Collaboration & Stabilization:

Achieving Project Stability

through

Effective Communication

&

Lime Stabilization

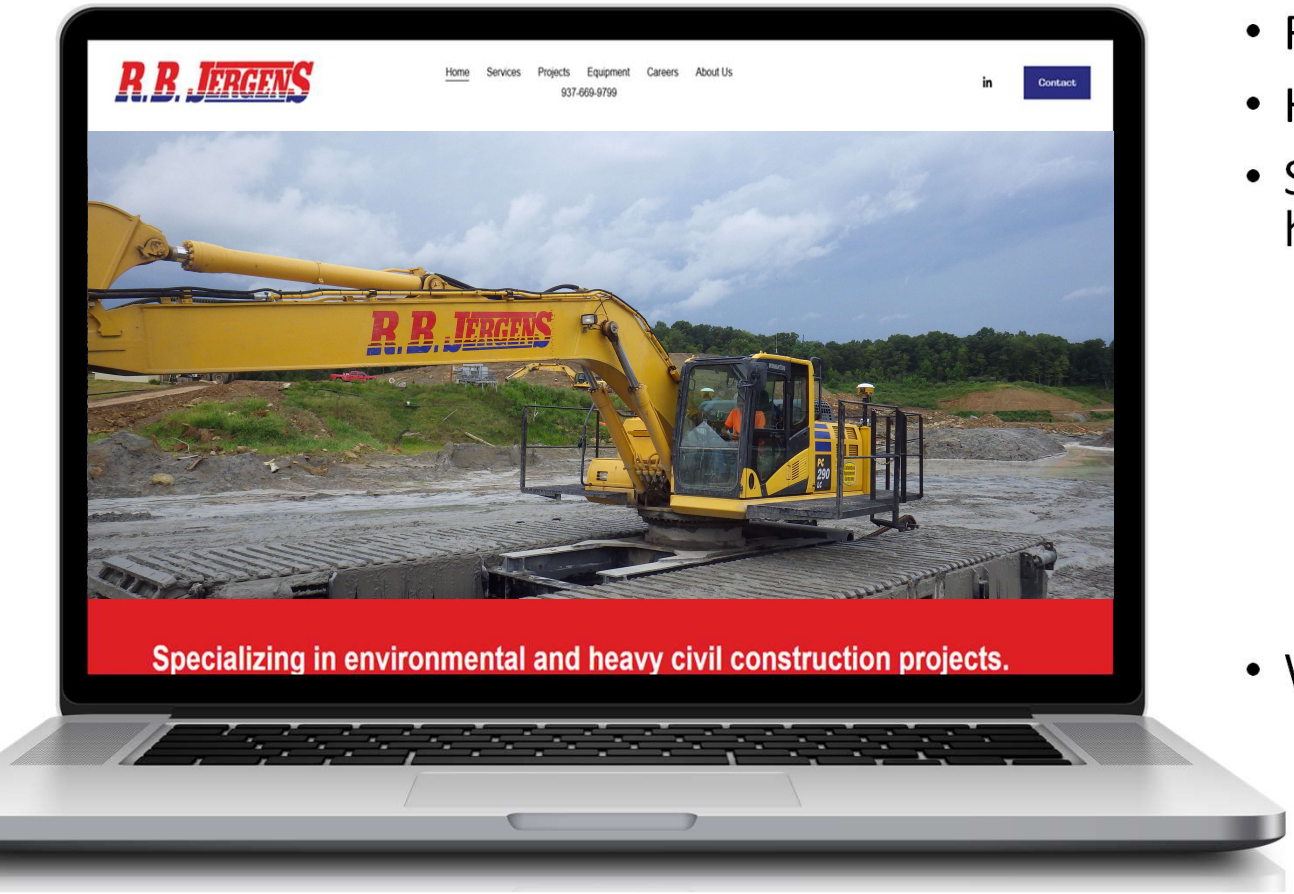
R.B. JERGENS

MINTEK RESOURCES

Agenda

1. Company Profiles
2. Project Background
3. Collaborative Efforts
4. Testing & Impact
5. Project Timeline
6. Collaboration & Support
7. Result

R.B. JERGENS



- Founded: 1987
- Headquarters: Vandalia, Ohio
- Specialization: Environmental & heavy civil construction projects
    - CCR work
    - Heavy civil earthwork
    - Ash management
    - Landfill construction
    - Public improvement projects
    - Industrial structural concrete
- Website: rbjergens.com

