

Technology Innovation News Survey

Entries for October 16-31, 2019

Market/Commercialization Information

WASTE MANAGEMENT AND SMALL ARMS RANGE SUPPORT ENVIRONMENTAL TECHNICAL SERVICES CONTRACT, IDIQ

NAVFAC Atlantic CMD, NAVFAC Southeast.
Federal Business Opportunities, Solicitation N6945020R0019, 2019

NAVFAC is considering issuing an IDIQ Environmental Technical Services contract for Environmental Restoration for certified 8(a) businesses under NAICS code 562910, size standard \$22M. The contract will support NAVFAC Southeast's area of responsibility — South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Louisiana, Arkansas, Missouri, Texas, Kansas, Oklahoma, and the Caribbean — plus other locations as necessary. The anticipated firm-fixed-price IDIQ contract is valued at \$4M over a 5-year ordering period. The work involves multi-disciplinary planning and environmental investigations for a wide variety of projects and tasks, including hazardous waste and other regulated waste management and release support; small arms firing range clearance, maintenance, and monitoring services; site investigations, monitoring and evaluations; and aqueous film-forming foam control, removal and disposal. Interested firms should respond to the Market Research Questionnaire no later than 2:00 PM ET on December 11, 2019. <https://beta.sam.gov/app/Rfbid1/cd77c4526825cfd52466d06d4view>

IRE2S [INTERNATIONAL REMEDIATION & ENVIRONMENTAL SERVICES 2]

U.S. Army Corps of Engineers, USACE HNC, Huntsville, AL.
Beta.Sam.gov, Solicitation W912DY-20-R-0007, 2019

The U.S. Army Corps of Engineers, Huntsville Engineering and Support Center is conducting market research to evaluate the interest and availability of qualified firms to provide services to safely locate, identify, recover, evaluate, manage, and make final disposition of munitions and explosives of concern and HTRW; implement and conduct environmental compliance and remediation services involving primarily HTRW and munitions; provide other munitions-related services; and reduce munitions stockpiles. Services will be provided at sites that might be located outside the continental U.S. The NAICS code is 541620, small business size standard \$16.5M. The Government's intent is to solicit and award a multiple-award task-order contract in support of the IRE2S Program for a 3-year base period and one 2-year option, anticipated program capacity about \$750M. Submit capabilities questionnaire responses by 2:00 PM CT on December 15, 2019. <https://beta.sam.gov/app/045ca3a73ba40d519b51c2d44726dc1856/view>

ARCHITECTURE AND ENGINEERING ENVIRONMENTAL SERVICES (AE ES 2020) FOR THE UNITED STATES AIR FORCE

Department of the Air Force, FA8903 772 ESS PK, JBSA Lackland, Texas.
Contract Opportunities From Beta.Sam.gov, Solicitation FA8903-20-D-XTBD, 2019

The purpose of this notice is to gain knowledge of interest, capabilities, and qualifications of small business size under NAICS code 562910 for A-E services primarily to be utilized in support of the Air Force Civil Engineering Center (AFCEC) multi-billion dollar environmental program, which will be executed by various agents, including AFCEC, USACE, AF base contracting, and other federal agencies. The Air Force is considering a suite of A-E contracts valued at ~\$1B with an ordering period of up to 10 years. This suite of contracts is expected to replace the current suite of A-E contracts for design and environmental oversight entitled AE ES 13. The A-E services capabilities will generally remain the same but, depending on the results of market research, the AF may consider awarding one or more single or multiple IDIQ contracts for multi-disciplinary or single-disciplinary A-E efforts. The market research will also aid in determining the geographical locations or functional areas for each IDIQ contract (which might vary from the current AE13 ES suite of contracts). Interested parties who consider themselves qualified to perform the work described in the attachments to the notice posted at Contract Opportunities are invited to submit a response to this sources sought. Responses must be received no later than 2:00 PM CT on December 23, 2019. <https://beta.sam.gov/app/43c45b3bc1cd9f641b5d4f3ba65813774d/view>

