouth's specified dollar threshold and have a useful life greater than one year are capitalized, while scheduled maintenance and minor renovations of less than that amount are charged to operations.

Land, buildings, and equipment are reflected net of accumulated depreciation calculated on a straight-line basis over the following estimated economic lives.

Buildings and building components	13 – 50 years
Depreciable land improvements	15 – 20 years
Equipment	5 – 20 years

Depreciation expense for facilities that are primarily used for sponsored research is based on the estimated economic lives of each component.

Collections

Dartmouth's collections include works of art, literary works, historical treasures, and artifacts that are maintained in its museum and libraries. These collections are protected and preserved for public exhibition, education, research, and the furtherance of public service. Each of the items is cataloged, preserved, and cared for, and activities verifying their existence and assessing their condition are performed continuously. The collections are subject to a policy that requires proceeds from their sale to be used to acquire other items for collections.

The collections, which were acquired through purchases and contributions since Dartmouth's inception, are not recognized as assets in the Consolidated Statements of Financial Position. Purchases of collection items are recorded in the Consolidated Statement of Activities as non-operating decreases in net assets without donor restrictions in the year in which the items are acquired or in net assets with donor restrictions if the assets used to purchase the items are restricted by donors. Contributed collection items are not recorded in the consolidated financial statements.

B. Receivables and Other Assets

Receivables and other assets consisted of the following at June 30 (in thousands):

	2023	2022
Student accounts	$ 6,293	$ 6,132
Sponsored research grants and contracts	29,382	20,317
Other accounts	122,083	46,558
Notes and student loans	42,281	46,577
Less: allowance for uncollectible accounts	(1,452)	(1,578)
Receivables, net	$ 198,587	$ 118,006
Prepaid costs, inventories, and other assets	20,112	15,415
Total receivables and other assets, net	$ 218,699	$ 133,421

Federally sponsored student loans with mandated interest rates and repayment terms are subject to significant restrictions as to their transfer and disposition. Amounts received from the Federal government to fund a portion of the Perkins student loans are ultimately refundable to the Federal government and are classified as government advances for student loans in the Consolidated Statements of Financial Position. The Perkins Loan Extension Act of 2015 ("the Act") ended the authority of participating institutions to make new Perkins Loans to students on September 30, 2017. The Act also requires each participating institution to refund to the federal government an amount calculated annually based on remaining outstanding loans and other factors. Dartmouth refunded $1,152,000 of the government advance during fiscal year 2023. Due to the nature and terms of student loans funded by the Federal government and Dartmouth funds, it is not practical to estimate the fair value of such loans. All other receivables are carried at estimated net realizable value.

C. Gifts and Pledges Receivable

Gifts received during the years ended June 30 were as follows (in thousands):

	2023	2022
Gifts to support operations	$ 108,509	$ 105,119
Gifts for:		
Facilities and student loans	30,761	25,533
Other restricted uses	7,974	26,666
Endowment	120,557	122,280
Split-interest agreements	14,239	7,684
Total gifts	$ 282,040	$ 287,282

Unconditional pledges as of June 30 are expected to be realized in the following periods, discounted at rates ranging from 0.3% to 6.2% (in thousands):

	2023	2022
In one year or less	$ 183,784	$ 152,952
Between one year and five years	263,827	264,996
Six years and after	72,487	53,749
Gross pledges receivable	$ 520,098	$ 471,697
Less: present value discount	(31,612)	(17,964)
Less: allowance for uncollectible pledges	(21,578)	(32,444)
Pledges receivable, net	$ 466,908	$ 421,289

At June 30, 2023 and 2022, Dartmouth had known non-legally binding bequests of $498,627,000 and $439,133,000, respectively. When conditional promises to give become unconditional or cash payments on non-legally binding bequests are received, they are recorded and may be restricted by the donor for operations, endowment or capital projects.

D. Investments

Dartmouth's endowment and other investment portfolios include investments in various asset classes, each with different return expectations, risk characteristics, and liquidity provisions.

Cash and short-term investments designated for investment purposes in the Endowment are included in Investments on the Consolidated Statements of Financial Position and may include money market funds, foreign currency, foreign government bonds and U.S. treasury securities with an original or remaining maturity of three months or less when purchased. These investments are valued based on market price or cost, which approximates fair value.

Fixed income includes strategies based on capital preservation and yield as well as more opportunistic strategies focused on generating return through price appreciation. These strategies generally include corporate debt securities, government securities, mortgage backed and asset backed securities and other financial instruments. Exposures to these investments may include directly held securities as well as investments through commingled funds.

Global equity investments include directly held public equity securities, exchange traded funds, and commingled funds, whose managers primarily invest in global public long-only and long/short equity securities with portfolios that are directionally exposed to the market.

Hedge funds include investments in commingled funds with discrete and blended strategies, including long/short equity, absolute return, market neutral, distressed and credit strategies. Hedge funds generally hold long and short securities or other financial instruments for which a ready market exists, and may include stocks, bonds, put or call options, swaps, futures, currency hedges, and other financial instruments.

Dartmouth also invests in venture capital, private equity, real estate, other real assets, and other debt-related strategies primarily through private limited partnerships, which are illiquid. These investments often require the estimation of fair value by the general partner in the absence of readily determinable market values. The private portfolio is based primarily in the United States but includes managers who may invest globally. Real estate investments also may include real estate investment trust securities held directly or through publicly traded mutual funds as well as direct real estate. Other real asset investments may include natural resource or renewable investments through limited partnerships, exchange traded funds or commingled funds.

Investments consisted of the following at June 30 (in thousands):

	2023	2022
Endowment investments	$ 7,961,121	$ 8,099,182
Split-interest agreement investments	128,392	137,786
Operating and other investments	1,032,566	1,052,265
Total investments	$ 9,122,079	$ 9,289,233

The framework for measuring fair value utilizes a hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The three levels of the fair value hierarchy are as follows:

Level 1 - Quoted prices (unadjusted) in active markets for identical investments as of the reporting date. The type of investments in Level 1 includes cash and short-term investments, actively listed and traded securities, U.S. treasury securities, and exchange traded and registered funds all held directly by Dartmouth, and excludes listed equities and other securities held indirectly through commingled funds.

Level 2 - Pricing inputs, including broker quotes, are generally those other than exchange quoted prices in active markets, which are either directly or indirectly observable as of the reporting date, and fair value is determined through the use of models or other valuation methodologies. The type of investments in Level 2 includes fixed income securities and certain derivatives.

Level 3 - Pricing inputs are unobservable for the investment and include situations where there is little, if any, market activity for the investment. The inputs into the determination of fair value require significant management judgment or estimation. The type of investments in Level 3 includes directly held real estate, private equity, and other illiquid investments.

The inputs or methodology used to value or classify investments for financial reporting purposes is not necessarily an indication of the risk associated with investing in those investments.

The following Fair Value Leveling table summarizes Dartmouth's investments that are reported at fair value by their fair value hierarchy classification as of June 30, 2023 (in thousands):

	Level 1	Level 2	Level 3	Total
Investments:				
Cash and short-term investments	$ 178,320	$ -	$ -	$ 178,320
Fixed income	447,610	157,777	42	605,429
Global equity:				
US equity	464,822	-	186	465,008
International	82,027	-	-	82,027
Emerging markets	4,453	-	-	4,453
Private equity/Venture capital	-	-	77,445	77,445
Real assets:				
Real estate	12,618	-	213,821	226,439
Other real assets	9	-	-	9
Other investments	-	-	184	184
Derivative assets (liabilities)	(1,041)	629	-	(412)
Subtotal	$ 1,188,818	$ 158,406	$ 291,678	$ 1,638,902
Investment receivables				223,907
Investment payables				(232,370)
Investments at NAV				7,320,129
Investments at cost less impairment				171,511
Total Investments	$ 1,198,706	$ 158,406	$ 291,678	$ 9,122,079

The following Fair Value Leveling table summarizes Dartmouth's investments that are reported at fair value by their fair value hierarchy classification as of June 30, 2022 (in thousands):

	Level 1	Level 2	Level 3	Total
Investments:				
Cash and short-term investments	$ 326,003	$ -	$ -	$ 326,003
Fixed income	511,267	173,698	40	685,005
Global equity:				
US equity	315,492	-	136	315,628
International	56,803	-	-	56,803
Emerging markets	9,821	-	-	9,821
Private equity/Venture capital	-	-	72,183	72,183
Real assets:				
Real estate	13,395	-	207,458	220,853
Other real assets	8	-	-	8
Other investments	-	-	184	184
Derivative assets (liabilities)	2,091	572	-	2,663
Subtotal	$ 1,234,880	$ 174,270	$ 280,001	$ 1,689,151
Investment receivables				106,538
Investment payables				(141,289)
Investments at NAV				7,463,322
Investments at cost less impairment				171,511
Total Investments	$ 1,234,880	$ 174,270	$ 280,001	$ 9,289,233

The following Fair Value NAV table lists specified investment terms by asset category for Dartmouth's interest in certain commingled funds and private partnership interests, including certain illiquid investments where the timing of liquidity is unknown. The investments are reported using NAV as the practical expedient to estimate fair value as of June 30, 2023 (in thousands):

	Fair Value	Redemption Terms	Days Notice	Remaining Unfunded Commitment
Fixed income	$ 30,736	Monthly	30 – 40	$ -
Global equity:				
US equity[1]	799,042	Ranges from quarterly to bi-annual	60 – 105	23,780
International[2]	342,341	Ranges from semi-monthly to quarterly	3 – 180	2,755
Emerging markets[3]	282,046	Ranges from monthly to annually	30 – 180	-
Hedge funds[4]	1,748,888	Ranges from monthly to annually; illiquid	30 – 90	13,753
Private equity / Venture capital	3,273,837	Illiquid	Not applicable	722,476
Real assets:				
Real estate	461,889	Illiquid	Not applicable	319,000
Other real assets	381,350	Illiquid	Not applicable	41,716
Total	$ 7,320,129			$ 1,123,480

[1] US equity includes funds that have restrictions on the ability to fully redeem up to three years, excluding illiquid securities and special investments.
[2] International includes funds that have restrictions on the ability to fully redeem up to one year, excluding illiquid securities and special investments.
[3] Emerging markets includes funds that have restrictions on the ability to fully redeem up to three years, excluding illiquid securities and special investments.
[4] Hedge funds includes funds that have restrictions on the ability to fully redeem up to four years, excluding illiquid securities and special investments.

The following Fair Value NAV table lists specified investment terms by asset category for Dartmouth's interest in certain commingled funds and private partnership interests, including certain illiquid investments where the timing of liquidity is unknown. The investments are reported using NAV as the practical expedient to estimate fair value as of June 30, 2022 (in thousands):

	Fair Value	Redemption Terms	Days Notice	Remaining Unfunded Commitment
Fixed income	$ 74,004	Monthly	30 – 40	$ -
Global equity:				
US equity[1]	699,736	Ranges from quarterly to bi-annual	60 – 105	23,780
International[2]	243,468	Ranges from semi-monthly to annually	3 – 180	-
Emerging markets[3]	391,359	Ranges from quarterly to annually	30 – 180	-
Hedge funds[4]	1,670,877	Ranges from monthly to annually; illiquid	30 – 90	16,458
Private equity / Venture capital	3,423,118	Illiquid	Not applicable	797,704
Real assets:				
Real estate	417,906	Illiquid	Not applicable	335,457
Other real assets	542,854	Illiquid	Not applicable	72,627
Total	$ 7,463,322			$ 1,246,026

[1] US equity includes funds that have restrictions on the ability to fully redeem up to five years.
[2] International includes funds that have restrictions on the ability to fully redeem up to two years.
[3] Emerging markets includes funds that have restrictions on the ability to fully redeem up to three years, excluding illiquid securities.
[4] Hedge funds includes funds that have restrictions on the ability to fully redeem up to four years, excluding illiquid securities and special investments.

At June 30, 2023 and June 30, 2022, the aggregate carrying amount of Dartmouth's investments measured at cost less impairment is $171,511,000. There have been no impairment adjustments or changes in observable prices recognized.

