# Technology Innovation News Survey

***Entries for July 1-15, 2024***

## Market/Commercialization Information

### F -- SOURCES SOUGHT / REQUEST FOR INFORMATION (RFI) (SRCSGT)
U.S Department of Energy, Environmental Management Consolidated Business Center, Cincinnati, OH
Contract Opportunities on SAM.gov 89303324REM000134, 2024

This is a sources sought notice for marketing research purposes only. DOE's Office of Environmental Management (EM) is currently in the market research phase for the eventual follow-on competitive procurement for legacy cleanup at the Los Alamos National Laboratory (LANL), hereafter referred to as the "Los Alamos Legacy Cleanup Contract II (LLCC II)," under NAICS code 562910. LANL is owned by the National Nuclear Security Administration and is managed and operated by an NNSA prime contractor. The EM Los Alamos Field Office program's mission is to safely, efficiently, and with full transparency complete the cleanup of legacy contamination resulting from nuclear weapons development and government-sponsored nuclear research at LANL. Since October 1, 1988, the programs that characterize and remediate contaminants in the environment, decontaminate and decommission process contaminated facilities, and manage and dispose of legacy transuranic waste have been funded by DOE EM. DOE is seeking innovative, risk-based End-State approaches (based on risk analysis) for completing cleanup activities in a safe, compliant, and efficient manner that will result in an accelerated reduction of risk and environmental liability. The term "End State" is defined as the specified situation at successfully completing an interim and/or final phase of an environmental cleanup activity. Capability statements are due by 5:00 PM EDT on September 5, 2024. https://sam.gov/opp/2ee855703aa049f5ad2d34f713a8910b/view

### F -- MANSFIELD TRAIL SUPERFUND SITE OU2 (SOL)
U.S. Army Corps of Engineers, Northwestern Division, Kansas City, MO
Contract Opportunities on SAM.gov W912DQ24R3100, 2024

This is a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers requires a contractor to conduct a remedial action of Operable Unit 2 at the Mansfield Trail Superfund Site in Byram Township, New Jersey. The site consists of former waste disposal trenches in an upland wooded area with associated groundwater and residual soil contamination. Groundwater contaminated with CVOCs, primarily TCE and cis-1,2-DCE from the former waste disposal trenches, migrated to nearby residential potable wells. Residual soil contaminated with lead and PCBs from the former waste disposal trenches, specifically the waste disposal trench referred to as Dump Area A, migrated to the backyards of two residential properties. The work will be conducted under an ID/IQ Single Award Task Order Contract (SATOC) with a capacity of $49M. The SATOC will provide the Government with continuity of personnel and institutional knowledge for developing a streamlined response and flexible vehicle for cost-effective soil and groundwater remediation. Work may require, but is not limited to, remedial actions, short-term operation and maintenance, reports, and any other actions necessary to implement the soils and groundwater remedies at the site. The remedial action work includes but is not limited to, contaminated soil excavation and disposal, stormwater controls, soil vapor extraction, ISCO/ISCR injection, well installation, and monitoring well sampling. All site-related work must comply with CERCLA. Offers are due by 12:00 PM CDT on September 9, 2024.https://sam.gov/opp/62863b2030174d29a5473ddd332305f1/view

### F -- DFSP OZOL, CA O&M REMEDIATION SYSTEMS (SOL)
U.S. Department of Defense Logistics Agency, DLA Energy, Fort Belvoir, VA
Contract Opportunities on SAM.gov SPE60324R0504, 2024

This is a total small business set-aside under NAICS code 562910. The U.S. Department of Defense Logistics Agency requires remediation, compliance, and facility maintenance services at Defense Fuel Support Point Ozol, located west of Martinez, California. Work will include 1) project management; 2) site investigation, risk assessment, evaluation of remedial alternatives, and selection of remedial action; 3) environmental remediation systems Operation and Maintenance (O&M) at the site; 4) monitoring and reporting of site environmental conditions; 5) public involvement; 6) records and data management; 7) emergency response event evaluation; 8) environmental compliance support; and 9) environmental facility maintenance activities. The objective is to protect human health and the environment by managing, operating, maintaining, and monitoring contaminant recovery systems and the environmental media (e.g., surface water, groundwater, soil, or air). Offers are due by 4:00 PM EDT on September 20, 2024. https://sam.gov/opp/9be81f4b115e4e7496fdc9e536c52430/view

