

# Technology Innovation News Survey

## Entries for June 16-30, 2019

### Market/Commercialization Information

#### RAPID RESPONSE 6 ENVIRONMENTAL REMEDIATION SERVICES

U.S. Army Corps of Engineers, USACE District, Omaha, NE.  
Federal Business Opportunities, Solicitation W9128F19R0060, 2019

This acquisition is unrestricted. The USACE Omaha District has a requirement for a rapid response environmental remediation services single-award task-order contract (SATOC), NAICS code 562910, in support of the District and its customers in the Continental United States, including Alaska and Hawaii, the South Atlantic Division area of responsibility (AOR), and the Pacific Ocean Division AOR. The awarded contract will include both cost reimbursement and firm-fixed-price task orders for response actions and remediation of various hazardous waste sites as identified in Section C of the RFP. There is no limit on the number of task orders that may be executed against this contract. The SATOC will have a base ordering period of three years with a 4-year option, or until the \$80M contract capacity is expended, whichever occurs first. Offers are due by 2:00 PM CT on August 30, 2019.  
<https://www.fbo.gov/spg/USA/COE/DAC445/W9128F19R0060/listing.html>

#### LEGACY MANAGEMENT SUPPORT SERVICES

U.S. Department of Energy, Washington, DC.  
Federal Business Opportunities, Solicitation 89303019RLM000002, 2019

This procurement is 100% set-aside for competitive small businesses under NAICS code 562910 (Environmental Remediation Services). DOE's Office of Legacy Management (LM) has a requirement for post remediation Legacy Management Support Services (LMS). The contractor shall provide technical, project management, and administrative services to support the LM mission. LM ensures post-closure responsibilities are met for the protection of human health and the environment. The solicitation will result in a single-award IDIQ contract with time-and-materials/labor-hour, firm-fixed-price, or cost-plus-fixed-fee task orders, or in a hybrid of these contract types. The contract will be awarded for a 60-month ordering period. Task orders issued from the master IDIQ will contain option periods. Details are posted on FedConnect at <https://www.fedconnect.net/FedConnect/?doc=89303019RLM000002&agency=DOE>. Offers are due by 4:00 PM ET on September 3, 2019.

#### MEGA UNRESTRICTED PRE-PLACED REMEDIAL ACTION CONTRACT (PRAC): PHASE B

U.S. Army Corps of Engineers, USACE District, Kansas City, MO.  
Federal Business Opportunities, Solicitation 1 W912DQ19R3006, 2019

When issued on or after August 6, 2019, this solicitation will provide for full and open competition. The forthcoming PRAC IDIQ multiple-award task-order contract (MATOC) is part of the USACE Multiple Environmental Government Acquisition strategy to support work assigned to the federal government. Performance will include a wide range of environmental remediation services, the majority of which will be in EPA Region 2. Architect-Engineer services under FAR Subpart 36.6 will not be performed under the contract. Award of one MATOC is anticipated with a target of 10 awardees. The maximum value for all orders issued against the contract is \$185M. Orders may be either fixed-price or cost-reimbursement type.  
<https://www.fbo.gov/spg/USA/COE/DAC441/W912DQ19R3006/listing.html>

#### \$35M INDEFINITE DELIVERY, INDEFINITE QUANTITY (IDIQ) SINGLE AWARD TASK ORDER CONTRACT (SATOC) FOR RAPID RESPONSE 5 SDVOBS

Department of the Army, US Army Corps of Engineers, USACE District, Omaha, NE.  
Federal Business Opportunities, Solicitation 1 W9128F-19-R-0023, 2019

After release of the solicitation on or about August 7, 2019, the government intends to issue a \$35M IDIQ SATOC to one service-disabled veteran-owned small business firm for rapid response services. Task Orders may be cost reimbursable or firm fixed price contingent upon the Government's assessment of project risk. The SATOC will have a 3-yr base period and a 2-yr option period. The contract will be for time-sensitive remediation of various hazardous waste sites within the United States and outlying areas. The contractor shall furnish and transport all plant, labor, materials and equipment necessary to perform the work required. The contract will use performance-based work statements to simplify the task order requirements while providing flexibility for the contractor to successfully complete the project at the lowest price. FedBizOpps registration will be required to access the solicitation documents. Monitor FedBizOpps for updates and amendments to this notice. <https://www.fbo.gov/spg/USA/COE/DAC445/W9128F-19-R-0023/listing.html>

#### SPK FUDS GENERAL MMRP SOURCES SOUGHT

Department of the Army, US Army Corps of Engineers, USACE District, Sacramento, CA.  
Federal Business Opportunities, Solicitation W9123819S2323, 2019

