Technology Innovation News Survey

Entries for August 1-15, 2017

Market/Commercialization Information

FY 2018 SERDP SUPPLEMENTAL SOLICITATION

Strategic Environmental Research and Development Program (SERDP), 2017

The FY 2018 SERDP supplemental solicitation seeks projects that will be selected through a competitive process, limited to no more than $200,000, and of about one year's duration. Successful projects may be considered for additional follow-on funding. All submissions must respond to a SERDP Statement of Need, such as the two SONs under Environmental Restoration:

- **ERSON-18-L1:** Innovative approaches for treatment of waste derived from per- and polyfluoroalkyl substance (PFAS) subsurface investigations.
- **ERSON-18-L2:** Defining knowledge gaps in the understanding of PFASs in the subsurface.

Researchers from universities, federal organizations, and private industry can apply for funding. A webinar—SERDP Funding Opportunities: FY 2018—will be presented September 25, 2017. Proposals must be received no later than 2:00 PM ET on October 19, 2017. https://www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations

EPA SBIR PHASE I FISCAL YEAR 2018

U.S. Environmental Protection Agency, RTP Procurement Operations Division, NC.
Federal Business Opportunities, FBO-5776, Solicitation SOL-NC-17-00028, 2017

U.S. EPA contemplates awarding about 12 firm-fixed-price contracts of $100,000 each under the Small Business Innovation Research (SBIR) Program Phase I during FY 2018. Among the six topic areas identified by the Agency, the needs for feasibility-related research or R&D efforts on per- and polyfluoroalkyl compounds may be of particular interest to the cleanup community:

- **Clean and Safe Water:** (A) Removal of PFOA/PFOS from drinking water; and (B) Removal of PFOA/PFOS from wastewater.
- **Land Revitalization:** Remediation of PFAS-contaminated soil and sediment.

The anticipated release date of the solicitation is October 17, 2017, with proposals likely due December 7, 2017. Phase I awards are anticipated by June 30, 2018, each with a 6-month period of performance. An informational webinar will be held on Thursday, September 28, 2017. More information on the event will be posted at https://www.epa.gov/sbir. After the webinar, slides and questions and answers will be posted at https://www.epa.gov/sbir/sbir-special-announcements. Monitor FedConnect for updates at https://www.fedconnect.net/FedConnect/?doc=SOL-NC-17-00028&agency=EPA.

PERFORM FENCE TO FENCE ENVIRONMENTAL SERVICES

Department of the Air Force, AFICA - CONUS, Joint Base San Antonio, Lackland, Texas.
Federal Business Opportunities, FBO-5777, Solicitation FA8903-17-R-0062, 2017

The 772 ESS/PKS at Joint Base San Antonio, Lackland, Texas, intends to issue an RFP for a firm-fixed-price contract for Fence to Fence (F2F) Environmental Services at Joint Base Charleston (JB CHS) and Shaw AFB, South Carolina. The solicitation will be set aside for small business concerns under NAICS code 562910 (Remediation Services). With options, the overall period of performance for the proposed contract will be 60 months from date of award. The F2F environmental services will be performance-based and encompass the full range of methods, technologies, and supporting activities necessary to conduct environmental operations needs at JB CHS and Shaw AFB. Release of the RFP is anticipated at some time in October 2017, with a closing date likely 30 calendar days thereafter. https://www.fbo.gov/notices/655f0d2be049d4088da1bcb7990cdda4

DOE EM: CONSOLIDATED TECHNICAL SUPPORT SERVICES

U.S. DOE, Office of Environmental Management (EM), Cincinnati, OH.
Federal Business Opportunities, FBO-5775, Solicitation DE-SOL-0011000, 2017

On April 21, 2017, DOE EM issued a request for information for Consolidated Technical Support Services under NAICS code 541620 (Environmental Consulting Services). Since then, EM has reviewed the capabilities statements submitted and developed an acquisition plan. This requirement is expected to be a competitive 8(a) procurement resulting in a single-award IDIQ contract with a ceiling of $24.5M. DOE tentatively anticipates issuing the final RFP within the next 30-45 days (i.e., by or before the end of October). Contract award is expected in or about the second quarter of Government FY 2018. Interested parties are should watch for updates on the DOE EMCBC procurement website at https://www.emcbc.doe.gov/About/CurrentAcquisitionWebsites and on FedConnect at https://www.fedconnect.net/FedConnect/default.aspx?ReturnUrl=%2fFedConnect%2f%3fdoc%3dDE-SOL-0011000%26agency%3dDOE&doc=DE-SOL-0011000&agency=DOE [Note: It might be necessary to copy and paste the URL into your browser for direct access].

