Technology Innovation News Survey

Entries for July 1-15, 2016

Market/Commercialization Information

NAVAJO NATION AREA URANIUM MINES: RESPONSE, ASSESSMENT AND EVALUATION SERVICES
U.S. Environmental Protection Agency, Office of Acquisition Management, Region IX.
Federal Business Opportunities, FBO-5377, Solicitation SOL-R9-16-00002, 2016

U.S. EPA intends to issue a solicitation for a competitive acquisition on or about August 31, 2016, via FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-R9-16-00002&agency=EPA [Note: It might be necessary to copy and paste the URL into your browser for direct access.]. FedConnect will be the sole repository for all information related to the Navajo Nation AUM solicitation. The procurement will provide contractor support for scientific/technical services to assist EPA Regions 6 and 9 on and around the Navajo Nation with assessment activities for time-critical and non-time-critical actions as mandated under CERCLA. The anticipated solicitation will be procured using full and open competition for a single contract award with a partial small business set-aside for cultural resources. The contract will be a fixed-rate IDIQ contract with a 2-year base period and two 18-month option periods at an anticipated total capacity of $85M. Two preproposal conferences are tentatively scheduled for the week of September 12.

ENVIRONMENTAL REMEDIATION SERVICES [U.S. NAVY]
Naval Facilities Engineering Command, NAVFAC Southwest, Environmental Contract Core.
Federal Business Opportunities, FBO-5377Solicitation N6247316R8013, 2016

NAVFAC Southwest is seeking capabilities statements from qualified sources with current relevant qualifications, experience, personnel, and capability to perform, under contract, all management, labor, travel, transportation, equipment, material, and supervision necessary for environmental remediation and other services at various locations in Alaska, Arizona, California, Hawaii, New Mexico, Nevada, Oregon, Utah, Colorado, Washington, and U.S. Trust Territories (i.e., Puerto Rico and Guam). Work is anticipated to be accomplished under Task Orders written against an IDIQ Environmental Multiple-Award Contract. The estimated task order range is $300,000 to $10M, with an estimated aggregate value of all contract task orders of about $240M. Award of Task Orders will be on a firm-fixed-price basis. The proposed contract will be for a one-year base period and four one-year options. Submit capabilities statements via email by 2:00 PM PT on September 1, 2016. https://www.fbo.gov/spg/DON/NAVFAC/N68211A6A/N6247316R8013/listing.html

AFICA ENVIRONMENTAL SERVICES 2017
Department of the Air Force, AFICA--CONUS.
Federal Business Opportunities, FBO-5376, Solicitation FA8903-17-R-0001, 2016

This request for information is issued for the purpose of developing a viable solicitation that will best communicate the Government's future requirements to industry. The 772d Enterprise Sourcing Squadron/Environmental Services Contracting at Joint Base San Antonio, Lackland, Texas, is planning a future procurement to address environmental needs at Air Force installation locations within the continental United States. The environmental services encompass the full range of methods, technologies, and supporting activities necessary to conduct environmental restoration/remediation, operations, and services efforts at Air Force installations and other locations in accordance with technical and regulatory requirements. If/when the RFP is issued, the Government plans to award multiple IDIQ contracts utilizing a competitive 100% small business set-aside procurement. Interested firms are invited to submit responses to the questionnaire attached to the FBO notice by 10:00 AM CT on September 12, 2016https://www.fbo.gov/notices/ff9ad551b3003737b8a9890e1ff2f381d

ENVIRONMENTAL SERVICES: MULTIPLE AWARD TASK ORDER CONTRACT (MATOC)
U.S. Army Corps of Engineers, USACE District, Nashville.
Federal Business Opportunities, FBO-5373, Solicitation W912P5-16-B-0012, 2016

The Nashville District U.S. Army Corps of Engineers intends to issue an invitation for bid for environmental services around or about August 17, 2016, with bids due about 30 calendar days thereafter. The purpose of the acquisition is to provide a full range of non-AE environmental services to the Nashville District of the U.S. Army Corps of Engineers and Fort Campbell, Kentucky. The environmental services will fall generally under the categories of environmental compliance, environmental restoration, environmental conservation, and asbestos abatement. Up to four 5-year contracts may be awarded. The total IDIQ MATOC pool capacity shall not exceed $10M. A preproposal site visit is tentatively planned for 9:00 AM CT, August 31, 2016, at Old Hickory Dam Power Plant, 10 Power Plant Road, Hendersonville, TN 37075-3465. https://www.fbo.gov/spg/USA/COE/DACA62/W912P5-16-B-0012/listing.html

