Technology Innovation News Survey

Entries for March 16-31, 2020

Market/Commercialization Information

RADIUM DECONTAMINATION AND REMEDIATION OF FACILITIES AT LAND GRANT UNIVERSITIES IMPACTED BY THE US BUREAU OF MINES

Department of the Interior, Office of Surface Mining, Funding Opportunity S20AS00007, 2020

The U.S. Department of the Interior is offering a one-time, competitive grant or grants that will fund radium decontamination and remediation of facilities located at any land-grant university that was contaminated by actions of the former U.S. Bureau of Mines. To be eligible, any receiving land-grant university must have been notified by federal or state agencies that such contamination exceeds allowable levels for radium. The closing date for applications is May 12, 2020. https://www.grants.gov/web/grants/view-opportunity.html?oppId=325267

SCIENCE AND TECHNOLOGY PROJECTS RELATED TO COAL MINING AND RECLAMATION

Department of the Interior, Office of Surface Mining, Funding Opportunity S20AS00005, 2020

The Office of Surface Mining Reclamation and Enforcement is requesting applied science proposals for projects that develop and demonstrate improved science and technologies related to the mining of coal and reclamation of land after mining. The closing date for applications is May 25, 2020. https://www.grants.gov/web/grants/view-opportunity.html?oppId=325777

REMOVAL EMERGENCY RESPONSE PROGRAM

Environmental Protection Agency, Funding Opportunity EPA-OLEM-OEM-19-08, 2020

U.S. EPA announces the availability of funds and solicits applications from eligible entities to promote the participation of individual state and territorial programs in research activities with the mission of advocating for and supporting state emergency response readiness and removal program planning and preparedness. Under CERCLA §128(a), grants are provided to States and Tribes for their response programs. The states and tribes act as co-regulators/co-implementers with EPA. The state/tribal programs address contaminated sites that do not require federal action but need cleanup before the sites are considered ready for reuse. The recipient will provide the necessary framework for the participation of individual state and territorial programs in research activities with the mission of advocating for and supporting state emergency response and removal action programs, to enhance these programs' readiness capabilities to perform emergency response and removal actions that address immediate risks to human health and the environment resulting from the release or potential release of hazardous substances. See details at https://www.epa.gov/sites/production/files/2020-04/documents/19-08.pdf. A single award is anticipated. The closing date for applications is June 10, 2020. https://www.grants.gov/web/grants/view-opportunity.html?oppId=326168

OPTIMIZED REMEDIATION CONTRACT (ORC) OK/AR GROUP

U.S. Army Engineer District Tulsa, OK.
Contract Opportunities at Beta.SAM, Solicitation W912BV20R0002, 2020

This procurement is issued as a total small business set-aside, NAICS code 562910, for environmental remediation services at Air Force Plant 3, Altus AFB, Little Rock AFB, Tinker AFB, and Vance AFB. The range of activities identified in the Performance Work Statement includes maintenance of established remedies, implementation of optimization to enhance remedial progress at applicable sites, and achievement of site-specific objectives. Contractor shall undertake environmental remediation activities to achieve performance objectives at 65 sites, which includes 64 Installation Restoration Program sites and one Military Munitions Response Program site. Proposals are due by 3:00 PM CT on June 12, 2020. The solicitation and other documentation are attached to the beta.sam presolicitation notice. https://beta.sam.gov/opp/d77dd5de8273409a9b8cd8fb5f8a283b/view

ENVIRONMENTAL RESPONSE LABORATORY NETWORK (ERLN) ANALYTICAL SUPPORT SERVICES

Environmental Protection Agency Headquarters Acquisition Div., Washington, DC.
Contract Opportunities at Beta.SAM, Solicitation 68HERH20Q0073, 2020

