Technology Innovation News Survey

Entries for November 1-15, 2018

Market/Commercialization Information

SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM (START V)

U.S. Environmental Protection Agency, Office of Acquisition Management, Region VIII, Denver, CO.
Federal Business Opportunities, Solicitation 68HE0819R0001, 2018

This RFI is issued as market research solely for information and planning purposes. U.S. EPA is seeking information from both large and small businesses regarding the DRAFT Statement of Work (SOW) attached to the FedBizOpps notice for EPA's Region 8 START V (NAICS code 541620). The purpose of the START V contract is to provide nationally consistent advisory and assistance services to EPA on-scene coordinators and other federal officials implementing EPA's responsibilities under the national response system. Interested parties are invited to review the Draft SOW and respond to the 17 questions in the body of the FedBizOpps notice, which will help to inform the development of an acquisition strategy. Responses are due by 4:00 PM MT on December 20, 2018. https://www.fbo.gov/spg/EPA/OAM/RTMS-G/68HE0819R0001/listing.html

DOE OFFICE OF ENVIRONMENTAL MANAGEMENT MODIFICATION TO END STATE CONTRACTING MODEL

U.S. Department of Energy, Office of Environmental Management (EM), Washington, DC.
Federal Business Opportunities, Solicitation Special_Notice_ESCM_12-12-18, 2018

DOE's Office of Environmental Management (EM) recently released two end-state-oriented Draft RFPs to seek industry input (i.e., the Central Plateau Cleanup Contract acquisition, Richland, WA, and the Nevada Environmental Program Services acquisition). As a result of the comments received from interested parties (industry, community, and stakeholders), EM has decided to move forward with the End State Contracting Model (ESCM), utilizing a single-award IDIQ contract for each acquisition with the ability to issue both cost-reimbursable and firm-fixed-price Task Orders. DOE invites all interested parties to review the ESCM and to submit comments in the Microsoft Word format provided on the EM procurement website at https://www.emchc.doe.gov/SEB/em_escm/News%20and%20Announcements.php. Comments are due by 5:00 PM ET on December 21, 2018.
https://www.fbo.gov/spg/DOE/PAM/HQ/Special_Notice_ESCM_12-12-18/listing.html

NAVAJO AUM - ABANDONED MINES RESPONSE AND CONSTRUCTION SERVICES

U.S. Environmental Protection Agency, Office of Acquisition Management, Region IX, San Francisco, CA.
Federal Business Opportunities, Solicitation 68HE0918R0014, 2018

This notice constitutes market research issued solely for information purposes. EPA is requesting comments on a DRAFT RFP for the Navajo Area Abandoned Mines Response and Construction Services (AMRCS). The anticipated release date of the final RFP is spring 2018. The Draft RFP is posted only on FedConnect at https://www.fedconnect.net/FedConnect/?doc=68HE0918R0014&agency=EPA [Note: It might be necessary to copy and paste the URL into your browser for direct access]. The purpose of the Navajo Area AMRCS contract is to provide cleanup, response, and construction services to U.S. EPA, primarily at former uranium mining-related sites on or within the Navajo Nation (within EPA Region 9 in Arizona and New Mexico) and within the Grants Mining District (located in EPA Region 6, New Mexico). Total small business set-asides are anticipated for multiple-award IDIQ contracts, contract duration of one base year and four one-year options (not to exceed 66 months), and estimated total magnitude of $220M for all contracts combined. Comments are due via FedConnect by 2:30 PM PT on January 4, 2019. https://www.fbo.gov/spg/EPA/OAM/RegIX/68HE0918R0014/listing.html

SMALL BUSINESS VENDOR DAY HOSTED BY THE FAA SMALL BUSINESS OFFICE

Federal Aviation Administration, Greater Southwest Region, Texas.
Federal Business Opportunities, Solicitation 32022, 2018

The FAA is hosting a Vendor Day at the FAA Southwest Regional Office, 10101 Hillwood Parkway, Fort Worth, Texas 76177-1st Floor Conference Center, Rooms 10A-E, on Wednesday, January 23, 2019, from 9:00 AM to 12:00 Noon. The purpose of the meeting is to learn about FAA's requirements and to assist in identifying qualified small business capabilities to support the FAA mission. Participating agencies include DOT, SBA, U.S. Army Corps of Engineers, U.S. Air Force, Cross Timbers Procurement Technical Assistance Center, and San Antonio International Airport. Attendance is limited to the first 50 small business firms (2 representatives per firm max) that register by 4:00 PM CT on Friday, January 18, 2019, at https://www.eventbrite.com/e/small-business-vendor-day-hosted-by-federal-aviation-administration-faa-tickets-52606540579. There is no cost to attend, but pre-registration is required. Only small businesses registered in the System for Award Management under one of the NAICS codes (541620, 562910, and others) listed in the FedBizOpps notice are eligible to attend.
https://www.fbo.gov/spg/DOT/FAA/SWR/32022/listing.html

FY19 GUIDELINES FOR BROWNFIELDS PROGRAM GRANTS

U.S. Environmental Protection Agency Funding Opportunities, 2018

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofit organizations to prevent, inventory, assess, clean up, and reuse brownfield sites. The closing date for applications for all of these opportunities is January 31, 2019.

