

## Investigating Moisture Damage to Pavement

In the last several years, pavements in areas recently rehabilitated, on both major interstates and on smaller projects, have exhibited significant distress, primarily rutting. This has often occurred within months of the rehabilitation activity. A limited number of investigations of early pavement failures revealed that moisture damage, within underlying inlayed layers, was a likely cause.

Oregon State University completed a thorough forensic investigation of five projects that exhibited such pavement distress. These projects were evaluated to determine appropriate site investigation methods and testing procedures. The goal of testing was to identify sources of moisture and other conditions that lead to premature failures, and to evaluate design, construction, and materials requirements that will minimize the risk of future premature failures related to moisture damage.

For each project, field investigations were conducted, ODOT maintenance personnel were interviewed, and records were reviewed. Where possible, core samples were collected and historic records of pre-rehabilitation cores were examined. Thickness, layer identification, and the condition of each core (Figure 1) were evaluated and were noted in a core log. Laboratory testing of the cores included permeability and volumetric tests, as well as bulk specific gravity tests.

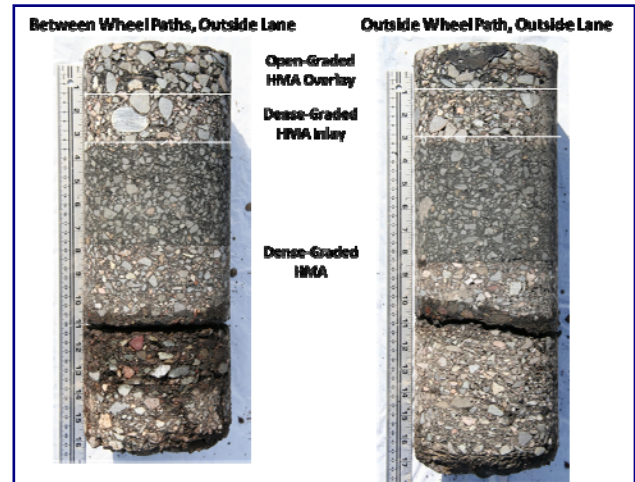


Figure 1: A Comparison of Adjacent Core Samples

In addition, in three of the project areas, trenches were excavated. The trenches measured approximately 2-foot wide, extended across the entire width of the outside travel lane, and were excavated to full pavement depth, through all layers. Visual assessments were made of exposed pavement layers in trench profiles (Figure 2).

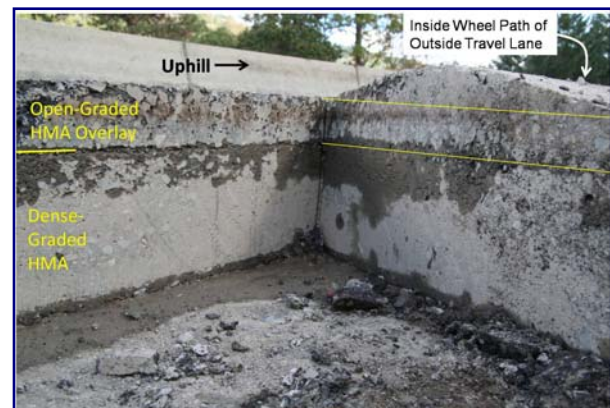


Figure 2: One of the Trenches Excavated for the Investigation

Ground penetrating radar (GPR) surveys of the project sites were also made to evaluate this testing technique. The survey results from an investigation site are shown below in Figure 3.

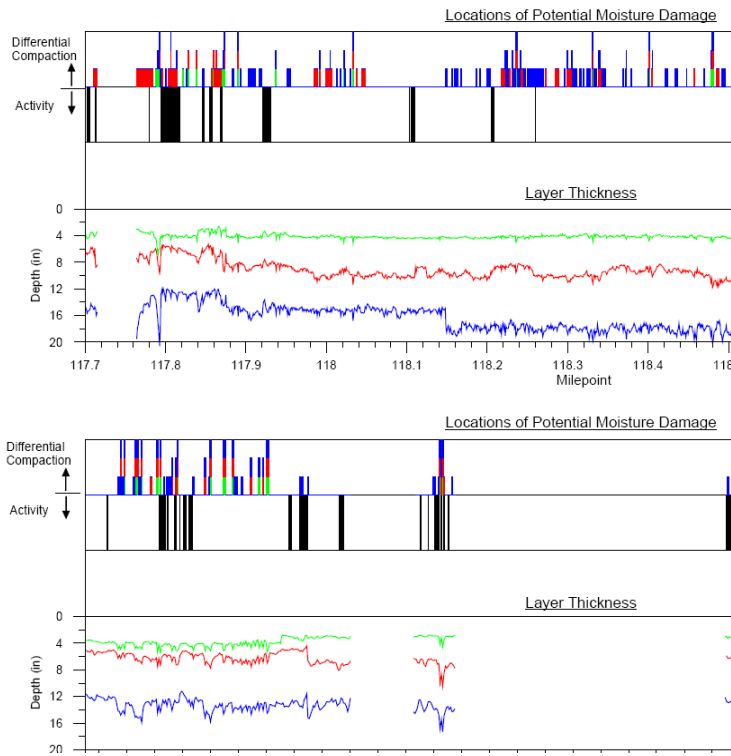


Figure 3: Ground Penetrating Radar Results Showing the Locations of Potential Moisture Damage

Through this research the following observations were made:

- ❖ Visual examination of cores provided valuable information regarding layer depths and conditions. However, the presence of moisture damage was not always identified from these observations, suggesting a more thorough evaluation may be advisable.
- ❖ Trenching operations revealed key information that was not readily obtained from cores alone. Perhaps most importantly, observations of the trenches revealed that water flowed through or between pavement layers.
- ❖ Factors likely contributing to the observed rutting in the project areas included: improper tack coat or failure; permeable dense-graded layers; stripping; inadequate drainage; and, possibly, inadequate compaction of dense-graded material.

As a result of this project, a set of four guidelines have been established for use in pre-construction site investigations, pavement structural design, construction techniques and materials selection and testing. The ODOT Pavement Services Unit will implement these practices into their design process.



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The final report for this project was published in July 2009 and is available on the Research Section web page:  
[http://www.oregon.gov/ODOT/TD/TP\\_RES/docs/Reports/2009/Moisture\\_Damage.pdf](http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2009/Moisture_Damage.pdf)