SOURCES SOUGHT ON PROFESSIONAL SERVICES FOR USEPA SUPERFUND GE-PITTSFIELD/HOUSATONIC RIVER CLEANUP PROJECT

U.S. Army Corps of Engineers, USACE District, New England, Concord, MA.
Federal Business Opportunities, FBO-5777, Solicitation W912WJ-17-X-0024, 2017

The U.S. Army Corps of Engineers, New England District seeks to determine interest, availability, and capability of 8(a), HUBZone, small business, service-disabled veteran-owned small business, and woman-owned small business concerns under NAICS code 541620. The estimated contract amount is $15M. Work will begin in fall 2019 and extend over a 5-year period for technical oversight of response actions performed by General Electric and their contractors at the GE-Pittsfield/Housatonic River Site, Mass., where PCBs and other hazardous substances were released over a wide area. The Consent Decree between EPA and GE segregated the site into 28 separate cleanups. Capabilities packages must be received by 2:00 PM ET on October 6, 2017. https://www.fbo.gov/spg/USA/COE/DACA33/W912WJ-17-X-0024/listing.html

SLUDGE REMOVAL AND SOIL REMEDIATION

Department of the Air Force, Air Combat Command, 9 CONS, Beale AFB, CA.
Federal Business Opportunities, FBO-5773, Solicitation FA4686-17-R-0047, 2017

The FedBizOpps announcement constitutes a DRAFT combined synopsis/solicitation for sludge removal and soil remediation from the surrounding area near the water treatment plant off Doolittle Drive on Beale AFB, CA. This acquisition is to be competed as a small business set-aside under NAICS code 562910 (Remediation Services). The 9th Contracting Squadron intends to award a fixed-price contract for removal of sludge and remediation of soil containing iron, manganese, barium, beryllium, and chromium. The period of performance is 60 days after contract award. Interested parties are encouraged to monitor FedBizOpps closely as all proposals must be received no later than 2 days after release of the final combined synopsis/solicitation. https://www.fbo.gov/spg/USAF/ACC/9CONS/FA4686-17-R-0047/listing.html

Cleanup News

IN SITU REMEDIATION OF CHLORINATED SOLVENT-CONTAMINATED GROUNDWATER USING ZVI/ORGANIC CARBON AMENDMENT IN CHINA: FIELD PILOT TEST AND FULL-SCALE APPLICATION

Yang, J., L. Meng, and L. Guo.
Environmental Science Pollution Research Int. [12 pp - Publication online 2017 prior to print]

In situ remediation via direct-push amendment injection was conducted to enhance reductive dechlorination of chlorinated solvents in groundwater in a low-permeability aquifer at an active manufacturing facility in Shanghai, China. A field pilot test of a commercially available amendment, EHC®, at the clay till site was followed by full-scale application to address 1,1,1-TCA, 1,1-DCA, 1,1-DCE, VC, and chloroethane. EHC combines zero-valent iron and organic carbon. Pilot results showed that direct-push EHC injection efficiently facilitated in situ reductive dechlorination, achieving mean removal rates of 99.6% 1,1,1-TCA, 99.3% 1,1-DCA, and 73.3% 1,1-DCE at 270 days post-injection, considerably higher than those of VC and chloroethane (42.3 and 37.1%, respectively). Clear decreases in oxidation-reduction potential and dissolved oxygen concentration and increases in Fe^{2+} and total organic carbon concentration observed during the monitoring period indicate that EHC promotes the anaerobic degradation of chlorinated hydrocarbons primarily via long-term biological reductive dechlorination, with instant chemical reductive dechlorination acting as a secondary pathway. The optimal effective time of EHC injection was 0-90 days, and its radius of influence was 1.5 m. In full-scale application, the maximum concentrations of 1,1,1-TCA and 1,1-DCA in the contaminate plume fell below the relevant Dutch Intervention Values at 180 days post-injection. The dynamics of the target pollutant concentrations mirrored those of the pilot test.

