

EICP Busts the Dust by Forming Carbonate Crust

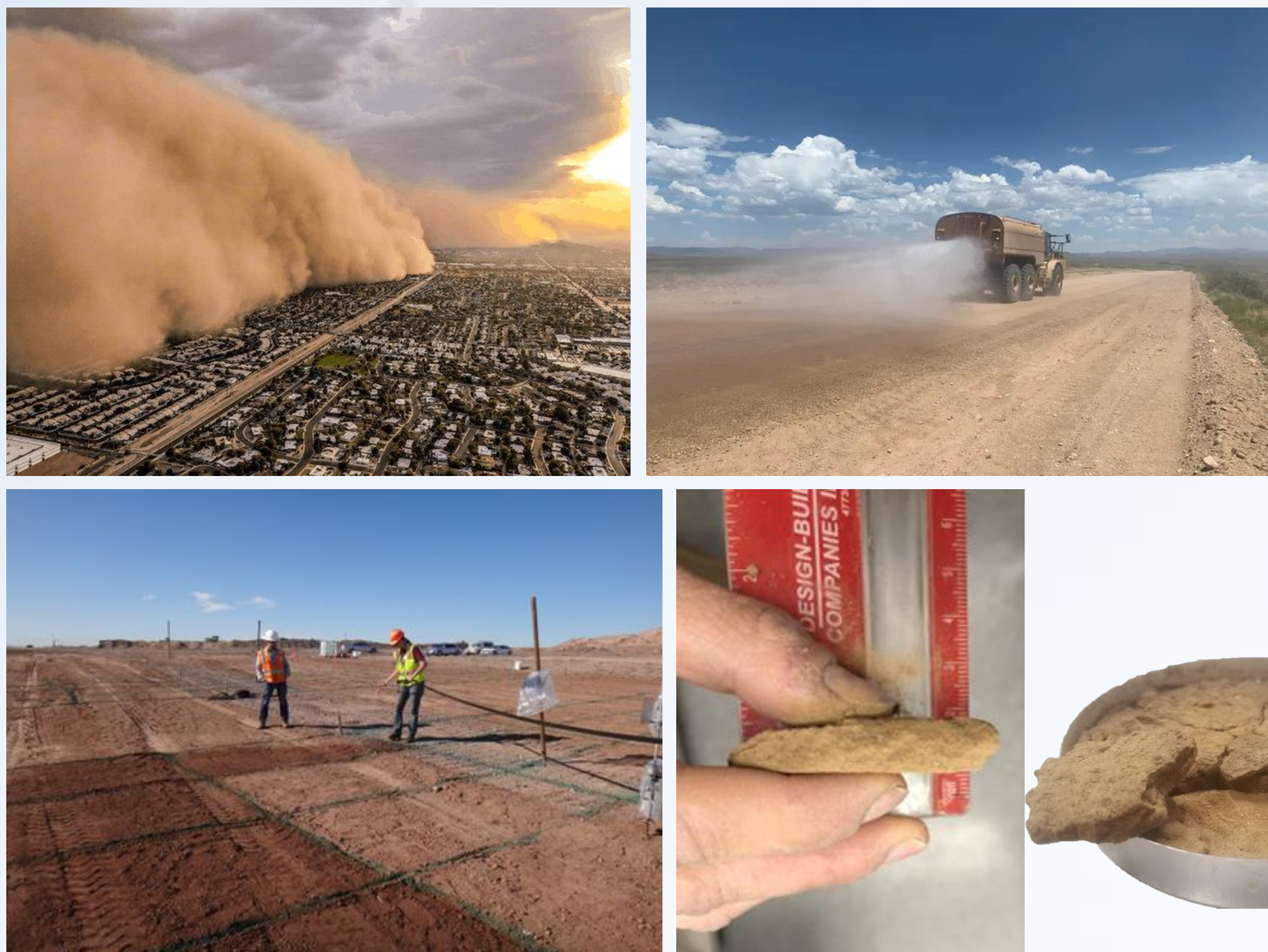
Jason Parsons

Mentors: Dr. Hamed Khodadadi Tirkolaei and Abishek Aryal

2023 Research Experiences for Teachers, Arizona State University

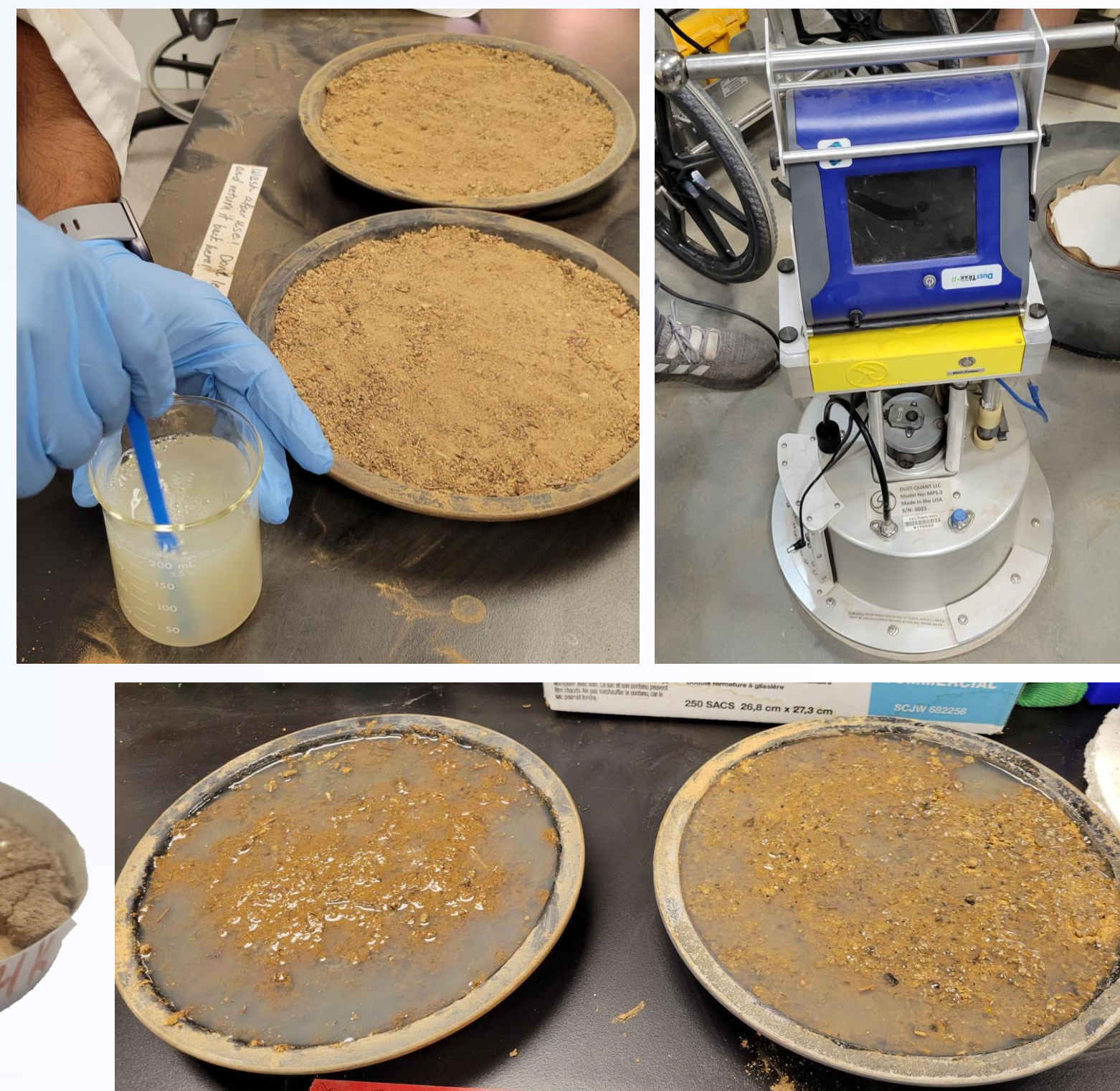
Research Background

- Fugitive dust is a source of many hazards.
- Traditional control measures include water tanks:
Issues: Water waste, CO2 emissions.
- Bio-cementation via EICP solution: Cost-effective and efficient method.



