Earthlok

Reduction of soil swell through chemical stabilization

What is Earthlok?

- Earthlok Soil Stabilizer is a chemical soil stabilizer which induces an ionic exchange on the clay's surface at the molecular level
- The water bound to the soil is replaced by ions in Earthlok Soil Stabilizer
- Uses a surfactant to enhance the ability of the chemical to reach the soil

How does it work?

- The water bound to the soil is replaced by ions in Earthlok Soil Stabilizer
  - The bound water is expelled as free water, water which is not electrostatically bound to other molecules
  - Reduces the ability of the clay to absorb or expel water
  - This results in both increased soil density and reduced shrink/swell potential

Applications for Earthlok

- **Near surface building foundations**
  - Reduces shrink/swell within the zone of seasonal moisture variation
  - Increases density of soils below the foundation
  - Reduces movement of water below the building
- **Roadways**
  - Reduces movement due to shrink/swell
  - Increases subgrade strength
- **Railroad Embankments, levees, and cut slopes**
  - Reduces movement of embankment soils
  - Reduces moisture intrusion
- **Moisture Barriers**
  - Can be used around the perimeter of existing buildings and roads to reduce moisture transfer
- In short, any place that it is desired to reduce the shrink/swell potential of the soil or reduce the flow of water through the soil

Testing performed by Henley Johnston & Associates, Inc.

- This report presents the results of a subsurface investigation performed for the 4,600 square foot Voge Residence to be located along Farm to Market Road 47 in Wills Point, Texas.
- The purpose of this investigation was to evaluate subsurface conditions and provide recommendations for design and construction of the foundation.
- Potential Vertical Movements (PVM) were evaluated using TxDOT Method 124E1 and the results of the absorption pressure-swell tests. Based on this analysis, total soil movements are anticipated to be on the order of 5 to 5-1 /2 inches considering the current soils conditions at the time of drilling.
- Current literature indicates 4-1/2 inches is the maximum amount of movement a ground supported, stiffened slab can withstand. Considering PVM of 5 to 5-1/2 inches, a ground-supported slab should not be used unless remedial earthwork is conducted to reduce post-construction movements to under 4-1/2 inches.

Pre Injection Results

BORING NUMBER	DEPTH (ft.)	SWELL PRESSURE (psf)	GAIN IN MOISTURE (%)	PERCENT SWELL (%)	MATERIAL DESCRIPTION
1	1.0-2.0	737.28	4.87	0.72	CLAY, Dark Brown
1	4.0-5.0	7139.97	11.78	8.72	CLAY, Light brown, brownish-yellow and light gray
2	5.0 - 6.0	7178.77	11.96	9.03	CLAY, Sandy, brownish- yellow and light gray
2	14.0 -15.0	2716.29	8.74	3.38	CLAY, Sandy, brownish- yellow and light gray

Post Injection Results

Boring	Depth (ft.)	Pocket Penetrometer	Swell	Material Description
1	1-2	0.5	0.0	FILL: Clay, brown and light brown
1	4-5	3.0	1.7	CLAY, brown to brown
1	8-9	4.5	0.7	CLAY, Brownish-yellow and light gray
1	9-10		0.4	CLAY, Brownish-yellow and light gray
2	2-3	2.0	1.8	CLAY, Brown
2	6-7	3.0	1.3	CLAY, Brownish-yellow and light gray
2	8-9	4.5++	1.2	CLAY, Brownish-yellow and light gray
2	9-10	4.0	0.9	CLAY, Brownish-yellow and light gray

PURDUE
UNIVERSITY

DEPARTMENT OF
BUILDING CONSTRUCTION MANAGEMENT

Letter of Transmittal:

April 26, 2011

To: Attn:
Rodney Green
Earthlok Inc.
PO Box 275
Waxahachie, TX 75168

From: Douglas Keith, Randy Rapp
Faculty, Building Construction Management
Knoy Hall of Technology, Purdue University
401 N. Grant Street
West Lafayette, IN 47906

Subject:

Enclosed are two copies of the white paper that Earthlok had funded a sponsored research contract with Purdue University.

