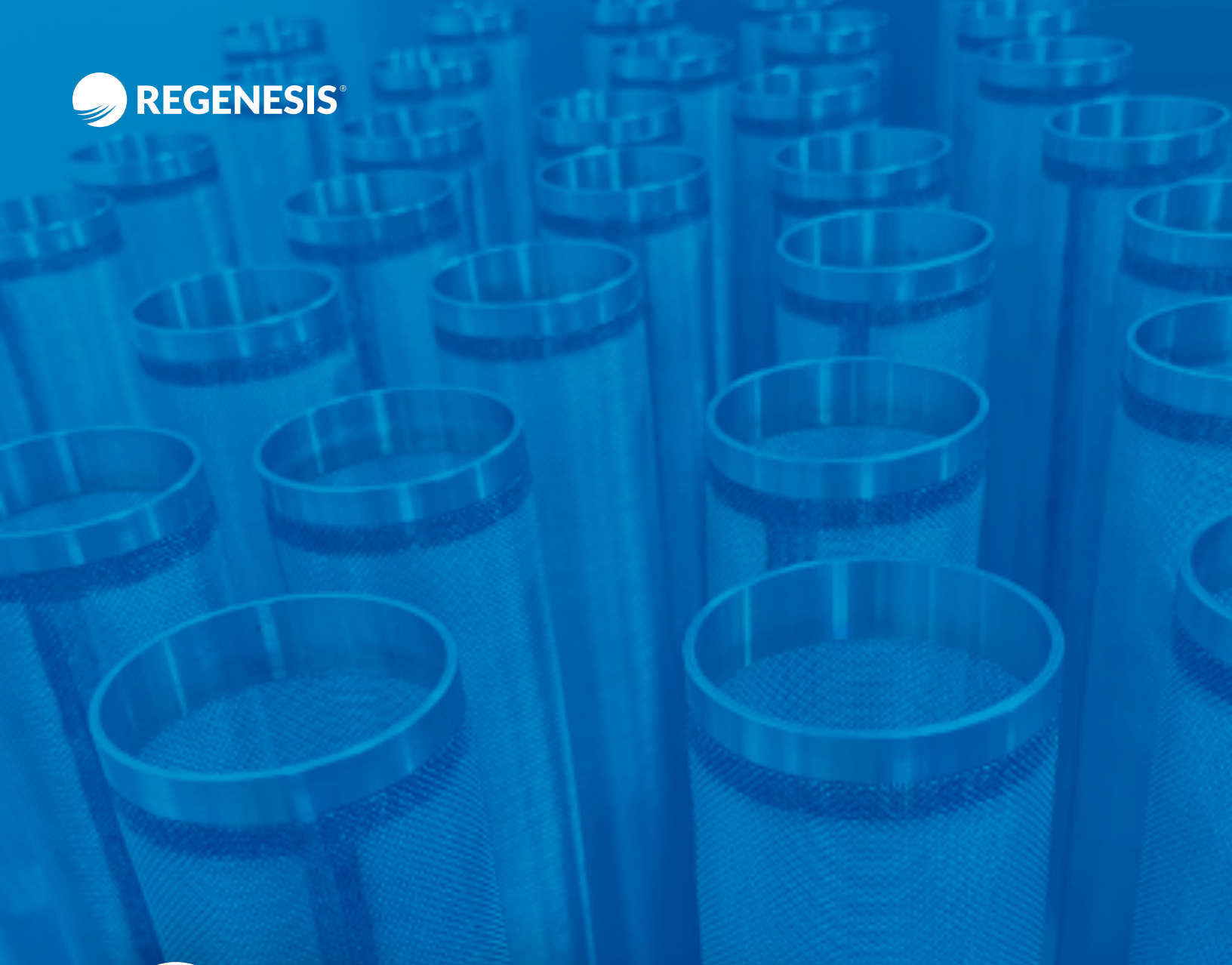
REGENESIS®



FluxTracer
Flux Mapping Tool

FluxTracer Overview

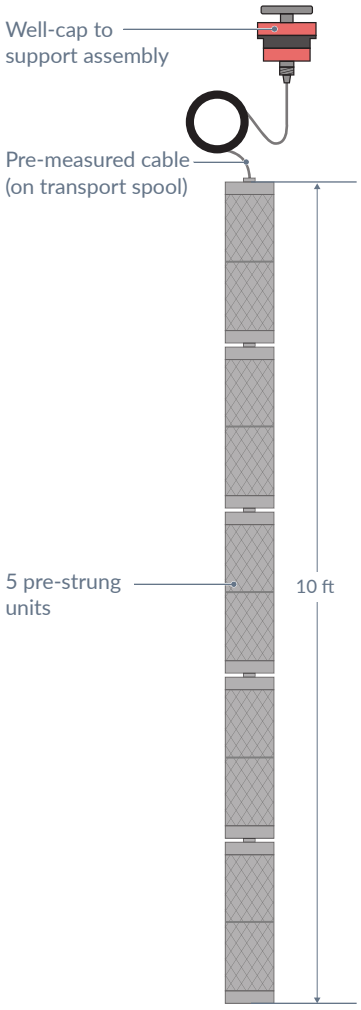
Technology at-a-Glance

Overview

FluxTracer: Technology at-a-glance

FluxTracer® Flux Mapping Tools are easy-to-use devices that vertically delineate contaminant mass flux and groundwater velocity within existing monitoring wells to aid in site characterization and remedial designs.

Conventional methods (pump and slug tests) give a single value for groundwater velocity whereas passive tools like FluxTracer are designed to distinguish individual zones within an aquifer. This level of resolution is especially useful for remediation design. See Figure 1 for visual representation.



A Dual-Functioning, Passive Sampling Technology For Site Characterization and *In Situ* Remediation Designs

