Technology Innovation News Survey

Entries for September 16-30, 2016

Market/Commercialization Information

FY17 GUIDELINES FOR BROWNFIELDS ASSESSMENT GRANTS AND CLEANUP GRANTS

U.S. Environmental Protection Agency, OLEM, OBLR, 2016

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofits to prevent, inventory, assess, clean up, and reuse brownfield sites.

- Under Funding Opportunity EPA-OLEM-OBLR-16-08, EPA is seeking proposals for Assessment Grants, which are funded over a period of three years. http://www.grants.gov/web/grants/view-opportunity.html?oppId=289469
- Under Funding Opportunity EPA-OLEM-OBLR-16-09, EPA is seeking proposals for Cleanup Grants, which are also funded over a period of three years. http://www.grants.gov/web/grants/view-opportunity.html?oppId=289447

The proposal submission deadline for both types of grants is December 20, 2016. See more information at http://www.epa.gov/brownfields/apply-brownfields-grant-funding.

PARKVIEW WELL O&M OF GROUNDWATER TREATMENT SYSTEM

U.S. Environmental Protection Agency, Region VII, Lenexa, KS.
Federal Business Opportunities, FBO-5455, Solicitation SOL-R7-17-00001, 2016

This announcement is a presolicitation notice for a forthcoming requirement for services to support long-term remedial action (LTRA) for Parkview Well Site OU1, O&M of the Groundwater Treatment System (GWTS). The Parkview Well Superfund Site OU-1 is located in the southwestern portion of the city of Grand Island in Hall County, Nebraska. The scope of the Groundwater Treatment Plant (GWTP), housed in a 60-ft by 45-ft building, includes the GWTP, four extraction wells, and associated system components and structures both above and below ground surface. The LTRA will be conducted pursuant to CERCLA and the National Contingency Plan. EPA anticipates advertising this requirement as a woman-owned small business set-aside, resulting in a fixed-price contract consisting of a one-year base period and four one-year options. Estimated dollar value for this procurement with options exercised is between $1M and $2M. Release of the solicitation is anticipated by or before November 30. The details of this requirement will be posted on FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-R7-17-00001&agency=EPA [Note: It may be necessary to copy and paste the URL into your browser for direct access.].

FY 2018 SERDP SOLICITATIONS

Strategic Environmental Research and Development Program (SERDP), 2016

DoD's SERDP office is seeking environmental R&D proposals for Environmental Restoration and Munitions Response topics as identified in the Core Statements of Need:

- ERSON-18-C1: Improved Understanding of Per- and Polyfluoroalkyl Substance Source Zones.
- ERSON-18-C2: In Situ and Ex Situ Remediation of Per- and Polyfluoroalkyl Substance Contaminated Groundwater.
- ERSON-18-C3: Improved Understanding of Stormwater Impacts and Control on Sediment Recontamination and Recovery.
- ERSON-18-C4: Innovative Approaches for Monitoring and Implementing In Situ Remediation of Contaminated Aquatic Sediments.
- MRSON-18-C1: Detection, Classification, and Remediation of Military Munitions Underwater.

All Core preproposals are due by 2:00 PM ET on January 5, 2017.
The SERDP Exploratory Development (SEED) solicitation for FY 2018 requests proposals addressing any aspect of munitions response for underwater sites, with particular interest in (1) characteristics of munitions underwater and their environment; (2) technologies that allow rapid wide area and detailed surveys; and (3) cost-effective recovery and disposal. SEED proposals are due by 2:00 PM ET on March 7, 2017. See details at https://www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations.