The following tables present Dartmouth's activity for the fiscal years ended June 30, 2023 and 2022 for investments measured at fair value in Level 3 (in thousands):

	Fixed Income	US Equity	Real Assets	Private Equity/Venture Capital	Other Investments	Total
Balance as of June 30, 2022	$ 40	$ 136	$ 207,458	$ 72,183	$ 184	$ 280,001
Acquisitions / purchases	-	43	1,470	-	-	1,513
Distributions / sales	-	-	(869)	-	-	(869)
Transfers out	-	-	-	-	-	-
Realized gain/(loss)	-	-	-	-	-	-
Change in unrealized gain/(loss)	2	7	5,762	5,262	-	11,033
Balance as of June 30, 2023	$ 42	$ 186	$ 213,821	$ 77,445	$ 184	$ 291,678

	Fixed Income	US Equity	Real Assets	Private Equity/Venture Capital	Other Investments	Total
Balance as of June 30, 2021	$ 38	$ 112	$ 199,641	$ 73,657	$ 184	$ 273,632
Acquisitions / purchases	-	25	840	6,919	-	7,784
Distributions / sales	-	-	(3,412)	-	-	(3,412)
Transfers out	-	-	-	(2,016)	-	(2,016)
Realized gain/(loss)	-	(4)	985	-	-	981
Change in unrealized gain (loss)	2	3	9,404	(6,377)	-	3,032
Balance as of June 30, 2022	$ 40	$ 136	$ 207,458	$ 72,183	$ 184	$ 280,001

Cumulative unrealized gains related to Level 3 investments totaled $98,753,000 and $86,175,000 as of June 30, 2023 and 2022, respectively. The net change in unrealized gains/(losses) related to Level 3 investments held at June 30, 2023, and June 30, 2022 was $12,578,000 and $5,686,000, respectively.

The following tables summarize quantitative inputs and assumptions used for Level 3 investments at June 30, 2023 and 2022 for which fair value is based on unobservable inputs. Significant increases or decreases in these unobservable inputs may result in significant higher or lower valuation results, however actual results could differ materially from these estimates particularly during periods of investment and/or interest rate volatility.

June 30, 2023 (in thousands):

Asset Class	Fair Value[1]	Valuation Technique	Unobservable Inputs	Input Value(s)	Weighted Average
Real Estate	$ 184,130	Third party appraisal-income capitalization approach	Capitalization rate	5.75 – 7.75%	6.68%
	28,541	Third party appraisal-comparable sales	Market value per square foot		
	1,150	Third party appraisal-adjusted cost	Discount rate	25.00%	25.00%
Private Equity	48,627	Market comparables	EBITDA multiple	14.3x – 17.9x	17.0x
	19,077	Market comparables	Revenue multiple	6.5x – 7.1x	6.8x
	9,741	Third Party Appraisal – DCF, utilizing WACC as discount rate	Weighted average cost of capital	13.0%	13.0%
Total	$ 291,266				

[1]The fair value may be determined using multiple valuation techniques.

June 30, 2022 (in thousands):

Asset Class	Fair Value[1]	Valuation Technique	Unobservable Inputs	Input Value(s)	Weighted Average
Real Estate	$ 182,111	Third party appraisal-income capitalization approach	Capitalization rate	6.75 – 8.5%	7.41%
	24,206	Third party appraisal-comparable sales	Market value per square foot		
	1,142	Third party appraisal-adjusted cost	Discount rate	25.00%	25.00%
Private Equity	46,048	Market comparables	EBITDA multiple	13.4x – 18.2x	16.8x
	14,075	Market comparables	Revenue multiple	6.2x – 6.6x	6.4x
	9,559	Discounted cash flow	Weighted average cost of capital	12.0%	12.0%
Total	$ 277,141				

[1]The fair value may be determined using multiple valuation techniques.

For June 30, 2023 and 2022 certain level 3 investments are valued at cost totaling $412,000 and $2,860,000 respectively and are excluded from the above tables.

The following tables set forth the fair value of Dartmouth's derivative instruments for investment purposes by contract type as of June 30, 2023 and 2022 and gains/(losses) related to derivative activities for the years ended June 30, 2023 and 2022 (in thousands):

June 30, 2023:

	Notional Exposure		Fair Value[1]		
	Long	Short	Asset	Liability	Net Gain/(Loss)[2]
Foreign currency contracts	$ 9,152	$ (2,330)	$ 101	$ (84)	$ 1,463
Fixed income futures contracts	107,902	(78,643)	632	(1,673)	2,902
Interest rate swaps[3]	1,540	-	154	(1)	164
Credit default swaps	385	(9,901)	109	(198)	(69)
Other	-	(29,297)	548	-	(12,901)
Total	$ 118,979	$ (120,171)	$ 1,544	$ (1,956)	$ (8,441)

June 30, 2022:

	Notional Exposure		Fair Value[1]		
	Long	Short	Asset	Liability	Net Gain/(Loss)[2]
Foreign currency contracts	$ 22,594	$ (72,171)	$ 2,673	$ (27)	$ 10,949
Fixed income futures contracts	111,026	(97,201)	1,122	(770)	3,721
Equity Futures	-	-	-	-	(7,095)
Interest rate swaps[3]	620	-	132	-	141
Credit default swaps	11,915	(3,415)	298	(765)	(457)
Total	$ 146,155	$ (172,787)	$ 4,225	$ (1,562)	$ 7,259

[1] The net fair value of these derivative instruments is included in the Consolidated Statements of Financial Position as Investments.
[2] The net gain/(loss) from these derivative instruments is presented in the endowment, operating, and non-operating sections of the Consolidated Statement of Activities as other operating income and other non-operating changes.
[3] The notional amount of these contracts represents a structure which pay based on a fixed rate and receive based on a variable rate.

Dartmouth enters into certain foreign currency contracts, equity and government bond futures and forwards to efficiently manage portfolio exposures to global equity markets, currencies and interest rates. These instruments may be used to hedge the portfolio from unwanted equity, currency, and/or interest rate risk, as well as to efficiently implement active duration and relative value strategies. These instruments are valued using quoted prices in active markets or pricing inputs derived from market-based prices and therefore are included in Level 1 or 2 in the Fair Value Leveling table respectively. In certain circumstances Dartmouth is obligated to pledge to the appropriate broker cash or securities to be held as collateral, as determined by exchange margin requirements for futures contracts held. At June 30, 2023 and 2022, Dartmouth had no pledged collateral on futures contracts for investment purposes.

Dartmouth enters into swap contracts for investment purposes. Interest rate swap contracts are used to efficiently manage portfolio exposures to interest rates. These instruments may be used to hedge the portfolio from unwanted interest rate risk, but also to efficiently implement active duration strategies. These instruments are valued using market-based prices and are included in Level 2 in the Fair Value Leveling table.

Credit default swaps are used to simulate long or short positions or to reduce credit risk where exposure exists. The buyer of a credit default swap is obligated to pay to the seller a periodic stream of payments over the term of the contract in return for a contingent payment upon occurrence of a contracted credit event. The seller of a credit default swap bears the obligation to pay the buyer upon occurrence of a contracted credit event in return for a periodic stream of fixed payments from the buyer over the term of the contract. These instruments are valued using market-based prices and are included in Level 2 in the Fair Value Leveling table.

E. Endowment

The changes in fair value of net assets held in endowment and similar funds for the years ended June 30 were as follows (in thousands):

	Without Donor Restrictions	With Donor Restrictions	Total
Endowment net assets, June 30, 2022	$ 1,815,893	$ 6,249,850	$ 8,065,743
Investment return, net	24,384	86,238	110,622
Gifts	69	120,488	120,557
Distribution of endowment return	(88,276)	(307,538)	(395,814)
Transfers and other changes, net	14,801	14,215	29,016
Endowment net assets, June 30, 2023	$ 1,766,871	$ 6,163,253	$ 7,930,124

	Without Donor Restrictions	With Donor Restrictions	Total
Endowment net assets, June 30, 2021	$ 1,912,300	$ 6,571,890	$ 8,484,190
Investment return, net	(59,453)	(209,781)	(269,234)
Gifts	69	122,211	122,280
Distribution of endowment return	(76,005)	(259,596)	(335,601)
Transfers and other changes, net	38,982	25,126	64,108
Endowment net assets, June 30, 2022	$ 1,815,893	$ 6,249,850	$ 8,065,743

Transfers and other changes, net include additions to the endowment from matured split-interest agreements, net transfers resulting from changes in donor restrictions or Dartmouth designations, and other internal charges including certain fundraising costs and excise tax.

Endowment net assets consist of the following as of June 30, 2023 (in thousands):

	Without Donor Restrictions	With Donor Restrictions	Total
Board-designated funds	$ 1,766,871	$ -	$ 1,766,871
Donor-restricted funds			
Accumulated investment gains	-	3,862,874	3,862,874
Original donor-restricted gift amount and amounts required to be maintained in perpetuity by donor	-	2,300,379	2,300,379
Total endowment net assets	$ 1,766,871	$ 6,163,253	$ 7,930,124

Endowment net assets consist of the following as of June 30, 2022 (in thousands):

	Without Donor Restrictions	With Donor Restrictions	Total
Board-designated funds	$ 1,815,893	$ -	$ 1,815,893
Donor-restricted funds			
Accumulated investment gains	-	4,095,017	4,095,017
Original donor-restricted gift amount and amounts required to be maintained in perpetuity by donor	-	2,154,833	2,154,833
Total endowment net assets	$ 1,815,893	$ 6,249,850	$ 8,065,743

The classification of endowment net assets by purpose as of June 30, 2023 is as follows (in thousands):

	Without Donor Restrictions	With Donor Restrictions	Total
Teaching and Research	$ 552,962	$ 2,569,333	$ 3,122,295
Financial Aid	72,603	1,853,755	1,926,358
Academic and Student Support	133,366	657,611	790,977
Operations and Facilities	1,007,940	1,082,554	2,090,494
Endowment net assets, June 30, 2023	$ 1,766,871	$ 6,163,253	$ 7,930,124

The classification of endowment net assets by purpose as of June 30, 2022 is as follows (in thousands):

	Without Donor Restrictions	With Donor Restrictions	Total
Teaching and Research	$ 576,202	$ 2,601,116	$ 3,177,318
Financial Aid	74,339	1,863,116	1,937,455
Academic and Student Support	143,335	665,181	808,516
Operations and Facilities	1,022,017	1,120,437	2,142,454
Endowment net assets, June 30, 2022	$ 1,815,893	$ 6,249,850	$ 8,065,743

From time to time, the fair values of assets associated with individual donor-restricted endowment funds may fall below the level that the donor or UPMIFA requires to retain as a fund of perpetual duration due to market declines. Deficiencies of this nature are reported as reductions in net assets with donor restrictions. As of June 30, 2023, and 2022, there were $9,985,000 and $5,025,000, respectively, in endowment funds with a market value less than this required level.

Dartmouth employs a total return endowment utilization policy that establishes the amount of investment return made available for spending each fiscal year. The amount appropriated for expenditure each year is independent of the actual return for the year. The Board approves the formula that determines the amount appropriated from endowment each year. The resulting fiscal year 2023 endowment distribution of $395,814,000 represents a 4.9% distribution rate when measured against the previous year's June 30th endowment value. Investment return earned in excess of the amount appropriated annually is reinvested in the funds but can be appropriated in future years in accordance with the utilization policy. The net appreciation on donor restricted endowment funds is reported net assets with donor restrictions until such time as all or a portion of the appreciation is appropriated for spending in accordance with the utilization policy and applicable state law.

The overall investment performance objective for the endowment is to generate real (inflation-adjusted) returns net of investment expenses sufficient to support Dartmouth's current operating needs while maintaining the long-term purchasing power of the endowment. The Investment Committee of the Board of Trustees has determined that a well-diversified mix of assets offers the best opportunity for maximum return with acceptable risk over time. Dartmouth relies on a total return strategy in which investment returns are achieved through both capital appreciation (both realized and unrealized) and current yield (interest and dividends). Investment decisions are made with a view toward maximizing long-term return opportunities while maintaining an acceptable level of investment risk and liquidity.

F. Land, Buildings, Equipment, and Construction in Progress

Land, buildings, equipment, and construction in progress balances at June 30 were as follows (in thousands):

	2023	2022
Land	$ 20,955	$ 20,955
Buildings	1,820,473	1,540,590
Land improvements	138,739	129,319
Equipment and software	444,933	401,414
Land, buildings, and equipment	$ 2,425,100	$ 2,092,278
Less: accumulated depreciation	(1,278,091)	(1,204,953)
Construction in progress	110,994	329,356
Total net book value	$ 1,258,003	$ 1,216,681

Dartmouth has conditional asset retirement obligations arising from legal obligations to perform certain activities in connection with the retirement, disposal, or abandonment of assets, including asbestos abatement, leasehold improvements, hazardous materials, and equipment disposal and cleanup. The liability was initially recorded at fair value, and is adjusted for accretion expense, and changes in the amount or timing of cash flows. The corresponding asset retirement costs are capitalized as part of the carrying values of the related long-lived assets and depreciated over the useful lives of the assets.

