Technology Innovation News Survey

Entries for August 1-15, 2018

Market/Commercialization Information

CALIFORNIA - SYSTEMS O&M AND REMEDIATION

Defense Logistics Agency, DLA Energy, Fort Belvoir, VA.
Federal Business Opportunities, FBO-6039, Solicitation SPE600-18-R-5X23, 2018

DLA Energy is conducting market research to investigate the interest, capability, and availability of small businesses that can provide the following services: (1) environmental assessment and long-term management; (2) potential implementation of new remedial systems; (3) advancement of restoration sites as close to site closure as practicable while maintaining long-term O&M in a cost-effective manner; (4) operation of in-place remediation systems; (5) and emergency response services in California for DFSP Norwalk, DFSP San Pedro, or DFSP Ozol. These services include long-term monitoring, public meetings, and related remediation activities. The Government anticipates awarding three separate firm-fixed-price contracts from this solicitation, one for each of the listed facilities. The proposed solicitation is being considered for a set-aside, NAICS code 562910, size standard 750 employees. The Government invites the submission of brief (5 pages max) statements of capability from the following small business categories: small business, small disadvantaged business, 8(a), HUBZone, service-disabled veteran-owned, and woman-owned small business concerns. The expected period of performance is November 1, 2019, through October 31, 2023. Capabilities statements must be received by 2:00 PM ET on October 12, 2018. The solicitation for this requirement will be posted under a separate notice number. https://www.fbo.gov/spg/DLA/J3/DFSC/SPE600-18-R-5X23/listing.html

MIXED WASTE

Department of the Navy, Naval Sea Systems Command, Norfolk Naval Shipyard, VA.
Federal Business Opportunities, FBO-6033, Solicitation N42158-18-R-E004, 2018

This presolicitation notice is issued to advise interested contractors that the Norfolk Naval Shipyard, Contracting Department, Services Division intends to negotiate an IDIQ Contract on an unrestricted basis in support of the Naval Nuclear Propulsion Program (NNPP) for contractor services for transportation, treatment, and disposal of NNPP waste materials. The waste materials may have both a hazardous component (defined under RCRA - 40 CFR 260 through 270) and a radioactive component. In addition, some waste material may contain TSCA-regulated PCBs, asbestos, and material identified with state-only hazardous waste codes. Treatment methods used must ensure that the final waste form meets Land Disposal Restriction standards per 40 CFR 268, and the Waste Acceptance Criteria and Radioactive Material License requirements of all applicable disposal sites. The waste materials shall be handled and disposed of according to all applicable federal, state, and local laws and regulations. Detailed specifications shall be set forth within the written solicitation. The period of performance for the resulting contract will be for one 12-month base period and four 12-month option periods, including an option to extend services. The NAICS code for this acquisition is 562211, small business size standard $38.5M. Release of the RFP on FedBizOpps is anticipated on or about November 26, 2018.
https://www.fbo.gov/notices/183ec346318164f2462058cb734806d33

Cleanup News

TECHNICAL MEMORANDUM: FT007 ISCR MITIGATION INJECTION ROUND 1

Kansas Department of Health and Environment (KDHE), 15 pp, 2017

This technical memorandum outlines the field activities to be completed as part of a mitigation injection event for in situ chemical reduction (ISCR) treatment at FT007 (Fire Training Area 7), McConnell AFB. In October and November 2014, an initial injection of zero-valent iron (ZVI) was completed in 116 injection points at FT007 to treat chlorinated VOC contamination in the groundwater. Performance monitoring results in March 2017 indicated the initial ZVI injections affected contaminant concentrations in that a majority of the TCE contamination had been treated and remained below its USEPA MCL/KDHE risk-based standards value at all performance monitoring wells except one (MW13R at 7.7 µg/L). Cis-1,2-DCE, trans-1,2-DCE, and VC were detected above their USEPA MCL/KDHE RSK values of 70 µg/L, 100 µg/L, and 2 µg/L, respectively, at two or more monitoring wells where contaminant concentrations had decreased from baseline concentrations but remained above their respective regulatory values. The FT007 mitigation injection activities are described. See this memorandum and other technical site information under Documents/Photos at http://kenexa.kdhe.state.ks.us/plsql/SI_Pub_Detail?id=C08271468.

