

**Research Project Title:** Evaluating Roadway Subsurface Drainage Practices

**Purpose of the Project:** The purpose of this project is to develop a means for assessing the drainability of subgrade soils in Tennessee and conduct a comprehensive performance review of them under different weather conditions (e.g., high-intensity storms, sequences of storm events, winter weather requiring salt application).

**Scope and Significance:** Nearly 60% of premature pavement failures are triggered by inadequate drainage. Poor subgrade soil drainability causes a build-up of water within the aggregate subbase, which reduces its strength and bearing capacity, as well as accelerates the deterioration of the above pavement from moisture warping and potholes. The drainability of a subgrade not only can vary spatially based on soil type and seasonally, but it will also change as the soil becomes compacted during construction. The scope of this work includes a combination of geospatial mapping, analytical methods, and controlled lab experiments. We will identify critical areas in the three regions Tennessee (east, central, and west) that are prone to poor drainage using satellite-based, remote sensing and GIS information. The performance of current and alternative drainage designs will be assessed using a simple drainage calculator. The performance of the proposed alternative designs will also be determined using complementary laboratory analyses that consider, for the first time, all three mechanisms of water entering the sublayers, namely, penetration through pavement joints and cracks, lateral seepage from ditches, and intrusion of rising groundwater.

**Expected Outcomes:** The benefit of this project will be seen through decreased expenses towards pavement rehabilitation. Nomographs will be derived for the subgrade soils throughout Tennessee. The nomographs will identify if additional drainage system modifications are needed to improve the drainability at a site and to what degree they are needed. They can also be used to help cost-benefit analyses that quantify trade-offs between using local materials with added drainage and transporting materials from an outside quarry. Other deliverables include the following: (1) Maps of soil drainability for the three regions of Tennessee on a seasonal basis; (2) a simple calculator that can assess roadway drainage efficiency by calculating the Time to Drain for current and alternative drainage designs.

**Time Period**

The time period for the project is from October 2018 through September 2020.

**Contact Information**

<p><b>Principal Investigator (PI):</b>          Thanos Papanicolaou          Department of Civil &amp; Environmental Engineering          University of Tennessee - Knoxville          851 Neyland Dr., Room 325          865-974-7836  <a href="mailto:tpapanic@utk.edu">tpapanic@utk.edu</a></p>	<p><b>TDOT Lead Staff:</b>          Wesley Peck          Hydraulic Design Section, Structures Division          615-532-5660  <a href="mailto:Wesley.Peck@tn.gov">Wesley.Peck@tn.gov</a></p>
--	--