

**State of Wisconsin/Department of Transportation**  
**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: Jun 30, 2004**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Investigation of Bridge Approach Settlements</b>	<b>Project ID: 0092-00-13</b>
<b>Administrative Contact: Nina McLawhorn</b>	<b>Sponsor:</b>
<b>WisDOT Technical Contact: Bob Arndorfer</b>	<b>Approved Starting Date: Apr 18, 2000</b>
<b>Approved by COR/Steering Committee: \$99,979.00</b>	<b>Approved Ending Date: Apr 18, 2007</b>
<b>Project Investigator (agency &amp; contact): Sam Helwany: UW-Milwaukee</b>	

**Description:** The study will be conducted over 7 years (84 months), and the five (5) tasks will be completed in two (2) phases.

Phase I: Synthesis of Previous and Current Work on Bridge Approach Settlement

Task 1: Literature Review and Personal Interviews

Task 2: "Best Practices" Summary Report

Task 3: Methods for Settlement Calculations

Phase II: Effectiveness of the Selected Mitigation Methods

Task 1: Instrumented Full-Scale Tests

Task 2: Interim and Final Reports

Background:

This study will be broken into two phases. Phase one will consist of personal interviews and a literature search of all existing work and research in this area. After this portion of the study is completed, a 'best practices' summary report will be submitted. This report will discuss which methods appear to be the most promising for solving the identified approach problems. Phase two will involve performing field pilot studies of a limited number (2-5) of the 'best practice' methods that show the most promise for WisDOT use. This will include construction of the bridge approaches as well as monitoring of them for a period of several years. Monitoring may include such items as pavement distress, maintenance history and vertical displacement. A cost comparison of the various methods will also be performed. Interim reports will be submitted yearly until the final report is written at the conclusion of the testing period.

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
<b>\$99,979.00</b>	<b>\$12,497.37</b>	\$0.00	<b>\$62,069.29</b>	<b>70 (%)</b>

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**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

Monitoring of the two bridges (Cranberry bridge and Hemlock) in District 4 continues. Excellent inclinometer measurements were obtained in terms of consistency with previous measurements. Little lateral displacements were noted in the top 10 ft of the approach fills. No significant difference between regular backfills and special backfills (CLSM and Geosynthetic-reinforced) was noted. Monitoring of the College avenue bridge in District 2 (South Milwaukee) continues. The search for two or three more bridges is ongoing.

Three new bridges were originally selected (1-Beloit Ave in Milw Co, 2-Western Ave in Washington Co.; 3-Two Mile Road in Racine). The first two are proceeding with the research project. For the 3rd bridge, Racine was not willing to participate in the research project unless they were credited for any maintenance that may be incurred due to backfill changes from the original plans. Our 4th option was in Fox Point who also was not willing to participate for the same reasons. The research team was informed by WisDOT maintenance that they will not be responsible for maintenance of local roads projects.

Beloit Avenue in Milwaukee County

Both bridge abutments on this project were originally supposed to be backfilled by CLSM. As part of the research, the research team changed the east side to standard compacted WisDOT granular fill with approval from Milw County and Cape. This project is currently under construction and started in May 2004 under project engineer Mr. Josh Mount of Milw Co. The north half of either abutment was backfilled in early June 2004. The west side was backfilled with CLSM, and the east side was backfilled

with granular backfill. The south abutment is scheduled to be backfilled until late July / August. The entire corridor is scheduled to be open in Nov 2004. Inclinometer casing will be installed by WisDOT/the research team prior to Nov 2004.

#### Western Avenue in Washington County

The bridge abutments on this project were proposed to be backfilled with Standard compacted WisDOT granular backfill. As part of the research, the research team is changing one side to MSE reinforced backfill. The research team has been working with Mr. Steve Young and Mr. Joe Klarkowski from EarthTech on this bridge. Specifications for the MSE reinforced backfill were sent, and they are currently receiving prices from Lunda. This project is supposed to begin in July, and backfilling operations are anticipated in August 2004.

WisDOT indicated that they would like to install inclinometer casings for both bridges at the same time (likely end of August or September). This is feasible, but will first have to coordinate with EarthTech and Milwaukee County.

#### **Work Next Quarter:**

Monitoring of instrumented abutments will continue. The construction of the new abutments and instrumentation will continue.

