Technology Innovation News Survey

Entries for October 1-15, 2017

Market/Commercialization Information

ENVIRONMENTAL ANALYTICAL SERVICES

Department of the Army, U.S. Army Corps of Engineers, USACE District, Sacramento, CA.
Federal Business Opportunities, FBO-5826, Solicitation W9123818S0008, 2017

The purpose of this notice is to gain knowledge of potential small business sources in the following categories—small business, certified 8(a), certified HUBZone, and service-disabled veteran-owned small business—for a potential small business-category set-aside IDIQ contract for the USACE Sacramento District. Analytical services support is needed for chemical analysis of soils, sediments, sludges, groundwater, surface water, soil gas, air, and other environmental samples, under NAICS code 541380. Samples typically have been collected from various hazardous and toxic waste site cleanup projects. Responses from capable parties will be used to determine the appropriate acquisition strategy. Submit responses by 4:00 PM PT on November 30, 2017. This project is planned for advertising in December 2017. https://www.fbo.gov/spg/USA/COE/DACA05/W9123818S0008/listing.html

DEMOLITION OF ABANDONED FACILITIES

Department of the Navy, Naval Facilities Engineering Command, NAVFAC Mid-Atlantic, Norfolk, VA.
Federal Business Opportunities, FBO-5823, Solicitation N4008517R5033, 2017

This solicitation will be advertised as total small business set-aside in the second half of November 2017 under NAICS code 562910. The proposed acquisition will result in a firm-fixed-price Design-Bid-Build construction contract for Project DE15-1640: Demolition of abandoned facilities, Melville Tank Farm #1, Naval Station Newport, Rhode Island. Work includes demolishing 8 abandoned fuel underground storage tanks (USTs) at Tank Farm #1, along with all associated fuel distribution piping and concrete pipe chambers, bottom sediment, water piping, ring drain piping, oil-water separators, facilities, and earth berm containments. The USTs and piping were temporarily closed and documented in 1996. The tanks were cleaned and patched to hold ballast water. Tank demolition includes removing the ballast water and any remaining tank sludge from inside the tanks, removing the tanks, and recycling suitable material.
https://www.fbo.gov/spg/DON/NAVFAC/N62470HR/N4008517R5033/listing.html

LOWER ROUGE RIVER OLD CANAL REMEDIAL DREDGING

Department of the Army, U.S. Army Corps of Engineers, USACE District, Detroit, MI.
Federal Business Opportunities, FBO-5830, Solicitation W911XK18B0002, 2017

The U.S. Army Corps of Engineers, Detroit District, seeks to identify potential contractors, particularly small businesses, to provide construction services associated with environmental dredging and remediation of the Lower Rouge River, Old Channel, in Detroit, Michigan. The Old Channel is about 200 feet wide and 1.5 miles long, running between Zug Island on the east and the Detroit shoreline on the west side of the channel. Years of industrial activity have contaminated the channel sediments with PAHs and NAPLs. The objective is to remediate and dispose of contaminated sediments under the authority of the Great Lakes Legacy Act, as implemented by U.S. EPA. Estimated cost of construction is between $10M and $25M. The NAICS code is 237990, small business size standard of $27.5M. Release and award of the contract is anticipated in late spring 2018, with a one-year period of performance. Interested firms may submit capabilities statements by 2:00 PM ET on November 24, 2017. https://www.fbo.gov/spg/USA/COE/DACA35/W911XK18B0002/listing.html

SMALL BUSINESS INNOVATION RESEARCH (SBIR) 2017-2018 PHASE I SOLICITATION

U.S. Environmental Protection Agency, Funding Opportunity SOL-NC-17-00028, 2017

Small businesses can apply for EPA SBIR Phase I awards up to $100,000 to demonstrate proof of concept for an EPA topic of need. Among the 14 research needs listed in the solicitation are 5 topics of potential interest to the cleanup community:

- Removal of PFOA/PFOS from drinking water to concentrations below 0.07 ppb.
- Removal of PFOA/PFOS from wastewater to concentrations below 0.07 ppb.
- Remediation of PFAS-contaminated soil and sediment, i.e., technologies for sampling, detecting, analyzing, removing, or destroying PFASs.
- Decontamination of category A viruses (e.g., Ebola) on porous surfaces and sensitive equipment.
- Packaging for on-site fumigation and transport of category A virus-contaminated materials.

