



# Land Science<sup>®</sup>

a division of REGENESIS<sup>®</sup>

Vapor Barrier Innovations:  
Metalized Film & Spray-Applied Asphalt-Nitrile Core

ALBFA Conference  
September 26, 2019

Jordan Knight, MPA  
Central Region Manager



# Presentation Agenda

- Introduce Land Science
- History of Vapor Intrusion Barrier Technologies
- Critical Characteristics of VI Barriers
- Three New VI Barrier Technologies
  - Materials/Composition
  - Chemical Resistance
  - Installation
- Case Studies Applications

# The Leading Authority on: **Contaminant Vapor Barrier Technologies**



A global leader in advanced technologies for contaminated site remediation



We work with federal, state and local regulatory agencies on developing VI guidance



We provide technologies that mitigate the evolving issues and risks associated with these sites.

# CONTAMINANT VAPOR BARRIER EVOLUTION

**2003**

**Rubberized asphalt spray** (Styrene butadiene (SBR)-modified asphalt)

- Low chemical resistance, but easily applied

**2012**

**Surface Coating Vapor Barrier for Existing Buildings**

**2019**

**Aluminized polyethylene sheet** (MonoShield, TerraShield)

- Very high chemical Resistance >100X HDPE (10mil)

**2007**

**HDPE / SBR-modified asphalt** (e.g. Geo-Seal®)

- Chemical resistance, good constructability

**2019**

**Nitrile-modified asphalt spray** (MonoShield™, TerraShield™, Nitra-Seal™)

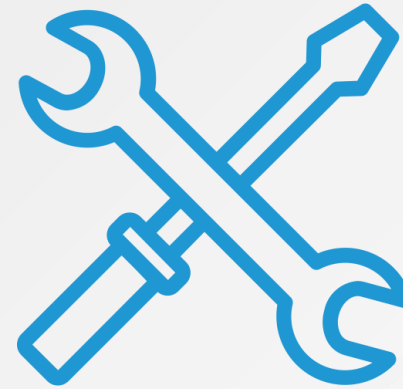
- High chemical resistance (>10X SBR-Modified Asphalt)

# CONTAMINANT VAPOR BARRIER REQUIREMENTS



## Chemical Resistance

How well it blocks vapors



## Constructability

How easily it is installed





## CHEMICAL RESISTANCE



The ability of a barrier material to limit the diffusion of contaminants



Measure the flux of contaminant vapors across the barrier



“Diffusion coefficient” is calculated to compare materials\*

\*Permeation testing is used for water vapor – not appropriate for hydrophobic contaminants





## CONSTRUCTABILITY



Verified Installation with High Standards



Industry Best, Rapid Installation



QA/QC Testing



# NEW VAPOR BARRIER TECHNOLOGIES





# Terra Shield™

Aluminum Nitrile Vapor Barrier

- Unparalleled Chemical Resistance
- Excellent Constructability
- Dual-Metalized Film
- Asphalt-Nitrile Core