Alt & Witzig Soil Sample Swell and Pressure		
Specimen	Free Swell Value	Swell Pressure (psf)
Treated	1.02	330
Untreated	9.10	445

	As Received Moisture Content (%)	*pH*	*Liquid Limit/Plastic Limit/Plasticity Index*	*Specific Gravity*	*Unconfined Compressive Strength (psf)*	*Maximum Dry Density (psf)*	*Optimum Moisture Content (%)*	*CBR at 90% Compaction*	*CBR at 95% Compaction*	*CBR at 100% Compaction*	*Hydraulic Conductivity (ft/min)*
Test Standard	*ASTM D4959*	*ASTM D4972*	*ASTM D4318*	*ASTM D854*	*ASTM D2166*	*ASTM D1557*	*ASTM 1557*	*ASTM D1883*	*ASTM D1883*	*ASTM D1883*	*ASTM D5084*
Untreated	**26.4**	**5.3**	**41/21/20**	**2.645**	**2508**	**112.1**	**16.3**	**5.9**	**14.2**	**26.3**	**1.08×10^{-5}**
Treated	**25.3**	**5.1**	**40/22/18**	**2.640**	**3655**	**116.7**	**14.5**	**7.7**	**17.6**	**26.0**	**1.14×10^{-6}**

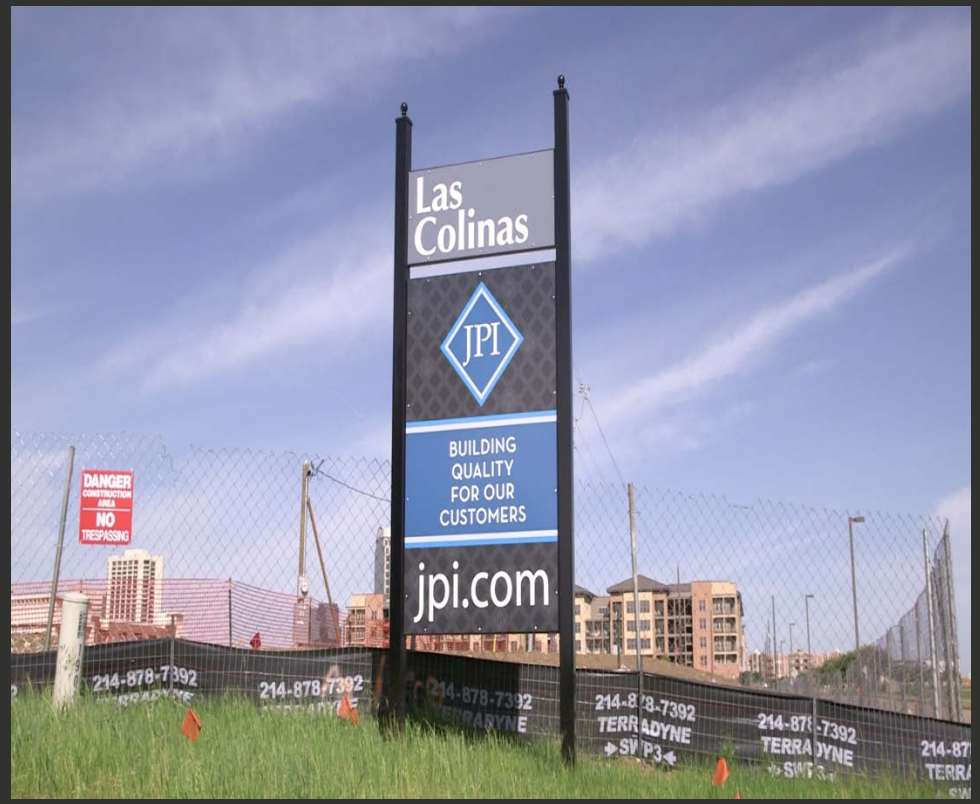
Projects

SLR: The Canals in Frisco

500,000 sq. ft.

JPI: Las Colinas, Lake Carolyn

223,762 sq. ft.