This funding opportunity closes December 19, 2017. Visit https://www.epa.gov/sbir for information on eligibility, application process, and the SBIR program. All applications must be submitted through FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-NC-17-00028&agency=EPA.

2018 DOE SBIR/STTR PHASE I RELEASE 2

U.S. Department of Energy, Office of Science, Funding Opportunity DE-FOA-0001770, 2017

Small businesses can apply for DOE SBIR Phase I awards up to $150,000 in the following subtopic areas:

- Provide dust suppression alternatives to the use of water for large open areas.
- Develop a vadose zone pore water sampler.
- Develop 2D surveys (walkover, drone, overflight) for long-term monitoring of residual contamination, potentially including geophysical or other remote sensing techniques that allow for spatial delineation of contaminant changes through time (e.g., for Cr(VI) at Hanford).
- Develop innovative methods for delivery of treatment amendments to increase spatial distribution in complex geology (fractured rock at substantial depths, e.g., 1000 feet).

https://science.energy.gov/~/media/sbir/pdf/TechnicalTopics/FY2018_Phase_I_Release_2_Topics_Combined.pdf See additional information at http://science.energy.gov/sbir/funding-opportunities/. The period of performance will not exceed 12 months. A letter of intent to submit an application must be received by January 8, 2018. Full applications are due February 26, 2018.

FY18 ENVIRONMENTAL WORKFORCE DEVELOPMENT AND JOB TRAINING GRANTS

U.S. Environmental Protection Agency, Funding Opportunity EPA-OLEM-OBLR-17-10, 2017

EPA is soliciting proposals from eligible entities, including nonprofit organizations, to deliver Environmental Workforce Development and Job Training (EWDJT) programs that recruit, train, and place local, unemployed, and under-employed residents with the skills needed to secure full-time employment in the environmental field. Recipients of a FY 2017 EWDJT grant are not eligible to apply for funding in FY 2018. See additional details at https://www.epa.gov/grants/fy-2018-environmental-workforce-development-and-job-training-ewdjt-grants. The Agency anticipates granting about 16 awards out of an estimated program funding of $3M. The closing date for EWDJT applications is December 15, 2017.
http://www.grants.gov/web/grants/view-opportunity.html?oppId=298017

Cleanup News

REMOVAL OF PFAS FROM GROUNDWATER IN AN EXTRACTION AND TREATMENT SYSTEM

Evans, C.
Maine Sustainability & Water Conference, 30 March 2017, 28 slides, 2017

Poly- and perfluoroalkylated substances (PFASs) are a large class of emerging contaminant compounds that have been used in aqueous film-forming foams (AFFF) produced for fire suppression. At a former Naval Air Station, PFASs associated with fire training are co-located with a chlorinated solvent plume for which the Navy has operated a groundwater extraction and treatment system (GWETS) since the mid-1990s. The treatment system comprises two carbon vessels and an oxidation unit. The Navy modified the system in 2015 in response to detections of PFAS in the effluent water at the GWETS and to delineation of PFOA and PFOS in groundwater and surface water at the base above health advisory criteria. The existing carbon was replaced and data were collected to evaluate the effectiveness of two different granular activated carbons to remove PFASs and chlorinated solvents from groundwater at this site. System monitoring at multiple points demonstrated that the carbon is effective for PFAS removal to non-detect levels. Breakthrough occurred at faster rates for shorter chain PFASs than for longer chain compounds. Performance of coal-based carbon proved superior to that of coconut-based activated carbon. However, the oxidation unit potentially could enhance degradation of precursor compounds into the target compounds PFOS and PFOA. https://umaine.edu/mitchellcenter/wp-content/uploads/sites/293/2017/04/Evans_MSWC_.pdf

ELECTRICAL RESISTANCE HEATING (ERH)