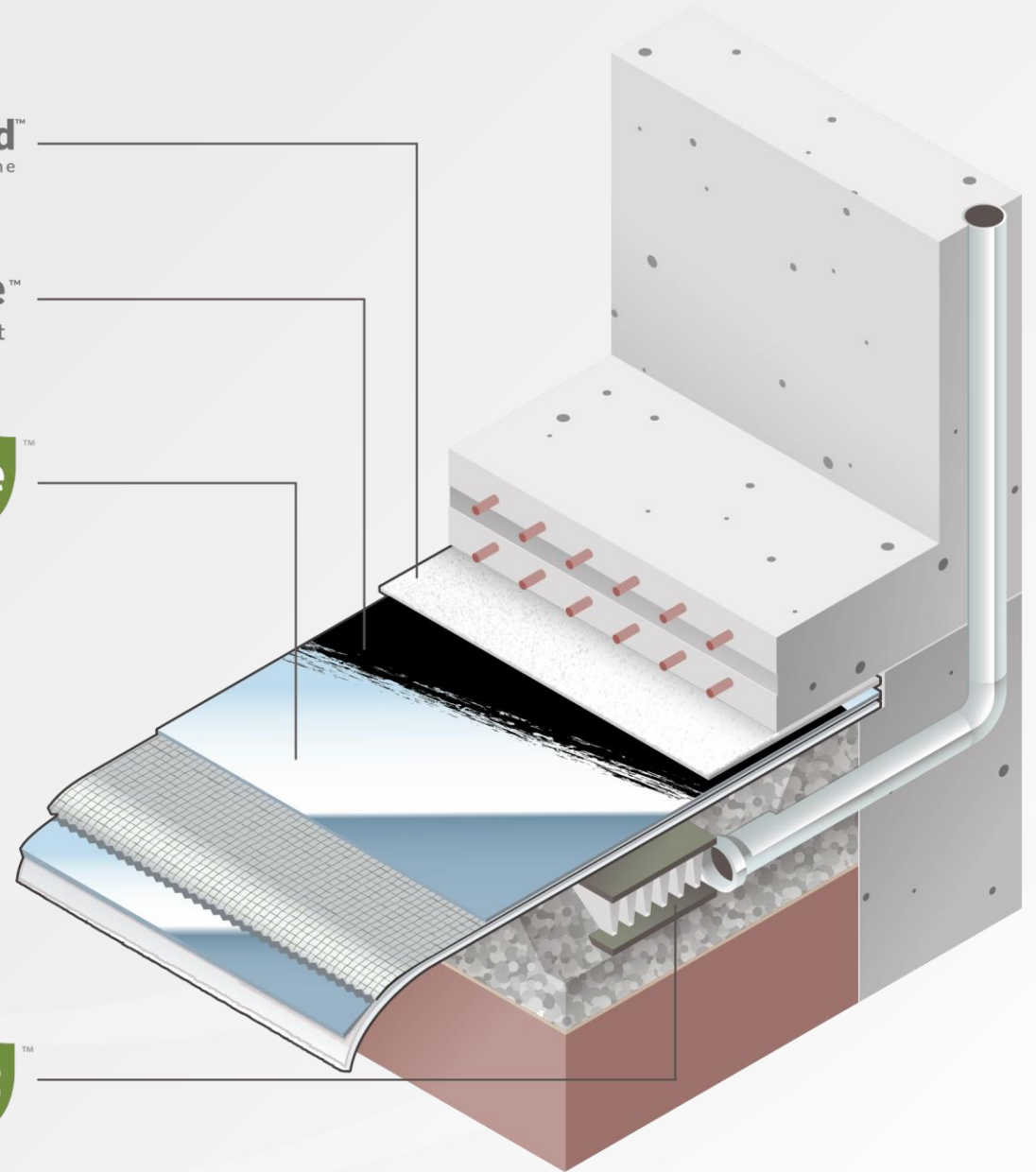
**LandScienceBond™**  
HDPE Composite Geomembrane