The FluxTracer consists of separate two-foot-long stainless steel cannisters internally spaced in two chambers and secured in a series on a premeasured central wire line equipped with a modified J-plug. FluxTracers are always pre-assembled, and ready to deploy with no on-site construction required. The unique design provides joint-like flexibility between the closely stacked cannisters to easily install and remove from a well.

Key Benefits:

- High Data Resolutition and Accuracy
- Plume Characterizatition
- Estitimate *In Situ* Product Longevity
- Reliable Turnaround Time
- Affordable with Full Customer Support

Fast Installatition:

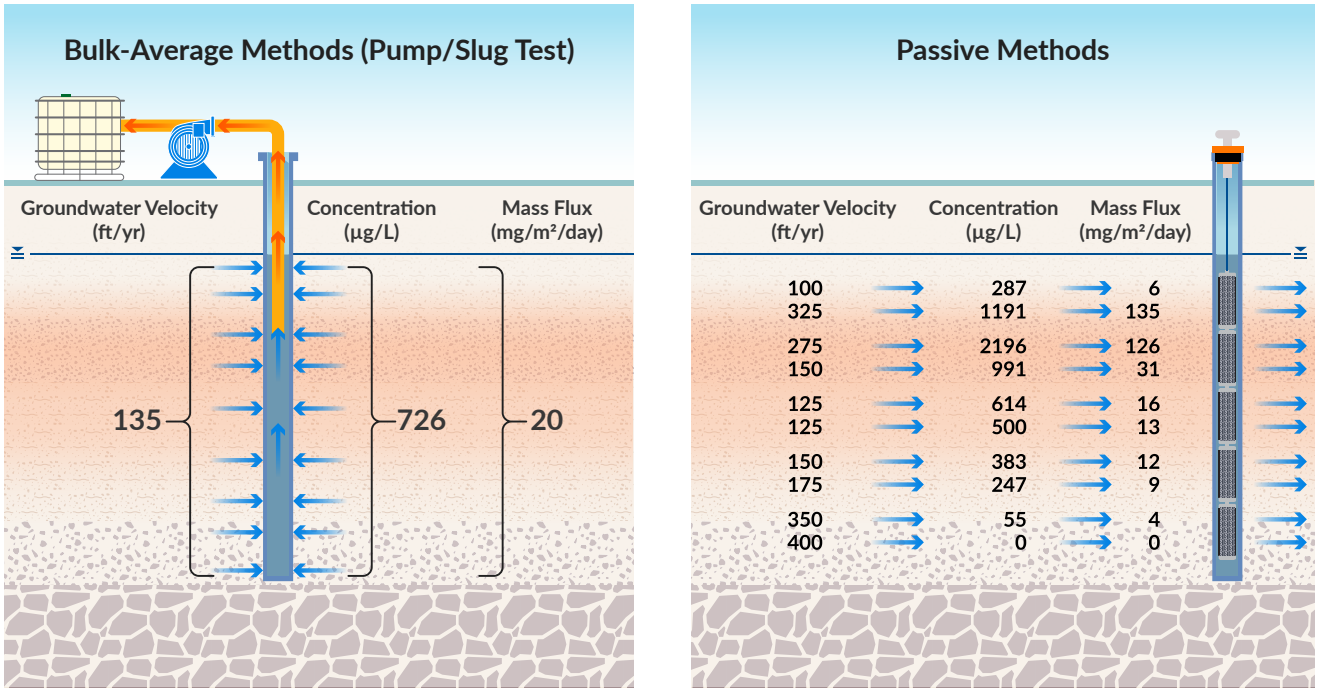
- 15-Minute Install Per Device
- Ready to Deploy Upon Arrival
- No Assembly Required

