

## **SUMMARY OF TEXAS A&M RESEARCH**

### **Phase 1 – Samples Soaked in the Laboratory (1998)**

Undisturbed samples of clay (PI=63) were soaked for 5 days with either water or EcSS 3000 diluted chemical in a swell device. Microstructure tests were performed and showed that EcSS 3000 (1) did not pre-swell the clay layers as the water-soaked sample did, (2) did not change the clay mineralogy, (3) did change the structure of the clay from a normal expanding crystalline lattice to an amorphous (noncrystalline) structure, (4) removed aluminum and other ions from the clay lattice and clay particles as part of the structure change and (5) reduced the negative charge on the clay particles, thus reducing both the attraction to water and the swell potential.

### **Phase 2 – Testing of Samples Collected 2 yrs after Injection (1999)**

Undisturbed samples of clay (PI=22-26) EcSS 3000-injected for a roadway in Crowley, Texas in 1997 were tested. Clay sampled from an adjacent street were used as the control samples. Microstructure and limited engineering properties tests were conducted. The microstructure tests showed that EcSS 3000 treatment resulted in the same five changes observed in Phase 1. The engineering properties tests showed that EcSS 3000 treatment (1) reduced volume changes with changes in moisture content, (2) did not reduce soil strength and (3) did not affect the coefficient of permeability, even though the treated soil is much more friable than the untreated soil.

### **Phase 3 - Testing of Samples Collected 7 yrs after Injection (2000-2001)**

Samples (PI=50s) were collected from the Venus Retirement Center (Venus, Texas) parking lot that was EcSS 3000-injected in 1993. Testing was not done until 2001, putting the time after injection at 8 years. The same structure change caused by the chemical treatment, observed during Phase 1 and Phase 2, is still evident in the 8-year-old treated soils. This result shows that there is a longterm effect of treatment with EcSS 3000.

### **Testing on Lab-Manufactured Soils (2002)**

Soil was prepared with 20% Wyoming Bentonite and 80% fine sand (PI=41) to give identical samples for testing. Swell testing was conducted on samples (1) mixed with either EcSS 3000 diluted chemical or water and (2) on samples of water-mixed soil inundated with either EcSS 3000 diluted chemical or water. All samples tested showed a significant difference in swelling characteristics between water and chemical treated/soaked samples, with the water treated samples having swell potentials of 3 to 4 times higher than the chemically-treated or -soaked samples.

**Microstructure testing showed the structure change as previously identified in other phases. Also new testing using nuclear magnetic resonance (NMR) also showed that the original clay lattice structure collapses upon treatment, as the theory indicates. This is very important as it further confirms that EcSS 3000 treatment is permanent, where other stabilization techniques are not.**