Van den Brand, M. and W. Leys.
Remediation Day 2017, February 9. 14 slides, 2017

The in situ thermal remediation project site is situated in Anderlecht, near Brussels (Europe), in a former industrial area that will be redeveloped for housing. The site is heavily contaminated with a mixture of volatile chlorinated hydrocarbons in phases that include DNAPL. The source zone contains an estimated 50,000 kg of contaminant mass. At a maximum treatment depth of 18 m bgs, the thermal treatment heats the groundwater up to ~100°C to volatilize the hydrocarbons toward the surface for capture in a treatment facility. The project is expected to operate for a period of about half a year. The electrodes network that provides the heat is a combination of steel pipes and sheet piles driven into the ground. These electrodes are connected via a power control unit to an electricity connection of 11kV. Treatment of the high mass load of extracted warm vapors containing several chemical compounds with diverse chemical properties in a very short time frame is the most complex part of the project, requiring a series of vapor treatment units that combine vapor condensation at -20°C, aliphatic scrubbing, and catalytic oxidation.
http://www.bmvt.nl/sites/bmvt.nl/files/languages/5%29%20TRS%20Europe%20-%20Electrical%20Resistance%20Heating%20-%20Rem%20Day%202017.pdf

Demonstrations / Feasibility Studies

PILOT-SCALE DEMONSTRATION OF IN SITU CHEMICAL OXIDATION INVOLVING CHLORINATED VOLATILE ORGANIC COMPOUNDS: DESIGN AND DEPLOYMENT GUIDELINES, PARRIS ISLAND, SC, MARINE CORPS RECRUIT DEPOT, SITE 45 PILOT STUDY

Huling, S.G., B.E. Pivetz, K. Jewell, and S. Ko.
EPA 600-R-16-383, 176 pp, 2016

A pilot-scale demonstration of in situ chemical oxidation (ISCO) using sodium permanganate was performed at Site 45 to address groundwater originally contaminated with PCE. High-resolution site characterization involved multiple iterations of soil core sampling and analysis in addition to the use of nested micro-wells and conventional wells to sample groundwater for analysis of PCE and daughter products. Site impediments to ISCO activities in the source area involved subsurface utilities, including a high-pressure water main, a high-voltage power line, a communication line, and sanitary and stormwater sewer lines. A portable, low-cost, direct-push injection system was designed, constructed, and deployed at the site. Oxidant delivery deployment and design included numerous injection locations, a narrow radius of influence of the injected oxidant, short vertical-screen injection intervals, low injection pressure, outside-in oxidant injection, and a total porosity oxidant volume design. Following three oxidant injection events, significant reductions were observed in post-oxidation CVOC concentrations in groundwater and soil, and a 92% and 76% reduction in total CVOC mass flux in shallow and deep micro-wells, respectively. CVOC rebound was determined in 3 of the 38 wells, and post-oxidation PCE concentrations in one well indicated the presence of DNAPL, which suggests that rebound will continue and that additional ISCO activities are needed in the source area.

Results of this study are intended to provide details and guidelines that can be used by EPA and DoD remedial project managers for planning ISCO remediation at other sites.
https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100SDXW.txt

ENHANCED IN SITU CO-METABOLIC BIODEGRADATION OF 1,4-DIOXANE IN WEATHERED BEDROCK VIA PROPANE BIOSPARGING

Krevinghaus, A., C. Bell, and C. Favero.
Groundwater Solutions: Innovating to Address Emerging Issues for Groundwater Resources, 8-9 August 2017, Arlington, VA. Presentation 11507, 2017

In September 2016 a propane biosparge pilot test was initiated at the RACER Trust site in Lansing, Mich. Air and propane were injected into contaminated weathered bedrock at 3 ft^3/min and up to 35% of the lower explosive limit (LEL) for 11-12 hours per day into each of two sparge wells. The propane concentration was increased from 15% to 35% LEL during the test to evaluate any change in the biodegradation rate. Bioaugmentation with a propanotrophic culture was conducted alongside nutrient addition of diammonium phosphate. After four months of operation, dioxane concentrations declined as much as 98% at monitoring locations within the test area. Higher reductions were observed at locations better connected with the sparge well, which received increased dissolved oxygen (>3 mg/L) and propane (>100 mg/L). Little effect on dioxane degradation was observed by increasing the 15% propane to 35% of the LEL. Distributing the gas mixture effectively within the weathered bedrock is considered the key to making biosparging a viable remedy for the site.

