

Federal Contract # DTFH61-17D00001 – Task Order #2

LONG-TERM BRIDGE PERFORMANCE PROGRAM

PROGRESS REPORT NO. 5

Report Period: February 1, 2018 – February 28, 2018

Prepared For:

Federal Highway Administration

Prepared By:



A. Account of work performed in this period

1. Coordination and Meetings Between the Contractor and FHWA LTBP Team

The Rutgers team attended a meeting at FHWA Turner Fairbank on 2/23 to provide a through update about all tasks related to task order 1 and task order 2 of the LTBP TSSC contract. The Rutgers team provided the minutes of the meetings on 3/2.

Co-PI: 26 hours

Project Support: 1 hour

2. Develop LTBP Program bridge performance strategic research matrix

In February 2018 work began on the visualization concept development for the Strategic Research Matrices (Task 2.2.4). Work was continued on development of the automated literature meta-data collection routines for use in Phase II (Task 2.2.3). Further, work was continued on investigating available sources of data for funding information (Task 2.2.3). The scope of work was modified in this time to better align with FHWA priorities as communicated in the February meeting at Turner-Fairbank. More details about each task can be found later in this section.

Task 2.2.3 - Development of Review Protocol: After the meeting with FHWA, the focus of work was shifted towards the collection and dissemination of meta-data concerning recent, current, and planned research, as opposed to a more comprehensive and qualitative survey of fundamental research. This shift in focus requires modification to the review protocols. It was decided that the body of research to be investigated would include research only from the following sources: a) NCHRP, b) Pooled-Fund Studies, c) single State DOT-funded research, and d) FHWA. This excludes research funded by NSF, NIST, and other parties. Because of this shift in focus, work was performed to create a software tool to “scrape” information from the Transportation Research Board website. The TRB website contains a repository of research that includes research funded by the four entities listed above.

Task 2.2.3 - Development of Review Protocol: Work was begun on investigating resources for supplementary research funding information. Early work with the TRB research repository showed that most literature is missing funding information for State DOT and Pooled-Fund research. Work is continuing on searching for State-owned repositories of research that include research funding information.

Task 2.2.4 - Development of Initial Visualization Concepts: An initial survey of visualization concepts was begun. It is the intention of the research team to create a basic visualization package to match that created for the Long-Term Pavement Performance program, called

the “Tablecloth.” (See Appendix A).

Co-PI: 4.5 hours

Project Engineer: 150 hours

Staff Engineer: 80 hours

Project Support: 6 hours

3. Conduct training for all field personnel on LTBP Protocols

No work was performed for this task.

4. Development of data collection protocols and RABIT-CE operations manual

Task 4.2.1. Instrumentation Protocols - After initial submission of the drafts on January 25th, the Rutgers team did a complete review to assure the consistency of developed protocols. Several issues were found and a comprehensive review letter was submitted to the Pennoni (see Appendix B). The outlines of the comments were also discussed with the Pennoni group via a conference call. A synopsis of the problematic issues was also presented to the COR team at the February 23rd meeting at the FHWA-TFHRC office. While Pennoni was resolving the issues, the Rutgers team continued working on important protocols (mainly instrumentation design protocols).

Task 4.2.2. Legacy Data Mining Protocols - After initial submission of the drafts on January 25th, the Rutgers team prepared a list of several issues (beyond the scope of the current contract) to discuss during the February 23rd meeting at the FHWA- TFHRC office (see Appendix C). Given the COR approval for removing the unnecessary fields (which have been never found from the bridge documents), the Rutgers team started working on that additional task.

Task 4.2.3. RABIT-CE Operations Manual - After initial submission of the RABIT-CE manual on January 25th, the Rutgers team repeated the review of the manual. The list of comments was later submitted to the Infratek for further revisions (see Appendix D). Multiple conference calls were made with Infratek to discuss the details. Infratek continued working on the manual to revise the problematic and incomplete sections. In addition, the outlines of the proposed Validation Plan were also discussed with the COR team at the February 23rd meeting at the FHWA- TFHRC office.

