Technology Innovation News Survey

Entries for September 1-15, 2023

Market/Commercialization Information

FY24 GUIDELINES FOR BROWNFIELD PROGRAM GRANTS
Environmental Protection Agency, Funding Opportunities, 2023

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofit organizations to prevent, inventory, assess, clean up, and reuse brownfield sites. The closing date for applications for all of these opportunities is November 13, 2023.

- EPA-I-OLEM-OBLR-23-14: FY24 Guidelines for Brownfields Assessment Grants (Community-Wide Assessment Grants for States and Tribes). EPA anticipates 78 awards for brownfield assessment out of total estimated program funding of $50M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=350286
- EPA-I-OLEM-OBLR-23-15: FY24 Guidelines for Brownfield Cleanup Grants. EPA anticipates 65 awards for brownfield cleanup out of total estimated program funding of $95M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=335837
- EPA-OLEM-OBLR-23-12: FY24 Guidelines for Brownfield Assessment Grants (Community-Wide Assessment Grants). EPA anticipates 60 awards for brownfields assessments out of total estimated program funding of $30M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=350284
- EPA-OLEM-OBLR-23-11: FY24 FY24 Guidelines for Brownfield Multipurpose Grants. EPA anticipates 20 awards for brownfield cleanup out of total estimated program funding of $20M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=350282
- EPA-OLEM-OBLR-23-13: FY24 Guidelines for Brownfield Assessment Grants (Assessment Coalition Grants). EPA anticipates 26 awards for brownfield cleanup out of total estimated program funding of $40M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=350285

MATTEO AND SONS SUPERFUND SITE OU1 - REMEDIAL ACTION (SOL)
U.S. Department of the Army, Northwestern Division Kansas City District, Kansas City, MO
Contract Opportunities on SAM.gov, Solicitation W912DQ23R3016, 2023

This is a full-and-open competition under NAICS code 562910. The U.S. Department of the Army requires a contractor to perform remedial action efforts at the Matteo and Sons uperfund Site OU1 in West Deptford, New Jersey. The overall objective for this requirement is to perform remedial action efforts to include the removal and disposal of battery-casing waste material and contaminated soils at several locations across the site's 80 acres. Offers are due by 1:00 PM EDT on November 1, 2023. https://sam.gov/opp/aa6966f1494043eb9fe37fc46ccebca4/view

F -- WHITTIER, ALASKA ENVIRONMENTAL REMEDIATION SERVICES (SRCSGT)
U.S. Department of Defense Logistics Agency, Disposition Service-EBS, Fort Belvoir, VA
Contract Opportunities on SAM.gov, Solicitation SPE603-24-R-5X01, 2023

This is a sources sought notice for marketing research purposes only under NAICS code 562910. The U.S. Department of Defense Logistics Agency (DLA), DLA Energy - FESDA, is seeking small businesses that can provide environmental assessment and long-term management, operations of in-place remediation systems, and emergency response services for DLA at the former Defense Fuel Support Point in Whittier, Alaska. Services include long-term monitoring and operation and maintenance (O&M) of remediation systems, public meetings, and other related environmental remediation activities and requirements in accordance with the State of Alaska and local regulations and requirements. Except as otherwise noted, the contractor shall employ best commercial practices and guidelines in accordance with all applicable federal, state and local regulations to meet the requirements. The government anticipates awarding one firm-fixed-price contract for this work. No solicitation is being issued at this time. Responses to this sources sought notice are due by 4:00 PM EDT on November 2, 2023. https://sam.gov/opp/50265f0536df410aae86c74a35a80891/view

RESEARCH FOR UNDERSTANDING PFAS UPTAKE AND BIOACCUMULATION IN PLANTS AND ANIMALS IN AGRICULTURAL, RURAL, AND TRIBAL COMMUNITIES
Environmental Protection Agency Funding Opportunity EPA-G2023-STAR-J1, 2023