Castle Hills Phase 8 & 9

- Phase 9 currently under construction
- 195 lots for residential construction

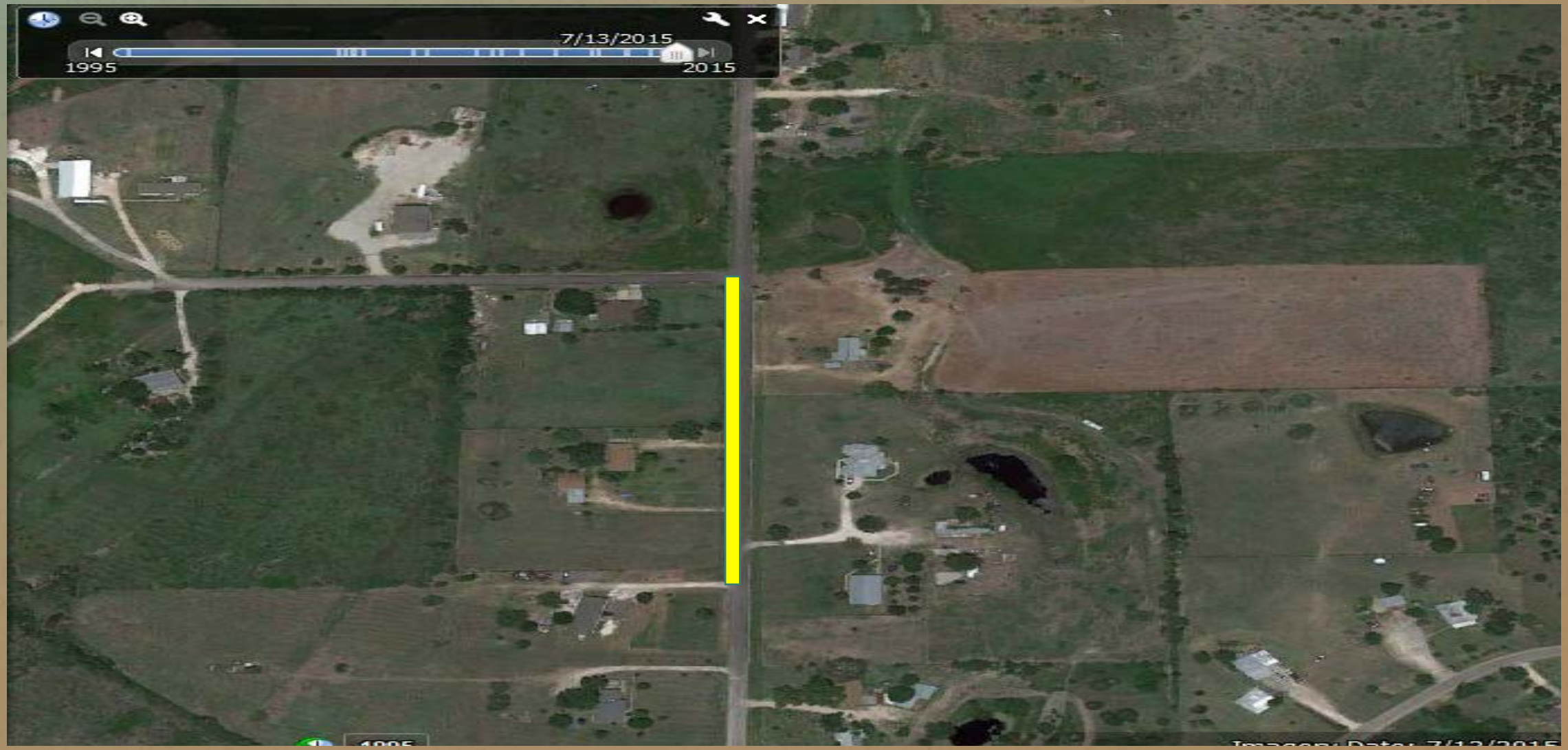
- Phase 8 completed in 2015
- 150 lots for residential construction

Underwood Road Project

Buda, Texas

Underwood Road prior to any work

Earthlok injected the highlighted portion of the road. The remaining area was untreated.



Injection of Earthlok's Patented Soil Stabilizer

Applied after injection:

- 6 inches of compacted subgrade
- 8 inches of flex base
- 4 inches of asphalt

1.5 year later

The treated portion of the roadway exhibits significantly better rideability and minimal cracking compared to the non treated portion.

Cracks that were in the road prior to injection, are now on the shoulder outside of the injection area.

The untreated portion is in need of repair

Earthlok

Soil Stabilizer TM

“It is happy for us that the test results were favorable and demonstrated the value of the product. You, who take such risks and work so hard to move us all forward is what has made this nation such a great place to live. It would seem that more folks should take a hard look at Earthlok and the benefits it may offer.”

Randy Rapp, Associate Professor and Graduate Program Chair, Perdue University