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**THE STATE OF NEW HAMPSHIRE**  
**DEPARTMENT OF TRANSPORTATION**

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*William Cass, P.E.*  
 Commissioner

*David Rodrigue, P.E.*  
 Assistant Commissioner  
*Andre Briere, Colonel, USAF (RET)*  
 Deputy Commissioner

Bureau of Materials & Research  
 May 15, 2023

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

**REQUESTED ACTION**

The Department of Transportation requests placing this item on the Consent Calendar.

Authorize the Department of Transportation to amend a **Sole Source** Cooperative Project Agreement (CPA) with the University of New Hampshire Sponsored Programs Administration (Vendor #315187), Durham, New Hampshire, to study the Use of Drilling Parameters for Enhancing Geotechnical Site Investigations by extending the completion date from August 31, 2023, to September 30, 2024, effective upon Governor and Council approval. No additional funding is involved in this time extension. The original contract was approved by Governor and Council on May 5, 2021, Item #26, and Amendment #1 was approved on June 15, 2022, Item #55.

**EXPLANATION**

The Department is collaborating with UNH to conduct a cooperative research study, "Use of Drilling Parameters for Enhancing Geotechnical Site Investigations". The Standard Penetration Test (SPT) of soil is a proven tool widely used in providing disturbed soil samples to aid in estimating soil properties for the design of New Hampshire Department of Transportation (NHDOT) projects. Testing and sampling is typically done at 5 to 10-foot intervals with engineering judgement used to characterize interim changes. A technique known as Measurement-While-Drilling (MWD) makes use of the mechanical response of the drill rig and cutting tools while advancing a borehole. When combined with SPT testing, MWD can be used to produce a continuous quantitative drilling record, and the correlated parameters can be applied more reliably to develop recommendations and aid in the design of the NHDOT projects. The research study addresses an immediate Department need; is unique to New Hampshire's environment and conditions, thereby requiring substantial local experience; and is directly aligned with a particular area of University expertise, requiring a **Sole Source** agreement.

On May 5, 2021, the original CPA was approved by Governor and Council (Item #26, copy of resolution attached), and Amendment #1 was approved on June 15, 2022 (Item #55, copy of resolution attached). This requested action extends the completion date of the research study. This research project has experienced delays due to equipment challenges and, as a result, a no-cost extension is requested. Initially ordered in June 2022, a torque sensor system was received in December 2022. When used on

the research project, mechanical issues were identified, the system was returned to the manufacturer, and a repaired system was received on April 19, 2023. Essential to meeting the requirements and objectives of this research project, the time needed to obtain an operating system has resulted in significant delays.

Authorization is requested to allow the Department to enter into this amended CPA with the recipient to ensure compliance with Federal Aid requirements and to permit State personnel to supervise the project and the Department to expend Federal Funds.

In the event that Federal Funds become unavailable, general funds will not be requested to support this program. All other provisions of the agreement shall remain in effect.

This amended Agreement has been approved by the Attorney General as to form and execution. A copy of the fully executed amendment is on file at the Secretary of State's Office and the Department of Administrative Services, and subsequent to the Governor and Council approval will be on file at the Department of Transportation.

It is respectfully requested that authority be given to amend this Agreement.

Sincerely,

A handwritten signature in black ink that reads "William Cass". The signature is written in a cursive style with a large initial "W" and a long, sweeping underline.

William Cass, PE  
Commissioner

Attachments

**AMENDMENT #2 to**  
**COOPERATIVE PROJECT AGREEMENT**  
between the  
**STATE OF NEW HAMPSHIRE, Department of Transportation**  
and the  
**University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE**

The Cooperative Project Agreement, approved by the State of New Hampshire Governor and Executive Council on 5/5/21, item #26, and amended on 6/15/22 item #55, for the Project titled "Use of drilling parameters for enhancing geotechnical site investigations with applications to rock assessment (SPR 42372F)," Campus Project Director, Dr. Jean Benoit, is and all subsequent properly approved amendments are hereby modified by mutual consent of both parties for the reason(s) described below:

**Purpose of Amendment (Choose all applicable items):**

- Extend the Project Agreement and Project Period end date, at no additional cost to the State.
- Provide additional funding from the State for expansion of the Scope of Work under the Cooperative Project Agreement.
- Other:

**Therefore, the Cooperative Project Agreement is and/or its subsequent properly approved amendments are amended as follows (Complete only the applicable items):**

- Article A. is revised to replace the State Department name of \_\_\_\_\_ with \_\_\_\_\_ and/or USNH campus from \_\_\_\_\_ to \_\_\_\_\_.
- Article B. is revised to replace the Project End Date of 08/31/23 with the revised Project End Date of 09/30/24, and Exhibit A, article B is revised to replace the Project Period of G&C approval – August 31, 2023 with G& C approval – September 30, 2024.
- Article C. is amended to expand Exhibit A by including the proposal titled, " \_\_\_\_\_ ," dated \_\_\_\_\_.
- Article D. is amended to change the State Project Administrator to \_\_\_\_\_ and/or the Campus Project Administrator to \_\_\_\_\_.
- Article E. is amended to change the State Project Director to \_\_\_\_\_ and/or the Campus Project Director to \_\_\_\_\_.
- Article F. is amended to add funds in the amount of \$ \_\_\_\_\_ and will read:  
Total State funds in the amount of \$ \_\_\_\_\_ have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.
- Article F. is amended to change the cost share requirement and will read:  
Campus will cost-share \_\_\_\_\_ % of total costs during the amended term of this Project Agreement.
- Article F. is amended to change the source of Federal funds paid to Campus and will read: \_\_\_\_\_

Federal funds paid to Campus under this Project Agreement as amended are from Grant/Contract/Cooperative Agreement No. \_\_\_\_\_ from \_\_\_\_\_ under CFDA# \_\_\_\_\_. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as revised Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

- Article G. is exercised to amend Article(s) \_\_\_\_\_ of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, as follows:

Article \_\_\_\_\_ is amended in its entirety to read as follows:

Article \_\_\_\_\_ is amended in its entirety to read as follows:

- Article H. is amended such that:

- State has chosen not to take possession of equipment purchased under this Project Agreement.
- State has chosen to take possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

- Exhibit A is amended as attached.

- Exhibit B is amended as attached.

All other terms and conditions of the Cooperative Project Agreement remain unchanged.

This Amendment, all previous Amendments, the Cooperative Project Agreement, and the Master Agreement constitute the entire agreement between State and Campus regarding the Cooperative Project Agreement, and supersede and replace any previously existing arrangements, oral and written; further changes herein must be made by written amendment and executed for the parties by their authorized officials.

This Amendment and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire or other authorized officials approve this Amendment to the Cooperative Project Agreement.

IN WITNESS WHEREOF, the following parties agree to this Amendment #2 to the Cooperative Project Agreement.

By An Authorized Official of:

University of New Hampshire

Name: Karen Jensen

Title: Director, Pre-Award Compliance

Signature and Date: Karen Jensen

Digitally signed by Karen Jensen  
Date: 2023.05.23 13:39:22 -0400

By An Authorized Official of:

Department of Transportation

Name: William Oldenburg

Title: Director of Project Development

Signature and Date: *William Oldenburg* 5/30/23

By An Authorized Official of: the New  
Hampshire Office of the Attorney General

Name: EMILY C. GOERING

Title: AAG

Signature and Date: *Emily C. Goering* 6/13/23

By An Authorized Official of: the New  
Hampshire Governor & Executive Council

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Signature and Date: \_\_\_\_\_



Victoria F. Sheehan  
Commissioner

THE STATE OF NEW HAMPSHIRE  
DEPARTMENT OF TRANSPORTATION

G+C #26  
Date 5/5/21



William Cass, P.E.  
Assistant Commissioner

Bureau of Materials & Research  
April 2, 2021

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

**REQUESTED ACTION**

Authorize the Department of Transportation to enter into a **SOLE SOURCE** Cooperative Project Agreement with the University of New Hampshire Sponsored Programs Administration (vendor 315187), Durham, New Hampshire, for a fee not to exceed \$159,757.00, for a cooperative evaluation of an alternate method of exploring subsurface geological conditions, a technique known as Monitoring-While-Drilling (MWD) effective upon Governor and Council approval through August 31, 2023. 100% Federal Funds.

Funds to support this request are available in the following account for FY 2021 and is contingent upon the availability and continued appropriation of funds in FY 2022, with the ability to adjust encumbrances between State Fiscal Years through the Budget Office, if needed and justified.