U.S. EPA has the responsibility of enhancing national capabilities for decontamination and disposal as a result of terrorist events and environmental sampling and analysis of all environmental matrices in response to nationally significant incidents. To protect the nation from the potential threats posed by terrorism or environmental emergencies, EPA implemented the Environmental Response Laboratory Network (ERLN), which is one of seven laboratory response networks under the Integrated Consortium of Laboratory Networks. The ERLN mission is to provide known laboratory capabilities, capacities, and quality data in a scalable, systematic, and coordinated response to environmental emergencies as well as preparedness, response, remediation and recovery analytical support. ERLN is available to support a variety of response actions, including CERCLA removals, OPA responses, NSI, a terrorist event involving weapons of mass destruction, and other federally led trainings and exercises. EPA's Office of Acquisition Solutions intends to establish basic ordering agreements (BOAs) with vendors who are capable of analyzing environmental sample matrices contaminated by toxic industrial chemicals, chemical warfare agents, biological agents, and radiochemical agents as a result of acts of terrorism or an environmental emergency. A BOA is a written instrument of understanding negotiated between an agency, contracting activity, or contracting office and a contractor that contains (1) terms and clauses applying to future contracts (orders) between the parties during its term, (2) a description, as specific as practicable, of supplies or services to be provided, and (3) methods for pricing, issuing, and delivering future orders under the BOA. Monitor FedConnect for updates at https://www.fedconnect.net/FedConnect/?doc=68HERH20Q0073&agency=EPA. This requirement will close at 3:00 PM ET on June 29, 2020. https://beta.sam.gov/opp/0ba79321c4c24d95823a6be0c7fb8d0b/view

2020 BROAD AGENCY ANNOUNCEMENT (BAA)

DoD, Engineer Research and Development Center, Funding Opportunity W912HZ-20-BAA-01, 2020

The U.S. Army Engineer Research and Development Center (ERDC) has issued a BAA for a wide range of R&D topics. Among the eight ERDC labs and centers, the Environmental Lab, located in Vicksburg, Mississippi, is particularly interested in topics relevant to hazardous waste site investigation and remediation. See details in the full BAA and its several amendments attached to the posting at Grants.gov. This BAA is open until February 5, 2021, or until superseded by another announcement. Proposals are accepted at any time.
https://www.grants.gov/web/grants/view-opportunity.html?oppId=325483

Cleanup News

SRS DEPLOYS INNOVATION TO CLEAN UP GROUNDWATER CONTAMINATION

U.S. Department of Energy, Office of Environmental Management (DOE-EM), 2019

DOE-EM has launched an innovative process using silver chloride, a conventional industrial product, to clean up contaminated groundwater at the Savannah River Site (SRS). The goal is to immobilize the contaminant iodine-129 indefinitely underground near its original source. Silver chloride can capture and lock into place a high percentage of the iodine nuclides, reducing the amount of contamination in groundwater within the treatment zone. The material is milled to create ultra-fine particles with highly irregular edges, which greatly increases the surface area of the particles. The silver chloride (165 gal) was mixed with water (240,000 gal) and injected into the water table 30-60 ft bgs. SRS scientists and geologists have found that over a short time period silver chloride can bind permanently with dissolved iodine-129, becoming silver iodide, an immobile solid.
https://www.energy.gov/em/articles/srs-deploys-innovation-clean-groundwater-contamination

BRENNTAG SOUTHWEST, WICHITA, KS - 1520 NORTH BARWISE, FOURTH QUARTER 2018: PROGRESS REPORT

Kansas Department of Health & Environment, Topeka. 221 pp, 2019

This report describes groundwater monitoring results following an in situ groundwater Corrective Action using a chemical oxidant (potassium permanganate). The Corrective Action was conducted during the fourth quarter of 2016 as summarized in the 2017 *Corrective Action Implementation Report* (http://kensas.kdhe.state.ks.us:1776/herisl/getDocument.kdhe_her2documentId=2000000I3P_0WPDHGCRK42F). Quarterly groundwater sampling results documented for the period October 1 to December 31, 2018, show that none of the onsite wells exceeded the residential RSK values for PCE or TCE, whereas concentrations in all of the offsite monitoring wells exceeded those values for one or both of the contaminants. Long-term monitoring will continue at this site.
http://kensas.kdhe.state.ks.us:1776/herisl/getDocument.kdhe_her2documentId=2000000FKL_0XXXN6ENY7HW