G. Liquidity and Availability of Resources

As of June 30, 2023 and 2022, Dartmouth's financial assets and liquidity resources available within one year for general expenditure, including operating expenses, scheduled principal payments on debt, and capital construction costs not financed with debt, were as follows (in thousands):

	2023	2022
Financial assets:		
Cash and liquid operating investments	$ 1,146,876	$ 1,005,332
Notes and accounts receivable, net	146,730	52,822
Contributions receivable	163,597	127,460
Taxable debt (unexpended)	208,953	213,555
Approved endowment payout for following year	427,538	394,618
Total financial assets available within one year	$ 2,093,694	$ 1,793,787
Liquidity resources:		
Taxable commercial paper (undrawn)	120,000	120,000
Bank lines of credit	350,000	350,000
Total financial assets and liquidity resources available within one year	$ 2,563,694	$ 2,263,787

As part of Dartmouth's liquidity management strategy financial assets are structured to be available as general expenditures, liabilities and other obligations come due. In addition, Dartmouth invests cash in excess of daily requirements in short-term investments. To manage liquidity, Dartmouth maintains three lines of credit and a taxable commercial paper program that are drawn upon as needed during the year to manage cash flows. The maturity dates range from December 29, 2023 through June 30, 2024. There was no outstanding borrowing on any of the lines of credit as of June 30, 2023 or 2022.

Additionally, Dartmouth has board-designated endowment funds of $1,766,871,000. Although Dartmouth does not intend to spend from its board-designated endowment funds other than amounts appropriated for expenditure as part of its annual budget approval process, amounts from these funds could be made available if necessary. However, both the board-designated and donor-restricted endowments contain investments with lock-up provisions that reduce the total investments that could be made available.

H. Bonds, Mortgages, and Notes Payable

Indebtedness at June 30 consisted of the following (in thousands):

	Fiscal Year Maturity	2023 Interest Rate	2023	2022
New Hampshire Health and Education Facilities Authority (NHHEFA):				
Tax-Exempt Fixed Rate:				
Series 2017	2028	5.00%	37,660	37,660
Tax-Exempt Variable Rate:				
Series 2003	2023	0.66% - 4.08%	-	9,670
Series 2007B	2041	0.31% - 4.37%	75,000	75,000
Series 2015A&B	2040	1.91% - 4.75%	101,000	101,000
Series 2015C&D	2038	1.91% - 4.75%	89,515	89,515
Series 2016A	2043	1.41% - 4.28%	165,000	165,000
Subtotal tax-exempt bonds			$ 468,175	$ 477,845
Taxable Bonds:				
Fixed Rate				
Series 2012A	2042	4.00%	70,000	70,000
Series 2012B	2043	3.76%	150,000	150,000
Series 2016A	2046	3.47%	250,000	250,000
Subtotal taxable bonds			$ 470,000	$ 470,000
Subtotal bonds			$ 938,175	$ 947,845
Mortgages on real estate investments:				
Fixed Rate	2024 – 2037	4.34% - 4.50%	15,225	17,197
Taxable commercial paper note:				
Variable Rate		2.50% - 5.18%	30,000	30,000
Subtotal bonds, mortgages and notes payable			$ 983,400	$ 995,042
Original issue premium, net			4,449	5,364
Unamortized debt issuance costs			(2,040)	(2,200)
Total bonds, mortgages, and notes payable, net			$ 985,809	$ 998,206

Interest expense for the years ended June 30 consists of (in thousands):

	2023	2022
Consolidated Statement of Activities:		
Endowment Activities		
Interest expense on mortgage and debt used to finance endowment-related real estate projects, presented as a reduction in net investment return	$ 1,066	$ 1,167
Operating Activities (amounts included in Interest on the Consolidated Statement of Operating Expenses)		
Interest expense of debt (including payments on interest rate swap agreements) used to finance facilities projects	29,866	30,222
Interest expense on other operating indebtedness	1,347	196
Non-Operating Activities (amounts included in Non-operating expenses)		
Interest expense on debt used to finance student loans	1,406	1,406
Interest expense on other non-operating indebtedness	7,079	8,102
Total interest expense on the Consolidated Statement of Activities	$ 40,764	$ 41,093
Consolidated Statements of Financial Position:		
Interest paid on debt used to finance facilities projects capitalized in connection with various construction projects	$ -	$ 1,130

Scheduled principal payments due for each of the next five years ending June 30 and thereafter are as follows, excluding maturity of commercial paper and unamortized discounts and premiums are (in thousands):

June 30	Principal Due
2024	1,072
2025	970
2026	1,003
2027	1,036
2028	38,729
Thereafter	910,590
Total	$ 953,400

Principal due after June 30, 2028, includes the following "balloon" payments due on Dartmouth's indebtedness (in thousands):

June 30	Indebtedness	Payment
2036	NHHEFA Series 2007B bonds	$ 18,000
2038	NHHEFA Series 2015 C&D bonds	89,515
2040	NHHEFA Series 2015 A&B bonds	101,000
2041	NHHEFA Series 2007B bonds	57,000
2042	Series 2012 A bonds	70,000
2043	Series 2012 B bonds	150,000
2043	NHHEFA Series 2016A bonds	165,000
2046	Series 2016 A bonds	250,000

The bonds are unsecured general obligations of Dartmouth, backed by Dartmouth's full faith and credit. None of the bonds are secured by a reserve fund, mortgage lien or security interest on or in any funds, revenues or other assets of Dartmouth, except

for funds held from time to time by the Bond Trustee for the benefit of the bondholders. Dartmouth has agreed to certain covenants with respect to encumbrance or disposition of its core campus.

Dartmouth is party to six interest rate swap agreements. Information related to these interest rate swap agreements as of June 30, 2023, including the fixed interest rate paid by Dartmouth and percent of SOFR received on the notional amount, is presented in the table below:

Expiration Date	Notional Amount (in thousands)	Fixed Interest Rate %	% of SOFR
06/01/2027	$ 31,810	3.77	72
06/01/2028	52,280	3.78	72
06/01/2032	100,000	3.75	67
06/01/2041	100,000	3.73	70
06/01/2042	100,000	3.73	70
06/01/2043	165,000	3.74	70

The fair value of these agreements at June 30, 2023 and 2022 based on various factors contained in the interest rate swap agreements and certain interest rate assumptions, was approximately $67,814,000 and $107,700,000, respectively, and is considered a Level 2 measurement. The decreases in the liability of $39,886,000 and $97,206,000 for the years ended June 30, 2023 and 2022 are presented as a change in unrealized gain in the non-operating section of the Consolidated Statement of Activities. Net payments or receipts under the swap agreements associated with facilities debt are reflected as interest expense. These financial instruments involve counter-party credit exposure.

Commercial paper consists of notes issued in the short-term taxable market, and is sold at a discount from par. The maturities of individual notes are issued in ranges from one day to no more than 270 days and fall on average in a range of thirty to ninety days. Dartmouth reports commercial paper at carrying value, which closely approximates fair value for those liabilities.

Dartmouth maintains a stand-by bond purchase agreement totaling $75,000,000 to provide alternative liquidity to support its variable rate demand bonds in the event that the bonds cannot be remarketed. Financing obtained through stand-by credit agreements to fund the repurchase of such bonds would bear interest rates different from those associated with the original bond issues and mature over a three or a five-year period following repurchase. The agreement has a maturity date of December 2024. There were no amounts outstanding at June 30, 2023 or 2022 under these agreements.

Dartmouth has three lines of credit totaling $350,000,000. The maturity dates range from December 29, 2023 through June 30, 2024. There was no outstanding borrowing on any of the lines of credit as of June 30, 2023 or 2022.

I. Employment and Retirement Obligations

Liabilities for retirement medical benefits, salaries, wages, and other benefits under employment agreements consisted of the following at June 30 (in thousands):

	2023	2022
Retirement medical benefits	$ 202,626	$ 196,159
Deferred compensation obligation	53,052	45,106
Compensated absences, Self-insured benefits and other commitments	50,347	46,924
Total employment related obligations	$ 306,025	$ 288,189

Retirement benefits are provided to employees principally through defined contribution plans. Dartmouth also has a defined benefit pension plan that was closed to non-union staff in fiscal year 1998 and closed to union staff in fiscal year 2007.

Dartmouth's retirement medical benefits consist of medical insurance coverage for retirees. Employees hired prior to July 1, 2009 that are 55 or older and have at least ten continuous years of service in a benefits-eligible position immediately prior to retirement are currently eligible for a subsidy toward the purchase of retiree medical benefits. The subsidy amount is based on the employee's annual salary, age, and years of service as of June 30, 2009. For retirees under the age of 65, the medical insurance options are the same as for active employees. At age 65, the retiree would enroll in the Dartmouth College Medicare Supplement (DCMS) plan. New employees hired on or after July 1, 2009 are eligible to participate in a retirement savings match and are eligible to purchase the retiree group medical insurance at full cost if they qualify at retirement.

Information pertaining to the pension and retirement medical benefits at June 30 include (in thousands):

	Pension Benefits		Retirement Medical Benefits	
Change in benefit obligation:	2023	2022	2023	2022
Beginning of year	$ 102,461	$ 132,866	$ 196,159	$ 226,773
Service cost	1,155	1,514	727	1,211
Interest cost	4,517	3,219	8,659	5,332
Benefits paid	(10,855)	(11,297)	(12,168)	(11,681)
Actuarial (gain)/loss	(2,420)	(23,841)	9,249	(25,476)
End of year	$ 94,858	$ 102,461	$ 202,626	$ 196,159
Change in estimated fair value of plan assets:				
Beginning of year	$ 114,145	$ 156,298	$ -	$ -
Actual return on plan assets	3,384	(30,856)	-	-
Employer contributions	-	-	12,168	11,681
Benefits paid	(10,855)	(11,297)	(12,168)	(11,681)
End of year	$ 106,674	$ 114,145	$ -	$ -
Funded status (plan assets more (less) than benefit obligation)	$ 11,816	$ 11,684	$ (202,626)	$ (196,159)

The pension asset of $11,816,000 and $11,684,000 as of June 30, 2023 and 2022, respectively, is included in Receivables and other assets, net, in the Consolidated Statement of Financial Position.

Net periodic benefit (income) cost included the following:				
Operating - Service cost	$ 1,155	$ 1,514	$ 727	$ 1,211
Non-operating:				
Interest cost	4,517	3,219	8,659	5,332
Expected return on assets	(7,091)	(5,631)	-	-
Recognized net actuarial loss	-	-	(7,978)	(4,963)
Total non-operating	$ (2,574)	$ (2,412)	$ 681	$ 369
Settlement charge/(credit)	-	(215)	-	-
Net periodic benefit cost (income)	$ (1,419)	$ (1,113)	$ 1,408	$ 1,580

	Pension Benefits		Retirement Medical Benefits	
	2023	2022	2023	2022
Weighted-average assumptions for determining net periodic benefit cost:				
Discount Rate – Benefit Obligation	4.71%	2.79%	4.82%	3.07%
Discount Rate – Service Cost	4.83%	3.08%	4.96%	3.50%
Discount Rate – Interest Cost	4.59%	2.34%	4.52%	2.40%
Expected return on plan assets	5.70%	4.15%	-	-
Weighted-average assumptions for determining benefit obligations:				
Rate of compensation increase	4.00%	2.50%	-	-
Discount rate used to determine benefit obligations	5.11%	4.79%	5.17%	4.82%

The increase in the retirement medical benefit obligation is primarily due to higher inflation rates, actual and expected claims and updated utilization assumptions. The increase is partially offset by an increase in the discount rate used to determine benefit obligations, which increased to 5.17% in 2023, compared to 4.82% in 2022.

The increase (decrease) in net assets without donor restrictions resulting from the change in pension and retirement medical benefit obligations consisted of the following (in thousands):

	Pension Benefits	Retirement Medical Benefits	Total 2023	Total 2022
Amounts recognized in non-operating activities:				
Net actuarial gain (loss)	$ (1,287)	$ (9,249)	$ (10,536)	$ 12,830
Amortization of gain	-	(7,978)	(7,978)	(4,963)
Settlement recognition of net actuarial (gain) loss	-	-	-	215
Net periodic benefit cost other than service cost	2,574	(681)	1,893	2,043
Total non-operating gain (loss)	1,287	(17,908)	(16,621)	10,125
Amounts recognized in operating activities:				
Service cost	(1,155)	(727)	(1,882)	(2,725)
Total increase (decrease)	$ 132	$ (18,635)	$ (18,503)	$ 7,400

The cumulative amounts in net assets without donor restrictions that have not yet been recognized as components of net periodic benefit cost are as follows (in thousands):

	Pension Benefits		Retirement Medical Benefits	
	2023	2022	2023	2022
Net (gain)/loss	$ 3,361	$ 2,074	$ (87,195)	$ (104,422)
Total	$ 3,361	$ 2,074	$ (87,195)	$ (104,422)

The following table lists specified investment terms by asset category for defined benefit pension plan (the Plan) investments in certain commingled funds and private partnership interests that are reported using NAV as the practical expedient as of June 30, 2023 (in thousands):

	Amount	Redemption Terms	Days Notice	Remaining Unfunded Commitment
Fixed income	$ 70,124	Daily	2	$ -
Global equity	30,408	Daily	2	-
Private equity / Venture capital	567	Illiquid	Not applicable	108
Total	$ 101,099			$ 108

In addition to the investments disclosed above, the Plan also holds $5,575,000 in cash and cash equivalents at June 30, 2023, which is classified as a Level 1 investment in the fair value hierarchy.