Research

OPPORTUNITIES FOR GROUNDWATER MICROBIAL ELECTRO-REMEDIATION

Pous, N., M.D. Balaguer, J. Colprim, and S. Puig.
Microbial Biotechnology [Publication online 6 Oct 2017 ahead of print]

Microbial electro-remediation by means of microbial electrochemical technologies (MET) can be applied to groundwater treatment in situ or ex situ as well as to monitoring chemical state or microbiological activity. In this technological approach, electroactive bacteria are able to use a solid electrode as an electron donor alternative to organic matter/hydrogen or as an electron acceptor alternative to oxygen/nitrate. Depending on contaminant and groundwater characteristics, a MET system can be operated as a microbial fuel cell (MFC) or as a microbial electrolysis cell (MEC). The MFC is an autonomous device from which energy can be extracted, while the MEC is a device that accepts energy to support or enhance a bioelectrochemical process. This paper reviews the application of microbial electro-remediation to organics, chlorinated hydrocarbons, inorganics, and nutrients (e.g., nitrate) in groundwater. *This paper is* ***Open Access*** *at* http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12866/full.

THE BIOELECTRIC WELL: A NOVEL APPROACH FOR IN SITU TREATMENT OF HYDROCARBON-CONTAMINATED GROUNDWATER

Palma, E., M. Daghio, A. Franzetti, M.P. Papini, and F. Aulenta.
Microbial Biotechnology [Publication online 11 Jul 2017 ahead of print]

Field-scale application of microbial electrochemical technologies has been hindered by the limited availability of scalable system configurations. A bioelectrochemical reactor configuration—the bioelectric well—can be installed directly within groundwater wells and applied to the in situ treatment of organic contaminants, such as petroleum hydrocarbons. A lab-scale prototype of the bioelectric well, operated in continuous-flow regime with phenol as the model contaminant, obtained its best performance when the system was inoculated with refinery sludge and the anode was potentiostatically controlled at +0.2 V. Under this condition, the influent phenol (25 mg/L) was almost completely (99.5 ± 0.4%) removed, with an average degradation rate of 59 ± 3 mg/L d and a coulombic efficiency of 104 ± 4%. Microbial community analysis revealed pronounced enrichment of *Geobacter* species on the surface of the graphite anode, pointing to direct involvement of this electro-active bacterium in the current-generating and phenol-oxidizing process. *This paper is* ***Open Access*** *at* http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12760/full.

BIOELECTROVENTING: AN ELECTROCHEMICAL-ASSISTED BIOREMEDIATION STRATEGY FOR CLEANING-UP ATRAZINE-POLLUTED SOILS

Dominguez-Garay, A., J.R. Quejigo, U. Doerfler, R. Schroll, and A. Esteve-Nunez.
Microbial Biotechnology [Publication online 23 Jun 2017 ahead of print]

Bioelectroventing is a bioelectrochemical strategy that aims to enhance the biodegradation of a pollutant in the environment by overcoming the electron acceptor limitation and maximizing metabolic oxidation. Microbial electroremediating cells were used in different configurations to stimulate soil bacteria to achieve complete biodegradation of the herbicide ^{14}C-atrazine to $^{14}CO_2$ in soils. Electrodes used at a positive potential (+600 mV) enhanced atrazine mineralization 20-fold compared to natural attenuation in electrode-free controls. Ecotoxicological analysis of the soil after the bioelectroventing treatment showed effective cleanup in 14C-atrazine metabolites and ^{14}C mass balance in response to the different treatments. *This paper is* ***Open Access*** *at* http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12687/full.

FIELD APPLICATION OF EMERGING COMPOSITE SAMPLING METHODS

U.S. EPA, National Homeland Security Research Center.
EPA 600-R-17-212, 107 pp, 2017

For a wide-area contamination incident, traditional surface sampling methods can become a critical bottleneck in the remediation process because they are time and labor intensive and might require large number of samples to achieve reasonable confidence in the results. Innovative composite sampling techniques may prove useful as an addition to currently used surface sampling methods. These composite sampling techniques include aggressive air (AA) sampling as well as sampling using readily available surface cleaning technologies, such as robotic floor cleaners (RFCs) and wet vacuums. AA, RFCs, and wet vacuum sampling are suitable for use in many building interiors and can allow rapid sampling using fewer personnel and taking fewer samples per unit area than current surface sampling methods. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100SN1I.txt

SOIL WASHING BENCH SCALE TREATABILITY STUDY WORK PLAN, OFFSITE PROPERTIES WITHIN THE EXIDE PRELIMINARY INVESTIGATION AREA