FORT DRUM MOVES TOWARD 2020 ENVIRONMENTAL GOAL

Hess, R. | The Corps Environment, p 33, May 2019

Environmental cleanup continues in northern New York at the Army's 108,000-acre training installation known as Fort Drum. The innovative effort of the post's Installation Restoration Program (IRP) team was recognized with a 2019 Secretary of the Army Award for Environmental Restoration (Installation). For example, the IRP team in 2017 completed a single in situ chemical oxidation injection to address PCE found in an aquifer. Sampling in 2018 showed a sharp decrease in contaminants that resulted in the site's closure and saved the Army more than $750,000. The team also addressed petroleum contamination from underground storage tanks and piping that persisted despite previous remediation efforts. Two of the five sites active at the beginning of this award cycle were closed in May 2018, ahead of the 2020 objective, saving more than $300,000 in system operating and electrical costs. The remaining three petroleum-contaminated sites saw significant progress as well, allowing the team to focus on persistent problem areas and expand use of solar and waste heat from remediation equipment to enhance biodegradation. During cleanup of a 500,000-gal jet fuel spill, the team in 2018 recommended permanent shutdown of several components of the groundwater remediation system. The spill cleanup currently is five years ahead of schedule, resulting in a savings of $11.5M. The team previously demonstrated the application of a thermal in situ sustainable technology that uses solar energy to remediate soil and groundwater via a closed-loop system. In addition, Fort Drum is implementing phytoremediation systems, using willows to extract and metabolize contaminants at a closed solid waste landfill and switch grass seedlings to treat range residuals. The team is also involved in cutting-edge research to evaluate the use of specialized microbes to enhance PFAS biodegradation. https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll8/id/4044

COASTAL TANK FARM, EL DORADO REFINERY

Kansas Department of Health and Environment (KDHE), 2020

In Kansas, the former Coastal Refinery El Dorado Site encompasses ~420 acres containing several subareas: former main process area, former asphalt handling area, wastewater/stormwater ponds to the east, and former south tank farm. Primary contaminants of concern in site soil and groundwater include petroleum-related compounds (benzene, naphthalene, TPH), select VOCs, and isolated impacts from metals. Interim remedial measures completed between 2006 through 2014 include construction of groundwater, seep, and spring interceptor trenches; storm water collection structures; a tar removal treatment system; a wetland-based groundwater treatment system; and soil and waste excavation, stabilization, consolidation, and capping. The 2016 Corrective Action Decision document outlined the preferred remedial alternatives for the site: hydraulic containment via operation of existing and proposed trenches, the wetland-based groundwater treatment system, phytoremediation technologies, additional soil removal, surface water sampling, cap maintenance, environmental use controls, long-term monitoring, receptor management surveys, product recovery, MNA, natural source zone depletion, and continued operation of the existing groundwater and product treatment systems. Several of the remedy design documents—interceptor trenches, phytoremediation, tar treatment system—are available at http://kensas.kdhe.state.ks.us:1776/herisl/getIdentifiedSiteListing.kdhe_her?projectCode=C2-008-70243&siteName=COASTAL%20REFINERY,%20EL%20DORADO along with work plans and monitoring reports.

CONTAMINATED SEDIMENTS: REVIEW OF SOLUTIONS FOR PROTECTING AQUATIC ENVIRONMENTS

Olsen, M., K. Petersen, A.P. Lehoux, M. Leppaenen, M. Schaanning, I. Snowball, S. Oxnevad, and E. Lund.
Nordic Council of Ministers, Copenhagen, Denmark. TemaNord 2019:514, 83 pp, 2019

This review and compilation of information on sediment remediation strategies includes an evaluation of the different approaches in relation to cost, efficiency, and adverse effects on the environment. The objective of this report is to provide a status snapshot of regulatory framework and sediment management within the Nordic countries of Norway, Sweden, Finland, and

Denmark, along with experience gained from selected Nordic cleanup projects. The report also provides an overview of international knowledge regarding remediation approaches, techniques, and materials. https://norden.diva-portal.org/smash/get/diva2:1336098/FULLTEXT01.pdf