PLUM ISLAND REMEDIATION SERVICES

Department of Homeland Security, Plum Island Animal Disease Center.
Federal Business Opportunities, FBO-5451, Solicitation HSHQPD-17-Q-00002, 2016

The Plum Island Animal Disease Center (PIADC), located on Plum Island, New York, is soliciting for subsurface petroleum remediation at the PIADC. The Contractor shall use various methods to recover LNAPL from the subsurface and perform O&M of the remediation system, installation of product recovery pumps and skimmers, well gauging, groundwater sampling, and management of investigation-derived waste. Quotes must be received by 11:00 AM ET on November 24, 2016. PIADC is a secure U.S. Government facility; hence, all contractors performing work on Plum Island must follow strict security protocols and adhere to site-specific requirements and conditions. https://www.fbo.gov/spg/DHS/OCPO/PIADC/HSHQPD-17-Q-00002/listing.html

ENVIRONMENTAL JUSTICE SMALL GRANTS PROGRAM

U.S. Environmental Protection Agency, Funding Opportunity EPA-OECA-OEJ-17-01, 2016

The Environmental Justice Small Grants (EJSG) Program provides funding to eligible applicants for projects that address local environmental and public health issues within an affected community. The EJSG Program is designed to help communities understand and address exposure to multiple environmental harms and risks. Applying organizations are encouraged to have a direct connection to the vulnerable affected, community impacted by environmental harms and risks. From an estimated total program funding of $1,200,000, about 40 awards are anticipated. The closing date for applications is January 31, 2017. http://www.grants.gov/web/grants/view-opportunity.html?oppId=289829

Cleanup News

THE EFFECTIVENESS OF WATER-TREATMENT SYSTEMS FOR ARSENIC USED IN 11 HOMES IN SOUTHWESTERN AND CENTRAL OHIO, 2013

Thomas, M.A. and M. Ekberg.
U.S. Geological Survey, Reston, VA. Scientific Investigations Report 2015-5156, 37 pp, 2016

In 2013, the U.S. Geological Survey and the Miami Conservancy District investigated the effectiveness of methods used to remove arsenic (As) from drinking water at 11 homes in southwestern and central Ohio. The untreated groundwater had concentrations of 7.7-382 µg/L As, and the median concentration was 30 µg/L. The pH was neutral to slightly alkaline, and redox conditions were strongly reducing, as indicated by high concentrations of iron. The predominant As species was arsenite, which is difficult to treat because it exists in water as an uncharged compound (H_3AsO_3). The water-treatment systems included (1) seven single-tap reverse-osmosis systems, (2) two whole-house oxidation/filtration systems, and (3) two systems comprising whole-house anion exchange and single-tap reverse osmosis. All but one system included pretreatment by a water softener, and two systems included preoxidation to convert arsenite to arsenate before treatment by anion exchange. None of the treatment systems removed all As from the drinking water. About one-half of the systems decreased the As concentration to https://pubs.er.usgs.gov/publication/sir20155156

FULL-SCALE IMPLEMENTATION OF A PULSED AIR SPARGE SYSTEM FOR TREATMENT OF VOCs, SVOCs, AND ARSENIC

Novalis, K., O.J. Uppal, M. Ambrusch, N. Najib, S. Ciambruschini, and A. Lee.
IPEC 2015: 22nd Annual International Petroleum Environmental Conference, 23 PowerPoint slides, 2015

An air sparge system was designed to provide pulsed in situ flow-through treatment of groundwater contaminated with VOCs, SVOCs, and arsenic in a complex geologic setting at a state-mandated cleanup program site in northern New Jersey. A biosparge system was operated from 2002 through 2012 at the site. The air sparge system design consists of 127 sparge well screens organized to be operated in a pulsed configuration to allow for more efficient COC mass removal. The system also contains a vapor collection component to capture, treat, and discharge organic vapors generated by sparging. The initial operational data of the modified system indicates significant performance improvements, expedited contaminant mass removal, and improved remedial efficiency. Performance data confirm that pulsed air sparge operation is more efficient than continuous operation in removing contaminant mass from the subsurface under mass-transfer limiting conditions, primarily due to enhanced groundwater mixing in the treatment zones. The final remedial strategy includes excavation, capping, pulsed air sparge and aerobic biodegradation for VOCs and SVOCs, and sorption on metal/iron oxy-hydroxides for arsenic. The anticipated cleanup time frame is 3 to 5 years.
Slides: http://ipec.utulsa.edu/Conf2015/Manuscripts/novalis_Fullscale.pptx