Co-PI: 3 hours

Staff Engineer: 165 hours

Subject Matter Expert: 15 hours

Senior Engineer: 153 hours

Project Engineer: 78 hours

Project Support: 31 hours

5. Legacy Data Mining data extraction

The Rutgers team accomplished the following during the month of February:

- Data extraction were performed throughout the month for the bridge plans provided. It should be noted that these data extraction being performed by everyone in the LDM group will take up the majority of the groups effort to complete.
- Continued to work on extracting the BLOB (Binary Large Object) files for implementation into Bridge Portal. A large portion of the team's efforts will lay in the data extraction for the immediate future.
- Quality control and quality assurance was provided for the data extraction performed this month and last month by reviewing the data collected by the students on the data extraction excel input sheet.
- Continued to periodically work on updating and improving the excel input sheet for data extraction to ensure that all of the data being collected and included in the sheet is uniform as well as accurate.
- Developed a list of potential issues with certain LDM technical fields that data extraction is being performed on as well as recommended solutions to fix them. This list will be included in future recommended changes to LDM protocols.
- Measures have been taken to ensure smoother upload to bridge portal when the time comes by checking all bridge structure numbers on both file folders and extracted data sheets in preparation for data upload to server (all LDM SN must exactly match NBI SN, e.g. SN000012314 cannot just be SN12314).

CO-PI: 4.5 hours

Staff Engineer: 135.00 hours

Technician: 87.00 hours

Project Support: 17 hours

6. Organize, conduct, and participate in LTBP workshops and meetings

No work was performed for this task.

7. Publications, website, communications, and technical assistance

The Rutgers team prepared the electronic version of the monthly progress report and submitted it to FHWA. Moreover, the Rutgers team developed a MS Project file showing the project milestone and submitted it to FHWA.

Moreover, the Bridge Intelligence team replied to numerous FHWA's requests. The detail is in the subcontract section.

Co-PI: 21

Project Support: 20 hours

B. Work to be accomplished during the next period

1. Coordination and Meetings Between the Contractor and FHWA LTBP Team

The Rutgers team will attend the 3/6 meeting at TFHRC and will talk to Dr. Zobel to check the necessity of any other meeting for the month of March.

2. Develop LTBP Program bridge performance strategic research matrix

The Rutgers team will continue working on creating the software framework for obtaining relevant meta-data from the web. Moreover, the team will continue working on the conceptualization and creation of data visualization schemes.

3. Conduct training for all field personnel on LTBP Protocols

No work is planned under this task for the next reporting period as of now. However, FHWA might ask the Rutgers team to do a round of training for the HDR team in March.

4. Development of data collection protocols and RABIT-CE operations manual

Task 4.2.1. Instrumentation Protocols –the Pennoni and Rutgers teams are completing the instrumentation protocols. There are several fields need to be extended in more details.

Task 4.2.2. Legacy Data Mining Protocols – the Rutgers team is analyzing the data extracted from the 1200 bridge documents, which has been completed through the last contract. Through this analysis, it is possible to locate the protocols fields which have been rarely or never filled up. The selected fields will then be removed from the revised protocols.

Task 4.2.3. RABIT-CE Operations Manual – the Infratek and Rutgers teams work collaboratively to finalize the manual. As soon as COR returns his comments, the Rutgers team will implement those on the final draft as well.

5. Legacy Data Mining data extraction

The Rutgers team will continue with the data extraction from bridge documentations for the bridges that are assigned by FHWA. In addition, the team will perform QA/QC to make sure that the content being recorded in the main excel file is of high quality. The team will continue to update the main excel sheet with minor improvements in order to increase efficiency.

6. Organize, conduct, and participate in LTBP workshops and meetings

No work is planned under this task for the next reporting period.

7. Publications, website, communications, and technical assistance

The Rutgers team will prepare the electronic version of the monthly progress report and will submit it to FHWA. Moreover, the Rutgers team will submit the updated MS Project file to FHWA.

The Rutgers team will work on the tasks related to Bridge Portal as they are requested by FHWA.

C. Problems/Recommended Solutions

No problems encountered during this period.