PERFORM GROUNDWATER MONITORING AT SS005 AT AIR FORCE PLANT 59, NEW YORK
Department of the Air Force, Air Force Plant 59, Vestal, NY.
Federal Business Opportunities, FBO-5369, Solicitation FA8903-16-Q-0011, 2016

This requirement is issued as a small business set-aside. The 772 ESS/PKS intends to award a single firm-fixed-price contract for groundwater monitoring at SS005 under NAICS code 562910 (size standard 750 employees). Over the 12-month period of performance, the contractor shall conduct annual groundwater monitoring for 1,4-dioxane and VOCs at 11 monitoring wells at Site SS005 in support of the long-term monitoring effort. Groundwater is migrating toward the Johnson City well field. Due to demolition activities in the area, locations of wells may be altered from their current location. Quotations must be received by 10:00 AM CT on September 2, 2016.
https://www.fbo.gov/notices/ff8e8ac20bfd55533bf6e450e2644749

Cleanup News

BIOREMEDIATION OF SOURCE ZONE AND MIGRATED PLUMES
Blomgren, N., P.K. Juriasingani, and J.R. Woertz.
Third International Symposium on Bioremediation and Sustainable Remediation Technologies, 18-21 May 2015, Miami, Florida. Poster abstract, 2015

The former Unocal distribution facility in Wichita, Kansas, blended and packaged bulk chemicals for industrial customers. During historical operations, PCE was released to the site groundwater. Remedial technologies implemented at the site since 1989 to treat chlorinated VOCs in the groundwater include soil vapor extraction, pump and treat, excavation, bioremediation, and phytoremediation. Despite these measures, contaminated groundwater has migrated a quarter mile from the primary source area to adjacent properties. During annual groundwater monitoring conducted in 2013, PCE and its daughter products were present at concentrations over 10,000 µg/L. Monitoring data indicated that reductive dechlorination was ongoing, but little to no biodegradation was apparent in many off-site portions of the plume. A phased treatment approach is being implemented at the site. Based on results from a 2013 Bio-Trap® treatability study, EHC® and EHC® Liquid were selected to stimulate both biodegradation and chemical reduction. Baseline monitoring was conducted in June 2014, and the first round of injections began in July 2014. A total of ~29,500 lb EHC (as 30% slurry) and 1,850 gal EHC Liquid (diluted to make a 5% solution) were injected among six barriers and one injection grid through 165 injection points over a one-month period. Performance monitoring results (Nov 2014 and Mar 2015) indicate the amendments are conditioning the aquifer to promote reductive dechlorination.**Additional information:** *Interim Measure Injection Completion Report, Former Unocal Chemical Distribution Facility* (2015) at http://kensas.kdhe.state.ks.us/herisl/getDocument.kdhe_her?documentId=2000000467_0VDLEC9B3W0FC
and *Interim Measure Performance Monitoring Report, March 2015 Event* at http://kensas.kdhe.state.ks.us/herisl/getDocument.kdhe_her?documentId=2000000DGX_0VZFEJEBN550I

BASIS OF DESIGN REPORT/FINAL (100%) DESIGN SUBMITTAL FOR THE FINAL GROUNDWATER REMEDY, PG&E TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA
California Department of Toxic Substances Control, 456 pp, 2015

The remedy for historical Cr(VI) contamination in the site groundwater consists of five main elements: (1) an in situ reactive zone (IRZ) with a line of wells along the length of National Trails Highway where a carbon source (e.g., ethanol) will be added to stimulate indigenous bacteria; (2) extraction wells near the Colorado River to extract water for pumping to the western edge of the plume for more nutrient addition; (3) in situ flushing via freshwater injection wells to the west and outside of the plume to accelerate groundwater flow toward the IRZ; (4) restrictions on groundwater use; and (5) continued monitoring of the treatment process and the groundwater plume.
http://dtsc-topock.com/sites/default/files/1_Final%20BOD%20Report_MainText_111815.pdf

Demonstrations / Feasibility Studies

FINAL REPORT FOR SURFACTANT ENHANCED AQUIFER REMEDIATION (SEAR) PILOT TEST
The LA LNAPL Workgroup. Western States Petroleum Association, Torrance, CA. 490 pp, 2015