#### **Circumstances affecting progress/budget:**

**State of Wisconsin/Department of Transportation**  
**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: Jun 30, 2004**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Investigation of Testing Methods to Determine Long Term Durability of WI Aggregate Resources Including Natural Mat... Materials, Industrial By-Product</b>	<b>Project ID: 0092-02-03</b>
<b>Administrative Contact: Nina McLawhorn</b>	<b>Sponsor:</b>
<b>WisDOT Technical Contact: Bob Arndorfer</b>	<b>Approved Starting Date: Oct 29, 2002</b>
<b>Approved by COR/Steering Committee: \$202,084.00</b>	<b>Approved Ending Date: Sep 15, 2005</b>
<b>Project Investigator (agency &amp; contact): Richard Weyers: Error! Bookmark not defined.</b>	

**Description:** This study will be conducted over 30 months, and will be completed in five (5) phases.

Phase 1: Literature Search

Phase 2: Aggregate Durability Test Methods

Phase 3: Laboratory Investigation

Phase 4: Analysis of Test Results

Phase 5: Reports (Quarterly, Final, Implementation)

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
<b>\$202,084.00</b>	<b>\$67,361.33</b>	\$28,527.26	Error! Bookmark not defined.	<b>21 (%)</b>

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**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

Please note, this overlay will not allow entry into above Total Expenditures to Date field. The total expenditures to date is \$ 43,483.95

1. Completed Interim Report and sent it to Dan Reid, report included literature review and final proposed test methods for unbound, asphalt and Portland cement concrete, and recycled asphalt and Portland cement concrete and blast furnace slag aggregate.
2. Meet with project technical committee in Madison Wisconsin, discussed Interim Report and proposed aggregate test methods.
3. Made initial arrangements to sample about 70 aggregates.

**Work Next Quarter:**

**Sample and transport aggregate to Virginia Tech Civil Engineering Materials research Laboratory.**

Begin Phase 3 aggregate testing program.

**Circumstances affecting progress/budget:**

**None this quarter**

**State of Wisconsin/Department of Transportation**  
**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: Jun 30, 2004**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Determination of Typical Resilient Modulus Values for Selected Soils Representative of the Soils Distributions of Wisconsin</b>	<b>Project ID: 0092-03-11</b>
<b>Administrative Contact: Nina McLawhorn</b>	<b>Sponsor:</b>
<b>WisDOT Technical Contact: Bob Arndorfer</b>	<b>Approved Starting Date: Jan 31, 2003</b>
<b>Approved by COR/Steering Committee: \$103,049.00</b>	<b>Approved Ending Date: Jan 31, 2005</b>
<b>Project Investigator (agency &amp; contact): Hani Titi: UW-Milwaukee</b>	

**Description:** The study will be conducted over 24 months, and be completed in 5 phases:

Task 1: Literature Review on Resilient Modulus of Subgrade Soils

Task 2: Selection of a Wide Spectrum of Subgrade Soils that Comprise Core Soil Types in Wisconsin

Task 3: Evaluate the Effects of Soil Properties and Stress Levels on the Resilient Modulus of Wisconsin Sugrade Soils

Task 4: Analyses of Test Results and Development of Models to Predict Resilient Modulus

Task 5: Final Report

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
<b>\$103,049.00</b>	<b>\$34,349.66</b>	\$16,598	<b>\$0.00</b>	<b>75 (%)</b>

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**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

1. Continued laboratory testing program on typical Wisconsin soils. The laboratory testing include: grain size distribution, consistency limits, specific gravity, soil classification, compaction characteristics, and repeated load triaxial testing (resilient modulus) at three different densities/moisture content combinations: dry side, optimum, and wet side)
2. Conducted repeated load triaxial testing to investigate the effect of sample size on the resilient modulus of typical Wisconsin soils.
3. Continued data reduction and analysis
4. Assembled/manufactured soil sample extruder to eject the 4 inch soils samples after compaction according to AASHTO T 307 procedure
5. Published a technical paper at the ASCE/Geo-Institute Geotechnical Practice Publication (GPP) No. 1, published at the international conference Geo-Jordan.