### F -- $249M IDIQ MATOC FOR ENVIRONMENTAL REMEDIATION SERVICES (ERS) - SMALL BUSINESS SET-ASIDE (PRESOL)
U.S. Army Corps of Engineers, Northwestern Division, Omaha District, Omaha, NE
Contract Opportunities on SAM.gov W9218F24R0012, 2024

When this solicitation is released on or about August 21, 2024, it will be competed as a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers requires a contractor to provide services related to all requirements of RCRA, CERCLA, the Clean Air Act, and other related Federal Programs in addition to State/Local specific regulations/ requirements. Remedial activities may address both regulated and non-regulated toxic substances. In addition, construction activities are included for some ERS task orders, where these requirements directly support specific activities. The contract will include cost reimbursement and firm-fixed-price task orders for a wide range of environmental remediation services at various known or suspected Hazardous, Toxic, and Radioactive Waste or MMRP sites or Natural Resources areas. Project-specific task orders will be issued under the basic contract and any exercised option period thereto. The USACE CO or COR will provide the contractor with any site-specific information upon issuance of each task order. Project locations will include the U.S. Army Corps of Engineers Northwestern Division Area of Responsibility and its approved customers. However, contract capacity may be transferred with other USACE Districts where the ER-1-10 and Project Management Business Process principles have been met. Proposals are expected to be due on or about October 15, 2024, depending upon the actual issue date of the solicitation. This solicitation will have a target of 8 contract awards; the Source Selection Authority may determine during the source selection process that fewer or more than that number should be awarded and has the discretion of adjusting that number or awarding none at all. The estimated shared capacity of the MATOC is $249 million. Task orders awarded under this MATOC may be firm fixed price or cost-reimbursement. There is no solicitation at this time,be dependent on the current known status of the site. Each task order will define the contractor's performance requirements.
https://sam.gov/opp/fa71f32332c1427485c8c7da3aa44914/view

## Cleanup News

### ENHANCING REMEDIATION IN LOW PERMEABILITY SOILS
Davis, E. I Thirteenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, 2-6 June, Denver, CO, 19 slides, 2024

This presentation discusses the effects of increasing the temperature of thermal remediation technologies, electrical resistance heating, and thermal conductive heating on the recoverability of contaminants. Challenges of remediation in low permeability soils include limitations to injecting and extracting liquids and/or gases to facilitate the treatment or recovery of organic compounds. For many legacy contaminated sites, there can be decades or more between when the contamination occurred and when efforts are undertaken to remediate the site. While migration of contaminants into low permeability soils is slow, the delays between when the contamination occurs and when remediation is undertaken provide ample opportunity for the low permeability soils to become contaminated. Remediation efforts generally attempt to recover or treat the contaminants in much less time. Lower groundwater flow rates in low permeability soils means the contaminants are not flushed out rapidly. While the low permeability limits liquid flow in these soils, they can readily be heated. The presentation includes two case studies where thermal treatments were used to remediate PCE in soil.
https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=362292&Lab=CESER&simplesearch=0&showcriteria=2&sortby=pubDate&timstype=&datebeginpublishedpresented=06/15/2019&searchall=contamination.
*More information on Point Richmond remediation:* https://ngwa.onlinelibrary.wiley.com/doi/abs/10.1111/gwmr.12028.
*Solvents Recovery Service of New England Superfund site:* https://www.srsnesite.com/.

### SUSTAINABLE AND RESILIENT ADAPTIVE MANAGEMENT STRATEGIES FOR SOURCE AREA BIOREMEDIATION OF TCE DNAPL IN FRACTURED BEDROCK
Morris, K. I Thirteenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, 2-6 June, Denver, CO, 22 slides, 2024