A SEAR pilot test was conducted at the Tesoro East Hynes Terminal in Long Beach, Calif., in a 50 ft x 75 ft treatment area containing six injection wells, three extraction wells, and eight monitoring wells. A low-concentration surfactant and electrolyte solution was injected in the deepest of three units from April 15 through June 4, 2014. Extraction from the same wells (June 19 through October 20, 2014) was conducted as part of a push-pull test. SEAR technology was unsuccessful at removing LNAPL from the thin, highly heterogeneous sand unit at the Tesoro East Hynes facility. Soils of low hydraulic conductivity (40% lower than the design value based on injection well slug tests) limited effective injection of the surfactant solution as demonstrated by the very low injection flow rates observed. http://www.gsi-net.com/en/publications/la-lnapl-recoverability-study/source-report-c-surfactant.html

IN SITU AND EX SITU BIOLOGICAL TREATMENT OF NDMA
Hatzinger, P.
Emerging Contaminants Summit, March 1-2, 2016, Westminster, Colorado. 27 slides, 2016

As a drinking water contaminant, NDMA requires treatment to low ppt (ng/L) concentrations. A pilot-scale fluidized bed reactor (FBR) containing *Rhodococcus ruber* ENV425 was installed at the White Sands Test Facility in Las Cruces, N.M., to treat NDMA-contaminated groundwater. With influent NDMA concentrations of ~1 µg/L, the propane-fed FBR achieved effluent concentrations of 95%. **Slides:** http://www.contaminantssummit.com/images/presentations/8_PaulHatzinger.pdf

EVALUATION OF BIOSTIMULATION AND BIOAUGMENTATION TO STIMULATE HEXAHYDRO-1,3,5-TRINITRO-1,3,5,-TRIAZINE DEGRADATION IN AN AEROBIC GROUNDWATER AQUIFER
Michalsen, M.M., A.S. King, R.A. Rule, M.E. Fuller, P.B. Hatzinger, C.W. Condee, F.H. Crocker, et al.
Environmental Science & Technology, Vol 50 No 14, 7625-7632, 2016

Researchers compared in situ RDX degradation rates following bioaugmentation with *Gordonia* sp. strain KTR9 to rates under biostimulation conditions in an RDX-contaminated aquifer in Umatilla, Oregon. Bioaugmentation was achieved by injecting site groundwater (6,000 L) amended with KTR9 cells (108 cells/mL) and low carbon substrate concentrations (15 mM fructose) carbon substrate concentrations in an effort to stimulate aerobic or anaerobic microbial activity, respectively. RDX degradation rates for each treatment were measured using single-well push-pull tests. Results suggest that bioaugmentation with KTR9 is a feasible strategy for in situ biodegradation of RDX and, at this site, is capable of achieving RDX concentration reductions comparable to those obtained by high carbon biostimulation while requiring ~97% less fructose.

Research

GRAPHENE-BASED MICROBOTS FOR TOXIC HEAVY METAL REMOVAL AND RECOVERY FROM WATER
Vilela, D., J. Parmar, Y. Zeng, Y. Zhao, and S. Sanchez.
NanoLetters, Vol 16 No 4, 2860-2866, 2016

Graphene oxide-based microbots (GOx-microbots) have been developed as active self-propelled systems for the capture, transfer, and removal of a heavy metal (in this case, lead) and its subsequent recovery for recycling purposes. The microbot structure consists of nanosized multilayers of graphene oxide, nickel, and platinum, which provide different functionalities. The outer layer of graphene oxide captures lead on the surface; the inner layer of platinum functions as the engine, decomposing hydrogen peroxide fuel for self-propulsion; and the middle layer of nickel enables external magnetic control of the microbots. Mobile GOx-microbots remove lead 10 times more efficiently than nonmotile GOx-microbots, cleaning water from 1,000 ppb down to below 50 ppb in 60 min. The microbots can be collected from the water by a magnetic field and then treated in an acidic solution to remove the lead ions, which can be recovered and reused. The microbots also can be reused for further cleanup. *This paper is* ***Open Access*** *at*http://pubs.acs.org/doi/abs/10.1021/acs.nanolett.6b00768

IMPACT OF CLAY-DNAPL INTERACTIONS ON TRANSPORT AND STORAGE OF CHLORINATED SOLVENTS IN LOW PERMEABILITY ZONES
Demond, A., M. Goltz, and J. Huang.
SERDP Project ER-1737, 126 pp, 2015

