Technology Innovation News Survey

Entries for August 1-15, 2023

Market/Commercialization Information

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

When this solicitation is released , it will be competed as 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 Superfund 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. This notice does not constitute a commitment on the part of the Government to award a contract, nor to pay any costs incurred as a result of replying to this notice. This notice should not be construed as a commitment by the Government for any purpose. There is no solicitation at this time. https://sam.gov/opp/b2d14ee1694c4a38a76318ec554bcfb2/view

F -- IDIQ MULTIPLE AWARD TASK ORDER CONTRACT (MATOC) TO SUPPORT THE ENVIRONMENTAL REMEDIATION SERVICES (ERS)
U.S. Army Corps of Engineers, Savannah District, Savannah, GA
Contract Opportunities on SAM.gov, Solicitation W912HN24R1000, 2023

When This Solicitation Is Released On Or About October 30, 2023, it will be competed as an 8(A) set-aside under NAICS code 562910. The U.S. Army Corps of Engineers plans to issue a Request for Proposal (RFP) for an Indefinite Delivery/ Indefinite Quantity (IDIQ) MATOC for Environmental Remediation Services (ERS) to respond to numerous requests for environmental support for the U.S. Army Corps of Engineers South Atlantic Division as well as customers of the Savannah District. This IDIQ contract will support military installations, federal agencies, Formerly Used Defense Sites (FUDS), and civil work entities where the USACE is authorized to respond. However, contract capacity may be shared with other CONUS geographic USACE Districts where the principles of the ER 5-1-10 and ER 5-1-11 (Project Management Business Process) have been met. The Contractor shall be responsible for providing services related to requirements of RCRA, CERCLA, the Clean Air Act, and other related Federal Programs in addition to State/Local specific regulations/requirements dealing with hazardous waste management/disposal and with Underground Storage Tanks (USTs), and other fuels related issues. The ERS actions may address both regulated and non-regulated toxic substances. As part of any site remediation activities, incidental construction may also be included in the task orders. Remedial actions may address both regulated and non-regulated toxic substances and emerging contaminants for customers of the U.S. Army Corps of Engineers. Traditional construction activities only related to restoration, renovations, repairs, and modernization of existing facilities are included. The period of performance includes a three-year base period and one two-year option period. https://sam.gov/opp/feb8807ae1ed4f9a8a5ad88dd0e8e02d/view

DEPARTMENT OF ENERGY (DOE) ENVIRONMENTAL MANAGEMENT (EM) WEST VALLEY DEMONSTRATION (SNOTE)
U.S. Department of Energy, Environmental Management Consolidated Business Center, Cincinnati, OH
Contract Opportunities on SAM.gov, Solicitation 89303323REM000116, 2023

The DOE is releasing the Draft Request for Proposal (RFP) pertaining to the West Valley Demonstration Project (WVDP) Phase 1B procurement, for review. The purpose of the Draft RFP is to solicit questions and comments from all interested parties and to assist DOE in developing a Final RFP for this procurement. The West Valley Demonstration Project (WVDP) is located on the Western New York Nuclear Service Center and comprises 3,300 acres of land used for the commercial reprocessing of spent nuclear fuel. The scope of this contract generally includes: contract transition (incoming and outgoing); safeguards and security; stewardship, maintenance, and operational activities necessary to maintain the site; waste management, storage, and disposal; soil excavation and remediation; facility deactivation and demolition; programmatic support activities to safely and compliantly execute the scope; and support for other DOE contractors as currently authorized under the existing regulatory framework at the WVDP. Specifically, this includes WVDP contractor groups providing support services including, but not limited to, soil, sediment, and groundwater characterization, environmental monitoring, and associated regulatory documentation supporting decommissioning activities at the WVDP site to support DOE in satisfying regulatory requirements in the WVDP Act of 1980 and the Cooperative Agreement between USDOE and NYSERDA and Supplemental Agreements to the Cooperative Agreement. Written comments on the draft RFP and the accompanying procurement website (https://www.emcbc.doe.gov/seb/wvdpphase1b/) are due by October 2, 2023. https://sam.gov/opp/caa6f1fadb824e4chd41e9c1f6ca83c3/view