D. How the results of the work performed supports one or more of the FHWA, DOT and LTBP Goals

The following is a summary of how the work performed on the primary tasks of this task order contribute to meeting the FHWA, DOT, and LTBP program goals.

Task 2 - Develop LTBP Program bridge performance strategic research matrix

Fundamentally, the SRMs aim to link the LTBP program to the larger research community. By placing the LTBP efforts in this larger context, the program will be able to identify potential synergies and collaborative opportunities as well as any overlaps that may exist. This will both increase the cost effectiveness of the program as well as the program's impact on bridge engineering practice through clearly showing how the LTBP program contributes to the overall bridge performance research landscape.

Task 3 - Conduct training for all field personnel on LTBP Protocols

At the heart of the LTBP program's data collection effort is the requirement that data be obtained in a consistent and reliable manner across the breadth of the program. Variations in collection techniques or unreliable practices would pollute the data streams and greatly limit the ability of the program to meet its goal of improving our understanding of long-term bridge performance. Activities under this task aim to ensure that the data collection efforts of the LTBP program are executed by teams with the required expertise to obtain consistent and reliable data.

Task 4 - Development of data collection protocols and RABIT-CE operations manual

Similar to the training work being conducted under Task 3, this task is also involved in ensuring consistent and reliable data collection throughout the program. Specifically, this task will develop additional protocols and operations manuals that specify best-practice approaches for data collection.

Task 5 - Legacy Data Mining data extraction

In addition to ensuring consistent and reliable data collection efforts, the overarching goal of the program is also dependent upon the completeness of the data collection efforts. This task contributes to this through the collection of available legacy data. This data not only provides a means to ensure field data collection efforts are carried out efficiently (i.e. on bridges best suited to meeting the program's goals) but also provides context to the data to help explain observed trends and correlations (and thus further our understanding of long-term bridge performance).

E. Purchases and Rentals

Nothing was purchased during this period.

F. Travel Details for Reporting Period

Name	Destination	Date	Purpose
Dr. Frank Moon	McLean, VA	23-Feb	Meeting with LTBP Personnel at TFHRC
Dr. Saeed BabaNejad	McLean, VA	23-Feb	Meeting with LTBP Personnel at TFHRC
Dr. John Devitis	McLean, VA	23-Feb	Meeting with LTBP Personnel at TFHRC
Mr. Hooman Parvardeh	McLean, VA	23-Feb	Meeting with LTBP Personnel at TFHRC
Dr. David Masceri	McLean, VA	23-Feb	Meeting with LTBP Personnel at TFHRC

G. Current and Cumulative Expenditures (cost shown includes benefits and overhead)

Institution	Current Expenditures 2/1/2018 – 2/28/2018	Cumulative Expenditures 10/1/2017 – 2/28/2018
Rutgers, the State University of New Jersey	\$ 62,739.00	\$ 215,363.00
Bridge Intelligence LLC	\$ 7,570.06	\$ 18,935.55
Pennoni Associates	\$ 21,299.00	\$ 21,299.00
Infratek Solutions	\$ 18,244.00	\$ 18,244.00

H. Subcontractor's Progress Report

Sub-recipient Name: Bridge Intelligence LLC

Subaward No: 00000286

Principal Investigator: Hooman Parvardeh

LTBP TSSC

Federal Contract # DTFH61-17-D00001

PROGRESS REPORT NO. 2

For the Period from 2/1/2017 through 2/28/2018

A. Accomplishments/Work Performed

The following is a complete account of all accomplishments and work performed on each task during this reporting period.

Task 1: (Coordination and Meetings between the Rutgers and FHWA LTBP Team)

During this period, Mr. Parvardeh was invited to a meeting at FHWA TFHRC on 2/23. The purpose of the meeting was to provide a through update about all tasks related to task order 1 and task order 2 of the LTBP TSSC contract. Mr. Parvardeh attended multiple preparation meeting at CAIT to prepare for the actual meeting. Mr. Parvardeh attended the meeting and prepared the minutes of the meeting afterwards.

Number of hours during this period: 26 hours

This task is approximately 15% complete.