The objective of this research was to examine clay-DNAPL waste interactions as a contributor to the accumulation of chlorinated compound contamination in subsurface clay lenses and layers. Results showed that contact between DNAPL waste and Na-smectitic clay materials caused a contraction of the clay's basal space, producing cracking, in a time frame on the order of weeks. The hypothesized mechanism is syneresis, involving the sorption of the surfactants from the waste onto the clay surface and the solvation of the surfactants' aggregates. Numerical simulations suggest that even a small amount of cracking, and the time-variable dissolution of the DNAPL stored in the cracks into the surrounding clay matrix, extends the remediation time by decades. https://www.serdp-estcp.org/content/download/39943/383468/file/ER-1737%20Final%20Report_V2%20April%202015.pdf

INTEGRATED FIELD-SCALE, LAB-SCALE, AND MODELING STUDIES FOR IMPROVING OUR ABILITY TO ASSESS THE GROUNDWATER TO INDOOR AIR PATHWAY AT CHLORINATED SOLVENT-IMPACTED GROUNDWATER SITES
Johnson, P.C., C. Holton, Y. Guo, P. Dahlen, H. Luo, K. Gorder, E. Dettenmaier, and R.E. Hinchee.
SERDP Project ER-1686, 248 pp, 2016

This project was conducted primarily at a house overlying a dilute chlorinated hydrocarbon (TCE) groundwater plume. The house was outfitted with sensors and automated systems to facilitate monitoring of indoor air and ambient and building conditions as well as groundwater and soil gas. Monitoring was conducted under both natural and controlled building conditions, and both TCE and radon were quantified in indoor air and soil gas. Sampling was conducted under natural conditions for about 2.5 yr. Two recurring behaviors were observed with the indoor air data. The temporal behavior prevalent in fall, winter, and spring involved time-varying impacts intermixed with sporadic periods of inactivity. In summer, VI had long periods of inactivity combined with sporadic VI impacts. Subsurface concentrations were less temporally variable than indoor air, and the variability increased in moving from the source to indoor air.
https://www.serdp-estcp.org/content/download/39274/382131/file/Final%20Report%20V2%20FR-1686%20July%202016%20FOR%20POSTING.pdf

EXCEPTIONALLY LONG MTBE PLUMES OF THE PAST HAVE GREATLY DIMINISHED
McDade, J.M., J.A. Connor, S.M. Paquette, and J.M. Small.
Groundwater, Vol 53 No 4, 515-524, 2015

Studies published in the late 1990s and early 2000s identified the presence of exceptionally long MTBE plumes (>2,000 ft) in groundwater, cited in technical literature as characteristic of MTBE plumes. To investigate the subsequent behavior and fate of these MTBE plumes over the past decade, reviewers compiled recent groundwater monitoring records for nine historical MTBE groundwater plumes whose lengths formerly ranged from 2,700 ft to 10,500 ft in length. Groundwater monitoring data compiled in this review show that these large MTBE plumes decreased in length over the past decade, with five of the nine plumes exhibiting decreases of 75% or more compared to their historical maximum lengths. MTBE

concentrations within these plumes declined by 93-100%, with two of the nine sites showing such significant decreases (98% and 99%) that the regulatory authority found the sites require no further action. *This paper is* ***Open Access*** *at* http://onlinelibrary.wiley.com/doi/10.1111/gwat.12322/pdf

EFFECTS OF PH ON THE KINETICS OF METHYL TERTIARY BUTYL ETHER DEGRADATION BY OXIDATION PROCESS (H_2O_2/NANO ZERO-VALENT IRON/ULTRASONIC)
Samaei, M.R., H. Maleknia, and A. Azhdarpoor.
Jundishapur Journal of Health Sciences, Vol 7 No 3, 40-45, 2015

In advanced oxidation processes, pH can have a significant effect on the removal efficiency of organic compounds. This study examined the effect of pH changes on the removal efficiency and kinetics of MTBE concentration in an aquatic environment. An optimal pH of 3.5 in the H_2O_2/NZVI/ ultrasonic oxidation process eliminated about 89.56% of a high MTBE concentration. Adjusting pH in this range can enhance the rate and efficiency of MTBE oxidation when using the H_2O_2/NZVI/ultrasonic method. http://jihsci.com/47337.pdf