Target Contaminants:

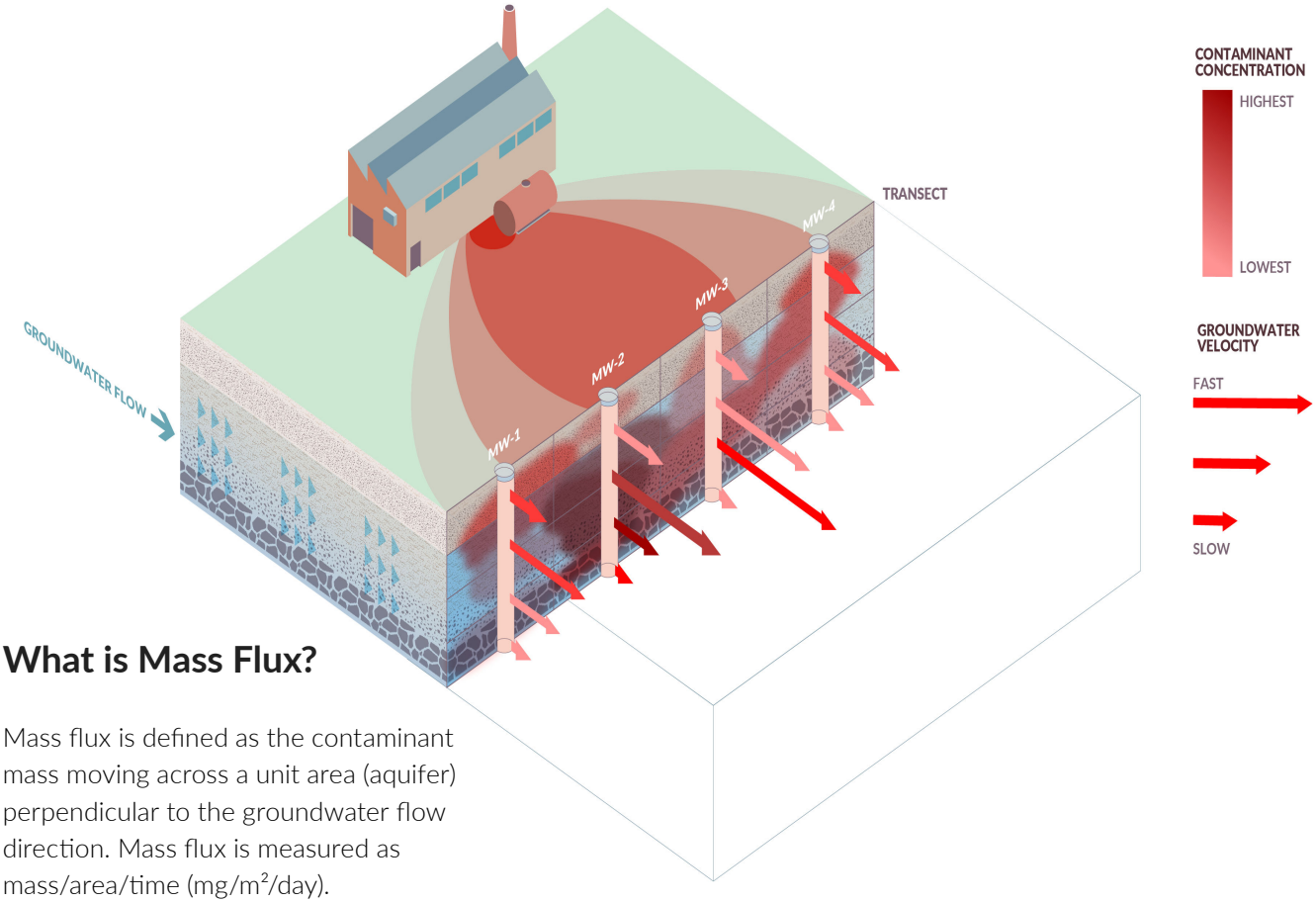
- Chlorinated Volatitile Organic Compounds (CVOCs)
- PFAS
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX) and Total Petroleum Hydrocarbons (TPH) (PFM)*