Demonstrations / Feasibility Studies

FROM THE LAB TO THE FIELD - DEMONSTRATING BIOAUGMENTATION IN SITU TO ENHANCE ANAEROBIC BENZENE BIODEGRADATION

Dworatzek, S., J. Roberts, J .Webb, K. Bradshaw, R. Peters, C. Toth, N. Bawa, S. Guo, et al.
RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 48 slides, 2019

A methanogenic benzene enrichment culture (DGG-B) developed at the University of Toronto transforms benzene under either methanogenic or sulfate-reducing conditions. The first field application of the DGG-B bioaugmentation culture is planned for summer 2019 at a site in Saskatchewan, with several other sites to follow. The presentation includes results from treatability studies, which aided in the field pilot test design. One field pilot test will include three injection points, two of which will receive up to 10 L of DGG-B culture. Killed culture will be applied at the third to serve as a control and determine if dead cells promote any degradation. These first field projects will establish clear guidelines and approaches for using these new bioaugmentation cultures. https://www.esaa.org/wp-content/uploads/2019/10/19-Dworatzek.pdf. *More information on the DGG-B culture:* http://anaerobicbenzene.ca/

POLYETHERSULFONE AS SUITABLE PASSIVE SAMPLER FOR WATERBORNE HYDROPHOBIC ORGANIC COMPOUNDS - LABORATORY CALIBRATION AND FIELD TEST IN THE SOSIANI RIVER, KENYA

Chepchirchir, B.S., X. Zhou, A. Paschke, and G. Schuurmann.
Science of The Total Environment 699:134056(2020)

A polyethersulfone (PES) membrane was deployed in a field test as a cost-saving and less labor-intensive single-phase passive sampler to measure waterborne hydrophobic organic compounds (HOCs), such as organochlorine pesticides, PCBs, and PAHs. Following laboratory tests, the PES membranes were tested in a field trial in a tropical river against the well-established silicone rubber (SR) sheets. Laboratory-based Rs for PES generated under field-relevant temperature and water flow velocity were used to calculate time-weighted average concentrations in the lower ng/L range, which are comparable (within a factor of two) with those derived from accumulated amounts in SR sheets (using in situ sampling rates).

IMPACT OF AN IN-SITU CR(VI)-CONTAMINATED SITE REMEDIATION ON THE GROUNDWATER

Sedlazeck, K.P., D. Vollprecht, P. Muller, R. Mischitz, and R. Giere.
Environmental Science and Pollution Research [Published online 14 January 2020 prior to print]

The latest groundwater monitoring results are presented from a field project that is testing a combined pump and treat method with in situ reduction Cr(VI) at an abandoned site in Austria. The reducing agent sodium dithionite was injected underground in two hotspots to reduce Cr(VI) to Cr(III) using different injection strategies. Throughout the treatment, part of the Cr(VI) was mobilized and not instantly reduced. To prevent further spreading of the mobilized Cr(VI), the pump and treat method, which used zero-valent iron, was installed downgradient of the hot spots. Based on the groundwater sample analyses, it was possible to distinguish different remediation phases, characterized by excess chromate and excess sulfite. During the excess sulfite conditions, Cr(VI) was successfully removed from the system, but after terminating the sodium dithionite injection, the Cr(VI) rebounded.
https://link.springer.com/content/pdf/10.1007/s11356-019-07513-9.pdf

BIODEGRADATION OF PCBS IN CONTAMINATED WATER USING SPENT OYSTER MUSHROOM SUBSTRATE AND A TRICKLE-BED BIOREACTOR

Sredlova, K., Z. Skrob, A. Filipova, P. Main, J. Holecova, and T. Cajthaml.
Water Research 170:115274(2020)