RELEASE ABATEMENT MEASURE PLAN PRE-CONSTRUCTION REMEDIATION ACTIVITIES, (FORMER) EVERETT STAGING YARD, 1 HORIZON WAY, EVERETT, MASSACHUSETTS

Massachusetts Dept. of Environmental Protection, Bureau of Waste Site Cleanup, Release Tracking Number 3-13341, 400 pp, 2015

Soil, groundwater, and sediment at the disposal site have been contaminated by historic activities, including former use of the site for chemical manufacturing. The activities described in the Release Abatement Measure Plan will reduce the risks associated with soil and groundwater contamination in three areas of the site identified as A-5, CES-2, and Low pH. Soil containing elevated concentrations of arsenic and lead in the A-5 Area and elevated concentrations of arsenic in the CES-2 Area will be excavated for off-site disposal. Soil and groundwater in the Low pH Area (pH measured at = 4) will be treated using in situ solidification/stabilization to reduce the ability of groundwater to flow through the area and raise the pH to limit further mobilization of metals (As, Cd, Cr, Pb, Ni, and Zn). http://www.wynnineverett.com/files/Wynn_Everett_RAM_Plan_Pre-Construction_Remediation_8-18-15_Final.pdf

UST 2 TCE-SOURCE REMEDIAL ACTION SUMMARY OF MPE SYSTEM OPERATION, LOCKHEED MARTIN MIDDLE RIVER COMPLEX, 2323 EASTERN BOULEVARD, MIDDLE RIVER, MARYLAND

Lockheed Martin Middle River Complex, 3026 pp, 2016

A multi-phase extraction (MPE) system was installed at the Middle River Complex in Middle River, Maryland, in August 2014 and operated in 2014 and 2015. The system was designed to remove TCE mass from the subsurface near the former location of underground storage tank 2 in Block E of the Middle River Complex. The tank, identified during installation of an in situ bioremediation system in Block E, contained high concentrations of TCE, and upon the tank's removal, the mass and concentration of TCE in soil and groundwater near the tank was too great for in situ bioremediation alone to be effective. Temporary operation of the MPE system was recommended and then approved by the Maryland Department of Environment. This report details the operation of the MPE system in 2014 and 2015. MPE operation is now complete, and a groundwater sampling event will be conducted to identify modifications necessary to the remedial program based on the current TCE plume extent.
http://www.lockheedmartin.com/content/dam/lockheed/data/corporate/documents/remediation/middle-river/ust2-tce-source-ra-mpe-system-ops-04%202016.pdf

Demonstrations / Feasibility Studies

INTEGRATED STABLE ISOTOPE-REACTIVE TRANSPORT MODEL APPROACH FOR ASSESSMENT OF CHLORINATED SOLVENT DEGRADATION

Kuder, T., P. Philp, B. van Breukelen, H. Thouement, and M. Vanderford.
ESTCP Project ER-201029, 133 pp, 2016

This demonstration project was funded by ESTCP with the main goal of demonstrating the utility of combining compound-specific isotope analysis (CSIA) and reactive transport modeling (RTM) to quantify and strengthen support for monitored natural attenuation remedies for groundwater contaminated with chlorinated ethene constituents. The demonstration followed two main

tracks: development and initial calibration of the modeling software and a demonstration of the combined CSIA/RTM approach through an assessment of a contaminated site (the Shallow TCE & PCE Plume and the Deep TCE Plume at Hill AFB, Operable Unit 10). The success of the technology demonstration was defined in terms of producing results that are useful for development/improvement of the conceptual site model and are superior to those obtained by CSIA alone.
https://www.estcp.com/content/download/40453/387653/file/ER-201029%20Final%20Report.pdf *See also the User's Guide and model input files, completed in 2014*: https://www.estcp.com/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/ER-201029.