INTERIM MEASURES REMEDIAL DESIGN REPORT, FORMER SCHLAGE LOCK FACILITY, 213 RED IRON ROAD, ROCKY MOUNT, NORTH CAROLINA

North Carolina Dept. of Environmental Quality (NC DEQ), 405 pp, 2018

The facility consists of a 49.15-acre property that includes a 196,000 ft^2 building and a remediation outbuilding. Remediation of the vadose zone and aquifer matrix materials source areas is intended to facilitate the long-term objective of risk-based closure and reduction or elimination of the groundwater extraction and sub-slab vapor depressurization system operational requirements. This report describes the results of a supplemental investigation conducted to update the target treatment zones, and provides the final design of the in situ thermal remediation (ISTR) treatment system in Appendix A. The goal is to remove chlorinated VOCs (PCE, TCE, cDCE, tDCE, 1,1-DCE, and VC) predominantly from the vapor phase, potentially as a NAPL phase, and as dissolved contaminants in extracted groundwater. ERH was chosen over thermal conductive heating because of its ability to work in the vadose zone; provide uniform heating of the treatment zone; and allow safe application beneath buildings and sensitive infrastructure. [NC DEQ approved this design in June 2018.]
http://edocs.deq.nc.gov/WasteManagement/0/edoc/1088189/NCD065300519_Former%20Schlage%20Lock_Corrective%20Action_20180402.pdf

IMPLEMENTING SUSTAINABLE REMEDIATION VIA BIOSTIMULATION TO EXPEDITE SITE CLOSURE OF A LARGE DISSOLVED TCE PLUME IN NORTHERN GEORGIA

Morris, K.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 33, 2018

A full-scale bioremediation approach via stimulation of the indigenous microbes to achieve anaerobic reductive dechlorination was developed and implemented to remediate TCE-impacted groundwater at an industrial facility in Northern Georgia. This bioremediation strategy replaced an ineffective and energy-intensive electro-chemical remedy that operated for over 5 years. The biostimulation design included both source area treatment to address elevated residual TCE concentrations and a permeable injection biobarrier to mitigate additional migration of dissolved phase TCE offsite. In January-February 2009, injections of emulsified vegetable oil (NewmanZone) into 70 wells totaled 98,000 gal of solution, comprising 95,000 gal of water and 3,000 gal of substrate. Groundwater pumped from a bedrock well provided mixing and flushing water together with hydrant water. Analysis of groundwater in the source area continues to show the lowest TCE concentrations since sampling began in 1993 (from an average concentration of 6 mg/L to < 5 µg/L). Innocuous reductive dechlorination end products ethene and ethane were also detected at concentrations as high as 120 ppb in three of the source area wells. Monitoring wells downgradient of the injection barrier show a decreasing trend 4 years after injection completion. Low TCE concentrations and detections of ethene and ethane indicate that the biobarrier continues to remain effective > 2 years after initial biostimulation. Trend analysis of data from the site monitoring wells indicates that natural attenuation can be proposed as the final remedy for an additional 2-year period, which is anticipated to lead to site closure ~15 years ahead of the original closure estimates.

IN-SITU GEOCHEMICAL STABILIZATION (ISGS) FOR NON-AQUEOUS PHASE LIQUID TREATMENT: TECHNICAL ASSESSMENT

Scalzi, M. and A. Karachalios.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 40-41, 2018

In situ geochemical stabilization (ISGS) technology entails the use of a modified permanganate solution that targets NAPL mass removal and flux reduction. As the permanganate solution migrates through the treatment area, geochemical reactions occur that destroy targeted contaminants that are present in the dissolved phase. The NAPL then starts to steadily lose its more labile components and "hardening" occurs. Subsequently a net increase in viscosity of the organic material is observed, yielding a more stable, recalcitrant residual mass. Both the insoluble manganese dioxide precipitated by permanganate oxidation and other mineral species included in the ISGS formulation accumulate along with the NAPL interface, acting in the physical coating of the NAPL and thereby reducing the flux of dissolved-phase constituents into the groundwater. ISGS was implemented at a site located in northern New Jersey to decrease the source area NAPL present. Post remedial data showed the ISGS technology was very effective in addressing the groundwater and the free product contamination in all five targeted monitoring wells. The free product that was present in the five wells disappeared within 30 days of the injection event.