* Analysis for BTEX and TPH are in development.

Figure 1 Measuring Groundwater Velocity & Mass Flux: Data Comparison



A comparison of conventional and passive methods of velocity and flux measurement



What is Mass Flux?

Mass flux is defined as the contaminant mass moving across a unit area (aquifer) perpendicular to the groundwater flow direction. Mass flux is measured as mass/area/time (mg/m²/day).

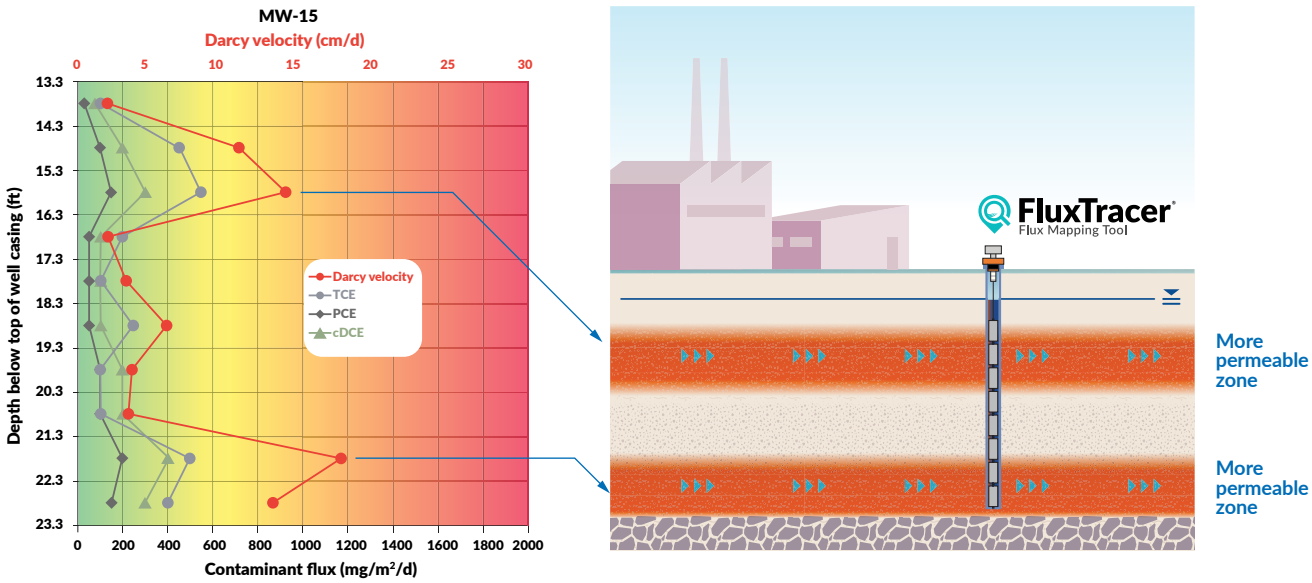
A Closer look

Each FluxTracer canister is filled with an adsorbent material pre-loaded with biodegradable tracers. The tracers are composed of five different alcohols each having well-known partitioning characteristics with the media. As groundwater passively flows through a FluxTracer canister over the deployment period, the alcohol tracers are depleted from the adsorbent material, with the net loss of the tracers directly correlating to the groundwater speed. At the same time, the contaminants of concern (COC) present in the groundwater adsorb to the FluxTracer during the deployment period. The total mass of contaminants accumulated on the adsorbent material is then quantified and the contaminant mass flux is calculated.