MATTEO AND SONS SUPERFUND SITE - REMEDIAL ACTION
U.S. Army Corps of Engineers (USACE), 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 USACE Kansas City District requires a contractor to perform remedial action efforts at OU1 of the Matteo and Sons Superfund site in West Deptford, New Jersey. The magnitude of construction is estimated between $25,000,000 and $100,000,000. The Government contemplates the award of a Cost-Plus-Fixed-Fee contract resulting from this solicitation. A scheduled site visit is planned for September 14, 2023, at 10:00 AM EDT at the west side of the parking lot located at 1692 Crown Point Road, Thorofare, New Jersey 08086. Offers are due by 12:00 PM CDT on October 18, 2023. https://sam.gov/opp/7ee1d9302c544d2bbc76a81a39bb43f2/view

Cleanup News

DO YOU KNOW YOUR SITE? QUALITATIVE CHARACTERIZATION, MODELING, AND REMEDIATION TO PREDICT SITE CLOSURE
Paulson, R. and B. Brab. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, poster, 2023

As a result of a fuel release that occurred near a wellhead protection area, five gasoline tanks were removed or closed-in-place, followed by a series of mobile-enhanced multi-phase extraction events. Soil gas survey points indicated free product was present in a monitoring well, and benzene concentrations remained elevated above the site-specific cleanup level in seven monitoring wells on and offsite. A remedial design characterization rapidly characterized the extent of total petroleum mass in soil and groundwater. Emergency interim corrective actions included in situ remedial injections. Modeling of the total mass present in soil and groundwater indicated the required time to reach cleanup would be 4-6 years following completion of the interim measures. High-resolution site characterization was conducted using UVOST® to identify the potential extent of remaining residual LNAPL and evaluate the progress of the interim measures. A subsequent qualitative High-Resolution Site Characterization (qHRSC) program included the installation of 18 soil borings to establish a new baseline for contaminant concentrations and update the existing conceptual site model (CSM). Using the data from the qHRSC, a surgical injection design was developed using Trap & Treat®BOS 200+®. Post-injection performance monitoring of COCs and degradation byproducts was completed from baseline through the current date and microbial diagnostics were completed to further evaluate conditions and progress. The presentation demonstrates the efficient use of investigative methods to expedite the time to implement a fiscally responsible remediation program, reducing the time to reach site closure. Remedial evolution highlights developing, selecting, and using a new and cutting-edge application of powdered activated carbon coupled with an enhanced biological component. Lessons learned and relevant data are presented, including the benefits of high-density indiscriminate soil and groundwater sampling for qualitative analysis in the lab. Post-injection analytical performance and microbial diagnostic tools are also provided.
Slides: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-posters/d3_330_poster_brab.pdf?sfvrsn=982fc0ed_3
Longer abstract: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-abstracts/330.pdf?sfvrsn=59413b81_3

COMPARISON OF BIOREMEDIATION OF BIOSPARGE SYSTEMS FROM TWO SITES
Lothe, A. and A. Rees. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 28 slides, 2023