- **EPA-OLEM-OBLR-18-07: FY19 Guidelines for Brownfields Cleanup Grants**
  About 40 awards are anticipated out of an estimated program funding of $11M.
  Grant application: http://www.grants.gov/web/grants/view-opportunity.html?oppId=310661
  Guidelines: http://www.epa.gov/grants/fy19-guidelines-brownfields-cleanup-grants
- **EPA-OLEM-OBLR-18-06: FY19 Guidelines for Brownfields Assessment Grants**
  About 114 awards are anticipated out of an estimated program funding of $37M.
  Grant application: http://www.grants.gov/web/grants/view-opportunity.html?oppId=310660
  Guidelines: http://www.epa.gov/grants/fy19-guidelines-brownfields-assessment-grants
- **EPA-OLEM-OBLR-18-08: FY19 Guidelines for Brownfields Multipurpose (MP) Grants**
  About 10 awards are anticipated out of an estimated total program funding of $8M.
  Grant application: http://www.grants.gov/web/grants/view-opportunity.html?oppId=310676
  Guidelines: http://www.epa.gov/grants/fy19-guidelines-brownfields-multipurpose-grants

ENVIRONMENTAL SERVICES AT BEALE AIR FORCE BASE

General Services Administration, Network Services Division (7QFA), Fort Worth, Texas.
Federal Business Opportunities, Solicitation ID07180034, 2018

When issued, this solicitation will be 100% set-aside for small businesses, size standard $15M. Contractor shall support the environmental quality programs on Beale AFB, which include but are not limited to hazardous waste, hazardous materials, air quality, wastewater and stormwater, drinking water, solid waste, storage tanks, cultural resources, environmental management system, pollution prevention, and toxics as regulated by U.S. EPA and other state and local regulatory agencies. Solicitation documents will be posted on or about January 16, 2019.
https://www.fbo.gov/notices/28317f21481a15f2b89f41e00813e290

Cleanup News

DESIGN AND APPLICATION OF A LOW IMPACT MOBILE DRILL RIG FOR ASSESSMENT OF PETROLEUM HYDROCARBONS IN A REMOTE AND ECO-SENSITIVE ENVIRONMENT USING LASER INDUCED FLUORESCENCE

Morrow, D., R. Green, B. Sweet, and K. Weber.
2018 RPIC Federal Contaminated Sites National Workshop, 13-15 June, Toronto, ON. 21 slides, 2018

In Canada, the Environmental Sciences Group (ESG) partnered with several other groups to conduct a high-resolution site characterization (HSRC) investigation at Sable Island National Park Reserve, a remote and ecologically sensitive barrier island located 175 km offshore of eastern Canada. The unique surficial geology of the assessment location consisted of well-sorted homogenous sand. To realize the use of HRSC technology at the site, a unique low-impact mobile drill rig (LIMB DRIG), was designed and tested through a research grant. The LIMB DRIG was designed to be hand assembled, weigh Slides: http://rpic-ibic.ca/images/2018_FCSW_/Presentations/4_-_58_-_Morrow_ENG.pdf

PHYTO-UTILIZATION: SUSTAINABLE METHOD FOR ON-SITE LEACHATE DISPOSAL

Granley, B. 2018 SWANA Western Regional Symposium, 22-24 May, Palm Springs, CA. 2018

A phyto-utilization system capitalizes on the natural ability of plants, such as poplar trees and vetiver grass, to utilize the components of leachate (moisture and various compounds) as beneficial resources. The evapotranspiration (ET) capacity of these specially selected plants actually consumes (eliminates) leachate through the transpiration process, which, when the treatment system is properly sized, can also eliminate hauling leachate to wastewater treatment plants. Hybrid poplar and willows are used for phytoremediation applications in many parts of the United States. Fast-growing vetiver grass is a unique plant that is especially well-suited for phyto-utilization of leachate in warm climates owing to its extremely high demand for moisture and nutrients. Vetiver grass is noninvasive, long-lived, tolerant to high levels of most contaminants, and resistant to pests and diseases. This presentation illustrates three case studies: the use of hybrid poplars at the Jeffco Landfill, St. Louis, Mo., and at the South Barrington Landfill, Chicago, Ill., and the use of vetiver grass at the Gulf Pines Landfill, Biloxi, Miss. **Slides:** http://www.mowastecoalition.org/resources/Documents/2016%20conference/MWCCrev%20-%20Phyto_Utilization%20of%20Leachate%20_%20July%202016%20-%20Granley.pdf