EPA is soliciting novel research that proposes innovative and multidisciplinary approaches to better understand PFAS uptake in plants and animals in agricultural environments. PFAS mitigation and contamination prevention strategies should also be an aspect of the research. The proposed research should further the knowledge of PFAS bioaccumulation in agriculture within the scope of mitigating PFAS exposure from the food supply. Applicants are strongly recommended to develop research proposals that may produce results that can be translated into real-world applications and utilized in future decision-making. Strong research proposals should leverage any existing scientific research regarding PFAS plant and animal uptake in agricultural operations and incorporate approaches to understand PFAS accumulation in agricultural environments. The development of different agricultural PFAS management perspectives and outlooks should also be a facet of the proposed research. The specific objective of the research should focus on mitigating PFAS exposure from the food supply through the exploration of PFAS bioaccumulation in plants and animals in agricultural settings with the goal of promoting farm viability and public health. The proposed research should support cost-effective solutions and management strategies that address agricultural environments at scales appropriate to mitigate PFAS concerns on farms that may have high volumes of water or soil with relatively low PFAS concentrations. It is anticipated that a total of ~ $8,000,000 will be awarded under this announcement, depending on the availability of funds, quality of applications received, and other applicable considerations. EPA anticipates funding approximately five awards under this RFA. Requests for amounts in excess of a total of $1,600,000 per award, including direct and indirect costs, will not be considered. The total project period requested in an application submitted for this RFA may not exceed four years. The closing date for responses is 11:59:59 pm ET on December 6, 2023.https://www.grants.gov/web/grants/view-opportunity.html?oppId=350492

INNOVATIVE TOOLS FOR CHARACTERIZING PFAS DISTRIBUTION AND MASS DISCHARGE IN GROUNDWATER
Lohmann, R. and C. Divine. SERDP & ESTCP Webinar, September 2023

This SERDP and ESTCP webinar focuses on DoD-funded research efforts to develop innovative tools for PFAS sampling and monitoring. Specifically, investigators covered research on field testing of passive PFAS samplers and the assessment of a novel multi-port well system to support PFAS site characterization efforts. Three different passive sampler types were evaluated to determine dissolved concentrations of PFAS in groundwater, surface water (fresh and saltwater), and porewater, while representative sorbents were characterized for PFAS uptake.
https://serdp-estcp.org/tools-and-training/details/dc6d0a6a-7b4b-4810-8965-5711d6020acc/innovative-tools-for-characterizing-pfas-distribution-and-mass-discharge-in-groundwater

Cleanup News

WHEN IT COMES TO LNAPL, ACTIVATED CARBON MAY REPLACE NSZD AS THE BEST AVAILABLE CLOSING TECHNOLOGY
Noland, S. I AIPG 60th Anniversary Conference, 16-19 September, Covington KY. poster, 2023

A design strategy based on kinetic mass removal rates rather than adsorption capacity was developed to treat LNAPL mass with activated carbon. The presentation includes results from research underpinning the basis and the performance of the design approach implemented at multiple sites. The research involved testing performed with GAC preloaded with diesel fuel. Biological activity was enhanced with nutrients and a long-term complex carbohydrate substrate. A blend of microbes capable of degrading fuel hydrocarbons and complex carbohydrate were provided. Hydrocarbon mass removal was tracked over six months. Lab results showed zero-order kinetics for diesel fuel degradation adsorbed in the activated carbon and that the mean degradation rate is independent of concentration. This situation commonly occurs when a reaction is catalyzed by attachment to a solid surface (heterogeneous catalysis) or an enzyme. In this case, both are likely occurring, but the available surface area of the activated carbon controls the mass removal rate. The kinetic design approach was implemented at numerous sites over five years. Contaminant mass removal rates observed at these sites are five to ten times greater than those realized under comparable NSZD scenarios. At the oldest site, kinetic design predicted the elimination of measurable LNAPL in 18 to 24 months. Although not a goal, dissolved benzene at most former LNAPL-impacted wells was reduced to below 5 ppb. Substantial reductions in the time required for cleanup at LNAPL sites are possible using this approach. *See poster from previous presentation:* https://www.trapandtreat.com/wp-content/uploads/2022/06/RPI_LNAPL_PRINT.pdf

FISCALLY CONSCIOUS DNAPL REMEDIATION - LEGACY LIABILITY TO MANAGED CLOSURE
Brab, B. and K. Thompson I AIPG 60th Anniversary Conference, 16-19 September, Covington KY, 19 slides, 2023