**Nitra-Core™**  
Nitrile-Modified Asphalt

**Terra Base™**

**Terra Vent™**

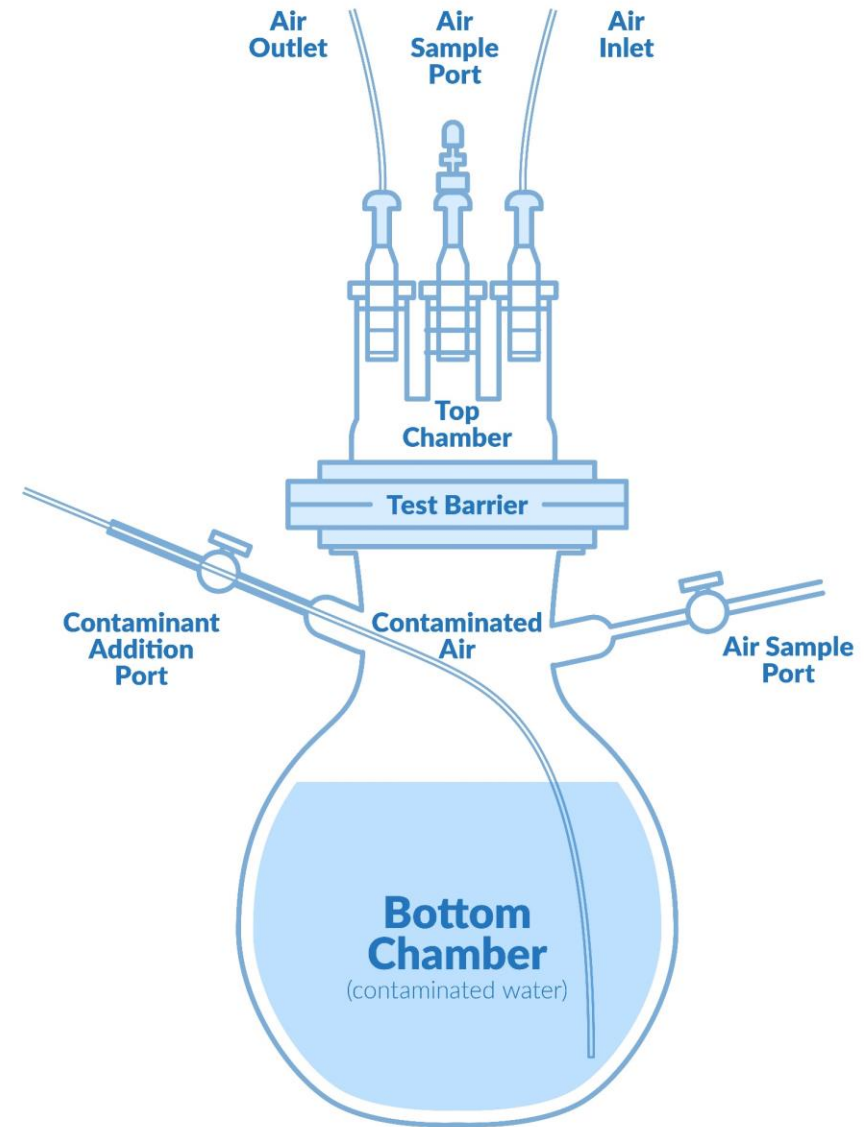
Low-Profile Venting System



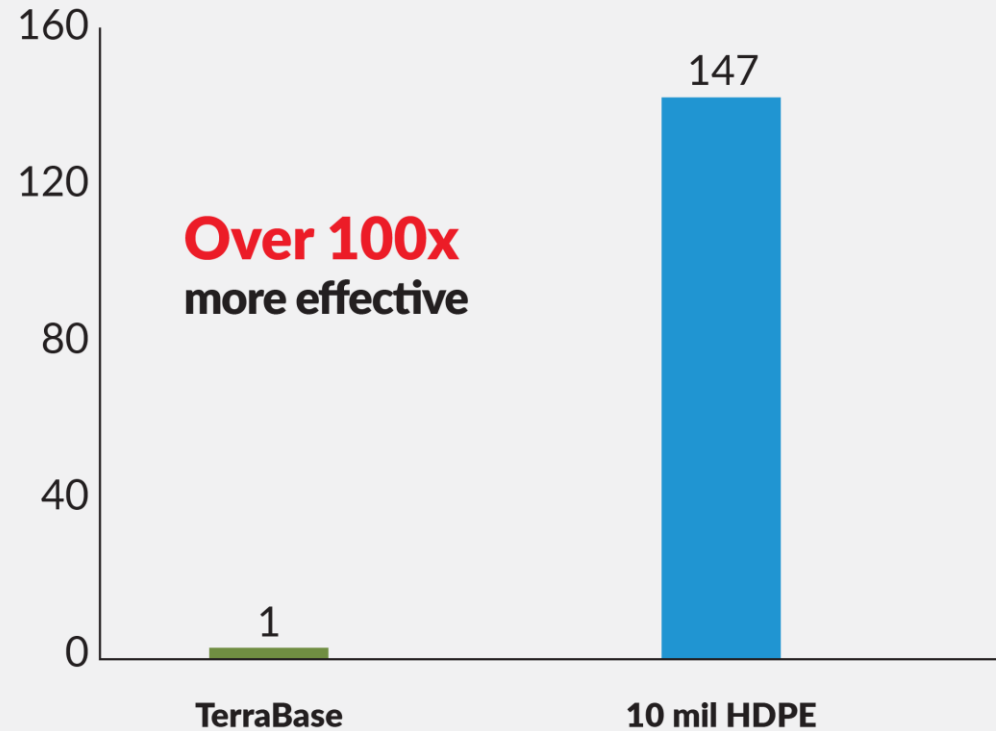


## GEO MEMBRANE TESTING

- Two-Chamber active diffusion testing
- Represent sub-slab cVOC challenge contaminant vapors
- TerraBase aluminized polyethylene vs HDPE sheet (10 mil)