BRAC ENVIRONMENTAL CONSTRUCTION OPTIMIZATION SERVICES (BECOS)

Department of the Air Force, AFICC - CONUS, JBSA Lackland, Texas.
Beta.Sam.gov, Solicitation FA8903-20-R-0002, 2019

This pre-solicitation notice is issued to advise potential offerors of the Government's requirement for follow-on performance-based contracts to current environmental remediation activities at 40 BRAC installations under new BRAC Environmental Construction Optimization Services, designated BECOS. At present this work is accomplished through multiple PBR task orders at multiple installations managed by BRAC/CIB, Joint Base San Antonio-Lackland. If the Air Force determines to proceed with this RFP and award a single RFP with award of six individual single-award IDIQ contracts anticipated, one per annotated region, to include full/open, 8(a) set-aside, and 100% small business set-aside, each resulting in a firm-fixed-price B-type contract with cost-reimbursable CLINs. The IDIQ initial ordering period (7-31-2020 to 7-30-2025) has the option to extend three more years, through July 30, 2028, and then up to two years after the end of the ordering period to complete existing task orders by July 30, 2030. Copies of DRAFT solicitations for the different regions are available on beta.Sam.gov, and vendor comments and questions are invited. <https://beta.sam.gov/app/93cd468b9ee7d993a3f744dc63ca73dd45/view>

PARTNERSHIP OPPORTUNITY: USGS NEXT GENERATION WATER OBSERVING SYSTEM

Department of the Interior, U.S. Geological Survey, Reston, VA.
Beta.Sam.gov, Solicitation 10_17_2019_OPA, 2019

USGS is soliciting information from industry, academia, nonprofits, and research institutions on innovative technologies that should be considered as part of its Next Generation Water Observing System effort. This RFI seeks to identify promising technologies or interested partners who are capable of jointly developing technologies that can integrate with current USGS R&D efforts. A few items from the list of the types of technologies of interest include (1) new sensors for monitoring continuous water quality, including sediment, nutrients, contaminants, and environmental DNA and (2) innovative technologies for detecting and monitoring hazards such as spills and harmful algal blooms. Responses are due by 11:59 PM Hawaii Time on December 31, 2019. <https://beta.sam.gov/app/6a3d9904fcb22ab65e9d9c77ef3e37/view> USGS also posted solicitation 10_18_2019_OPA under this same title at <https://beta.sam.gov/app/1f797805cc449ca687d5c5cf9fb8680d4view> with the same responses due date.

Cleanup News

INNOVATIONS IN SMOLDERING: MANAGEMENT OF PFAS, BIOSOLIDS, ACID MINE DRAINAGE, AND OTHER ENVIRONMENTAL APPLICATIONS

Grant, G. | RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 29 slides, 2019

An overview of the in situ Self-sustaining Treatment for Active Remediation (STAR) and ex situ STARx technologies is accompanied by summaries of ongoing research into the application of these low-energy thermal techniques to address PFAS and other recalcitrant compounds as well as media such as mine tailings (to mitigate acid mine drainage) and biosolids. Presentation slides illustrate STAR implemented to remediate coal tar at a former manufacturing facility in Newark and STARx to co-treat stockpiled separator sludge with oil-impacted site soils at an active terminal facility in Southeast Asia. **Longer abstract:** <https://www.esaa.org/wp-content/uploads/2019/09/16-18-OT-2019-Abstract.pdf> **Slides:** <https://www.esaa.org/wp-content/uploads/2019/09/16-18-Grant.pdf> More information on the STAR technology project in New Jersey: <https://www.esaa.org/a3competition/2019superiorachievement.php>

SHORELINE REMEDIATION OF PETROLEUM HYDROCARBONS USING OLEOPHILIC BIOBARRIER FOR SHEEN CONTROL ON THE PORTLAND HARBOR SUPERFUND SITE