A phased approach utilizing combined remedies was selected as the preferred remedial option based on the site's geology at a former chemical plant that stored and repackaged hydrogen peroxide, methylisobutyl carbinol (MIBC), PCE, acetone, ethanol, and diesel fuel. Trap & Treat® BOS 100® was installed as a permeable reactive barrier (PRB) offsite to capture dissolved impacts while shallow soil mixing with activated persulfate was used to mitigate unsaturated soil impacts adjacent to source media. In addition, Trap & Treat® CAT 100 was used to mitigate saturated soil source mass and groundwater impacts. High-density quantitative soil and groundwater sampling was conducted to refine the Conceptual Site Model and confirmed a sustained NAPL source for a downgradient, offsite dissolved solute plume. Phase 1 utilized Trap & Treat® CAT 100 to evaluate effectiveness in mitigating saturated source mass soil and groundwater impacts. Phase 2 included additional offsite source and dissolved-phase treatment utilizing CAT 100. Phases 3 and 4 included CAT 100 injections in the source area. Lastly, Phase 5 included CAT 100 injections in the remaining onsite source areas. The presentation discusses the development of the CSM, and highlights the remedial action as a site-specific case study example, including characterizing and injecting remediation products into tighter lithologies and the financially responsible phased approach deployed over multiple years. Lessons learned and relevant data include the benefits of high-density indiscriminate soil and groundwater sampling for quantitative lab analysis and improvements to the BOS 100® platform to mitigate source-level DNAPL mass onsite. Long-term performance monitoring demonstrated CVOC reductions compared with abiotically and biologically generated degradation byproducts and microbial biomass and metagenomic sequencing analysis, supporting the decision to issue a managed closure status for the facility. *See presentation from 2023 Bioremediation conference* https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-presentations/track-a/a3_1505_192_brab.pptx.pdf?sfvrsn=d859c42d_3

STATE OF THE PRACTICE WORLDWIDE: COMPLEX INSTALLATION FOR IN SITU THERMAL REMEDIATION BENEATH AN ACTIVE MANUFACTURING FACILITY
Heron, G., C. Thomas, C. Crownover, R. Glass, G. Crisp, B.S. Kennington, S. Tarmann, and L. Hidalgo. I Groundwater Monitoring & Remediation [Published online 7 June 2023 before print]

This article presents major challenges and solutions for the design, construction, and operation of in situ thermal remediation (ISTR) to treat a vadose-zone TCE source at depths of 60 to 125 ft. below an occupied building at an active manufacturing facility. Innovative methods were required to install 135 steel casings from inside the building, including access limitations, space constraints that required angled borings and pre-modeling of rig mast positions, control measures to manage exhaust from up to four drill rigs operating simultaneously, adjustments to heater wiring to limit temperatures in shallow soils leading to indoor air heating and potential for vapor intrusion and ensure proper positioning and trajectory of closely spaced heaters. The installed heater casings were surveyed using a Devi-Flex™ tool to monitor heater placement in casings that ranged from 87-196 ft. at angles between 90° and 30° from horizontal and periodically needed to compensate for deflections caused by cobbles and boulders. Additional casings were installed to ensure adequate heater spacings in cases where deviations exceeded design parameters. ISTR was conducted using custom-built thermal conduction heaters designed to minimize heat output in the shallow vadose zone and inside the building. Temperatures in the lower vadose zone were maintained near boiling. Cables, vapor extraction pipes, and exhaust ducts were routed overhead and through the building roof to minimize disturbance to manufacturing operations. Three groups of heaters and vapor recovery wells were installed and operated in overlapping periods to expedite remediation.

Demonstrations / Feasibility Studies

REMOVAL AND DESTRUCTION OF PFAS AND CO-OCCURRING CHEMICALS FROM GROUNDWATER VIA EXTRACTION AND TREATMENT WITH ION EXCHANGE MEDIA, AND ON-SITE REGENERATION, DISTILLATION, AND PLASMA DESTRUCTION
Hagelin, N., Y. Aly, K. Chick, J. Heath, E. Thompson, C. Vowles, and J. Kornuc. ESTCP Project ER18-5015, 2,902 pp, 2022