Phased in situ bioremediation (bioremediation and bioaugmentation) was selected to achieve risk-based remedial goals at a former manufacturing facility with PCE/TCE-contaminated soil. High-resolution site characterization, including sorbers to refine the conceptual site model, also identified elevated concentrations of TCE and degradation products in the bedrock aquifer (> 300,000 µg/L). Nine injection points, ranging in depth from 100 to 170 feet bgs, were installed using a 6% EVO solution to establish the anaerobic reducing treatment zone. Nine additional injection points were installed to target the source area and create a downgradient biobarrier to depths ranging from 110 to 180 ft bgs, targeting the most transmissive fractures using subsurface geophysics. Supplemental injections, including lab-cultured microcosms, were implemented at 10 points after reviewing the pilot test data with TCE concentrations exceeding 250,000 µg/L. Nine large-diameter bioborings were installed to replace several fouled injection points and backfilled with hardwood mulch and gravel. Anaerobic-reducing conditions were observed in adjacent shallow and intermediate monitoring wells within 6 months of initial injections. Concentrations decreased in the source area ~98% in the shallow well and 99% in the intermediate well over 10 years. Initial injections mobilized potential separate phase TCE DNAPL from solution channels in the fractured rock that were not previously identified. Use of the hardwood mulch placed in bioborings helped maintain anaerobic reducing conditions without mobilizing the residual TCE DNAPL.
***Longer Abstract:***https://battellestaging.xcddev.com/index.cfm/article/view/ID/16442
***Slides:*** https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/A1_1325_969_Morris.pdf

### COMBINED IN SITU CONDUCTIVE HEATING, STEAM INJECTION AND AIR SPARGING FOR REMEDIATION OF FRACTURED CHALK AT A FORMER CHEMICAL FACILITY IN KENT (UK)
Couto, F. I Thirteenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, 2-6 June, Denver, CO, 19 slides, 2024

An intensive groundwater monitoring program was conducted at a former chemical factory to assess hydraulic properties, site-specific physicochemical parameters, and microbial population dynamics through investigations and Membrane Interface and Hydraulic Profiling to create a conceptual site model and assess remedial options. Underlying unsaturated soil and the chalk aquifer were contaminated with benzene and trimethyl-benzene. Fissures within the chalk promoted localized vertical migration, creating a large contamination plume. Significant seasonal fluctuations of the water table resulted in a smear zone within the capillary fringe. In addition, a band of horizontal fissures within the aquifer resulted in contamination in offsite monitoring wells. A remediation system combining steam injection to heat the aquifer with in situ thermal remediation (ISTR) to treat the capillary fringe and the unsaturated soils was selected. Hydraulic control of the aquifer and VOC capture were achieved by a dual-phase extraction system with a combined GAC filtration and catalytic oxidizer system to abate VOCs in the off-gases. Six steam injection and air sparging wells, 16 ISTR wells, 7 dual-purpose wells, and 8 SVE wells were installed. Soil samples were analyzed to create a 3-D contamination map and make adjustments to the system. 3D modeling was used to calculate contamination mass and assess system performance. In situ steam injection and ISTR, operated sequentially over 9 months, maintained soil and groundwater temperatures of > 80°C. SVE and air sparging operated continuously for an additional 4 months and then at intervals over 6 months. Findings and the results of post-remediation monitoring, including bacteria population assessment and half-life calculations for benzene degradation, are presented.
***Longer Abstract:***https://battellestaging.xcddev.com/index.cfm/article/view/ID/16446
***Slides:*** https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/A1_1350_431_Couto.pdf

## Demonstrations / Feasibility Studies

### KARST FORMATION BIOAUGMENTATION PILOT STUDY FOR A TRICHLOROETHYLENE SOURCE AT AN ELECTRONICS MANUFACTURER IN NEW YORK
Mirabello, S. I Thirteenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, 2-6 June, Denver, CO, 23 slides, 2024