THE EVOLUTION OF REMEDIATION IN DNAPL IMPACTED LOW PERMEABILITY SOILS FROM PRE-RCRA TO 2018: A SITE HISTORY

Stiffler, E. and M. Allendorf.
AEG News 61(4):200(2018) [AEG 61st Annual Meeting, Program with Abstracts, Poster]

Since 1985, an unlined pre-RCRA solid waste management unit storage pit has undergone a series of treatments to restore the site groundwater to acceptable drinking water standards. Operated from about 1978 to 1980, the pit previously contained waste contaminated with chlorinated solvents. The first remedial solution utilized was excavation of the pit and associated contaminated soils. Because the excavation was limited to 25 ft bgs by the water table, the area below that remained as a secondary source zone. In the late 1990s, in situ chemical oxidation (ISCO) injections were conducted unsuccessfully due to the low permeability of the formation. The third remedial technology, groundwater pump and treat, was operated from May 2001 to December 2009, but following cessation of groundwater extraction, rebounding contaminant concentrations in extraction wells previously clean prior to the ISCO injections indicated that back diffusion was occurring from source material that remained sorbed to the soil matrix. The fourth remedial technology implemented, enhanced in situ bioremediation (EISB), succeeded in reducing parent constituents (PCE, TCE, etc.) to daughter products (1,2-DCE and VC). The fifth method planned for remediation is direct-push jet injection of zero-valent iron and EISB solution, which will place remedial material in direct contact with residually impacted low-permeability soils.

CASE STUDY: ACCELERATED SITE CLOSURE VIA MULTIMODAL LNAPL TRANSMISSIVITY TESTING AND PLUME STABILITY ANALYSIS, WEST TEXAS

Daigle, T., J.M. Hawthorne, L. Reyenga, and D. White.
2018 IPEC: 25th International Petroleum Environmental Conference, October 30 - November 1, 2018, Denver, Colorado. 20 slides, 2018

The Former Waddell Compressor Station, located southwest of Midland/Odessa, Texas, is regulated by the Texas Railroad Commission and is enrolled in the Operator Cleanup Program, which allows for risk-based site closure for remediation of LNAPL contamination in the form of natural gas condensate. The site has >20 yrs of groundwater monitoring data. LNAPL transmissivity

testing was performed at five wells in 2018 using both oil/water ratio test methods and mobile dual-phase extraction (MDPE) data analysis. Transmissivity calculated for both methods in accordance with ASTM E2856-13 indicated that the LNAPL is not hydraulically recoverable, which was corroborated when https://www.api.org/oil-and-natural-gas/environment/clean-water/ground-water/gwsdat). Results suggest that the dissolved-phase plume is stable to decreasing in mass and is not expected to migrate beyond the current extent. **Slides:**
https://cese.utulsa.edu/wp-content/uploads/2018/11/IPEC-2018-Accelerated-Site-Closure-Via-Transmissivity-Testing-and-Plume-Stability-Analysis.pptx

Demonstrations / Feasibility Studies

CHROMIUM REMOVAL WITH ENVIRONMENTALLY FRIENDLY IRON NANOPARTICLES IN A PILOT SCALE STUDY

Mystrioti, C., A. Toli, N. Papasiopi, D. Dermatas, and S. Thimi.
Bulletin of Environmental Contamination and Toxicology 101(6):705-710(2018)

The goal of the study was to evaluate the efficiency of iron nanoparticles (GT-NZVI), synthesized by a green synthesis route, for Cr(VI) removal in a pilot-scale application. A tank with dimensions of 2.5 m (width) x 3.75 m (length) x 1.5 m (height) was constructed and filled with 24 tons of soil. First, 3 m^3 of GT-NZVI suspension was injected and then the supply of contaminated water containing 5 mg/L Cr(VI) was initiated. Samples were analyzed for pH, redox potential, and electric conductivity as well as Fe_{tot} and Cr(VI). The reactive zone operated efficiently for the treatment of contaminated water for 1 year. See more about this pilot in the project final technical report at http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=LIFE10_ENV_GR_000601_FTR.pdf.

