**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

**Lead Agency: Utah Department of Transportation**

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

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| **Transportation Pooled Fund Program Project #**  **TPF-5(264)** | | **Transportation Pooled Fund Program - Report Period:**  \_ Quarter 1 (January 1 – March 31, 2012)  **x** **Quarter 2 (April 1 – June 30)**  \_ Quarter 3 (July 1 – September 30)  \_ Quarter 4 (October 1 – December 31) | |
| **Project Title:**  Passive Force-Displacement Relationships for Skewed Abutments | | | |
| **Name of Project Manager(s):**  David Stevens | **Phone Number:**  801-633-6246 | | **E-Mail**  [davidstevens@utah.gov](mailto:davidstevens@utah.gov) |
| **Lead Agency Project ID:**  5H06652H, 42051, ePM PIN 10903  UDOT PIC No. UT11.406 | **Other Project ID (i.e., contract #):**  UDOT Contract No. Pending | | **Project Start Date:**  Contract in Preparation |
| **Original Project End Date:**  Contract in Preparation | **Current Project End Date:**  Contract in Preparation | | **Number of Extensions:** |

Project schedule status:

**X** On schedule \_ On revised schedule \_ Ahead of schedule \_ Behind schedule

Overall Project Statistics:

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| **Total Project Budget** | **Total Cost to Date for Project** | **Percentage of Work**  **Completed to Date** |
| $130,000.00 | $0 | 0 |

***Quarterly*** Project Statistics:

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| --- | --- | --- |
| **Total Project Expenses**  **and Percentage This Quarter** | **Total Amount of Funds**  **Expended This Quarter** | **Total Percentage of**  **Time Used to Date** |
| 0 | $0 | 0 |

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| **Project Description**:  Passive force-displacement relationships have been developed based on lateral load tests on pile caps/abutments aligned perpendicular to the soil backfill. However, many bridge abutments are constructed at a skew relative to the backfill. The orientation of the skew appears to cause the abutment to slide past the backfill and leads to torsion on the bent. This becomes an important consideration for integral abutments subject to thermal expansion. In addition, post-earthquake reconnaissance studies in Chile and numerical analysis suggest that bridges with skewed abutments are likely to experience more damage in seismic events. No large scale tests have been performed on skewed abutments to this point to help designers better analyze this behavior, but limited small scale tests and computer analyses indicate that the ultimate passive force may decrease as skew angle increases. No design procedures are currently available to define how the passive resistance would change for variations in skew angle.  This research study will conduct large-scale field tests to evaluate the effect of abutment skew on passive force. The field tests will be performed at a pile cap testing facility located at the Salt Lake City International Airport. This study builds on previous pooled fund testing conducted by BYU to evaluate passive force-deflection relationships for non-skewed abutments: TPF-5(122), Dynamic Passive Pressure on Abutments and Pile Caps.  Four objectives are outlined for this new study:  1. Determine passive force-displacement curves for skewed abutments with and without wingwalls from large scale tests.  2. Provide comparisons of behavior of skewed abutments with that of normal abutments.  3. Evaluate the effect of wingwalls on response.  4. Develop design procedures for calculating passive force-displacement curves for skewed abutments.  The scope of work consists of six specific tasks:  1. Perform literature review to collect available data and analysis regarding skewed abutment performance.  2. Perform passive force-deflection tests on 2 ft high wall in lab with skew angles of 0º, 15º, 30º and 45º.  3. Perform passive force-deflection tests on 5.5 ft high walls in field with skew angles of 0º, 15º, and 30º with transverse wingwalls and parallel MSE wingwalls.  4. Calibrate computer model to results of physical model tests and conduct parametric studies.  5. Develop a simplified design procedure for predicting passive resistance-displacement considering skew angle.  6. Submit a final report that documents the entire research effort. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**  UDOT requested transfer of committed FFY 2012 funds from partner states MT, NY, and OR. These have all been received by UDOT. At their May 2012 research workshop, UDOT considered adding additional funding to this project for FFY 2013.  A draft work plan was prepared by Dr. Kyle Rollins of BYU and circulated for review by UDOT and the other agency partners. Dr. Rollins updated the work plan based on the technical advisory committee’s comments, including a description of additional scope items, suggested by committee members, which would be considered for supplemental testing if additional funding from current or new agency partners became available during the project. UDOT and Dr. Rollins continued preparing the contract documents. |
| **Anticipated work next quarter**:  Dr. Rollins will contact members of the technical advisory committee with his responses to their review comments on the draft work plan. The work plan and contract documents will be finalized. The contract will be authorized, and BYU will begin work on the project. It is anticipated that two meetings of the technical advisory committee will be held in Salt Lake City during the course of the project (2012-2014).  Tasks 1 (literature review) and 2 (lab testing with 2 ft high wall) will be completed, and task reports on these two will be prepared and circulated among the technical advisory committee for review. On Task 3 (field testing with 5.5 ft high wall), preparations will be made for the initial round of field passive force tests with transverse wingwalls.  UDOT and Dr. Rollins will continue discussions with additional state DOTs that have expressed interest in participating in the study with funding and technical input. |

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| **Significant Results:** |
| **Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that**  **might affect the completion of the project within the time, scope and fiscal constraints set forth in the**  **agreement, along with recommended solutions to those problems).** |

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| **Potential Implementation:** |