TWO MATHER SOIL VAPOR EXTRACTION UNITS ACHIEVE CLEANUP GOALS

Grotewohl, A.
U.S. Air Force Civil Engineer Center News, 19 July 2017

The remediation program at the former Mather Air Force Base in California took another stride forward this summer when two of three soil vapor extraction (SVE) units achieved their cleanup goals. The treatment systems have removed over 1 million lb of VOCs and petroleum products from the subsurface and treated over 12 billion gal of groundwater. Operation of the two SVE units began in 1998. One was installed near an old wash rack, where airplane parts were cleaned and degreased. Contaminants at this location included jet fuels and TCE. The second unit was placed near an oil-water separator. Both units were switched off in 2015 while the Air Force confirmed that cleanup was complete in those areas. The third unit, also offline since 2015, is located near a former dry-cleaning facility where PCE was used. Removing vaporized contaminants from the deep soil in this area has been completed and the Air Force is working with regulatory agencies to achieve site closure. Demolition of the unit near the oil-water separator is tentatively scheduled for 2017, but the unit near the wash rack may be put back into service to treat a newly discovered site requiring additional remediation; TCE was found in the soil near an airplane hangar currently used by Mather Aviation. Institutional controls will be used at each site to ensure inadvertent exposure to contamination does not take place. http://www.afcec.af.mil/News/Article-Display/Article/1252498/two-mather-soil-vapor-extraction-units-achieve-cleanup-goals/

Demonstrations / Feasibility Studies

VASTINT UK BV, STRAND EAST, SUGAR HOUSE LANE, STRATFORD, ADDENDUM: GROUNDWATER REMEDIATION STRATEGY REPORT

London Legacy Development Corporation, 75 pp, 2016

The site is located in Stratford, London, occupying ~6 hectares. The majority of the site has been demolished to ground level, with remediation and earthworks ongoing at the time of writing. This report sets out the remediation strategy to reduce or remove DNAPL in the north of the site. A pilot trial was implemented between February and July 2015 to inform the remediation approach for deep groundwater affected by DNAPLs consisting primarily of creosote and tar. The trial in area PTA1, located over the highest recorded DNAPL thicknesses, comprised DNAPL removal through dual-phase extraction enhanced with steam injection and air sparging/soil vapor extraction. About 5,800 L of free-phase creosote was recovered during the trial. Area PTA2, located over the southern edge of the plume, provided an evaluation of in situ chemical oxidation (ISCO) using persulfate and H_2O_2. Results indicated that ISCO is unsuitable for further use at the site. The trials were designed to support the development of the remediation strategy for contamination in the Kempton Park Gravels through process proof of concept and the development of appropriate lines of evidence for verification of full-scale remediation. Full details of the completed trials are given in the 36-page in situ pilot trial technical report presented as Appendix 1 in this document. http://planningregister.londonlegacy.co.uk/swift/apas/run/WCHDISPLAYMEDIA.showImage?theSeqNo=98766&theApnkey=5972&theModule=1

ASSESSMENT OF BIODEGRADATION POTENTIAL AT A SITE CONTAMINATED BY A MIXTURE OF BTEX, CHLORINATED POLLUTANTS AND PHARMACEUTICALS USING PASSIVE SAMPLING METHODS: CASE STUDY

Lhotsky, O., E. Krakorova, L. Linhartova, Z. Kresinova, J. Steinova, L. Dvorak, T. Rodsand, et al.
Science of the Total Environment 607-608:1451-1465(2017)

A remediation pilot test to address a commingled plume containing BTEX, chlorinated pollutants, and pharmaceuticals was attempted using a combination of approaches, including a pump and treat system applying an advanced oxidation process and targeted direct-push injections of calcium peroxide. The treatment process was monitored intensively using conventional and passive sampling methods, including next-generation amplicon sequencing. Results showed that the injection of oxygen-saturated treated water with residual H_2O_2 and elevated temperature enhanced the in situ removal of monoaromatics and chlorinated pollutants. When combined with calcium peroxide injection, the conditions facilitated in situ bacterial biodegradation of the pollutants. The mean groundwater concentration of benzene declined from 1349 µg/L prior to the test to 3 µg/L within 3 months after the calcium peroxide injections; additionally, monochlorobenzene concentration fell from 1545 µg/L to 36 µg/L and toluene from 143 µg/L to 2 µg/L. Significant degradation of the contaminants bound to the soil matrix in less permeable zones was also observed. Based on a developed 3D model, the pilot test removed 90% of toluene and 88% of chlorobenzene bound to the soil, and benzene almost completely. The psychopharmaceuticals, however, were removed effectively only by the advanced oxidation process; their concentrations in groundwater remained stagnant due to inflow from adjacent areas and an absence of in situ degradation. The passive sampling techniques—passive diffusion bags for VOCs and their respective transformation products, in situ soil microcosms for microbial community analysis, and polar organic compound integrative samplers for pharmaceuticals—were proven suitable for monitoring remediation in saturated zones.

