

# TRI - REGIONAL JETS 2025



# Advancing Resilience in Civil Works and Vertical Facilities:

Long-lasting Solutions to Water Intrusion Through  
Innovation and Public-Private Collaboration



**SPEAKER**



**Marco Sousa**

CLWizard®

President, civil engineer



- **Sports Teams:** Ferrari Formula 1 (Cadillac Team 2026)
- **Did You Know:** I built my first R/C Airplane at the age of 11.
- **Hobbies:** Petrolhead
- **Coollest Project(s):** Diplomat Residences full Exp. Joints recovery.

MODERATOR



Thomas Chapman

Guidon

Principal, Vice-President



- **Sports Teams:** Eagles
- **Vacation Spots:** The South of France
- **Hobbies:** Golf, Triathlon, Sailing
- **Cooler Project(s):** Sodium Azide storage facility

# Learning Objectives

- **Identify** the water intrusion resilience opportunities in civil works and vertical facilities located in high water tables and heavy rainfall regions.
- **Understand** the costly collateral effect of incorrect applications and how injection systems have evolved over the years to become highly precise and reliable.
- **Sharing** case studies showing long-term resilience, cost efficiency, and sustainability.
- **Discuss** how public-private collaboration strengthens resilience and extends asset lifecycles.

# Agenda

- Resilience Opportunities to Address Water Intrusion
- Injection Systems & Best Practices
- Innovative Solutions with New Materials
- Driving Resilient Outcomes Through Collaboration
- Q&A / Discussion

# Resilience Opportunities to Address Water Intrusion



# Resilience Opportunities to Address Water Intrusion

“If you want a structure to last, keep water out.”

- **Critical Factor:** Water intrusion is central to resilience challenges
- **Benefits:**
  - **Structural Integrity & Safety** – stop corrosion, cracking, collapse risk (Surfside, 2021)
  - **Environmental Impact** – Prevents land field contamination
  - **Military Readiness** – protects facilities, enhances mission readiness (Strategic Plan 2030)
  - **Economic Costs** – cuts rework, liability and reduces cost
  - **Lifecycle Performance** – extends service life

# Common Mistakes

- Material and installation failures
- Constructive Methods
- Underground Waterproofing layer (materials that expand under hydrostatic pressure)
- Negative vs Positive Side Repairs (more cold joints)
- Traditional Repairs (invasive, temporary, costly)

*What makes you think that doing the same thing over and over will get you different results?*