Research Objectives

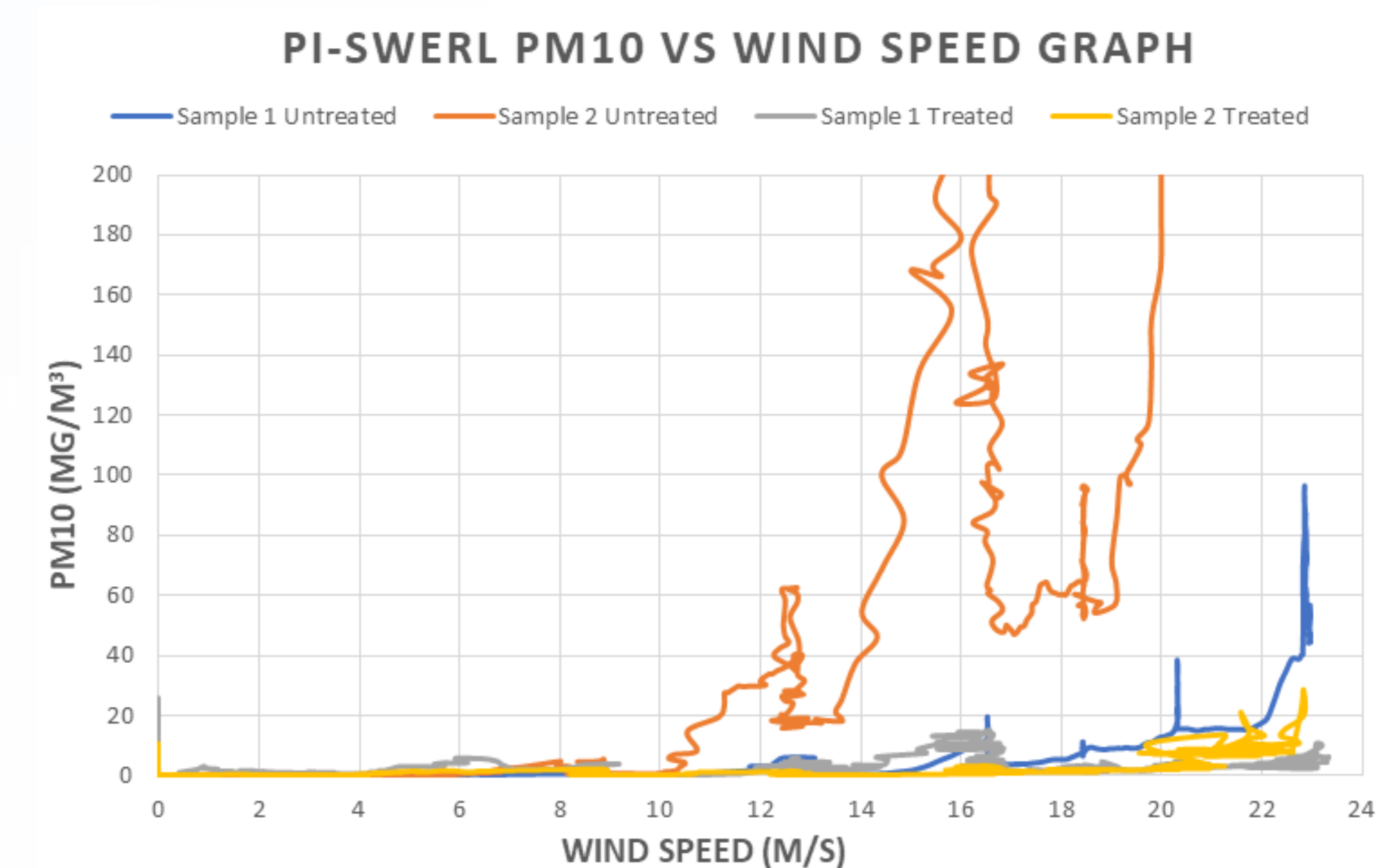
- Prepare EICP solution with urease extracted from Jack bean, urea, non-fat milk powder, and calcium chloride to precipitate a calcium carbonate crust on the exposed soil surface.
- Minimize fugitive dust at the TUHSD Innovation Center on exposed surface soils.