BIOSTIMULATION PROVED TO BE THE MOST EFFICIENT METHOD IN THE COMPARISON OF IN SITU SOIL REMEDIATION TREATMENTS AFTER A SIMULATED OIL SPILL ACCIDENT

Simpanen, S., M. Dahl, M. Gerlach, A. Mikkonen, V. Malk, J. Mikola, and M. Romantschuk.
Environmental Science and Pollution Research 23(24):25024-25038(2016)

Researchers compared biostimulation, chemical oxidation, and natural attenuation treatments in freshly contaminated conditions at pilot scale during a 16-month experiment. A real fuel spill accident provided a model for the experiment setup and soil contamination. Biostimulation was found to decrease contaminant leaching into water significantly, including NAPL. Total NAPL leachate was 19% lower in the biostimulation treatment than in untreated soil and 34% lower with biostimulation than with oxidation treatment. Soil bacterial growth and community changes were first observed due to the increased carbon content via oil amendment and later due to enhanced nutrient content via biostimulation. Overall, biostimulation enhanced biodegradation of readily available oil in the mobile phase and consequently reduced contaminant migration through the soil. Chemical oxidation did not enhance soil cleanup and even mobilized contaminants. *This paper is* ***Open Access*** *at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5124059/. *For additional information on this study see S. Simpanen's dissertation at* https://helda.helsinki.fi/handle/10138/168815.

CLEAN BREAK

Stoeckmann, E.
Energy Source - Summer:18-21(2017)

Defense Logistics Agency Energy is one step closer to shutting down 27 World War II underground storage tanks at the Navy-owned Defense Fuel Support Point in San Pedro, Calif. The tanks will be filled with foamcrete and returned to the Navy. DLA Energy Installation Support for Energy provides overall management of the $15M closure effort. Following tank closure, Energy project managers will oversee pilot tests of two aggressive remediation technologies—electrical resistance heating (ERH) and steam injection—to remove petroleum contamination from the soil and groundwater at two tank areas with differing geology and physical composition. ERH delivers current to an underground array of metal rods, which become hot enough to turn groundwater into steam. This technique is effective for groundwater and for saturated and unsaturated soil. At the second site, steam injection will be combined with multiphase extraction of soil vapor and groundwater. Introducing heat below ground surface displaces and breaks up the fuel contamination so that it can be extracted more easily. Results from these pilot studies will determine how best to implement the technologies at other tanks in the fuel facility to meet the aggressive 2018-2019 cleanup schedule at San Pedro. Thermal technologies are expected to take less than two years to remediate all the facility's tank sites once full-scale cleanup begins.
http://www.dla.mil/Portals/104/Documents/Energy/Energy%20Source/Current%20Edition/ES_Summer2017_CleanBreak.pdf

Research

KINETIC ANALYSIS OF AEROBIC BIOTRANSFORMATION PATHWAYS OF A PERFLUOROOCTANE SULFONATE (PFOS) PRECURSOR IN DISTINCTLY DIFFERENT SOILS

Zhang, L., L.S. Lee, J. Niu, and J. Liu.
Environmental Pollution 229:159-167(2017)

Aerobic biodegradation of N-ethyl perfluorooctane sulfonamidoethanol (EtFOSE) was monitored in two soils from Indiana: an acidic forest silt loam (FRST-48, pH = 5.5) and a high-pH agricultural loam (PSF-49, pH = 7.8) with similar organic carbon contents (2.4 and 2.6%) for 210 d and 180 d, respectively. Triplicate samples were sacrificed for analysis at designated times. Measured profiles of EtFOSE degradation and generation/degradation of subsequent metabolites were fitted to the Indiana soils data as well as to a previously published data set for a Canadian soil using an R-based model (KinGUII) to explore pathways and estimate half-lives (t1/2) for EtFOSE and metabolites. EtFOSE degradation ranged from a few days to up to a month. PFOS yields ranged from 1.06 to 5.49 mol%, with the alkaline soils being four to five times higher than the acidic soil. Of all metabolites, the sulfonamidoacetic acids were the most persistent (t1/2 ≥ 3 months) in all soils. While pH-pKa dependent speciation may have impacted rates, differences in microbial communities between the soils arising from varied soil properties (e.g., pH, nutrient levels, soil management, climatic regions) likely are the major factors affecting pathways, rates, and PFOS yields.