The following table lists specified investment terms by asset category for defined benefit pension plan (the Plan) investments in certain commingled funds and private partnership interests that are reported using NAV as the practical expedient as of June 30, 2022 (in thousands):

	Amount	Redemption Terms	Days Notice	Remaining Unfunded Commitment
Fixed income	$ 78,233	Daily	2	$ -
Global equity	31,570	Daily	2	-
Private equity / Venture capital	957	Illiquid	Not applicable	138
Total	$ 110,760			$ 138

In addition to the investments disclosed above, the Plan also holds $3,385,000 in cash and cash equivalents at June 30, 2022, which is classified as a Level 1 investment in the fair value hierarchy.

The overall investment strategy of the Plan is to utilize an asset mix that is designed to meet the near and longer term benefit payment obligations of the Plan. Over time, the asset mix may include global equity and fixed income exposures. Global equity exposure is designed to capture the equity market performance of developed markets while fixed income exposure provides a predictable yield as well as a hedge against changing interest rates by holding corporate bonds and other financial instruments. Other types of investments may include private equity, venture capital, and other private real asset partnerships that employ different underlying strategies. Outside investment advisors are utilized to manage the Plan assets and are selected based on their investment style, philosophy, and past performance. Dartmouth's investment office is responsible for managing the asset allocation and investment risk management of the Plan.

Dartmouth may make annual contributions to maintain funding for the defined benefit plan, taking into account investment and actuarial information, including minimum funding requirements. Dartmouth currently does not expect to contribute to the Plan in fiscal year 2024.

Benefit payments, which reflect expected future service, as appropriate, are expected to be paid in each of the next five years ending June 30 and thereafter as follows (in thousands):

	Pension Benefits	Retirement Medical Benefits
2024	10,600	9,800
2025	8,600	10,500
2026	8,500	11,100
2027	8,500	11,700
2028	8,200	12,300
Years 2029 – 2033	37,800	67,400

The accumulated benefit obligation (ABO) of the defined benefit plan was $91,419,000 and $99,017,000 as of June 30, 2023 and 2022, respectively.

Assumed health care cost trend rates have a significant effect on the estimated amounts reported for the retirement medical benefit plan. The medical cost trend rates for pre-age 65 and post-age 65 retirees, respectively, are assumed to be 7.50% and 7.80% in year 2023, decrease gradually to 4.5% and 4.5% in fiscal year 2031, respectively, and remain level thereafter. Dartmouth's estimate of retirement medical benefit expense and obligations also reflects the impact of the Medicare Prescription Drug Improvement and Modernization Act, which provides for tax-free subsidies to employers that offer retirement medical benefit plans with qualifying drug coverage.

Dartmouth estimates the costs of the service and interest components through a full yield curve approach by applying the specific spot rates along the yield curve used in the determination of the net periodic expense to the relevant present value of projected cash flows.

Dartmouth also maintains defined contribution retirement plans for its employees. These benefits are individually funded and are subject to various vesting requirements. Under these arrangements, Dartmouth makes contributions to individual self-directed retirement investment accounts for the participants. These contributions for the years ended June 30, 2023 and 2022 were $32,025,000 and $28,922,000, respectively. Dartmouth also maintains deferred compensation plans. The liabilities for the plans are included in employment and retirement obligations in the Consolidated Statements of Financial Position.

J. Other Operating Income

The major components of other operating income for the years ended June 30 were as follows (in thousands):

	2023	2022
Medical School services and other support	$ 17,205	$ 15,440
Foreign study and continuing education programs	13,027	8,453
Student activities and other program revenues	18,250	16,258
Athletics revenues	3,685	2,888
Royalty revenues	251,877	36,623
Other revenues	19,975	19,289
Investment income (loss)	62,736	(42,123)
Total other operating income	$ 386,755	$ 56,828

Other operating income related to program revenue is recognized over the period during which the services are provided.

Dartmouth recognized royalty revenue of $249,429,000 and $31,166,000 in fiscal years 2023 and 2022, respectively, relating to intellectual property used in the development and sale of various Covid-19 vaccines. Under Dartmouth's Policy on Patent, Copyright, and Other Intellectual Property Rights, the inventors of the intellectual property are entitled to a percentage of the royalty revenue that Dartmouth receives.

K. Net Assets

Additional information pertaining to Dartmouth's net assets at June 30 is presented below (in thousands):

	2023		
	Without Donor Restrictions	With Donor Restrictions	Total
Detail of net assets:			
Operating funds	$ 539,399	$ 168,271	$ 707,670
Pledges	-	466,908	466,908
Postretirement and pension benefit obligations	(190,810)	-	(190,810)
Third-party charitable trusts	-	6,466	6,466
Facilities and capital	731,333	62,780	794,113
Interest rate swap agreements	(67,814)	-	(67,814)
Student loan funds	10,338	20,012	30,350
Other non-operating activities	173,125	19,498	192,623
Life income, annuity, and similar funds	-	86,728	86,728
Endowment funds	1,766,871	6,163,253	7,930,124
Total net assets	$ 2,962,442	$ 6,993,916	$ 9,956,358

	2022		
	Without Donor Restrictions	With Donor Restrictions	Total
Detail of net assets:			
Operating funds	$ 365,989	$ 150,397	$ 516,386
Pledges	-	421,289	421,289
Postretirement and pension benefit obligations	(184,478)	-	(184,478)
Third-party charitable trusts	-	11,561	11,561
Facilities and capital	641,217	53,924	695,141
Interest rate swap agreements	(107,700)	-	(107,700)
Student loan funds	9,872	19,383	29,255
Other non-operating activities	175,443	51,760	227,203
Life income, annuity, and similar funds	-	94,857	94,857
Endowment funds	1,815,893	6,249,850	8,065,743
Total net assets	$ 2,716,236	$ 7,053,021	$ 9,769,257

L. Commitments and Contingencies

Outstanding commitments on uncompleted construction contracts total $141,390,000 at June 30, 2023.

Investment related commitments as of June 30, 2023 and 2022 are disclosed in the Fair Value NAV tables in Note D, Investments.

All funds expended by Dartmouth in connection with government sponsored grants and contracts are subject to audit by governmental agencies. The ultimate liability, if any, from such audits, is not expected to have a material adverse effect on Dartmouth's financial position.

In conducting its activities, Dartmouth from time to time is the subject of various claims and also has claims against others. The ultimate resolution of such claims is not expected to have either a material adverse or favorable effect on Dartmouth's financial position.

M. Related Party Transactions

Members of Dartmouth's Board of Trustees and senior management may, from time to time, be associated, either directly or indirectly, with companies doing business with Dartmouth. Dartmouth has a written conflict of interest policy that requires annual reporting by each Trustee, as well as senior management. Additionally, Dartmouth has a policy on Pecuniary Benefit Transactions and Related Party Investments. This policy supplements the Dartmouth College Conflict of Interest Policy with regard to pecuniary benefit transactions, as defined by New Hampshire law, including but not limited to Dartmouth's investment in investment vehicles in which Trustees have a financial interest. These policies include, among other things, that no member of the Board of Trustees can participate in any decision in which he or she (or an immediate family member) has a material financial interest. When such relationships exist, measures are taken to mitigate any actual or perceived conflict, including requiring that such transactions be for goods or services purchased or benefits provided in the ordinary course of the business of Dartmouth, for the actual or reasonable value of the goods or services or for a discounted value, based on terms that are fair and reasonable to and in the best interest of Dartmouth, and in accordance with applicable conflict of interest laws.

N. Subsequent Events

For purposes of determining the effects of subsequent events on these consolidated financial statements, management has evaluated events subsequent to June 30, 2023 and through October 26, 2023, the date on which the consolidated financial statements were issued, and has concluded that there were no subsequent events requiring adjustment or disclosure.

Dartmouth College Current Trustees

The Board of Trustees consists of twenty-six trustees – the President of the College (ex officio), the Governor of New Hampshire (ex officio), sixteen Charter Trustees and eight Alumni Trustee positions.

Sian Leah Beilock
President
Professor of Psychological and Brain Sciences

Jeffrey M. Blackburn '91
Elected 2016 (Charter Trustee)
Seattle, WA

Constance W. Britton '89
Elected 2019 (Charter Trustee)
Los Angeles, CA

Jeffrey M. Crowe '78
Elected 2018 (Alumni Trustee)
Palo Alto, CA

Susan M. Finegan '85 (Vice-Chair)
Elected 2020 (Alumni Trustee)
Newton, MA

James S. Frank '65
Elected 2019 (Charter Trustee)
Winnetka, Illinois

Odette A. Harris '91
Elected 2020 (Alumni Trustee)
Silicon Valley, CA

Susan S. Huang '84
Elected 2020 (Charter Trustee)
New York, NY

Neal K. Katyal '91
Elected 2021 (Charter Trustee)
Washington, D.C.

Gregg R. Lemkau '91
Elected 2020 (Alumni Trustee)
Bedford, NY

Elizabeth Cahill Lempres '83 Th'84 (Chair)
Elected 2018 (Alumni Trustee)
Boston, MA

Richard W. Lewis '84 (Vice-Chair)
Elected 2017 (Charter Trustee)
London, United Kingdom

Christopher H. Lord '86
Elected 2018 (Charter Trustee)
San Francisco, CA

Elizabeth Mahoney Loughlin '89
Elected 2017 (Charter Trustee)
Boston, Massachusetts

David M. McKenna '89
Elected 2023 (Charter Trustee)
Sudbury, Massachusetts

Jane Pfaff Novak '92
Elected 2022 (Charter Trustee)
London, United Kingdom

Shonda L. Rhimes '91 H'14
Elected 2023 (Charter Trustee)
New York, New York

Erica Ruliffson Schultz '95
Elected 2016 (Charter Trustee)
San Francisco, CA

Joyce A. Sackey, M.D. '85 MED'89
Elected 2021 (Alumni Trustee)
Palo Alto, CA

Todd B. Sisitsky '93
Elected 2023 (Charter Trustee)
San Francisco, California

Scott M. Stuart '81
Elected 2021 (Charter Trustee)
Greenwich, CT

Governor Christopher T. Sununu
Concord, New Hampshire

Jacob P. Tapper '91, H'17
Elected 2022 (Charter Trustee)
Washington, DC

Hilary C. Tompkins '90, H'19
Elected 2019 (Alumni Trustee)
Washington, D.C.

OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02/28/2023)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Rees, Judith R.

eRA COMMONS (credential, e.g., agency login): USER NAME: [redacted]

POSITION TITLE: Associate Professor of Epidemiology and of Community and Family Medicine

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Oxford University, England	BA	06/1985	Physiological Sciences
Oxford University, England	BM, BCh	06/1988	Medicine
University of California, Berkeley	MPH	05/1996	Epidemiology
University of California, Berkeley	PhD	05/2001	Epidemiology

A. Personal Statement

I am a physician-epidemiologist in the Department of Epidemiology at the Geisel School of Medicine, Dartmouth College, and, since 2019, I have been the Associate Director for Community Outreach and Engagement (COE) at the Dartmouth Cancer Center (DCC). A graduate of Oxford University Medical School in the United Kingdom, I completed a three-year general practice residency in the United Kingdom, followed by an MPH and PhD in Epidemiology at the University of California, Berkeley. My career has centered on cancer epidemiology and cancer prevention research within the framework of directing the New Hampshire State Cancer Registry since 2004 and overseeing Community Outreach and Engagement for the Dartmouth Cancer Center since 2020. I have increasingly centered my research focus around local issues in rural New England – especially cancer screening, and environmental exposures relating to cancer risk. With the Office of COE I have studied the characteristics of the DCC Cancer Center's catchment area of New Hampshire and Vermont.