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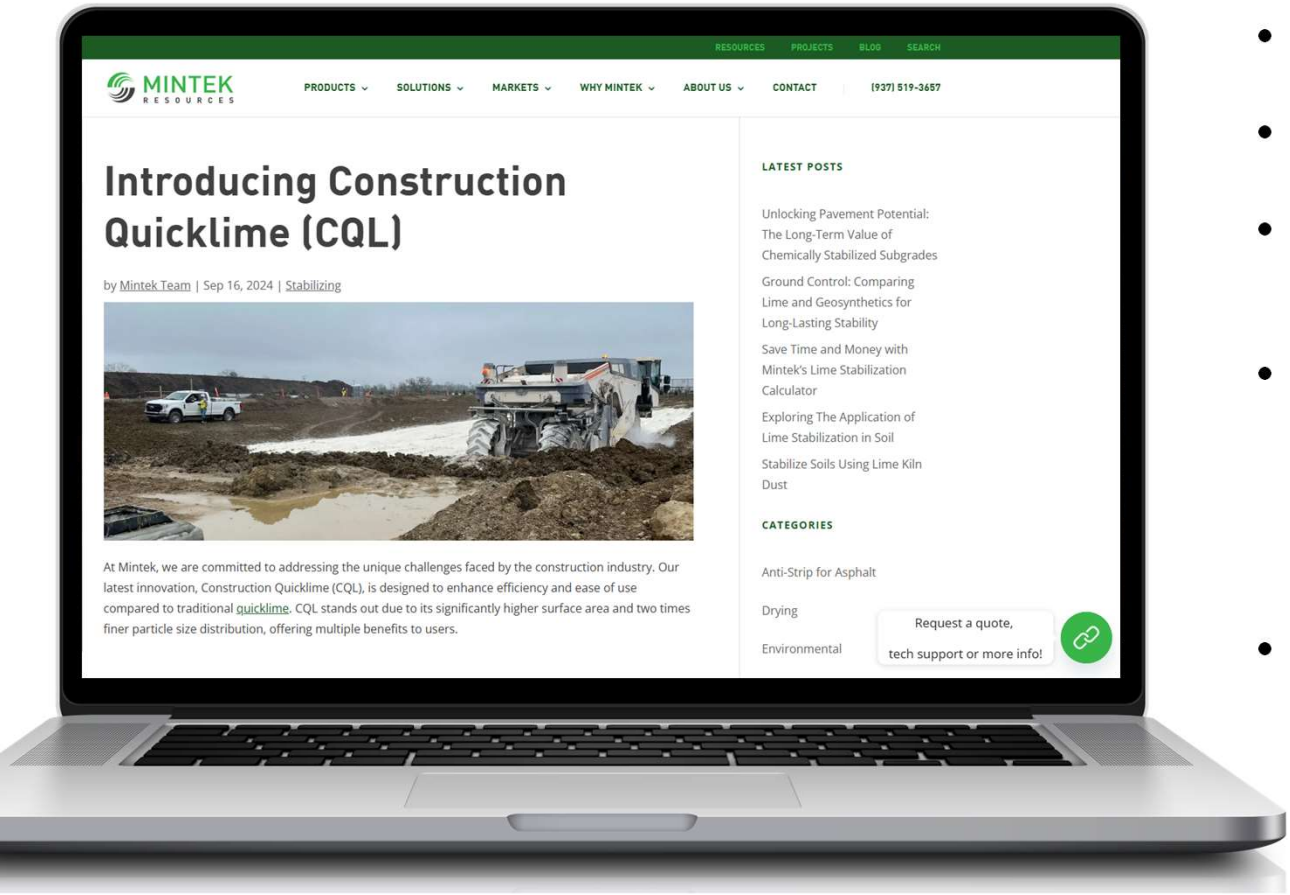
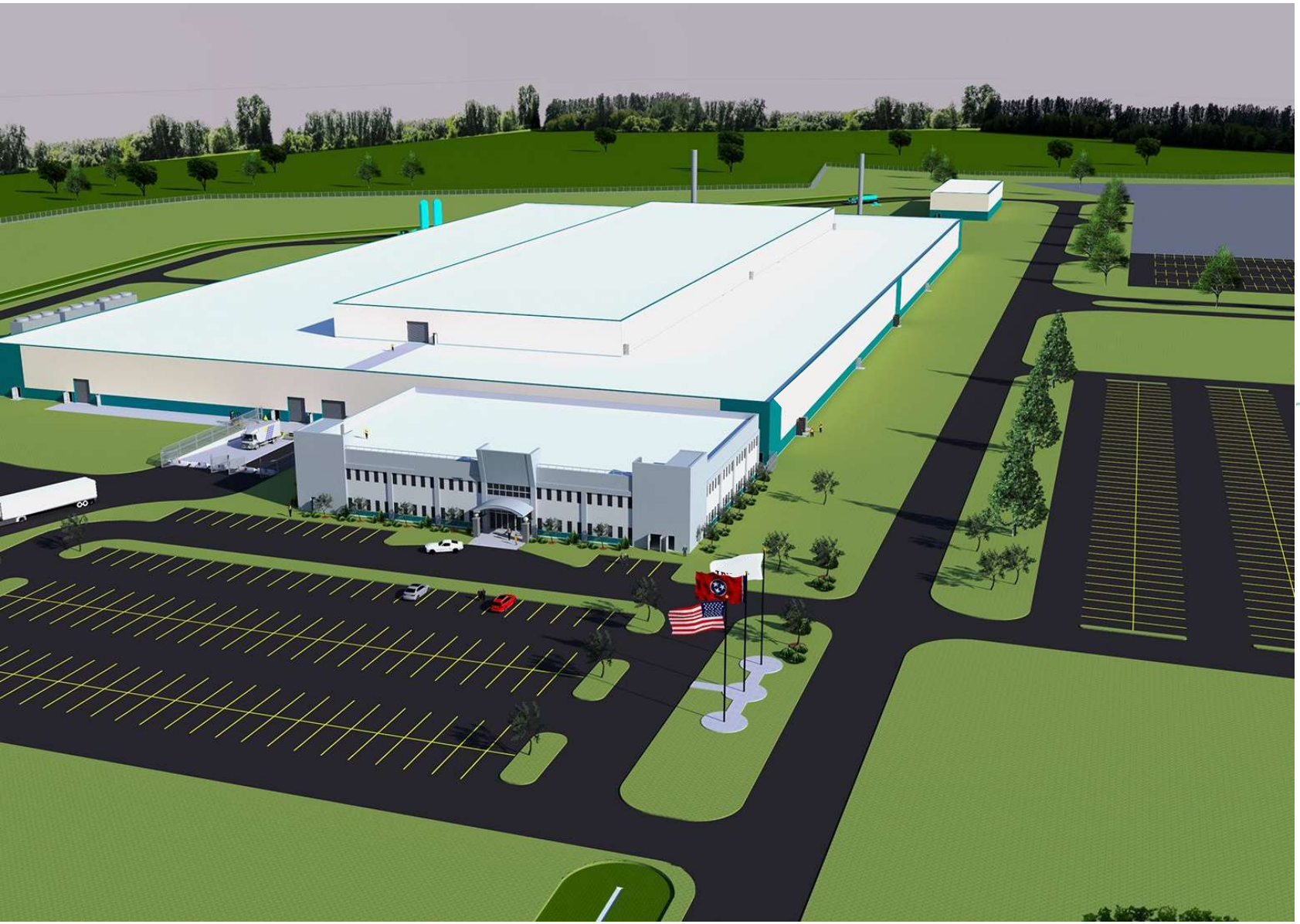


- Founded: 1994
- Headquarters: Beavercreek, Ohio
- Footprint: East of the Mississippi (primarily)
- Specialization: Lime-based solutions for soil treatment
  - Quicklime
  - CQL
  - Calciment® LKD
- Website: mintekresources.com



Project Background

Location:

Significance:

- Supporting America's Energy Sector

Historical Context:

- Area’s legacy in innovation

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Collaborative Efforts

- Specification and acceptance testing discussions
- 3rd party testing to determine PI range
- Soils bench testing for dosage rate identification
- Cold weather liming support

Project Execution

- 100 Acre site
  - Developed for manufacturing & production facility
- 500,000 CY
  - Total cubic yards of **Excavation**
- 380,000 CY
  - Total cubic yards of **Fill**
- 160,000 CY
  - Total cubic yards of **Lime Stabilized Structural Fill**

