This topic is "practice ready."   ☐ **Yes**   ☒ **No**

Granular Roads Asset Management System (GRAMS)

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Abstract

Iowa County Engineers manage over 66,000 miles of granular surfaced roads. In contrast to paved routes, these roadways require constant reworking because their condition varies from point to point, day to day, and season to season. This makes it impractical to apply a segment by segment traditional asset management approach to identifying needs and scheduling actions. But engineers must, nonetheless, evaluate conditions; optimize maintenance techniques and effectively 'tell the story' of granular surface performance vs. investment for the system as a whole. The Iowa County Engineers Association Service Bureau, ICEASB, working with county engineers across the state, has developed a concept that can address this need, and is working with research partners to refine and complete the underlying theory, then implement the findings for everyday use, delivered in the form of a web based, mobile device application for field work and a desktop version for in the office.

There are two parts to the Iowa GRAMS concept.   First, it associates the risk of impaired roadway usability at times of weak subgrade conditions with effective crust, expressed as tons of granular material per mile, TPM, -- modified by material quality, embankment drainage, subgrade quality, roadway width and surface crown.   The premise is that for any given effective crust TPM there exists a matching risk of roadway failure during freeze/thaw and high precipitation periods.   By quantifying the TPM vs Risk relationship in a logistics curve like formula, it becomes possible to assess the overall risk

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level of the network, based on the distribution of TPM levels in the system.   By matching these results with the probability of weak subgrade conditions over time, it becomes possible to estimate what percentage of the next year or years will show impaired travel will be impaired and to what extent. Using this information, a road agency can, based on balancing acceptable risk versus budget needs, select an optimal crust TPM target and matching resurfacing program.

The second part of the concept is to develop methods making repeatable, representative determinations of key condition evaluators: granular material quality, quantitatively measuring 'effective crust' in tons-per-mile,   and accurate estimation of annual material losses, with adjustment factors for material quality, crown, subgrade, drainage, and width. The goal is to synthesize standard field assessment methods that are representative, reliable and reproducible from person to person, time to time and county to county. Accurate information on these items will enable developing realistic predictions when using the probabilistic methods of Part 1.

With these new aids, it is envisioned that a county engineer and board of supervisors will be better able to identify a crust tons-per-mile target consistent with rural travel/transport needs, balanced with an annual replacement program that fits budget constraints.

The goal is to formally derive both the risk vs. crust TPM probability formula and the quantitative field methods, then implement a web based application with which county engineers can study risk vs. TPM vs. budget tradeoffs to find the best mix for their county -- and prepare public information summaries that help communicate the need for a selected granular strategy and maintenance program.

Keywords: Granular Risk Management Implementation Testing