B. Positions, Scientific Appointments and Honors

2023	Dartmouth Cancer Center Search Committee, Director of Office of Inclusive Excellence.
2022	Dartmouth Cancer Center / Department of Epidemiology Search Committee, Faculty Recruit
2019-present	Dartmouth Cancer Center Executive Council, committee member
2019-present	Associate Director for Community Outreach and Engagement, Dartmouth Cancer Center
2017-present	Associate Professor of Epidemiology and of Community and Family Medicine
2013-2020	PLOS ONE Editorial Board member
2010	Prevention Translation Supplement Awards Review Committee, Canadian Cancer Society
2010-present	Medical Advisory Board, New Hampshire Colorectal Cancer Screening Program
2009-present	Medical Education Committee, Dartmouth Medical School
2008-present	Course Director, Biostatistics & Epidemiology (a core course for year 1 medical students)
2008-present	Member, American Cancer Society/Norris Cotton Cancer Center Local Institutional Research Grant Committee, Lebanon, NH
2007-present	NH State Cancer Registry Advisory Panel
2006	NH DHHS Comprehensive Cancer Collaboration Management RFP review panel
2005-2008	NH Comprehensive Cancer Collaboration: Steering Committee & Emerging Issues Committee
2005-2007	NH Advisory Panel on Cancer and Chronic Disease
2005-present	NH Comprehensive Cancer Collaboration: Data Use Committee
2005	NH Chronic Disease Conference Planning Committee
2004-present	Director, New Hampshire State Cancer Registry

2004-present	Cancer Epidemiology and Chemoprevention Research Program member, Norris Cotton Cancer Center, Lebanon, NH
2002-present	Assistant Professor, Biostatistics and Epidemiology, Dartmouth Medical School, NH
1998-1999	University Fellowship for Graduate Study in Public Health (University of California, Berkeley)
1997-2000	Project Director, Drinking Water Evaluation Trial, (CEIP), Berkeley, CA
1997-1998	Non-Resident Tuition Scholarship (University of California, Berkeley)
1995-2001	Surveillance Officer, California Emerging Infections Program (CEIP), San Francisco, CA
1994	George Herbert Hunt Traveling Scholarship (Oxford University)
1991-1994	Resident, General Practice (Obstetrics/Gynecology, Pediatrics, Internal Medicine, Rheumatology, Palliative Care, Psychiatry), Northampton General Hospital, UK
1990	Resident, Accident & Emergency Department, St. Helier Hospital, Surrey, UK
1989-1990	Programmer, Welsh Health Services, Cardiff, UK
1989	Intern, General Surgery and Urology, Churchill Hospital, Oxford, UK
1988-1989	Intern, Medicine & Gastroenterology, Northampton General Hospital, UK

Other Experience and Professional Memberships

C. Contribution to Science

1. Cancer Epidemiology: I examine patterns and discrepancies in cancer diagnosis and treatment using New Hampshire State Cancer Registry (NHSCR) and other national data. For example, patterns of adult cancer show excess cancer incidence and mortality in Northern New England, a mortality pattern that differs when compared to that seen in Northern New England.[a] Pediatric cancer incidence in the United States shows strong geographic variation with highest incidence in the Northeast[b]. During geospatial analyses in New Hampshire, we identified an association between kidney cancer risk and trichloroethylene exposure; this is currently being followed by an assessment relating to PFAS, which is a concern in the Merrimack area where an excess of kidney cancer has been identified[c]. I also conducted a large population-based survey in New Hampshire and Vermont to identify disparities in cancer-related risk factors, and found that several important risk factors with greater prevalence in our rural residents may actually reflect confounding by educational attainment; the more direct independent association appears to be with lower educational attainment rather than rural residence *per se*[d]. This finding has implications for cancer education and prevention strategies in our catchment population.

a. **Rees JR**, Weiss J, Gunn C, Carlos MS, Dragnev N, Supattapone EY, Tosteson ANA, Kraft S, Vahdat L, Peacock JL. Cancer Epidemiology in Northeast and New England (2013-2017). Cancer Research Communications, June 2023. https://doi.org/10.1158/2767-9764.CRC-23-0152

b. **JR Rees**, JE Weiss, BL Riddle, K Craver, MS Zens, JL Peacock. Childhood Cancer by Race, Ethnicity and Region in the United States. Cancer Epidemiology Biomarkers & Prevention, 2022; 31 (10): 1896–1906 PMID: 35861625

c. AS Andrew, M Li, X Shi, **JR Rees**, KM Craver, JM Petali et al. (2022) Kidney cancer risk associated with historic groundwater trichloroethylene contamination. Int J Environ Res Public Health. Jan 6;19(2):618. doi: 10.3390/ijerph19020618. PMID: 35055441 PMCID: PMC8775807

d. Skipper TA, Weiss JE, Carlos HA, Gunn CM, Hasson RM, Peacock JL, Schiffelbein JE, Tosteson ANA, Lansigan F, **Rees JR**. A Survey of Cancer Behaviors, Beliefs, and Social Drivers of Health in New Hampshire and Vermont. Cancer Research Communications, June 2023, https://aacrjournals.org/cancerrescommun/article/doi/10.1158/2767-9764.CRC-23-0267/728192/A-Survey-of-Cancer-Risk-Behaviors-Beliefs-and

2. Randomized controlled trials: A primary interest is the study of methodology including unblinding and bias in randomized controlled trials, and the conduct of trials in community settings[a,b] as well as chemoprevention trials[c,d]. My methodological work included a funded RO3 to assess participants beliefs and perceptions about study treatments, and their effects on adherence and health outcomes that was featured with a researcher profile by the NCI's Behavioral Research, Cancer Control & Population Sciences published as an example for other grant writers http://staffprofiles.cancer.gov/brp/granteeProfile.do?contactId=22545693&grpId=52812.

a. J Carey, AM Guess, T Keirns, P Loewen, E Merkley, Brendan Nyhan, JB Phillips, **J Rees**, J Reifler. Minimal effects from injunctive norm and contentiousness treatments on COVID-19 vaccine intentions: Evidence from three countries. PNAS Nexus, Vol 1, Issue 2, May 2022 https://doi.org/10.1093/pnasnexus/pgac031**Rees JR,** Wade TJ, Levy DA, Colford JM, Jr., Hilton JF (2005).

Changes in beliefs identify unblinding in randomized controlled trials: a method to meet CONSORT guidelines. *Contemp Clin Trials* 26(1):25-37.

b. Colford JM, Jr., **Rees JR**, Wade TJ, Khalakdina A, Hilton JF, Ergas IJ, Burns S, Benker A, Ma C, Bowen C, Mills DC, Vugia DJ, Juranek DD, Levy DA (2002). Participant blinding and gastrointestinal illness in a randomized, controlled trial of an in-home drinking water intervention. *Emerg Infect Dis* 8(1):29-36. *PMCID: PMC2730258*

c. **Rees JR**, Morris CB, Peacock JL, Ueland PM, Barry EL, McKeown-Eyssen GE, Figueiredo JC, Snover DC, Baron JA (2017). Unmetabolized Folic Acid, Tetrahydrofolate, and Colorectal Adenoma Risk. *Cancer Prev Res (Phila)* 10(8):451-458. *PMCID: PMC5544920*

d. Baron JA, Barry EL, Mott LA, **Rees JR**, Sandler RS, Snover DC, Bostick RM, Ivanova A, Cole BF, Ahnen DJ, Beck GJ, Bresalier RS, Burke CA, Church TR, Cruz-Correa M, Figueiredo JC, Goodman M, Kim AS, Robertson DJ, Rothstein R, Shaukat A, Seabrook ME, Summers RW (2015). A Trial of Calcium and Vitamin D for the Prevention of Colorectal Adenomas. *N Engl J Med* 373(16):1519-30. *PMCID: PMC4643064*

3. Cancer Registry Operations and Data Quality: At NHSCR we have examined several aspects of cancer registry operations and data quality. Two were published in full; one is in revision; and several others were presented as posters at national conferences.

a. BL Riddle, MS Eliassen, MO Celaya, C Bancroft, A Johnson, J Oh, C Chawla, **JR Rees**. Identifying Duplicate Cancer Cases across State Boundaries: Pseudonymization as a Method to Encrypt Identifiers. In revision at Journal of Registry Management (JRM) anticipated publication summer edition 2022

b. Celaya MO, Riddle BL, Cherala SS, Armenti KR, **Rees JR** (2010). Reliability of rapid reporting of cancers in New Hampshire. *J Registry Manag* 37(3):107-111.

b. Armenti KR, Celaya MO, Cherala S, Riddle B, Schumacher PK, **Rees JR** (2010). Improving the quality of industry and occupation data at a central cancer registry. *Am J Ind Med* 53(10):995-1001.

4. Skin cancer epidemiology and multiple malignancies: I have combined my roles as a co-investigator on the study "Non-Melanoma Skin Cancer in New Hampshire" (PI, Karagas), and director of the New Hampshire State Cancer Registry to conduct linkage studies assessing the risk of cancer and death after keratinocyte cancer, and have also examined risk of others cancers after skin cancer in two other collaborative settings. These studies confirm the elevated risk of cancer after keratinocyte cancer and after melanoma, and the increased mortality after keratinocyte cancer even with adjustment for the time-dependent occurrence of intervening major cancers. They also highlight differences between basal and squamous cell carcinoma and argue for caution when pooling these two very different cancers during epidemiologic studies. I am also the site PI for InterMEL, a multi-center collaboration to explore molecular prognostic markers for melanoma.

a. MR Sargen, EK Cahoon, MM Madeleine, Y Zeng, **JR Rees**, E Engels, Spectrum of skin cancer risk among solid organ transplant recipients in the United States. JAMA Dermatology Accepted, Jan 2022

b. **Rees JR**, Zens MS, Gui J, Celaya MO, Riddle BL, Karagas MR (2014). Non melanoma skin cancer and subsequent cancer risk. *PLoS One* 9(6):e99674. *PMCID: PMC4061037*

c. **Rees JR**, Zens MS, Celaya MO, Riddle BL, Karagas MR, Peacock JL (2015). Survival after squamous cell and basal cell carcinoma of the skin: A retrospective cohort analysis. *Int J Cancer* 137(4):878-884. *PMCID: PMC4478145*

d. Robsahm TE, Karagas MR, **Rees JR**, Syse A (2014). New malignancies after squamous cell carcinoma and melanomas: a population-based study from Norway. *BMC Cancer* 14:210. *PMCID: PMC3994878*

5. Infectious disease epidemiology: In a secondary study in the colorectal adenoma chemoprevention trial, I reported that 1000 IU vitamin D_3 daily supplementation during the H1N1 influenza pandemic of 2009-10 did not reduce the incidence or duration of colds or influenza-like illness. This report was featured on Dec 3, 2013 in the New York Times (D6 of the New York edition) with the headline: "Prevention: Hold the Vitamin D and Calcium" that is archived on-line. The data were subsequently used in an individual patient data meta analysis that showed a significant impact of vitamin D supplementation on the prevention of colds and flu,[b] and a recently updated aggregate data meta analysis conducted because of the COVID-19 pandemic, that again showed a small but statistically significant preventive effect on colds and flu symptoms.[c] In 2000, in response to the COVID-19 pandemic, I quickly implemented a prospective syndromic surveillance study in New Hampshire because COVID-19 testing was not available to the public and the extent of disease locally was unknown. We rapidly published 16 reports online in the Dartmouth Epidemiology Department and University of

New Hampshire websites over three months (April-June 2020), covering a variety of topics starting with the prevalence of symptoms, and describing the pandemic's effects on health, stress, employment, and mental health, and attitudes towards COVID-19 testing, social distancing, and vaccination.

a. **Rees JR**, Hendricks K, Barry EL, Peacock JL, Mott LA, Sandler RS, Bresalier RS, Goodman M, Bostick RM, Baron JA (2013). Vitamin D3 supplementation and upper respiratory tract infections in a randomized, controlled trial. *Clin Infect Dis* 57(10):1384-1392. *PMCID: PMC3805175*
b. Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, Dubnov-Raz G, Esposito S, Ganmaa D, Ginde AA, Goodall EC, Grant CC, Griffiths CJ, Janssens W, Laaksi I, Manaseki-Holland S, Mauger D, Murdoch DR, Neale R, **Rees JR**, Simpson S, Jr., Stelmach I, Kumar GT, Urashima M, Camargo CA, Jr. (2017). Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. *BMJ* 356:i6583. *PMCID: PMC5310969*
c. Jolliffe DA, Camargo CA Jr, Sluyter JD, Aglipay M, Aloia JF, Ganmaa D, Bergman P, Bischoff-Ferrari HA, Borzutzky A, Damsgaard CT, Dubnov-Raz G, Esposito S, Gilham C, Ginde AA, Golan-Tripto I, Goodall EC, Grant CC, Griffiths CJ, Hibbs AM, Janssens W, Khadilkar AV, Laaksi I, Lee MT, Loeb M, Maguire JL, Majak P, Mauger DT, Manaseki-Holland S, Murdoch DR, Nakashima A, Neale RE, Pham H, Rake C, **Rees JR**, Rosendahl J, Scragg R, Shah D, Shimizu Y, Simpson-Yap S, Trilok-Kumar G, Urashima M, Martineau AR. Vitamin D supplementation to prevent acute respiratory infections: a systematic review and meta-analysis of aggregate data from randomised controlled trials. Lancet Diabetes Endocrinol. 2021 May;9(5):276-292. doi: 10.1016/S2213-8587(21)00051-6. Epub 2021 Mar 30. PMID: 33798465.
d. Dartmouth College and University of New Hampshire Survey Center, COVID-19 in New Hampshire

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/judith.rees.1/bibliography/44014541/public/?sort=date&direction=ascending

OMB No. 0925-0001 and 0925-0002 (Rev. 10/2021 Approved Through 01/31/2026)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Romano, Megan E.

eRA COMMONS USER NAME (credential, e.g., agency login): [redacted]

POSITION TITLE: Postdoctoral Research Associate

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
Allegheny College, Meadville, PA	BS	01/2004	Biology
Boston University, Boston, MA	MPH	05/2007	Environmental Health & Epidemiology
University of Washington, Seattle, WA	PHD	08/2013	Epidemiology
Brown University, Providence, RI	Postdoctoral Fellow	07/2016	Environmental Epidemiology

A. Personal Statement

I am an environmental and perinatal epidemiologist leading impactful research investigating the ways in which exposure to environmental endocrine-disrupting chemicals during the sensitive window of pregnancy/gestation affect the short- and long-term health of mothers and children. I have substantial technical expertise and more than ten years of experience conducting studies that investigate the health effects of environmental toxicants in addition to my formal educational training. I am also deeply committed to environmental justice and have engaged deeply with stakeholders in New Hampshire (NH), including government representatives, advocacy organizations (Testing for Pease, Merrimack Citizens for Clean Water), and NH state agencies (NH Department of Environmental Services and NH Department of Health and Human Services) to support translational research that benefits communities suffering the effects of environmental contamination.