ZERO-VALENT IRON ACTIVATED PERSULFATE REMEDIATION OF POLYCYCLIC AROMATIC HYDROCARBON-CONTAMINATED SOILS: AN IN SITU PILOT-SCALE STUDY

Song, Y., G. Fang, C. Zhu, F. Zhu, S. Wu, N. Chen, T. Wu, Y. Wang, J. Gao, and D. Zhou.
Chemical Engineering Journal 355:65-75(2019)

Different types of zero-valent iron (ZVI)—micro/nanostructured ZVI (NZVI), stearic-coated micro/nanostructured ZVI (C-NZVI), and commercial micron-sized ZVI (MZVI)—were used to activate persulfate (PS) to remove PAHs from a contaminated site. Three reaction pits were excavated to test the activation ability of the different ZVI types, each with an area of ~30 m^2 and a depth of 4 m. PS at 30 g/kg and ZVI at 3.5 g/kg were added in soil slurry by in situ stirring. After treatment for 104 d, PAHs (~17 mg/kg) removal efficiencies were 82.21%, 62.78%, and 69.14% for PS activated by NZVI, C-NZVI, and MZVI, respectively. Soil pH was observed to decrease owing to the release of H^+ from PS decomposition. Soil bacterial community populations decreased markedly, particularly bacteria of the phylum Chloroflexi, which almost disappeared after remediation. Bacteria of the phylum Firmicutes, however, still dominated after remediation and exhibited a tolerance to PS.

DEVELOPMENT AND CHARACTERIZATION OF SMALL-SCALE WASHING SYSTEMS FOR REMOVAL OF DEPLETED URANIUM OXIDES

Unz, R.J., J.P. McCown, C.A. Waggoner, S.L. Larson, and J.H. Ballard.
ERDC/CRREL TR-18-1, 69 pp, 2018

Researchers from the Mississippi State University Institute for Clean Energy Technology (MSU-ICET) and the U.S. Army Engineer Research and Development Center have collaborated on procedures and methodologies for identifying leaching solutions to assist in the removal of depleted uranium (DU) oxides from contaminated soils. The team developed a bench-scale leach system to optimize leaching procedures and methodologies. A 2-molar (M) acetic acid solution with a 15% (v/v) 0.3 M hydroxylamine hydrochloride solution was able to remove ~70% of the uranium in the soil sample. Pretreating the soil with 3 M hydrochloric acid improved leaching efficiency to ~90%. The MSU-ICET researchers developed the preliminary design of a mobile leaching system based on hydrochloric acid pretreatment followed by 2-M acetic acid/15% 0.3 M hydroxylamine hydrochloride leaching method. Further work resulted in a pilot-scale soil-leaching trailer system designed to be used on site, eliminating the need for additional transport of radioactive contaminated soils.
https://erdc-library.erdc.dren.mil/xmlui/bitstream/handle/11681/26383/ERDC-El%20TR-18-1.pdf

COMPREHENSIVE APPROACH FOR MONITORING AND REMEDIATING PETROLEUM-DERIVED CONTAMINANTS IN THE ARCTIC: CASE STUDY OF THE FORMER NARL SITE NEAR UTQIAGGVIK, ALASKA (FORMERLY BARROW)

Bjella, K.L., A.M. Wagner, A.J. Barker, C.A. Hiemstra, A. Gelvin, S.P. Saari, R.A. Barbato, et al.
ERDC/CRREL TR-18-18, 76 pp, 2018

Activities at the former Naval Arctic Research Laboratory outside the city of Utqiagvik, Alaska (formerly known as Barrow), contaminated the local soils and groundwater with petroleum hydrocarbons. Since the lab's closure in 1987, the U.S. Navy (primarily) has implemented many environmental investigations and remediation, monitoring, and containment strategies. Given the subsurface soil unique to the Arctic, the harsh environment, and the underdeveloped infrastructure of the remote site, bioremediation represents an attractive method of decontamination because it is relatively easy to implement. A bench-scale lab experiment and parallel pilot-scale field study were conducted to study different bio- and phytoremediation options. Results from this study offer a comprehensive approach for characterizing petroleum-derived contamination specific to Arctic regions by coupling nondestructive geophysical tools with in situ hydro-biogeochemical methods. https://erdc-library.erdc.dren.mil/xmlui/bitstream/handle/11681/29611/ERDC-CRREL%20TR-18-18.pdf

ENHANCED REDUCTIVE DECHLORINATION OF CHLORINATED SOLVENTS AT THE FORMER GLOUCESTER LANDFILL AND A BRIEF HISTORY OF SITE ACTIVITIES

Livingstone, S., C. Durrant, L. Warner, and C. Truax.
2018 RPIC Federal Contaminated Sites National Workshop, 13-15 June, Toronto, ON. 31 slides, 2018