Results and conclusions of a pilot study conducted at former Pease Air Force Base in Portsmouth, New Hampshire, are presented in this report. The purpose of the study was to further prove the effectiveness and develop scale-up criteria for integrating a PFAS treatment and destruction technology into existing groundwater treatment systems. The effectiveness of four PFAS Treatment and Destruction Trains (ion exchange resin, resin regeneration, distillation of spent regenerant, and low energy plasma destruction) of concentrated PFAS waste was evaluated. Performance assessment included pretreatment success criteria, resin performance, reuse and regeneration of resin, and plasma destruction. Findings were used to develop a cost model for regenerable IX/distillation/plasma scenario to compare to other currently available technologies.
Final Report: https://serdp-estcp-storage.s3.us-gov-west-1.amazonaws.com/s3fs-public/2023-06/ER18-5015%20Final%20Report.pdf?VersionId=XzoiImIcIZGfrCsh2UIw.Zh5LdtoLRqF
Executive Summary: https://serdp-estcp-storage.s3.us-gov-west-1.amazonaws.com/s3fs-public/2023-06/ER18-5015%20Executive%20Summary.pdf?VersionId=pGsB.1VanzD_9z_hsW1p_duUgh2GP7uv
YouTube Video of the DMX Plasma System: https://www.youtube.com/watch?v=pq7O9mwjgLY

FIELD DEMONSTRATION: ELECTROCHEMICAL DEGRADATION OF PFAS MASS IN WASTEWATERS
Casson, R., R. Gwinn, and R. Mora.
2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 17 slides, 2023

A three-month pilot demonstration using an electrochemical oxidation (EO) technology (DE-FLUORO™) to destroy PFAS mass was completed at a facility in Australia. The pilot treated 13,200 L of redundant 'end-of-life' AFFF and 20,800 L of PFAS-impacted first flush wash water. The 20-foot system container, "Meg" houses six 40-L cylindrical reactors equipped with novel reactive membrane electrodes that continuously circulate wastewater without the need for onsite staff. Building on the lessons from Meg, a larger demonstration system was constructed, named Orca, and tested on PFAS-laden wastes associated with a fire-training area. EO reactors in each system were assembled with recirculation pumps, chiller, a human-machine interface, vapor emission control, and a foam suppression system. Key operational parameters are fully adjustable and can be preset for automated operation. Each demonstration comprised a series of experiments under different treatment conditions and reactor configurations, including different retention times/flow rates and current supply of 100 to 300, and up to 1,200 amperes. Time-course samples were collected and analyzed for 30 PFAS compounds, TOP assay-PFAS, select anions (fluoride, sulfate, and perchlorate), total organic carbon (TOC), SVOCs, metals, and total organic fluorine (TOF) for mass balance evaluation. The presentation compares the results of the two systems, contrasting their strengths and best application and lessons learned on treating very high-concentration wastewater, including optimizing system conditions and methods for controlling foaming. After EO treatment of first-flush rinse water, PFOA concentrations were reduced by 77%-99%, and the sum of PFOS and PFHxS were reduced by 95%-100%. TOF mass balance calculations indicated that reductions of 96% of measurable and unmeasurable PFAS mass were achieved under ideal operational parameters. Three pilot demonstrations coupling EO with concentrating technologies are scheduled in 2023.
Slides: https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-presentations/track-b/b5_1030_315_gwinn.pptx.pdf?sfvrsn=991ebaf2_3
Longer abstract: https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-abstracts/315.pdf?sfvrsn=f3b22592_3

PUMP-AND-TREAT (P&T) VS GROUNDWATER CIRCULATION WELLS (GCW): WHICH APPROACH DELIVERS MORE SUSTAINABLE AND EFFECTIVE GROUNDWATER REMEDIATION?
Ciampi, P., C. Esposito, E. Bartsch, E.J. Alesi, and M.P. Papini.
Environmental Research 234:116538(2023)