Centry, J., S. Martin, T. Salek, K. Sheets, and J. Centry.
10th International Conference on the Remediation and Management of Contaminated Sediments, 11-14 February, New Orleans, Louisiana, poster, 2019

Despite a 216-ft sheet pile wall, hydraulic control, and LNAPL recovery system to prevent LNAPL migration from at the Portland Harbor Superfund Site, occasional petroleum sheening was observed on the Willamette River. Additional investigation to augment the conceptual site model determined that the sheens occurred when the river levels inundated a 2- to 4-ft-thick lens of LNAPL located riverside of the wall. A 65-ft oleophilic bio-barrier cap was constructed from October-November 2017 on the riverbank to contain and treat contamination and prevent sheening. The cap included activated carbon and armoring layers and a top cover of fish-friendly beach habitat mix. No sheen has been observed since bio-barrier construction. **Longer abstract:** https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/cb-nap-and-organic-solvents-4654-poster-centry.pdf?sfvrsn=467232_2 See the cap construction completion report for more information: <https://www.dco.state.or.us/Webdocs/Controls/Output/DiffHandler.ashx?op=download&file=7787455aa-4314b79b872bhe3aepdf> Also see the 2017 EPA ROD: <https://semspub.epa.gov/wdr/10/100036257.pdf>

EVIDENCE FOR NATURAL ATTENUATION OF 1,4-DIOXANE IN A GLACIAL AQUIFER SYSTEM

Jackson, L.E. and L.D. Lemke. | Hydrogeology Journal [Published 2 October 2019 prior to print]

Multiple lines of evidence were employed to evaluate attenuation of 1,4-dioxane at the Gelman Site beneath Ann Arbor, Michigan. Over three decades, site characterization revealed a series of dioxane plumes expanding throughout a complex glacial aquifer system. At the same time, remedial pumping and ex situ treatment removed >100,000 lbs of 1,4-dioxane. A recent reduction in the Michigan groundwater standard for 1,4-dioxane to 7.2 µg/L prompted the evaluation of alternative remediation efforts to further reduce contaminant concentrations. Utilizing data from a network of groundwater monitoring and remediation wells and historical plume maps helped determine mass-in-place, mass influx rates, and mass removal rates for the primary segment of 1,4-dioxane contamination in the Eastern Area of the site from 2005-2017. Individual point and plume-scale metrics indicated that attenuation may have been occurring at rates too small to meaningfully contribute to remediation results at the site. Conversely, plume-scale mass balance calculations revealed a 1,4-dioxane storage surplus for the first 6 years, followed by a storage deficit during the remaining 6 years that could not be explained by mass influx or removal estimates. Mass balance deficits observed in the aquifer system were attributable to biodegradation and/or unrecognized discharge to surface water and storm drain systems at rates like remedial pump-and-treat mass removal during 2011-2017. <https://link.springer.com/content/pdf/10.1007/s10040-019-07028-6.pdf>

NEW DELIVERY METHOD TO INJECT REMEDIAL AMENDMENTS INTO A DIFFICULT AQUIFER

Licht, N. and G. Feeney. | RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 48 slides, 2019

Recent advances in the in situ delivery of amendments to remediate "in-between" treatment zones that are inaccessible for direct push injection and not competent enough for pressure packer systems are the focus of this presentation. It also features a case study site with a deep treatment zone in tight soil that proved inaccessible using industry-standard delivery methods. Case study project components include lab, field-scale, and full-scale remediation as well as follow-up performance monitoring of treatment effectiveness. Methods, observations, results of each step of the remediation process, and lessons learned are presented. **Longer abstract:** <https://www.esaa.org/wp-content/uploads/2019/09/16-18-OT-2019-Abstract.pdf> **Slides:** <https://www.esaa.org/wp-content/uploads/2019/09/16-18-1rcht.pdf>