A pilot study is being conducted at a former manufacturing site that historically used TCE and 1,1,1-TCA as degreasing solvents. The site is underlain by the karst Onondaga Formation, consisting of mudstone and packstones overlain by glacial till and sand and gravel backfill, with competent bedrock ranging from over 40 to less than 3 ft bg. Contamination is present in soil, overburden and shallow bedrock groundwater, and soil vapors. A prior microbiological census showed *Dehalococcoides* (DHC) bacteria are present inconsistently along the groundwater flow path with the greatest populations downgradient from the source. CSIA demonstrated that degradation of TCE to daughter products occurs along the plume and suggests the existence of a secondary source area with downgradient mixing. The goals of the pilot study were to confirm the feasibility of bioremediation of the karst source area through the combined use of emulsified vegetable oil (EVO) to facilitate reductive conditions and introduce DHC-predominant bacterial cultures with functional genes for complete degradation to enhance existing native bacterial populations. The pilot study is planned to occur over a 12-month interval, with initial activities including EVO injection at four wells at adjustable dilution ratios, coupled with transducers at adjacent and downgradient wells for hydrogeological evaluation. Planned groundwater sampling and aquifer characterization events will occur before injection and at 1, 3, 6, 9, and 12 months post-injection. Groundwater elevations, chlorinated compound concentrations, and groundwater quality parameters (pH, specific conductivity, oxidation-reduction potential, and dissolved oxygen) will be measured. Monitoring of dissolved gases is planned for the 6- and 12-month events. The bacterial culture was introduced after confirmation of acceptable reducing conditions.
***Longer Abstract:***https://battellestaging.xcddev.com/index.cfm/article/view/ID/16443
***Slides:*** https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/A1_1300_624_Mirabello.pdf

### A FIELD STUDY OF A NOVEL PERMEABLE-REACTIVE-BIOBARRIER TO REMEDIATE CHLORINATED HYDROCARBONS CONTAMINATED GROUNDWATER
Liu, C., X. Chen, S. Wang, Y. Luo, W. Du, Y. Yin, and H. Guo.
Environmental Pollution 351:124042(2024)

A novel three-layer permeable reactive barrier (PRB) material incorporating $Fe^0$ and coconut shell biochar was field-scale tested at a chlorinated hydrocarbon (CH)-contaminated site. Monitoring data revealed conditions conducive to reductive dechlorination (low oxygen levels and a relatively neutral pH in the groundwater). The engineered PRB material consistently released organic carbon and iron, fostering CH-dechlorinating bacteria proliferation. Over 250 days, the pilot-scale PRB achieved CH removal efficiencies from 21.9%-99.6% for various CH compounds. Initially, CHs were predominantly eliminated through adsorption and iron-mediated reductive dechlorination, but microbial reductive dechlorination emerged as the predominant mechanism for sustained and long-term CH removal. *See the introduction and section snippets at* https://www.sciencedirect.com/science/article/abs/pii/S0269749124007565

### THREE-YEAR FIELD EXPERIMENTS REVEALED THE IMMOBILIZATION EFFECT OF NATURAL AGING BIOCHAR ON TYPICAL HEAVY METALS (PB, CU, CD)
Chen, X., S. Jiang, J. Wu, X. Yi, G. Dai, and Y. Shu.
Science of The Total Environment 912:169384(2024)

The stability of immobilized heavy metals (Cd, Cu, Pb) on biochar was investigated during a three-year field study using desorption experiments. The main objectives of the study were 1) to identify the release risk of Cd, Cu, Pb from biochar remediated soil under different field pH conditions; 2) determine the mechanisms governing the stability of fixed metals through the characterization of biochar under long-term aging in the field; and 3) comprehensively evaluate the practical repair efficacy of biochar in soil contaminated with multiple metals. Results indicated that the biochar application and the aging of biochar in the field remarkably increased the immobilization of the three metal ions. The cumulative desorption of the metals decreased with biochar aging, and the desorption rate of $Pb^{2+}$, $Cu^{2+}$ and $Cd^{2+}$ in T3 (application of 30 t/hm$^2$ of biochar) during the third year was 0.08%, 0.20%, and 13.15%. The desorption rates and extents exhibited significant differences in the order of $Pb^{2+}$ < $Cu^{2+}$ < $Cd^{2+}$. Increasing soil pH, enhancing the O/C ratio (increase from 0.30 for fresh BC to 0.61 for aged BC[S3]), oxygen-containing functional groups in biochar, and the accretion of organo-mineral micro-agglomerates on biochar surfaces and in pores during field aging process jointly contributed to the immobilization of metals in soil mainly through co-precipitation and complexation.