The following figures present typical test results on the effect of the sample size on the resilient modulus of typical Wisconsin soils:

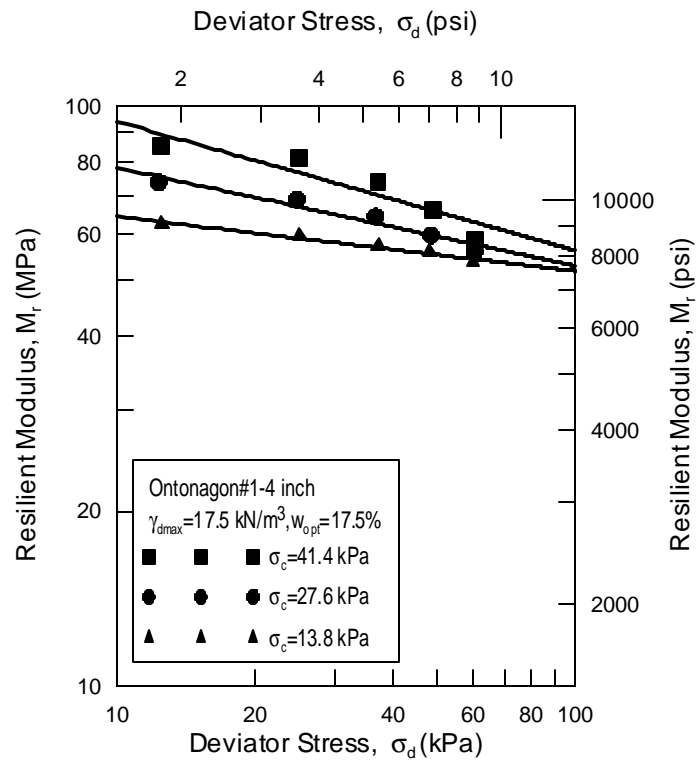


Figure 1: Results of repeated load triaxial test on 4 inch diameter soil sample from Ontonagon.

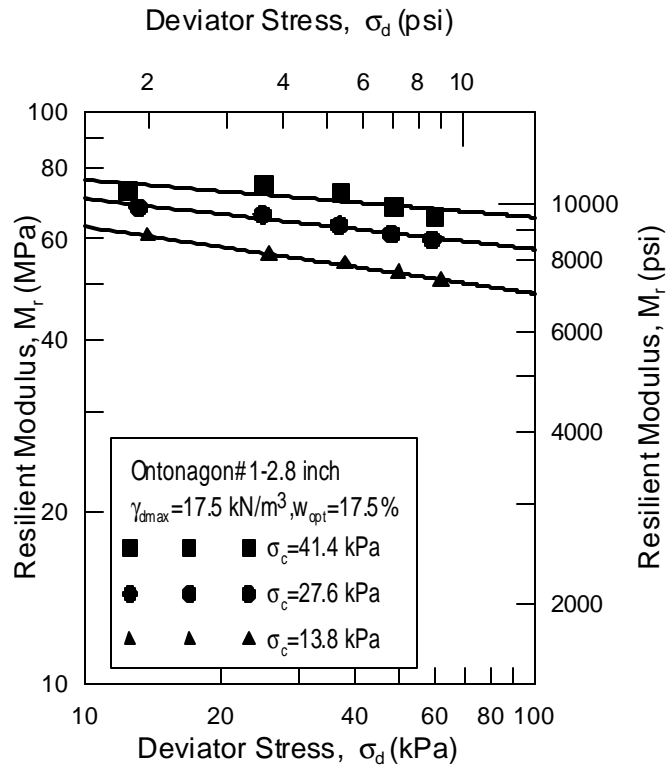


Figure 2: Results of repeated load triaxial test on 2.8 inch diameter soil sample from Ontonagon.

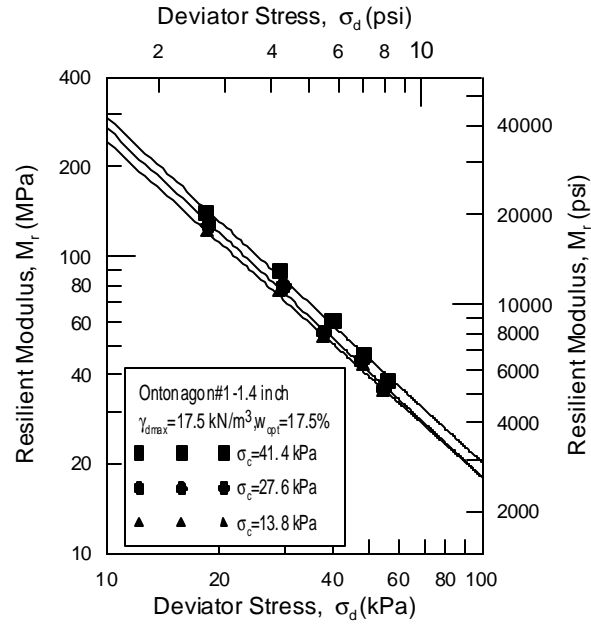


Figure 3: Results of repeated load triaxial test on 1.4 inch diameter soil sample from Ontonagon.