A TREE-BASED REMEDIATION SYSTEM FOR TREATMENT AND HYDRAULIC CONTROL OF A HYDROCARBON PLUME IN A 20 FOOT DEEP AQUIFER AT A FORMER REFINERY IN CENTRAL OKLAHOMA

Gatliff, E. and B. Snow. IPEC 2015: 22nd Annual International Petroleum Environmental Conference, 26 PowerPoint slides, 2015

The 15-20 ft deep groundwater at the former refinery occurs mainly in a sandy aquifer overlain by 20 ft of dense clay. A detailed groundwater model of the aquifer and petroleum hydrocarbon contaminant plume indicated that a tree-based remediation system using 400 trees, each pumping 50 gal/d/yr, could control the plume's off-site migration. A TreeMediation® system using patented TreeWell® technology was identified as the best approach for insuring that the tree-based system would use groundwater at the required rates. Four non-irrigated pilot study areas were established in 2012, each consisting of 72 trees (hybrid poplar, weeping willow, and London plane) planted in cased holes 3 ft in diameter to force root development to the water table and insure that contaminated groundwater was the primary water source. The pilots evaluated tree growth and development under the effects of extreme climate conditions and up-to-LNAPL levels of groundwater contamination. Following successful demonstration of the phytotechnology option, the selected solutions for the site included treating LNAPL pockets with oxygen sparging, and reducing the hydraulic gradient with a tree-based pump-and-treat system to create an opportunity for monitored natural attenuation to control off-site migration of the contaminant plume. Based on the pilot results, half of a full-scale phytoremediation installation was completed in spring 2015.
Slides: http://ipec.utulsa.edu/Conf2015/Manuscripts/Gatliff_TreeBased.pptx

CAN A PILOT DEMONSTRATION BE TOO SMALL?

Lundy, W., Sr. IPEC 2015: 22nd Annual International Petroleum Environmental Conference, 17 PowerPoint slides, 2015

At a site where dry cleaning businesses have operated for over 20 years, a pilot demonstration was requested to validate the effectiveness of Cool-Ox® technology on chlorinated compounds in the affected soils. The objectives were to demonstrate the viability of the technology to reduce PCE concentrations within the pilot area to the maximum extent possible while deriving information to optimize the treatment of the entire site. The client selected a highly contaminated area adjacent to the former drycleaner building as the site for the pilot demonstration. A 5 ft x 6 ft area was excavated to 5 ft bgs. All soil that was removed from the excavation was placed on PVC sheeting. Reagent (10 gal/yd^3) was applied to the pilot demonstration area and blended into the soil until sufficient contact was achieved. Very active reactions were observed with the evolution of significant quantities of carbon dioxide gas, but no heavier foams were observed, indicating the absence of Stoddard solvent in the pilot area. Despite the bubbling expulsion of carbon dioxide gas from the formation, sampling results indicated insufficient or no destruction of contaminants. Why this result? Possibly because no samples were taken immediately after the application, and time elapsed, allowing contaminant intrusion from surrounding soils. Also, if a larger area (say 10 ft x 10 ft) had been treated, samples could have been collected from the center of the treatment area, where reductions would have been apparent. **Slides:** http://ipec.utulsa.edu/Conf2015/Manuscripts/Lundy_CanPilotDemonstrationbetooSmall.pptx

MERCURY REMOVAL FROM CONTAMINATED GROUNDWATER: PERFORMANCE AND LIMITATIONS OF AMALGAMATION THROUGH BRASS SHAVINGS

Richard, J.H. and H. Biester.
Water Research 99:272-280(2016) doi: 10.1016/j.watres.2016.05.007.