### PILOT TESTS FOR THE OPTIMIZATION OF THE BIOREMEDIATION STRATEGY OF A MULTI-LAYERED AQUIFER AT A MULTI-FOCUS SITE IMPACTED WITH CHLORINATED ETHENES
Blazquez-Palli, N., C. Torrento, E. Marco-Urrea, D. Garriga, M. Gonzalez, and M. Bosch.
Science of The Total Environment 935:173093(2024)

A multi-layered aquifer in an industrial area north of the Iberian Peninsula was heavily contaminated with chlorinated ethenes (CEs), including PCE, TCE, cis-1,2-DCE, and VC. Both shallow and deep aquifers were contaminated, with two differentiated north and south CEs plumes. Lab treatability studies confirmed the intrinsic biodegradation potential of the north and south shallow aquifers to dechlorinate CEs to ethene after lactate injection and the combination of lactate and sulfidized mZVI as an alternative treatment for the north deep aquifer. In the lactate-amended microcosms, full dechlorination of CEs was accompanied by an increase in 16S rRNA gene copies of *Dehalococcoides* and *Dehalogenimonas* and the tceA, vcrA, and bvcA reductive dehalogenases. Three in situ pilot tests were implemented: lactate injections in the north and south shallow aquifers and lactate and sulfidized mZVI injections in the north deep aquifer. Hydrogeochemical, isotopic, and molecular analyses showed that results obtained mimicked lab observations, albeit at different dechlorination rates. Injection efficiency was likely affected by amendment distribution. Monitoring in the shallow aquifers showed the release of CEs due to back diffusion from secondary sources, which limited the use of isotopic data for assessing treatment efficiency. Both biotic and abiotic pathways contributed to ethene production in the pilot test that combined the injection of lactate and sulfidized mZVI.

## Research

### STABILIZATION OF PFAS-CONTAMINATED SOIL WITH SEWAGE SLUDGE- AND WOOD-BASED BIOCHAR SORBENTS
Sormo, E., C.B.M. Lade, J. Zhang, A.G. Asimakopoulos, G. Wold Asli, M. Hubert, A.I. Goranov, H.P.H. Arp, and G. Cornelissen.
Science of The Total Environment 922:170971(2024)

A study investigated the effects of waste-based biochars on PFAS leaching from sandy soil at a former fire-fighting facility with a low total organic carbon content (TOC, 0.57 ± 0.04%) impacted by PFAS from AFFF. Six different biochars (pyrolyzed at 700-900°C) made from clean wood chips (CWC), waste timber (WT), activated waste timber (aWT), two digested sewage sludges (DSS-1 and DSS-2), and de-watered raw sewage sludge (DWSS) were tested. Up-flow column percolation tests (15 days and 16 pore volume replacements) with 1% biochar indicated that PFOS was retained best by the aWT biochar (99.9% reduction) in the leachate, followed by sludge-based DWSS (98.9%) and DSS-2 (97.8%) and

DSS-1 (91.6%). The non-activated wood-based biochars (CWC and WT) reduced leaching by < 42.4 %. Extrapolating this to field conditions, 90% leaching of PFOS would occur after 15 y for unamended soil and after 1200 y and 12,000 y, respectively, for soil amended with 1% DWSS-amended and aWT biochar. The high effectiveness of aWT and the three sludge-based biochars in reducing PFAS leaching from the soil was attributed largely to high porosity in a pore size range (>1.5 nm) that can accommodate the large PFAS molecules (>1.02-2.20 nm) combined with a high affinity to the biochar matrix. Other factors, like anionic exchange capacity, could play a contributing role. Sorbent effectiveness was better for long-chain than short-chain PFAS due to weaker apolar interactions between the biochar and the latter's shorter hydrophobic CF2-tails.

### RESEARCH BRIEF 356: PYRITE IMPROVES ELECTROCHEMICAL SYSTEM FOR REMOVING A CHEMICAL MIXTURE
National Institute of Environmental Health Sciences, Superfund Research Program (SRP), August 2024