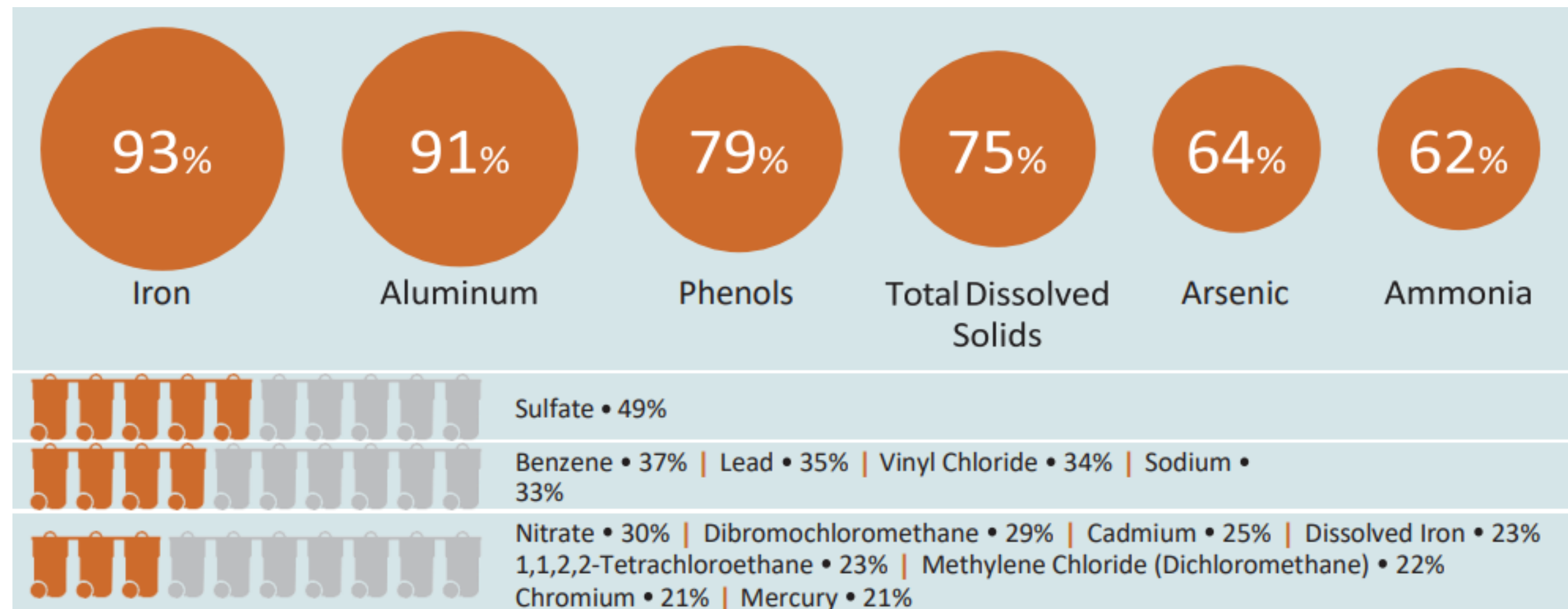
# Environmental Impacts

Complete  
EPA study (PDF)

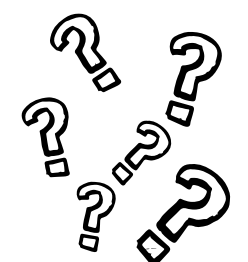


- 2018 EPA Study: Everglades Land fields – Natural resource contamination
- Federal Government spent \$3.2 bi (FY 2024)

## SITES EXCEEDING FLORIDA GROUNDWATER CLEAN-UP TARGET LEVEL



What does this  
have to do  
with Water  
Intrusion?



# How to address that?



# Injection Systems Overview

- Injection systems & best practices (ASTM/ACI)

|                         | Definition                                                        | Applications                                                                              | Benefits                                                                                                                                                                                                                                                                            | Drawbacks                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Single Component</b> | All components mixed in one container and pumped through one line | <ul style="list-style-type: none"> <li>• Soil</li> <li>• Structure</li> </ul>             | <ul style="list-style-type: none"> <li>• Simple setup</li> <li>• Highly mobile</li> <li>• More affordable</li> </ul>                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Less control over reaction</li> <li>• Variable performance</li> <li>• Dependent on external reaction agents</li> <li>• Unpredictable reaction behavior and timing</li> </ul> |
| <b>Bi Component</b>     | Part A and Part B are kept separate, mixed only at the gun.       | <ul style="list-style-type: none"> <li>• Water</li> <li>• Hydrostatic pressure</li> </ul> | <ul style="list-style-type: none"> <li>• Controlled and adjustable reaction</li> <li>• Higher quality assurance</li> <li>• Reliable, consistent injection</li> <li>• Defined reaction timing</li> <li>• Complete material activation</li> <li>• Precise pressure control</li> </ul> | <ul style="list-style-type: none"> <li>• More complex setup</li> <li>• Sensitive equipment</li> <li>• Requires skilled crew</li> </ul>                                                                                |

# Define Material Purpose

According to DIN EN 1504-5, materials are grouped into three categories:

**Structural (F – Force Transmitted): Epoxy, Cementitious, Structural PU, Silicates**

**Movement (D – Ductile): PU**

**Waterstop (S – Swelling): Acrylic, PU**

# Materials

There are 4 materials used by injection systems.

| Material            | Best Use Case                    | Strengths                      | Limitations                                     |
|---------------------|----------------------------------|--------------------------------|-------------------------------------------------|
| <b>EPOXY</b>        | Structural bonding, Crack repair | Strong, Durable                | Rigid, doesn't absorb cracks' natural movements |
| <b>POLYURETHANE</b> | Void filling, flow control       | Bonds well, Strong             | High Viscosity, expands without control         |
| <b>ACRYLATES</b>    | Soils, permanently wet areas     | Fluid, low viscosity, flexible | Needs hydration, no bonding                     |

*What's the 4th material?*

**What if we could eliminate the negative features and combine all the positive ones in one material?**



# POLYVINYL (DWG Nano-Polymer Eco V)<sup>®</sup>

- Water-like viscosity (turns into a flexible rubber)
- Bonds well
- Low Surface tension
- Flexible with or without water contact
- Active hydro-retaining
- Non-expansion reaction
- 100 years of design life
- Adjustable reaction time (40s a 600s)

Developed in Deerfield Beach (FL) and applied in the U.S. since 2017.