This sources sought is for market research only to determine the availability of firms to develop the most appropriate acquisition strategy for two separate Military Munitions Response Program (MMRP) projects. Responses will be used to determine the appropriate acquisition strategy for a potential future acquisition, which likely would be a firm-fixed-price contract. The NAICS Code is 562910, small business size standard 750 employees. Example projects are described in the attachments at FedBizOpps for sites that require surface removal of military munitions at a bombing range and surface plus sub-surface removal of military munitions at a bombing target. Two projects are planned for advertising in winter 2019 as firm-fixed-price contracts. Potential offers of full size states having the skill, capabilities, and bonding necessary to perform the described work are invited to provide feedback via email. Responses are due by 2:00 PM PT on August 20, 2019. <https://www.fbo.gov/spg/USA/COE/DACA05/W9123819S2323/listing.html>

#### MULTIPLE-AWARD REMEDIAL ACTION CONTRACT (MARAC) FOR ENVIRONMENTAL REMEDIATION SERVICES

Naval Facilities Engineering Command, NAVFAC Southwest, San Diego, CA.  
Federal Business Opportunities, Solicitation N6247318R2418, 2019

This procurement is a 100% small business set-aside with the intent to award 3 to 4 cost-plus-award-fee IDIQ multiple-award remedial action contracts under NAICS code 562910 (Environmental Remediation), size standard 750 employees. Contracts will be awarded for a base period of 24 months and one 36-month ordering period. Details are posted at NECO: [https://www.neco.navy.mil/hiz\\_ops/840-v5static.aspx?hkey=193380979](https://www.neco.navy.mil/hiz_ops/840-v5static.aspx?hkey=193380979). The aggregate value of all task orders issued under the contracts shall not exceed \$240M. Offers are due by 2:00 PM PT on August 13, 2019. <https://www.fbo.gov/notifications/6rd7hd482d4d1b1794d18ea94ae1hd>

### Cleanup News

#### USING ADAPTIVE MANAGEMENT TO GUIDE MULTIPLE PARTNERS IN TCE REMEDIATION USING A PERMEABLE REACTIVE BARRIER

Nino de Guzman, G.T., C.J. Hapeman, P.D. Milner, A. Torrents, D. Jackson, and B.V. Kjellerup.  
Environmental Research Communications 1:075001(2019)

The USDA Agricultural Research Services and the University of Maryland, College Park, collaborated to design a biowall to remediate TCE-contaminated groundwater at the Beaverdam Road Landfill. OU of the Beltsville Agricultural Research Center Superfund site in Beltsville, MD. A hybrid adaptive management strategy incorporated up-to-date information into the remediation plan throughout the process. Lab experiments and a historic data assessment were conducted with a monitoring plan to modify the monitoring and biowall construction plans during the design process. The project's scope grew to include investigations of the soil microbial community for future structural biostimulation and bioaugmentation activities. While the biowall has reduced the concentration of TCE to levels at or below the maximum contaminant level, work is ongoing to improve the functionality of the biowall and address emerging challenges.  
<https://pubs.cercla.gov/handle/document/101088/2515-7620/ab2de4.pdf>. Locate the 2018 Five Year Review and monitoring reports by selecting **BARC 27 (Beaverdam Road Landfill)** at <https://cercla.ba.ars.usda.gov/advancesearch>.

#### FULL-SCALE APPLICATION OF EHC® LIQUID TECHNOLOGY FOR THE ISCR AND ERD TREATMENT OF AN AQUIFER CONTAMINATED WITH TETRACHLOROMETHANE AND CHLOROFORM

Leombruni, A., L. Collina, M. Avogadri, A. Trezzi, P. Trefiletti, M. Consonni, and C. Di Carlo.  
15th International AquaConSoil Conference: Sustainable Use and Management of Soil, Sediment and Water Resources, 20-24 May, Antwerp, Belgium, 2019

EHC® technology was applied to a highly-industrialized site in northern Italy, where groundwater was primarily contaminated with >10 ppb tetrachloromethane, >10 ppb chloroform, >2 ppb Cr(VI), and small amounts of PCE and TCE. In the intervention area and downstream, 10 wells were dug to accelerate the removal of various contaminants. During remediation, some wells were shut down to prevent an increase in groundwater speed and emulsion removal and to modulate the flow. After ~15 months from injection in the main source area, contaminant concentrations were reduced compared to the pre-treatment concentrations. By 25 months post-injection, CVCOC concentrations in wells directly downgradient of the source zone had decreased by >99% without significant rebound or daughter product generation. See **pages 181-189** at [https://www.aquaconsoil.org/assets/ars2019\\_proceedings\\_lores.pdf](https://www.aquaconsoil.org/assets/ars2019_proceedings_lores.pdf).