04-96-96-962015-3036	<u>FY 2021</u>	<u>FY 2022</u>
SPR Research Funds		
046-500464 General Consultants Non-Benefit	\$79,878.00	\$79,879.00

**EXPLANATION**

The following research study will address an immediate Department need; is unique to New Hampshire's environment and conditions, thereby requiring substantial local experience; and is directly aligned with a particular area of University expertise. In addition, the Principal Investigator is a nationally recognized expert in his field. As such, the proposed work does not lend itself to a selection process that includes private industry or out-of-state organizations, and it is in the Department's and the State's best interest to work directly with the University of New Hampshire, requiring a **sole source** agreement.

This work is part of the Department's Statewide Planning and Research (SPR) program. The Department of Transportation and the University of New Hampshire (UNH) have a long-standing cooperative relationship in transportation research. This relationship has been mutually beneficial, culminating in savings to the State while enhancing work force development and maintaining New Hampshire's position on the leading edge of new technology. Research studies conducted by UNH for the Department have led to numerous innovations in the highway and bridge industry, including improved pavement design, increased use of recycled materials, stormwater management evaluation, and rapid construction techniques.

Statewide-SPR 42372F. Use of Drilling Parameters for Enhancing Geotechnical Site Investigations with Applications to Rock Assessment

The Department is collaborating with UNH to conduct a cooperative research study, "Use of Drilling Parameters for Enhancing Geotechnical Site Investigations with Applications to Rock Assessment". The Standard Penetration Test (SPT) of soil is a proven tool widely used in providing disturbed soil samples to aid in geotechnical site characterization along with estimating soil properties for the design of New Hampshire Department of Transportation (NHDOT) projects. Testing and sampling is typically done at 5 to 10 foot intervals and between these samples engineering judgement is used to identify the changes in stratigraphy and respective properties of the soils. The results from these tests are used to develop recommendations and aid in the design of the NHDOT projects.

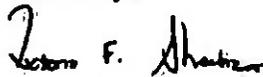
A technique known as Monitoring-While-Drilling (MWD) makes use of the mechanical response of the drill rig and cutting tools while advancing a borehole. When combined with SPT testing, MWD can be used to produce a continuous quantitative drilling record, and the correlated parameters can be applied more reliably to the design process. For a total fee not to exceed \$159,757 effective upon Governor and Council approval though August 31, 2023, this research will provide a thorough and accurate representation of subsurface conditions supporting higher quality and economical design for NHDOT projects.

The funding is 80% Federal Funds with 20% state match. Turnpike toll credit is being used for the match requirement, effectively using 100% Federal Funds. The Capital Budget Overview Committee approved the use of Turnpike Toll Credits on April 2, 2021.

This Agreement has been approved by the Attorney General as to form and execution. Copies of the fully-executed Agreement are on file at the Secretary of State's Office and the Department of Administrative Services, and subsequent to Governor and Council approval will be on file at the Department of Transportation.

It is respectfully requested that authority be given to enter into these sole-source Agreement for consulting services as outlined above.

Sincerely,



Victoria F. Sheehan  
Commissioner

Attachments



*Victoria F. Sheehan*  
Commissioner

**THE STATE OF NEW HAMPSHIRE**  
**DEPARTMENT OF TRANSPORTATION**

**Approved by the Capital Budget  
Overview Committee April 2, 2021**



*William Cass, P.E.*  
Assistant Commissioner

**CAP 21-002**

Bureau of Materials and Research  
February 17, 2021

The Honorable Chairman  
Capital Budget Overview Committee  
State House  
Concord, New Hampshire 03301

**REQUESTED ACTION**

Pursuant to the provisions RSA 228:12-a, Use of Toll Credits, the Department requests the Capital Budget Overview Committee approve the Department of Transportation's use of Toll Credits to meet funding match requirements for seven (7) proposed research projects as described in the federally approved Department's 2021 State Planning and Research Part II (SPR2) Work Program. The estimated cost of research related work is \$863,409.70. Based on the estimated cost, the maximum amount of Turnpike Toll Credit needed is \$172,681.94.