THE USE OF CARBON ADSORBENTS FOR THE REMOVAL OF PERFLUOROALKYL ACIDS FROM POTABLE REUSE SYSTEMS

Inyang, M. and E.R.V. Dickenson.
Chemosphere 184:168-175(2017)

Bench- and pilot-scale sorption tests were conducted to probe the performance of several biochars at removing perfluoroalkyl acids (PFAAs) from field waters, compared to granular activated carbon (GAC). Hardwood (HWC) and pinewood (PWC) biochars had the highest PFOA removal performance, comparable to that of bituminous coal GAC. PWC and HWC had a stronger affinity for PFOA sorbed in Lake Mead surface water containing a lower dissolved organic carbon (DOC) concentration than in a tertiary-filtered wastewater. A pilot-scale study using three parallel adsorbers (GAC, anthracite, and HWC biochar) treated the same tertiary-filtered wastewater. Compared to HWC, and anthracite, GAC was the most effective in mitigating perfluoropentanoic acid (PFPnA), perfluorohexanoic acid (PHxA), PFOA, PFOS, and DOC (45-67% removed at 4354 bed volumes) followed by HWC, and then anthracite. Based on the bench- and pilot-scale results, shorter-chain PFAAs were more difficult to remove with both biochar and GAC than longer-chain PFOS and PFOA.

A ZERO-VALENT IRON AND ORGANIC MATTER MIXTURE ENHANCES HERBICIDE AND HERBICIDE DEGRADATION PRODUCT REMOVAL IN SUBSURFACE WATERS

Kerminen, K., V. Salovaara, and M.H. Kontro.
Journal of Environmental Science (China) 57:411-417(2017)

The destruction in groundwater of the pesticide atrazine, its degradation products, and 2,6-dichlorobenzamide (BAM) was studied using EHC®, which combines a complex carbon source and zero-valent iron. The application rates were 1.0% and 2.0% (by weight) in subsurface sediment slurries (atrazine 30 mg/L), and 2.0% in 1.5 m pilot-scale sediment columns with groundwater flow-through [atrazine 0.08, desethylatrazine (DEA) 0.03, BAM 0.02 µg/L]. In the slurries under aerobic conditions, atrazine at 0.88±0.14 mg/g of EHC was dissipated chemically, as concentrations did not differ significantly between the slurries and their sterilized controls. No degradation occurred in the slurries under anaerobic conditions. In the pilot-scale columns under water-saturated conditions, atrazine, DEA, and BAM were not detected in effluents at 33, 64, and 64 days, respectively, from the beginning of water flow through EHC® columns, but traces of the compounds could be detected thereafter. No atrazine or degradation products (BAM, DEA, deisopropylatrazine, desethyldeisopropylatrazine) could be extracted from the column sediments at the end of the experiment. As a result, the sum of dissipated pesticides was achieved at ~7.6 µg/g of EHC in columns under water-saturated conditions, and 0.88 mg/g of EHC in slurries under aerobic conditions.

RECLAMATION OF METAL-CONTAMINATED TAILINGS WITH ORGANIC AMENDMENTS: PORE WATER QUALITY CONTROL AND PHYTOSTABILIZATION

Rakotonimaro, T.V., M. Guittonny-Larcheveque, and C.M. Neculita.
Athens 2017: 5th International Conference on Sustainable Solid Waste Management, 21-24 June, Athens, Greece. 10 pp + 15 slides, 2017

Revegetation aided with organic amendments is a promising approach for simultaneous physical (limitation of wind and water erosion) and chemical (acid neutralization and metals/metalloids immobilization) stabilization for reclamation of metal-contaminated tailings. This critical review of available knowledge on organic amendments and their performance is based upon data collected from review papers and case studies (0-5 y), with a particular focus on pore water quality and plant phytostabilization abilities (plant self-sustaining, toxicity). Screening of the most promising materials was carried out according to whether metallic elements were mobilized/immobilized from pore water through speciation change (not including microbial mediation), or sequestered into rhizosphere or plant aboveground parts. Results showed that a mixture of organic and inorganic materials were more efficient than organics alone to reclaim contaminated tailings, particularly the combination of mature and composted animal manures with inorganic materials (e.g., hydrated lime).
Slides: http://uest.ntua.gr/athens2017/proceedings/presentations/15_15Rakotonimaro_et_al_Athens2017_Vf.pdf
Paper: http://uest.ntua.gr/athens2017/proceedings/pdfs/Athens2017_RakotonimaroGuittonnyLarcheveque_Neculita.pdf