From 1969-1980, the Special Waste Compound (SWC) portion of the former Gloucester Landfill municipal waste site was used by various Canadian federal government agencies for the disposal of wastes, mainly oils and cleaning solvents. A groundwater pilot study was commissioned at the SWC in 2016 to assess the feasibility of enhanced in situ bioremediation of chlorinated VOCs. Pilot results established proof of concept that enhanced reductive dechlorination (ERD) was occurring in the test area based upon the presence of reducing conditions in the target aquifer, a flourishing population of *Dehalococcoides mccartyi*, and destruction of VOCs. Results also supported full-scale ERD design calculations of the amounts of molasses substrate required and the anticipated radius of influence (5.5 m downgradient and 4 m cross-gradient). Implementation of the full-scale design began in January 2018.
Slides: http://rpic-ibic.ca/images/2018_FCSW_/Presentations/5-__169_-_Livingstone_EN_V2.pdf
Longer abstract [see the 3rd abstract from the bottom of the page]:
http://rpic-ibic.ca/en/events/federal-contaminated-sites-fcs-national-workshop/2018-fcs-national-workshop/oral-abstracts-2018fcsnw-2/stream5-2018fcsnw-9#Enhanced

Research

ENHANCED DEGRADATION OF PHENOL IN FLOATING TREATMENT WETLANDS BY PLANT-BACTERIAL SYNERGISM

Saleem, H., K. Rehman, M. Arslan, and M. Afzal.
International Journal of Phytoremediation 20(7):692-698(2018)

Plant-bacterial synergism was established in floating treatment wetlands (FTWs) in an attempt to maximize the removal of phenol from contaminated water. The FTWs employed a common wetland plant, *Typha domingensis*, vegetated on a floating mat and augmented with three phenol-degrading bacterial strains: *Acinetobacter lwofii* ACRH76, *Bacillus cereus* LORH97, and *Pseudomonas* sp. LCRH90. All the strains are known to have phenol-reducing properties and grow well in FTWs. *T. domingensis* was able to remove a small amount of phenol from the contaminated water, while bacterial augmentation enhanced the removal potential, i.e., 0.146 g/m^2/d versus 0.166 g/m^2/d, respectively. Plant biomass also increased in the presence of bacterial consortia, and inoculated bacteria displayed successful colonization/survival in the plant rhizosphere and root and shoot interior. The highest reduction in chemical oxygen demand (COD), biochemical oxygen demand (BOD5), and total organic carbon (TOC) also was achieved by the combined application of plants and bacteria. The study demonstrates the improved remediation effectiveness of plant-bacterial synergism in FTWs. *See more on this work at* https://www.sciencedirect.com/science/article/pii/S1319562X18300329.

ASPARAGUS DENSIFLORUS IN A VERTICAL SUBSURFACE FLOW PHYTOREACTOR FOR TREATMENT OF REAL TEXTILE EFFLUENT: A LAB TO LAND APPROACH FOR IN SITU SOIL REMEDIATION

Watharkar, A.D., S.K. Kadam, R.V. Khandare, P.D. Kolekar, B.H. Jeon, J.P. Jadhav, S.P. Govindwar.
Ecotoxicology and Environmental Safety 161:70-77(2018)

This study explored the potential of *Asparagus densiflorus* to treat disperse Rubin GFL (RGFL) dye and a real textile effluent in a constructed vertical subsurface flow (VSbF) phytoreactor. Field cultivation of *A. densiflorus* decolorized RGFL (40 gm/L) up to 91% within 48 h. The VSbF phytoreactor successfully reduced American dye manufacture institute BOD, COD, total dissolved solids (TDS), and total suspended solids (TSS) of real textile effluent by 48-66% within 6 d. Anatomical study of the advanced root tissue of *A. densiflorus* exhibited progressive dye accumulation and removal during phytoremediation. One field remediation study revealed 67% dye removal from polluted soil within 30 d.

DOES THE ORIGIN OF CUTTINGS INFLUENCE YIELD AND PHYTOEXTRACTION POTENTIAL OF WILLOW IN CONTAMINATED SOIL?

Beauchamp, S., C.F. Dussault, F.E. Pitre, and M. Labrecque.
Ecological Engineering 111:125-133(2018)

The ability of different willow cultivars to survive and adapt to contamination in polluted soils can vary according to the nature and concentration of the contaminants. A study was undertaken to identify which cultivars had the highest yields, and to determine whether the origin of the cuttings influenced survival, growth, and phytoextraction potential of willow cultivars grown on polluted soil. Survival, growth and phytoextraction of trace elements (Cd, Cr, Cu, Ni, Pb, Zn) were compared for 10 willow cultivars planted in a highly organics-contaminated industrial environment versus in an uncontaminated control. Variations in cultivar response according to cutting origin (contaminated site or not) were also analyzed for each site. The results of the study could help build more effective phytoremediation protocols for highly contaminated environments by identifying willow cultivars and cutting selection techniques appropriate for specific environments. *For additional information, see* ***pages 29-57*** *in S. Beauchamp's thesis at* https://papyrus.bib.umontreal.ca/xmlui/handle/1866/19396.