A study consists of a FluxTracer installation into a well across a predetermined vertical interval of the saturated zone. The FluxTracer unit is typically in the well for two weeks and then retrieved. Once removed from the well, the FluxTracer devices are simply repackaged into the provided sleeves with zip ties and returned to the REGENESIS Lab for analysis. No on-site disassembly or sampling is required.

Upon receipt in the REGENESIS lab, each FluxTracer canister's contents will be sampled and analyzed at one-foot intervals. From those analyses, an accurate vertical profile of contaminant mass flux and groundwater Darcy flux (speed) is generated, and the results are provided in a report. The generated data provides remedial designers with important information on the flux zones within the aquifer, which ultimately aids to improve the results of remediation efforts.

Figure 2 **Conceptual Site Model**



Site data showing mass flux of chlorinated contaminants (PCE, TCE, cDCE). Data shows highest TCE mass flux at 15.75' depth below casing and highest cDCE at 14.75' depth below casing. The mass flux data can be used to design with more certainty through applying additional focus on areas of the interval with the highest flux.

Why Design with Mass Flux and Groundwater Velocity?

- Identify impacted zone beyond well interval
- Developed for *in situ* remediation scale products
- High resolution data on conductive zones
- Estimate longevity of permeable reactive barriers
- Identify discrete zones with the highest contaminant mass
- Comparable cost to pump and slug tests
- Lower costs than HPTs

Oftentimes 90% of contaminant mass is moving through 10% of the aquifer

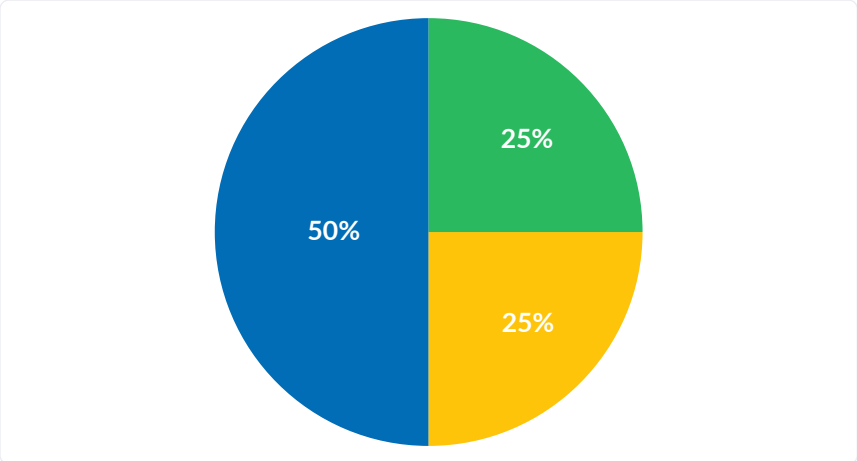
Conventional Methods can Significantly Underestimate Velocities in Flux Zones