A cost-effective method for PCB bioremediation that utilizes the degradation capability of *Pleurotus ostreatus* (the oyster mushroom) was laboratory and pilot tested. Several 1 L lab-scale reactors were optimized. Oyster mushrooms from a commercial farm were used as a fungal inoculum and growth substrate. The highest degradation efficiency (87%) was obtained with a continuous low-flow setup, which was then scaled up to 500 L capacity and used for the treatment of 4000 L of real contaminated groundwater containing 0.1-1 µg/L PCBs. The trickle-bed pilot-scale bioreactor was able to remove 82, 80, 65, and 30-50% of di-, tri-, tetra- and penta-chlorinated PCB congeners, respectively. No degradation was observed for hexa- or hepta-chlorinated congeners. Multiple mono- and dichlorobenzoic acids were identified as transformation products by mass spectrometry, confirming the role of biodegradation in PCB removal. A *Vibrio fischeri* bioluminescence inhibition test revealed slight ecotoxicity of the primary reactor effluent (sampling after 24-h), which was quickly suppressed once the effluent passed through the reactor for the second time. No other effluent exhibited toxicity for the rest of the experiment (71 days in total). Microbial analyses (phospholipid fatty acid analysis and next-generation sequencing) showed that *P. ostreatus* was able to degrade PCBs in the presence of an abundance of other fungal species as well as aerobic and anaerobic bacteria.

Research

BIOREMEDIATION OF TCE BY MULCH BIOBARRIERS: IMPACTS OF THE PRESENCE OF CO-CONTAMINANTS

Li, Y. Master's Thesis, 73 pp, 2019

Column- and batch-scale tests were conducted to observe and measure the dechlorinating performance KB-1T™ in simulated lab-scale permeable reactive barriers (PRBs) to remediate TCE. The study also aimed to determine whether the presence of nitrate, sulfate, and RDX prevented TCE dechlorination under anaerobic conditions. The PRBs were filled with pine bark mulch substrate to serve as the electron donor to favor the growth of microbes. Butyric acid was injected to reduce oxygen and serve as extra electron donors. The analyses were conducted via gas chromatography, PCR amplification, and DNA sequencing. In column experiments, sulfate at a concentration of 0.25 mM had no obvious inhibitory impact on the dechlorination ability of mulch biobarrier when receiving 1 mg/L TCE. Batch-scale tests revealed that the presence of 1 mM nitrate decreased the dechlorination rate of chlorinated ethenes, while the presence of 1 mg/L RDX made no difference. Tests also indicated that the presence of chlorinated ethenes would inhibit the denitrification process. Results from DNA sequencing showed that significantly higher amounts of dechlorinators existed in columns without the presence of nitrate and sulfate, indicating that these two alternative electron acceptors are driving the differences of microbial diversity between control and experimental columns. https://ecommons.cornell.edu/bitstream/handle/1813/67315/Li_cornell_0058O_10544.pdf?sequence=1

ENHANCED EXTRACTION OF AFFF-ASSOCIATED PFASS FROM SOURCE ZONE SOILS

Nickerson, A., A.C. Maizel, P.R. Kulkarni, D.T. Adamson, J.J. Kornuc, and C.P. Higgins.
Environmental Science & Technology 54(8):4952-4962(2020)

A sequential basic and acidic methanol extraction method was developed and evaluated to recover anionic, cationic, and zwitterionic PFASs from field-collected aqueous film-forming foam (AFFF)-impacted soils. The method was validated by spike-recovery experiments with equilibrated soil-water-AFFF and analytical standards. The concentrations of those PFASs that currently lack commercially available analytical standards were estimated by a novel semiquantitation approach. Total PFAS concentrations determined by semiquantitation were compared with concentrations determined by the total oxidizable precursor assay. The method was applied to two soil cores from former fire-training areas in which cations and zwitterions were found to contribute up to 97% of the total PFAS mass, which demonstrates the need for extraction and analysis methods that are capable of quantifying cationic and zwitterionic PFASs in AFFF-impacted source zone soils.