**Work Next Quarter:**

1. Continue laboratory testing program on new soil types
2. Continue data analysis
3. Meet with the project committee and do presentation on the up to date work conducted

**Circumstances affecting progress/budget:**

**Gantt Chart:**

**Note: Gantt chart shown in State Fiscal Year Quarters**

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**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: June 30, 2004**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Application of Electromagnetic Geophysics (EMG) Technology to Subsurface Investigations</b>	<b>Project ID: 0092-04-08</b>
<b>Administrative Contact: Nina McLawhorn</b>	<b>Sponsor: WHRP</b>
<b>WisDOT Technical Contact: Bob Arndorfer/Dan Reid</b>	<b>Approved Starting Date: January 7, 2004</b>
<b>Approved by COR/Steering Committee:</b>	<b>Approved Ending Date: March 31, 2005</b>
<b>Project Investigator (agency &amp; contact): Michael Kalinski, University of Kentucky (859-257-6117)</b>	

**Description:**

Total study budget	Current FFY budget	Expenditures for current quarter	Total Expenditures to date	Percent Complete
29824		11955	11955	40

**Project Description:** The scope of this research includes describing the current state of practice of electromagnetic geophysics (EMG) technology, compiling a list of contractors and vendors for performing transportation-related studies in Wisconsin, and developing guidelines for selecting providers for specific types of field studies.

**Progress from Jan. 7 – March 31, 2004:** The contract was executed, and the PI visited WisDOT personnel in Madison on February 27 for a kickoff meeting to discuss the project with Dan Reid and Bob Arndorfer. A literature search of the soil and surface geological conditions commonly found in Wisconsin was initiated.

**Progress This Quarter:** A literature search of the soil and surface geological conditions commonly found in Wisconsin was completed. Sources of literature included the University of Kentucky Library System and the Wisconsin Geological Survey. This information will be used in developing the Request for Proposals (RFP) to be sent to geophysical contractors during the next quarter.

Compilation of a list of geophysical contractors began, and was approximately 90% completed. The compiled list of 36 firms and individuals includes contractors in the eastern and central portion of the United States, and several providers in Wisconsin. A list of 20 equipment manufacturers, including firms that lease equipment and firms that produce data reduction software, was also compiled. Both lists are attached. Primary sources of information for these lists include attendance lists from professional meetings, professional journals and newsletters, and references from the PI's personal library.

**Work Next Quarter:** The list of geophysical contractors will be completed, and an RFP will be written and disseminated to the contractors on September 1, 2004. The RFP will request information with respect to qualifications for performing EMG surveys for transportation-related problems in soils commonly encountered in Wisconsin, including the soil conditions identified in the literature search. Each firm will be asked to list their methods and equipment, provide relevant project descriptions and publications, and provide a generic fee schedule. Statements of Qualifications (SOQs) will be due on September 30, 2004, and this information will be assimilated into a set of guidelines for selecting contractors to perform EMG. The PI will also begin contacting equipment vendors to ask for information regarding equipment capabilities, purchase costs, lease costs, and training options. This task will carry into the following quarter.



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**RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: Jun 30, 2004**

<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Investigation of Standard Penetration Torque Testing (SPT-T) to Predict Pile Performance</b>	<b>Project ID: 0092-04-09</b>
<b>Administrative Contact:</b> Nina McLawhorn	<b>Sponsor:</b>
<b>WisDOT Technical Contact:</b> Error! Bookmark not defined.	<b>Approved Starting Date:</b> Oct 9, 2003
<b>Approved by COR/Steering Committee:</b> \$79,029.65	<b>Approved Ending Date:</b> Oct 9, 2005
<b>Project Investigator (agency &amp; contact):</b> Al Wagner: Wagner Komurka Geotechnical Group	

**Description:** Following are the research objectives:

- Phase 1: Literature Review
- Phase 2: Acquire/Develop Equipment
- Phase 3: Preliminary Field SPT-T Testing on One Site
- Phase 4: Field SPT-T Testing on Multiple Sites
- Phase 5: Analysis of Test Data
- Phase 6: Preparation of Research Report

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
\$79,029.65	\$26,343.21	\$3,764.74	\$12,716.76	35. (%)

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**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

Met with WisDOT oversight committee regarding results of SPT-T investigation. Processed invoice from supplier of testing equipment.