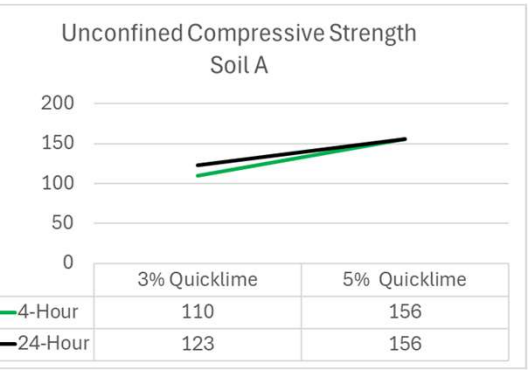
Project Execution

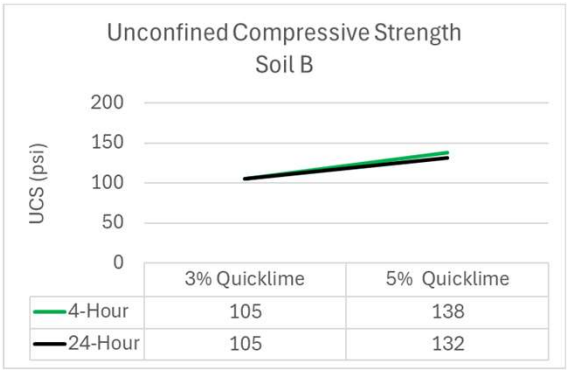
- Project awarded: November ’24
- Mix Design Approved: December ’24
- Lime stabilization: Jan 3, ‘25
  - **Accelerated** winter schedule required efforts to modify material performance and specifications.
  - Mintek technical & lab **support**
- Combination of Storage
  - Silo & Mintek Pig **expedited loading** & **increased production rate**
  - Allowed the site to receive sufficient material deliveries & **prevented crew down time**.

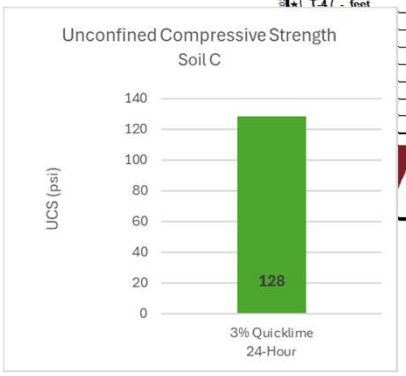
Lab Results & Impact

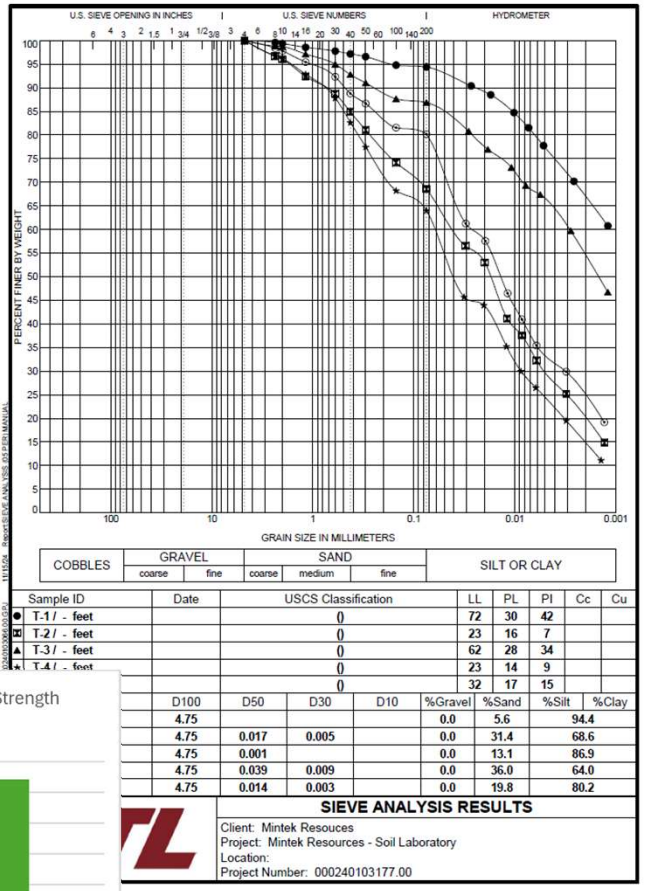
	USCS Classification				Percent of Each Component			
	USCS Symbol	LL	PL	PI	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
Soil A	CH	87	36	51	0.3	3.5	28.6	67.5
Soil B	CL-ML	23	17	6	6.1	29.7	41.4	22.8
Soil C	CL	44	21	23	0.2	18.1	28.5	53.2

	0% Quicklime	2% Quicklime	3% Quicklime	4% Quicklime	5% Quicklime	6% Quicklime
Soil A (pH)	7.00	12.37	12.45	12.52	12.54	12.60
Soil B (pH)	7.00	12.40	12.51	12.56	12.58	12.63
Soil C (pH)	7.00	12.41	12.45	12.49	12.52	12.55