I have successfully led multiple studies investigating per- and polyfluoroalkyl substances (PFAS) [P20GM104416 PI: Karagas, PL: Romano; P20GM104416-08S PI: Karagas, PL: Romano; R21 ES032187 Multi-PI: Chen & Romano; R03ES03514 PI: Romano] and authored 17 peer-reviewed papers examining the health effects of PFAS or identifying under-appreciated sources of PFAS exposure. Across my work, I apply novel statistical methods for the investigation of chemical mixtures in epidemiologic studies and seek to advance and innovate methodologies for environment epidemiologic studies [U2C OD023375- Subaward; Opportunities and Infrastructure Fund (OIF) Project PI]. My PFAS research, particularly that on PFAS and breastfeeding has informed efforts to regulate PFAS in water in several U.S. states, including New Hampshire (NH) where the proposed work is based.

In the proposed work I build directly upon my previous research to fill an important knowledge gap in our understanding of PFAS and kidney cancer. I bring the research skills and technical experience needed to enthusiastically support this team of experts and ensure the successful completion of the proposed project.

Ongoing and recently completed projects that I would like to highlight include:
UG30D023275, NIEHS
Karagas (PI), Role: Co-Investigator
09/01/2023–05/31/2025
A prospective study of critical environmental exposures in formative early life that impact lifelong health in rural US children: the New Hampshire Birth Cohort Study

R03ES035140, NIEHS
Romano (PI)
2/23/2023–1/31/2025
Effects of per- and polyfluoroalkyl substances on placental features and size at birth

R21 ES032187, NIEHS

Chen & Romano (multi-PI)
09/11/2020– 08/31/2023
Per- and polyfluoroalkyl substances (PFAS) in marine fish and shellfish: a biomonitoring tool for PFAS remediation and a metric for potential human exposure through seafood consumption

P20GM104416, NIGMS
Karagas (PI), Role: Project Leader
02/01/2018–01/31/2023
Effects of Perfluoroalkyl Substances on Gestational Weight Gain, Breastfeeding, & Early Life Growth

Citations:

1. Rokoff LB, Wallenborn JT, Harris MH, Rifas-Shiman SL, Criswell R, Romano ME, Young JG, Calafat AM, Oken E, Sagiv SK, Fleisch AF. Plasma concentrations of per- and polyfluoroalkyl substances in pregnancy and breastfeeding duration in Project Viva. Sci Total Environ. 2023 Sep 15;891:164724. PubMed Central PMCID: PMC10327962.
2. Laue HE, Moroishi Y, Palys TJ, Christensen BC, Criswell RL, Peterson LA, Huset CA, Baker ER, Karagas MR, Madan JC, Romano ME. Early-life exposure to per- and polyfluoroalkyl substances and infant gut microbial composition. Environ Epidemiol. 2023 Feb;7(1):e238. PubMed Central PMCID: PMC9916123.
3. Criswell RL, Wang Y, Christensen B, Botelho JC, Calafat AM, Peterson LA, Huset CA, Karagas MR, Romano ME. Concentrations of Per- and Polyfluoroalkyl Substances in Paired Maternal Plasma and Human Milk in the New Hampshire Birth Cohort. Environ Sci Technol. 2023 Jan 10;57(1):463-472. PubMed Central PMCID: PMC9837617.
4. Romano ME, Xu Y, Calafat AM, Yolton K, Chen A, Webster GM, Eliot MN, Howard CR, Lanphear BP, Braun JM. Maternal serum perfluoroalkyl substances during pregnancy and duration of breastfeeding. Environ Res. 2016 Aug;149:239-246. PubMed Central PMCID: PMC4907828.

B. Positions, Scientific Appointments and Honors

Positions and Scientific Appointments

2023	*Ad Hoc* Reviewer, Specialized Centers of Research Excellence (SCORE) on Sex Differences Study Section/ ZRG1 EMS A 70
2023	*Ad Hoc* Reviewer, Special Emphasis Panel: NIEHS Support for Conferences and Scientific Meetings / ZES1-ARL-W (13)
2023	*Ad Hoc* Reviewer, Social and Environmental Determinants of Health Study Section Population Sciences and Epidemiology Integrated Review Group (2023- 485046)
2022 -	Associate Professor of Epidemiology, Dartmouth Geisel School of Medicine, Lebanon, NH
2021 - 2021	*Ad Hoc* Reviewer, NIEHS Time-Sensitive R21 Special Emphasis Panel/ ZES1 ARL-S (TS) 1
2021 - 2021	*Ad Hoc* Reviewer, Infectious Diseases, Reproductive health, Asthma and Pulmonary Conditions Study Section/ ZRG1 PSE-N (90)
2016 - 2022	Assistant Professor of Epidemiology, Dartmouth Geisel School of Medicine, Lebanon, NH
2016 - 2019	Adjunct Assistant Professor, Brown University School of Public Health, Providence, RI
2013 - 2016	Postdoctoral Research Associate, Brown University School of Public Health, Providence, RI
2012 - 2013	Predoctoral Teaching Associate, University of Washington School of Public Health, Department of Epidemiology, Seattle, WA
2012 - 2013	UW Student Affiliate, Swedish Medical Center, Center for Perinatal Studies, Seattle, WA
2010 - 2012	Graduate Research Associate, University of Washington School of Public Health, Department of Epidemiology, Seattle, WA
2008 - 2009	Project Coordinator, Boston University, Superfund Basic Research Program, Boston, MA
2007 - 2009	Teaching Assistant, Boston University School of Public Health, Department of Environmental Health, Boston, MA
2007 - 2008	Research Assistant, Boston University, Superfund Basic Research Program, Boston, MA
2005 - 2007	Graduate Research Assistant, Boston University School of Public Health, Deparment of Epidemiology, Boston, MA

2005 - 2005	Teaching Assistant , Boston University School of Public Health, Department of Epidemiology, Boston, MA

Honors

2022 - 2023	Guest Editor, , Special Issue: Insights of Perinatal Endocrine Disruptors Exposure Influencing Maternal and Child Health, Toxics
2020	Co-Section Editor, Current Environmental Health Reports
2017	Semi-Finalist - Environmental Health Pioneers Under 40, Collaborative on Health and the Environment
2017	Editorial Board Member, , International Journal of Hygiene and Environmental Health
2016	Registration Support, , Gordon Research Seminar & Conference on Environmental Endocrine Disruptors
2015	Michael Shannon Research Award, Academic Pediatric Association
2014	Travel Award for Annual Meeting, International Society of Environmental Epidemiologists
2013	Predoctoral Fellow, University of Washington Reproductive, Pediatric and Perinatal Epidemiology Training Program
2012	Predoctoral Fellow, University of Washington Reproductive, Pediatric and Perinatal Epidemiology Training Program
2012	Participant, 8th Annual Summer Institute: Reproductive and Perinatal Epidemiology, Eunice Kennedy Shriver National Institute of Child Health and Human Development-Institute of Human Development, Child and Youth Health
2012	Participant, Translational Genomics Pipeline: From populations to individuals, Wellcome Trust
2011	Predoctoral Fellow, University of Washington Reproductive, Pediatric and Perinatal Epidemiology Training Program
2010	Predoctoral Fellow, University of Washington Reproductive, Pediatric and Perinatal Epidemiology Training Program
2009	Predoctoral Fellow, University of Washington Reproductive, Pediatric and Perinatal Epidemiology Training Program
2007	Genetics in Clinical Practice Intern, Centers for Disease Control and Prevention/ Association of Schools of Public Health
2006	Deans Award for Student Research, Boston University School of Public Health

Other Experience and Professional Memberships

2018–	Member, Society for Epidemiologic Research
2014–2020	Member, International Society for Children's Health and the Environment
2013–	Member, International Society for Environmental Epidemiology
2009–2014	Student Member, Society for Epidemiologic Research
2009–	Member, Society for Pediatric and Perinatal Epidemiologic Research

C. Contribution to Science

1. **Identifying the health effects of per- and polyfluoroalkyl substances (PFAS).**
   My work is situated at the nexus of environmental health and perinatal epidemiology. For nearly a decade, my research has elucidated the effects of PFAS on multiple facets of maternal and child health in the United States, where PFAS is a common environmental justice issue in contaminated communities. The proposed work underscores a critical need for public health professionals and policymakers alike to understand the mechanisms and long-term health effects of PFAS.

   a. Yim G, McGee G, Gallagher L, Baker E, Jackson BP, Calafat AM, Botelho JC, Gilbert-Diamond D, Karagas MR, **Romano ME**, Howe CG. Metals and per- and polyfluoroalkyl substances mixtures and birth outcomes in the New Hampshire Birth Cohort Study: Beyond single-class mixture approaches. Chemosphere. 2023 Jul;329:138644. PubMed Central PMCID: PMC10208216.

b. Liu Y, Wosu AC, Fleisch AF, Dunlop AL, Starling AP, Ferrara A, Dabelea D, Oken E, Buckley JP, Chatzi L, Karagas MR, **Romano ME**, Schantz S, O'Connor TG, Woodruff TJ, Zhu Y, Hamra GB, Braun JM. Associations of Gestational Perfluoroalkyl Substances Exposure with Early Childhood BMI z-Scores and Risk of Overweight/Obesity: Results from the ECHO Cohorts. Environ Health Perspect. 2023 Jun;131(6):67001. PubMed Central PMCID: PMC10246497.

c. Wang Y, Howe C, Gallagher LG, Botelho JC, Calafat AM, Karagas MR, **Romano ME**. Per- and Polyfluoroalkyl Substances (PFAS) Mixture during Pregnancy and Postpartum Weight Retention in the New Hampshire Birth Cohort Study (NHBCS). Toxics. 2023 May 10;11(5) PubMed Central PMCID: PMC10223499.

d. Padula AM, Ning X, Bakre S, Barrett ES, Bastain T, Bennett DH, Bloom MS, Breton CV, Dunlop AL, Eick SM, Ferrara A, Fleisch A, Geiger S, Goin DE, Kannan K, Karagas MR, Korrick S, Meeker JD, Morello-Frosch R, O'Connor TG, Oken E, Robinson M, **Romano ME**, Schantz SL, Schmidt RJ, Starling AP, Zhu Y, Hamra GB, Woodruff TJ. Birth Outcomes in Relation to Prenatal Exposure to Per- and Polyfluoroalkyl Substances and Stress in the Environmental Influences on Child Health Outcomes (ECHO) Program. Environ Health Perspect. 2023 Mar;131(3):37006. PubMed Central PMCID: PMC10015888.

2. **Examining lactation as a vulnerable function and important marker of maternal health.** While the benefits of breastfeeding are well elucidated, there is much about lactation that remains unknown. Unlike most organs that develop primarily *in utero*, the mammary gland develops in three stages during gestation, puberty, and pregnancy. During the final stage of development in pregnancy, milk ducts form to allow for lactation; however, very few studies have investigated factors that may interfere with lactation at this critical third stage of mammary gland development. Environmental endocrine-disruptors are increasingly suspected to interfere with this highly hormonally-regulated process. Though not all studies agree, findings of shorter duration of breastfeeding following maternal PFAS exposure in pregnancy are fairly consistent across several geographically distinct and socioeconomically diverse populations. These include two studies authored by me that represent the first two studies of PFAS and breastfeeding in North American populations. A NHBCS manuscript, undergoing peer review, further supports this hypothesis. Collectively this work informed the central hypothesis of the proposed research. My work related to lactation outcomes is frequently referenced by U.S. states in the creation of PFAS drinking water standards.

a. **Romano ME**, Xu Y, Calafat AM, Yolton K, Chen A, Webster GM, Eliot MN, Howard CR, Lanphear BP, Braun JM. Maternal serum perfluoroalkyl substance concentrations during pregnancy and duration of breastfeeding. Environ Res. 2016; 149:239-46. PMCID: PMC4907828

b. Criswell RL, Wang Y, Christensen B, Botelho JC, Calafat AM, Peterson LA, Huset CA, Karagas MR, **Romano ME**. Concentrations of Per- and Polyfluoroalkyl Substances in Paired Maternal Plasma and Human Milk in the New Hampshire Birth Cohort. Environ Sci Technol. 2023 Jan 10;57(1):463-472. PMCID: PMC9837617.

c. Rokoff LB, Wallenborn JT, Harris MH, Rifas-Shiman SL, Criswell R, **Romano ME,** Young JG, Calafat AM, Oken E, Sagiv SK, Fleisch AF. Plasma concentrations of per- and polyfluoroalkyl substances in pregnancy and breastfeeding duration in Project Viva. Sci Total Environ. 2023 Jun 7;891:164724. PMID: 37290653.

d. Crawford KA, Gallagher LG, Baker ER, Karagas MR, Romano ME. Predictors of Breastfeeding Duration in the New Hampshire Birth Cohort Study. Matern Child Health J. 2023 Aug;27(8):1434-1443. Epub 2023 Jun 3. PubMed PMID: 37269393.