This study provides a quantitative comparative analysis of the performance of an alternative system to traditional pump-and-treat (P&T) to support the development of sustainable groundwater remediation plans at two industrial sites contaminated with DNAPL and arsenic (As), respectively. At both locations, decade-long attempts were made to remediate groundwater contamination using P&T. Persistently high levels of pollutants led to the installation of groundwater circulation wells (GCWs) to explore the possibility of accelerating the remediation process in unconsolidated and rock deposits. A comparative evaluation focused on the different mobilization patterns observed, resulting in variations in contaminant concentration, mass discharge, and volume of extracted groundwater. A geodatabase-supported conceptual site model (CSM) was utilized as a dynamic and interactive interface to facilitate the fusion of multi-source data, including geological, hydrological, hydraulic, and chemical information, and enable the continuous extraction of time-sensitive information. Using this approach, the performance of GCW and P&T at the investigated sites was assessed. At Site 1, the GCW stimulated microbiological reductive dichlorination and mobilized significantly higher 1,2-DCE concentrations than P&T despite recirculating a smaller volume of groundwater. At Site 2, the As removal rate by GCW was generally higher than pumping wells. One conventional well mobilized higher As mass in the early stages of P&T, reflecting P&T's impact on accessible contaminant pools in early operational periods. P&T withdrew a significantly larger volume of groundwater than the GCW. The outcomes unveil the diverse contaminant removal behavior characterizing two distinct remediation strategies in different geological environments, revealing the dynamics and decontamination mechanisms that feature GCWs and P&T and emphasizing the limitations of traditional groundwater extraction systems in targeting aged pollution sources. GCWs have been shown to reduce remediation time, increase mass removal, and minimize the significant water consumption associated with P&T. https://www.sciencedirect.com/science/article/pii/S0013935123013427/pdfft?md5=e081ff9735bcc1285cd4e33109fa0a29&pid=1-s2.0-S0013935123013427-main.pdf

Research

UPTAKE MECHANISMS OF A NOVEL, ACTIVATED CARBON-BASED EQUILIBRIUM PASSIVE SAMPLER FOR ESTIMATING POREWATER METHYLMERCURY

Washburn, S.J., J. Damond, J.P Sanders, C.C. Gilmour, and U. Ghosh.
Environmental Toxicology and Chemistry 41(9):2052-2064(2022)

A study validated a novel polymeric equilibrium passive sampler of agarose gel with embedded activated carbon particles (ag+AC) to estimate aqueous monomethylmercury (MeHg) concentrations. Sampler behavior was tested using idealized media and realistic sediment microcosms. Isotherm bottle experiments with ag+AC polymers were conducted to constrain partitioning to these materials by various environmentally relevant species of MeHg bound to dissolved organic matter (MeHgDOM) across various sizes and characters. Log partitioning coefficients for passive samplers (K_{PS}) ranged from 1.98 ± 0.09 for MeHg bound to Suwannee River humic acid to 3.15 ± 0.05 for MeHg complexed with Upper Mississippi River natural organic matter. A series of dual isotope–labeled exchange experiments demonstrated reversible equilibrium exchange of environmentally relevant MeHg species. Isotopically labeled MeHgDOM species approached equilibrium in the samplers over 14 days. Mass balance was maintained, providing strong evidence that the ag+AC polymer material can achieve equilibrium measurements of environmentally relevant MeHg species within a reasonable deployment time frame. Samplers deployed across the sediment-water interface of sediment microcosms estimated both overlying water and porewater MeHg concentrations within a factor of 2 to 4 of measured values, based on the average measured K_{PS} values for species of MeHg bound to natural organic matter in the isotherm experiments. Results indicate that ag+AC polymers, used as equilibrium samplers, can provide accurate MeHg estimations across many site chemistries with a simple back-calculation based on a standardized K_{PS}.

ENHANCED DEGRADATION OF METHYL ORANGE AND TRICHLOROETHYLENE WITH PNIPAM-PMMA-FE/PD-FUNCTIONALIZED HOLLOW FIBER MEMBRANES

Mills, R., C. Tvrdik, A. Lin, and D. and Bhattacharyya.
Nanomaterials 13(14):2041(2023)

Hollow fiber membranes (HFMs) were functionalized with stimuli-responsive poly-N-isopropylacrylamide (PNIPAm), poly-methyl methacrylate (PMMA), and catalytic zero-valent iron/palladium (Fe/Pd) for heightened reductive degradation of such pollutants, using methyl orange (MO) as a model compound for TCE. Utilizing PNIPAm's transition from hydrophilic to hydrophobic expression above the lower critical solution temperature (LCST) of 32°C increased pollutant diffusion and adsorption to the catalyst active sites. PNIPAm-PMMA hydrogels exhibited 11.5× and 10.8× higher equilibrium adsorption values for MO and TCE, respectively, when transitioning from 23°C to 40°C. With dip-coated PNIPAm-PMMA-functionalized HFMs (weight gain: ~15%) containing Fe/Pd nanoparticles (d(p)~34.8 nm), surface area-normalized rate constants for batch degradation were determined. This resulted in a 30% and 420% increase in degradation efficiency above 32°C for MO and TCE due to enhanced sorption on the hydrophobic PNIPAm domain. Overall, efficient treatment of high-volume contaminated water can be achieved with functionalized membranes containing superior surface area-to-volume ratios and enhanced sorption sites.