APPLICATION OF FIRST ORDER KINETICS TO CHARACTERIZE MTBE NATURAL ATTENUATION IN GROUNDWATER
Metcalf, M.J., G.J. Stevens, and G.A. Robbins.
Journal of Contaminant Hydrology, Vol 187, 47-54, 2016

Although MTBE dissipates by natural attenuation (NA), it continues to be present in groundwater long after its use was banned. This study estimated the rate of NA in groundwater following the Connecticut ban (2004) by evaluating the MTBE concentration 2 yr before and 2 yr after the ban at 83 monitoring wells from 22 retail gasoline stations where MTBE contamination was observed. Sites chosen for this study had not undergone active remediation. Results indicate that MTBE has dissipated in the natural environment at more than 80% of the sites and at ~82% of the individual monitoring wells. In general, dissipation approximated first-order kinetics. Dissipation half-lives, calculated using concentration data from the 2-yr period after the ban, ranged from ~3 weeks to just over 7 yr, with an average half-life of 7.3 months with little variability in estimates for different site characteristics. The accuracy of first-order estimates to predict further MTBE dissipation were tested by comparing predicted concentrations with those observed after the 1-yr post-ban period; the predicted concentrations closely match the observed concentrations, which supports the use of first-order kinetics for predictions of this nature.

AN EXTRACTIVE MEMBRANE BIOFILM REACTOR AS ALTERNATIVE TECHNOLOGY FOR THE TREATMENT OF METHYL TERT-BUTYL ETHER CONTAMINATED WATER
Guisado, I.M., J. Purswani, J. Gonzalez-Lopez, and C. Pozo.
Biotechnology Progress [Epub ahead of print] 2016

Extractive membrane biofilm reactor (EMBFR) technology offers productive solutions for the removal of volatile and semi-volatile compounds. EMBFR technology is based on the use of extractive semipermeable membranes through which contaminants migrate to the biological compartment in which microorganisms with pollutant biotransformation and/or mineralization capacities can grow, forming an active biofilm on the membrane surface. This study assessed the use of three bacterial strains (*Paenibacillus* sp. SH7 CECT 8558, *Agrobacterium* sp. MS2 CECT 8557, and *Rhodococcus ruber* EE6 CECT 8612) as inocula in a lab-scale EMBFR running for 28 days at three different hydraulic retention times (1 h, 6 h, and 12 h) under aerobic conditions to eliminate MTBE from water samples. Results from MTBE degradation, biofilm formation, and toxicity analysis indicated that bacterial strains MS2 and EE6 were the most effective options as selective inocula, although further research is needed, particularly with regard to their possible use in a mixed culture. *See additional information in Chapter 4 of I.M. Guisado's dissertation at* http://digibug.ugr.es/bitstream/10481/40695/1/25469459.pdf.

ACCELERATED CATALYTIC FENTON REACTION WITH TRACES OF IRON: AN FE-PD-MULTICATALYSIS APPROACH
Georgi, A., M. Velasco Polo, K. Crincoli, K. Mackenzie, and F.D. Kopinke.
Environmental Science & Technology, Vol 50 No 11, 5882-5891, 2016

An accelerated catalytic Fenton (ACF) reaction was developed based upon a multicatalysis approach, facilitating efficient contaminant oxidation at trace levels of dissolved iron. Beside the Fe(II)/H_2O_2 catalyst/oxidant pair for production of OH-radicals, the ACF system contains Pd/H_2 as catalyst/reductant pair for fast reduction of Fe(III) back to Fe(II), which accelerates the Fenton cycle and leads to faster contaminant degradation; the concentration of the dissolved iron catalyst thereby can be reduced to trace levels (1 mg/L) below common discharge limits, thus eliminating the need for iron sludge removal, which is one of the major drawbacks of conventional Fenton processes. ACF provides fast degradation of the model contaminant MTBE (C0 = 0.17 mM) at a half-life of 11 min with 1 mg/L dissolved iron, 500 mg/L H_2O_2, 5 mg/L Pd (as suspended Pd/Al_2O_3 catalyst) and 0.1 MPa H_2, pH 3. The heterogeneous Pd/Al_2O_3 catalyst was reused within six cycles without significant loss in activity.