Demonstrations / Feasibility Studies

VALIDATION OF BIOTECHNOLOGY FOR QUANTIFYING THE ABUNDANCE AND ACTIVITY OF VINYL-CHLORIDE OXIDIZERS IN CONTAMINATED GROUNDWATER: GUIDANCE DOCUMENT

Mattes, T.
ESTCP Project ER-201425, 40 pp, 2018

The purpose of this project was to evaluate qPCR-based molecular diagnostic tools for the purpose of estimating the attenuation contribution of VC-oxidizing bacteria. Groundwater and aquifer samples were taken from several DoD sites. The method targeted functional genes used by etheneotrophic bacteria in the aerobic VC biodegradation pathway. Functional genes associated with both VC oxidation and VC reduction were found present and expressed in groundwater samples. The researchers determined this by analyzing the relationships between functional genes associated with VC biodegradation and geochemical parameters, as well as the bulk VC attenuation rate at these contaminated sites. This novel technology promises to reveal the abundance and functionality of etheneotrophs at VC-contaminated sites. When this information is provided alongside a site-wide VC degradation rate, it could provide evidence that aerobic VC biodegradation is a significant contributor to overall VC natural attenuation processes. https://www.serdp-estcp.org/content/download/47715/454864/file/ER-201425%20Guidance%20Document.pdf

ASSESSMENT OF POST REMEDIATION PERFORMANCE OF A BIOBARRIER OXYGEN INJECTION SYSTEM AT A METHYL TERT-BUTYL ETHER (MTBE)-CONTAMINATED SITE, MARINE CORPS BASE CAMP PENDLETON, SAN DIEGO, CALIFORNIA

Neil, K., T. Chaudhry, K.H. Kucharzyk, H.V. Rectanus, C. Bartling, P. Chang, and S. Rosansky.
ESTCP Project ER-201588, 284 pp, 2017

Project ER-201588 was conducted to evaluate the long-term performance of natural attenuation of MTBE after shutdown of a biobarrier system. The long-term impact of the biobarrier system on formation permeability was assessed via slug tests. In addition to evaluating data collected using conventional monitoring techniques, this project applied metagenomics and metaproteomics to improve the understanding of long-term impacts of the remedy on biodegradation at the site.
https://www.serdp-estcp.org/content/download/47650/454318/file/ER-201588%20Final%20Report.pdf

LONG-TERM PERFORMANCE ASSESSMENT AT A HIGHLY CHARACTERIZED AND INSTRUMENTED DNAPL SOURCE AREA FOLLOWING BIOAUGMENTATION: ESTCP COST AND PERFORMANCE REPORT

Schaefer, C.E., G.M. Lavorgna, M.D. Annable, and A. Haluska.
ESTCP Project ER-201428, 67 pp, 2018

Monitoring was performed using soil sampling, passive flux meters, and push-pull tracer testing up to 3.7 years following active bioremediation of chlorinated ethene DNAPL source areas located at Alameda Point, Calif. Results showed that despite the absence of lactate, lactate fermentation transformation products, or hydrogen, biogeochemical conditions remained favorable for the reductive dechlorination of chlorinated ethenes. While ethene levels suggested relatively low dechlorination of the parent TCE and daughter products, compound-specific isotope analysis (CSIA) showed that the extent of complete dechlorination was much greater than indicated by ethene generation. Results of the push-pull tracer testing confirmed that DNAPL remained in a portion of the source area, consistent with soil and groundwater data. Reliance on ethene generation alone as an indicator of complete dechlorination significantly underestimated the extent of complete dechlorination, as CSIA analysis provided a more reliable estimate of dechlorination than reliance on ethene generation alone.
https://www.serdp-estcp.org/content/download/47711/454836/file/ER-201428%20Cost%20&%20Performance%20Report.pdf **See also the manuscript version of a paper prepared by the project participants to describe the conceptual model at https://www.serdp-estcp.org/content/download/47717/454884/file/ER-201428%20Conceptual%20Model%20Report.pdf