ELUCIDATING THE ROLE OF CAPPING AGENTS IN FACET-DEPENDENT ADSORPTION PERFORMANCE OF HEMATITE NANOSTRUCTURES

Rudel, H.E. and J.B. Zimmerman. ACS Appl Mater Interfaces 15(29):34829-34837(2023)

A study evaluated the impact of the capping agent, poly(N-vinyl-2-pyrrolidone) (PVP), on the adsorption performance of nanohematite particles of varying prevailing facets, in the removal of selenite (Se(IV)) as a model system. The PVP capping agent reduces the available surface area for contaminant binding, reducing the overall Se(IV) adsorbed. However, accounting for the effects of surface area, {012}-faceted nanohematite demonstrates a significantly higher sorption capacity for Se(IV) compared with that of {001}-faceted nanohematite. Notably, chemical treatment minimally removes strongly bound PVP, indicating that complete removal of surface ligands remains challenging.

CRITICAL ROLE OF SEMIQUINONES IN REDUCTIVE DEHALOGENATION

Lokesh S., M.L. Lard, R.L. Cook and Y. Yang.
Environmental Science & Technology 57(38):14218-14225(2023)

A study focused on the reductive dehalogenation of a model organohalogen (triclosan) by 1,4-benzohydroquinone (H_2Q). In the presence of H_2Q only, triclosan degradation did not occur within the experimental period (up to 288 h), however, degradation did occur in the presence of H_2Q and $FeCl_3$ under anoxic conditions at pH 5 and 7 (above the pK_a of SQ˙ = 4.1), but was halted in the presence of dissolved oxygen. Kinetic simulation and thermodynamic calculations indicated that benzosemiquinone (SQ˙⁻) was responsible for the reductive degradation of triclosan, with the fitted rate constant for the reaction between SQ˙⁻ and triclosan of 317/M/s. The critical role of semiquinones in reductive dehalogenation can be relevant to a wide range of quinones in natural and engineered systems based on the reported oxidation-reduction potentials of quinones/semiquinones and semiquinones/hydroquinones and supported by experiments with additional model hydroquinone

SURVEY OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) IN SURFACE WATER COLLECTED IN PENSACOLA, FL

Ferreira da Silva, B., J.J. Aristizabal-Henao, J. Aufmuth, J. Awkerman, and J.A. Bowden.
Heliyon 8(8):e10239(2022)

A study monitored the presence of 51 PFAS in the Pensacola Bay System (PBS), FL. Due to the presence of many potential PFAS sources near the PBS (military bases, industries, airports, and firefighting stations), PFAS distribution and concentration in the PBS provide insights into the fate of the compounds and the possible impacts on coastal systems. Surface water was collected and analyzed from 45 sites via Strata-X-AW cartridge extractions and ultra-high pressure liquid chromatography-tandem mass spectrometry analysis. Recoveries for many PFAS (13/51) were > 60% (mean 77%), with relative standard deviations < 20%, except for N-methylperfluoro-1-octanesulfonamidoacetic acid (22%). Of the PFCAs (most PFAS detected), PFOA and PFHxA were present in all samples. However, PFPeA had the highest concentration of the group (51.9 ng/L, at site 81). The PFAS detected at the highest concentrations were PFSA, with PFOS having the highest detected concentration (269 ng/L, at site 81). Eight or more PFAS were quantified at all sites. Sites close to areas suspected of PFAS use had elevated concentrations. For example, one coastal location near an airfield had a ΣPFAS of 677 ng/L. Expansion from these ongoing efforts will focus on assessing PFAS-related effects on local wildlife and evaluating the distribution of PFAS at the "hotspot" sites during large episodic weather events, a critically understudied phenomenon regarding PFAS and vulnerable coastal environments.