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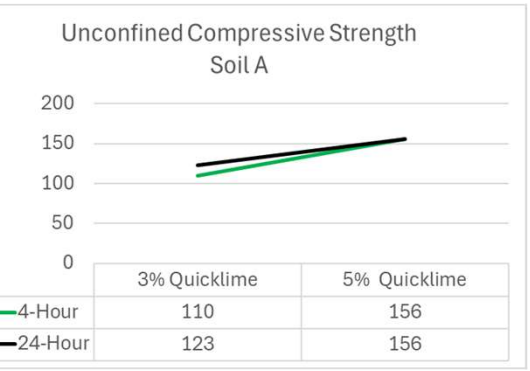
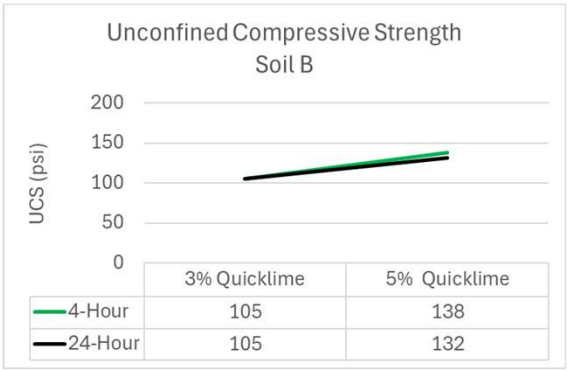
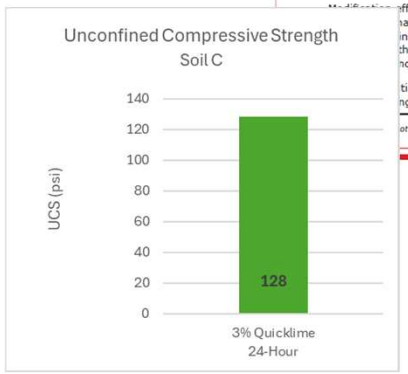
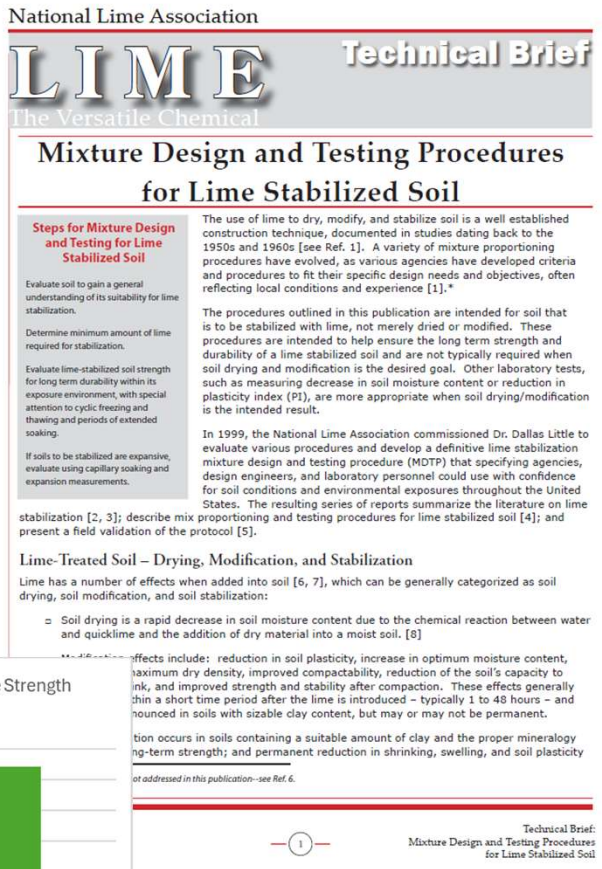







National Lime Association

LIME
The Versatile Chemical

Technical Brief

Mixture Design and Testing Procedures for Lime Stabilized Soil

Steps for Mixture Design and Testing for Lime Stabilized Soil

Evaluate soil to gain a general understanding of its suitability for lime stabilization.

Determine minimum amount of lime required for stabilization.

Evaluate lime-stabilized soil strength for long term durability within its exposure environment, with special attention to cyclic freezing and thawing and periods of extended soaking.

If soils to be stabilized are expansive, evaluate using capillary soaking and expansion measurements.

The use of lime to dry, modify, and stabilize soil is a well established construction technique, documented in studies dating back to the 1950s and 1960s [see Ref. 1]. A variety of mixture proportioning procedures have evolved, as various agencies have developed criteria and procedures to fit their specific design needs and objectives, often reflecting local conditions and experience [1].*

The procedures outlined in this publication are intended for soil that is to be stabilized with lime, not merely dried or modified. These procedures are intended to help ensure the long term strength and durability of a lime stabilized soil and are not typically required when soil drying and modification is the desired goal. Other laboratory tests, such as measuring decrease in soil moisture content or reduction in plasticity index (PI), are more appropriate when soil drying/modification is the intended result.

In 1999, the National Lime Association commissioned Dr. Dallas Little to evaluate various procedures and develop a definitive lime stabilization mixture design and testing procedure (MDTP) that specifying agencies, design engineers, and laboratory personnel could use with confidence for soil conditions and environmental exposures throughout the United States. The resulting series of reports summarize the literature on lime stabilization [2, 3]; describe mix proportioning and testing procedures for lime stabilized soil [4]; and present a field validation of the protocol [5].

Lime-Treated Soil – Drying, Modification, and Stabilization

Lime has a number of effects when added into soil [6, 7], which can be generally categorized as soil drying, soil modification, and soil stabilization:

- Soil drying is a rapid decrease in soil moisture content due to the chemical reaction between water and quicklime and the addition of dry material into a moist soil. [8]

...effects include: reduction in soil plasticity, increase in optimum moisture content, ...aximum dry density, improved compactability, reduction of the soil's capacity to ...ink, and improved strength and stability after compaction. These effects generally ...thin a short time period after the lime is introduced – typically 1 to 48 hours – and ...nounced in soils with sizable clay content, but may or may not be permanent.

...tion occurs in soils containing a suitable amount of clay and the proper mineralogy ...ng-term strength; and permanent reduction in shrinking, swelling, and soil plasticity

...ot addressed in this publication--see Ref. 6.

1

Technical Brief:
Mixture Design and Testing Procedures for Lime Stabilized Soil

Stafford, VA

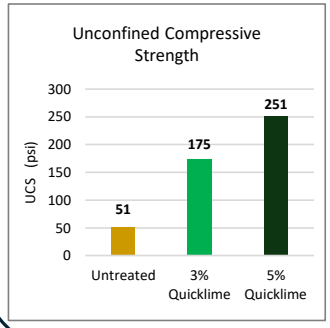
Sample 1: CH Soil

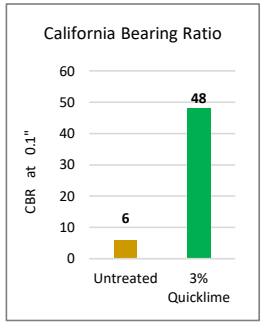
Untreated

Liquid Limit (LL), %	57
Plastic Limit (PL), %	30
Plasticity Index (PI), %	27
Clay (%)	49.6
USCS Symbol	CH

Improvement After Lime

- ↓ PI from 27 to 6
- ↑ UCS • ↑ CBR • ↓ Swell





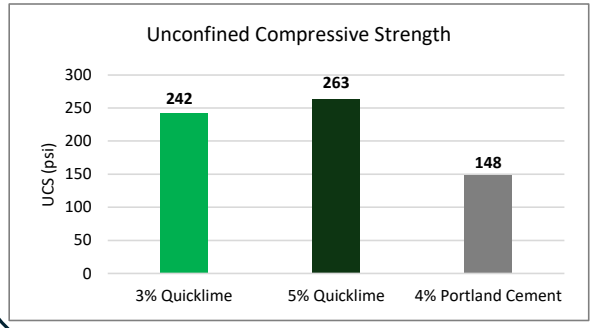
Sample 2: ML Soil

Untreated

Liquid Limit (LL), %	41
Plastic Limit (PL), %	28
Plasticity Index (PI), %	13
Clay (%)	37.4
USCS Symbol	ML