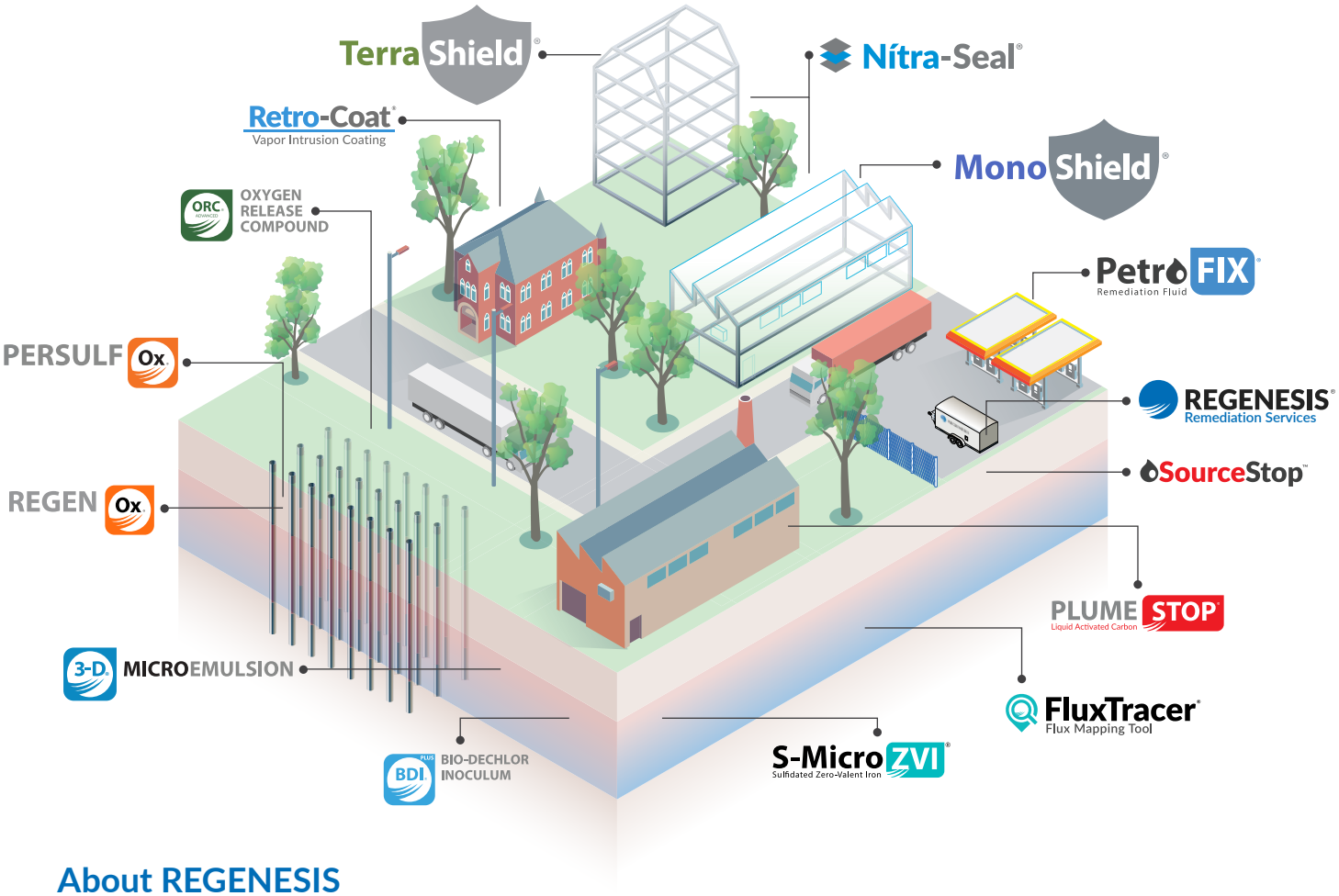
Groundwater velocity is a major component of contaminant mass flux and understanding the flux is essential to designing for in-situ remediation.
The study summarized in the chart below shows that groundwater velocity can be underestimated 50% of the time using conventional methods such as slug and pump testing, and hydraulic profiling tools (HPTs). Slug and pumping tests provide bulk water averages and do not provide the resolution required for in-situ remediation designs. HPTs can provide resolution and has good vertical response across the target zone using k values, but the data generated are qualitative and not quantitative.

Approximately 50% of designs are modified after conducting FluxTracer measurements

Figure 3 **Passive Flux Device & Traditional Seepage Velocity Comparison**

Traditional seepage velocities are those derived from slug tests or pump tests





About REGENESIS

At REGENESIS we value innovation, technology, expertise and people which together form the unique framework we operate in as an organization. We see innovation and technology as inseparably linked with one being born out of the other.

Inherently, innovation imparts new and better ways of thinking and doing. For us this means delivering expert environmental solutions in the form of the most advanced and effective technologies and services available today.