Brass shavings have been proposed as a cost-effective filter material to remove Hg from contaminated groundwater. This method, which is based on the reduction of reactive Hg(II) and subsequent formation of amalgams, has been shown to be fast and effective in the short term. The effectiveness of brass filters and their stability over the long term is unknown, especially if used in passive filter systems such as permeable reactive barriers (PRBs) under high flow conditions. To evaluate the performance and limitations of brass shavings for Hg removal from contaminated groundwater, long-term pilot-scale filtration tests (6 and 28 months) were performed at two former wood treatment sites with severe groundwater contamination (up to 870 µg/L Hg). Results showed that even under high flow conditions (>60 m/d), 60-80% of the Hg was removed in the first 8 mm of the brass shavings filter bed. The kinetics of filtration, Hg total removal performance (>99.95%), and loading capacity (164 g/L) surpassed those of an Hg-specific synthetic resin (LEWATIT® MonoPlus TP-214); however, under natural pH conditions (pH 6.4 and 6.7), Zn was leached from the brass and exceeded the threshold value (0.5 mg/L) in the filter outflow by up to a factor of 40. Increasing pH (>8.5) decreased the Zn concentration (http://dl.umsu.ac.ir/bitstream/Hannan/110502/1/2016%20WR%20Volume%2099%20August%20(6).pdf

Research

POTENTIAL OF BRASS TO REMOVE INORGANIC HG(II) FROM AQUEOUS SOLUTION THROUGH AMALGAMATION

Wenke, A., A. Bollen, J.H. Richard, and H. Biester.
Water Environment Research 88(6):531-539(2016) doi: 10.2175/106143016X14504669768813

In a study of the efficacy of brass shavings ($CuZn_{45}$) in removing mercury [Hg(II)] from contaminated groundwater through amalgamation, column tests were performed with brass filters (3-9 cm thickness) flushed with 1000 µg/L Hg solution for 8 hr under different flow rates (300-600 mL/h). The brass filters consistently removed >98% of Hg from solution independent of filter thickness and flow rate. In a long-term experiment (2 cm filter thickness), Hg retention declined from 96% to 92% over a period of 2000 hr. Batch and column experiments for studying kinetics of Hg removal indicate ~100% Hg removal from solution within only 2 hr. Solid-phase mercury thermo-desorption analysis revealed that Hg(0) diffusion into the brass surface controls kinetics of mercury retention. Brass surface alteration could be observed but did not influence Hg retention.

SUSTAINABLE RANGE MANAGEMENT OF RDX AND TNT BY PHYTOREMEDIATION WITH ENGINEERED PLANTS

Bruce, N.C., E.L. Rylott, S.E. Strand, A. Palazzo, and T.J. Cary.
SERDP Project ER-1498, 94 pp, 2016

A previous SERDP project (ER-1318) demonstrated that expression of the rhodococcal gene, *xplA*, in the model plant *Arabidopsis* conferred the ability to tolerate and degrade high concentrations of RDX. Additionally, expression of the bacterial nitroreductase gene, *nfsI*, in tobacco and *Arabidopsis* conferred resistance to toxic levels of TNT. Transgenic grass cultivars (Western wheatgrass and switchgrass) that provide resilience, rapid establishment, and good coverage were further developed for use on live-fire training ranges to remediate TNT- and RDX-contaminated soil. Methods for seeding grasses on remote ranges were developed in the form of seedballs. Seedball construction and formulation were optimized to improve germination and establishment. Optimal spacing of the plants for field trials was determined. Test cells were designed and constructed at Fort Drum, New York, for commencement in 2016 of field studies to validate the phytotechnology at demonstration scale. https://www.estcp.com/content/download/40372/387069/file/ER-1498%20Final%20Report.pdf

AIDED PHYTOEXTRACTION OF CU, PB, ZN, AND AS IN COPPER-CONTAMINATED SOILS WITH TOBACCO AND SUNFLOWER IN CROP ROTATION: MOBILITY AND PHYTOAVAILABILITY ASSESSMENT

Hattab-Hambli, N., M. Motelica-Heino, and M. Mench.
Chemosphere 145:543-550(2016) doi: 10.1016/j.chemosphere.2015.11.051