SPATIOTEMPORAL ANALYSIS OF PERFLUOROALKYL SUBSTANCES IN WHITE-TAILED EAGLE (*HALIAEETUS ALBICILLA*) NESTLINGS FROM NORTHERN NORWAY-A TEN-YEAR STUDY

Jouanneau, W., B.-J. Bardsen, D. Herzke, T.V. Johnsen, I. Eulaers, and J.O. Bustnes.
Environmental Science & Technology 54(8):5011-5020(2020)

PFAS levels in plasma of white-tailed eagle nestlings from northern Norway were studied from 2008 to 2017. While PFOA and PFNA exposure did not follow a significant time trend, PFOS and PFHxS concentrations decreased over time, and ≥ C11 perfluorinated carboxylic acids seemed to level off during the last four years. This may be evidence for a change in the trend for some of these compounds. The study also investigated the potential of the two main regional airports to act as hotspots for PFAS. Results showed decreasing exposure to PFOA with distance from the airports. The study determined that legislation actions are effective, and continued concern for PFAS exposure of high trophic wildlife is still warranted, even in the northern environment.

EFFECT OF BIOTURBATION ON CONTAMINATED SEDIMENT DEPOSITED OVER REMEDIATED SEDIMENT

Knox, A.S. and M.H. Paller. | Science of The Total Environment 713:136537(2020)

Sediments contaminated with As, Cd, Cu, Ni, Pb, and Zn were deposited over clean sediment capped with apatite, a sequestering agent, and clean uncapped sediment to simulate the recontamination of remediated sediment by influxes of particle-bound contaminants from unknown sources. The experiment aimed to determine whether apatite could sequester contaminants present in the deposited sediment, reducing their impact. Cap effectiveness was assessed in the presence and absence of*Corbicula fluminea*. Effectiveness was based on metal fluxes to sediment pore water and surface water, the distribution of mobile contaminants in sediment and surface water measured by the diffusive gradients in thin films technique, and contaminant bioaccumulation by *Lumbriculus variegatus*. The metal sequestration capacity of apatite caps was unaffected or improved by bioturbation for all elements except As. Effects with uncapped sediment were metal-specific, including reductions in the bioavailable pool for Ni, Cd, and to a lesser extent, Pb, increases in the bioavailable pool for As and Cu, and little effect for Zn. The reductions observed for some metals in uncapped, clean sediment were likely the result of burial and dilution of contaminated sediment combined with chemical processes such as sequestration by minerals and other compounds. Results indicate that apatite caps can control recontamination by metals regardless of bioturbation but point to the complexity of sediment recontamination and the need for further study of this problem.

LOW PERMEABILITY ZONE REMEDIATION OF TRICHLOROETHENE VIA COUPLING ELECTROKINETIC MIGRATION WITH IN SITU ELECTROCHEMICAL HYDRODECHLORINATION

Liu, B., G. Li, K.G. Mumford, B.H. Kueper, and F. Zhang.
Chemosphere 250:126209(2020)

A Cu-Ni bimetallic cathode was tested in an electrokinetic remediation system to couple electrokinetic migration and in situ electrochemical hydrodechlorination as a technique to remediate TCE in a low-permeability zone. Aqueous phase TCE was originally added into the anolyte to obtain breakthrough curves through the low permeability porous soil compartment. The curves also allowed for a better understanding of TCE migration driven by electroosmosis flow using different cathodes. The Cu-Ni cathode resulted in 7.64 mg of TCE migration compared to 5.99 mg with a Ni cathode and 4.22 mg with mixed metal oxide (MMO) cathode, suggesting that the Cu-Ni cathode could drive more TCE flux out of the contaminated soil. About 98.4% of TCE flux that reached the Cu-Ni cathode was electrochemically reduced, which was much higher than that MMO cathode (77.9%) or Ni cathode (59.6%). TCE mass that was transported by electroosmosis flow increased from 2.04 to 6.68 mg when the voltage gradient increased from 1 to 4 V/cm, with the normalized energy consumption increasing from 0.06 to 0.16 kWh/kg per unit water movement, and from 0.54 to 2.55 kWh/g per unit TCE transport. For TCE that did reach the cathode compartment, > 98% degradation maintained at the Cu-Ni cathode with various voltage gradients.