# Case Studies



# Expansion Joints

Diplomat Residences (Hollywood,  
FL)



## Key benefits:

- Cost reduction
- Immediate results
- Long-term resilience
- Operational continuity
- Minimal disruption

US Customs and Border Protection Office  
(Miramar)



# Public-Private Collaboration



# AUSTRALIA

Method of choice in major Australian public infrastructure projects.

## Designers:

- JACOBS
- WSP
- SMEC

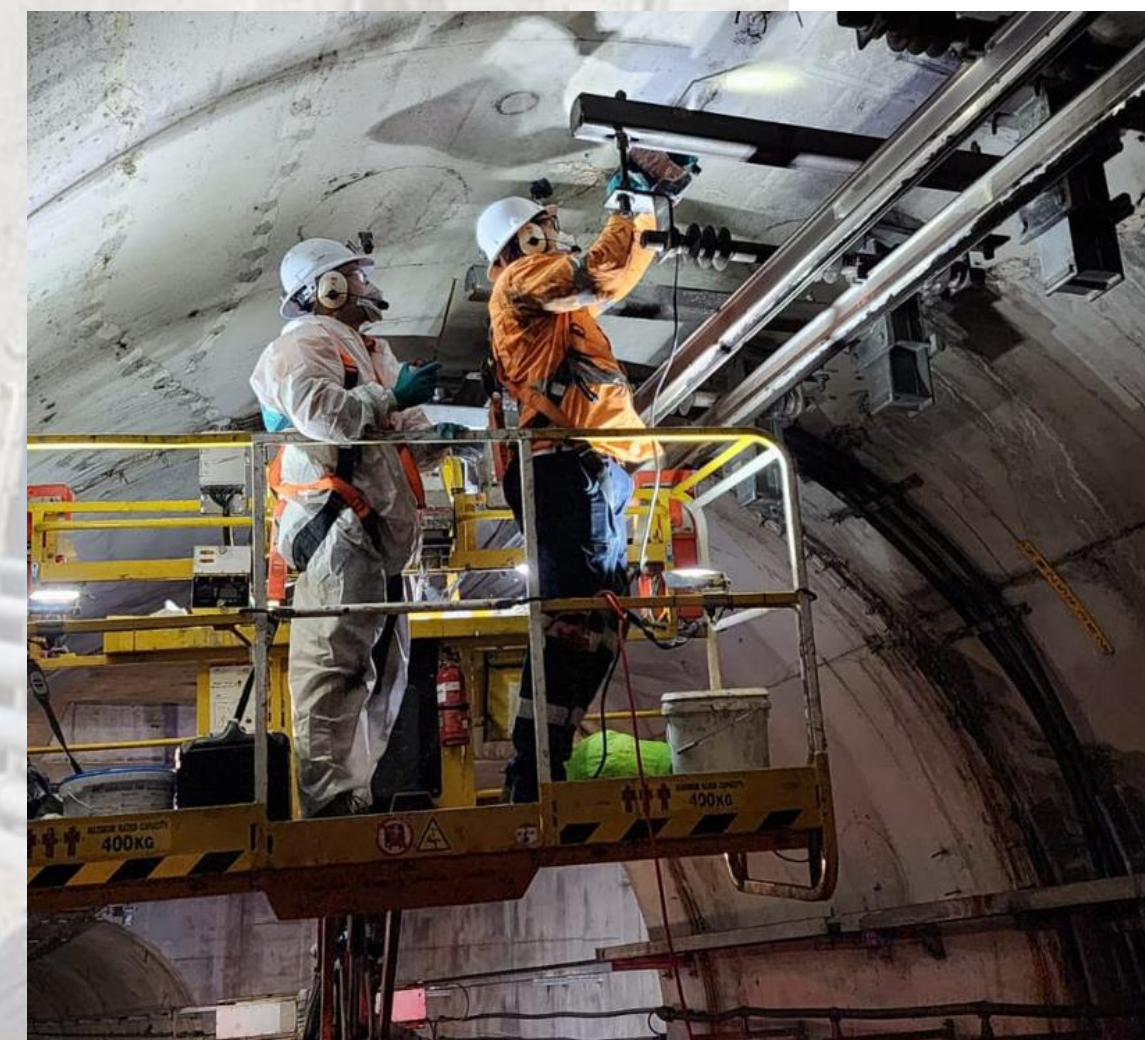
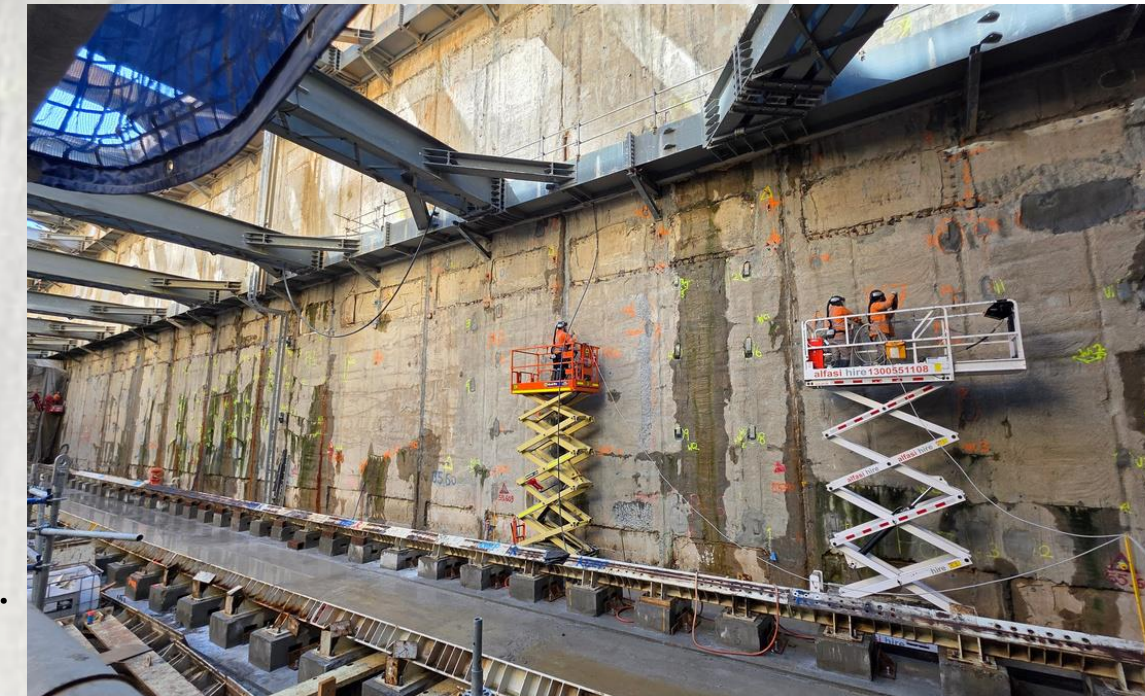
## Australian Agencies:

- Transport New South Wales
- Sydney Metro
- Sydney Train

- ✓ Replacement of German materials by an American material developed in Deerfield Beach, FL.
- ✓ Today introduced to the US Federal Government.

## Key Benefits

|            |                        |
|------------|------------------------|
| Time       | Cost Efficiency        |
| Resilience | Environmental Benefits |



**TRI - REGIONAL  
JETS 2025**



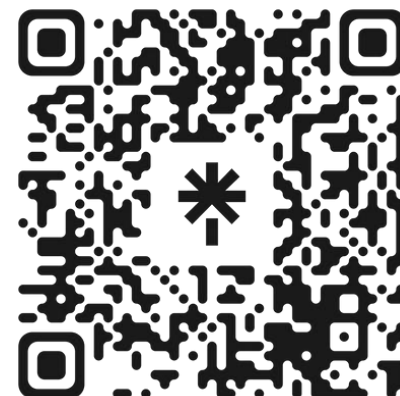
# ***Contact Us***



**Marco Sousa**  
*marco@clwizard.com*



**Thomas Chapman**  
*tchapman@guidon.com*



# Q&A / Discussion



# TRI - REGIONAL JETS 2025