This presentation reviews the complexities of site conditions at two active industrial petroleum sites in Southern California contaminated with LNAPL and dissolved-phase BTEX and compares microbial community responses to oxygen levels depending on differences in hydrogeologic settings, operating conditions, and baseline contamination levels. Biosparge systems were designed and constructed under stringent engineering requirements and utilized different remediation technology implementation approaches: one using mechanical and electrical power sources and equipment and computer-based controls, and the other using solar power and external plant compressed air. System parameters, including flow rates and pressures at the main header, branch lines, and sparge wells, were recorded and modified weekly. Performance monitoring was conducted to measure fluid levels, dissolved oxygen, oxidation-reduction potential, temperature, pH, and electrical conductance in groundwater. Groundwater samples were collected before system startup and at 12, 24, and 48 weeks following startup for lab analysis of COCs. Microbial BioTraps® were collected at baseline and six to twelve weeks post-startup for lab analysis of functional genes responsible for aerobic and anaerobic biodegradation of petroleum hydrocarbons. The pressure response at the sparge wells for the biosparge system that operated on mechanical and electrical power ranged from 9 to 16 psi and had an average flow rate of 1.1 standard cubic feet per minute (scfm). In contrast, the pressure at the sparge wells for the solar-powered and plant air biosparge system ranged from 16.5 to 80 psi and had an average flow rate of 2.5 scfm. The differences in pressure and flow rates between the two sites are primarily driven by the difference in depth and hydrostatic pressure on sparge screens. In response to the sparging flow rates and pressures at both sites, the fluid elevation changes at the monitoring wells fluctuated from +4.2 to -3.4 ft. In wells with historically persistent LNAPL, the LNAPL thickness decreased to zero. The increase in DO concentrations correlated with the magnitude of flow rates, the effective zone of sparging influence, and the permeability of the formation. The DO concentrations ranged from 2.4 to 28 mg/L for the solar-powered system and from 1.90 to 4.88 mg/L for the mechanical system. A significant difference was observed in the microbial communities, correlating to decreased dissolved BTEX concentrations at both sites. However, the reduction in dissolved BTEX concentrations was not uniform across the site and was dependent on the heterogeneities of the local geology. The COC degradation efficiency can be increased by developing a coherent site model to identify and optimize the sparge well-specific operating parameters.
Slides: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-presentations/track-c/c6_1030_359_lothe_pptx.pdf?sfvrsn=ab2ec0d_3
Longer abstract: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-abstracts/359_updabs.pdf?sfvrsn=446ae008_3

TRANSITION FROM ACTIVE REMEDIATION TO NATURAL SOURCE ZONE DEPLETION (NSZD) AT A LNAPL-IMPACTED SITE, SUPPORTED BY SUSTAINABLE REMEDIATION APPRAISAL
Tom M. Statham, Richard Sumner, Alan F.M. Hill, and Jonathan W.N. Smith.
Quarterly Journal of Engineering Geology and Hydrogeology 56:qjegh2022-140(2023)

A case study of the transition from active remediation to passive natural source zone depletion (NSZD) is presented for a petroleum-impacted site in northwestern Europe. The transition was supported by multiple lines of evidence/management options, including introducing institutional controls on groundwater and land-development restrictions, residual-NAPL risk assessment results, monitoring to establish reduction of the LNAPL plume an LNAPL transmissivity assessment, a CO_2 equivalent assessment of remediation options, and an LNAPL recovery diminishing returns model. Regulatory approval was obtained for a partial closeout of the remediation system by applying local, sustainable remediation principles consistent with ISO/SuRF-UK sustainable remediation frameworks and tools. By the final year of operation, NSZD rates were over three times greater than active LNAPL recovery rates (12,000 l/ha/a for NSZD; 3,800 l/ha/a for active LNAPL recovery). In the remaining active remediation areas, total fluids extraction outperforms NSZD and will continue until a comparable point is reached when NSZD removal exceeds active remediation. At that point, a transition to NSZD alone will be considered as the most sustainable risk-based approach. https://www.lyellcollection.org/doi/pdf/10.1144/qjegh2022-140

Demonstrations / Feasibility Studies

FIELD-SCALE EVALUATION OF BIOSPARGING AT A CERCLA SITE TO DEPLETE GROUNDWATER CONTAMINANTS FROM CREOSOTE AND ACHIEVE REMEDIAL ACTION OBJECTIVES
Sillan, R., R. Holm, G. Jeffries, J. Smith. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 16 slides, 2023