**Work Next Quarter:**

Project on hold pending direction from WisDOT oversight committee.

**Circumstances affecting progress/budget:**

**Gantt Chart:**

**Note: Gantt chart shown in State Fiscal Year Quarters**

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<b>Program: SPR-0010(36) FFY99</b>	<b>Part: II Research and Development</b>
<b>Project Title: Monitoring and Evaluation of a Fly Ash Stabilized Subgrade Constructed by the Wisconsin Department of Transportation</b>	<b>Project ID: 0092-04-10</b>
<b>Administrative Contact: Nina McLawhorn</b>	<b>Sponsor:</b>
<b>WisDOT Technical Contact: Error! Bookmark not defined.</b>	<b>Approved Starting Date: Jul 21, 2003</b>
<b>Approved by COR/Steering Committee: \$84,603.00</b>	<b>Approved Ending Date: May 21, 2006</b>
<b>Project Investigator (agency &amp; contact): Tuncer Edil: UW-Madison</b>	

**Description:** This study will determine how fly ash stabilization for subgrade improvement impacts construction and pavement design parameters. It will allow field validation and refinement of the design and construction concepts developed in previous research by the PIs. The study will recommend pavement design parameters for fly ash stabilized soils and investigate impacts to the construction process. The results of the study will provide WisDOT with the basis for making informed policy decisions on inclusion of fly ash stabilization in pavement design and construction.

This Project includes the following phases:

Phase I - Development of Laboratory Testing and Field Monitoring Program

Phase II - Implementation of Data Collection and Monitoring Plan

Phase III - Long-term Monitoring

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
<b>\$84,603.00</b>	<b>\$21,150.75</b>	\$1,113.72	<b>\$11,564.76</b>	<b>0 (%)</b>

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**Progress This Quarter:**

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

A paper entitled "Case Study of Subgrade Stabilization Using Fly Ash: State Highway 32, Port Washington, Wisconsin" has been written and accepted for publication in a special geotechnical publication by the Geo Institute of ASCE entitled "USE OF RECYCLED MATERIALS IN GEOTECHNICS". The paper is available from the PIs upon request.

During this quarter major effort was spent in connection with the fly ash stabilization taking place in STH 12 west of Fort Atkinson. This project was identified by the WisDOT Soils Unit for monitoring as part of our research. During difficult construction conditions as a result of very wet conditions several activities were initiated and accomplished:

1. The subgrade along the entire fly ash stabilization route (about 5000 ft) was sampled and subjected to nuclear density gauge (NDG), soil stiffness gauge (SSG) and dynamic cone penetration (DCP) testing at 200 ft intervals.
2. Three lysimeters (two in fly ash sections and one control) were constructed in the subgrade to sample leachate.
3. Two sections were instrumented to collect continuous ground temperature and moisture data in the subgrade and fly ash layer and also air temperature and humidity.
4. During fly ash stabilization, mixed samples were obtained and field compacted to the field densities as determined from NDG for laboratory CBR, resilient modulus, and unconfined compression test after 7 days of curing at 200 ft intervals.
5. After fly compacted and several days passed, a rolling weight deflectometer (RWD) survey was conducted. RWD was developed for WisDOT by Marquette University. It was reactivated for this project. Additionally SSG and DCP surveys were conducted on the finished stabilized subgrade at 200 ft intervals.
6. Falling weight deflectometer test of the highway after concrete pavement has been scheduled.

**Work Next Quarter:**

- Continue laboratory tests.
- Analyze collected field data.
- Have FWD test conducted and analyze results.

➤ Hook up data collection system and start collecting data.

**Circumstances affecting progress/budget:**

None

**Gantt Chart:**

The main part of this project started nearly 12 months late. i.e., in 2004 instead of 2003 construction season.

Phase I: 100% complete

Phase II: 80% complete

Phase III: 0% complete.

**Note: Gantt chart shown in State Fiscal Year Quarters**