SUSTAINED IN SITU CHEMICAL OXIDATION (ISCO) OF 1,4-DIOXANE AND CHLORINATED VOCS USING SLOW-RELEASE CHEMICAL OXIDANT CYLINDERS

Evans, P., J. Hooper, M. Lamar, D. Nguyen, P. Dugan, M. Crimi, and N. Ruiz.
ESTCP Project ER-201324, 576 pp, 2018

Slow-release chemical oxidant cylinders were applied to the treatment of a plume containing 1,4-dioxane and chlorinated VOCs (1,2-DCE, 1,1-DCA, cis-1,2-DCE, and TCE) in a technology demonstration conducted at Naval Air Station North Island, Calif. The objectives were to demonstrate and evaluate the technology's effectiveness, sustainability, longevity, oxidant transport and destruction, implementability, secondary water quality impacts, and technology reproducibility. Unactivated persulfate embedded in a slow-release paraffin wax formulation was emplaced in two 4-inch wells housed inside 18-inch diameter boreholes. The majority of the project's performance objectives were met. The oxidant cylinders are commercially available, but equipment for suspending cylinders in wells or reactive gates is not standardized and will require engineering design and possible custom fabrication.
https://www.serdp-estcp.org/content/download/47649/454308/file/ER-201324%20Final%20Report.pdf

ELECTROKINETIC-ENHANCED (EK-ENHANCED) AMENDMENT DELIVERY FOR REMEDIATION OF LOW PERMEABILITY AND HETEROGENEOUS MATERIALS

Cox, E., J. Wang, D. Reynolds, D. Gent, M. Singletary, and A. Wilson.
ESTCP Project ER-201325, 204 pp, 2018

Electrokinetic (EK)-enhanced amendment delivery for in situ bioremediation (EK-BIO) via enhanced reductive dechlorination of a PCE source area in clay was conducted at Naval Air Station Jacksonville, Florida. The EK-enhanced amendment delivery technology entails the establishment of an electric field in the subsurface using a network of electrodes. The electrical current and voltage gradient established across a direct-current electric field provide the driving force to transport remediation amendments, including electron donors, chemical oxidants, and even bacteria, through the subsurface. The EK demonstration system consisted of 9 electrode wells and 8 supply wells located within a target treatment area measuring ~40 ft by 40 ft. The remediation amendments distributed by the EK system included electron donor (lactate provided as potassium lactate), pH control reagents (potassium carbonate), and a dechlorinating microbial consortium (KB-1®) containing *Dehalococcoides*. Project results showed that EK achieved relatively uniform transport in low-permeability materials. https://www.serdp-estcp.org/content/download/47648/454298/file/ER-201325%20Final%20Report.pdf

Research

IN SITU MONITORING OF GROUNDWATER CONTAMINATION USING THE KALMAN FILTER

Schmidt, F., H.M. Wainwright, B. Faybishenko, M. Denham, and C. Eddy-Dilek.
Environmental Science & Technology 52(13):7418-7425(2018)

Scientists at DOE's Lawrence Berkeley and Savannah River national laboratories have developed a low-cost method for real-time monitoring of pollutants using commonly available sensors. Conventional methods of monitoring involve taking water samples every year or every quarter and analyzing them in the lab, whereas this new methodology allows continuous monitoring in situ using proxy measurements, which enables the tracking of plume movement in real time. The framework uses principal component analysis to identify correlations between the contaminant concentrations of interest and in situ measurable variables. The Kalman filter is applied to estimate contaminant concentrations continuously and in real time by coupling data-driven concentration-decay models with the previously identified data correlations. The approach was demonstrated with historical groundwater data from the Savannah River Site F-Area, using specific conductance and pH data to estimate tritium and uranium concentrations over time.