California Department of Toxic Substances Control, 588 pp, Jan 2017

A bench-scale treatability study was designed for soils with elevated concentrations of lead (Pb) from properties surrounding the former Exide Technologies Battery Recycling Facility (Vernon, Calif.) to determine if soil washing might be utilized as an effective means of reducing the volume of excavated Pb-contaminated soil that requires disposal. http://www.envirostor.dtsc.ca.gov/public/community_involvement_documents.asp?global_id=60002267&document_folder=+676788711 *February 2017 Update*: The combined soil sample results indicated that only the gravel fraction contained Pb below the 80 ppm DTSC Residential Soil Screening Level; this was only 13% of the soil. The estimated cost of soil washing would be $65,388 per property, which is 76.99% higher than the soil disposal option identified in the draft cleanup plan. The estimated cost of disposal of contaminated soil with soil washing would be $552.7/ton versus $312.3/ton to excavate and dispose of contaminated soil. http://www.dtsc.ca.gov/HazardousWaste/Projects/upload/Exide_Soil-Washing-Study_Update.pdf

MODELING THE MOVEMENT OF SOLUTES THROUGH THE SUBSURFACE: APPLICATION TO GROUNDWATER REMEDIATION WITH OXIDANT CANDLES

Chatterton, C.
University of Nebraska, Lincoln, UCARE Research Products. 47 (Poster), 2016

Slow-release permanganate candles are a relatively new technique for remediating groundwater contaminated with chlorinated solvents. A practical question limiting candle use is determining how close the oxidant candles should be spaced to treat a contaminant plume effectively. To address this question, a custom-built flow tank and 3D modeling techniques are being used to determine the zone of influence of the slow-release candles via the dispersion of permanganate. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1046&context=ucareresearch Progress in 2017 toward commercialization of the oxidant candle technology is described at http://newsroom.unl.edu/announce/snr/6706/37896.

DEGRADATION OF CYCLIC ETHERS BY MICROORGANISMS ISOLATED FROM CONTAMINATED GROUNDWATER

Thompson, Rowan, Master's thesis, Rochester Institute of Technology, NY, 73 pp, 2017

Using groundwater samples collected from a Superfund site contaminated with chlorinated compounds and other VOCs, the samples were enriched to select for organisms capable of degrading the cyclic ethers tetrahydrofuran and 1,4-dioxane. The isolates were tested for their degradation capacity and to determine if they were affected by the presence of aliphatic chlorinated compounds. Consortia of the isolated organisms grew readily on rich media, in high concentrations of tetrahydrofuran and dioxane (616 mM THF, 586 mM dioxane), and in the presence of, and directly on, PCE (0.2 mM). Previous research conducted at the source of the organisms revealed the presence of functional and phylogenetic genes that might cometabolize tetrahydrofuran and dioxane. This research has confirmed the previous hypothesis that microorganisms on site are capable of degrading the contaminants. 16sRNA analysis was completed on the isolates; the majority of organisms had not been seen previously in degradation of these compounds. Commonly known degraders were not found in the samples, suggesting other degradation pathways are being used. http://scholarworks.rit.edu/theses/9528/

1,4-DIOXANE-DEGRADING CONSORTIA CAN BE ENRICHED FROM UNCONTAMINATED SOILS: PREVALENCE OF *MYCOBACTERIUM* AND SOLUBLE DI-IRON MONOOXYGENASE GENES

He, Y., J. Mathieu, M.L.B. da Silva, M. Li, and P.J.J. Alvarez.
Microbial Biotechnology [published online 6 Oct 2017 prior to print]

Two bacterial consortia were enriched from uncontaminated soil by virtue of their ability to grow on dioxane as a sole carbon and energy source. Their specific dioxane degradation rates at 30°C, pH = 7 (i.e., 5.7 to 7.1 g-dioxane per g-protein per day) were comparable to those of two dioxane-metabolizing archetypes: *Pseudonocardia dioxanivorans* CB1190 and *Mycobacterium dioxanotrophicus* PH-06. Based on 16S rRNA sequencing, *Mycobacterium* was the dominant genus. Although biodegradation of trace levels of dioxane is a common challenge at contaminated sites, both consortia degraded dioxane at low initial concentrations (300 µg/L) below detectable levels (5 µg/L) in bioaugmented microcosms prepared with contaminated groundwater. Overall results show that dioxane-degrading bacteria (and the associated natural attenuation potential) exist even in some uncontaminated soils. *This paper is temporarily* ***Open Access*** *at* http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12850/full.