EFFECTS OF MICROARRANGEMENT OF SOLID PARTICLES ON PCE MIGRATION AND ITS REMEDIATION IN POROUS MEDIA

Wu, M., J. Wu, J. Wu, and B.X. Hu.
Hydrology and Earth System Sciences 22(2):1001-1015(2018)

Two different microscale arrangements of sand particles were compared to reveal the effects of microstructure on contaminant migration and remediation. With the help of fractal theory, the mathematical expressions of permeability and entry pressure were conducted to delineate granular materials with regular triangle arrangement (RTA) and square pitch arrangement (SPA) at microscale. Using a sequential Gaussian simulation method, a synthetic heterogeneous site contaminated by PCE was then used to investigate the migration and remediation affected by two different microscale arrangements. PCE was released from an underground storage tank into the aquifer, and surfactant was used to clean up the subsurface contamination. Results suggest that RTA materials can not only expand groundwater contamination but also make remediation more difficult. PCE remediation efficiency of 60.01-99.78% with a mean of 92.52 and 65.53-99.74% with a mean of 95.83% was achieved for 200 individual heterogeneous realizations based on the RTA and SPA, respectively, indicating that the cleanup of PCE in an aquifer containing SPA materials is significantly easier. This study leads to a new understanding of the microstructures of porous media and shows how microscale arrangements can affect contaminant migration in aquifers. https://www.hydrol-earth-syst-sci.net/22/1001/2018/hess-22-1001-2018.pdf

COMPARING ROCK MATRIX CONTAMINANT PROFILES DOWNGRADIENT OF A DNAPL SOURCE AFTER 10 YEARS OF GROUNDWATER DISSOLUTION

Buckley, A., J. Meyer, D. Austin-Blaine, and B. Parker.
Abstracts: NGWA Conference on Fractured Rock and Groundwater, Burlington, VT, 2-3 October 2017

Prior to 1970, over 70,000 L of DNAPLs were released into the subsurface at a site in south central Wisconsin. The mixed organic DNAPL migrated through unconsolidated glacial sediments and shallow sedimentary bedrock, eventually accumulating ~56 m bgs in fractured sandstone. A study was conducted to characterize the temporal evolution of contaminant mass in the source zone

by comparing two co-located rock core VOC concentration profiles, one collected in 2003 and the other in 2014. The rock core VOC profiles provided depth-discrete and detailed (at least 1 sample/ft of core) quantification of the contaminant mass in the rock matrix. The 2003 core showed relatively uniform rates of mass accumulation with depth for most contaminants, whereas the 2014 core showed highly variable rates of mass accumulation with depth, particularly in the shallow rock units. These results indicated variable attenuation rates for specific depth horizons. Assessment of specific contaminants showed declines in concentration for parent ethanes and ethanes, dichloromethane, and MIBK and increases in concentrations for daughter products (e.g., chloroethane, VC). Core and borehole geophysical logs and hydraulic testing provided site-specific parameters for evaluating the influence of various attenuation processes (e.g., dispersion, diffusion, sorption, abiotic/biotic degradation) on source zone fluxes and longevity. *See more on this project in A. Buckley's thesis at* http://atrium.lib.uoguelph.ca/xmlui/handle/10214/10464.

BIOELECTROCHEMICAL SYSTEMS FOR REMOVAL OF SELECTED METALS AND PERCHLORATE FROM GROUNDWATER: A REVIEW

Cecconet, D., A. Callegari, and A.G. Capodaglio.
Energies 11:Article 2643(2018)

This review examines the application of bioelectrochemical systems (BESs) for groundwater remediation of arsenic, cadmium, chromium, vanadium, and perchlorate, focusing also on the perspectives of the technology in the groundwater treatment field. BESs present an alternative to conventional treatments for a wide variety of wastewaters and have been proposed as a feasible option for groundwater remediation due to the nature of the technology, i.e., the presence of two different redox environments, the use of electrodes as virtually inexhaustible electron acceptor/donor (anode and cathode, respectively), and the possibility of microbial catalysis enhance their potential to achieve complete remediation of contaminants, even in combination.
https://www.mdpi.com/1996-1073/11/10/2643/pdf

QUANTITATIVE DETERMINATION OF PERFLUOROALKYL SUBSTANCES (PFAS) IN SOIL, WATER, AND HOME GARDEN PRODUCE

Huset, C.A. and K.M. Barry.
MethodsX 5:697-704(2018)

Simple and efficient analytical methods were used to measure perfluoroalkyl substances (PFASs) in water, soil, and produce from home gardens in Minnesota. PFASs in water were analyzed via direct injection. PFASs were extracted from homogenized soil using sonication and from produce using dispersive solid-phase extraction. Isotope dilution was used for quantitation in all methods. The method performance parameters and quality control measures described are applicable for PFASs ranging from C4-C8. The produce method was used on a wide variety of produce. *This paper is available in full text at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039355/.

