



## PetroFix Groundwater Sampling Technical Bulletin



## PetroFix In Monitoring Wells Post Injection

During injection, PetroFix® may flow into nearby monitoring wells, as evidenced by sampling the well and finding the water color to be black. This occurrence is not uncommon and is simply the result of the PetroFix material transporting through the natural flux zones of the aquifer. To ensure that

PetroFix in monitoring wells doesn't interfere with commercial analytical methods, several things can be done. This document describes the best practices for analysis of PetroFix-impacted water in monitoring wells.

## What should be done?

If a well is impacted, the best solution is to delay sampling and analysis until PetroFix has had more time to deposit onto the soil which will result in clarified groundwater samples. *At many sites, two to four weeks is enough, although it can take up to three months or more.* The time to equilibrate in the subsurface is correlated with soil clay and silt content. Generally, increased clay and silt content will decrease the time for PetroFix to sorb and equilibrate. Divalent cations (ex. calcium or magnesium) in groundwater also speed up the clarification process.

If PetroFix is observed in a groundwater well during application, the well can be flushed with clear water (i.e., no reagent). More information on a clear water well flush can be found in the [“PetroFix Well Flushing” Technical Bulletin](#). If sampling at least four weeks post-PetroFix application, extended low-flow purging of the monitoring well may improve the water clarify.

As a rule of thumb, if a sample is placed in a 40-mL VOA vial and you can see through the vial it is probably safe to sample. The inability to effectively see through a vial is approximately 100 mg/L of PetroFix (see image of various PetroFix concentrations below for reference). Regenesi provides simple in-field PetroFix testing kits that can be used to measure in-well concentrations to give

more certainty if a sample can be sent to a lab or if sampling should be delayed. This test kit has a pre-made 50 mg/L standard used to estimate your groundwater concentrations. Plotting concentrations over time might provide some sense on when your site might reach a good time to sample. Please contact Regenesi at [info@petrofix.com](mailto:info@petrofix.com) or 949-366-8000 if you want to obtain a test kit.

If you are interested in independent research on showing if and when suspended carbon from PlumeStop (or PetroFix since they are the same form of carbon) interferes with laboratory samples please view the [webinar entitled "Remediation of Chlorinated Solvents in Groundwater with PlumeStop: Analytical Challenges and Solutions"](#) which was given by Heather Lord, PhD, the Environmental Research and Development Manager for Maxxam Labs. Starting at roughly 15 minutes the presenter begins discussing the ranges up to where PlumeStop (or PetroFix) does not cause significant lab interference (roughly 100 mg/L) and positive results from passive diffusion bag samplers.

Passive diffusion bag (PDB) samplers can be used to sample groundwater where PetroFix is present. The PetroFix cannot diffuse through these bags so the groundwater collected will be free of PetroFix. More information on PDB samplers is discussed in the next section.

Unfortunately, there are no commercial laboratory prep procedures that can easily remove PetroFix from samples prior to analysis without deviating from standard methods. Filtering the 1 to 2 micrometer diameter particles from suspension is possible, although difficult and not always an accepted approach by every regulatory agency.

While centrifuging is a possible option, commercial labs typically do not have one with the necessary centrifugal force to effectively separate PetroFix. If you need further technical assistance addressing interference of PetroFix when sampling, please contact Regenesys at [info@petrofix.com](mailto:info@petrofix.com).

## *Passive Diffusion Bags and PetroFix Sampling*

The big advantage of PDBs is confidence that you can sample groundwater for VOC's at any time post injection based on your desired sampling time frames and without interference from any suspended PetroFix. Furthermore, according to the Interstate Technology Regulatory Council (ITRC) PDB sampling is cost-effective and a viable alternative to standard or low-flow purge and sample techniques for collecting volatile organic compound (VOC) data at monitoring wells. A majority of sites won't need PDBs, particularly if you plan to sample a full quarter or more post PetroFix injection. However, if there is any concern about potential sampling delays because of suspended PetroFix in a well then we recommend that you consider using PDBs.