INDUCED PHYTOEXTRACTION OF LEAD FROM CONTAMINATED SOILS BY *PANICUM VIRGATUM*, ENHANCED WITH EDTA, CITRIC ACID, BENOMYL, PROPICONAZOLE AND NITRIC OXIDE

Beavers, Adrianna E., Master's thesis, Kennesaw State University, Kennesaw, GA. 98 pp, 2016

North American native switchgrass (*Panicum virgatum*) can achieve high biomass yields across a variety of climates and environmental conditions. The switchgrass plants in this study were treated with chemical chelates, fungal suppressants, and nitric oxide (NO) donors to optimize phytoextraction of Pb. Soils collected from sites located in urban Atlanta were chemically manipulated to increase Pb bioavailability and uptake into harvestable switchgrass tissues. In addition to a comparison of the chelating agents EDTA and citric acid, two fungal suppressants—benomyl and propiconazole—were also compared for their abilities to suppress arbuscular mycorrhizal fungi. Exogenous NO donor application was also studied to determine the effects on switchgrass biomass and Pb uptake using S-Nitroso-N-acetylpenicillamine (SNAP), sodium nitroprusside (SNP), and S-nitrosoglutathione (GSNO).
http://digitalcommons.kennesaw.edu/integrbiol_etd/12

OPTIMIZATION OF EX-SITU WASHING REMOVAL OF POLYCYCLIC AROMATIC HYDROCARBONS FROM A CONTAMINATED SOIL USING NANO-SULFONATED GRAPHENE

Gan, X.-H., Y. Teng, W.-J. Ren, J. Ma, P. Christie, and Y.-M. Luo.
Pedosphere 27(3):527-536(2017)

Nano-sulfonated graphene (SGE) was used as an ex situ washing agent to evaluate different processing parameters for the ectopic leaching removal of PAHs from a coking plant soil. X-ray photoelectron spectroscopy (XPS) and fourier transform infrared spectroscopy (FTIR) were used to analyze the characteristics of the SGE tested. Results showed that SGE had a strong adsorption capacity for PAHs, achieving >80% PAH removal under optimum parameters consisting of an SGE concentration of 2000 mg/L, a liquid/soil ratio of 10:1, and 4 successive cycles of washing. The PAH removal rate decreased with increasing ring numbers. After one washing cycle at SGE concentration of 2000 mg/L and L/S ratio of 10:1, the PAH removal rate was much higher than the rate obtained using Tween 80 or methyl-cyclodextrin. *This paper is* ***temporarily*** *Open Access at* http://www.sciencedirect.com/science/article/pii/S1002016017603485.

SUSTAINABLE REMEDIATION OF HEAVY METAL POLLUTED SOIL: A BIOTECHNICAL INTERACTION WITH SELECTED BACTERIA SPECIES

Emenike, C.U., P. Agamuthu, and S.H. Fauziah.
Journal of Geochemical Exploration [Available online prior to publication] 2017

Although bioremoval or immobilization of heavy metals in leachate-contaminated soil is possible with the use of designated microbes, manipulation of bacteria in relation to diversity matching/blending and cell concentration takes advantage of biotechnical mechanisms for biotransformation, bioreduction or bioremoval of heavy metals. This study projected the blending of *Bacillus* sp., *Lysinibacillus* sp., and *Rhodococcus* sp. for optimal removal of extractable Al (72%), Cu (88%), Cd (41%), Mn (65%), and Pb (71%) ions from leachate-contaminated soil.
https://umexpert.um.edu.my/file/publication/00005472_146395.pdf

BIOSURFACTANT-ENHANCED BIOREMEDIATION OF AGED POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) IN CREOSOTE CONTAMINATED SOIL

Bezza, F.A. and E.M. Chirwa.
Chemosphere 144:635-644(2016)

The potential for biological treatment of complex petrochemical contaminants was evaluated using creosote-contaminated soil in ex situ bio-slurry reactors to investigate the efficacy of biosurfactant application and the stimulation of in situ biosurfactant production. The biosurfactant produced was purified and characterized using FTIR spectroscopy. Biosurfactant-enhanced degradation of PAHs was 86.5% (with addition of biosurfactant) and 57% in controls with no biosurfactant and nutrient amendments after incubation for 45 days. A slight decrease in degradation rate observed in the simultaneous biosurfactant- and nutrient-supplemented microcosm can be attributed to preferential microbial consumption of the biosurfactant. Overall PAHs removal was determined to be mass transport-limited because the dissolution rate caused by the biosurfactant enhanced PAH bioavailability to the microorganisms. The consortium culture was dominated by the aromatic ring-cleaving species *Bacillus stratosphericus*, *B. subtilis*, *B. megaterium*, and *Pseudomonas aeruginosa*. *For additional information on this study, see F.A. Bezza's dissertation at* https://repository.up.ac.za/bitstream/handle/2263/61284/Bezza_Biosurfactant_2017.pdf