THE FATE OF MTBE DURING FENTON-LIKE TREATMENTS THROUGH LABORATORY SCALE COLUMN TESTS
Piscitelli, D., D. Zingaretti, I. Verginelli, R. Gavasci, and R. Baciocchi.
Journal of Contaminant Hydrology, Vol 183, 99-108, 2015

The effectiveness of a Fenton-like in situ chemical oxidation process for MTBE treatment was proven in soil column tests performed at operating conditions (i.e., oxidant and contaminant concentration and flow rates) resembling those typically used for in situ applications. No MTBE by-products were detected in any of the tested conditions, thus suggesting that the tert-butyl group of MTBE was completely degraded. A mass balance based on the CO_2 produced was used as evidence that most of the MTBE removed was actually mineralized. Preconditioning of soil with a chelating agent (EDTA) significantly enhanced MTBE oxidation.

REMOVAL OF MTBE FROM A CLAY SOIL USING ELECTROKINETIC TECHNIQUE
Estabragh, A.R., A.T. Bordbar, F. Ghaziani, and A.A. Javadi.
Environmental Technology, Vol 37 No 14, 1745-1756, 2016

Tests were carried out on MTBE-contaminated soil with distilled water and EDTA solution as electrolyte in an electro-osmotic apparatus at different applied gradients of voltage and time. The values of pH at anode and cathode reservoirs and also the discharge from cathode were measured during each test. Soil samples were extracted from the middle of the soil at different distances from the anode at the end of each test, and contaminant removal was measured by gas chromatography. Results indicate that with EDTA as electrolyte, the highest efficiency for removal of MTBE is achieved with 2.0 V/cm gradient over a period of 14 days. In addition, EDTA causes pH values to increase and decrease in the cathode and anode reservoirs, respectively. It also decreases the effluent and electro-osmotic permeability in comparison with distilled water.

LAB-SCALE TESTS AND NUMERICAL SIMULATIONS FOR IN SITU TREATMENT OF POLLUTED GROUNDWATER
Careghini, A., S. Saponaro, E. Sezenna, M. Daghio, A. Franzetti, I. Gandolfi, and G. Bestetti.
Journal of Hazardous Materials, Vol 287, 162-170, 2015

Lab-scale batch and column tests and mathematical modeling were performed to study the feasibility of a biobarrier, i.e., an in situ permeable biological barrier with or without inoculation, for the remediation of MTBE and other gasoline-derived pollutants (e.g., BTEX) in groundwater and to estimate kinetic constants. Results showed simultaneous biodegradation of MTBE and BTEX, with similar removals in inoculated and uninoculated systems. The lab test results supported an improved mathematical model and the design of a full-scale biobarrier at a gasoline-contaminated site.

ENHANCEMENT AND MONITORING OF POLLUTANT REMOVAL IN A CONSTRUCTED WETLAND BY MICROBIAL ELECTROCHEMICAL TECHNOLOGY
Wei, M., J. Rakoczy, C. Vogt, F. Harnisch, R. Schumann, and H.H. Richnow.
Bioresource Technology, Vol 196, 490-499, 2015

A bench-scale constructed wetland combined with microbial electrochemical technology (MET-CW) was run for 400 days to address groundwater contaminated with benzene, MTBE, and ammonium. Four vertically stacked anode modules were embedded into a sand bed and connected with a stainless steel cathode placed in an open water pond. Significantly more benzene and MTBE were removed in the zone of influence of the anode modules in the MET-CW compared to the control CW without MET in the first 150 operation days. Benzene was identified as primary electron donor at the anode. Benzene removal and current densities were linearly correlated, implying the potential of the system for electrochemically monitoring benzene biodegradation. Compound-specific isotope analysis indicated that benzene was initially activated by monohydroxylation, forming intermediates that subsequently were oxidized accompanied by extracellular electron transfer, leading to production of current.

TRANSPARENT AQUABEADS TO MODEL LNAPL GANGLIA MIGRATION THROUGH SURFACTANT FLUSHING
Tabe, K.
Geotechnical Testing Journal, Vol 38 No 5, 787-804, 2015

Transparent synthetic soil can be used to visualize flow problems in the subsurface environment by an optical system and digital image processing. A water-based transparent material called Aquabeads has similar macroscopic hydraulic characteristics to natural soils and compatibility with water- and oil-selected surfactants/alcohols used for simulating multiphase flow. This transparent material can be used to visualize 2D flow and soil-contamination problems. Surfactant-flushing tests were conducted to model LNAPL ganglia transport through a multilayer Aquabeads model. This model visualized the concentration profile and upward migration of motor oil ganglia during surfactant flushing, thus indicating the feasibility of surfactant flushing on multilayer soils using the Aquabeads model.