#### RAPID DEPLOYMENT OF PFAS REMOVAL SYSTEM FOR TOWN WATER SUPPLY IN KATHERINE, AUSTRALIA

Woodard, S. | 2019 Real Property Institute of Canada (RPIC) Federal Contaminated Sites Regional Workshop, 4-5 June, Halifax, Nova Scotia. 28 slides, 2019

PFAS contamination (~310 ng/L) from firefighting foam used at the Royal Australian Air Force Base Tindal impacted a bore in the Katherine water utility supply. The Australian Department of Defense requested accelerated fabrication of a 12.5 L/sec turnkey, modular system to quickly remediate the PFAS-contaminated water. Delivery was accelerated by air-freighting the system from Maine, U.S., to Darwin, Australia, in an Antonov An-225 transport plane. The PFAS water treatment system included pre-treatment filtration and ion exchange to remove solids and other fouling agents and specialized ion exchange resins for PFAS removal. The system was installed in international shipping containers to allow for easier transportation and rapid on-site readiness and to facilitate operational debugging prior to shipment. The system went online in late October 2017 and has met all project objectives for 34 PFAS compounds. The system required no resin change-outs, and no PFAS breakthrough has been detected.  
[http://mpic-jpic.ca/images/2019\\_FCSB/Representations/Rapid\\_Deployment\\_of\\_Pfas\\_Removal\\_System\\_for\\_Town\\_Water\\_Supply\\_in\\_Katherine\\_Australia.pdf](http://mpic-jpic.ca/images/2019_FCSB/Representations/Rapid_Deployment_of_Pfas_Removal_System_for_Town_Water_Supply_in_Katherine_Australia.pdf) More Information [http://www.defence.gov.au/Environment/PFAS\\_master/Includes/Publications/Reports/TindalReports.asp](http://www.defence.gov.au/Environment/PFAS_master/Includes/Publications/Reports/TindalReports.asp)

#### LONG-TERM EVALUATION OF AN EHC INJECTION PERMEABLE REACTIVE BARRIER IN A SULFATE-RICH, HIGH-FLOW AQUIFER

Molin, J., J. Valkenburg, A. Seech, R. Oesterreich, and J. Son.  
Remediation Journal 29(3):17-29(2019)

A direct-push injection permeable reactive barrier (PRB) composed of EHC® was installed in 2005 to intercept a 2,500-ft carbon tetrachloride (CT) groundwater plume at a site in Kansas. The PRB was constructed by injecting EHC® in situ chemical reduction reagent slurry into a line of direct push injection points. The PRB achieved a >99% removal rate 16 months after installation. The 2-yr removal rate decreased to >95% and plateaued for 12 yrs post-injection. While the organic carbon was consumed faster than expected, the PRB has continued to support a high degree of treatment for >12 yrs. Recycling of biomass and the contribution from a reduced iron sulfide mineral zone are discussed as possible explanations for the sustained reducing conditions and continued chloromethane treatment.

#### THE IN SITU REMEDIATION OF A PFAS PLUME USING COLLOIDAL ACTIVATED CARBON

McGregor, R. | 2019 Real Property Institute of Canada (RPIC) Federal Contaminated Sites Regional Workshop, 4-5 June, Halifax, Nova Scotia. 20 slides, 2019

PFOA and PFOS were detected in a shallow aquifer at a site in Canada at concentrations up to 3,300 ng/L and 1,500 ng/L, respectively. Colloidal activated carbon (AC) was applied over a 26-month period using direct push technology to remove PFOA and PFOS to levels at or below the analytical detection limit of 20 ng/L. Post-injection analyses showed that all PFAS were below method detection limits. Detailed examination of cores taken post-injection indicated that the colloidal AC was successfully distributed within the target zone of the impacted aquifer and was

measured up to 5 m away from the injection point. [http://mpic-ibic.ca/images/2019\\_FCSRW/presentations/The\\_In-Situ\\_Remediation\\_of\\_a\\_PFAS\\_Plume\\_Using\\_Colloidal\\_Activated\\_Carbon.pdf](http://mpic-ibic.ca/images/2019_FCSRW/presentations/The_In-Situ_Remediation_of_a_PFAS_Plume_Using_Colloidal_Activated_Carbon.pdf)  
More information [https://go.pardot.com/1/9642/2018-08-24/9nv3vx/9642/183663/McGregor\\_2018\\_Remediation\\_Journal.pdf](https://go.pardot.com/1/9642/2018-08-24/9nv3vx/9642/183663/McGregor_2018_Remediation_Journal.pdf)

