FY 07/08 Research Initial Scope of Work

I. Project Title: **S004**

Development of Abutment Modeling Procedures

II. Background:

On many bridges in California, particularly shorter bridges, the abutment backwalls are a critical element in reducing longitudinal movement of the structure. However, the performance (soil/structure interaction) of the backwalls is not as well understood as other bridge components. The results of this research will allow engineers to model bridge abutments in order to more accurately assess the seismic behavior of bridges.

III. Project Problem Statement:

Engineers frequently rely on a bridge's abutments to limit the longitudinal movement of the superstructure. However, the behavior of the abutments in a seismic event is not well understood and current modeling techniques may not accurately capture the abutment's performance. Bridge engineers need a procedure to evaluate and model abutments to account for skew and height effects and thus improve the seismic performance of bridges. Improved modeling procedures for bridge abutments are needed to account for skew and height effects and to accurately determine their behavior during seismic events.

IV. Objective:

The objective of this research is to develop modeling procedures to estimate the effects of abutment configuration (height and skew) on the soil/structure interaction and consequent behavior of abutment backwalls. The research should include both analytical and physical testing. A recommended procedure should be prepared as a modification to the Seismic Design Criteria (SDC) or design practice

V. Description of Work and Expected Deliverables:

Description of Work: It is anticipated that this project will utilize several full-scale in-situ abutment backwalls placed in engineered backfill of varying height and skew angles. The backwalls will be pushed against the backfill in order to determine the behavior and passive capacity of the soil mass for each height and skew angle. From these results, a method for determining abutment springs (used in analytic models) including height and skew effects will be developed.

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Expected Deliverables: Upon completion of the project, a final report will be delivered. The report should include a procedure for modeling abutment springs and recommendations for modifications to Caltrans' design practice.

VI. Estimate of Duration:

24 months

VII. Related Research:

"Full Scale Cyclic Large Deflection Testing of Foundation Support Systems for Highway Bridges" researched by Prof. Jonathan Stewart at UCLA.

"Experimental and Analytical Investigation of Stiffness and Ultimate Capacity of Bridge Abutments" researched by Prof. Scott Ashford at UCSD.

VIII. Deployment Potential:

As a result of this research new design procedures for abutment backwalls will be incorporated into the SDC. These procedures will lead to improved safety and more cost effective designs of highway bridges in California.

IX. Date: July 18, 2007