Task 2: (Develop LTBP Program Bridge Performance Strategic Research Matrix)

During this period Mr. Parvardeh attended a meeting on 2/28 to discuss the progress of the Strategic Research Matrix task. Moreover, Mr. Parvardeh worked with Dr. Masceri on brainstorming for a platform to capture the data for this task.

Number of hours during this period: 4.5 hours

This task is approximately 10% complete.

Task 3: (Conduct Training on Proper Use and Application of LTBP Field Assessment Protocols)

Nothing was done during this period.

Number of hours during this period: 0 hours

This task is approximately 12% complete.

Task 4: (Development and Refinement of Data Collection Protocols)

During this period, Mr. Parvardeh assisted Dr. Babanejad with a few tasks related to Long and Short-Term instrumentation protocols.

Number of hours during this period: 3 hours

This task is approximately 40% complete.

Task 5: (Legacy Data Mining Data Extraction and Upload)

During this period, Mr. Parvardeh worked on a template for the Binary Large Object (BLOB) file storage and upload for the Legacy Data Mining Task.

Number of hours during this period: 4.5 hours

This task is approximately 10% complete.

Task 6: (Organize, Conduct, and Participate in LTBP Workshops and Meetings)

Nothing was done during this period.

Number of hours during this period: 0 hours

This task is approximately 10% complete.

Task 7: (Publication, Website, Communication, and Technical Assistance)

During this period, the Bridge Intelligence team performed the following tasks:

- Modified the MS Project to be ready for monthly progress submittal (Feb 2018)
- Prepared and submitted monthly progress report for February including updated MS project
- Review and answer to Dr. Zobel's request regarding the Rutgers and PSI Legacy Data Mining efforts (Provided a detailed list of LDM bridges from both Rutgers and PSI)
- Review of a paper on Bridge Portal with Dr. BabaNejad

Number of hours during this period: 21 hours

This task is approximately 20% complete.

B. Work Anticipated During the Next Period

For the next period, the Bridge Intelligence team will work with the Rutgers team to satisfy the FHWA requirements.

C. Changes /Problems

None.

D. Participants & charged Level of Efforts

Personnel Name	Role/Contribution	Total Hours	Billed Cost
Hooman Parvardeh	Principal	59	\$ 7,434.00

Below is a breakdown of level of effort per task:

Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Total
26 hrs	4.5 hrs	0	3 hr	4.5 hr	0	21 hrs	59 hrs

E. Travel

On 2/23/2018, Mr. Parvardeh travelled to Washington DC for a meeting at the TFHRC. The purpose of this meeting was to present the FHWA personnel with a detailed update on all tasks defined under the LTBP TSSC. This meeting was request by Dr. Zobel.

Below are the details for the cost of this travel:

- Mileage: \$64.96 (Drive to and from Dr. Moon's house)
- Tolls: \$7.1
- Per diem \$64

Total cost of travel: \$136.09

PROJECT PROGRESS REPORT

March 14, 2018

Project: 005 –New Content Development,
Modification and Formatting for RABIT-CE User
Manual as per Rutgers University’s Request and
Proposed Guidelines

Progress Report #:	1
Project ID:	820631
Grant Period:	1/2/2018 to 3/25/2018
Report Period:	1/2/2018 to 2/28/2018
Rutgers Subcontract #:	0345
Rutgers Purchase Order #:	745226

Summary of Work Performed During This Period 1/2/2018 to 02/28/2018

- Conducted a thorough review of LTPP user manual to record formatting and evaluate the new content that is needed to be developed.
- Built a new outline structure to be used as template for new content development
- Conducted meetings with Rutgers University to discuss the deliverables and assist with their questions
- Reformatted the document sections and created new ones to match that of the LTPP user manual and Rutgers' proposed outline
- Identified the content that needs to be added
- Developed content, formatted and added various chapters
- Made new figures, designs, and images to be added to the document
- Reformatted existing figures, designs, and images to match the proposed outline by Rutgers University
- Developed and added several standard forms to the appendix section:
 - Data collection form
 - Maintenance request form
 - Problem reporting form
- Took additional pictures, edited and added to the document
- Modified and re-organized the troubleshooting guide according to the proposed outline by Rutgers University
- Submitted the first work in progress version to Rutgers University for feedback and comments
- Received feedback from Rutgers University
- Started incorporating Rutgers University's feedback in the document.