## Demonstrations / Feasibility Studies

### ENHANCED REDUCTIVE DECHLORINATION OF PCE AND TCE IN A SOURCE ZONE VIA RECIRCULATION: PILOT TEST AND RESULTS

Waeyaert, P. | 15th International AquaConSoil Conference: Sustainable Use and Management of Soil, Sediment and Water Resources, 20-24 May, Antwerp, Belgium, 2019

A fully automated recirculation system was pilot tested over 1 yr to evaluate the applicability of enhanced reductive TCE and PCE dechlorination in a source zone at high concentrations and the effect of recirculation on hydrocarbon bioavailability in groundwater. Groundwater was extracted through central wells, amended with Envic (a carbon source made in-house), and reinjected through 4 surrounding wells. The test was performed at two depth intervals. Results showed a full breakdown of PCE and TCE to ethene. Reductive dechlorination of PCE and TCE occurred quickly but DCE reduction to VC and ethane required a lag period of ~6 months. See [pages 64-73](https://www.aquaconsoil.org/assets/acs2019_proceedings_lores.pdf) at [https://www.aquaconsoil.org/assets/acs2019\\_proceedings\\_lores.pdf](https://www.aquaconsoil.org/assets/acs2019_proceedings_lores.pdf)

### THERMAL DESORPTION WITH SMART BURNERS: CASE STUDY FOR THE IN SITU TREATMENT OF UNSATURATED SOILS AT THE REFINERY OF GELA (ITALY)

Pacella, K., J. Haemers, and H. Saadaoui.

15th International AquaConSoil Conference: Sustainable Use and Management of Soil, Sediment and Water Resources, 20-24 May, Antwerp, Belgium, 2019

A pilot-scale study tested a new thermal desorption technology on contaminated soils within the Refinery of Gela in Gela, Italy. The site is contaminated with light and heavy hydrocarbons, benzene, PAHs, chlorinated compounds, and mercury. The thermal desorption technology heats contaminated soil using Smart Burners to reach an evaporation point, where the volatile contaminants are aspirated through perforated extraction pipes. During the pilot test, 143 burners were installed and positioned on top of steel pipes. Treatment was complete when reaching a temperature of 200°C at the cold points for 20 days or 250°C for 3 days. Results showed the complete removal of contaminants in the soil matrix after sustained treatment at the target temperature, allowing for maximum extraction of vapors. See [pages 123-132](https://www.aquaconsoil.org/assets/acs2019_proceedings_lores.pdf) at [https://www.aquaconsoil.org/assets/acs2019\\_proceedings\\_lores.pdf](https://www.aquaconsoil.org/assets/acs2019_proceedings_lores.pdf)

### NEW BRIGHTON: ADVANCED OXIDATION PROCESS PILOT EVALUATION AND FINAL DESIGN FOR 1,4-DIOXANE REMOVAL FROM GROUNDWATER

Ling, A. and J. Macejkovic. | World Environmental and Water Resources Congress, 3-7 June, Minneapolis, Minnesota, 30 slides, 2018

Elevated 1,4-dioxane concentrations were discovered in New Brighton's groundwater supply wells in 2014, likely sourced from the nearby Twin Cities Army Ammunition Plant. To remediate contamination, an existing plant was upgraded. A 6-month pilot test evaluated 2 advanced oxidation process systems: low-pressure UV/peroxide, and ozone/peroxide. While both treated dioxane to See presentation for more information

[http://mpic-ibic.ca/images/2019\\_FCSRW/presentations/14-Dioxane\\_Removal\\_in\\_Municipal\\_Water\\_Supply\\_Impacted\\_by\\_Off-Site\\_Groundwater\\_Contamination.pdf](http://mpic-ibic.ca/images/2019_FCSRW/presentations/14-Dioxane_Removal_in_Municipal_Water_Supply_Impacted_by_Off-Site_Groundwater_Contamination.pdf)

## Research

### A NOVEL REACTIVE ELECTROCHEMICAL MEMBRANE SYSTEM FOR TREATMENT OF MIXED CONTAMINANTS

Huang, Q., | SERDP Project ER-2717, 70 pp, 2019

The aim of this project was to test whether a reactive electrochemical membrane (REM) system could remove and degrade co-mingled PFAAs and TCE in groundwater. The REM system included an electric-conductive porous Magneli-phase titanium sub-oxide (TSO) ceramic material that served as a 3-D anode and a membrane through which contaminated water was filtered and treated electrochemically. Four TSO electrodes were tested in batch reactors under different conditions to compare electrooxidation (EO) treatment efficiencies and analyze the effects of major operation parameters, water compositions, and co-contaminants. Two electrodes were further tested in a series of REM treatments. The REM enhanced EO efficiency and created a larger reaction anode surface that effectively degraded long-chain PFAAs. Chlorate and perchlorate were formed during REM treatment of a PFAA/TCE co-mingled solution with added chlorine. Researchers envision the use of TSO-based REM technology to treat PFAS in contaminated groundwater in pump-and-treat scenarios. <https://www.serdp-estrp.org/content/download/49468/471628/file/ER-2717%20Final%20Report.pdf>