Demonstrations / Feasibility Studies

FEASIBILITY STUDY 7th STREET AND MISSOURI AVENUE WATER QUALITY ASSURANCE REVOLVING FUND SITE PHOENIX, ARIZONA

Arizona Department of Environmental Quality, 212 pp, 2019

Former drapery cleaner activities from 1969 to ~1980 led to PCE, TCE, cDCE, tDCE, and VC contamination in the subsurface. In June 2018, as part of an early removal action, a soil vapor extraction (SVE) pilot study was initiated to decrease PCE contamination in the vadose zone. By the end of the first SVE cycle on May 2, 2019, the SVE system removed ~537 lbs of PCE and operated for 3,439 hours. In November 2018, a pilot-scale ozone sparging system was installed to remediate VOCs in groundwater. The system comprises an ozone sparge unit and two dual-nested ozone injection wells within the source area at the site. Six rounds of groundwater sampling conducted between November 7, 2018, and April 4, 2019, suggest positive remedial effect associated with the ozone treatment in areas downgradient of the source area. Near the source area, VOC reductions have been modest, likely due to continued source addition from ongoing dissolution of PCE from the vadose zone into the local area groundwater. http://static.arizona.gov/qaqaf/27hmic_100919_fs.pdf

DEMONSTRATION AND VALIDATION OF ENHANCED MONITORED NATURAL RECOVERY AT A PESTICIDE-CONTAMINATED SEDIMENT SITE

Fetters, K., G. Rosen, V. Kirtay, B. Chadwick, J. Conder, V.P. Sacks, M. Grover, and V. Magar.
Journal of Soils and Sediments [Published online 6 August 2019 ahead of print]

The demonstration study evaluated the effectiveness of a nominal 15-cm thin-layer sand cap (TLC) as an enhanced monitored natural recovery (EMNR) remedial strategy to address sediments moderately contaminated with dichlorodiphenyltrichloroethane and its derivatives (collectively DDX). Reductions observed were: surface sediment (84-97%), porewater (33-75%), and tissue concentrations (*Lumbriculus variegatus* deployed in situ) (72-82%). A 63-72% decrease in DDX depositional mass flux also was observed. Multiple lines of evidence indicated that the TLC material remained stable. The deposition of suspended material with low concentrations of DDX influenced concentrations in the surface sediments. No adverse effects were observed on the benthic invertebrate community after TLC placement, and ecological metrics indicated increases in benthic community health. The demonstration showed that EMNR can be effective at reducing biological exposure in surface sediments while minimizing short-term disturbances to benthic communities at sites where MNR is a remedy option, but natural deposition rates are inadequate to achieve cleanup goals within a reasonable timeframe. See additional information for this ESTCP-sponsored project at <https://static.estcp.net/ProgramAreas/EnvironmentalRestoration/ContaminatedSedimentsIn-placeRemediation/FB-201368/FB-201368>

STABILIZED HYDROGEN PEROXIDE FOR THE REMEDIATION OF HYDROCARBONS AND MTBE IN HIGH TEMPERATURE AND SALINE GROUNDWATER

Kashir, M. and R. McGregor.
Remediation 29(1):27-36(2019)

A field pilot-scale test was conducted to determine whether citric acid-stabilized hydrogen peroxide (H₂O₂) was effective to remediate dissolved petroleum hydrocarbon compounds and MTBE in impacted high-salinity groundwater. The test was carried out adjacent to an operational hydrocarbon fuel facility in Western Saudi Arabia. A 7.5% weight H₂O₂ solution was injected into a series of injection wells positioned to target the plume within an unconfined aquifer. The plume contains total BTEX at concentrations <6,890 µg/L. MTBE was detected at concentrations <55,182 µg/L. A total of 9,012 L citric acid-stabilized H₂O₂ solution was injected over three events spaced over a 1-month period. Results indicated that the average cone of non-aqueous phase liquid (NAPL) decreased by 22% for total BTEX and 85% for MTBE. Water quality, pH, oxidation-reduction potential, and dissolved oxygen did not fluctuate significantly between pre- and post-injection. Post-injection microbiological community measurement indicated that the community diversity and biomass were reduced with a shift to a more aerobic population. Results of compound-specific isotope analyses showed petroleum hydrocarbon and MTBE degradation.