Summary of Work Anticipated During Next Period 3/1/2018 to 3/25/2018

- Continue the ongoing incorporation of Rutgers University's feedback in the document
- Continue development of additional content for remaining chapters
- Make additional standard forms per Rutgers University's request
- Conduct overall formatting of the final document
- Conduct proofreading
- Submit the final document to Rutgers University

Changes and Problems

There were no changes or problems during this period.

Level of Effort

NAME	Hourly Rate	Hours	Billable
Ali Asmari	\$173.00	50	\$8,650.00
Andrew Morrero	\$123.00	35	\$4,305.00
Max Meng	\$123.00	43	\$5,289.00
Total for This Period			\$18,244.00

Sub-recipient Name: Pennoni Associates Inc.

Subaward No: 00000285

Principal Investigator: Jeffrey E. Purdy, P.E.

LTBP TSSC

Federal Contract # DTFH61-17-D00001

PROGRESS REPORT NO. 2

For the Period from 2/1/2018 through 2/28/2018

A. Accomplishments/Work Performed

The following is a complete account of all accomplishments and work performed on each task during this reporting period.

Task 4.2: Long Term Instrumentation of Untreated and Treated Decks, Bridge Bearings, and Bridge Joints

This task is broken into four subtasks including the following:

- Identification of Performance Metrics for Treated and Untreated Concrete Decks, Bridge Bearings, and Bridge Joints
- Sensors, Data Acquisition, Installation, and Data Validation
- Protocol Development
- Development of Generalized Instrumentation Plan

During this period Pennoni staff received a first review of the submitted protocols. After reviewing these comments Pennoni and Rutgers had a conference call to discuss the comments. Pennoni staff also began revising the protocols to address the comments from Rutgers.

Number of hours during this period: 17 hours

This task is approximately 43% complete.

B. Work Anticipated During the Next Period

During the next period Pennoni anticipates submitting the revised protocols to Rutgers.

C. Changes /Problems

None.

D. Participants & charged Level of Efforts

Personnel Name	Role/Contribution	Total Hours	Billed Cost
Jeffrey E. Purdy	Project management and protocol review	10	\$ 2,320.00
John Blair Prader	Revision of draft instrumentation protocols	7	\$ 1,211.00

E. Travel

None.