### POLYMERIC FLUIDS FOR IN SITU REMEDIATION OF HEXAVALENT CHROMIUM USING TRAP AND TREAT TECHNOLOGY

Siwik, A., Master's Thesis, University of Guelph, 62 pp, 2019

In this study, natural polymers (scleroglucan, xanthan, guar, and carboxymethyl cellulose) were combined with the reducing agent sodium thiosulfate to create a gel to trap and treat Cr(VI). Batch tests, shear rheology, mechanical compression tests, microfluidic tests, and other experiments showed that the proposed remediation technology was effective at simultaneously immobilizing and reducing Cr(VI), both with and without the presence of humic acids.

[https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/15926/siwik\\_amanda\\_201904\\_Msc.pdf?sequence=1&isAllowed=y](https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/15926/siwik_amanda_201904_Msc.pdf?sequence=1&isAllowed=y)

### SUSPECT SCREENING OF HYDROCARBON SURFACTANTS IN AFFFs AND AFFF-CONTAMINATED GROUNDWATER BY HIGH-RESOLUTION MASS SPECTROMETRY

Garcia, R.A., A.C. Chiaia-Hernandez, P.A. Lara-Martin, M. Loos, J. Hollender, K. Oetjen, et al.

Environmental Science & Technology 53(14):8068-8077(2019)

Researchers analyzed 8 commercial aqueous film-forming foams (AFFFs) manufactured from 1988-2012 and 10 AFFF-contaminated groundwaters collected from near-source zones of fire-fighter training areas for the presence of hydrocarbon surfactants by liquid chromatography quadrupole time-of-flight mass spectrometry. Nine classes of hydrocarbon surfactants were detected in AFFFs. Of those, 6 were also found in groundwater samples, along with diethanolamines and alkyl amido betaine, indicating that hydrocarbon surfactants likely persist in groundwater due to anaerobic aquifer conditions.

### SYNERGISTIC REDUCTIVE DECHLORINATION OF 1,1,1-TRICHLOROETHANE AND TRICHLOROETHENE AND AEROBIC BIODEGRADATION OF 1,4-DIOXANE

Rittman, B.E., Y. Tang, R. Krajinanik-Brown, Y. Luo, and B. Wang.  
SERDP Project ER-2721, 116 pp, 2019

This project proposed and tested a sequential synergistic platform to remediate groundwater co-contaminated with TCE/TCA and 1,4-dioxane. H<sub>2</sub>-based reactors tests revealed that a hydrogen-based membrane palladium-film reactor (MPFR) using a Pd catalyst anaerobically dechlorinated TCE/TCA more efficiently. A synergistic platform was configured that linked the MPFR with a 1,4-dioxane-oxidizing O<sub>2</sub>-based membrane biofilm reactor (O<sub>2</sub>-MBFR) in sequence. Ethane produced from the reduction of TCE and TCA in the MPFR served as the primary electron donor for cometabolic biodegradation of 1,4-dioxane in the O<sub>2</sub>-MBFR. The system ran without significant accumulation of toxic intermediates. Proposed next steps include advancing the synergistic platform toward commercial application for environmentally relevant contaminant concentrations by a combination of modeling advancements, filling in key knowledge gaps, and pilot-scale testing. <https://www.serdp-estrp.org/content/download/49399/471023/file/ER-2721%20Final%20Report.pdf>

### STABILIZATION AND SOLIDIFICATION REMEDIATION OF SOIL CONTAMINATED WITH POLY- AND PERFLUOROALKYL SUBSTANCES (PFAS)

Sorengard, M., D.B. Kleja, and L. Ahrens.  
Journal of Hazardous Materials 367:639-646(2019)

A stabilization and solidification (S/S) technique was tested on aged PFAS-contaminated soil artificially spiked with 14 PFASs using 7 different additives at 2% concentration: powdered activated carbon (PAC), Rembind<sup>®</sup>, pulverized zeolite, chitosan, hydrotalcite, bentonite, and calcium chloride. By adding PAC and Rembind<sup>®</sup>, leaching of 13 out of 14 target PFASs was reduced by ~70% and 94%, respectively. Longer-chained PFASs were stabilized by 99.9% in all S/S treatments using PAC or Rembind<sup>®</sup>. The S/S stabilization efficiency increased on average by 11-15% per CF<sub>3</sub>-moiety and was ~49% higher for PFASs than PFCAs. <https://ziteck.com/wp-content/uploads/2019/03/RemBind-Paper-Journal-of-Hazardous-Materials-PFAS-Sweden.pdf>