Improvement After Lime

- Reactive with lime
- ↑ UCS



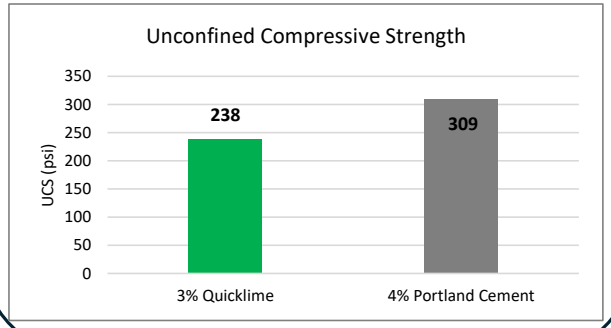
Sample 3: SM Soil

Untreated

Liquid Limit (LL), %	NT
Plastic Limit (PL), %	NT
Plasticity Index (PI), %	NP
Clay (%)	**16**
USCS Symbol	S

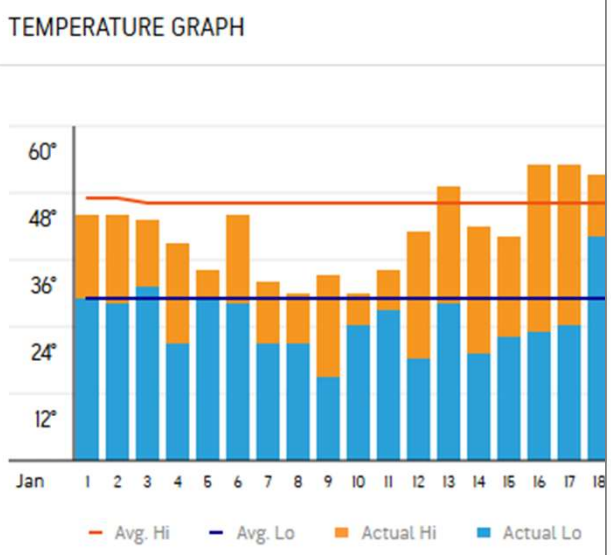
Improvement After Lime

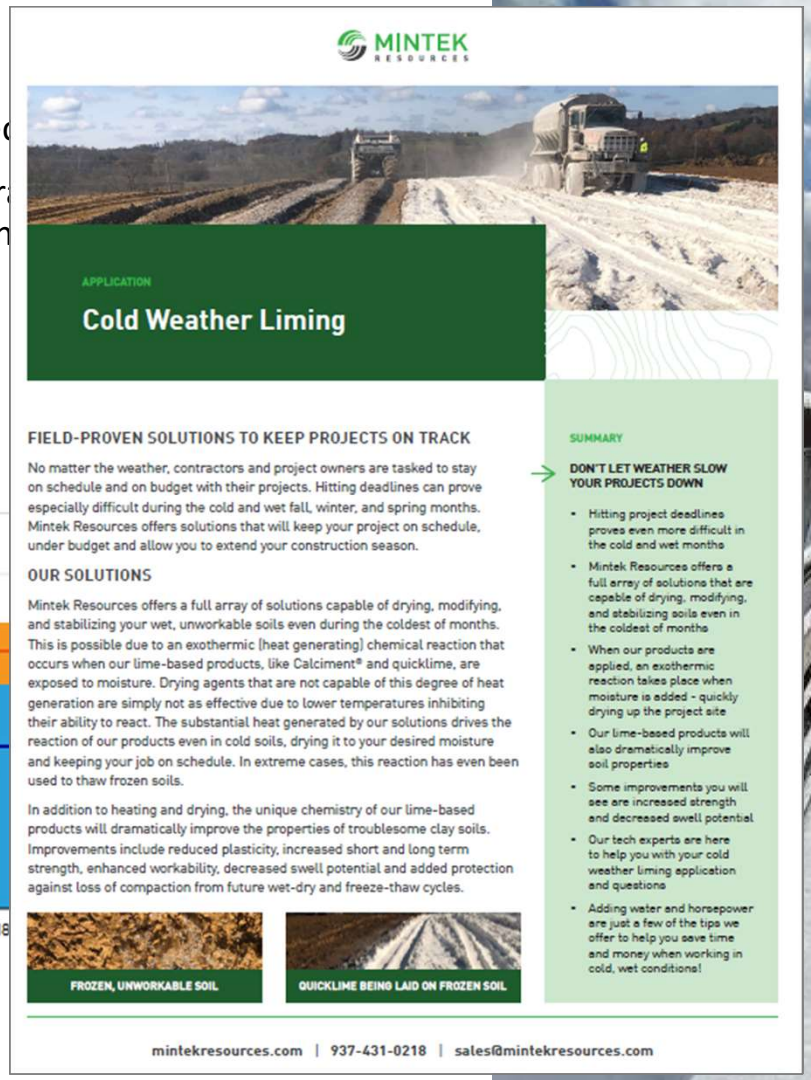
- 70% sand, 14% silt, 16% clay.
- ↑ UCS w/ lime & PC



Cold Weather Challenges

- Rec
- Str
sch





MINTEK RESOURCES

APPLICATION

Cold Weather Liming

FIELD-PROVEN SOLUTIONS TO KEEP PROJECTS ON TRACK

No matter the weather, contractors and project owners are tasked to stay on schedule and on budget with their projects. Hitting deadlines can prove especially difficult during the cold and wet fall, winter, and spring months. Mintek Resources offers solutions that will keep your project on schedule, under budget and allow you to extend your construction season.

OUR SOLUTIONS

Mintek Resources offers a full array of solutions capable of drying, modifying, and stabilizing your wet, unworkable soils even during the coldest of months. This is possible due to an exothermic (heat generating) chemical reaction that occurs when our lime-based products, like Calciment® and quicklime, are exposed to moisture. Drying agents that are not capable of this degree of heat generation are simply not as effective due to lower temperatures inhibiting their ability to react. The substantial heat generated by our solutions drives the reaction of our products even in cold soils, drying it to your desired moisture and keeping your job on schedule. In extreme cases, this reaction has even been used to thaw frozen soils.