ZWITTERIONIC, CATIONIC, AND ANIONIC PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES INTEGRATED INTO TOTAL OXIDIZABLE PRECURSOR ASSAY OF CONTAMINATED GROUNDWATER

Martin, D., G. Munoz, S. Mejia-Avendano, S.V. Duy, Y. Yao, K. Volchek, C.E. Brown, J. Liu, and S. Sauve. Talanta 195:533-542(2019)

The total oxidizable precursor (TOP) assay has potential utility for integrating precursors to perfluoroalkyl acids (pre-PFAAs) into the assessment of sites contaminated by per- and polyfluoroalkyl substances (PFASs). Current research gaps include risks of instrumental matrix effects due to the complexity of post-oxidation extracts, potential reproducibility issues during TOP itself, and limited information for zwitterionic and cationic pre-PFAAs. Investigation of a suitable method for the analysis of groundwater samples using liquid chromatography high-resolution mass spectrometry revealed that initial sample pretreatment through filtration could affect the dissolved PFAS concentrations. Amending the post-oxidation samples with methanol allowed for improved precision and low instrumental matrix effects. Documentation of the oxidation yields of 23 anionic, neutral, zwitterionic, and cationic precursor compounds of PFAAs indicated that these precursor compounds were amenable to TOP conversion. In application, summed PFAS concentrations as high as 5 mg/L were reported before oxidation, and post-oxidation increases of PFCAs up to +2300% were observed.

EMISSIONS, TRANSPORT, AND FATE OF EMERGING PER- AND POLYFLUOROALKYL SUBSTANCES FROM ONE OF THE MAJOR FLUOROPOLYMER MANUFACTURING FACILITIES IN CHINA

Song, X., R. Vestergren, Y. Shi, J. Huang, and Y. Cai.
Environmental Science & Technology 52(17):9694-9703(2018)

During a comprehensive spatial trend and inter-year comparison of surface water and sediment samples from the Xiaoqing River, which receives water discharge from one of the major fluoropolymer manufacturing facilities in China, screening identified 42 chemical formulas, including the tetramer acid of hexafluoropropylene oxide (HFPO-TeA) and numerous tentatively detected isomers of C9-C14 per- or polyfluoroalkyl ether carboxylic acids (PFECAs). As revealed by the spatial trends and peak area-based sediment-water distribution coefficients, emerging PFASs with 3-9 perfluorinated carbons were transported with the bulk water flow, exhibiting no measurable degradation. Emerging PFASs with >9 perfluorinated carbons displayed more rapidly decreasing spatial trends than shorter-chain homologues in surface water due to increasing sedimentation rates. The presence of HFPO oligomers, monoether PFECAs, monohydrogen-substituted perfluoroalkyl carboxylic acids (PFCAs) and monochlorine-substituted PFCAs could be explained partly by the active use of polymerization aids or their impurities.

EVALUATION OF TREATMENT OPTIONS FOR WELL WATER CONTAMINATED WITH PERFLUORINATED ALKYL SUBSTANCES USING LIFE CYCLE ASSESSMENT

Emery, I., D. Kempisty, B. Fain, and E. Mbonimpa.
The International Journal of Life Cycle Assessment [Published online 13 July 2018 prior to print]

To examine the life-cycle impacts of treating drinking water affected by perfluoroalkyl substances (PFASs), researchers assembled life-cycle models for groundwater treatment and bottled water delivery to residents of Wright-Patterson AFB, Ohio, where wells were taken out of service due to concerns related to PFAS contamination. Two treatment methods, granular activated carbon filtration and ion-exchange columns, were modeled under a range of contaminant concentrations covering three orders of magnitude: 0.7, 7.0, and 70 µg/L PFAS. Impacts of bottled water production and supply were assessed using two data sets reflecting a range of production and supply chain assumptions. Results show that for PFAS concentrations
https://www.afit.edu/BIOS/publications/EmeryEtAl.2018.PDF

General News

STATE OF MICHIGAN: SAMPLING GUIDANCE FOR PER- AND POLYFLUOROALKYL SUBSTANCES (PFASs)

Michigan Department of Environmental Quality (DEQ), 2018

When sampling for PFASs, many special guidelines are recommended to avoid cross-contamination. The guidelines differ from those followed in sampling for other types of contaminants due to the presence of PFASs in many things used in everyday life to make products resistant to water, stains, heat, and oil. Because PFASs are analyzed in such small concentrations (parts per trillion), even the smallest cross-contamination could contribute to producing a false positive. The Michigan DEQ in 2018 posted a series of field and residential technical sampling guides for PFASs that range from the general to the matrix or media specific.