Copper-contaminated soils were managed with aided phytoextraction in 31 field plots at a former wood preserving site using a single incorporation of compost (OM) and dolomitic limestone (DL), followed by crop rotation with tobacco and sunflower. Cu, Zn, Cr, and As phytoavailability was characterized by growing dwarf beans in potted soils and determining the biomass of their plant parts and their foliar ionome. Total Cu concentrations in the soil pore water increased with total soil Cu. Total Cu, Zn, Cr, and As concentrations in soil pore water decreased in year 3 compared to year 2, likely due to annual shoot removals by the plants and lixiviation. Available soil Cu and Zn fractions also declined in year 3. The Cu, Zn, Cr, and As phytoavailability, assessed by their concentration and mineral mass in the primary leaves of beans, was reduced in year 3. *Additional background on the phytoremediation effort at this site is available in an earlier paper at* https://hal-insu.archives-ouvertes.fr/insu-00991112/document.
See also ***pages 91-155*** *in N. Hattab's thesis at* ftp://ftp.univ-orleans.fr/theses/nour.hattab_3309.pdf.

THE EFFECT OF PARTICLE SIZE AND MINERAL LIBERATION ON THE ACID GENERATING POTENTIAL OF SULPHIDIC WASTE ROCK

Opitz, J., M. Edraki, and T. Baumgartl.
Geochemistry: Exploration, Environment, Analysis (2016) [Epub ahead of print]

The study objective was to determine the effect of particle size and mineral liberation on the production of acid rock drainage (ARD) and then to use the information to classify waste rocks from an Australian mine site for their potential use as cover material. Samples crushed and sieved into different particle size fractions were subjected to a series of static and kinetic tests, including paste-pH, acid neutralization capacity, kinetic net acid generation, and humidity cell tests. Results showed a strong influence of particle size, possibly attributable to the widely different mineral liberation characteristics of acid generating and neutralizing minerals. Whereas standard acid base accounting (ABA) resulted in an uncertain or non-acid-forming classification of open-pit waste rocks, the application of modified ABA test procedures using different particle size fractions resulted in an uncertain or potentially acid-forming classification of the very same material. Results demonstrated that the standard ABA procedure may lead to erroneous classification with potentially costly environmental consequences by overlooking the specific mineral liberation effects of particle size.

HYDRAULIC AND ELECTROKINETIC DELIVERY OF REMEDIANTS FOR IN-SITU REMEDIATION

Chowdhury, Ahmed I.A., Ph.D. thesis, University of Western Ontario, Paper 4135, 170 pp, 2016

The first of three studies evaluated nano-scale zero valent iron (NZVI) mobility and subsequent reactivity with in situ contaminants in variably saturated porous media. The NZVI particles, synthesized on site at subzero temperatures, demonstrated complete TCE degradation within the target area. A 3D finite difference model (CompSim) utilized to investigate NZVI mobility in variably saturated zones showed that model-predicted wellhead data agreed very well with field observations, and results suggested that the numerical simulator can be a practical tool for optimal design of NZVI field applications. For the second study, aimed at alleviating back-diffusion from low-permeability porous media, experiments were conducted in a 2D sandbox with alternate vertical layers of coarse sand and silt flooded with TCE at aqueous solubility. Electrokinetics (EK) was used to enhance permanganate delivery through the silt layers. The suite of experiments demonstrated that EK was able to drive more permanganate at a faster rate throughout the silt layers compared to no-EK experiments. The third study investigated a novel approach of EK-assisted persulfate delivery followed by electrical resistance heating (ERH) for persulfate activation in low-permeability soil remediation. EK delivered persulfate throughout the silt, and ERH application successfully activated the persulfate within the porous matrix, leading to complete in situ PCE degradation. http://ir.lib.uwo.ca/etd/4135

AN OVERVIEW OF PREPARATION AND APPLICATIONS OF STABILIZED ZERO-VALENT IRON NANOPARTICLES FOR SOIL AND GROUNDWATER REMEDIATION

Zhao, X., W. Liu, Z. Cai, B. Han, T. Qian, and D. Zhao.
Water Research 100:245-266(2016)

This work provides an update on the latest developments of stabilized nanoscale zero-valent iron (NZVI) for various environmental cleanup uses and reviews the evolution and environmental applications of stabilized NZVI. Comparison of commonly used stabilizers and a discussion of the stabilizing mechanisms are followed by a summary of the effectiveness and constraints of NZVI-based in situ remediation technology. This review also identifies critical knowledge gaps and research needs, such as interactions between delivered NZVI and local biogeochemical conditions.

