The Effects of Implements of Husbandry "Farm Equipment" on Pavement Performance
National Pooled Fund Study TPF-5(148)

April 30, 2007 Meeting Minutes
MnROAD Facility (Albertville, MN)

Introductions were made and an attendance sheet was passed around for everyone to sign up. Carol Wiese pointed out the expense reimbursement (meals, travel, hotel, etc.) form in the folder. One person from each participating agency is eligible for travel reimbursement for each meeting.

Shongtao Dai gave a presentation on the background and current status of the project. He briefly described the pooled fund participants, background, objectives, suggested test vehicles, test site layout, test section design, instrumentation design, and funding available. Because of limitations in scope, funding, and expertise this study is not able to investigate the effects of farm equipment on bridges, even though that is of great interest to the manure haulers. The test section construction will be part of a larger MnROAD letting on June 8, 2007. Construction is expected to be completed in the fall, and field testing is anticipated to start in October 2007. The project will conclude in the summer of 2010.

The general schedule for field testing is in the spring and fall of each year. Spring testing is desired because of Spring Load Restrictions due to a soft subgrade typical in northern climates. Fall is a very busy time for the manure haulers (October through January), so they would prefer to test in late summer (July – August), once the subgrade fully recovers in stiffness.

Kevin Erb gave a presentation on typical equipment used by the PNAAW. Variables include the vehicle type (tractor pulled, straight truck, semi truck), tire type (radial, flotation, Galaxy), axle configuration (2/3/4 axles – some steerable, 1/2/3 tires per axle), vehicle width (8.5-14 ft wide), tanker capacity (3250, 4000, 5300, 6000, 7300 gallons most common), and tractor type (straight, articulated, front wheel assist).

Lev Khazanovich (prime contractor – University of Minnesota) gave a presentation detailing the work plan of his proposed study. Halil Ceylan (Iowa State University) and Imad al-Qadi (University of Illinois at Urbana-Champagne) will be subcontractors to Lev. The basic outline of the tasks is as follows:

1. Design Experimental Sections
    a. Design pavement sections – mostly complete via email
    b. Instrumentation plan – thermocouples, moisture sensors, HMA strain gages, LVDTs for deflections, unbound materials, & joint movements, 3D strain in base, pressure gages, tire-pavement contact pressure gage, FWD
    c. Data collection plan – measure effects of vehicle speed, traffic wander, braking forces, tire pressure, existing distresses, load level, shear forces
2. Database Development – includes summary data tables and QC/QA procedures
3. Predict Pavement Responses – predict stresses, strains, & deflections before measurements

4. Construction of MnROAD Test Sections – perform in place and lab testing on materials
5. Pavement Response Monitoring – collect pavement response & performance data
6. Conduct Comprehensive Data Analysis – includes structural models
7. Damage Analysis – evaluate relative damage from various farm equipment vs. standard truck
8. Final Report

A discussion of the test vehicles followed. The table below is currently proposed the farm equipment, more equipment can be added later if requested by panel member. PNAAW will provide all of the equipment and operator for the farm equipment per their agreement with Mn/DOT. MnROAD will provide the standard semi truck, and Iowa will arrange for a MTV to be provided.

Vehicle Type	Gross Weight, lbs	Tanker Size	# of Axles	Tire Type	Total Width	Comments
Straight Truck	55,000 - 58,000	4000 gal	3	flotation (24")	8.5 - 9.0 ft	same truck with triple wheels (dual axle) may be
Straight Truck	55,000 - 58,000	4000 gal	3	duals (22")	8.5 - 9.0 ft	tested
Tankers	40,000	3500 - 4000	2	small (20")	10.5 ft	tires & tire pressures will be standard
Tankers	60,000	6000	2	flotations	10.5 ft	run each with 2 different tractors (25,000+ lbs)
Tankers	80,000	7300	3	bias, float	10.5 ft	Houle, Balzer, Husky may provide tankers
Tankers	95,000	9000 - 9500	4	flotations	10.5 ft	
Grain Cart	120,000 - 140,000	800-1000	3	flotation (50")	12 - 14 ft	2 tractors - straight & articulated
Grain Cart	120,000 - 140,000	bushels	1	flotation (50")	12 - 14 ft	2 tractors - straight & articulated
Terragator	need to look up particulars	1600	2	flotations	need to look	3 wheel
Terragator		4000	2	flotations	up	4 wheel
Terragator		4000	3	flotations	particulars	5 wheel
Tractors	variable sizes, drive characteristics					run each individual tractor by itself
Standard Semi Truck	80,000	n/a	5	duals (22")	8.5 - 9.0 ft	MnROAD 80k truck - control vehicle
Overloaded Semi Truck	102,000	n/a	5	duals (22")	8.5 - 9.0 ft	MnROAD 102k truck
Material Transfer Vehicle (3 different models/sizes)	75,500 (empty)	25 tons HMA	2	flotation (25")	9' 10"	wait until towards end of testing - don't want to damage cells for farm equipment testing or take time away

The preliminary testing plan is to test 3 pieces of farm equipment per day at 10 passes each. One test will be run in the morning, and one test will be run in the afternoon to account for temperature differences. The time in between will be for testing tire pressures, vehicle speed, braking, and other variables outlined in Lev's proposal. It is anticipated that testing will last 2 weeks each in the spring and fall over three years, beginning in October 2007. Once the construction contract is underway, we will have a better idea of the time the cells will become available.

Action Items

- **Tim Clyne** – Work with Jack Herndon (MnROAD site manager) and Kevin Erb to provide water to manure tankers. There are several options:
    - Pump water from and back to the pond just past the fence to the west of the stockpile area. I checked into this and there are no environmental regulations we need to worry about, so this might be easiest. However, the pond is shallow with a maximum depth of 4 feet.
    - Provide water for a portable FRAC tank that will be stored on site. One tank will hold approximately 20,000 gallons.
    - Provide water from a water truck rented from a local contractor or city/county.
    - The City of Otsego has a water tower directly across the county road from the stockpile area. This would be an easy place to fill up for one of the above

options, but we would need permits for each vehicle to fill directly from to tower (fire hydrant). One of the local utility agencies charges $0.25 per 83 gallons.

- **Tim Clyne** – Ensure that all parties are aware of and follow all Mn/DOT safety regulations when on site. This essentially means wearing a high-reflectivity vest and cap when working in the field.
- **Tim Clyne** – Update the group when information becomes available as to the construction schedule and when field testing can begin.
- Shongtao Dai – Work with Ashley Hartfiel @ Mn/DOT Consultant Services to set up the contract with the University of Minnesota through our Master Agreement. The University is not permitted to start work until the contract is in place. Dai will be responsible for the bulk of the contract administration.
- **Len Palek** – Work with CSIR folks in South Africa and their U.S. contacts to bring the tire pressure device to MnROAD for measuring each vehicle. Also work with Tekscan (a local company) to bring their (1-D) device to MnROAD.
- **Len Palek** – Look into bringing a portable scale to MnROAD to measure gross vehicle weight of each piece of equipment.
- **Lev Khazanovich, Halil Ceylan, Imad al-Qadi** – Get a list of the equipment specifications that they need (i.e., gross weight, tire width, vehicle width, tire pressure, etc.) to Kevin Erb. Kevin will compile the desired specifications of each piece of equipment.