BIODEGRADATION OF ISOPRENOIDS, STERANES, TERPANES, AND PHENANTHRENES DURING IN SITU BIOREMEDIATION OF PETROLEUM-CONTAMINATED GROUNDWATER

Beskoski, V.P.S. Miletic, M. Ilic, G. Gojgic-Cvijovic, P. Papic, N. Maric, T. Solevic-Knudsen, et al.
Clean—Soil, Air, Water 45(2):1600023(2017)

When researchers followed changes in the abundance and distribution of n-alkanes and petroleum biomarkers after stimulating microbial biodegradation of petroleum pollution in groundwater, >95% of n-alkanes and petroleum biomarkers were biodegraded after 60 days. Decomposition of unsaturated hydrocarbons, such as phenanthrene, clearly were underway after just 30 days, which suggests that depending on the microbial community, biodegradation of phenanthrene can precede biodegradation of saturated hydrocarbons.

OPTIMAL REMOVAL OF HEAVY METALS FROM LEACHATE CONTAMINATED SOIL USING BIOAUGMENTATION PROCESS

Emenike, C.U., W. Liew, M.G. Fahmi, K.N. Jalil, A. Pariathamby, and F.S. Hamid.
Clean—Soil, Air, Water 45(2):1500802(2017)

In an evaluation of metal reduction through bioaugmentation in leachate-contaminated soil, bacteria species resident in landfill soil were amended to increase their diversity and used in a bioremediation system. The reduction efficiency of *Lysinibacillus* sp., *Bacillus* sp., and *Rhodococcus* sp. was >70% for Pb^{2+}, Al^{3+}, and Cu^{2+}.

PAPERCHAIN PROJECT: ESTABLISHING A NEW CIRCULAR ECONOMY MODEL BETWEEN THE MINING SECTOR AND THE PULP & PAPER INDUSTRY TO PREVENT ACID MINE DRAINAGE

Cepria, J., E. Guedella, C. Maurice, and G. Westin.
Mine Water & Circular Economy (Wolkersdorfer, C. et al., eds.). IMWA, Vol II:892-900(2017)

The European Pulp and Paper Industry generates 11 million tonnes of waste yearly. Most of it is burned for energy recovery or used for landspreading, but around 1.5 million tonnes go to landfills. Green liquor dregs (GLDs) are the largest waste fraction retrieved in the chemical recovery cycle at the sulfate pulp mills. About 240,000 tonnes are landfilled in Sweden alone each year because their only current application is as final landfill cover layers. The mining sector also can benefit from GLDs as alternative material for covers to reduce raw material consumption in reclamation projects. If managed in a sustainable manner, GLDs can become a valuable secondary raw material for other resource-intensive industries. PAPERCHAIN, a research and innovation project funded by the European Commission, addresses this potential resource to demonstrate the technical, economic, social, and environmental feasibility of using these waste materials from the Circular Economy perspective. https://www.imwa.info/docs/imwa_2017/IMWA2017_Cepria_892.pdf

ENHANCED MN TREATMENT IN MINE DRAINAGE USING AUTOCATALYSIS IN A STEEL SLAG-LIMESTONE REACTOR

Kim, D.-M., H.-S. Park, D.-K. Kim, and S.-H. Lee.
Mine Water & Circular Economy (Wolkersdorfer, C. et al., eds.). IMWA, Vol II:1063-1070(2017)

Modified steel slag and manganese (Mn) sand reactors were operated for one year to evaluate their ability to remove Mn. The steel slag reactor showed the lowest Mn, below 0.2 mg/L, but Mn increased above 2.7 mg/L at only 4.5 mg/L of Fe. In contrast, a reactor consisting of steel slag and limestone, after accumulating autocatalytic Mn (hydr)oxides for 160 bed volumes, brought Mn to below 2 mg/L from an initial concentration of 30-50 mg/L and produced outflow with the lowest pH of 7-9. The reactor also maintained Mn
https://www.imwa.info/docs/imwa_2017/IMWA2017_Kim_1063.pdf