SYNERGISTIC TREATMENT OF MIXED 1,4-DIOXANE AND CHLORINATED SOLVENT CONTAMINATIONS BY COUPLING ELECTROCHEMICAL OXIDATION WITH AEROBIC BIODEGRADATION

Jasmann, J.R., P.B. Gedalanga, T. Borch, S. Mahendra, and J. Blotevogel.
Environmental Science & Technology [Publication online 2017 prior to print]

The use of flow-through electrolytic reactors equipped with Ti/IrO_2-Ta_2O_5 mesh electrodes to combine electrochemical oxidation with aerobic biodegradation produced an overadditive treatment effect for degrading 1,4-dioxane. Reactors bioaugmented with *Pseudonocardia dioxanivorans* CB1190 with 3.0 V applied oxidized dioxane 2.5 times faster than bioaugmented control reactors without an applied potential, and 12 times faster than abiotic electrolysis only. Quantitative polymerase chain reaction analyses of CB1190 abundance, oxidation-reduction potential, and dissolved oxygen measurements indicated that anodic oxygen-generating reactions promoted microbial growth. At a higher potential of 8.0 V, however, cell abundance near the anode declined, likely due to unfavorable pH or redox conditions. When coupled to electrolysis, dioxane biodegradation was sustained even in the presence of co-contaminant TCE in the influent. *For additional information, see Chapter 4 in J.R. Jasmann's dissertation at* https://dspace.library.colostate.edu/handle/10217/176785?show=full.

ADVANCES IN BIOREMEDIATION OF 1,4-DIOXANE-CONTAMINATED WATERS

Zhang, S., P.B. Gedalanga, and S. Mahendra.
Journal of Environmental Management 204(2):765-774(2017)

The unique chemical properties of 1,4-dioxane, such as high water solubility and low Henry's law constant as well as its common co-occurrence with chlorinated solvents and other contaminants, increase the challenges to analyze and clean up the compound. This review summarizes currently available chemical and physical dioxane treatment technologies and focuses on recent advances in bioremediation and monitoring tools. Lab studies and field applications are included to suggest the next steps in dioxane bioremediation research.

BEHAVIOR AND MECHANISMS FOR SORPTIVE REMOVAL OF PERFLUOROOCTANE SULFONATE BY LAYERED DOUBLE HYDROXIDES

Hu, Z., X. Song, C. Wei, and J. Liu.
Chemosphere 187:196-205(2017)

Researchers evaluated the sorptive removal behavior of PFOS from aqueous solution using a class of anionic clays having layered structures—layered double hydroxides, or LDHs—in three forms: nitrate-, carbonate- and chloride-intercalated LDHs. Batch experiments showed that the sorption process was very fast, with an equilibrium time of 10-60 min. The nitrate-LDH had the greatest ability to remove PFOS with a removal rate of 99.7% at an initial concentration of 100 mg/L; the maximum uptake capacity reached 865 mg/g. The sorption kinetic and equilibrium data could be fitted well with the pseudo-second-order model and Langmuir model, respectively. The intraparticle diffusion model suggested that both external diffusion and intraparticle diffusion are the rate-limiting processes for PFOS sorption onto the LDHs. The initial pH, background electrolyte concentration, and coexisting ions influenced LDH sorption of PFOS. Both surface adsorption and anion exchange appeared to play a part in PFOS sorption onto the LDHs.

ADVANCES IN POLY- AND PERFLUORALKYL SUBSTANCES (PFAS) ANALYTICAL TECHNIQUES: IMPLICATIONS FOR CONCEPTUAL SITE MODELS

Horneman, A., S. Burnell, J. Burdick, E. Houtz, M. Ahmad, and I. Ross.
Maine Sustainability & Water Conference, 30 March 2017, 21 slides, 2017

Per- and polyfluoroalkyl substances (PFASs), including PFOS and PFOA, are commonly elevated in soil and groundwater at sites with industrial PFAS applications or past use of fire-fighting foams. The products contain a complex mix of fluorinated components that include perfluorinated compounds, where all carbons are saturated with F atoms, and polyfluorinated compounds, where some carbons have hydrogen bonds. The polyfluorinated compounds, termed precursors, are transformed in the environment to form perfluorinated compounds that are extremely persistent and not susceptible to further transformation. Although the precursors are not accounted for by U.S. EPA Method 537, precursors represent a "hidden" mass that should be considered in fate and transport assessments and conceptual site models, especially given that many PFASs are anionic and are not retarded significantly in the subsurface, whereas some precursors are cationic and bind to soils via ion exchange mechanisms and represent a less mobile source mass. Three new analytical methods have been developed to quantify the total concentration of precursors and PFAS in water and soil samples: the total oxidizable precursor (TOP) method; particle-induced gamma emission (PIGE) spectroscopy; and adsorbed organic fluorine (AOF). https://umaine.edu/mitchellcenter/resource/allan-horneman-mswc-2017/