The feasibility of biosparging to deplete groundwater contaminants from creosotes was evaluated at a Superfund site in Minnesota. A two-phased treatability study was performed to collect data at the field scale to evaluate the effectiveness and implementability of biosparging to decrease concentrations of groundwater contaminants and achieve RAOs permanently. Phase 1 was performed to collect data that supported the design of a much larger biosparge system, while Phase 2 will treat the largest creosote source area with portions extending to 103 ft bgs. Phase 2 is planned to operate for several years to collect data to evaluate long-term performance and ability to achieve RAOs. Lab analysis of soil, groundwater, and creosote was used to evaluate biosparging performance and provide baseline data for ongoing evaluations of long-term performance. The baseline composition of creosote inferred from lab results for soil samples was similar to lab-measured compositions of creosote. During Phase 1, the mass and mass fraction of VOCs in creosote decreased by 23% and 15%, respectively, which was greater than for PAHs (the mass and mass fraction of naphthalene in the creosote decreased by 14% and 4%). Biosparging in the Phase 1 treatment area continued after Phase 1 was completed and during Phase 2 planning to provide additional data on further changes to creosote composition, which were used to build and calibrate a creosote depletion model.
Slides: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-presentations/track-a/a5_0850_288_sillan.pptx.pdf?sfvrsn=dc57610e_3
Longer abstract: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-abstracts/288.pdf?sfvrsn=a9e35017_3

MODELING OF COMPLEX, MULTI-COMPONENT NAPL REMEDIATION FOR DECISION SUPPORT
Stewart, L.D., J. Nyman, A.E. Prieto-Estrada, J.C. Chambon, M.A. Widdowson, and M.C. Kavanaugh. Groundwater Monitoring & Remediation 43(3):45-56(2023)

A modeling system that averaged the volume of NAPL-impacted saturated soil was developed and demonstrated at the former Williams AFB. The system combines upscaled, physically-based mass transfer coefficients for multi-component NAPL dissolution with theoretical enhancements specific to multiple remediation processes. These enhancement models are equally applicable to numerical simulations of NAPL remediation. The demonstration yielded realistic predictions, with greater certainty, for multiple technologies intended to reduce remedial timeframes and lifecycle costs. The enhanced dissolution modeling provides a site-specific, quantitative assessment of changes in NAPL source discharge concentration and mass discharge over time for various remedial options equivalent to assessments from complex numerical transport models, given typical input data limitations.

CHEMICALLY CATALYZED PHYTOEXTRACTION FOR SUSTAINABLE CLEANUP OF SOIL LEAD CONTAMINATION IN A COMMUNITY GARDEN IN JERSEY CITY, NEW JERSEY
Zhang, Z., D. Sarkar, F. Levy, and R. Datta. I Sustainability 15(9):7492(2023)

A field study was conducted to demonstrate the effectiveness of a chemically catalyzed phytoextraction model for Pb removal following successful lab, greenhouse, and panel experiments. The biodegradable chelating agent ethylenediaminedisuccinic acid (EDDS) was applied during Pb phytoextraction by vetiver grass (*Chrysopogon zizanioides*) in a Pb-contaminated community garden in Jersey City, N.J. The soil Pb concentration was reduced from 1,144 to 359 mg/kg in 3 years, despite ongoing Pb input to the field plots from a nearby construction site. EDDS effectively converted non-plant-available forms of Pb (i.e., carbonate-bound, oxide-bound, and organic-bound forms) to plant-available forms (i.e., water-soluble and exchangeable forms). With EDDS application, vetiver roots accumulated 532,231 and 401 mg/kg of Pb in years 1, 2, and 3, respectively, which were higher than the values obtained without EDDS applications (228, 154, and 214 mg/kg). *This article is* ***Open Access*** *at* https://www.mdpi.com/2071-1050/15/9/7492

THE IN SITU TREATMENT OF TCE- AND PFAS-IMPACTED GROUNDWATER USING ANAEROBIC BIOREMEDIATION, POLYLACTATE ESTER, AND COLLOIDAL ACTIVATED CARBON
Gregor, R. and L. Benevenuto. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 17 slides, 2023