PASSIVE SAMPLING OF PESTICIDES AND POLYCHLORINATED BIPHENYLS ALONG THE QUEQUEN GRANDE RIVER WATERSHED, ARGENTINA

Silva-Barni, M.F., F. Smedes, C. Filmann, and K.B. Miglioranza.
Environmental Toxicology and Chemistry 38(2):340-349(2019)

An integrative silicone rubber passive sampling technique was used in a year-long study to measure organochlorine pesticides, PCBs, and other pesticides along the Quequen Grande River watershed. Silicone rubber samplers were deployed at six sampling sites, selected according to different land use, during 3 periods in 2014 and 2015. Organochlorine pesticides were dominated by endosulfan (sum of α, β-endosulfan, and endosulfan sulfate=0.15-23.4 ng/L). The highest levels occurred during a pesticide application period from December-March when levels exceeded the 3 ng/L international water quality guidelines for protecting freshwater biota. Compared with previous reports, no reductions in endosulfan levels were observed, suggesting illegal use of the banned pesticide. Chlorypyrifos, widely used on soybean crops, was the second major pesticide found in water (0.02-4.3 ng/L). A reduction in levels of legacy pesticides (heptachlors, DDTs, dieldrin, and chlordanes) was evident compared with previous reports from 2007. Low levels of PCBs indicated that only minor diffuse sources were present along the watershed.

Research

ENHANCING GROUNDWATER REMEDIATION IN AIR SPARGING BY CHANGING THE PULSE DURATION

Neriahi, A.B. and A. Paster.
Groundwater Monitoring & Remediation 39(1):43-53(2019)

A series of laboratory experiments and numerical simulations were performed to study the effect of pulse duration (PD) on the air sparging remediation process. The experimental apparatus was a cylindrical tank packed with fine sand and partially filled with water contaminated with toluene. Toluene concentrations in water and in effluent air were measured over time during the application of pulsed AS, which was applied with three different PDe. Next, the TZVOC model was used to simulate the two-phase flow and transport processes for these cases. The simulation model was calibrated to the experimental results and then run with a range of PD values. Results showed that there exists an optimal PD which yields the highest remediation efficiency. Next, it was shown that this PD may be obtained by performing a PAS pilot test and measuring the groundwater pressure response in a monitoring well. The characteristic time that describes the exponential decay of the pressure response was shown to provide an adequate estimate for the optimal PD. The estimation improved by taking several injection cycles. <https://ojs.wwsnet.org/wwsnet/article/view/10.1111/gwmmr.12308>

USING PASSIVE ANODE-CATHODE TECHNOLOGY TO ASSESS MICROBIAL HAPPINESS AND BOOST BENZENE BIODEGRADATION RATES

Hyde, K., D. Peak, A. Schebel, S. Chomysheh, K. Bradshaw, S.D. Siciliano, et al.
RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 22 slides, 2019

As part of the Sustainable In Situ Remediation Cooperative Alliance, two experiments were conducted to test the passive anode-cathode technology (PACT) with different electron acceptors (EA) on the degradation of benzene in liquid media by anaerobic benzene-degrading microbial consortia. The first experiment tested the PACT with no EA, Fe^{3+} , SO_4^{2-} , and $\text{Fe}^{3+} + \text{SO}_4^{2-}$. The second experiment tested the PACT effect with $\text{NO}_3^- + \text{SO}_4^{2-} + \text{Fe}^{3+}$, PACT with no EA, no PACT with no EA, and no PACT with all EAs. Benzene degradation rates increased in the presence of the PACT and in particular, in treatments with high SO_4^{2-} . The $\text{Fe}^{3+} + \text{SO}_4^{2-}$ EA treatment showed the most benzene degradation. Gene sequencing analysis showed genera such as *Geobacter*, *Flavobacterium*, and *Thiobacillus*, microbes capable of direct interspecies electron transfer. These transfer processes are the predicted reason for increased benzene degradation rates and unique benzene:EA ratios. As the area of influence of the PACT is limited, transitioning this work to the field will involve an in situ biostimulant solution that includes nano-sized graphite powder, SO_4^{2-} , Fe^{3+} , a nitrogen source, and phosphate.
Longer abstract: <https://www.esaa.org/wp-content/uploads/2019/09/19-81-2019-Abstract.pdf> **Slides:** <https://www.esaa.org/wp-content/uploads/2019/10/19-Hyde.pdf> More information about SIRCA research: <http://www.sirca.org/>