# RESULTS



*Accelerated comparison showing the relative TCE flux through the vapor barrier base components: TerraBase, a dual-metalized geomembrane film, versus 10 mil HDPE.*

 **Nitra-Core™**

Nitrile-Modified Asphalt

- **No VOCs**
- **Good Mechanical Stability**
- **High Tensile Strength and Elongation**
- **Improves Puncture Resistance**
- **Significantly Improves Chemical Resistance**

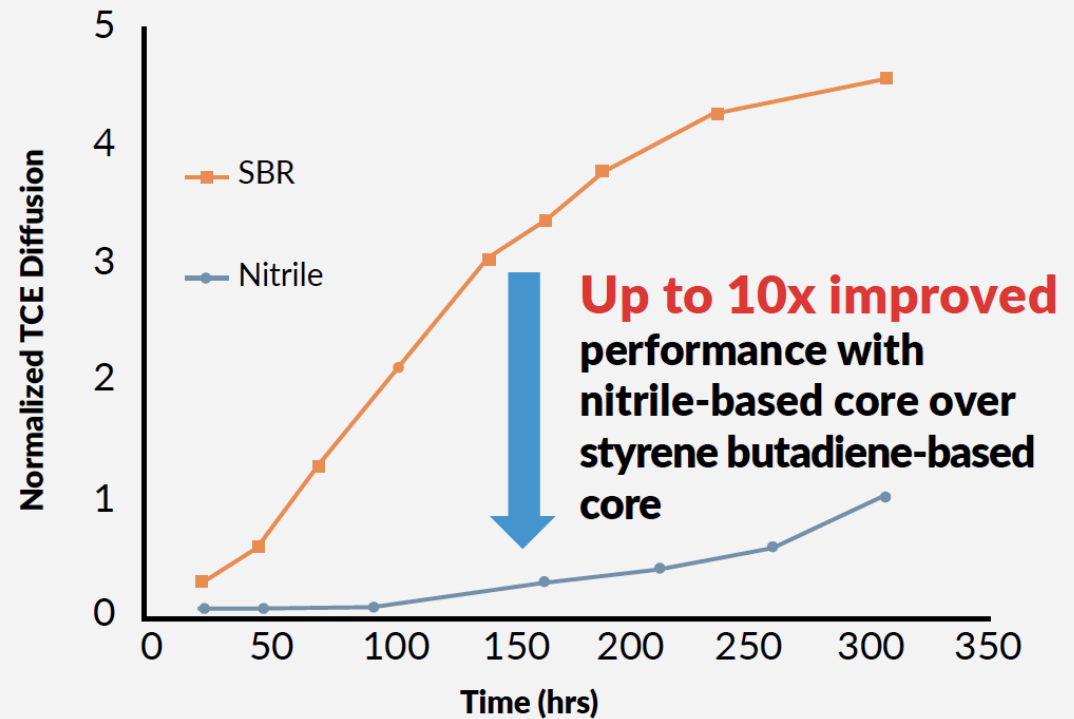




# RESULTS



## Nitra-Core Nitrile-Modified Asphalt



*Accelerated comparison of the TCE vapor resistance of Nitra-Core, a nitrile-modified spray applied asphalt layer, against spray-applied asphalt latex core, a styrene butadiene-modified asphalt layer. Both asphalt layers were sprayed to an identical thickness for the test.*