LABORATORY-SCALE DEMONSTRATION USING DILUTE AMMONIA GAS-INDUCED ALKALINE HYDROLYSIS OF SOIL CONTAMINANTS (CHLORINATED PROPANES AND EXPLOSIVES)
Medina, V.F., S.A. Waisner, C.G. Coyle, C.S. Griggs, and M.C. Maxwell.
ERDC/EL TR-16-10, 71 pp, 2016

Many environmental contaminants are amenable to degradation by alkaline hydrolysis. This project explored the use of ammonia gas to raise soil pH in order to stimulate alkaline hydrolysis. When ammonia gas dissolves in water, it forms ammonium ion, which consumes hydrogen ions, thereby increasing pH. This study established that 5% ammonia in air can increase soil pH from 7.5 to 10.3. Batch studies indicate that this pH increase can stimulate alkaline hydrolysis reactions, resulting in the degradation of chlorinated propanes (trichloropropane, dichloropropane) and explosives (TNT, nitrobenzene, and RDX). A column study focused on evaluating the penetration of ammonia and subsequent pH change showed pH penetration of 20 cm in a 2.5 cm diameter column over 7 days, with a flow of 5% ammonia gas at 1 sccm. Chlorinated propane concentrations were reduced from levels of as high as 2400 µg/kg to as low as non-detect. A small amount of these were captured in the column off-gas. The study also explored whether ammonia gas exposure could stimulate metabolic activity of ammonia-oxidizing microorganisms. A 283-day experiment showed significant increases in soil nitrogen concentrations no measureable increase in ammonia-oxidizing microorganisms. http://acwc.sdp.sirsi.net/client/en_US/search/asset/1050487

FLUOROCHEMICALS IN AFFF CONTAMINATED SITES: ENVIRONMENTAL FATE, TOXICITY AND TREATMENT
Liu, J., J. Paquin, and G. Zhong.
2016 RPIC Federal Contaminated Sites (FCS) National Workshop, 25-27 April 2016. 43 slides, 2016

McGill University and its industrial partner Sanexen Environmental Services Inc., along with collaborators that include the governments of Canada and Quebec, received an NSERC Strategic Project Grant in 2016 to conduct a 3-year project on aqueous film-forming foams (AFFFs) in the environment. Previous work at McGill focused on simultaneous removal of petroleum hydrocarbons and perfluorinated alkyl substances (PFAS) co-contaminants from contaminated water. In an instance where about 33,000 L of AFFF was used to fight a fire, water contaminated by petroleum hydrocarbons and AFFF was treated through various physical treatment processes, achieving excellent removal of both petroleum hydrocarbons and PFAS. Whereas removal of petroleum hydrocarbons varied from 97-99.9%, PFAS removal efficiencies varied between 87-91% for the summation of 21 compounds and from 98-99.9% when assessed using a total oxidizable precursors (TOP) assay. The TOP assay was indispensable for quantifying the complex mixture of various PFAS components with unknown structures. A lab-scale system was set up and operated to study PFAS removal mechanisms using different filtration media and water from different sources. Overall, the study has shown promising results for achieving simultaneous removal of petroleum hydrocarbons and PFAS using a cost-effective system. In terms of assessment, a strong linear correlation was observed between levels of TOP with the surface tension of water samples in a wide concentration range. The finding suggests that surface tension can approximate PFAS levels for AFFF-impacted waters and allow quick estimation of PFAS levels in the field. **Slides:** http://www.rpic-ibic.ca/documents/2016_FCS_NW/Presentation/Composes_organofluores_final_en.pdf

DESTRUCTION OF PFOS IN GROUNDWATER: A NEW IN SITU REMEDIATION TECHNOLOGY FOR PER/POLYFLUORINATED ALKYL SUBSTANCES
Ross, I.
Abstracts: American Chemical Society Conference, Philadelphia, August 2016

Recent lab work has demonstrated that activated persulfate can degrade PFOS, and the degradation mechanism is hypothesized to be a combination of oxidation and reduction as defluorination. Decreases in PFOS concentrations were observed only when a specific activation method was employed: the "Smart combined in situ oxidation and Reduction" (ScisoR®) technology. Lab data demonstrated that this technology results in defluorination indicative of PFOS mineralization. A mass balance demonstrated stoichiometric conversion of PFOS to fluoride. ScisoR was used for destruction of numerous PFAS precursors and perfluorinated alkyl acids (e.g., PFOS) in soil and groundwater sampled from an AFFF-impacted site in Scandinavia. Based upon a variety of analytical methods, PFASs were shown to be mineralized using ScisoR, whereas conventional oxidants transformed precursors to perfluorinated alkyl acids.