A study was conducted to evaluate if colloidal activated carbon (CAC), organic carbon, polylactate, and micro sulfidated zero-valent iron (mSZVI) could be injected into a shallow, unconfined heterogenetic aquifer below a former manufacturer facility to create a permeable reactive zone (PRZ) and treat chlorinated ethenes over 24 months. Groundwater was impacted with TCE (≤985 µg/L), 1,2-DCE (≤258 µg/L) and vinyl chloride (≤54 µg/L) and five PFAS, including PFPeA (≤12,800 ng/L), PFHxA (≤3,240 ng/L), PFBA (≤795 ng/L), PFOA (≤950 ng/L), and PFOS (≤2,140 ng/L). The study also evaluated the effect of amendments on physical and chemical parameters (general groundwater chemistry, aquifer microbiology) and whether heterogeneity impacted the distribution of the reagents within the injection zone. The PRZ was created using a series of 10 injection wells installed in a 10-ft grid configuration over the target injection area. Cores were collected to evaluate the pre- and post-injection distribution of the reagents using total organic carbon (TOC) as an indicator and the horizontal hydraulic conductivity variability of the aquifer. Results show that the amendments effectively attenuated the chlorinated ethenes and PFAS within the groundwater entering the PRZ. Groundwater sampling indicated that the five PFAS were treated to detection or below the analytical detection limit. Post-injection results showed that concentrations of TCE, cis-1,2-DCE, and vinyl chloride decreased by an order of magnitude within 4 months, with all ethenes decreasing by >99% within 8 months. Analysis of soil cores collected pre- and post-injection indicated that the distribution of the CAC was influenced by small-scale heterogeneities within the aquifer. However, all aquifer samples collected within the targeted injection zone contained TOC at an average increase of >1,000% compared to pre-injection TOC concentrations.
Slides: https://www.battelle.org/docs/default-source/bidden/2023-bio-symp-presentations/track-b/b4_0915_38_mcgregor.pptx.pdf?sfvrsn=3f24999b_3
Longer abstract: www.battelle.org/docs/default-source/bidden/2023-bio-symp-abstracts/38_updabs.pdf?sfvrsn=fc14cf56_3

Research

AEROBIC BIOTRANSFORMATION AND DEFLUORINATION OF FLUOROALKYLETHER SUBSTANCES (ETHER PFAS): SUBSTRATE SPECIFICITY, PATHWAYS, AND APPLICATIONS
Jin, B.S., Y.W. Zhu, WY. Zhao, Z.K. Liu, S. Che, K.P. Chen, Y.H. Lin, J.Y Liu, and Y. Men.
Environmental Science & Technology Letters [Published 7 August before print]

A study investigated the structure-biodegradability relationship for 12 different ether PFAS with a carboxylic acid head group, including GenX, in activated sludge communities. Only polyfluorinated ethers with at least one -CH2- moiety adjacent to or a C=C bond in the proximity of the ether bond underwent active biotransformation via oxidative and hydrolytic O-dealkylation. The bioreactions at ether bonds led to the formation of unstable fluoroalcohol intermediates subject to spontaneous defluorination. Aerobic biotransformation/defluorination was further demonstrated to complement the advanced reduction process in a treatment train system to achieve more cost-effective treatment for GenX and other recalcitrant perfluorinated ether PFAS. Findings provide essential insights into the environmental fate of ether PFAS, the design of biodegradable alternative PFAS, and the development of cost-effective ether PFAS treatment strategies.