AN EFFECTIVE KALMAN FILTER-BASED METHOD FOR GROUNDWATER POLLUTION SOURCE IDENTIFICATION AND PLUME MORPHOLOGY CHARACTERIZATION

Jiang, S., J. Fan, X. Xia, X. Li, and R. Zhang.
Water 10:1063(2018)

To tackle the challenges (optimal design of monitoring network, heavy computational burden, unexpected uncertainties, and erroneous measurements) in identifying pollution sources and plume morphology characterization, the Kalman filter method was adopted as the core algorithm. The concept of a concentration field library was invented to speed up the calculation of the inverse problem, and the covariance reduction, alpha-cut technique of fuzzy set, and linear programming model were incorporated into the Kalman filter method to realize the optimal monitoring network design and identify pollution source location and source fluxes. The performance of the proposed Kalman filter-based method for groundwater pollution source identification and plume characterization was assessed in a hypothetical aquifer model that included the random hydraulic conductivity field, measurement errors, and unknown uncertainty.

http://www.mdpi.com/2073-4441/10/8/1063/pdf

USING PCA & REPEATED ANOVA TO EVALUATE THE IN SITU BIOREMEDIATION PERFORMANCE OF SITES CONTAMINATED BY TRICHLOROETHYLENE

Chen, Xinyao, Master's thesis, Halmstad University, Sweden. 47 pp, 2018

In this study, principal components analysis (PCA) and repeated analysis of variance (ANOVA) were used to analyze the trends of variables over time to aid in the interpretation of the performance of an in situ bioremediation technique. The variables that most effectively described bioremediation performance were identified as Fe^{2+}, DOC, Mn^{2+}, methane, and alkalinity. Their dramatic changes with time indicated the active functioning of dechlorinating bacteria to remediate contamination. Three groups of indicators were identified according to their trends over time having a certain consistent character: (1) methane and ethane, (2) chloride, sulfate, and alkalinity, and (3) cDCE and tDCE. PCA can be an effective tool to analyze the overall trends and transformation pattern of variables over time and at different sampling points within the site, although the fragmented data set in this study reduced the possibilities for a complete understanding of the site's remediation process. http://hb.diva-portal.org/smash/record.jsf?pid=diva2%3A1230514&dswid=-5980

FIELD SCALE MOBILITY AND TRANSPORT MANIPULATION OF CARBON-SUPPORTED NANOSCALE ZEROVALENT IRON IN FRACTURED MEDIA

Cohen, M. and N. Weisbrod.
Environmental Science & Technology 52(14):7849-7858(2018)

In field applications, mostly in porous media, transport of stabilized nanoscale zero-valent iron particles (NZVI) has not exceeded a few meters in range. In the present study, the transport of carbo-iron colloids (CIC), a composite material of activated carbon as a carrier for NZVI stabilized by carboxymethyl cellulose (CMC), was tested under field conditions. The field site lies within a fractured chalk aquitard characterized by moderately saline groundwater. A forced-gradient tracer test was conducted where one borehole was pumped at a rate of 8 L/min and CMC-stabilized CIC was introduced at an injection borehole 47 m upgradient. Two CIC-CMC field applications were conducted: one used high 100% wt CMC (40 g/L) and a second used lower 9% wt loading (~2.7 g/L). Iodide was injected as a conservative tracer with the CIC-CMC in both cases. The ratio between the CIC-CMC and iodide recovery was 76% and 45% in the high and low CMC loading experiments, respectively. During the low CMC loading experiment, an increase in the pumping rate led to an additional CIC recovery of 2.5%. Results show the potentially high mobility of NZVI in fractured environments and the opportunity for transport manipulation through the adjustment of stabilizer concentration and transport velocity.