ASSESSMENT OF BIOCHAR AND ZERO-VALENT IRON FOR IN-SITU REMEDIATION OF CHROMATED COPPER ARSENATE CONTAMINATED SOIL

Frick, H., S. Tardif, E. Kandeler, P.E. Holm, and K.K.Brandt.
Science of The Total Environment 655:414-422(2019)

A Triad approach that combined chemical, ecotoxicological and ecological assessment of soil quality was used to investigate the abilities of biochar and zero-valent iron (ZVI) to remediate chromated copper arsenate (CCA) contaminated soil in a microcosm experiment. Soil samples from a highly contaminated CCA site (1,364, 1,662 and 540 µg/g of As, Cu, and Cr, respectively) were treated with two different biochars (fine and coarse particle size; 1% w/w) and ZVI (5% w/w), both as sole and combined treatments were conducted alone and in combination. The microcosms were incubated for 56 days at 15°C. In general, bioavailable As (As_{bio}) and Cu (Cu_{bio}) determined by whole-cell bacterial bioreporters corresponded well to water-extractable As

and Cu (As_{water} and Cu_{water}). However, in biochar treatments, only Cu_{bio} and not Cu_{water} was significantly reduced. Under ZVI treatments, only Cu_{water} and not Cubio was reduced, demonstrating the value of complementing analytical with bacterial bioreporter measurements to infer bioavailability of elements to soil microorganisms. The combined fine particle size biochar and ZVI treatment reduced water-extractable concentrations of Cr (45%), Cu (45%), and As (43%) and led to the highest ecological recovery of the soil bacterial community, as measured using the [^{3}H]leucine incorporation technique.

PHYTOREMEDIATION POTENTIAL OF *PISTIA STRATIOTES AND EICHHORNIA* CRASSIPES TO REMOVE CHROMIUM AND COPPER

Tabinda, A.B., R. Irfan, A. Yasar, A. Iqbal, and A. Mahmood.
Environmental Technology 41(12):1514-1519(2020)

A small-scale experiment was conducted to determine the phytoremediation efficiency of two macrophytes, *Pistia stratiotes* and *Eichhornia crassipes,* to remove Cr and Cu from prepared metal solutions of different concentrations (2, 4, 6, 8 mg/L) over one month. Both aquatic macrophytes showed different efficiencies for Cr and Cu removal and accumulation. The dry biomass of both macrophytes increased over the period. The average accumulation of Cr in roots and leaves of *P. stratiotes* was 85 mg and 56 mg, respectively. For Cu, average accumulation was 96 mg and 70 mg, respectively. The average accumulation of Cr in roots and leaves of *E. crassipes* was 90 mg and 53 mg, respectively. Average accumulation for Cu was 86 mg and 50 mg, respectively. The concentration of metals in the solution significantly decreased from day 1 to day 30. The results of one-way ANOVA showed that removal of Cr was significantly (p&lt.05) greater in E. crassipes, and removal of Cu was significantly (p<.05) greater in *P. stratiotes*.

General News

TECHNICAL RESOURCES FOR ADDRESSING ENVIRONMENTAL RELEASES OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Interstate Technology and Regulatory Council Per- and Polyfluoroalkyl Substances (PFAS) Team, Report No. PFAS-1, 380 pp, 2020.

Designed specifically to provide state and federal environmental staff, as well as stakeholders, project managers, and decision-makers a working knowledge of the current state of PFAS science and practice, this document was developed by a team of over 400 environmental practitioners drawn from state and federal government, academia, industry, environmental consulting, and public interest groups. It summarizes the current understanding of all aspects of PFAS from a broad perspective. The guide covers the definition of PFAS, their environmental behavior, evaluation of PFAS in the environment, techniques used to remediate PFAS, major concerns of communities and tribes, how to share PFAS knowledge, and special topics. ITRC has released 10 PFAS training modules to accompany the document that range from ~13- 30 minutes. They can be accessed at https://www.youtube.com/playlist?list=PL4BkJPBpegFGf41mTSSKvQ9_hAQ4gM27X. Topics covered include including sampling and analysis, treatment technologies, risk communication, human and ecological effects, fate and transport, and risk assessment and regulations, among others.
Web-based document: https://pfas-1.itrcweb.org/
PDF file: https://pfas-1.itrcweb.org/wp-content/uploads/2020/04/ITRC_PFAS_TechReg_April2020.pdf