**EXPLANATION**

As part of the Federal-Aid Highway Program, the Federal Highway Administration (FHWA) requires that 2% of the State's apportioned funds be set aside for State Planning and Research activities with 75% dedicated to planning and 25% to research. This is a federally mandated program and these funds can only be used for these purposes. To meet this requirement, the NHDOT's State Planning and Research Part II (SPR2) annual Work Program includes a blend of in-house and contracted research work.

Research activities included in the requested action are undertaken in accordance with federal regulations and state priorities and were selected by the Department's Research Advisory Council and approved by the NH Division Federal Highway Administration. They include the following:

- Crushed Gravel for Shoulder Leveling 304.32
- Use of Drilling Parameters for Enhancing Geotechnical Site Investigations
- Subsurface Investigations for the 21<sup>st</sup> Century - Advancing our Practices beyond the Borehole
- Water Quality Test Site and Public Outreach at the Sutton Rest Area
- Wildlife Vehicle Collisions Data Gathering and Best Management Practices
- Concrete Slab Jacking
- Bus Stops and Passenger Amenities in Public Highway Right-Of-Ways

Research studies conducted under the SPR2 program have led to numerous gains and innovations in the state's highway and bridge industry, including such successes as improved pavement treatment,

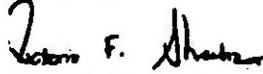
alternative materials and methods for bridge construction and repair, validation of environmental compliance, and forensic analysis of transportation construction activities.

Funding is from the annual State Planning and Research (SPR) program, a mandated federal program set-aside.

The balance of toll credits at the end of federal fiscal year 2020 is \$202.6 million.

Your approval of the above action is respectfully requested.

Sincerely,



Victoria F. Sheehan  
Commissioner

Attachments

**COOPERATIVE PROJECT AGREEMENT**

between the

**STATE OF NEW HAMPSHIRE, Department of Transportation**

and the

**University of New Hampshire of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE**

A. This Cooperative Project Agreement (hereinafter "Project Agreement") is entered into by the State of New Hampshire, **Department of Transportation**, (hereinafter "State"), and the University System of New Hampshire, acting through **University of New Hampshire**, (hereinafter "Campus"), for the purpose of undertaking a project of mutual interest. This Cooperative Project shall be carried out under the terms and conditions of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, except as may be modified herein.

B. This Project Agreement and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire approve this Project Agreement ("Effective date") and shall end on 8/31/23. If the provision of services by Campus precedes the Effective date, all services performed by Campus shall be performed at the sole risk of Campus and in the event that this Project Agreement does not become effective, State shall be under no obligation to pay Campus for costs incurred or services performed; however, if this Project Agreement becomes effective, all costs incurred prior to the Effective date that would otherwise be allowable shall be paid under the terms of this Project Agreement.

C. The work to be performed under the terms of this Project Agreement is described in the proposal identified below and attached to this document as Exhibit A, the content of which is incorporated herein as a part of this Project Agreement.

**Project Title: Use of drilling parameters for enhancing geotechnical site investigations with applications to rock assessment**

D. The Following Individuals are designated as Project Administrators. These Project Administrators shall be responsible for the business aspects of this Project Agreement and all invoices, payments, project amendments and related correspondence shall be directed to the individuals so designated.

**State Project Administrator**

**Name:** Deirdre Nash  
**Address:** NHDOT Bureau of Materials & Research  
5 Hazen Dr., PO Box 483  
Concord, NH 03302-0483  
**Phone:** 603-271-8995

**Campus Project Administrator**

**Name:** Karen Rooney  
**Address:** University of New Hampshire  
Sponsored Programs Administration  
51 College Rd. Rm 116  
Durham, NH 03824  
**Phone:** 603-862-5412

E. The Following Individuals are designated as Project Directors. These Project Directors shall be responsible for the technical leadership and conduct of the project. All progress reports, completion reports and related correspondence shall be directed to the individuals so designated.

**State Project Director**

**Name:** Krystle Pelham  
**Address:** NH DOT Bureau of Materials & Research  
7 Hazen Dr., PO Box 483  
Concord, NH 03302-0483  
**Phone:** 603-271-1657

**Campus Project Director**

**Name:** Jean Benoit  
**Address:** Civil & Environmental Engineering  
UNH/RM W177  
Kingsbury Hall  
Durham, NH 03824  
**Phone:** 603-862-1419

F. Total State funds in the amount of \$159,757 have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.

Check if applicable

Campus will cost-share \_\_\_\_\_ % of total costs during the term of this Project Agreement.