**Maximum Vapor  
Intrusion Protection**



**Excellent  
Constructability**



**Meets 60 Mil Barrier  
Requirement**

# Terra Shield™

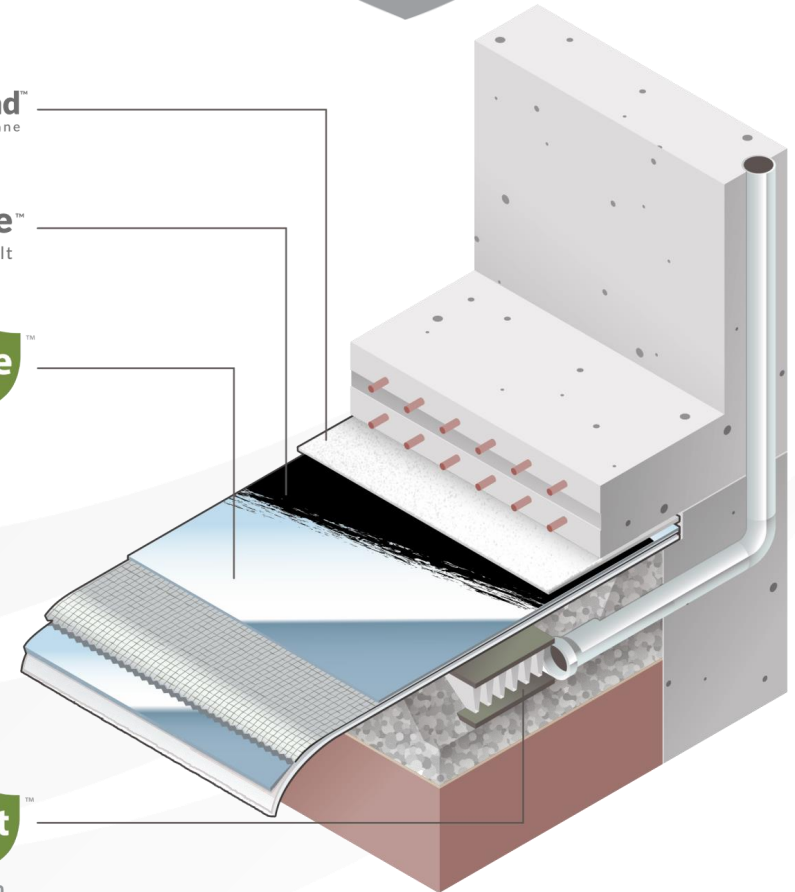
Aluminum Nitrile  
Vapor Barrier

 **LandScienceBond™**  
HDPE Composite Geomembrane

 **Nitra-Core™**  
Nitrile-Modified Asphalt

 **Terra Base™**

 **Terra Vent™**  
Low-Profile Venting System





 **Nitra-Seal**<sup>TM</sup>  
Nitrile-Advanced Vapor Barrier


**Constructability of a Composite Barrier**  
**10X More Chemically Resistant**

 **Nitra-Seal**<sup>™</sup>  
Nitrile-Advanced Vapor Barrier

# ADVANCED NITRILE COMPOSITE BARRIER SYSTEM

 **LandScienceBond**<sup>™</sup>  
HDPE Composite Geomembrane