I. Appendices

Appendix A - LTPP Tablecloth

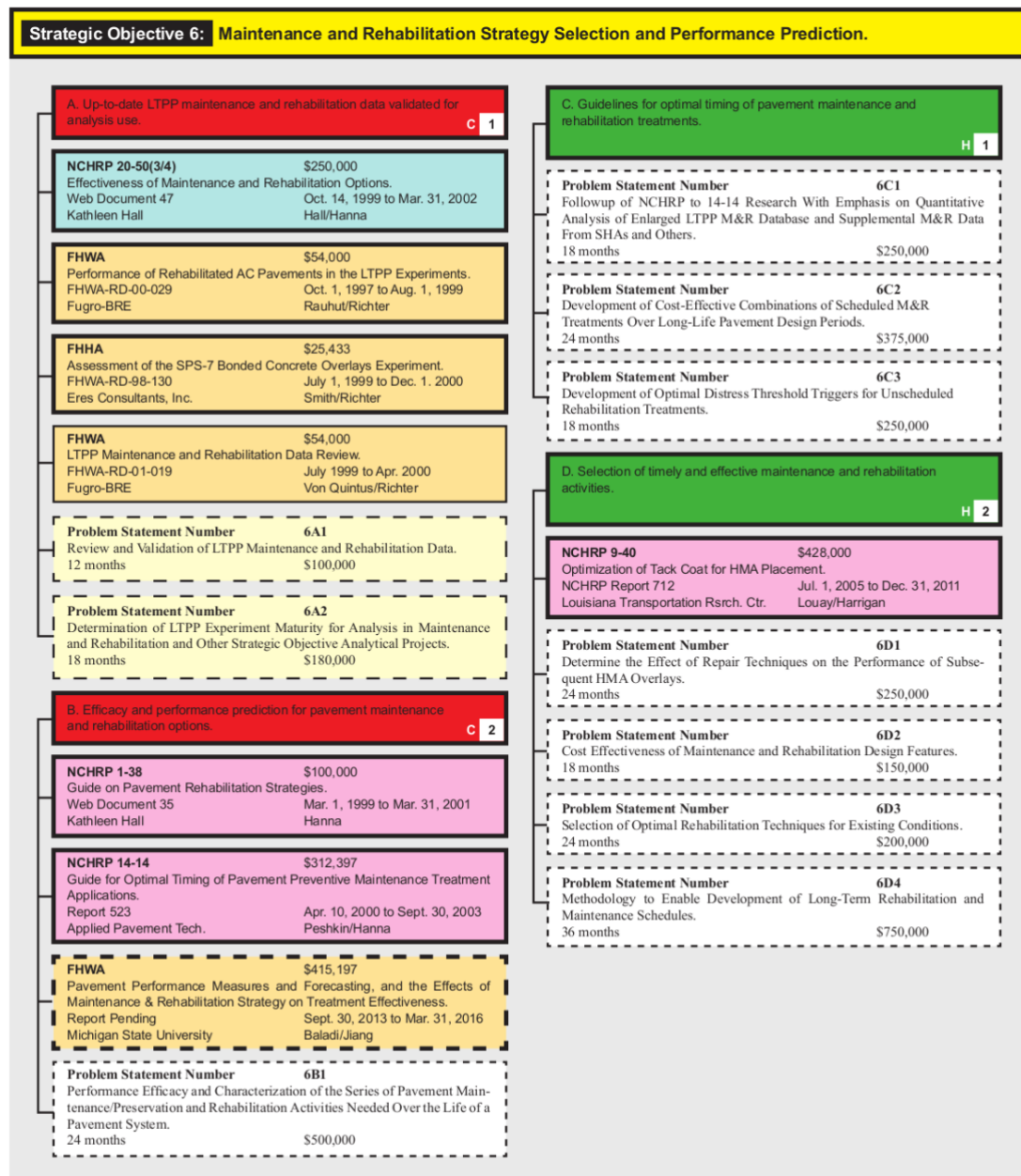


FIGURE 10.5. Excerpt of the expanded strategic plan for LTPP data analysis, showing analysis outcomes, supporting projects, and problem statements for Strategic Objective 6: Maintenance and Rehabilitation Strategy Selection and Performance Prediction (October 30, 2014). Refer to the legend in figure 10.4 for further explanation.

Appendix B - Review Response Submitted to Pennoni (first page)