EFFECT OF TEMPORAL CHANGES IN AIR INJECTION RATE ON AIR SPARGING PERFORMANCE GROUNDWATER REMEDIATION

Neriah, A.B. and A. Paster.
Ground Water, 22 Apr 2016. doi: 10.1111/gwat.12428. [Epub ahead of print]

During implementation of air sparging (AS) for groundwater treatment, a decline in remediation efficiency is often observed when using a constant injection of air (continuous mode), resulting from insufficient mixing of contaminants at the pore scale. It is well known that turning the injection on and off (pulsed mode) can improve remediation performance. Groundwater mixing and

contaminant removal efficiency were investigated in different injection modes (i.e., continuous and pulsed), and then compared to those achieved in a third "rate changing" mode. In this mode, injection is always on, and its rate varies with time by abrupt changes. In the first of two separate sets of experiments conducted in a lab tank, dye plume tracing was used to characterize the mixing induced by AS. In the second set of experiments, the tank was contaminated with a VOC for comparison of remediation efficiency between the different injection modes. As expected, time-variable injection modes led to enhanced mixing and contaminant removal. The decrease in contaminant concentrations during the experiment was found to be double for the rate-changing and pulsed modes compared to the continuous mode, with a slightly preferable performance for the rate-changing mode.
http://www.eng.tau.ac.il/~paster/pubs/14_Groundwater_AirSprg.pdf

NITROAROMATIC DETECTION AND INFRARED COMMUNICATION FROM WILD-TYPE PLANTS USING PLANT NANOBIONICS

Wong, M.H., J.P. Giraldo, S.-Y. Kwak, V.B. Koman, R. Sinclair, T.T.S. Lew, G. Bisker, P. Liu, and M.S. Strano.
Nature Materials (2016) doi:10.1038/nmat4771

Researchers embedded sensors for nitroaromatic compounds into the leaves of spinach plants using a technique called vascular infusion, which involves applying a solution of nanoparticles to the underside of the leaf. The sensors were placed into a leaf layer known as the mesophyll, which is where most photosynthesis takes place. The researchers also embedded carbon nanotubes that emit a constant fluorescent signal to serve as a reference. Comparison of the two fluorescent signals shows whether the explosives sensor has detected anything. If nitroaromatic compounds are present in the groundwater, it takes about 10 minutes for the plant to draw them up into the leaves, where they encounter the detector. To read the signal, the researchers shine a laser onto the leaf, prompting the nanotubes in the leaf to emit near-infrared fluorescent light, which can be detected with a small infrared camera connected to a computer, or possibly a smartphone. These results demonstrate the ability of living plants to function as chemical monitors of groundwater and communication devices to external electronics at standoff distances. See additional information at http://news.mit.edu/2016/nanobionic-spinach-plants-detect-explosives-1031.

DEGRADATION OF LANDFILL LEACHATE COMPOUNDS BY PERSULFATE FOR GROUNDWATER REMEDIATION

Zhong, H., Y. Tian, Q. Yang, M.L. Brusseau, L. Yang, and G. Zeng.
Chemical Engineering Journal 307:399-407(2017) doi:10.1016/j.cej.2016.08.069

In batch experiments, persulfate was compared with H_2O_2 and permanganate for oxidation of organic compounds in groundwater contaminated by landfill leachate (CGW). Complementary experiments were conducted to evaluate biodegradation (natural attenuation) potential for the system. Persulfate was observed to be superior to H_2O_2 and permanganate for degradation of total organic carbon (TOC) in the CGW, whereas biodegradation caused only partial removal of TOC in CGW. Persulfate completely degraded the TOC in CGW or aged CGW, showing no selectivity to the contaminants. Magnetite enhanced degradation of leachate compounds in both CGW and aged CGW with limited increase in persulfate consumption and sulfate production. Under dynamic flow in a 1D column experiment, magnetite enhanced both biodegradation and persulfate oxidation of TOC, although the enhancement was significantly greater for persulfate oxidation. In the batch and column experiments, magnetite by itself caused minimal consumption of persulfate and production of sulfate, indicating that magnetite is a good persulfate activator for treating CGW in heterogeneous systems. Results show that persulfate-based in situ chemical oxidation has great potential to treat CGW.