- General PFAS Sampling Guidance.
- Groundwater PFAS Sampling Guidance.
- Residential Well PFAS Sampling Guidance.
- Soil PFAS Sampling Guidance.
- Surface Water PFAS Sampling Guidance.
- Wastewater PFAS Sampling Guidance.
- PFAS Sampling Quick Reference Field Guide.
- Residential Well PFAS Sampling Guidance for Homeowners.
- Sampling and Lab Information.

https://www.michigan.gov/pfasresponse/0,9038,7-365-86510_87154-469832--,00.html

NEW CLU-IN FOCUS AREA: ACTIVATED CARBON-BASED TECHNOLOGY FOR IN SITU REMEDIATION

U.S. EPA, Office of Superfund Remediation and Technology Innovation, CLU-IN Website, 2018

Activated carbon (AC)-based technology involves emplacement of AC-based amendments for in situ remediation of soil and groundwater. Besides AC, amendments typically include other reactive products commonly used with in situ chemical reduction, in situ chemical oxidation, and bioremediation. AC-based amendments remove contaminant via two processes: adsorption by AC and degradation by reactive amendments. The coupling of adsorption and degradation makes this technology a promising remedial option for addressing persistent plumes emanating from contaminants sorbed on soil, residual NAPL, or mass stored in low-permeability zones. The technology might also be applicable near or at the source area, especially when combined with other source treatment remedies, to limit contaminant mass flux out of source zones to downgradient plumes. https://clu-in.org/ac

DRINKING WATER: STATUS OF DOD EFFORTS TO ADDRESS DRINKING WATER CONTAMINANTS USED IN FIREFIGHTING FOAM

U.S. Government Accountability Office, GAO-18-700T, 17 pp, 26 Sep 2018

The fire-fighting foam DoD has used for decades contains chemicals that, at elevated exposure levels, can increase risks of cancer or other health issues. As a result, DOD spent about $200 million on investigations and response (as of December 2016); identified 401 installations with known or potential releases of these chemicals; and took actions (e.g., providing alternative drinking water) at 32 locations (as of August 2017). This testimony is based largely on the GAO report on DoD's response to fire-fighting foam contamination in drinking water, which is part of a body of work on the federal government's environmental liabilities and an issue on GAO's High-Risk list. https://www.gao.gov/products/GAO-18-700T#summary

AQUEOUS FILM FORMING FOAM: REPORT TO CONGRESS

Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 28 pp, 2017

This report provides information regarding DoD efforts to address contamination by perfluorinated chemicals, commonly referred to as PFASs (per- and polyfluoroalkyl sustances), on military bases and in neighboring communities due to the use of aqueous film forming foam (AFFF). The number of formerly used and current military installations where AFFF was or is currently used is assessed along with the impact of PFAS contaminated drinking water on surrounding communities. Plans are described for prompt community notification of such contamination and the procedures for timely remediation. The appendices contain (A) Number of Installations and Drinking Water Systems Tested for PFOS and PFOA, and Associated Sampling Costs; (B) Summary of Safe Drinking Water Actions Where DoD is the Drinking Water Purveyor and the Systems Tested Above the EPA Lifetime Health Advisory Level; and (C) DoD Installations with a Known or Suspected Release of PFOS or PFOA. https://www.denix.osd.mil/derp/home/documents/aqueous-film-forming-foam-report-to-congress/

RESTORATION OF CHLORINATED SOLVENT CONTAMINATED GROUNDWATER SITES: THE VALUE OF INFORMATION CHALLENGE

Kavanaugh, M.C., D.A. Reynolds, and K.G. Mumford.
SERDP/ESTCP Webinar Series, Webinar #81, Oct 2018

SERDP and ESTCP held a webinar in October 2018 to detail results from DoD-funded research on effective site characterization and remediation decision-making at chlorinated solvent sites. Dr. Michael C. Kavanaugh and Dr. David Reynolds from Geosyntec Consultants, and Dr. Kevin Mumford from Queen's University, presented their work on applying value of information concepts to site characterization and conceptual site model development with a focus on a framework for optimizing site characterization to minimize the cost of achieving remedial goals. To view the archived webinar and speaker biographies, visit https://serdp-estcp.org/Tools-and-Training/Webinar-Series/10-18-2018.

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.