REUSE OF DRINKING WATER TREATMENT WASTE FOR REMEDIATION OF HEAVY METAL CONTAMINATED GROUNDWATER

Holmes, R.R., M.L. Hart, and J.T. Kevernig
Groundwater Monitoring & Remediation 39(4):69-79(2019)

Drinking water treatment waste (DWTW) from lime softening was incorporated as a recycled, low-cost additive to cement-based filter media (CBFM) for the removal of lead, cadmium, and zinc in groundwater. Jar testing at three different metal concentrations and breakthrough column testing using synthetic groundwater were performed to measure removal capacity and reaction kinetics. Results from jar tests showed that as DWTW content increased at low concentrations, removal approached 100%. At high metal concentrations, removal decreased due to saturation or exhaustion of the removal mechanisms. The removal occurred through the formation of metal carbonate precipitates, surface sorption, and ion exchange with calcium according to the preferential series $\text{Pb}^{2+} > \text{Zn}^{2+} > \text{Cd}^{2+}$. Removal kinetics measured through column tests exceeded estimated calculations derived from batch jar testing isotherms due to the large formation of oolitic metal carbonates. Pb, Cd, and Zn were concentrated in the column precipitates from 0.29, 0.23, and 20.0 $\mu\text{g/g}$ in the influent solution to ~200, 130, and 14,000 $\mu\text{g/g}$ in the reacted DWTW-CBFM. The concentrative abilities of CBFM through precipitate and oolitic mineral formation suggest the potential for a minable waste product that might close the waste-product cycle for DWTW.

ELECTROCHEMICAL OXIDATION OF HEXAFLUOROPROPYLENE OXIDE DIMER ACID (GENX): MECHANISTIC INSIGHTS AND EFFICIENT TREATMENT TRAIN WITH NANOFILTRATION

Pica, N.E., J. Furkhousen, Y. Yin, Z. Zhang, D.M. Ceres, T. Tong, and J. Blotveogel.
Environmental Science & Technology 53(21):12602-12609(2019)

Experimental and computational lines of evidence were provided in this study for GenX mineralization during electrochemical oxidation at a boron-doped diamond anode with a low potential for the generation of stable organofluorine intermediates. Density functional theory calculations considered the major operative mechanism, direct electron transfer, throughout the entire pathway. The initial oxidative attack did not break the ether bond but led to stepwise mineralization of the acidic side chain. Mechanistic investigations revealed that hydroxyl radicals were unreactive toward GenX, while electrochemically activated sulfate facilitated its oxidation. A NF90 membrane removed 99.5% of GenX from contaminated water. Electrochemical treatment of the nanofiltration rejectate reduced both energy and electrode costs by more than 1 order of magnitude compared to direct electrochemical treatment of the raw water. Overall, the nanofiltration-electrochemical oxidation treatment train was a sustainable destructive approach for the cost-effective elimination of GenX from contaminated water.