In addition to heating and drying, the unique chemistry of our lime-based products will dramatically improve the properties of troublesome clay soils. Improvements include reduced plasticity, increased short and long term strength, enhanced workability, decreased swell potential and added protection against loss of compaction from future wet-dry and freeze-thaw cycles.

FROZEN, UNWORKABLE SOIL

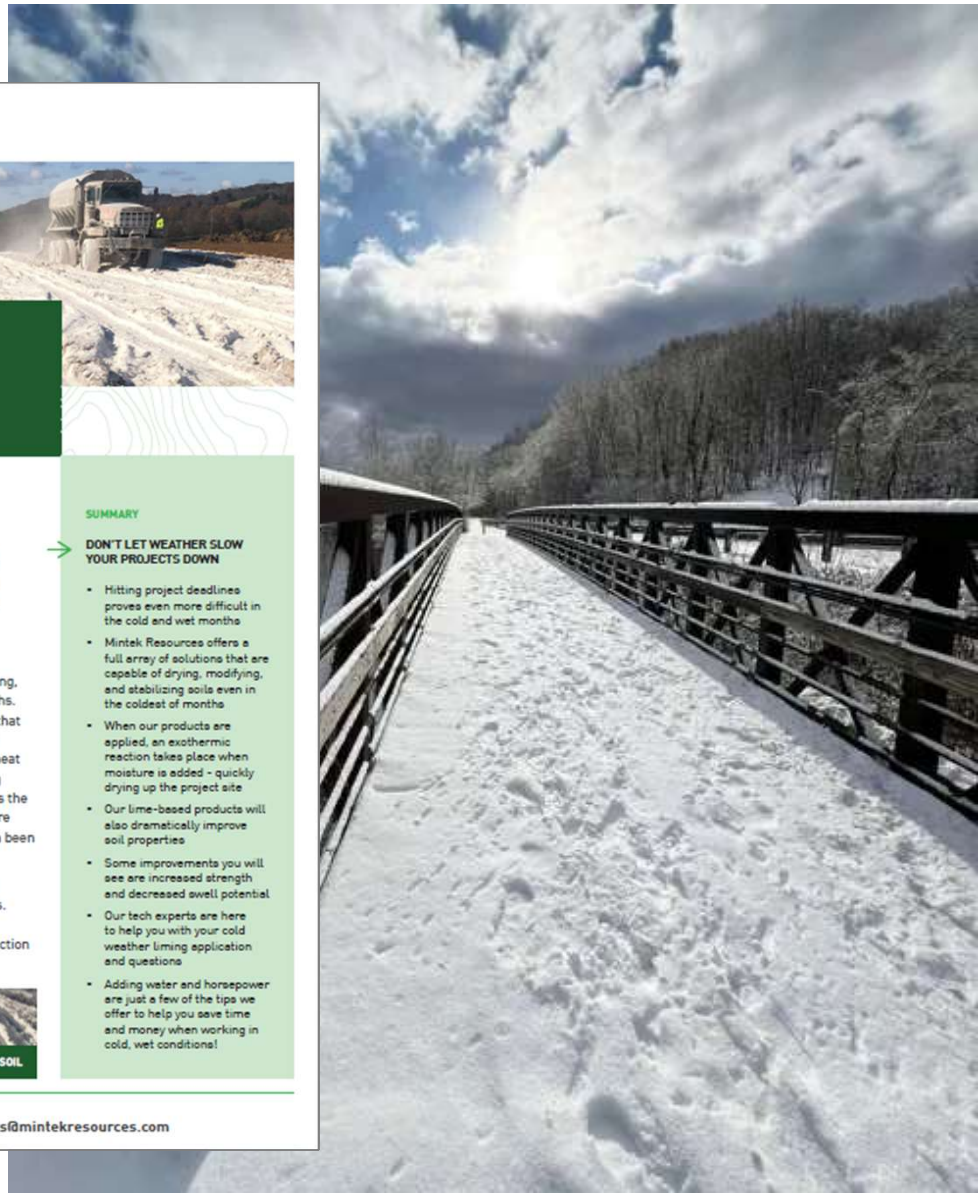
QUICKLIME BEING LAID ON FROZEN SOIL

SUMMARY

DON'T LET WEATHER SLOW YOUR PROJECTS DOWN

- Hitting project deadlines proves even more difficult in the cold and wet months
- Mintek Resources offers a full array of solutions that are capable of drying, modifying, and stabilizing soils even in the coldest of months
- When our products are applied, an exothermic reaction takes place when moisture is added - quickly drying up the project site
- Our lime-based products will also dramatically improve soil properties
- Some improvements you will see are increased strength and decreased swell potential
- Our tech experts are here to help you with your cold weather liming application and questions
- Adding water and horsepower are just a few of the tips we offer to help you save time and money when working in cold, wet conditions!