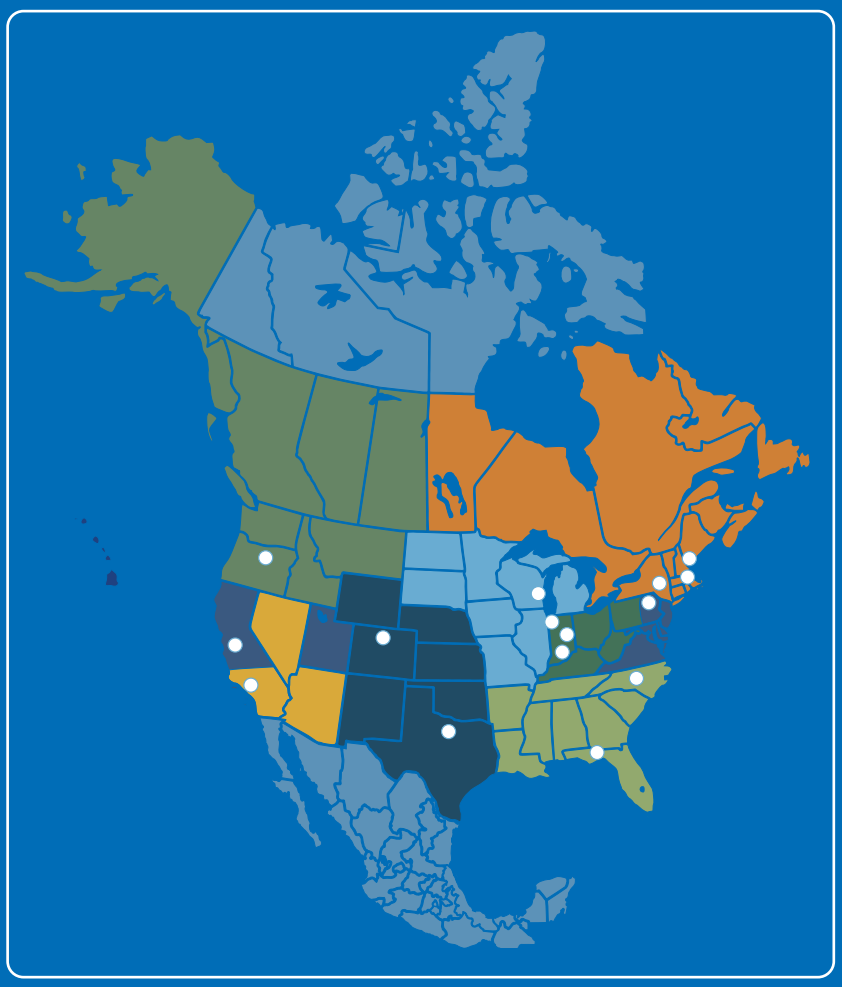
We value expertise, both our customers' and our own. We find that when our experienced staff collaborates directly with customers on complex problems there is a high potential for success including savings in time, resources and cost.

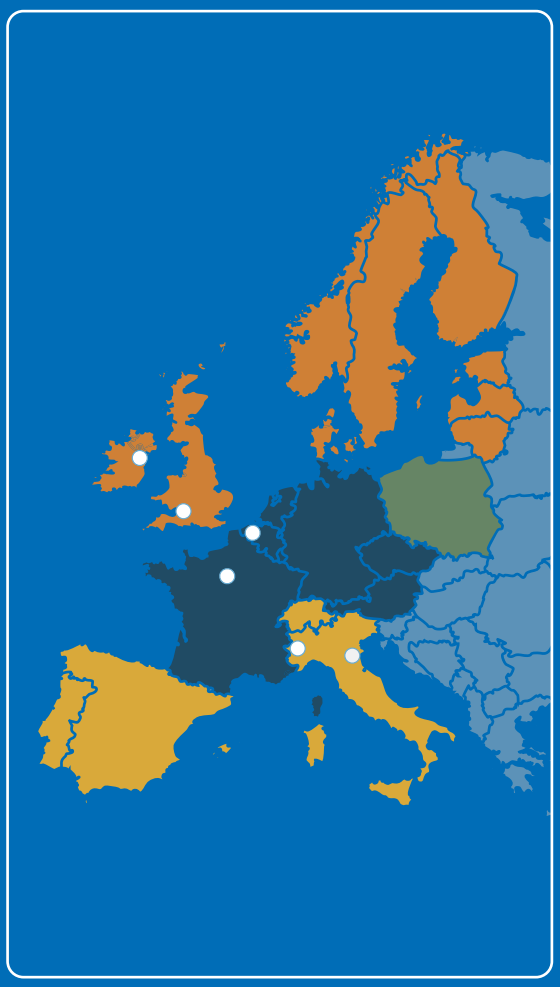
At REGENESIS we are driven by a strong sense of responsibility to the people charged with managing the complex environmental problems we encounter and to the people involved in developing and implementing our technology-based solutions. We are committed to investing in lasting relationships by taking time to understand the people we work with and their circumstances. We believe this is a key factor in achieving successful project outcomes.

We believe that by acting under this set of values, we can work with our customers to achieve a cleaner, healthier, and more prosperous world.

REGENESIS®

We're Ready to Help You Find the Right Solution For Your Site





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