EVALUATING A NOVEL PERMEABLE REACTIVE BIO-BARRIER TO REMEDIATE PAH-CONTAMINATED GROUNDWATER

Liu, C., X. Chen, E. E. Mack, S. Wang, W. Du, Y. Yin, S.A. Banwart, and H. Guo.
Journal of Hazardous Materials 368:444-451(2019)

Two permeable reactive barrier (PRB) columns that relied on microbes' self-domestication mechanisms were designed and used to remediate simulated PAH-impacted groundwater. The carbon source for A was based on wheat straw, and B was based on coconut shell biochar. Results showed that both A and B removed almost 100% of phenanthrene. More carbon was released from A (80-500 mg/L) than from B (72-195 mg/L), and slightly more oxygen was released from B (7.31-10.31 mg/L) than A (7.15-9.64 mg/L). The release of organic carbon from material B was more stable. The bacterial communities of both columns comprised members of the *Mycobacterium*, *Pseudomonas*, and *Sphingomonas* genera that are known to degrade phenanthrene, and *Pseudomonas* and *Sphingomonas* were seven times more abundant in column B than in column A. Results indicated that material B is more promising for treating PAH-contaminated groundwater.

FORMATION OF PAH DERIVATIVES AND INCREASED DEVELOPMENTAL TOXICITY DURING STEAM ENHANCED EXTRACTION REMEDIATION OF CREOSOTE CONTAMINATED SUPERFUND SOIL

Trine, L.S.D., E.L. Davis, C. Roper, L. Truong, R.L. Tanguay, and S.L.M. Simonich.
Environmental Science & Technology 53(8):4460-4469(2019)

Creosote-contaminated soil samples collected from the Wyckoff-Eagle Harbor Superfund site were remediated with laboratory-scale steam enhanced extraction (SEE). The samples were quantified for unsubstituted PAHs and their derivatives and assessed for developmental toxicity, pre- and post-SEE. Following SEE, unsubstituted PAH concentrations decreased, while oxygenated PAH concentrations increased in soil and aqueous extracts. Differences in developmental toxicity were also measured and linked to the formation of PAH derivatives. Additive toxicity was measured when comparing unfractionated extracts to fractionated extracts in pre- and post-SEE samples. SEE is effective in removing unsubstituted PAHs from contaminated soil, but other, potentially more toxic, PAH derivatives are formed.

BIOLOGICAL REDUCTION OF NITRATE AND PERCHLORATE IN SOIL MICROCOSMS: AN ELECTRON DONOR COMPARISON OF GLYCEROL, EMULSIFIED OIL, AND MULCH EXTRACT

Sarria, M., J.M. Gonzales, D. Gerrity, and J. Batista.
Groundwater Monitoring & Remediation 39(2):32-42(2019)

Soil microcosms augmented with emulsified oil (EO), glycerol, and mulch extract were conducted to compare standard versus slow-release electron donors for sequential nitrate and perchlorate biological reduction. Results indicated that EO and glycerol spiked at ~100 times stoichiometric excess achieved similar overall reductions and degradation rates for nitrate and perchlorate. Perchlorate exhibited first-order kinetics, with a rate constant of 0.36/day for both EO and glycerol. Stable chemical oxygen demand (COD) concentrations highlighted the slow-release properties of EO, which would reduce electron donor consumption in comparison to soluble substrates in soil remediation applications. The microcosms augmented with mulch extract failed to demonstrate any nitrate or perchlorate reduction due to the extract's lower COD concentration and would require compost or additional processing for the extract to be a viable alternative.

General News

STATUS OF SERDP AND ESTCP EFFORTS ON PFAS AND INNOVATIVE APPROACHES FOR THE TREATMENT OF WASTE DERIVED FROM PFAS SUBSURFACE INVESTIGATIONS

Leeson, A. and D. Major, SERDP & ESTCP Webinar Series, Webinar #103, November 2019

SERDP & ESTCP sponsored two presentations. The first featured an overview of several projects aimed at developing a better understanding of the occurrence, fate, and transport, remedial treatment options, and ecotoxicity at aqueous film-forming foam (AFFF)-impacted sites and presented key findings from the May 2017 SERDP and ESTCP sponsored workshop. The second presentation featured a project to treat PFAS contamination in soils as well as investigation derived wastes, such as drill cuttings and spent granular activated carbon (GAC). The project evaluated GAC as a surrogate fuel to support smoldering above the 900°C threshold required for PFAS destruction. PFAS adsorbed to GAC and then mixed with sand, or PFAS-contaminated soil mixed with uncontaminated GAC were tested. <https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series-11-07-2019>