FIELD-SCALE MULTI-PHASE LNAPL REMEDIATION: VALIDATING A NEW COMPUTATIONAL FRAMEWORK AGAINST SEQUENTIAL FIELD PILOT TRIALS

Lari, K.S., C.D. Johnston, J.L. Rayner, and G.B. Davis.
Journal of Hazardous Materials 345:87-96(2018)

Field-scale pilot trials of multi-phase LNAPL remediation were undertaken at a site to determine the effectiveness of recovery options. Sequential LNAPL skimming and vacuum-enhanced skimming conducted over 78 days, with and without water table drawdown, extracted over 5 m^3 of LNAPL. A multi-component simulation framework (including the multi-phase multi-component code TMVOC-MP and processing codes) was developed and applied to simulate the broad range of multi-phase remediation and recovery methods used in the field trials. This framework was validated against the sequential field pilots by comparing predicted and measured LNAPL mass removal rates and compositional changes. Simulations mimicked trends in LNAPL recovery rates (0.14-3 mL/s) across all remediation techniques, each of which operated over periods of 4-14 days during the 78-day trial. The code also approximated order of magnitude compositional changes of hazardous chemical concentrations in extracted gas during vacuum-enhanced recovery. The verified framework enables longer-term prediction of the effectiveness of remediation approaches, allowing for more accurate determination of remediation endpoints and long-term risks. http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=5061&context=ecuworkspost2013

ETHANOL CONTENT IN DIFFERENT GASOHOL BLEND SPILLS INFLUENCES THE DECISION-MAKING ON REMEDIATION TECHNOLOGIES

Vilela Steiner, L., D. Toledo Ramos, A.M. Rubini Liedke, M.P. Serbent, and H.X. Corseuil.
Journal of Environmental Management 212:8-16(2018)

Gasohol blend spills with variable ethanol content exert different electron acceptor demands in groundwater. Researchers conducted a comparison of two gasohol releases (E10 (10:90 ethanol and gasoline, v/v) and E25 (25:75 ethanol and gasoline, v/v) under natural attenuation (NA) and nitrate biostimulation, respectively, to assess the most effective remediation strategy for each gasohol release. Microbial communities were assessed to support geochemical data as well as to enable characterization of population shifts that evolved during biodegradation processes in E25 and E10 field experiments. Results revealed that whereas NA processes supported ethanol and BTEX biodegradation in the E10 release, nitrate reduction in the E25 release was largely responsible for ethanol and BTEX biodegradation. First-order decay constants demonstrated that ethanol degradation rates were similar for both NA and nitrate biostimulation, while BTEX compounds exhibited different degradation rates that were higher under NA. These results illuminate how ethanol content in different gasohol blends can influence decision-making on the most suitable remediation technology.
http://pngea.posgrad.ufsc.br/files/2017/10/CIEMA7151.pdf

RELEASE OF ELECTRON DONORS DURING THERMAL TREATMENT OF SOILS

Marcet, T.F., N.L. Capiro, L.A. Morris, S.M. Hassan, Y. Yang, F.E. Loeffler, and K.D. Pennell.
Environmental Science & Technology 52(6):3642-3651(2018)

To evaluate the potential of thermal treatment of soil and groundwater to provide an in situ source of soluble organic compounds and hydrogen that could stimulate microbial reductive dechlorination at chlorinated solvent sites, a study was conducted to identify and quantify the release of electron donors and fermentable precursors during soil heating and to estimate availability of these compounds following thermal treatment. The project findings will allow for more reliable prediction of substrate release during thermal treatment, supporting the implementation of coupled thermal and biological remediation strategies. This research received support from SERDP Project ER-2129; see more at https://www.serdp-estcp.org/content/download/47278/451071/file/ER-2129%20Final%20Report.pdf

NUMERICAL MODELING TO EVALUATE THE PERFORMANCE OF SLOW-RELEASE CANDLES FOR GROUNDWATER REMEDIATION

Liu, Chuyang, Master's thesis, University of Nebraska, 119 pp, 2017

Slow-release candles (SRCs) have been developed as a cost-effective technology to treat groundwater contaminants by passively delivering oxidants into the subsurface over a long time frame. In this thesis, a numerical model was developed to simulate oxidant release kinetics, transport, and reaction at field scale. Parameters of the model were obtained from a field site with SRCs installed. Modeling results showed that the oxidant radius of influence (ROI) was affected by the relative contribution of reaction and solute transport and that limited lateral spreading could be an issue to restrict SRC application. Enhanced aeration could increase or decrease the ROI of a candle, dependent on the incoming contaminant concentration. Enhanced mixing due to aeration could reduce the concentration of persulfate adjacent to the candle and greatly improve ROI when the incoming contaminant concentration is relatively low. A very high incoming contaminant concentration might reduce the ROI. The model developed in this work can be adapted to simulate SRC remediation under a variety of field scenarios. http://digitalcommons.unl.edu/civilengdiss/117/