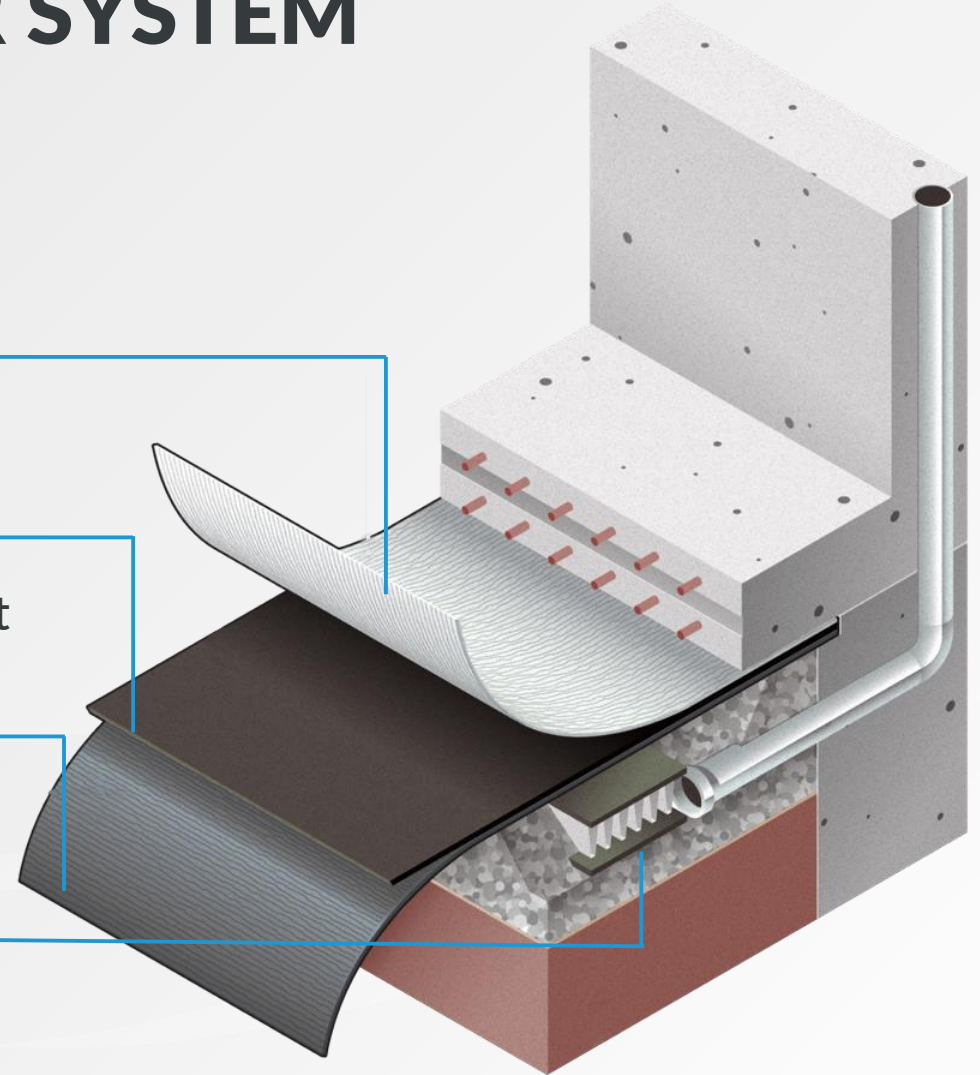
HDPE Composite Geomembrane

 **Nitra-Core**  
Nitrile-Modified Asphalt

 **Nitra-Base**  
Geo-Textile Substrate

 **TerraVent**<sup>™</sup>

Low-Profile Venting System







**MonoShield**™

Reinforced Aluminum  
Vapor Barrier

**Rapidly Installed Reinforced Aluminum Barrier  
Nitrile-Asphalt Spray Sealed Seams**

# MonoShield™

Reinforced Aluminum Vapor Barrier

- **Single Reinforced Aluminized Polyethylene Sheet**
- **Easily Installed**
- **Very Cost-Effective vs Thin Mil Plastic Sheets**
- **Nitrile-Asphalt Seams avoids Taped Seam Leaks**
- **Much More Puncture Resistant than Thin Mil Plastic Sheets**