### FUNCTIONAL GREEN WALL DEVELOPMENT FOR INCREASING AIR POLLUTANT PHYTOREMEDIATION: SUBSTRATE DEVELOPMENT WITH COCONUT COIR AND ACTIVATED CARBON

Pettit T., P.J. Irga, and F.R. Torpy.  
Journal of Hazardous Materials 360:594-603(2018)

The capacity of several green wall media was tested to filter a range of air pollutants. Different-sized coconut husk-based substrates with different ratios of activated carbon (AC) were evaluated using scaled-down model "cassettes." Tests assessed the substrates' ability to filter particulate matter, benzene, ethyl acetate, and ambient total VOCs. The addition of AC to coconut husk media improved the removal efficiency for all gaseous pollutants but inhibited the removal efficiency of particulate matter. AC's gas remediation capacity became asymptotic as the substrate concentration approached 50%, suggesting that a 50:50 composite medium provided the best VOC removal. In full-scale botanical biofilter modules, AC-based substrates increased benzene removal, yet decreased particulate matter removal despite the addition of plants.

### IDENTIFYING OPTIMAL GROUNDWATER REMEDIATION STRATEGIES THROUGH A SIMULATION-BASED PROMETHEE-TOPSIS APPROACH: AN APPLICATION TO A NAPHTHALENE-CONTAMINATED SITE

He, L., F. Shao, and L. Ren.  
Human and Ecological Risk Assessment: An International Journal [Published online 27 Mar 2019 prior to print]

Researchers aimed to develop a simulation-aided PROMETHEE-TOPSIS approach to select optimal groundwater remediation strategies. The combination of methods allows a user to evaluate and rank remediation alternatives, employing strong and weak point comparisons to facilitate a final selection. A case study is presented where the approach was used in the remedial alternative selection process for a naphthalene-contaminated site in Anhui, China. An analytic hierarchy process was used to weigh the importance of 4 attributes for 50 remedial processes.

### REMEDATION APPROACH FOR ORGANIC COMPOUNDS AND ARSENIC CO-CONTAMINATED SOIL USING THE PRESSURIZED HOT WATER EXTRACTION PROCESS

Islam, M.N., Y.-T. Jo, Y.-J. Jeong, and J.-H. Park.  
Environmental Remediation 40(1):125-131(2019)

The treatment effectiveness of a pressurized hot water (PHW) extraction process was measured on soil co-contaminated with phenol, crude oil, PAHs, and As. Heating to 260°C for 90 min eliminated ~99% of phenol, 63-100% of PAHs, 86% of petroleum hydrocarbon, and 67% As. Organic contaminants were mainly removed by desorption, dissolution, and degradation in subcritical water, while As was potentially eliminated by oxidation and dissolution of As-bearing minerals.

### INFLUENCE OF GROUNDWATER CONDITIONS AND CO-CONTAMINANTS ON SORPTION OF PERFLUOROALKYL COMPOUNDS ON GRANULAR ACTIVATED CARBON

Sirwardena, D.P., M. Crimi, T.M. Holsen, C. Bellona, C. Divine, and E. Dickenson.  
Remediation Journal 29(3):5-15(2019)

Sorption tests were conducted on several granular activated carbons (GACs) to determine which was most effective at sorbing PFOA and PFOS and whether different groundwater conditions affected sorption. PFOA and PFOS were tested alone and in the presence of co-contaminants (kerosene, TCE, and ethanol). The F400 GAC and coconut-based carbon (CBC) were most effective in preliminary PFAS sorption experiments. Sorption for PFOA and PFOS was higher alone than when present in the mixture. PFOS showed higher sorption than PFOA both individually and in the mixture. The presence of co-contaminants and variations in groundwater conditions had limited impact on the sorption of PFAS onto GAC under the experimental conditions tested.

## COMBINED ELECTROCHEMICAL PROCESSES FOR THE EFFICIENT DEGRADATION OF NON-POLAR ORGANOCHLORINE PESTICIDES

Raschitor, A., J. Llanos, M.A. Rodrigo, and P. Canizares.  
Journal of Environmental Management 248:109289(2019)

Efficient and economical electrochemical treatment processes were developed to degrade non-polar organochlorine pesticides using a process that first concentrated the contamination via electrocoagulation and then degraded the pesticides via electro-oxidation (EO) or electro-Fenton (EF). The system removed ~50% of contamination using EO and >94% using EF. The pre-concentration stage decreases the power consumption needed for EO and EF, showing that removal efficiency increases with the concentration of the pollutant.