TECHNOLOGICAL INNOVATION FOR SOIL/SEDIMENT REMEDIATION

Sarkar, B., D.C.W. Tsang, H. Song, S. Ding, and M. Vithanage.
Journal of Soils and Sediments 19(12):3881-3953(2019)

This special journal issue compiles six papers covering different topics on novel soil/sediment intervention strategies to remediate both organic and inorganic contaminants. The papers were presented at the Contaminated Land, Ecological Assessment and Remediation conference in Hong Kong (August 16-18, 2018), and cover innovative and emerging approaches for remediating soil and sediment. The remediation approaches include soil amendments with natural and synthetic materials, recycled biomasses and waste materials, and phytoremediation with efficient plant species. The remediation approaches may be less expensive and more environmentally friendly than many conventional dig-and-dump and incineration type approaches. To see the special issue introduction and link for each publication, see <https://link.springer.com/content/pdf/10.1007/s11368-019-02503-3.pdf>

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) REMEDIATION WORKSHOP

Keane, D., S. Crawford, E. Moyer, R. Ball, and F. Taylor.
The 34th Annual International Conference on Soils, Sediments, Water, and Energy, 16 October, Amherst, MA, 126 slides, 2018

The workshop covered PFAS physical-chemical properties and fate and transport mechanisms relevant to remediation. Non-destructive and destructive treatment technologies for treating PFAS in soil and water are discussed. Cutting edge technologies using advanced carbon, synthetic resins, alternative natural adsorbents, and advanced oxidation are explained, and some case studies are included. **Slides:** <http://www.wcd-llr.com/wp-content/uploads/2019/11/PFAS-Workshop-2018-Abstract-10-22-19.pdf>

NATURAL SOURCE ZONE DEPLETION OF LNAPL: A CRITICAL REVIEW SUPPORTING MODELLING APPROACHES

Lari, K.S., G.B. Davis, J.L. Rayner, T.P. Bastow, and G.J. Puzon.
Water Research 157:630-646(2019)

A recent review of natural source zone depletion (NSZD) is expanded to establish the key processes required to model NSZD long term. Key challenges to understanding NSZD include the dominance of methanogenic or aerobic biodegradation processes, the potential changeability of rates due to the weathering profile of LNAPL product types and ages, and linkages to underlying bioprocesses. Scales in subsurface simulation and modeling are discussed, and 36 models addressing processes important to NSZD are investigated. The capabilities of models to accommodate more than 20 subsurface transport and transformation phenomena are compared in a table. The applicability of the models to specific site conditions is also discussed.

SOIL AMENDMENTS FOR IMMOBILIZATION OF POTENTIALLY TOXIC ELEMENTS IN CONTAMINATED SOILS: A CRITICAL REVIEW.

Palansooriya, K.N., S.M. Shaheen, S.S. Chen, D.C.W. Tsang, Y. Hashimoto, D. Hou, et al.
Environment International [Published online 12 November 2019 prior to print]

This review focuses on the remediation of soils contaminated with potentially toxic elements (PTEs) through immobilization techniques using different soil amendments with respect to the type of element, soil, and amendment, immobilization efficiency, underlying mechanisms, and field applicability. Soil amendments to immobilize PTEs include manure, compost, biochar, clay minerals, phosphate compounds, coal fly ash, and liming materials. Integrated application of appropriate amendments is recommended to maximize their use efficiency. Soil properties, such as soil pH, and clay, sesquioxides, and organic matter content, and soil processes, such as sorption/desorption and redox processes, are the key factors governing the amendments' efficacy for PTEs immobilization in soils. Long-term stability of immobilized PTE compounds and the environmental impacts and cost-effectiveness of the amendments should be considered before amendment application.

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.

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