EFFECTS OF ISCO ON POLY- AND PERFLUOROALKYL COMPOUNDS IN AFFF
Bruton, T.
RemTEC Summit 2016, Poster

Time-course lab experiments were performed using synthetic groundwater containing two AFFF formulations to assess the fate of fluorinated organic compounds in the AFFF during oxidative chemical treatment. The AFFF-containing solutions were amended with Fenton's reagent, activated persulfate, or permanganate. For 3M AFFF, oxidation of PFASs resulted in the production of perfluorinated carboxylic acids. Oxidative treatment of Ansul AFFF by Fenton's reagent or persulfate resulted in production of n:2 fluorotelomer sulfonates, which were transformed subsequently to perfluorinated carboxylates of equal or lesser fluorocarbon chain length. In no case were perfluorinated carboxylates or perfluorinated sulfonates transformed by the chemical treatments. Results show that ISCO treatment of AFFF has the potential to increase concentrations of perfluorinated carboxylates in groundwater.

INVESTIGATION OF IN-SITU CHEMICAL OXIDATION TECHNIQUES FOR AFFF TREATMENT IN SOIL-WATER MICROCOSMS
Bishop, J., J. Hatton, D. Berggren, J. Field, K. Barzen-Hanson, T. Bruton, and W. DiGuiseppi.
Abstracts: American Chemical Society Conference, Philadelphia, August 2016

To test oxidation of an AFFF sample in laboratory soil-water microcosm systems, oxidation was undertaken by low-pH and high-pH catalyzed hydrogen peroxide and alkaline-activated persulfate at varying application doses, resulting in the formation of products with a lower molecular weight and a reduction in the length of the fluorinated tail when compared to the composition of the stock AFFF solution used for testing. These shorter-chained oxidation products seemed to have different sorption characteristics in the soil-water microcosm. Oxidation provided the expected variable levels of treatment based on oxidant used and extent of oxidation.

General News

INTEGRATING PASSIVE SAMPLING METHODS INTO MANAGEMENT OF CONTAMINATED SEDIMENT SITES: A GUIDE FOR DEPARTMENT OF DEFENSE REMEDIAL PROJECT MANAGERS
Thompson, T., C. Menzie, and S.K. Driscoll.
ESTCP Project ER-201216, 62 pp, 2016

This document discusses how to integrate passive sampling methods into the management of contaminated sediment sites, with a focus on the passive sampling devices most commonly used to measure non-polar organic chemicals, such as PCBs and PAHs. https://www.serdp-estcp.org/content/download/39780/382183/file/RPM%20Guide%20on%20the%20Use%20of%20Passive%20Samplers%20ER-201216%20April%202016%20FOR%20POSTING.pdf

SETTING THE STAGE FOR LEVERAGING RESOURCES FOR BROWNFIELDS REVITALIZATION
U.S. EPA, Office of Land and Emergency Management.
EPA 560-K-16-001, 40 pp, 2016

Many communities struggle to find and attract sufficient funding for brownfields redevelopment projects. EPA developed this guide to assist communities in overcoming the challenges of making sound investment decisions to attract additional resources for community revitalization. https://www.epa.gov/sites/production/files/2016-04/documents/final_leveraging_guide_document_4-19-16.pdf

DISENTANGLING PROPERTY VALUE IMPACTS OF ENVIRONMENTAL CONTAMINATION FROM LOCALLY UNDESIRABLE LAND USES: IMPLICATIONS FOR MEASURING POST-CLEANUP STIGMA
Taylor, L.O., D.J. Phaneuf, and X. Liu.
Journal of Urban Economics, Vol 93, 85-98, 2016

An empirical model was developed to consider the influence of uncontaminated commercial properties on home values concurrently with contaminated property influences, identifying stigma effects in a way not possible in past studies. Results indicate that environmental contamination more than doubles the negative influence commercial properties have on neighboring residential home values, but little evidence of stigma effects is found once a contaminated site is remediated. The negative spillover effects associated with remediated contaminated sites are largely indistinguishable from the spillover effects from the presence of commercial properties with no known contamination. *Additional information*: https://cenrep.ncsu.edu/2016/07/14/remediated-brownfield-sites-environmental-and-property-value-benefits/

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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