## SYNTHESIS OF NOVEL BIOCHAR FROM WASTE PLANT LITTER BIOMASS FOR THE REMOVAL OF ARSENIC (III AND V) FROM AQUEOUS SOLUTION: A MECHANISM CHARACTERIZATION, KINETICS, AND THERMODYNAMICS

Verma, L. and J. Singh.  
Journal of Environmental Management 248:109235(2019)

New biochars synthesized from *Tectona* (TB 800) and *Lagerstroemia speciosa* (LB 800) dry waste leaf litter was tested for its efficiency to remove As(III) and As(V) from an aqueous solution. A regeneration study revealed that the biochar could be used up to 4 times with good removal % of As(III and V). A thermodynamics study showed that the process of adsorption was endothermic for As(III) and exothermic As(V). The adsorption capacity for As(III) was 666.7µg/g for TB 800 and 454.54µg/g for LB 800, and adsorption capacity for As(V) was 1250µg/g (TB 800) and 714.28µg/g (LB 800).

## EFFICIENT REMOVAL OF PERFLUORINATED COMPOUNDS FROM WATER USING A REGENERABLE MAGNETIC ACTIVATED CARBON

Meng, P., X. Fang, A. Maimaiti, G. Yu, and S. Deng.  
Chemosphere 224:187-194(2019)

An ultrafine magnetic activated carbon (MAC) consisting of a 1:3 ratio of Fe<sub>3</sub>O<sub>4</sub> and powdered activated carbon was prepared by ball milling for 2 h to sorb PFASs from water. Increasing the percentage of Fe<sub>3</sub>O<sub>4</sub> and balling milling time decreased the adsorption capacity for PFOS but increased the magnetic separation property. Adsorption equilibria of 1.63, 0.90, 0.33 and 0.21 mmol/g for PFOS, PFOA, PFHxS and PFBS, respectively, were reached within less than 2 h. Increasing the solution pH decreased PFOS significantly when the pH was less than the zero potential point (around 6) of the MAC. The spent MAC could be easily separated with a magnet and regenerated by a small volume of methanol. Regenerated MAC could be reused more than 5 times and retained stable adsorption capacity for PFOS after 3 cycles.

## ARE PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) A VAPOR INTRUSION CONCERN?

Roth, J. | RemTEC Summit, February 26-28, 2019, Denver, Colorado. 22 slides, 2019

This presentation provides a comparison of the physical and chemical properties of various PFAS compounds, with a focus on those found in indoor and outdoor air. Site and remedial scenarios are described where vapor-phase transport may be significant. **Abstract:** <https://www.remtecsummit.com/platform-presenters/Julia-Roth> **Slides:** <https://www.remtecsummit.com/ext/resources/Static-Pages/presentations/Julia-Roth.pdf>

## General News

### VALIDATION OF BIOTECHNOLOGY FOR QUANTIFYING THE ABUNDANCE AND ACTIVITY OF VINYL-CHLORIDE OXIDIZERS IN CONTAMINATED GROUNDWATER

Mattes, T. | ESTCP Project ER-201425, 224 pp, 2019

This project demonstrated and validated quantitative, real-time PCR (qPCR) and reverse transcription technologies to enumerate the abundance and functionality of two major groups of VC-oxidizing bacteria. Functional genes used by ethenotrophic and methanotrophic bacteria in the aerobic VC biodegradation pathway were measured in over 100 groundwater samples from 6 VC-contaminated DOD sites. In addition, 134 high-resolution samples from cryogenic soil corings were analyzed to characterize aquifer geochemical conditions and investigate the spatial relationships between functional genes of aerobic and anaerobic VC-degrading bacteria and chlorinated ethene concentrations. Over the course of the project, a biological data set was built to describe changes in the abundance and functionality of ethenotrophs and methanotrophs spatially and temporally at several locations in one or more VC plumes. This demonstration showed that application of environmental molecular diagnostic tools such as qPCR during long-term monitoring of contaminated groundwater yields useful and cost-effective information for site managers interested in better understanding the potential for aerobic natural attenuation of VC at their sites. <https://www.sarfp-estcp.org/content/download/43466/471608/file/ER-2014-25%20Final%20Report.pdf>