Federal funds paid to Campus under this Project Agreement are from Grant/Contract/Cooperative Agreement No. N/A from **Federal Highway Administration** under CFDA# 20.205. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached to this document as Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

G. Check if applicable

Article(s) \_\_\_\_\_ of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002 is/are hereby amended to read:

H.  State has chosen **not to take** possession of equipment purchased under this Project Agreement.  
 State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

This Project Agreement and the Master Agreement constitute the entire agreement between State and Campus regarding this Cooperative Project, and supersede and replace any previously existing arrangements, oral or written; all changes herein must be made by written amendment and executed for the parties by their authorized officials.

IN WITNESS WHEREOF, the University System of New Hampshire, acting through the **University of New Hampshire** and the State of New Hampshire, **Department of Transportation** have executed this Project Agreement.

**By An Authorized Official of:**

**University of New Hampshire**

Name: Karen M. Jensen

Title: Director, Pre-Award

Signature and Date:

Karen Jensen 1/28/21

**By An Authorized Official of:**

**Department of Transportation**

Name: Peter E. Starnias

Title: Director of Project Development

Signature and Date:

[Signature] 4/7/21

**By An Authorized Official of:** the New Hampshire Office of the Attorney General

Name: Allison Greenstein

Title: Asst. Attorney General

Signature and Date:

Allison B Greenstein 4/14/21

**By An Authorized Official of:** the New Hampshire Governor & Executive Council

Name: \_\_\_\_\_

MAY 05 2021

Title: \_\_\_\_\_

Signature and Date:

[Signature]

## EXHIBIT A

### A. Project Title:

Use of drilling parameters for enhancing geotechnical site investigations with applications to rock assessment (SPR Project 42372F)

### B. Project Period

Governor and Council approval through August 31, 2023

### C. Objectives:

The Standard Penetration Test (SPT) of soil is a proven tool widely used in providing disturbed soil samples to aid in Geotechnical site characterization along with estimating soil properties for the design of New Hampshire Department of Transportation (NHDOT) projects. Testing and sampling is typically done at 5 to 10 foot intervals and thus between these samples, engineering judgement is used to identify changes in stratigraphy and the soils respective properties. The results from these tests are used to develop recommendations and aid in the design of the NHDOT projects. Performing the SPT in a continuous fashion is time consuming, labor intensive and not well-suited for many of the soils encountered in New Hampshire and cannot be used to characterize rock. Soils containing large particles such as gravel lead to poor sampling and unreliable results. A technique known as Monitoring-While-Drilling (MWD) makes use of the mechanical response of the drill rig and cutting tools while advancing a borehole. MWD can be used to explore the subsurface in any geological conditions. MWD data combined with SPT testing, a continuous quantitative drilling record is produced, and the correlated parameters can be applied more reliably to the design process. Additionally, data to objectively assess site variability is obtained and drilling parameters collected can provide a level of quality assurance for the soil classifications provided by incomplete testing and sampling exclusively by the SPT.

The objectives of this research are as follows:

1. Provide MWD as a tool for geotechnical site characterization that will result in a more thorough and accurate representation of subsurface conditions leading to safer and more economical designs. The MWD is an underutilized tool in the process of site soil characterization for infrastructure projects and is recognized by the Federal Highway Administration EDC-5: Advanced Geotechnical Methods in Exploration (A-GaME) initiative:  
[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_5/geotech\\_methods.cfm](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/geotech_methods.cfm).
2. Support more efficient use of design and construction resources and reduce the chance of delays due to unexpected subsurface conditions. This effort will contribute to the

overall goal of improving efficiency of the Department by increasing delivery time of classifying subsurface conditions and decreasing the time it takes to complete the analysis.

3. Provide data to support other project design needs: a) depth of bedrock, which is of interest to other parties for mapping efforts and water quality studies, b) rock properties and joint orientations to support rock slope stability evaluations with the Smart Rock technology and, c) estimates of relative permeabilities to support project needs with the Permeafor project SPR 26962U.