mintekresources.com | 937-431-0218 | sales@mintekresources.com



Cold Weather Challenges

- Rec
- Str
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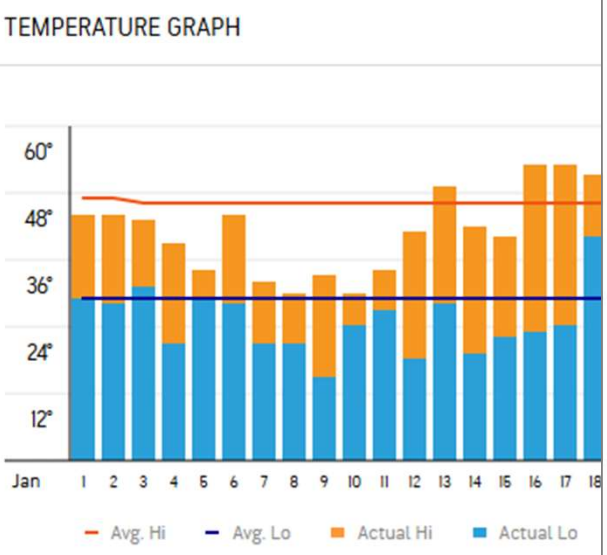
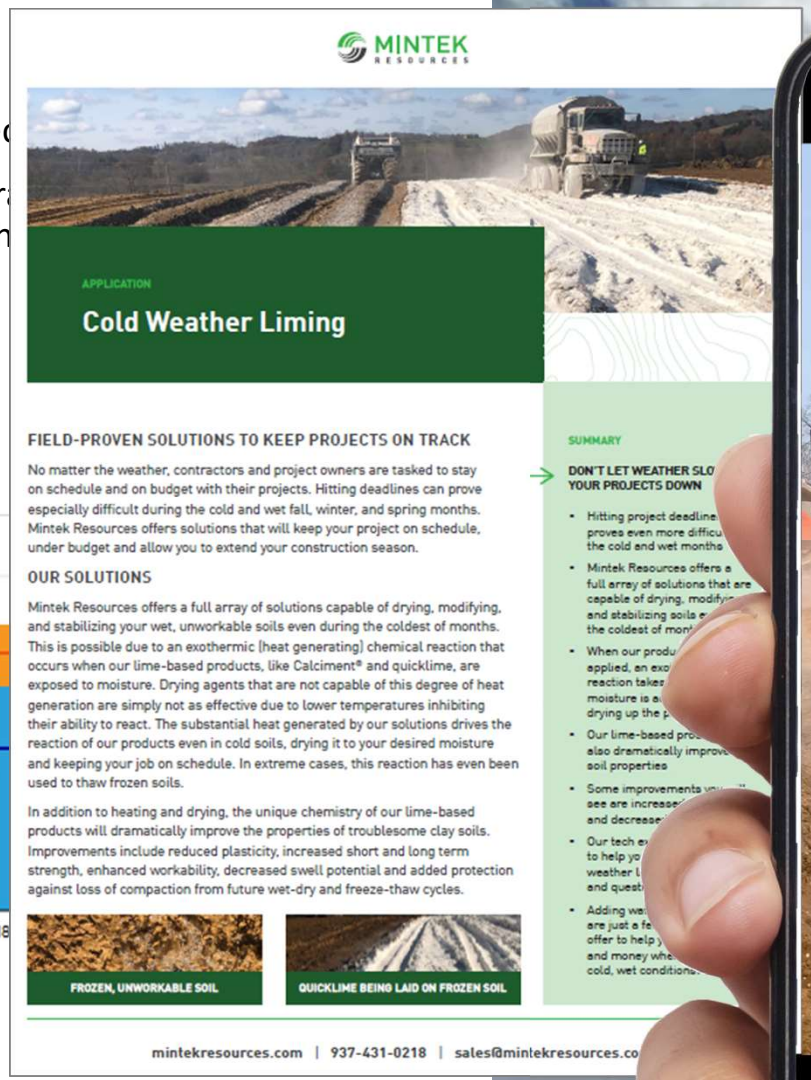
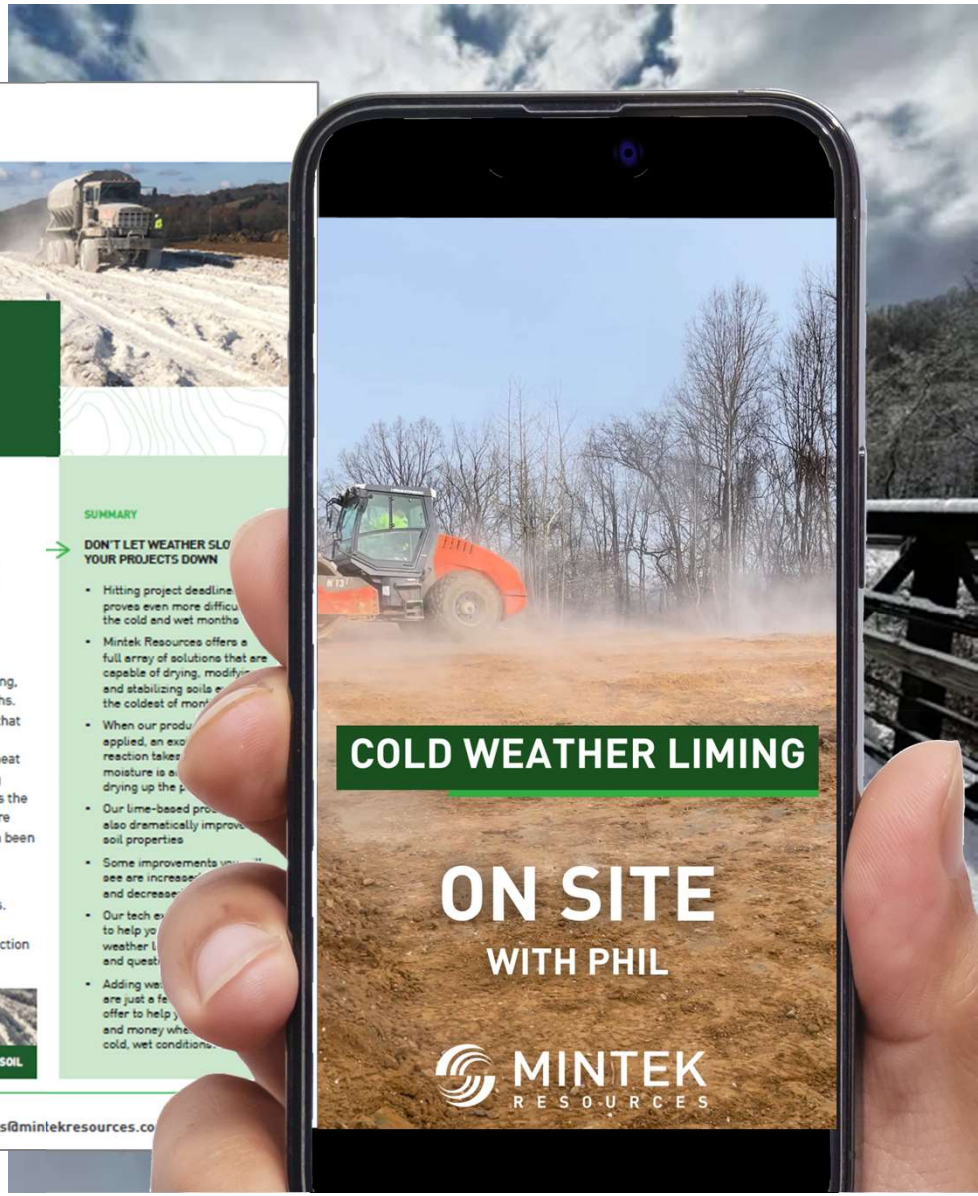






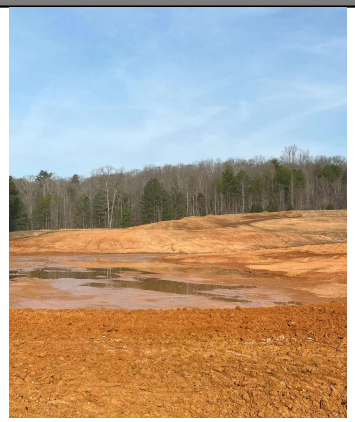
Field Results & Impact

- Confirmation of lab results
- Successful soil stabilization
- Upfront supply conversations led to Pig utilization

"There is an on-site quality control person that is taking strength tests in the field and sending samples off to a lab. So far, so good. It's working beautifully."