# MonoBase™

Composite Metalized Geomembrane Film

Polyester Reinforcement

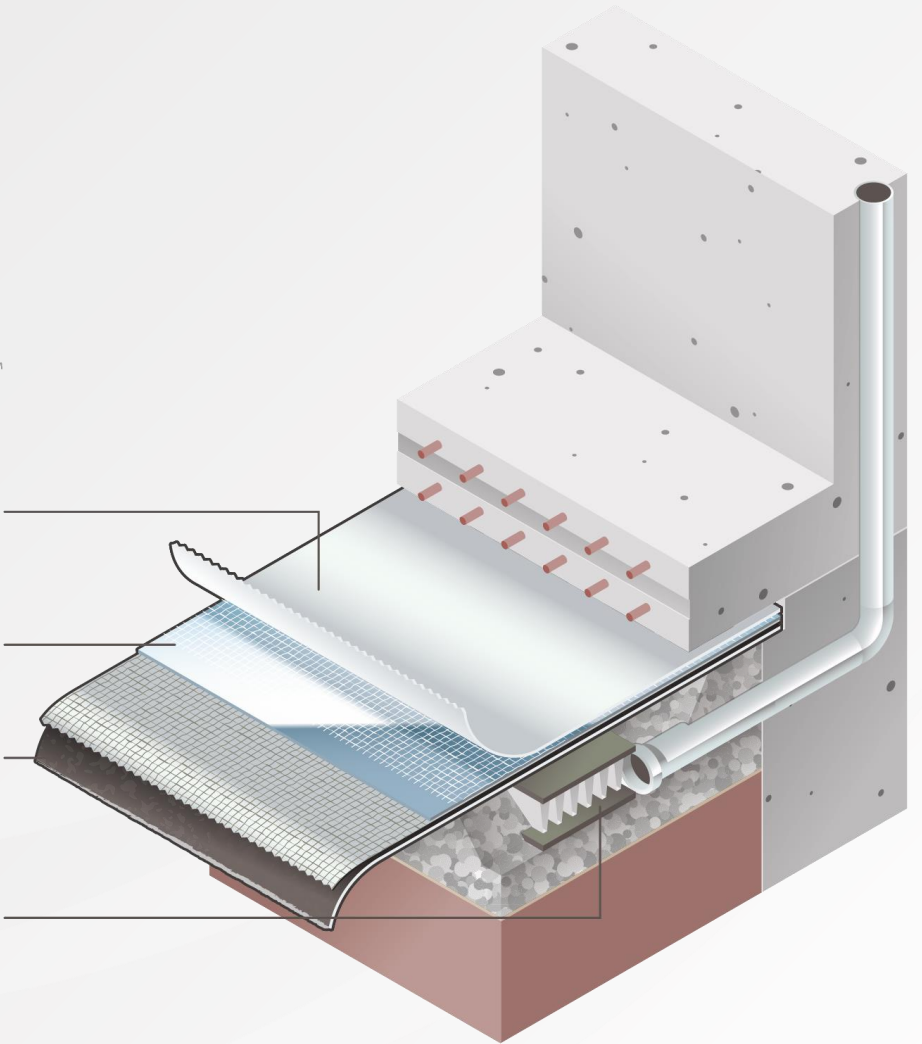
Metalized Film

Black Nonwoven Geotextile

# TerraVent™

Low-Profile Venting System

Low-Profile Venting System





# MONOSHIELD TARGET SITES

- Brownfield Sites With Low Vapor Intrusion Risk
- Large Warehouses Developments
- Preemptive Vapor Mitigation
- Not Appropriate for All Sites



# CHEMICAL RESISTANCE TESTING: MonoShield

## Internal testing:

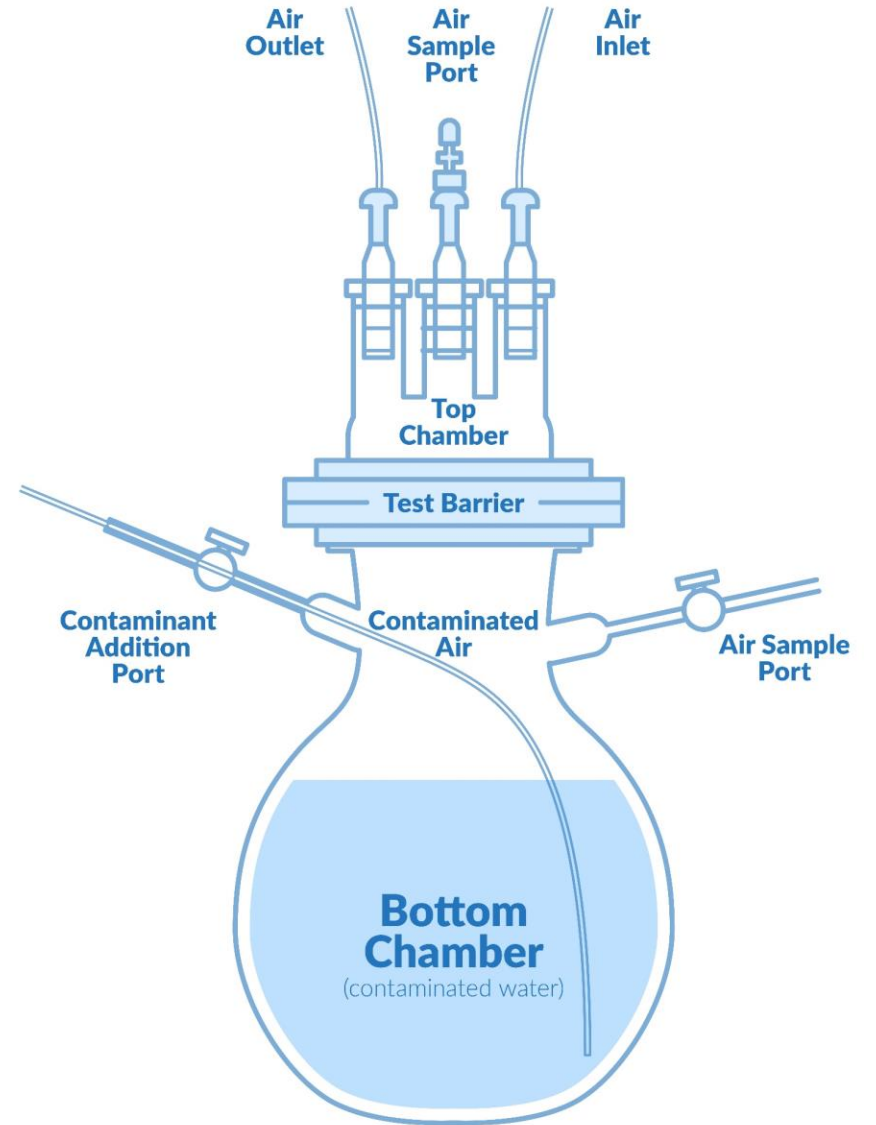
- Specialized testing chamber used to compare chemical resistance of various materials