### NANOSCALE ZEROVALENT IRON PARTICLES FOR ENVIRONMENTAL RESTORATION

Phenrat T. and G.V. Lowry (eds). Springer International Publishing, ISBN: 978-3-319-95340-3, ISBN: 978-3-319-95338-0, 597 pp, 2019

Based on more than two decades of research and demonstration with nanoscale zerovalent iron particles (NZVI), the 16 chapters in this book provide comprehensive and state-of-the-art descriptions of science principles and pilot- and field-scale engineering applications of NZVI for soil and groundwater remediation. The authors of each chapter are leading researchers and/or practitioners in NZVI technology. [View the table of contents and abstracts at https://www.springer.com/gp/book/9783319953380?w\\_mc=ThirdParty\\_SpringerLink\\_3\\_FPR653\\_About\\_eBook#otherVersion=9783319953403](https://www.springer.com/gp/book/9783319953380?w_mc=ThirdParty_SpringerLink_3_FPR653_About_eBook#otherVersion=9783319953403)

### EPA TOOLS AND RESOURCES WEBINAR: TREATING CONTAMINANTS OF EMERGING CONCERN

Speth, T., U.S. EPA National Risk Management Research Laboratory webinar, 40 slides, 2019

This presentation focused on treating contaminants of emerging concern with an emphasis on determining cost-effective solutions for small systems. PFAS, cyanotoxins, and perchlorate were used to show how contaminant properties influence treatment effectiveness, operational complexity, cost, and residual stream handling and to discuss novel technologies. Each technology and contaminant included a discussion on how to avoid unintended consequences, such as increased water corrosivity or residual handling problems. Available EPA tools and expertise were highlighted. [https://www.epa.gov/sites/production/files/2019-03/documents/2019-03-20\\_rec\\_treatment\\_state\\_webinar.pdf](https://www.epa.gov/sites/production/files/2019-03/documents/2019-03-20_rec_treatment_state_webinar.pdf)

### SUSTAINED RELEASE TECHNOLOGY AND ITS APPLICATION IN ENVIRONMENTAL REMEDIATION: A REVIEW

Wang, L. and Z. Liu.  
International Journal of Environmental Research and Public Health 16: 2153(2019)

Researchers summarize the principles and classification of sustained-release technologies, as well as typical preparation methods of sustained-release agents in this paper. Applied research progress of sustained-release technologies is considered for rainwater purification, sewage/drinking water treatment, and soil and atmosphere remediation. <https://www.mdpi.com/1660-4601/16/12/2153/pdf>

### NANOBUBBLE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING: REVOLUTIONIZATION POTENTIAL AND CHALLENGES

Lyu, T., S. Wu, R.J.G. Mortimer, and G. Pan.  
Environmental Science & Technology 53(13):7175-7176(2019)

This publication reevaluated the application of nanobubbles in environmental engineering, particularly targeting the technological revolution potential and challenges. <https://pubs.acs.org/doi/pdf/10.1021/acs.est.9b02821?rand=ull9ymbk>

## ARE PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) A VAPOR INTRUSION CONCERN?

Roth, J. | RemTEC Summit, February 26-28, 2019, Denver, Colorado. 22 slides, 2019

This presentation provides a comparison of the physical and chemical properties of various PFAS compounds, with a focus on those found in indoor and outdoor air. Site and remedial scenarios are described where vapor-phase transport may be significant. **Abstract:** <https://www.remtecsummit.com/platform-presenters/Julia-Roth> **Slides:** <https://www.remtecsummit.com/ext/resources/Static-Pages/presentations/Julia-Roth.pdf>

### BIOELECTROCHEMISTRY STIMULATED ENVIRONMENTAL REMEDIATION

Wang, A.-J., B. Liang, Z.-L. Li, H.-Y. Cheng (eds).  
Springer Singapore, ISBN: 978-981-10-8542-0, ISBN: 978-981-10-8541-3, 300 pp, 2019

In 12 chapters, this book reviews the latest advances in the bioelectrochemical degradation of recalcitrant environmental contaminants. The first part introduces readers to the basic principles and methodologies of bioelectrochemical systems, electron-respiring microorganisms, the electron transfer mechanism and functional electrode materials. The second part addresses the bioelectrochemical remediation/treatment of various environmental pollutants in wastewater, sediment and wetlands. Reactor configuration optimization, hybrid technology amplification, and enhanced removal principles and techniques are also discussed. [View the table of contents and abstracts at https://www.springer.com/gp/book/9789811085413?w\\_mc=ThirdParty\\_SpringerLink\\_3\\_FPR653\\_About\\_eBook#aboutBook](https://www.springer.com/gp/book/9789811085413?w_mc=ThirdParty_SpringerLink_3_FPR653_About_eBook#aboutBook)

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