SURFACTANT-ENHANCED FLUSHING ENHANCES COLLOID TRANSPORT AND ALTERS MACROPOROSITY IN DIESEL-CONTAMINATED SOIL

Guan, Z., X.Y. Tang, T. Nishimura, H. Katou, H.Y. Liu, and J. Qing.
Journal of Environmental Sciences (China) 64:197-206(2018)

Surfactant-enhanced soil flushing is a common remediation technique for soils contaminated by hydrophobic organic chemicals. Soil flushing with linear alkylbenzene sulfonates (LAS, an anionic surfactant) was conducted for intact columns (15 cm diameter and 12 cm length) of diesel-contaminated farmland purple soil aged for one year in the field. Removal rate of n-alkanes (representing the diesel) varied with the depth of the topsoil in the range of 14-96%, while the n-alkanes present at low concentrations in the subsoil were completely removed by LAS-enhanced flushing. Much higher colloid concentrations and larger colloid sizes were observed during LAS flushing in column outflow compared to water flushing. The X-ray micro-computed tomography analysis of flushed and unflushed soil cores showed that the proportion of fine macropores (30-250 μm in diameter) was reduced significantly by LAS flushing. This phenomenon can be attributed to increased clogging of fine macropores by colloids, which exhibited higher concentration due to better dispersion by LAS. http://www.jesc.ac.cn/jesc_en/ch/reader/create_pdf.aspx?file_no=S1001074216315297&year_id=2017

A REVIEW OF GLOBAL ENVIRONMENTAL MERCURY PROCESSES IN RESPONSE TO HUMAN AND NATURAL PERTURBATIONS: CHANGES OF EMISSIONS, CLIMATE, AND LAND USE

Obrist, D., J.L. Kirk, L. Zhang, E.M. Sunderland, M. Jiskra, and N.E. Selin.
Ambio 47:116-140(2018)

This paper contains a review of recent progress in understanding the global cycling of mercury (Hg), including best estimates of Hg concentrations and pool sizes in major environmental compartments and exchange processes within and between these reservoirs. Recent advances include the availability of new global datasets covering areas of the world where environmental Hg data were previously lacking. Integration of these data into global and regional models is continually improving estimates of global Hg cycling. New analytical techniques, such as Hg stable isotope characterization, provide novel constraints of sources and transformation processes. The major global Hg reservoirs that are, and continue to be, affected by anthropogenic activities include the atmosphere (4.4-5.3 Gt), terrestrial environments (particularly soils: 250-1000 Gg), and aquatic ecosystems (e.g., oceans: 270-450 Gg).
https://link.springer.com/content/pdf/10.1007%2Fs13280-017-1004-9.pdf

THE SUCCESSION OF THE PLANT COMMUNITY ON A DECONTAMINATED RADIOACTIVE MEADOW SITE

Maystrenko, T., B. Gruzdev, E. Belykh, and A. Rybak.
Journal of Environmental Radioactivity 192:687-697(2018)

The development of an arboreal willow meadow at a radioactively contaminated site under remediation has been studied for half a century. Succession stages in the reestablishment of the plant community were noted, and changes in the floristic composition, soil structure, and radionuclide activity concentrations in topsoil were registered at each step. Initial recultivation of the area included covering radioactive wastes with a mixture of sand and gravel, which lowered radiation levels during the first 5 to 8 years and allowed the plant community to develop with maximal effectiveness. Eventually the covering layer lost its barrier functions, but no adverse effects were observed at dose rates up to 150?μGy/h once the plant community was established. These results provide a practical demonstration that soil niches, climatic conditions, and relationships between plants played a more important role in the evolution of the studied community than the contamination type and radiation exposure levels.