ROBOTICS IN ENVIRONMENTAL SITE ASSESSMENT

Eichert, J., K. Pritchard, B. McAlexander, N. Sihota, and T. Hoelen.
2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 19 slides, 2023

A study evaluated two environmental site assessment approaches to test the use of robots. The first evaluation used autonomous and controlled robots to collect soil samples from a land treatment unit (LTU) previously used for biological and chemical treatment of oily sludges generated during petroleum refining operations at a former refinery in the Midwestern U.S. The robot was equipped with a portable x-ray fluorescent analyzer to measure lead concentrations in surface soil. Sample locations were determined by a dynamic algorithm that responded to real-time measurements and focused on delineating hot spots. The approach was compared to traditional hot spot delineation and removal at an adjacent property. The second study used robots to keep workers away from potentially unsafe soil excavations and stockpiles. Excavation monitoring and sampling are routinely conducted at a former petroleum refinery along the central coast of California. However, workers cannot enter excavations at the site and historically could only provide visual monitoring and analytical sampling from a distance. Remote-guided robots were tested to enter the excavation and monitor and sample soils directly. The presentation compares both traditional and robot-assisted techniques for excavation monitoring.
Slides: https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-presentations/track-p/s3_1235_141_eichert.pptx.pdf?sfvrsn=376fee34_3
Longer abstract: https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-abstracts/141_updabs.pdf?sfvrsn=df4b4d62_3
For more information, see the following videos: https://vimeo.com/battelle/review/834454982/0cbab2e503 and https://vimeo.com/battelle/review/834455777/95f3429cd3

PFAS-CONTAMINATED SOIL SITE IN GERMANY: NONTARGET SCREENING BEFORE AND AFTER DIRECT TOP ASSAY BY KENDRICK MASS DEFECT AND FINDPFΔS

Zweigle, J., B. Bugsel, K. Rohler, A.A. Haluska, and C. Zwiener.
Environmental Science & Technology 57(16):6647-6655(2023)

A composite sample from contaminated agricultural soil from northwestern Germany was investigated in depth with nontarget screening (NTS) (Kendrick mass defect and MS^2 fragment mass differences with FindPFΔS). Selected PFCAs and PFSAs were identified by detection in nearby surface and drinking water. Ten additional PFAS classes and 7 C8-based PFAS (73 single PFAS) previously unknown in this soil, were identified, including some novel PFAS. All PFAS classes except for one class comprised sulfonic acid groups and were semi-quantified with PFSA standards, from which ~97% were perfluorinated and are not expected to be degradable. New identifications comprised >75% of the prior known PFAS concentration, estimated at >30 µg/g. Pentafluorosulfanyl (SF>sub>5) PFSAs are the dominant class (~40%). Finally, the soil was oxidized with the direct TOP (dTOP) assay, revealing PFAA precursors covered largely by identified H-containing PFAS and additional TPs (perfluoroalkyl diacids) detected after dTOP. However, dTOP + target analysis covers <23% of the occurring PFAS in this soil, highlighting the importance of NTS to characterize PFAS contaminations more comprehensively.

General News

CASE STUDIES USING SURFACE WEIGHTED AVERAGE CONCENTRATION METHODS AT SEDIMENT REMEDIATION SITES

NAVFAC Technical Report, TR-NAVFAC-EXWC-SH-2315, 41 pp, 2023

Surface-Area Weighted Average Concentrations (SWACs) can be used to estimate mean contaminant concentrations over a specified area using contaminant data collected over different temporal and spatial scales. SWAC methodologies can also be used to define remedial footprints in the Feasibility Study and evaluate remedy effectiveness. This report describes several SWAC methods (arithmetic averages, weighted polygons and averaging over interpolated values), along with their advantages and limitations to assist RPMs in deciding whether to use SWACs for developing remedial footprints and assessing post-remediation achievement of remedial goals.
https://exwc.navfac.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/s/Final%20SWAC%20Case%20Study%20Technical%20Report%20_5_2023.pdf?ver=93dNskvJwGIa5_gHjoEXQg%3D%3D