Director of Construction
RB Jergens

Project Timeline



10/21/22
- Original Bid for lime from RBJ
- Hydrated lime vs. quicklime discussions

10/30/24
- RBJ wins project

11/19/24
- Acceptance testing spec reviewed by Mintek

11/26/24
- Mintek Lab testing reported

12/4/24
- External specification comparison support

12/5/24
- OMC field target support
- 1st lime loads to storage Pigs

1/3/25
- 1st load of lime spread!

3/18/25
- Mintek site visit

5/2/25
- last load of lime, 460 total. (~10,000 tons)

July '24 | Aug. '24 | Sept. '24 | Oct. '24 | Nov. '24 | Dec. '24 | Jan. '25 | Feb. '25 | Mar.

7/26/24
- Specification & acceptance testing discussions

10/31/24
- Soil amendment steps Mintek's General Guidelines for Lime Stabilization Doc.

11/4/24
- Soil Sampling

11/22/24
- Acceptance testing meeting (GC, 3rd party Lab, RBJ, Mintek)

11/27/24
- Mintek Cold Weather Liming support (doc.)

12/11/24
- Mix Design Approved

7/8/25
- Audit response support

Collaboration and Support

- Mintek Resources' Role:
  - Comprehensive support throughout the project
  - Engineering-level submittal documents
  - Continuous communication and feedback
- R.B. Jergens Contractors' Role:
  - On-site implementation and adjustments
  - Ask for support when needed


Product support throughout the project mitigated what could have been a tough project.
Director of Construction
RB Jergens
R.B. JERGENS
Lab testing allowed us to tailor the rates and meet the project specifications, eliminating any learning curve once on site which allowed us to achieve and maintain a high rate of production.
Project Manager
RB Jergens

Conclusion

- Key Takeaways:
  - Importance of collaboration and pre-project planning
  - Effectiveness of quicklime in soil stabilization
  - Communication & lime stabilization can help future projects

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Lime Stabilization

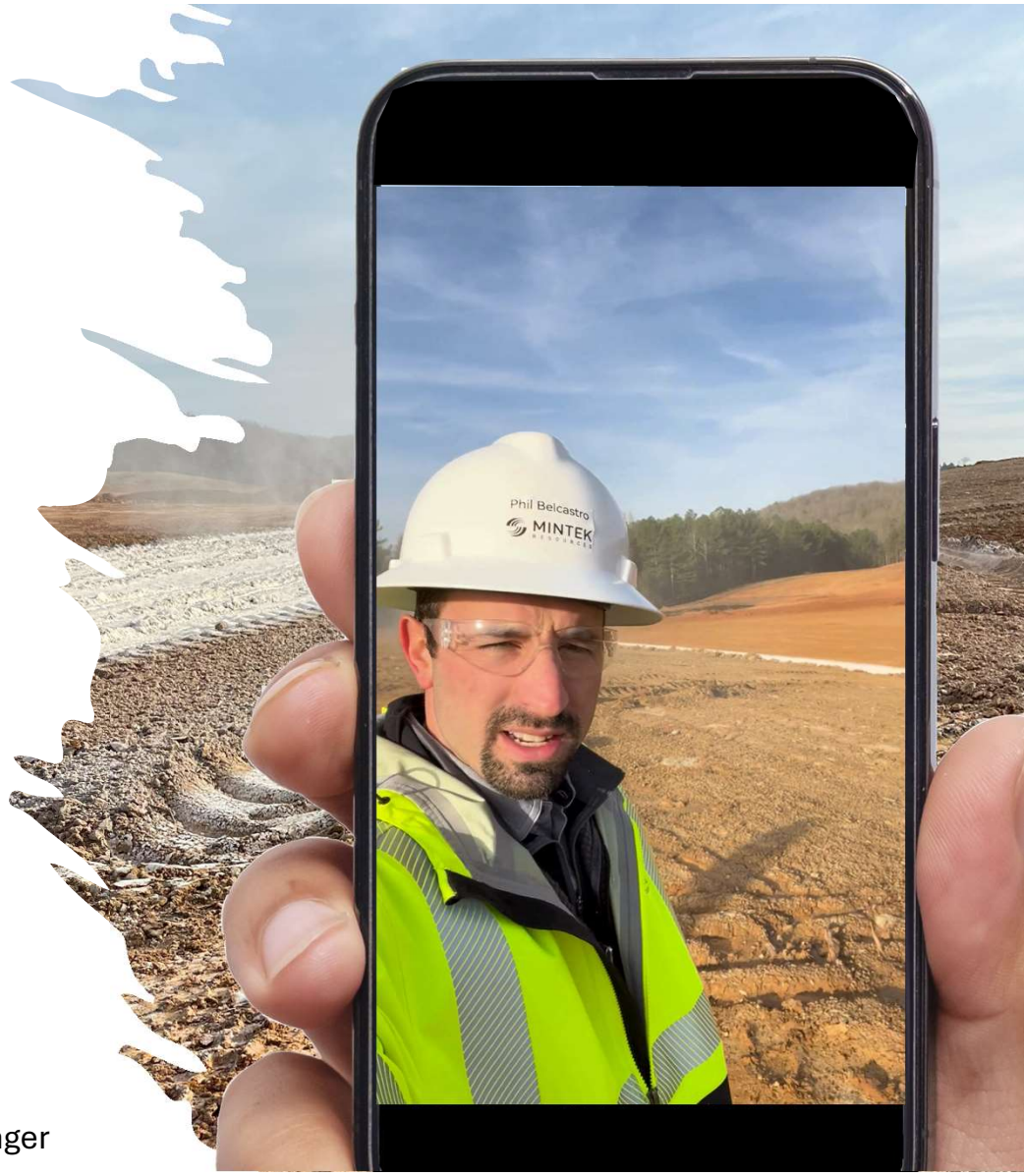
MINTEK RESOURCES

ELLYN VEAL

Customer Applications Engineer

PHIL BELCASTRO

Customer Applications Manager



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ELLYN VEAL

Customer Applications Engineer
ellyn.veal@mintekresources.com

MINTEK RESOURCES

PHIL BELCASTRO

Customer Applications Manager
phil.Belcastro@mintekresources.com