#### **D. Scope of Work:**

The proposed research will assess the use of MWD to be used on roadway and bridge foundation projects for the Department. The scope of work includes the following tasks:

##### *Task 1- MWD Upgrade:*

Upgrade the MWD system with the latest generation Lutz equipment using some components from the existing *University of New Hampshire (UNH) system*. The UNH system is 20 years old with only few components operational.

##### *Task 2 – MWD Installation:*

Install the MWD system on one of the NHDOT drill rigs and perform initial evaluation on a site with both soil and rock.

##### *Task 3 – Torque sensor design:*

Design or purchase a torque sensor to be fitted to the mechanically driven drill rig operated by the NHDOT. Collaborators on this design will include Montana DOT, University of Florida, and Jean Lutz company.

##### *Task 4 – MWD Testing:*

Using project sites selected by a NHDOT technical advisory group, drilling parameters recorded will be compared to measurements traditionally collected by SPT and the associated soil samples, along with rock cores for deep foundations. The following parameters will be collected:

- thrust on drilling tool
- rotation rate
- drilling fluid rate
- advance rate
- torque
- fluid injection pressure

- drilling fluid return rate

Other non-controlled parameters will be documented to include tool wear and changes in drilling fluid composition.

*Task 5 – MWD Data Evaluation:*

MWD data obtained in conjunction with key NHDOT projects identified as high-risk, will be evaluated to identify direct methods to correlate values to specific design parameters and will be documented for use on future Department projects.

*Task 6 – Collaboration with other users:*

Collaborate with other DOT MWD users and Messrs. Derrick Dasenbrock and Benjamin Rivers of the FHWA Resource Center to develop a database of information for best practices for drilling under various soil and rock conditions.

*Task 7- Final Report:*

Provide a final report summarizing the research and providing recommendations for implementing the MWD in everyday site and soil exploration. The information will be summarized to be included in the DOT Geotechnical Manual.

**Deliverables Schedule:**

Tentative Schedule	2021												2022												2023					
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun		
UNH MWD Update																														
MWD Installation																														
Torque Sensor Design																														
MWD Testing																														
MWD Data Evaluation																														
Collaboration with other users																														
Final Report																														

Quarterly summary reports will be submitted at the end of each three-month calendar year. The research group will meet with the Technical Advisory Group (TAG) quarterly or at major milestones. At these meetings, presentations of progress to-date and plans for continuing work will be presented to the TAG for comments and suggestions.

**F. Budget and Invoicing Instructions:**

UNH will submit invoices to State on regular UNH invoice forms no more frequently than monthly and no less frequently than quarterly. Invoices will be based on actual project expenses incurred during the invoicing period and shall show current and cumulative expenses. State will pay UNH within 30 days of receipt of each invoice. UNH will submit its final invoice not later than 60 days after the Project Period end date. State may withhold 10% of funds until receipt of final report from UNH. State will provide final payment within 30 days of receipt of the accepted final report.

**Budget Items**

1. Salaries & Wages:	\$61,878
2. Employee Fringe Benefits:	3,156
3. Tuition:	18,636
4. Materials & Supplies:	8,000
5. Travel:	4,500
6. Equipment:	27,000
Total Direct Costs:	123,170
Facilities & Administrative:	36,587

**Total Project Cost: \$159,757**

**The Materials & Supplies include the following:**

- Design and construction of torque sensor
- Portable MWD drill
- Sensors
- Field PC/Tablet

**Equipment will remain property of the NHDOT**

## EXHIBIT B

This Project Agreement is funded under a Grant/Contract/Cooperative Agreement to State from the Federal sponsor specified in Project Agreement article F. All applicable requirements, regulations, provisions, terms and conditions of this Federal Grant/Contract/Cooperative Agreement are hereby adopted in full force and effect to the relationship between State and Campus, except that wherever such requirements, regulations, provisions and terms and conditions differ for INSTITUTIONS OF HIGHER EDUCATION, the appropriate requirements should be substituted (e.g., OMB Circulars A-21 and A-110, rather than OMB Circulars A-87 and A-102). References to Contractor or Recipient in the Federal language will be taken to mean Campus; references to the Government or Federal Awarding Agency will be taken to mean Government/Federal Awarding Agency or State or both, as appropriate.

Special Federal provisions are listed here:  None or Uniform Guidance issued by the Office of Management and Budget (OMB) in lieu of Circulars listed in paragraph above. .