PDB samplers, which are typically low-density polyethylene bags filled with water, have been shown in multiple studies to provide accurate groundwater VOC measurements. These bags come in 1 to 4 foot lengths and are filled with clean water and hung into a well for a minimum of two weeks. PDB sampling is achieved as VOCs in groundwater diffuse through the wall of the bag and into the bag water, which eventually comes to equilibrium with the surrounding well water. Because the solid, colloidal activated carbon particles from PetroFix cannot penetrate bag, they are excluded from the PDB water and do not interfere with this sampling

technique. State regulatory agencies might ask you to compare PDB's to normal groundwater samples (i.e. low-flow sampling or bailing) to prove that they correlate. With this in mind, we recommend you take baseline samples alongside PDB samples prior to any PetroFix application where time-critical monitoring will begin shortly afterwards.

To get accurate groundwater VOC values that compare to past or present results it is critical to hang a PDB from the same vertical sampling interval in a monitoring well used from other sampling efforts. This is because groundwater contamination can stratify in an aquifer and a plume may have different vertical groundwater concentrations intersecting a monitoring well screen and those difference can be detected by PDBs hanging in a well. This phenomenon also is true for common low-flow sampling. For example, at a hydrocarbon site it is common for higher groundwater concentrations to be present in the aquifer near the surface of the aquifer where the smear zone resides versus at the bottom of a well where it is not likely present. However, multiple studies do show that when PDBs are hung in the same zone that you normally collect standard or low-flow purge and sample techniques they will correlate and provide accurate VOC concentrations.

Please note PDBs are not suitable for monitoring certain organic (MTBE, TBA) or ionic (nitrate, sulfate) species. These parameters should be measured using normal sampling techniques after the PetroFix suspension has mostly clarified from groundwater. The ITRC FAQ document linked below provides a list of compounds showing good correlation in laboratory tests.

We recommend you become familiar with available resources on PDBs (in particular the first ITRC FAQ listed below) and guidelines from the suppliers of PDBs. Here are some helpful links:

#### **PDB Guidance Documents:**

ITRC FAQ On PDBs And List Of VOC's Showing Good Sample Correlation:  
<https://www.itrcweb.org/Documents/PDBFAQs2.pdf>

Users Guide for Polyethylene-Based PDBs:  
<https://www.itrcweb.org/GuidanceDocuments/DSP-1a.pdf>

USEPA Clu-In.org guidance on Diffusion Samplers:  
[https://clu-in.org/characterization/technologies/default.focus/sec/Passive\\_\(no\\_purge\)\\_Samplers/cat/Diffusion\\_Samplers/](https://clu-in.org/characterization/technologies/default.focus/sec/Passive_(no_purge)_Samplers/cat/Diffusion_Samplers/)

#### **PDB Suppliers:**

ALS: <https://www.alsglobal.com/en-us/services-and-products/environmental/sampling/passive-diffusion-bags-pdbs>

EON Products Incorporated: <https://store.eonpro.com/store/c/71-Water-Sampling-Pumping.aspx>



**Figure 1** - PetroFix concentrations in 40 mL VOA vials. If a vial can be seen through (<100 mg/L) it is safe to sample and send to the lab.



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**PetroFIX**  
Remediation Fluid

Chemical Name	1,1,1-Trichloroethane	UN Number	1845
Product Name	REMED	UN Class	3
Manufacturer	REGENESIS	UN Subclass	
Product Description	Remediation Fluid	UN Special	
Product Code	REMED	UN Hazard	
Product Weight	300 lbs	UN Label	
Product Volume	300 gal	UN Marking	
Product Density	11.5 lb/gal	UN Identification	
Product Specific Gravity	1.49	UN Identification	
Product Viscosity	1.0 cP	UN Identification	
Product Boiling Point	74.3 °C	UN Identification	
Product Freezing Point	-109.3 °C	UN Identification	
Product Flash Point	> 100 °C	UN Identification	
Product Vapor Pressure	1.0 psi	UN Identification	
Product Solubility	Insoluble	UN Identification	
Product Odor	None	UN Identification	
Product Toxicity	None	UN Identification	
Product Corrosivity	None	UN Identification	
Product Reactivity	None	UN Identification	
Product Stability	Stable	UN Identification	
Product Incompatibility	None	UN Identification	
Product Hazardous Materials	None	UN Identification	
Product Environmental Hazards	None	UN Identification	
Product Disposal	None	UN Identification	
Product Storage	None	UN Identification	
Product Handling	None	UN Identification	
Product Safety	None	UN Identification	
Product Use	None	UN Identification	
Product Restrictions	None	UN Identification	
Product Expiration	None	UN Identification	
Product Shelf Life	None	UN Identification	
Product Lot Number	PFX19074	UN Identification	

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