Research Results

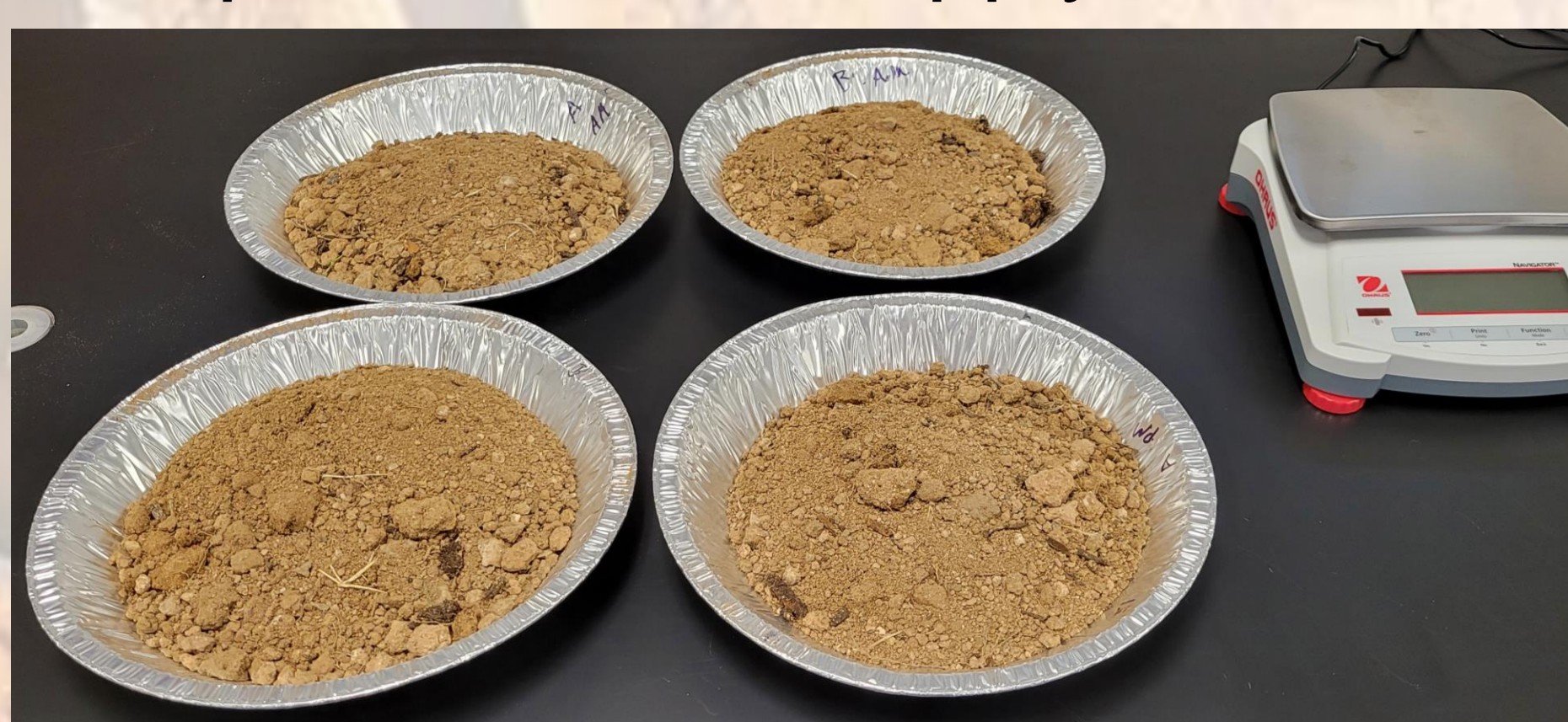
- EICP treated soil sample showed greater resistance to wind erosion.
- EICP solution effectively reduced the amount of fugitive dust in PI-SWERL tests.

Samples		% of mass lost after PI-SWERL test
IC Sample 1	Untreated	2.83%
	Treated	0.78%
IC Sample 2	Untreated	3.3%
	Treated	.08%



Lesson Description

- Students learning will be to conduct EICP experiments at the Innovation Center.
- Students learning will be active participation through EICP application labs.
- Students will be able to apply EICP solution and deduct results through actual results from experimentation.
- Assessment will be from students' ability to conduct experiments and apply results.



Lesson Objectives

- Students will observe how EICP solution can reduce fugitive dust on the exposed topsoil on the I.C campus.
- Students will glean the skills of accurate data collection, conducting scientific experiments, alignment of standards, working on a research team, applying scientific principles to a real-world issue.



Lesson Outcomes

- Through vigorous testing of EICP solution applied to soils samples with wind velocities of up to 101 mph, Innovation Center students have concluded that EICP solution does significantly reduce fugitive dust.
- Students will continue to experiment on ways to make EICP withstand extreme wind speeds on topsoil from the school property.



Acknowledgement This material is based upon work primarily supported by the Engineering Research Center Program of the National Science Foundation under NSF Cooperative Agreement No. EEC-1449501. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect those of the National Science Foundation.