SRP-funded researchers found that combining two types of remediation techniques – one that relies on applying an electrical current to destroy contaminants and another that uses minerals to adsorb contaminants – removed heavy metals, including arsenic and chromium, more effectively than either strategy alone. The antibacterial compound sulfanilamide was also tested and removed. First, researchers created an electrochemical reactor by embedding two electrical conductors, or electrodes, inside a plastic tube filled with sand. They created a similar second reactor, adding pyrite between the electrodes. Groundwater with either sulfanilamide, arsenic, or chromium was pumped from the bottom of the tube through each reactor. For each contaminant, the team conducted separate experiments using the electrochemical reactor, the pyrite reactor with the electrodes turned off, and the pyrite reactor with the electrodes turned on. Water samples were collected from the top of the reactors for chemical analysis at regular intervals. Finally, they tested if the combined system could simultaneously remove the antibiotic sulfanilamide, arsenic, and chromium. The electrochemical process and pyrite interacted together to create a very effective combined method that addressed the shortfalls of either method alone without the need for any chemical additives.
https://tools.niehs.nih.gov/srp/researchbriefs/view.cfm?Brief_ID=356&utm_medium=email&utm_source=govdelivery

### RESEARCH BRIEF 355: ENVIRONMENTAL FACTORS ALTER PFAS REMOVAL BY SPECIALIZED NANOMATERIALS
National Institute of Environmental Health Sciences, Superfund Research Program (SRP), July 2024

Researchers revealed how characteristics of water treatment systems may alter the ability of novel nanomaterials to remove PFAS. Scientists should be aware of factors like water pH or salt level to ensure that these nanomaterials effectively remove PFAS in aqueous environments. The team tested how well their nanomaterial removed PFAS under different water conditions like high pH, high concentrations of salt, or the presence of natural organic matter. First, the baseline performance of the nanomaterial was tested by placing $H_2O_2$, the nanomaterial, and PFOA or PFOS in a vial of water. After shaking the vial for 20 minutes, water samples were removed at 5, 10, and 20 minutes. The approach was repeated over five different experiments, changing one aspect of the water chemistry: pH level, PFAS concentration, salt level, presence of organic matter, and $H_2O_2$ concentration. After finishing the experiments, the researchers assessed nanomaterial performance by analyzing PFAS concentrations in each sample. The scientists also tested for fluoride, acetate, and formate, indicating that the PFOA and PFOS had been degraded into their base components. The study highlights the importance of understanding water chemistry when choosing this nanomaterial PFAS removal method. Water systems with optimal conditions will allow the nanomaterial to work at maximum efficiency.
https://tools.niehs.nih.gov/srp/researchbriefs/view.cfm?Brief_ID=355

### EVALUATING GROUNDWATER ECOSYSTEM DYNAMICS IN RESPONSE TO POST IN-SITU REMEDIATION OF MIXED CHLORINATED VOLATILE ORGANIC COMPOUNDS (CVOCS): AN INSIGHT INTO MICROBIAL COMMUNITY RESILIENCE, ADAPTABILITY, AND METABOLIC FUNCTIONALITY FOR SUSTAINABLE REMEDIATION AND ECOSYSTEM RESTORATION
Huang, S.-W., B. Hussain, J.-S. Chen, A. Asif, and B.-M. Hsu.
Science of The Total Environment 920:170874(2024)

A study employed high-throughput sequencing coupled with functional and physiological assays to provide valuable insights into the impacts of in situ remediation methods on groundwater microbial communities and ecosystem functionality. Results showed that both bioremediation and chemical remediation methods adversely affected microbial diversity and abundance compared to uncontaminated sites. Certain taxa, such as *Pseudomonas*, *Acinetobacter*, and *Vogesella* were sensitive to the remediation methods, while *Aquabacterium* exhibited greater adaptability. Functional annotation unveiled the beneficial impact of bioremediation on the sulfur cycle and specific taxa such as *Cellvibrio*, *Massilia*, *Algoriphagus*, and *Flavobacterium*, which showed a significant positive relationship with dark oxidation of sulfur compounds. In contrast, chemical remediation showed adverse impacts on the nitrogen cycle with a reduced abundance of nitrogen and nitrate respiration and a reduced utilization of amines (nitrogen-rich substrate).