IN SITU CONTAINMENT OF PFOA/PFOS USING COLLOIDAL ACTIVATED CARBON

Thoreson, K. and M. Pham.
Groundwater Solutions: Innovating to Address Emerging Issues for Groundwater Resources, 8-9 August 2017, Arlington, VA. Presentation 11538, 2017

Lab studies were conducted to measure the adsorption isotherms for PFOA and PFOS with a distributable form of colloidal activated carbon. The isotherm data then were used in an adapted version of the BioChlor model to estimate the expected adsorption longevity that a barrier of the colloidal carbon can provide for the contaminants, considering the flux and the concentration. Additionally, a 16-foot sand column experiment was conducted to determine the ability of the colloidal activated carbon to flow and deposit in an aquifer. The measured PFOA and PFOS isotherms were fit to the Freundlich equation, and the isotherm parameters were determined. The isotherm measurements included a demonstration that a dose of the colloidal activated carbon could reduce 100 mg/L of PFOA and PFOS below the 2016 EPA health advisory limits of 0.07 mg/L. Use of the isotherm parameters within the BioChlor model showed that a 50 mg/L plume of either PFOS or PFOA traveling with a velocity of 120 ft/yr could be contained and meet EPA limits with a single barrier of the colloidal activated carbon for up to 8 years. While this timeframe would depend on other water components, such as total organic carbon and the presence of additional contaminants, containment duration might be increased with multiple barriers or a higher dose of the colloidal carbon. *Video (23.55 minutes) at* https://www.youtube.com/watch?v=GAUQv9_FdxM.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS): SAMPLING STUDIES AND METHODS DEVELOPMENT FOR WATER AND OTHER ENVIRONMENTAL MEDIA: TECHNICAL BRIEF

U.S. Environmental Protection Agency. EPA 600-F-17-022, 2 pp, 2017

As of March 2017, no standard EPA methods have been developed for analyzing PFAS in groundwater, surface water, wastewater, or solids. Some U.S. laboratories are using modified methods for non-drinking water samples based on EPA Method 537. These modified methods have no consistent sample collection guidelines and have been neither validated nor systematically assessed for data quality. To provide validated methods for sample types other than drinking water to fill this sampling and analytical gap, EPA formed a cross-Agency method development and validation workgroup. The workgroup will develop analytical methods for quantifying 24 PFAS analytes using a phased approach. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100SB2J.txt

General News

ENHANCED ANAEROBIC OXIDATIVE BIOREMEDIATION

Chapter 14 in *How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers*. EPA 510-B-17-003, 79 pp, 2017

The addition of Chapter 14 is the first update to the guide since the updates published in 2004. This chapter provides the basic information needed to evaluate a corrective action plan (CAP) that proposes the use of enhanced anaerobic oxidative bioremediation (EAOB) to treat petroleum hydrocarbons contamination. The evaluation process is divided into four steps accompanied by a checklist to evaluate the completeness of the EAOB CAP and focus attention on areas where additional information might be needed.
https://www.epa.gov/sites/production/files/2016-11/documents/tum-ch14-rev.pdf *All the sections of the UST CAP review manual are available at* https://www.epa.gov/ust/how-evaluate-alternative-cleanup-technologies-underground-storage-tank-sites-guide-corrective.