Subject: Review Response for the First Draft of the Instrumentation Protocols

Submitted to: Pennoni Associates

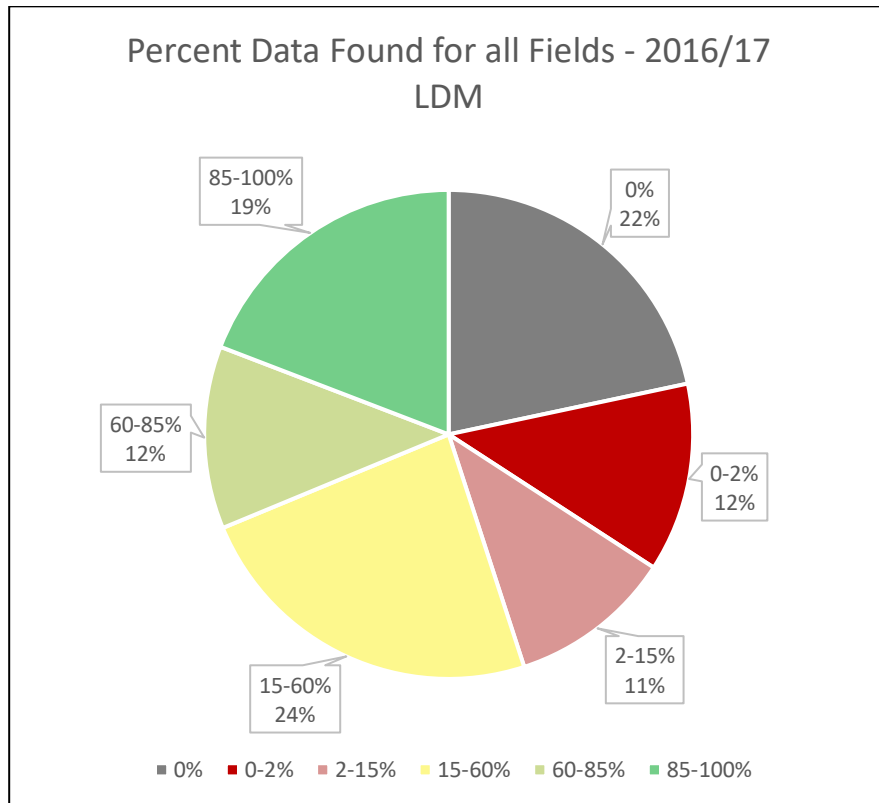
Submitted by: CAIT, Rutgers University

Submission Date: February 19, 2018

Rutgers went through the initial drafts of instrumentation protocols which were submitted by Pennoni on January 22nd, 2018. Rutgers appreciates the time and effort put together and develop the existing drafts. To that extent, Rutgers carefully reviewed the protocols and has provided detailed comments for each individual protocol. Attached to this document are 20 files (19 word+1 pdf) with detailed comments embedded. At the end of some of the documents, there are detailed explanations reflecting the ideas of Rutgers for completing these protocols. In general, there are a few major issues with the initial drafts:

- 1) Some grammatical errors have been found in the protocols. Also, some sentences are difficult to understand. Protocol PRE-PL-TD-005 is an example of the drafts which requires an immediate revision. Restructuring the sentences are also required to ease the reading process.
- 2) For the 8 sensor protocols (PRE-EQ-SE-00X), please specify the voltage range (if applicable), sampling frequency range, sensitivity (min level to be measured) range, accuracy, amplitude range, temperature range, humidity range, acceptable signal/noise ratio, sensor geometrics, sensor service life, etc.
Most of these terms are available in the sensor catalogs. Definitely, each manufacturer has specific types, however, a framework should be designed in the corresponding protocols to house these terms. A tabular format is a good idea to start with.
- 3) The structure of each of the protocols varies significantly from those published in 2016. Some references are section 7 in the 2016 protocols and section 3 in these protocols, for example. We are not sure if this was a design choice, but ideally, we would like to keep these consistent.
- 4) Please read the NDT protocols to get a sense of the protocols we are trying to develop for the LTBP program. The NDT protocols are designed in a more detailed style. Meaning that the user (with basic knowledge) can hand these protocols and conduct a field test. However, the current instrumentation protocols are primarily drafted in a general format with lack of sufficient details. The draft protocols provide very good information for general users, however, the components are apparent for more technical staff who has done SHM before. In other words, a user (with basic knowledge) cannot use these protocols to develop an instrumentation plan and use it for field testing. As explained in the attached protocols as well as the initial work plan, it is essential to provide the protocols to meet the FHWA expectations, as follows:
(1) Quantitatively track boundary conditions with time and changes in environmental conditions (inclusive of joints and bearings)

Appendix C - Analyzed statistics for the data collection task- 1200 bridges (from the previous contract)



Appendix D - Review Response Submitted to Infratek

Subject: Review Response for the First Draft of RABIT-CE operations manual

Submitted to: Infratek Solutions

Submitted by: CAIT, Rutgers University

Submission Date: February 27, 2018



Rutgers went through the initial draft of the RABIT-CE operations manual which was submitted by Infratek Solutions on January 24th, 2018. Rutgers appreciates the time and effort put together and develop the existing draft. To that extent, Rutgers carefully reviewed the manual and has provided detailed comments on the attached file. In general, there are few issues with the initial manual:

- 1) Some grammatical errors have been found in the manual. Also, some sentences are difficult to understand. A full proof-read and restructuring some of the vague sentences are recommended to enhance the ease of reading process. It is suggested to use the Grammarly software for proof-read as well. Rutgers team already used this software to review and correct some of the minor errors in the attached version. This version could be used as a starting point.
- 2) In the initial draft, Infratek has indicated some sections under development (mainly in green). So, in the second draft, it is assumed that all these parts will be completed. Also, please make sure that any additional content to the manual should be shown in Green to avoid repeating the review process.
- 3) Please use only "NDE" throughout the text. Replace "NDT" with "NDE" accordingly.
- 4) Many of the draft's pictures are embedded in the text with a "square" format. However, this style creates several issues when the text is being changed. It is highly recommended to change the "square" style into the "in line with text" style.
- 5) In the initial draft, several important figures have been added. Some of these figures could be sized in similar dimensions to keep the manual more unified. It is especially important to consider this fact for the figures which have been placed on the same page.
- 6) In the attached draft, Rutgers team has added a new section, called "4.3. Validation Plan". It would be great if Infratek reviews and provides recommendations for this section.
- 7) In the attached file, a number of comments have been embedded. Please respond accordingly.
- 8) After finalizing the manual, please make sure that you correctly reference the sections. For example, make sure the section number in the "As stated in **section 2.3.2.1.1 Rehearse the Test, Step 2**, correspondence during the preparation phase" is correctly referring to the right location.
- 9) It is necessary to include descriptions of the sensors, configuration, thresholds, and arrangements. Although there are explanations provided in the current version, additional details on these items. The layout of the sensors in the RABIT-CE must be schematically represented (e.g. Impact Echo individual sensors)
- 10) The following sections have been missing (even not indicated as "under development"): Chapter 5- Standard form for data storage and conversion, Standard form for bridge portal upload

Best Regards,

Saeed Babanajad, Task Leader

Franklin Moon, Principal Investigator

A handwritten signature in black ink, appearing to read "Saeed Babanajad".

Sub-recipient Name: Pennoni Associates Inc.

Subaward No: 00000285

Principal Investigator: Jeffrey E. Purdy, P.E.

LTBP TSSC

Federal Contract # DTFH61-17-D00001

PROGRESS REPORT NO. 1

For the Period from 1/1/2018 through 1/31/2018

A. Accomplishments/Work Performed

The following is a complete account of all accomplishments and work performed on each task during this reporting period.

Task 4.2: Long Term Instrumentation of Untreated and Treated Decks, Bridge Bearings, and Bridge Joints

This task is broken into four subtasks including the following:

- Identification of Performance Metrics for Treated and Untreated Concrete Decks, Bridge Bearings, and Bridge Joints
- Sensors, Data Acquisition, Installation, and Data Validation
- Protocol Development
- Development of Generalized Instrumentation Plan

Pennoni staff identified bridge deck, joint, and bearing performance metrics of interest. Using these metrics, it was then determined what should be measured to track the performance of these bridge components. Once it was determined what should be measured, Pennoni staff developed protocols detailing the sensors, data acquisition components, data acquisition routines, field installation techniques, and data storage and archiving routines to provide the required data. In addition to the protocol development, a generalized instrumentation plan was developed for a general bridge structure that detailed which sensors should be installed and where these sensors would be installed on a typical highway multibeam structure.

Number of hours during this period: 101 hours

This task is approximately 36% complete.

B. Work Anticipated During the Next Period

Pennoni anticipates receiving comments from FHWA on the protocols and generalized instrumentation plan. Pennoni staff will log the comments and work to address and incorporate the comments into the final protocols and generalized instrumentation plan.

C. Changes /Problems

None.

D. Participants & charged Level of Efforts

Personnel Name	Role/Contribution	Total Hours	Billed Cost
Jeffrey E. Purdy	Project management and protocol review	5	\$ 1,160.00
John Blair Prader	Research, protocol development, development of generalized instrumentation plan	96	\$ 16,608.00

E. Travel

None.