PASSIVE SAMPLING OF GROUNDWATER WELLS FOR DETERMINATION OF WATER CHEMISTRY: CHAPTER 8 OF SECTION D. WATER QUALITY, BOOK 1. COLLECTION OF WATER DATA BY DIRECT MEASUREMENT

Imbrigiotta, T.E. and P.T. Harte. Techniques and Methods 1-D8, 94 pp, 2020

Although passive samplers have been available for more than 15 years, their use by USGS hydrologists and hydrologic technicians to monitor groundwater quality largely has been limited to selected research studies. This report is an effort to expose personnel to passive samplers and their uses and develop a protocol for their use. The report focuses on three types of passive samplers (equilibrium-membrane type, equilibrium-thief type, and accumulation-type). It discusses the advantages and limitations of each as well as passive samplers in general. Report sections include Theories and Principles of Passive Samplers; Types of Passive Samplers; Considerations Prior to Use; Water Quality Sampling Considerations; Vertical Profiling; Decision Tools; Sampler Deployment, Retrieval, and Sample Collection; Data Reporting Procedures; Quality Assurance/Quality Control; and Data Evaluation. https://pubs.usgs.gov/tm/01/d8/tm1d8.pdf

AUSTRALIAN CASE STUDIES OF LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) NATURAL SOURCE ZONE DEPLETION RATES COMPARED WITH CONVENTIONAL ACTIVE RECOVERY EFFORTS

Rayner, J.L., E. Bekele, M. Donn, T.P. Bastow, G.B. Davis, R. Woodbury, A. Furness, et al.
CRC for Contamination Assessment and Remediation of the Environment (CARE), Adelaide, Australia: CRC CARE Technical Report No. 47, 263 pp, Mar 2020

The project "Towards national guidance of natural source zone depletion (NSZD)" was initiated by CRC CARE to understand the role of NSZD in the management of LNAPL contaminated sites. This report complements the LNAPL NSZD application guidance document *The role of natural source zone depletion in the management of light non-aqueous phase liquid (LNAPL) contaminated sites*and the LNAPL NSZD measurement guidance document *Technical measurement guidance for LNAPL natural source zone depletion* (both available at https://www.crccare.com/publications/technical-reports). This document provides detailed, Australian-specific measurements and case studies for six sites and multiple LNAPL product types. For these sites, NSZD rates were estimated for a range of LNAPLs, such as crude oil, diesel, jet fuel, and gas condensate. The NSZD rates are compared to the most representative active product recovery rates from each of these sites to provide context to the scale of the NSZD rates.
https://www.crccare.com/files/dmfile/CRCCARETechnicalReport47_AustcasestudiesofLNAPLNSZDrates.pdf

THERMAL TREATMENT OF PFAS IN ENVIRONMENTAL MEDIA: A REVIEW OF THE STATE-OF-THE-SCIENCE

Mills, M.A., D. Bless, K. Dasu, D.P. Siriwardena, and A. Dinal.
EPA Workshop: Thermal state of the Science, Cincinnati, OH, February 25, 2020

This workshop reviews the state-of-the-science review on thermal treatment technologies for PFAS and to identify data gaps to focus further research.
https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=348571&Lab=CESER

A NEW PARADIGM FOR ENVIRONMENTAL CHEMISTRY AND TOXICOLOGY FROM CONCEPTS TO INSIGHTS

Jiang, G. and X. Li (eds.). Springer, Singapore. ISBN 978-981-13-9446-1. 276 pp, 2020

In 16 independently authored chapters, this book provides comprehensive coverage of the theoretical developments and technological breakthroughs to deepen our understanding of environmental pollution and human health and stimulate a comprehensive strategy to address these problems. The chapters highlight concepts fueling the development of environmental chemistry and toxicology, the revolutionary analytical and computational approaches enabling novel insights into environmental health, and the nature-inspired, innovative engineering solutions tackling the complex hazardous exposures. It also features a forward-looking perspective on the global emerging environmental issues worthy of new research and regulatory paradigms, laying the groundwork for future advances in the broad field of environmental chemistry and toxicology. *View the table of contents and abstracts at* https://link.springer.com/book/10.1007/978-981-13-9447-8#toc.

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