EFFECT OF HYDRAULIC RESIDENCE TIME AND TEMPERATURE ON THE PERFORMANCE OF THE INTEGRATED SEMI-PASSIVE BIOPROCESS

Marais, T.S., S.T.L. Harrison, R.J. Huddy, and R.P. van Hille.
Mine Water & Circular Economy (Wolkersdorfer, C. et al., eds.). IMWA, Vol I:262-269(2017)

Researchers investigated system performance of an integrated semi-passive bioprocess for simultaneous sulfate reduction and partial sulfide oxidation within a single linear-flow channel reactor unit as a function of the operating conditions of hydraulic residence time, electron donor (lactate or acetate), and reactor size. The study aims to contribute to the characterization of a novel integrated bioprocess from an engineering and microbial ecology perspective. https://www.imwa.info/docs/imwa_2017/IMWA2017_Marais_262.pdf

ORICA BOTANY GROUNDWATER CLEANUP PROJECT: DNAPL AND GROUNDWATER REMEDIATION TECHNOLOGY ANNUAL REVIEW NO. 11

Report No. EN.1591.61.PR073, 29 pp, 2017

The Orica Botany Groundwater Cleanup is being achieved by groundwater extraction along three containment lines and ex situ treatment of the water in the Groundwater Treatment Plant to address 1,2-dichloroethane and carbon tetrachloride contamination. This report describes the technologies currently in use and innovative technologies under evaluation. No full-scale in situ groundwater treatment technologies are currently in use at the site, but work has continued in the reporting period to investigate and develop bioaugmentation techniques.
http://www.orica.com/ArticleDocuments/993/Annual%20Groundwater_DNAPL_Technology%20Report%202017.pdf.aspx

General News

REMEDIATION AND RECOVERY: INTERNATIONAL IN-SITU THERMAL TREATMENT (I2T2) SYMPOSIUM, MAY 30-31, 2017, BANFF, ALBERTA, CANADA

I2T2 Website, 464 pp, 2017

The goal of the 2-day I2T2 symposium was to share knowledge and experience on in situ thermal remediation and recovery technologies to provide the attendees with an informed and unbiased understanding of how these processes might be useful tools. Fifteen presentations from the meeting have been compiled in a PDF file and made available through a link at
https://www.i2t2symposium.org/i2t2-presentations/.

SUPERFUND REMEDY REPORT, FIFTEENTH EDITION

U.S. EPA, Office of Superfund Remediation and Technology Innovation, Aug 2017

The 15th edition of the Superfund Remedy Report focuses on Superfund remedial actions selected in fiscal years 2012-2014 and on remedy trends since 1982. The report includes remedies selected in 308 decision documents (Records of Decision [RODs], ROD amendments, and Explanations of Significant Differences with changes to remedy components) signed in this 3-year period. Data are compiled on overall remedy selection and remedies for source materials (soil and sediment), surface water, groundwater, and air (i.e., vapor intrusion).
https://semspub.epa.gov/src/document/11/100000349

ABSTRACT BOOKLET: 9th INTERNATIONAL PASSIVE SAMPLING WORKSHOP, MAY 31 & JUNE 1-2, 2017, TORONTO, ONTARIO CANADA

Workshop attendees gave presentations on passive samplers for targeted chemical classes; identified novel passive sampling devices for targeted matrices (i.e., air, water, sediment/soil, and biota); and discussed passive sampling applications and case studies. http://ipsw.eu/2017/wp-content/uploads/sites/4/IPSW2017_BoA.pdf

HARVARD, UNIVERSITY OF RHODE ISLAND RESEARCHERS TO STUDY CHEMICAL CONTAMINATION OF US WATERS

URI Today, 15 Aug 2017

University of Rhode Island (URI) and Harvard University professors are collaborating through a new research center to study perfluorinated compounds, which have contaminated water at sites nationwide. Although the chemicals are not regulated in drinking water, water reportedly has been contaminated with them near sites of industrial facilities and U.S. military bases. The 5-year, $8M grant from the National Institute of Environmental Health Sciences establishes URI as part of a national network of Superfund Research Program centers. The center will focus on gaining a better understanding of how perfluorinated chemicals make their way into water and through the food chain, and affect people and animals.
https://today.uri.edu/news/uri-receives-8-million-federal-grant-to-establish-research-center-on-chemical-pollutants-in-drinking-water/

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.