HORIZONTAL REMEDIATION WELLS

Appendix A in *How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers*. EPA 510-B-17-003, 47 pp, 2017

Horizontal directional drilling (HDD) can be used to install wells at environmental cleanup sites; these are known as horizontal remediation wells (HRWs) or horizontal environmental wells. HDD uses a specialized drill rig and drill-head locating equipment to create a curved borehole along a pre-determined borepath, producing either a surface-to-surface well or a blind well. HRWs are able to access locations beneath surface obstructions and to place long well screens in contact with the contaminated area. The wells can be thousands of feet long, with hundreds of feet of well screen. The potential for HRWs to complement a site remedy is described with reference to air sparging and soil vapor extraction, hot air or steam injection, bioremediation, chemical injection, LNAPL removal, plume containment, injection of treated water, and sampling. This appendix also provides a detailed overview of equipment and procedures for drilling a horizontal remediation well. https://www.epa.gov/sites/production/files/2017-10/documents/tums-app-a-oct2017.pdf

PFAS: PER- AND POLYFLUOROALKYL SUBSTANCES

Interstate Technology and Regulatory Council (ITRC), 2017

The ITRC has released three technical PFAS fact sheets: (1) History and Use (8 pages); (2) Regulations, Guidance, and Advisories (6 pages plus 2 Excel files); and (3) Naming Conventions and Physical and Chemical Properties (15 pages). The PFAS Technical Team has developed easily understood information about the whole spectrum of PFAS issues. The fact sheets also provide an extensive reference list if readers want additional details. The fact sheets are living documents and will be updated as more technical and regulatory information becomes available. Publication of three additional fact sheets is anticipated in December 2017. The PFAS team is also working on an in-depth guidance document to provide a greater understanding of the technical and regulatory aspects of PFAS as well as a fact sheet focused on aqueous film-forming foams (AFFF). The fact sheets are currently being translated into Spanish.
http://pfas-1.itrcweb.org/fact-sheets/

SERDP AND ESTCP WORKSHOP ON RESEARCH AND DEMONSTRATION NEEDS FOR MANAGEMENT OF AFFF-IMPACTED SITES

Stroo, H., A. Leeson, R. Deeb, C. Higgins, M. Mills, C. Patton, R. Porter, D. Sedlak, M. Sepulveda, et al.
SERDP-ESTCP, 43 pp, 2017

To provide strategic guidance for future research and demonstrations on management and remediation of aqueous film-forming foam (AFFF) sites, SERDP and ESTCP conducted a workshop on May 2-3, 2017, in Washington, D.C. The objectives were to (1) review the current state of the science regarding sources of per- and polyfluoroalkyl substances (PFASs) contamination, particularly AFFF, (2) evaluate currently available and developing technologies for characterization and remediation of AFFF sites, and (3) identify research and demonstration needs to improve remediation performance and efficiency, and ultimately reduce the cost of managing AFFF sites. Research needs identified during the workshop are described in Section 3.0, and demonstration and technology transfer needs are described in Sections 4.0 and 5.0, respectively. The broad needs categories are fate and transport properties, ecological risk characterization, treatment, and sampling and analytical procedures. https://www.serdp-estcp.org/content/download/45585/425201/file/PFAS%20Workshop%20Report%20Final%20September%202017.pdf

ADVANCE HYDROLOGICAL STUDIES UTILIZING OPEN ACCESS INTERNET DATABASES

Sun, K. and K.W. Sun.
Hydrological Processes 31:250-252(2017)

This paper introduces three web-based databases relating to hydrological and water resources studies in the United States with the intention of promoting public awareness of their existence. These open-access databases are the products of efforts taken by federal and state governments to make government-owned data more accessible to the general public. The first is NOAA's National Centers for Environmental Information, next is the USGS National Water Information System, and the last is GeoTracker, the data management system of the State Water Resources Control Board of California. All three databases have existed for some years but remain relatively unknown. http://onlinelibrary.wiley.com/doi/10.1002/hyp.10997/pdf

GROUNDWATER REMEDIATION: A PRACTICAL GUIDE FOR ENVIRONMENTAL ENGINEERS AND SCIENTISTS

Cheremisinoff, N.P. (ed.).
Wiley, New York. Print ISBN: 9781119407577, 400 pp, 2017

The volume introduces its topic with a chapter that describes the process of conducting investigations of groundwater quality. Each subsequent chapter reports the industrial applications, chemistry, behavior, and applicable remedial technologies for a particular contaminant or contaminant group: the family of DNAPLs, hydrocarbons, 1,4-dioxane, perfluorinated compounds, chlorinated solvents, mineral ions and natural groundwater contaminants, and heavy metals and mixed media. Specific treatment technologies that are applicable to the chemical contaminants where they are initially discussed are cross-referenced to other chemical classes or contaminants for which they are effective. Cost guidance is given to assist in developing preliminary estimates for capital equipment and O&M costs as well as for screening the treatment strategies.

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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