### NEW PFASS IDENTIFIED IN AFFF IMPACTED GROUNDWATER BY PASSIVE SAMPLING AND NONTARGET ANALYSIS
Gorji, S.G., M.J. Gomez Ramos, P. Dewapriya, B. Schulze, R. Mackie, T.M. Hong Nguyen, C.P. Higgins, K. Bowles, J.F. Mueller, K.V. Thomas, and S.L. Kaserzon.
Environmental Science & Technology 58(3):1690-1699(2024)

A suspect-screening and nontarget analysis (NTA) approach was developed and applied to identify novel PFAS in groundwater samples contaminated from historic AFFF use. A total of 88 PFAS were identified in both passive samplers and grab samples. The PFAS were dominated by sulfonate derivatives and sulfonamide-derived precursors, including several ultrashort-chain PFASs (≤C3), 11 reported for the first time in Australian groundwater. Several transformation products were identified, including perfluoroalkane sulfonamides (FASAs) and perfluoroalkane sulfinates (PFASis). Two new PFAS were reported (((perfluorohexyl)sulfonyl)sulfamic acid; m/z 477.9068 and (E)-1,1,2,2,3,3,4,5,6,7,8,8,8-tridecafluorooct-6-ene-1-sulfonic acid; m/z 424.9482). This study highlights that several PFAS are overlooked using standard target analysis, and the potential risk from all PFAS present is likely underestimated.

### SUSPECT, NONTARGET SCREENING, AND TOXICITY PREDICTION OF PER- AND POLYFLUOROALKYL SUBSTANCES IN THE LANDFILL LEACHATE
Feng, C., Y. Lin, S. Le, J. Ji, Y. Chen, G. Wang, P. Xiao, Y. Zhao, and D. Lu.
Environmental Science & Technology 58(10):4737-4750(2024)

A study proposed a comprehensive method to screen for PFAS in leachate samples using suspect and nontarget analysis. The method identified 48 PFAS from 10 classes; nine novel PFAS, including eight chloroperfluoropolyether carboxylates (Cl-PFPECAs) and bistrifilimide (HNTf2) were reported for the first time in the leachate, where Cl-PFPECA-3,1 and Cl-PFPECA-2,2 were first reported in environmental media. Optimized molecular docking models were established to prioritize the PFAS with potential activity against peroxisome proliferator-activated receptor α and estrogen receptor α. Results indicated that several emerging PFAS of N-methyl perfluoroalkyl sulfonamido acetic acids (N-MeFASAAs), n:3 fluorotelomer carboxylic acid (n:3 FTCA), and n:2 fluorotelomer sulfonate (n:2 FTSA) have potential health risks that cannot be ignored.

### ENHANCED BIOGENIC SULFIDATION OF ZERO-VALENT IRON IN COLUMNS: IMPLICATIONS FOR PROMOTING DECHLORINATION IN PERMEABLE REACTIVE BARRIERS
Wang, B., Q. Luo, Y. Pan, Z. Mei, T. Sun, Z. Zhong, F. He, L. Liang, Z. Wang, and B. Xing.
Environmental Science & Technology 57(49):20951-20961(2024)

Detailed interactions between sulfate-reducing bacteria (SRB) and zero-valent iron (ZVI) were examined in column experiments under enhanced biogenic sulfidation conditions for 4 months. SRB proliferation and changes in ZVI surface properties were characterized along the flow paths. Results show that ZVI can stimulate SRB activity by removing excessive free sulfide ($S^{2-}$) and lowering reduction potential. ZVI also hinders the downgradient movement of SRB via electrostatic repulsion, restricting SRB presence near the upgradient interface. Dissolved organic carbon (>2.2 mM) was essential for intense biogenic sulfidation in ZVI columns. The presence of SRB in the upgradient zone appeared to promote iron polysulfide formation. Biogenic FeSx deposition increased the S content on ZVI surfaces ~3-fold, corresponding to 3-fold and 2-fold improvements in the TCE degradation rate and electron efficiency in batch tests. Elucidation of SRB and ZVI interactions enhances sustained sulfidation in ZVI permeable reactive barrier.