3. **Investigating the impact of environmental co-exposures and complex mixtures on health.** The need to study complex mixtures and co-exposures in biomedical research has been long recognized, but slowly implemented. However, I have been at the forefront of the field, applying novel and innovative statistical methods to study adverse influences of exposure to mixtures of environmental toxicants during pregnancy on newborn thyroid hormones, birth outcomes, early life neurodevelopment, and many other health endpoints. Across these studies, I have applied innovative methods including weighted quantile sum regression, quantile g-computation, Bayesian kernel machine regression, and self-organizing maps to name only a few.

a. **Romano ME**, Eliot MN, Zoeller RT, Hoofnagle AN, Calafat AM, Karagas MR, Yolton K, Chen A, Lanphear BP, Braun JM. Maternal urinary phthalate metabolites during pregnancy and thyroid hormone concentrations in maternal and cord sera: The HOME Study. Int J Hyg Environ Health. 2018 May;221(4):623-631. PMCID: PMC5972051.
b. Doherty BT, **Romano ME**, Gui J, Punshon T, Jackon BP, Karagas MK, Korrick SA. Periconceptional and prenatal exposure to metal mixtures in relation to behavioral development at three years of age. Environ Epidemiol. 2020; 4(4) e0106. PMCID: PMC7595192.
c. Doherty BT, McRitchie SL, Pathmasiri WW, Stewart DA, Kirchner D, Anderson KA, Gui J, Madan JC, Hoen AG, Sumner SJ, Karagas MR, **Romano ME**. Chemical co-exposures assessed via silicone wristbands and endogenous plasma metabolomics during pregnancy. JESEE. 2021. 2022 Mar;32(2):259-267. PMC8930423.
d. Doherty BT, McRitchie SL, Pathmasiri WW, Stewart DA, Kirchner D, Anderson KA, Gui J, Madan JC, Hoen AG, Sumner SJ, Karagas MR, **Romano ME**. Chemical co-exposures assessed via silicone wristbands and endogenous plasma metabolomics during pregnancy. J Expo Sci Environ Epidemiol. 2022 Mar;32(2):259-267. PMCID: PMC8930423.

4. **Advancing our understanding of the predictors of exposure to environmental endocrine-disrupting chemicals and promoting novel techniques of exposure assessment.**
Exposure assessment is often the Achilles heel of environmental epidemiologic studies, so building upon my background in environmental health, I have given a high priority to advancing methodologies in support of more consequential environmental epidemiology. In my work, I have highlighted the importance of accounting for seasonal variations and secular trends in exposure profiles, identified factors influencing the variability and predictors of exposure to known and emerging contaminants of concern, and advanced the use of silicone exposome wristbands for exposure assessment.
a. **Romano ME**, Kalloo G, Etzel T, Braun JM. Re: Seasonal Variation in Exposure to Endocrine-Disrupting Chemicals. Epidemiology. 2017; 28(5): e42-e43.PMCID:PMC5539945.
b. **Romano ME**, O'Connell K, Du M, Rehm CD, Kantor ED. Use of supplements and prescription drugs in relation to urinary phthalate metabolite concentrations: results from the National Health and Nutrition Examination Survey. Environ Res. 2019. 172:437-443. PMCID: PMC6800060
c. **Romano ME**, Gallagher LG, Doherty BT, Yeum D, Lee S, Takazawa M, Anderson KA, Kannan K, Karagas MR. Inter-method reliability of silicone exposome wristbands and urinary biomarker assays in a pregnancy cohort. Environ Res. 2022 Aug 8;214(3):113981. PMCID: PMC9841893.
d. Herbstman JB, **Romano ME**, Li X, Jacobson LP, Margolis AE, Hamra GB, Bennett DH, Braun JM, Buckley JP, Colburn T, Deoni S, Hoepner LA, Morello-Frosch R, Riley KW, Sathyanarayana S, Schantz SL, Trasande L, Woodruff TJ, Perera FP, Karagas MR. Characterizing changes in behaviors associated with chemical exposures during the COVID-19 pandemic. PLoS One. 2023;18(1):e0277679. PMCID: PMC9838870.

Complete List of Published Work in My Bibliography:
https://www.ncbi.nlm.nih.gov/myncbi/megan.romano.1/bibliography/public

OMB No. 0925-0001 and 0925-0002 (Rev. 10/2021 Approved Through 09/30/2024)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Salas Diaz, Lucas A

eRA COMMONS USER NAME (credential, e.g., agency login): [redacted]

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Universidad Nacional de Colombia, Bogota, Distrito Capital	MD	12/2001	Medicine
Universidad de Antioquia, Bogota, Distrito Capital	MS	04/2007	Epidemiology
Universitat Pompeu Fabra, Barcelona, Catalonia	MPH	09/2011	Public Health (Environmental Health)
Universitat Pompeu Fabra, Barcelona, Catalonia	PHD	07/2015	Biomedicine
Centre of Research in Environmental Epidemiology, Barcelona, Catalonia	Postdoctoral Fellow	09/2015	Environmental Epigenetics
Geisel School of Medicine at Dartmouth, Lebanon, NH	Postdoctoral Fellow	11/2018	Cancer epigenetics

A. Personal Statement

As an Assistant Professor of Epidemiology at Dartmouth's Geisel School of Medicine, I lead a research program at the nexus of molecular biomarkers and population health. The proposed project seeks to explore potential associations between exposures to per- and poly-fluoroalkyl substances (PFAS) in areas of New Hampshire and kidney cancer incidence. Our goal is to establish a research foundation with the participation of the affected community to understand and monitor affected communities and whether or not PFAS exposure is affecting disease's development and prognosis.

This initiative is a natural extension of my keen interests in molecular, environmental, and cancer epidemiology. My PhD training was focused on understanding the epigenetic mechanisms involved in environmental carcinogens (disinfection by-products) in human populations. Throughout my career, I have worked to understand how DNA methylation and other epigenetic alterations are dysregulated in the health-disease continuum. I have probed the significance of DNA methylation and miRNA shifts on cell heterogeneity across various health conditions. My research has spotlighted innovative methodologies to deconvolve cellular heterogeneity using DNA methylation data, evident in diverse human samples, including blood, milk, urine, brain, and an array of carcinomas.

Currently, I lead a comprehensive single-cell multiome analysis of human kidney cancer samples and a project focusing on using urine as a biomarker for lupus nephritis. My arsenal of expertise spans single-cell and spatial transcriptomics, Epigenome Wide Association Studies (EWAS), Transcriptome Wide Association studies (TWAS), and the development of reference-based cell deconvolution strategies using DNA methylation data. I've also been successful in crafting and validating predictive DNA methylation biomarkers.

My medical foundation ensures a translation of our core insights into tangible health outcomes. Technically, I am proficient in bioinformatics and have been instrumental in conceiving and sustaining several open-source R

packages. My credentials also include robust management of research projects, covering the spectrum of planning, execution, staffing, budgetary considerations, and complex epidemiological data analysis.

Since 2012, I've been imparting knowledge as a lecturer for numerous medical and graduate courses, positioning me as a mentor for the next generation of scientists. My skill set, educational background, and intrinsic motivation make me an ideal fit for this project.

Ongoing research projects that I would like to highlight:

W81XWH-20-1-0778
Salas Diaz, Lucas A (PI)
09/01/20-08/31/24
Epigenetic modifications of cytosines in clear cell kidney carcinogenesis and survival

P20 GM104416
Karagas, Margaret (PI)
Salas Diaz, Lucas A (Subaward PI)
10/01/20-01/01/23
A single-cell approach to disentangle tumor microenvironments in short and long survivors to clear cell renal cell carcinoma

R01CA253976
Christensen, Brock/ Kelsey, Karl (PI)
01/2021 – 12/2025
DNA-based immune phenotyping in HNSCC for biomarkers of response to immunotherapy

R01CA258375
Peres, Lauren/ Christensen, Brock (PI)
01/2023 – 12/2027
Methylomic basis of survival disparities among Black and White women with high- grade serous ovarian cancer

P20 GM130454
Whitefield, Michael (PI)
Skopelja-Gardner, Sladjana /Salas Diaz, Lucas A (Subaward co-PIs)
8/1/23 - 6/30/24
Defining the pathogenic role of myeloid cell populations in glomerulonephritis using Spatial Transcriptomics and DNA Methylation

Citations:

1. **Salas LA**, Zhang Z, Koestler DC, Butler RA, Hansen HM, Molinaro AM, Wiencke JK, Kelsey KT, Christensen BC (2022). Enhanced cell deconvolution of peripheral blood using DNA methylation for high-resolution immune profiling. Nat Comm. 2022 13(1):761. PubMed Central PMCID: PMC8828780.
2. Zhang Z, Wiencke JK, Kelsey KT ,Koestler DC, Christensen BC, **Salas LA**. HiTIMED: Hierarchical Tumor Immune Microenvironment Epigenetic Deconvolution for accurate cell type resolution in the tumor microenvironment using tumor-type-specific DNA methylation data. J Transl Med. 2022 Nov 8;20(1):516. doi: 10.1186/s12967-022-03736-6. PubMed Central PMCID: PMC9644569.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2020 - Present Assistant Professor, Geisel School of Medicine at Dartmouth, Lebanon, NH
2018 - 2020 Research Scientist, Dartmouth College, Department of Epidemiology, Christensen lab, Lebanon, NH

2015 - 2018	Postdoctoral Research Associate, Dartmouth College, Department of Epidemiology, Christensen lab, Lebanon, NH
2015 - 2015	Graduate Assistant Professor, Universitat Pompeu Fabra, Medical School, Barcelona
2015 - 2015	Postdoctoral Fellow, Centre of Research in Environmental Epidemiology (CREAL), Barcelona
2011 - 2015	PhD Researcher, Centre of Research in Environmental Epidemiology (CREAL), Barcelona
2010 - 2011	Research Internship, Centre of Research in Environmental Epidemiology (CREAL), Barcelona
2007 - 2010	Project Manager, Fundacion Santa Fe de Bogota, Community Health Division, Bogota
2005 - 2007	Cancer Registry Physician, Instituto Nacional de Cancerologia Colombia, Research and Public Health Division, Cancer Surveillance Team, Bogota
2003 - 2005	Family Physician, Hospital Centro Oriente II nivel, Bogota
2003 - 2003	Emergency Room Physician, Fundacion Santa Fe de Bogota, University Hospital, Bogota
2002 - 2003	Research Assistant, Fundacion Santa Fe de Bogota, Education division, Bogota
2000 - 2001	Medical Intern, Fundacion Santa Fe de Bogota, Education division, Bogota

Honors

2011	Cum Laude ("Matrícula de honor"). Acknowledgment for the best master's thesis work MPH 2010-2011, Universitat Pompeu Fabra.
2001	Best ECAES (currently best "Saber Pro"). Sixth national place in the standardized test of medical sciences knowledge among medical students in Colombia
1996 - 2001	Best National High School Graduates Scholarship Program. Universidad Nacional de Colombia