UNDERSTANDING THE EFFECT OF SINGLE ATOM CATIONIC DEFECT SITES IN AN AL_2O_3 (012) SURFACE ON ALTERING SELENATE AND SULFATE ADSORPTION: AN AB INITIO STUDY

Gupta, S., A. Chismar and C. Muhich
The Journal of Physical Chemistry C127: 6925-6937

A study elucidated the relative importance of the water network effects and surface cation identity in controlling selenate and sulfate adsorption energy using density functional theory (DFT) calculations. DFT calculations predicted the adsorption energies of selenate and sulfate on nine transition metal cations (Sc-Cu) and two alkali metal cations (Ga and In) in the α - Al_2O_3 (012) surface under simulated acidic and neutral pH conditions. The water network effects had a larger impact on the adsorption energy than the cationic identity, although cation identity secondarily controlled adsorption. Most cations decreased the adsorption energy, weakening the overall performance. Larger Sc and In cations enabled inner-sphere adsorption in acidic conditions because they relaxed outward from the surface, providing more space for adsorption. Additionally, only Ti induced Se selectivity over S by reducing the adsorbing selenate to selenite but did not reduce the sulfate. The study indicates that tuning water network structure will likely have a larger impact than tuning cation-selenate interactions for increasing adsorbate effectiveness.

EVALUATION OF CURRENT ALTERNATIVES AND ESTIMATED COST CURVES FOR PFAS REMOVAL AND DESTRUCTION FROM MUNICIPAL WASTEWATER, BIOSOLIDS, LANDFILL LEACHATE, AND COMPOST CONTACT WATER

Barr Engineering Co., Hazen and Sawyer for the Minnesota Pollution Control Agency, 281 pp, 2023

A study developed alternatives to remove and destroy PFAS from water resource recovery facility (WRRF) effluent, biosolids, mixed municipal solid waste (MSW) landfill leachate, and compost contact water (waste streams) using currently feasible technologies. Over 50 PFAS separation and destruction technologies were screened for their ability to remove and destroy select PFAS to below current analytical reporting limits and for their demonstrated commercial status. Thirteen technologies were retained for detailed consideration and assembled into alternatives, including destroying PFAS in final waste products. Assembled alternatives were ranked for criteria related to technical feasibility, economic feasibility, and byproducts management. Currently, feasible technologies to separate PFAS from liquid waste streams are limited to sorption processes in pressure vessels (including granular activated carbon [GAC], anion exchange [AIX], and modified clay), reverse osmosis (RO) membrane separation, and foam fractionation. Feasible technologies to destroy PFAS from liquid media are currently limited to high-temperature incineration, thermal oxidation, and supercritical water oxidation (SCWO). Management of PFAS in biosolids remains a developing field with significant public and regulatory interest. Technologies selected as feasible at this time include SCWO, pyrolysis followed by thermal oxidation, and gasification followed by thermal oxidation. Two to four alternatives were retained for each waste stream for preliminary design and cost estimating. Costs were also evaluated with a lens on the cost per benefit provided by comparing the cost per mass of target PFAS removed between different waste streams and technologies over 20 years. https://www.pca.state.mn.us/sites/default/files/c-pfc1-26.pdf

PRE- AND POSTAPPLICATION THERMAL TREATMENT STRATEGIES FOR SORPTION ENHANCEMENT AND REACTIVATION OF BIOCHARS FOR REMOVAL OF PER- AND POLYFLUOROALKYL SUBSTANCES FROM WATER

Wang, Z., A. Alinezhad, R.Sun, F. Xiao, and J.J. Pignatello.
ACT ES&T Engineering 3(2):193-200(2023)

This article presents a strategy to employ biochar to remove PFAS that combines post-pyrolysis modification, which greatly improves performance, with a reactivation step that enables its reuse. Modification entails brief post-pyrolysis air oxidation at 400°C, which considerably enlarges pore size and specific surface area and thereby increases the solid-to-water distribution ratio, K_D, of individual PFAS by as much as 3 orders of magnitude. In some cases (e.g., PFOA), the K_D was comparable to commercial GAC. The sorbed PFAS could be decomposed by brief thermal reactivation of the spent biochar at 500°C in N_2 or air. After thermal reactivation in air, the biochars exhibited even greater PFAS K_D values in a second cycle. While thermal reactivation of GAC in air could also be achieved, sorption affinity for the shorter-chain PFAS was noticeably reduced.