BIOGEOCHEMICAL CONTROLS ON STRONTIUM FATE AT THE SEDIMENT-WATER INTERFACE OF TWO GROUNDWATER-FED WETLANDS WITH CONTRASTING HYDROLOGIC REGIMES

Boyer, A., M. Hatat-Fraile, and E. Passeport.
Environmental Science & Technology 52(15):8365-8372(2018)

Radioactive strontium (Sr) is a common groundwater contaminant at many nuclear sites. Although its natural retention in groundwater-fed wetlands suggests an attractive remediation strategy, the biogeochemical mechanisms controlling Sr transport at the sediment-water interface are poorly understood at present. In a field study, Sr fate was investigated in two wetlands with contrasting vegetation and hydrologic regimes: a marshland and a swamp. The marsh was an open-water wetland with constant water table and no emergent vegetation. The swamp was vegetated with fluctuating water levels and a thick mat of submerged cattail litter in the water column. High-resolution porewater Sr concentrations and solid-phase sediment Sr species revealed distinct profiles between the two wetlands. The marsh exhibited a strongly reduced environment and sharp concentration peaks at the sediment-water interface. In contrast, the smaller concentration gradients of the swamp resulted in a reduced flux of Sr to the surface water. The organic fraction of the sediment dominated Sr retention compared to the inorganic iron and manganese oxides. The marsh, however, had a significant fraction of recalcitrant Sr, presumably due to its incorporation into sulfur and/or carbonate minerals. Project results suggest that vegetated wetlands with fluctuating hydrologic regimes could act as efficient sinks for Sr pollution.*See more in A. Boyer's thesis at* https://tspace.library.utoronto.ca/handle/1807/79482

General News

ADVANCES IN THE STATE OF THE PRACTICE FOR ENHANCED IN SITU BIOREMEDIATION

Kucharzyk, K. and S. Rosansky.
Naval Facilities Engineering Command, TR-NAVFAC EXWC-EV-1806, 26 pp, 2018

Enhanced in situ bioremediation (EISB) is an engineered technology that introduces physical, chemical, and biological changes to the aquifer to create the conditions necessary for microorganisms to transform contaminants of concern to innocuous byproducts. Recent innovations and trends to facilitate successful application are introduced. While this document discusses current industry-accepted best practices to design and apply EISB with a primary focus on chlorinated ethene remediation, it also discusses progress in identifying microorganisms capable of degrading 1,4-dioxane.
https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/e/EISB-Advances-Final-022018.docx.pdf

TREATMENT WETLANDS

Dotro, G., G. Langergraber, P. Molle, J. Nivala, J. Puigagut, O. Stein, and M. von Sperling.
IWA Publishing, 172 pp, 2017

Treatment Wetlands is the seventh volume in the Biological Wastewater Treatment series, which gives a state-of-the-art presentation of the science and technology of wastewater treatment. The major variants of wetland systems are covered in this volume: (i) horizontal flow wetlands; (ii) vertical flow wetlands; (iii) French vertical flow wetlands; (iv) intensified wetlands; (v) free water surface wetlands; and (vi) other applications of treatment wetlands. The book presents the main concepts, working principles, expected performance, design criteria, design examples, construction aspects, and operational guidelines for each type of wetland. The text has been prepared by a team of international experts in this field. *The book is* ***Open Access*** *at*https://iwaponline.com/ebooks/book-pdf/1843/wio9781780408774.pdf

DRAFT GREAT LAKES BINATIONAL STRATEGY FOR MERCURY RISK MANAGEMENT

Environment and Climate Change Canada & U.S. EPA, 54 pp, 2018

This document outlines a binational strategy for mercury to focus efforts of the governments of Canada and the United States, in cooperation and consultation with state and provincial governments, tribal governments, First Nations, Metis, municipal governments, watershed management agencies, other local public agencies, industry, and the public in implementing risk mitigation and management options aimed at reducing mercury in the Great Lakes region. The parties and their partners will use this strategy as guidance to identify, prioritize, and implement actions to reduce chemicals of mutual concern. The parties commit to incorporating, to the extent feasible, options outlined in their decisions on programs, funding, and staffing, while implementation would take place by agencies with mandates to undertake work in these areas. https://binational.net/wp-content/uploads/2018/05/Mercury_Strategy_Draft-Apr-25-2018.pdf

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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