## Results:

- MonoShield performed 10x better than HDPE

## Independent third-party testing

- Benzene diffusion coefficient:\*  
 $2.55 \times 10^{-15} \text{ m}^2/\text{s}$  (preliminary, testing still in progress)
- Methane (ASTM D1434)  
 $105 \text{ (mL(STP))/m}^2\cdot\text{d}\cdot\text{atm}$





# MonoShield™

Reinforced Aluminum  
Vapor Barrier

## Vapor-Tight Seams & Penetrations



# QUALITY CONTROL (QC) MEASURES



**Certified Applicator Network**



**In-field Inspection**



**Inspector Training and Certification**



**Thickness Verification**



**Smoke Testing**





## LOW-PROFILE VENTING SYSTEM

- Reduces Install Cost
- Vent Vapors From Under the Building
- Works with All Land Science Vapor Systems



# VAPOR BARRIER SYSTEM WITH A WARRANTY

## Material Warranty Options

	1 Year	5 Years	10 Years	20 Years	30 Years
TerraShield	•		•	•	•
MonoShield	•	•			
Nitra-Seal	•		•	•	•
Geo-Seal	•				
Retro-Coat	•				

## System Warranty Options

		5 Years	10 Years	20 Years	30 Years
TerraShield		•	•	•	•
MonoShield	•	•			
Nitra-Seal		•	•	•	
Geo-Seal					
Retro-Coat					





## Case Study

---

# Liberty Park Brownfield

## Southeast Michigan

# BACKGROUND



Liberty Park is located in Sterling Heights, Michigan, 23 miles north of downtown Detroit. This area is home to major car manufacturers and is colloquially known as “Automotive Alley.”



The site is a landfill-based brownfield site where a nearby creek was filled with incinerator waste which led to site contamination in the 40’s-50’s.



Liberty Park posed multiple remediation challenges including a variety of known contaminants and load-bearing issues with the soil. A unique foundation and vapor intrusion mitigation solution were crucial.



A competitive tax increment finance plan from the State of Michigan and City of Sterling Heights made brownfield redevelopment possible



# TIMELINE



**1940's-1950's**

Incinerator waste was placed at the site leading to contaminated conditions



**2017**

Liberty Park closed and purchased by Ashley Capital, LLC for redevelopment



**May 2019**

MonoShield Installation



**1984**

Liberty Park recreation complex opened



**June 2018**

Construction began

**AshleyCapital**




**August 2019**

Scheduled completion





“I’ve been looking for a product that meets the efficiency of a roll out barrier with spray applied components for seams and penetrations for quite some time. I’m really excited to use MonoShield at Liberty Park.”

- Mark Quimby, Senior Consultant  **SME**





**The MonoShield system was the most cost-effective system in the market... we've been able to shave off a couple months of our construction by going with this system.**

-Allen Dresselhouse, VP Construction & Development

***AshleyCapital***



# QC/AC MEASURES



- Certified applicator network
- Inspector training and certification
- Smoke testing
- Visual inspection



# RESULTS – Liberty Park

1

Liberty Park and the Tri-County Commerce Building preemptively protected from vapor intrusion

2

Completed in Late Summer of 2019, bringing jobs and economic growth to Eastern Michigan

3

All stakeholders are pleased with the results, where they were able to quickly implement a proven mitigation approach for their development



# Land Science



**Full Suite of  
VI Technologies**



**Design  
Assistance**



**QA/QC  
Process**



**Certified  
Applicators**



**Onsite  
Support**



# QUESTIONS?

**Jordan Knight, MPA**

**(470) 218-5728**

**[jknight@landsciencetech.com](mailto:jknight@landsciencetech.com)**