## General News

### SENSORS FOR EMERGING WATER CONTAMINANTS: OVERCOMING ROADBLOCKS TO INNOVATION
Ateia, M., H. Wei, and S. Andreescu. Environmental Science & Technology 58(6):2636-2651(2024)

This article examines current sensing technologies for detecting emerging contaminants and analyzes critical barriers, such as high costs, lack of reliability, difficulties in implementation in real-world settings, and lack of stakeholder involvement in sensor design. It also provides examples of specific sensing systems and explores key strategies to address scientific challenges that must be overcome to translate these technologies into the field, such as improving sensitivity, selectivity, robustness, and performance in real-world water environments. The article also discusses other critical aspects, such as tailoring research to meet end-users' requirements, integrating cost considerations and consumer needs into the early prototype design, establishing standardized evaluation and validation protocols, fostering academia-industry collaborations, maximizing data value by establishing data-sharing initiatives and promoting workforce development.

### PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) AS CONTAMINANTS IN GROUNDWATER RESOURCES — A COMPREHENSIVE REVIEW OF SUBSURFACE TRANSPORT PROCESSES
Rasmusson, K. and F. Fagerlund. | Chemosphere 362:142663(2024)

This article compiles the current knowledge on processes affecting subsurface PFAS fate and transport based on a review of scientific literature that focuses on PFAA in soil- and groundwater systems. It also presents a compilation of data on transport parameters such as solubility and distribution coefficients, insight gained, and conclusions drawn from the reviewed material. The review showed a large spread in the magnitude of distribution coefficients and solubility for individual PFAS.

### IMPLICATIONS OF GROUPING PER- AND POLYFLUOROALKYL SUBSTANCES FOR CONTAMINATED SITE REGULATION
Bowles, K.C, J.K. Anderson, R. Anderson, B. Bani, C.M. Barnes, M. Brusseau, I.T. Cousins, P. Cushing, B. DiGuiseppi, B. Gray, C.P. Higgins, J. Mueller, I. Ross, S. Thomas, J. Thrasher, and C. Tremblay. | Remediation 34(3): e21783(2024)

This article summarizes the views of a group of environmental consultants, environmental regulators, land managers, and academics with significant experience researching or managing PFAS. The group considered that neither a single PFAS class approach nor a chemical-by-chemical approach is well suited to managing risks from PFAS in a contaminated site setting, and defining PFAS subgroups would have value. Grouping PFAS in subgroups while also maintaining a focus on a small number of the more hazardous "sentinel" PFAS may provide a more balanced approach. Some group members hypothesized that PFAS properties that drive fate and transport influence toxicity and bioaccumulation in animals. This may be a valuable observation for future discussions on dividing PFAS into subclasses for contaminated site regulation based on physicochemical properties rather than purely structural definitions. https://onlinelibrary.wiley.com/doi/epdf/10.1002/rem.21783

### ANALYTICAL METHODS FOR DETERMINING ENVIRONMENTAL CONTAMINANTS OF CONCERN IN WATER AND WASTEWATER
Kadadou, D., L. Tizani, H. Alsafar, and S.W. Hasana. MethodsX 12:102582(2024)

This paper reviews the development and utilization of highly advanced analytical tools, both essential for analyzing contaminants in water samples. The review seeks to deepen the understanding of pollution challenges and inspire innovative monitoring solutions that contribute to a cleaner and more sustainable global environment by emphasizing the critical role of the methods to address:

- Urgent global concerns: control and prevention of pollution from diverse sources.
- Varied contaminants, diverse methods: a comprehensive review of analytical tools.
- Inspiring a sustainable future: innovative monitoring for a cleaner environment.

### MODPATH-RW: A RANDOM WALK PARTICLE TRACKING CODE FOR SOLUTE TRANSPORT IN HETEROGENEOUS AQUIFERS
Perez-Illanes, R. and D. Fernandez-Garcia. | Groundwater 62(4):617-634(2024)

This article presents a solute transport code that implements the random walk particle tracking (RWPT) method by extension of the particle tracking model MODPATH, providing the base infrastructure for interacting with several variants of MODFLOW groundwater flow models. The implementation is achieved by developing a method for determining the exact cell-exit position of a particle undergoing simultaneous advection and dispersion, allowing for the sequential transfer of particles between flow model cells. The program is compatible with rectangular unstructured grids and integrates a module for the smoothed reconstruction of concentrations. In addition, the program incorporates parallel processing of particles using the OpenMP library, enabling faster simulations of solute transport in heterogeneous systems. Numerical test cases involving different applications in hydrogeology benchmark the RWPT model with well-known transport codes. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwat.13390

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