

Geochemical and Physical Characteristics of Vehicle Endurance and Dust Test Courses at U.S. Army Yuma Proving Ground

The goal was to gain a better understanding of the distribution of dust, soils with potential of producing dust when disturbed, the effects of that dust on performance of military equipment, and improving dust testing methodologies for select vehicle endurance courses at the Yuma Proving Ground (YPG). This project was implemented because there was concern as to how representative the test courses were of real-world operational areas. The test courses had been in use for over 50 years, experiencing hundreds of thousands of miles of impact from vehicle endurance testing over the same course. The project was conducted at YPG and results were reported in 2015. Our analyses showed that vehicle traffic and surface preparations have eroded and mixed the dust layer with the lower sand-rich horizon (B horizon), depleting the courses of their dust producing potential. The results from this project also showed that the proposed alternative dust course site lacked necessary salts for mimicking realistic conditions.

Summary of Project Details: Our approach was designed to address six specific questions pertaining to the mineralogical, chemical, and physical characteristics of soils at the YPG vehicle test courses and dust sampled from vehicles being tested on the same terrain. We accomplished this by collecting and analyzing soil samples on the unpaved vehicle endurance test courses and from the interiors and exteriors of wheeled and tracked vehicles undergoing testing. Specific analyses were for particle size distribution, Calcium carbonate, pH, soluble salts and anions, x-ray fluorescence and x-ray diffraction.

Management Implications: Desert dust has long been recognized as an important parameter for testing military vehicles and equipment due to the potential for adversely effecting performance and durability. The chemical composition of dust can be a critical factor in the testing of military equipment for

operations in the world's Deserts. In that light, we assessed two areas that were being considered for new test courses. The results of this study show that properties of the areas proposed for new dust test courses are largely similar to that of the existing dust test courses, with some differences which we explained. We recommended conducting additional studies in the proposed areas to further refine the positioning of new test courses to meet test needs while allowing for longevity. We recommended using our results to assist with identifying additional sites for consideration also. With those studies, a baseline should be established for comparison of use degradation over time. Lastly, we compared the dust at YPG to dust parameters associated with desert dust found in areas of current and future strategic concern.