WHAT WE KNOW: 6PPD AND 6PPD-QUINONE

ITRC Focus Sheet, 15 pp, 2023

6PPD-quinone, a transformation product of 6PPD, is an emerging contaminant of concern due to its exceedingly high aquatic toxicity and nearly ubiquitous presence in environmental media. In the short time since 6PPD-quinone (6PPD-q) was isolated and characterized, scientists have been working to understand its prevalence and behaviors in the environment. This focus sheet provides environmental officials with a brief overview of the current understanding of 6PPD-q sources, exposure, fate, transport, toxicity, and mitigation strategies. ITRC guidance will be released in summer 2024. https://6ppd.itrcweb.org/wp-content/uploads/2023/09/6PPD-Focus-Sheet-Web-Layout-9.pdf

ABSTRACT BOOK: 12TH ENVIRONMENTAL RISK MANAGEMENT WORKSHOP

AIPG Michigan, 13-14 June, Roscommon, Michigan, 69 pp. 2023

This 12th event in a series hosted by the Michigan Section of the American Institute of Professional Geologists focused on "The Basics to the Latest in Contaminant Fate & Transport," and included technical sessions on Emerging Contaminants, Site Investigation, and Remediation. https://mi.aipg.org/workshop/2023/2023%20Abstract%20Book%20Final.pdf

SOLIDIFICATION/STABILIZATION TECHNOLOGY FOR RADIOACTIVE WASTES USING CEMENT: AN APPRAISAL

Luhar, I., S. Luhar, M.M. Al Bakri Abdullah, A.V. Sandu, P. Vizureanu, R.A. Razak, D.D. Burduhos-Nergis, and T. Imjai. Materials 16(3):954(2023)

This article reviews the solidification/stabilization of radioactive wastes using cement and addresses the challenges that stand in the path of the design of durable cementitious waste forms for these problematical functioning wastes. Modern cement technologies for the S/S of radioactive waste are also reviewed, taking into consideration the engineering attributes and chemistry of pure cement, cement incorporated with SCM, calcium sulpho-aluminate-based cement, magnesium-based cement, along with their applications in the S/S of hazardous radioactive wastes. *This article is* ***Open Access*** at https://www.mdpi.com/1996-1944/16/3/954

SURFACTANT-ENHANCED MOBILIZATION OF PERSISTENT ORGANIC POLLUTANTS: POTENTIAL FOR SOIL AND SEDIMENT REMEDIATION AND UNINTENDED CONSEQUENCES

Bolan, S., L.P. Padhye, C.N. Mulligan, E.R. Alonso, R. Saint-Fort, T. Jasemizad, C. Wang, T. Zhang, J. Rinklebe, H. Wang, K.H.M. Siddique, M.B. Kirkham, and N. Bolan.
Journal of Hazardous Materials 443(Part A):130189(2023)

This article provides an overview of the sources and reactions of persistent organic pollutants (POPs) and surfactants in soil and sediments, the surfactant-enhanced solubilization of POPs, and the unintended consequences of surfactant-induced remediation of POP-contaminated soil and sediments. POPs include chemical compounds that are recalcitrant to natural degradation through photolytic, chemical, and biological processes in the environment; are potentially toxic compounds mainly used in pesticides, solvents, pharmaceuticals, personal care products, and industrial applications; and pose a significant and persistent risk to the ecosystem and human health. Surfactants can serve as detergents, wetting and foaming compounds, emulsifiers, or dispersants. They have been used extensively to promote POP solubilization and subsequent removal from environmental matrices, including solid wastes, soil, and sediments. Improper use of surfactants to remediate POPs may lead to unintended consequences, including surfactant toxicity to soil microorganisms and plants and leaching of POPs, resulting in groundwater contamination.

THE POTENTIAL IMPACT OF ACTIVATED CARBON GRAIN SIZE ON BIOREMEDIATION

Winner, E.J. | AIPG 60th Anniversary Conference, 16-19 September, Covington KY, poster, 2023

The centrality of particle size in activated carbon remediation when biodegradation is the expected, supported treatment mechanism is explained in this presentation. It demonstrates the centrality of grind to initiate and sustain bioremediation on activated carbon by presenting key elements from the peer-reviewed literature and lab experiments with illustrations from field data. The presentation will show biofilms, microbial structural matrices, and microbial population parameters from genome sequencing. The collected data illustrates the impact of activated carbon particle size on bioremediation. The data demonstrates the effects on microbial populations due to activated carbon particle size. *See the poster at* https://www.trapandtreat.com/wp-content/uploads/2023/06/RPI_Poster_SpaceForMicrobes_91x44_v2.pdf.

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