IN SITU INSIGHT INTO THE AVAILABILITY AND DESORPTION KINETICS OF PER- AND POLYFLUOROALKYL SUBSTANCES IN SOILS WITH DIFFUSIVE GRADIENTS IN THIN FILMS

Huang, Y.-R., S.-S. Liu, J.-X. Zi, S.-M. Cheng, J. Li, G.-G. Ying, and C.-E. Chen.
Environmental Science & Technology 57(20):7809-7817(2023)

A study employed diffusive gradients in thin films (DGT) to understand the distribution and exchange kinetics of five typical PFAS in four soils. Results showed a nonlinear relationship between the PFAS masses in DGT and time, implying that the solid phase partially supplied PFAS in all soils. A dynamic model, DGT-induced fluxes in soils/sediments (DIFS) was used to interpret the results and derive the distribution coefficients for the labile fraction (K_{dl}), response time (t_c), and adsorption/desorption rates (k_1 and k_{-1}). The larger labile pool size (indicated by Kdl) for the longer chain PFAS implied their higher potential availability. The shorter chain PFAS tend to have a larger t_c and relatively smaller k_{-1}, implying that the release of these PFAS in soil might be kinetically limited but not for more hydrophobic compounds, such as PFOS, although, soil properties might play an important role. K_{dl} ultimately controls the PFAS availability in soil, while the PFAS release from soil might be kinetically constrained (which may also hold for biota uptake), particularly for more hydrophilic PFAS.

THERMAL DESORPTION OPTIMIZATION FOR THE REMEDIATION OF HYDROCARBON-CONTAMINATED SOILS BY A SELF-BUILT SUSTAINABILITY EVALUATION TOOL

Li, Y., M. Wei, B. Yu, L. Liu, and Q. Xue.
Journal of Hazardous Materials 436:129156(2023)

A study evaluated various integrated indices of treatment cost and reuse of treated soil at three desorption temperatures. The changes in various treated soils, including shear strength, Atterberg limits, particle size distribution, permeability, soil carbon, and soil biomass, were analyzed using typical engineering and ecological characteristics closely related to soil reusability. A sustainability evaluation tool, that considered treatment costs and reuse indices, was developed for the greener disposal of hazardous soil. The evaluation concluded that the contaminated soils treated at 350°C generated the highest soil reusability with excellent remediation efficiency. The sensitivity analysis confirmed that the tool had better stability in a common situation where the weight of the remediation cost was heavier than the soil reusability. Published data were input into the tool to validate its applicability under different scenarios. Results were consistent with the qualitative assessment of the literature. The tool can quantitatively select a more sustainable desorption method for the disposal and reuse of hazardous soil.

General News

OPTIMIZING REMEDIATION TECHNOLOGIES

Scala, C., V. Lal, S. Moore, and R. Wice. NAVFAC User Guide, 122 pp, 2022

To ensure that progress is made toward achieving cleanup standards through active remediation, technology-specific guidance for optimizing 15 selected remedial technologies is presented in this document. For each technology, a description, an example performance plot, and a summary of common operational problems and corresponding optimization recommendations are presented.
https://exwc.navfac.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/o/NAVFAC%20EXWC-UG-2301_Final%20Tech%20Opt%20Report%2010_6_22_REV.pdf?ver=1qbMceCNM6ZwEHRPArUaNw%3d%3d

WORKSHOP REPORT: INNOVATIVE STRATEGIES FOR LONG-TERM MONITORING OF COMPLEX GROUNDWATER PLUMES AT DOE'S LEGACY SITES

Eddy-Cilek , C., J. Nyman, K. Belli, and E. Fabricatore. Savannah River National Laboratory, Report SRNL-STI-2023-00103, 24 pp, 2023