REVIEW OF CHEMICAL AND ELECTROKINETIC REMEDIATION OF PCBS CONTAMINATED SOILS AND SEDIMENTS

Fan, G., Y. Wang, G. Fang, X. Zhuc, and D. Zhou.
Environmental Science: Processes and Impacts 18(9):1140-1156(2016)

This review provides a general overview of recent developments in chemical treatment and electrokinetic remediation (EK) technologies related to PCBs remediation. Four technologies are reviewed in detail: photocatalytic degradation of PCBs combined with soil washing; Fe-based reductive dechlorination; advanced oxidation processes; and EK/integrated EK technology (e.g., EK coupled with chemical oxidation, nanotechnology, and bioremediation). The fundamental principles and governing factors of the chemical technologies and EK/integrated EK technologies are discussed, along with a comparative analysis (i.e., major advantages and disadvantages) of the technologies and their future prospects for PCBs remediation.

General News

THE ASTM STANDARD GUIDE FOR GREENER CLEANUPS: TEMPORARY COMPLIMENTARY ACCESS

ASTM International, Reston, VA. 2016

The ASTM Standard Guide for Greener Cleanups (E2893-16) provides a systematic protocol for identifying, prioritizing, selecting, implementing, and reporting the use of best management practices (BMPs) to reduce the environmental footprint of site remediation activities. The standard guide includes a list of BMPs linked to the core elements of a greener cleanup and to relevant cleanup technologies; guidelines for quantifying the footprint; and a structure for voluntarily reporting associated outcomes. The complete text of the standard guide is available for viewing at no cost through November 30, 2016, at http://www.astm.org/E2893-16.

CLEANING UP AMERICA'S NUCLEAR WEAPONS COMPLEX: 2015 UPDATE FOR GOVERNORS

Kambour, A., J. Boese, and R. Child.
National Governors Association Center for Best Practices, 48 pp, 2016

This update is intended to provide states with a status report on U.S. Department of Energy (DOE) sites in their jurisdictions and across the DOE complex. The report summarizes recent accomplishments complex-wide and at each major site. Finally, the report identifies issues that are critical to further cleanup progress.
http://www.nga.org/files/live/sites/NGA/files/pdf/2016/1604NuclearCleanUp.pdf

THE 22ND ANNUAL INTERNATIONAL PETROLEUM ENVIRONMENTAL CONFERENCE, DENVER, COLORADO, 17-19 NOVEMBER 2015

University of Tulsa, Continuing Education for Science & Engineering, 2015

Although petroleum issues are the primary focus of the IPEC conferences, topics include a wide variety of contaminant types and innovative treatment technologies. PowerPoint presentations from IPEC 2015 are available for the following technical sessions:

- Produced Water Management, Treatment & Beneficial Re-Use.
- Remediation of Brine Spills & Site Reclamation.
- Bioremediation of Hydrocarbon Impacted Soils & Groundwater.
- Advancements in LNAPL Science.
- In Situ Chemical Oxidation.
- Remediation of Hydrocarbon Releases.
- Site Characterization & Forensic Geochemistry/Soil Vapor Extraction.
- LNAPL Characterization & Recovery.
- Environmental Issues in Production & Use of Unconventional Fuels/Waste Management & Pollution Prevention.
- Bioremediation of Chlorinated Hydrocarbons, Oxygenates & Other.
- Environmental Issues in Hydraulic Fracturing.

http://ipec.utulsa.edu/Conf2015/Agenda/TechnicalSessions_2015.htm

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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