C. Contributions to Science

1. Open-Source Innovations in Molecular Epidemiology: My contributions to the field encompass refining DNA methylation techniques specifically tailored for both adult peripheral blood and umbilical cord blood cell deconvolution, brain tissue deconvolution, and carcinomas tumor microenvironment deconvolution. I've played a collaborative role in spearheading the development of various open-source bioinformatics tools geared towards molecular marker analysis and digital pathology. Notable contributions include: FlowSorted.Blood.EPIC, FlowSorted.CordBloodCombined.450k, PyMethylProcess, PathFlowAI, HiTIMED, HiBED, and HiTAIC.
   a. Levy JJ, **Salas LA**, Christensen BC, Sriharan A, Vaickus LJ. PathFlowAI: A High-Throughput Workflow for Preprocessing, Deep Learning and Interpretation in Digital Pathology. Pac Symp Biocomput. 2020;25:403-414. PubMed Central PMCID: PMC6919317.
   b. Gervin K, **Salas LA**, Bakulski KM, van Zelm MC, Koestler DC, Wiencke JK, Duijts L, Moll HA, Kelsey KT, Kobor MS, Lyle R, Christensen BC, Felix JF, Jones MJ. Systematic evaluation and validation of reference and library selection methods for deconvolution of cord blood DNA methylation data. Clin Epigenetics. 2019 Aug 27;11(1):125. PubMed Central PMCID: PMC6712867.
   c. Levy JJ, Titus AJ, **Salas LA**, Christensen BC. PyMethylProcess-convenient high-throughput preprocessing workflow for DNA methylation data. Bioinformatics. 2019 Dec 15;35(24):5379-5381. PubMed Central PMCID: PMC6954637.
   d. Zhang Z, Lee MK, Perreard L, Kelsey KT, Christensen BC, **Salas LA**. Navigating the hydroxymethylome: experimental biases and quality control tools for the tandem bisulfite and oxidative bisulfite Illumina microarrays. Epigenomics. 2022. Feb;14(3):139-152. PubMed Central PMCID: PMC8914583.
2. Epigenetic Techniques and Biomarkers in Cancer: Central to my research is the pioneering development and strategic application of epigenetic techniques and biomarkers tailored for cancer studies. Among my contributions is the *Methylation Dysregulation Index (MDI)*, which I've implemented as a marker for assessing global DNA methylation disruptions. *Fetal Cell of Origin (FCO) Biomarker:* Innovatively designed by me, this biomarker traces human stem cell lineage, providing insights into cellular origins and

developmental trajectories. *Neutrophil to Lymphocyte Ratio Indicator:* I introduced a distinctive DNA methylation biomarker that pinpoints the neutrophil to lymphocyte ratio, specifically tailored for glioma patients, aiding in more precise disease understanding and management.

a. Zhang Z, Wiencke JK, Kelsey KT ,Koestler DC, Christensen BC, **Salas LA**. HiTIMED: Hierarchical Tumor Immune Microenvironment Epigenetic Deconvolution for accurate cell type resolution in the tumor microenvironment using tumor-type-specific DNA methylation data. J Transl Med. 2022 Nov 8;20(1):516. doi: 10.1186/s12967-022-03736-6. PubMed Central PMCID: PMC9644569.
b. **Salas LA,** Wiencke JK, Koestler DC, Zhang Z, Christensen BC, Kelsey KT. Tracing human stem cell lineage during development using DNA methylation. Genome Res. 2018 Sep;28(9):1285-1295. PubMed Central PMCID: PMC6120629.
c. Zhang Z, Lu Y, Vosoughi S, Levy JJ, Christensen BC, **Salas LA**. HiTAIC: Hierarchical Tumor Artificial Intelligence Classifier Traces Tissue of Origin and Tumor Type in Primary and Metastasized Tumors Using DNA Methylation Data. NAR Cancer. 2023 Apr 19;5(2):zcad017. doi: 10.1093/narcan/zcad017. eCollection 2023 Jun. PMID: 37089814
d. **Salas LA,** Koestler DC, Butler RA, Hansen HM, Wiencke JK, Kelsey KT, Christensen BC. An optimized library for reference-based deconvolution of whole-blood biospecimens assayed using the Illumina HumanMethylationEPIC BeadArray. Genome Biol. 2018 May 29;19(1):64. PubMed Central PMCID: PMC5975716.

3. Epigenetic Biomarker Development: I specialize in crafting biomarkers and pinpointing distinct epigenetic signatures in cancer and other chronic diseases, leveraging DNA methylation data. For instance, in breast cancer epigenetics, I have been part of groups pioneering methods tailored for breast cancer research, utilizing unique biomatrices like human milk and combining breast/tumor tissue with other biomarkers.

a. Levy JJ, Chen Y, Azizgolshani N, Petersen CL, Titus AJ, Moen EL, Vaickus LJ, **Salas LA,** Christensen BC. MethylSPWNet and MethylCapsNet: Biologically Motivated Organization of DNAm Neural Networks, Inspired by Capsule Networks. NPJ Syst Biol Appl. 2021 Aug 20;7(1):33. PubMed Central PMCID: PMC8379254.
b. Muse ME, Carroll, CD, **Salas LA**, Karagas MR, Christensen BC. Application of novel breast biospecimen cell type adjustment identifies shared DNA methylation alterations in breast tissue and milk with breast cancer risk factors. Cancer Epidemiol Biomarkers Prev. 2023 Feb 10:EPI-22-0405. doi: 10.1158/1055-9965.EPI-22-0405. PubMed Central PMCID: PMC10068446.
c. **Salas LA,** Lundgren SN, Browne EP, Punska EC, Anderton DL, Karagas MR, Arcaro KF, Christensen BC. Prediagnostic breast milk DNA methylation alterations in women who develop breast cancer. Hum Mol Genet. 2020 Mar 13;29(4):662-673. PubMed Central PMCID: PMC7068171.
d. Chen Y, Wang Y, **Salas LA,** Miller TW, Mark K, Marotti JD, Kettenbach AN, Cheng C, Christensen BC. Molecular and epigenetic profiles of BRCA1-like hormone-receptor-positive breast tumors identified with development and application of a copy-number-based classifier. Breast Cancer Res. 2019 Jan 25;21(1):14. PubMed Central PMCID: PMC6347811.

4. My PhD thesis dissertation revolved around the molecular mechanisms of disinfection by-products and human cancer. This work laid the foundations for understanding the molecular mechanisms of these toxicants in long and short-term exposure in human populations.

a) **Salas LA**, Font-Ribera L, Bustamante M, Sumoy L, Grimalt JO, Bonnin S, Aguilar M, Mattlin H, Hummel M, Ferrer A, Kogevinas M, Villanueva CM. (2017). Gene expression changes in blood RNA after swimming in a chlorinated pool. *J Environ Sci (China).* Aug;58:250–261. *PMID: 28774616.*
b) **Salas LA**, Bustamante M, Gonzalez JR, Gracia-Lavedan E, Moreno V, Kogevinas M, Villanueva CM. (2015) DNA methylation levels and long-term trihalomethane exposure in drinking water: an epigenome-wide association study. *Epigenetics* 10(7):6506–61. *PMCID: PMC4622514*
c) **Salas LA**, Villanueva CM, Tajuddin SM, Amaral AF, Fernandez AF, Moore LE, Carrato A, Tardón A, Serra C, García-Closas R, Basagaña X, Rothman N, Silverman DT, Cantor KP, Kogevinas M, Real FX, Fraga MF, Malats N. LINE-1 methylation in granulocyte DNA and trihalomethane exposure is associated with bladder cancer risk. *Epigenetics* 2014 Nov;9(11):1532–9. PubMed Central PMCID: PMC4622716.
d) **Salas LA**, Cantor KP, Tardon A, Serra C, Carrato A, Garcia-Closas R, Rothman N, Malats N, Silverman D, Kogevinas M, Villanueva CM. (2013). Biological and statistical approaches for modeling

exposure to specific trihalomethanes and bladder cancer risk. Aug 15;178(4):652–660. *PMCID: PMC3736753.*

5. Broadening Horizons in Cancer & Beyond: While cancer research is at the heart of my endeavors, I maintain a dynamic presence in the realms of Epigenome Wide Association Studies (EWAS) and the Developmental Origins of Health and Disease. My collaborative efforts span across three prominent birth cohorts: INMA and NELA in Spain and the New Hampshire Birth Cohort in the USA. Additionally, I am a proactive member of the global Pregnancy and Childhood Epigenetics (PACE) Consortium.
   a. **Salas LA,** Baker ER, Nieuwenhuijsen MJ, Marsit CJ, Christensen BC, Karagas MR. Maternal swimming pool exposure during pregnancy in relation to birth outcomes and cord blood DNA methylation among private well users. Environ Int. 2019 Feb;123:459-466. PubMed Central PMCID: PMC6599635.
   b. Sharp GC, **Salas LA,** Monnereau C, Allard C, Yousefi P, Everson TM, Bohlin J, Xu Z, Huang RC, Reese SE, Xu CJ, Baïz N, Hoyo C, Agha G, Roy R, Holloway JW, Ghantous A, Merid SK, Bakulski KM, Küpers LK, Zhang H, Richmond RC, Page CM, Duijts L, Lie RT, Melton PE, Vonk JM, Nohr EA, Williams-DeVane C, Huen K, Rifas-Shiman SL, Ruiz-Arenas C, Gonseth S, Rezwan FI, Herceg Z, Ekström S, Croen L, Falahi F, Perron P, Karagas MR, Quraishi BM, Suderman M, Magnus MC, Jaddoe VWV, Taylor JA, Anderson D, Zhao S, Smit HA, Josey MJ, Bradman A, Baccarelli AA, Bustamante M, Håberg SE, Pershagen G, Hertz-Picciotto I, Newschaffer C, Corpeleijn E, Bouchard L, Lawlor DA, Maguire RL, Barcellos LF, Davey Smith G, Eskenazi B, Karmaus W, Marsit CJ, Hivert MF, Snieder H, Fallin MD, Melén E, Munthe-Kaas MC, Arshad H, Wiemels JL, Annesi-Maesano I, Vrijheid M, Oken E, Holland N, Murphy SK, Sørensen TIA, Koppelman GH, Newnham JP, Wilcox AJ, Nystad W, London SJ, Felix JF, Relton CL. Maternal BMI at the start of pregnancy and offspring epigenome-wide DNA methylation: findings from the pregnancy and childhood epigenetics (PACE) consortium. Hum Mol Genet. 2017 Oct 15;26(20):4067-4085. PubMed Central PMCID: PMC5656174.
   c. Morales E, Vilahur N, **Salas LA,** Motta V, Fernandez MF, Murcia M, Llop S, Tardon A, Fernandez-Tardon G, Santa-Marina L, Gallastegui M, Bollati V, Estivill X, Olea N, Sunyer J, Bustamante M. Genome-wide DNA methylation study in human placenta identifies novel loci associated with maternal smoking during pregnancy. Int J Epidemiol. 2016 Oct;45(5):1644-1655. PubMed PMID: 27591263.
   d. Joubert BR, Felix JF, Yousefi P, Bakulski KM, Just AC, Breton C, Reese SE, Markunas CA, Richmond RC, Xu CJ, Küpers LK, Oh SS, Hoyo C, Gruzieva O, Söderhäll C, **Salas LA,** Baïz N, Zhang H, Lepeule J, Ruiz C, Ligthart S, Wang T, Taylor JA, Duijts L, Sharp GC, Jankipersadsing SA, Nilsen RM, Vaez A, Fallin MD, Hu D, Litonjua AA, Fuemmeler BF, Huen K, Kere J, Kull I, Munthe-Kaas MC, Gehring U, Bustamante M, Saurel-Coubizolles MJ, Quraishi BM, Ren J, Tost J, Gonzalez JR, Peters MJ, Håberg SE, Xu Z, van Meurs JB, Gaunt TR, Kerkhof M, Corpeleijn E, Feinberg AP, Eng C, Baccarelli AA, Benjamin Neelon SE, Bradman A, Merid SK, Bergström A, Herceg Z, Hernandez-Vargas H, Brunekreef B, Pinart M, Heude B, Ewart S, Yao J, Lemonnier N, Franco OH, Wu MC, Hofman A, McArdle W, Van der Vlies P, Falahi F, Gillman MW, Barcellos LF, Kumar A, Wickman M, Guerra S, Charles MA, Holloway J, Auffray C, Tiemeier HW, Smith GD, Postma D, Hivert MF, Eskenazi B, Vrijheid M, Arshad H, Antó JM, Dehghan A, Karmaus W, Annesi-Maesano I, Sunyer J, Ghantous A, Pershagen G, Holland N, Murphy SK, DeMeo DL, Burchard EG, Ladd-Acosta C, Snieder H, Nystad W, Koppelman GH, Relton CL, Jaddoe VW, Wilcox A, Melén E, London SJ. DNA Methylation in Newborns and Maternal Smoking in Pregnancy: Genome-wide Consortium Meta-analysis. Am J Hum Genet. 2016 Apr 7;98(4):680-96. PubMed Central PMCID: PMC4833289.

Complete List of Published Work in My Bibliography:
https://www.ncbi.nlm.nih.gov/myncbi/lucas.salas.1/bibliography/public/

Dr. Judy Rees – Dartmouth College
Merrimack New Hampshire Kidney Cancer Incidence Phase 3 Feasibility Study Contract

Key Personnel

Name	Job Title	Total Salary to be Paid by this Contract
Judy Rees	Director, NHSCR	$28,576.85
Megan Romano	Associate Professor of Epidemiology	$32,957.59
Lucas Salas	Assistant Professor of Epidemiology	$28,989.46