As part of DOE's Office of Environmental Management (DOE-EM's) efforts to advance long-term monitoring systems, an in-person/virtual hybrid workshop was hosted by Savannah River National Laboratory (SRNL) on January 24-25, 2023, in Augusta, Georgia. The purpose of the workshop was to identify challenges and opportunities for deploying advanced technologies for long-term monitoring at DOE sites. The key issues discussed during the workshop were: 1) the regulatory acceptance of replacing a process that traditionally has used laboratory sampling and analysis of groundwater samples; and 2) the application of this strategy to the southwestern arid sites that include many of the remaining DOE-EM and DOE-LM complex groundwater plumes. Characteristics common to most arid sites present limitations and opportunities for advanced technologies. A DOE-EM-funded multi-laboratory team is currently developing and testing innovative monitoring strategies, including the use of in situ groundwater sensors, geophysics, drone/satellite-based remote sensing, reactive transport modeling, and artificial intelligence/machine learning (AI/ML). The project's demonstration testbed is at the Savannah River Site (SRS) F-Area Seepage Basins, where a well-characterized complex groundwater plume composed of uranium and other radionuclides is in the latter stages of remediation. The workshop included more than 70 participants, presentations, a field visit to the SRS F-Area, breakout working groups, and large group discussions. Participants developed recommendations on five topics: in situ sensors, spatially integrative tools, challenges to regulatory acceptance, AI/ML strategies, and transitioning sites to DOE-LM. https://sti.srs.gov/fulltext/SRNL-STI-2023-00103.pdf

DEVELOPING AND DEMONSTRATING PFAS PASSIVE SAMPLERS

Blaney, L. and P. Edmiston. SERDP & ESTCP Webinar, August 2023

This webinar featured DoD-funded research efforts to develop and demonstrate PFAS passive samplers. First, Dr. Lee Blaney discussed the development and performance of anion exchange membranes as passive samplers for PFAS. Second, Dr. Paul Edmiston discussed developing the Sentinel passive sampler and its use for groundwater, surface water, and stormwater monitoring.
https://serdp-estcp.org/tools-and-training/details/8866389e-9fc9-49ab-abaa-f34f7409f5d9/developing-and-demonstrating-pfas-passive-samplers

RECENT ADVANCES ON PFAS DEGRADATION VIA THERMAL AND NONTHERMAL METHODS

Verma, S., T. Lee, E. Sahle-Demessie, M. Ateia, and M.N. Nadagouda.
Chemical Engineering Journal Advances 13:100421(2023)

This review comprehensively examines the following thermal and nonthermal PFAS destruction technologies: sonochemical/ultrasound degradation, microwave hydrothermal treatment, subcritical or supercritical treatment, electrical discharge plasma technology, thermal destruction methods/incinerations, low/high-temperature thermal desorption process, vapor energy generator technology, and mechanochemical destruction. The background, degradation mechanisms/pathways, and advances of each remediation process are discussed in detail.

RECENT ADVANCES IN IMPROVING THE REMEDIATION PERFORMANCE OF MICROBIAL ELECTROCHEMICAL SYSTEMS FOR CONTAMINATED SOIL AND SEDIMENTS

Li, R., J. Wang, T. Li, and Q. Zhou.
Critical Reviews in Environmental Science and Technology 53(1):137-160(2022)

This review briefly introduces the removal mechanisms of different pollutants, including the mechanisms of electron releasing, transportation, and receiving. A detailed discussion of the recent progress in the enhancement of soil/sediment remediation in terms of reactor configurations, electrode arrangements, and electrode materials is presented. Lastly, the current emerging limitations of soil/sediment MES (SMES) and future research endeavors to improve the performance and promote the practical application, are discussed.

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

Mention of non-EPA documents, presentations, or papers does not constitute a U.S. EPA endorsement of their contents, only an acknowledgment that they exist and may be relevant to the Technology Innovation News Survey audience.