UTC Project Information	
Project Title	MPC-509 – Expansive Soil Mitigation for Transportation Earthworks by Polymer Amendment
University	Colorado State University
Principal Investigator	Joseph Scalia, Ph.D. Christopher Bareither, Ph.D., P.E.
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Agency ID or Contract Number	DTRT13-G-UTC38
Project Cost	$120,000
Start and End Dates	September 30, 2013 to September 30, 2019
Project Duration	September 30, 2013 to September 30, 2019
Brief Description of Research Project	The proposed project will evaluate if recently developed and commercialized polymer-based stabilizers are a viable option for future transportation earthwork construction that involves expansive soil problems. The proposed project will enhance the ability of transportation practitioners to improve highway conditions and performance via innovative technologies. The current lack of independent assessment inhibits the adoption of potentially valuable materials, as does a lack of information on the mechanisms underpinning stabilization. The proposed project will provide a basis for moving forward on expansive soil mitigation techniques for transportation infrastructure via review of relevant technical literature to summarize the current state-of-art and state-of practice in expansive soil mitigation, and by providing an independent laboratory evaluation of expansive soil-polymer composites. Laboratory testing will be used to assess treatment effectiveness relative to traditional stabilization methods, and to describe mechanistic behavior of polymer modification to aid in creating improved practices for construction of transportation infrastructure. The proposed project will also create a methodology for independent evaluation of future polymer-stabilization technologies.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The primary deliverable from the proposed project will be an assessment of expansive soil mitigation for transportation earthworks by polymer amendment. Emphasis will be placed on comparing polymer-based stabilization of expansive soils to conventional stabilization strategies. These findings will inform practitioners working on expansive soil problems in transportation earthwork applications as to the validity of claims made by polymer-amendment manufacturers. If true, state-of-the-art polymer amendments for expansive soil mitigation may allow for more sustainable transportation infrastructure in much of the Mountain-Plains region. This assessment also will have broader implications for expansive soils throughout the United States. The Principal Investigators (PIs) also anticipate that the project will lead to opportunities for technology transfer of state-of-the-art soil amendment with polymers. Potential technology transfer will include subgrade stabilization (in non-expansive application) and dust suppression in transportation applications, as well as use of polymers for stabilization of mine wastes and to produce or enhance engineered containment systems.
Impacts/Benefits of Implementation (actual, not anticipated)	The proposed project will provide the necessary resources for a student at CSU to pursue a Masters (MS) degree in Civil and Environmental Engineering. This graduate student will lead the proposed research, and the successful implementation of the project plan will allow the graduate student to prepare and defend a MS thesis. The graduate student will gain invaluable knowledge and experience for a future career as a Geotechnical Engineer. The graduate student will understand expansive soils, current and future expansive soil mitigation techniques and technologies, clay-polymer interaction, geotechnical laboratory testing, and critical review of engineering literature. Thus, the graduate student will be well-equipped to transition into an engineering consulting career with state-of-the-art knowledge and skills. The proposed project will also support an undergraduate researcher for one summer of research at CSU. The undergraduate researcher will be under direct supervision of the graduate student, with oversite from the PIs. The undergraduate researcher will gain invaluable knowledge and experience related to research, geotechnical laboratory testing, and expansive soils. During the summer, the undergraduate researcher will work closely with the graduate student in expansive soil testing at CSU. The undergraduate researcher will work closely with the graduate student, allowing the graduate student to gain experience in supervising and mentoring, both critical work-place skills. The undergraduate will be exposed to academic research, and if they so choose, should have a leg up in pursuing graduate study in Civil Engineering. The proposed project will provide an opportunity for the PIs to expand and enhance their understanding of expansive soil mitigation

	in transportation earthwork applications. This knowledge will be used in both undergraduate and graduate courses to provide students tangible connections to relevant civil engineering problems, as well as future research in this area by Drs. Bareither and Scalia. Dr. Scalia will integrate expansive soil mitigation into his future graduate-level course on unsaturated soil geoengineering and will incorporate the mechanisms of both conventional and clay-polymer expansive soil mitigation in his future class on fundamentals of soil behavior.
Web Links • Reports • Project Website	• MPC Research Report – Expansive Soil Mitigation for Transportation Earthworks by Polymer Amendment • Journal Article – Comparative Assessment of Expansive Soil Stabilization by Commercially Available Polymers • CSU Master's Thesis – Effectiveness of Polymer for Mitigation of Expansive Soils