Technology Innovation News Survey

Entries for November 16-30, 2016

Market/Commercialization Information

ARSENIC SENSOR CHALLENGE

The U.S. Bureau of Reclamation seeks to identify new or improved sensors, devices, or test kits to test for arsenic in water within natural and engineered systems. Solutions must improve on the current arsenic measurement methods. Areas of needed improvement include performance, ease of use, reduction in hazardous waste production, data interpretation, and cost. This is Stage 1 of a planned two-stage Challenge, with the second stage consisting of a prototype demonstration. The challenge is open until March 13, 2017. For more information: https://www.challenge.gov/challenge/arsenic-sensor/

PERFORM WELL ABANDONMENT AT HURLBURT FIELD FLORIDA

Department of the Air Force, AFICA - CONUS.
Federal Business Opportunities, FBO-5501, Solicitation FA8903-17-R-0029, 2016

The 772d Enterprise Sourcing Squadron/Environmental Contracting at JBSA Lackland, Texas, requires a contractor to perform abandonment of Installation Restoration Program wells at Hurlburt Field, Florida, during the 12-month period of performance. The contractor shall perform all necessary activities required to meet the requirements identified in the performance work statement. A single firm-fixed-price contract will be awarded under NAICS code 562910, Environmental Remediation Services. This requirement is issued as a 100% small business set-aside. Quotes must be received by 2:00 PM CT on January 17, 2017. Funds are not presently available for this effort; no award will be made under this solicitation until funds are available. https://www.fbo.gov/notices/0680ee3d833a2f3581c4220aef1b0547

TECHNICAL SUPPORT FOR UNDERGROUND FIELD CONSTRUCTED TANKS

U.S. EPA, Office of Acquisition Management, Region IX, San Francisco.
Federal Business Opportunities, FBO-5503, Solicitation SOL-R9-17-00001, 2016

This acquisition is unrestricted under NAICS 541620. The Navy's Red Hill Underground Fuel Storage Facility is a complex of 20 very large (~250 ft high x 100 ft diameter) field-constructed tanks (FCTs), four large FCTs, and associated piping network, pumping station, control room and fueling pier located at and near Pearl Harbor on the island of Oahu, Hawaii. Each underground tank is connected to a pipeline that runs ~2.5 miles through an underground tunnel from the facility to the fueling pier at Pearl Harbor. Over its 70+ years the facility has experienced fuel leaks that released unknown quantities of petroleum products around the facility. EPA, the Hawaii Department of Health (DOH), the U.S. Navy, and the Defense Logistics Agency (DLA) signed an Administrative Order on Consent (AOC) that requires the Navy and DLA to take steps to protect the groundwater resource in the facility vicinity. The purpose of this contract is for EPA and DOH to secure advice and technical support from a tank industry expert. The AOC requires the Navy and DLA to perform evaluations in the areas of (1) tank inspection, repair, and maintenance; (2) technologies to upgrade tank design and operation; (3) determining the extent and effects of metal corrosion and fatigue on tank operations; (4) leak detection technologies and practices; and (5) facility risk assessment. The contract's period of performance runs from date of award through September 30, 2021. Submit responses by 9:00 PM ET on January 19, 2017. Details of this procurement are available only on FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-R9-17-00001&agency=EPA [Note: It might be necessary to copy and paste the URL into your browser for direct access.].

ENVIRONMENTAL REMEDIATION: BEDROCK REMOVAL

U.S. Army Corps of Engineers, USACE District, Kansas City.
Federal Business Opportunities, FBO-5501, Solicitation W912DQ-17-R-3004, 2016

This solicitation will be set aside for eligible small business concerns registered under NAICS 562910, Environmental Remediation Services. The 1200 Area at the former Kansas Army Ammunition Plant refers to ~49 acres in its south-central portion. In 2007, USACE performed a remedial action that included excavation and off-site disposal of soil contaminated with Cr(VI) and PCBs. In November 2011, USACE implemented corrective measures consisting of investigation trenches and subsequent excavation of 100 x 250 ft of material down to the top of the weathered limestone, ranging from 5 to 6 ft bgs. Cr(VI) is expected to be the only contaminant exceeding the cleanup criteria at the 1200 Area. Results from confirmation sampling performed as part of the soil removal will be compared to the cleanup criteria for Cr(VI), and additional soil removal will be performed as needed. Bedrock excavation volumes are based on findings documented in the Final Pre-Design Investigation Work Summary (USACE 2016). Confirmation sampling of bedrock will not be conducted under this contract, but samples of bedrock will be collected by USACE or one of its contractors immediately after excavation. Release of the solicitation is anticipated on or about January 6, 2017, with subsequent award of a construction contract estimated between $1M and $5M.
https://www.fbo.gov/spg/USA/COE/DACA41/W912DQ-17-R-3004/listing.html

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT, SECTION 128(A) STATE IMPLEMENTATION SUPPORT GRANT

Environmental Protection Agency Funding Opportunity EPA-OLEM-OBLR-17-02, 2016

EPA anticipates awarding one cooperative agreement to support state implementation for CERCLA 128(a) and other brownfield-related issues. The purpose of this cooperative agreement is to fund research, training, and technical assistance to promote and stimulate information exchange among state officials managing solid, hazardous, and brownfield response programs and EPA officials; enable joint resolution of CERCLA Section 128(a) co-implementor and co-regulator issues; and identify emerging response program issues that are of interest to states. The maximum amount for the cooperative agreement is $1,000,000. The proposal deadline is January 31, 2017.
http://www.grants.gov/web/grants/view-opportunity.html?oppId=290977 *Additional information*:
https://www.epa.gov/brownfields/apply-brownfields-grant-funding

FY17 ENVIRONMENTAL WORKFORCE DEVELOPMENT AND JOB TRAINING GRANTS
Environmental Protection Agency Funding Opportunity EPA-OLEM-OBLR-17-01, 2016

This notice announces the availability of funds and solicits proposals from eligible entities, including nonprofit organizations, to deliver Environmental Workforce Development and Job Training programs that recruit, train, and place local unemployed and under-employed residents with the skills needed to secure full-time employment in the environmental field. While Environmental Workforce Development and Job Training Grants require training in brownfield assessment and/or cleanup, these grants also require that Hazardous Waste Operations and Emergency Response (HAZWOPER) training be provided to all individuals being trained. EPA encourages applicants to develop curricula based on local labor market assessments and employers' hiring needs, while also delivering comprehensive training that results in graduates securing multiple certifications. About 16 awards are anticipated from estimated total program funding of $3M. Applications are due by February 24, 2017.
http://www.grants.gov/web/grants/view-opportunity.html?oppId=290955 *Additional information*:
https://www.epa.gov/sites/production/files/2016-12/documents/17-01.pdf

Cleanup News

USE OF A CHEMICAL OXIDATION MIXING PROCEDURE TO ADDRESS TCE CONTAMINATION IN A FORMER INDUSTRIAL FACILITY
Scalzi, M., A. Karachalios, and W. Meese.
IPEC 2016: 23rd Annual International Petroleum Environmental Conference, 23 slides, 2016

Chemical oxidation was implemented to address TCE contamination at a former manufacturer of automobile parts in Columbus, Ohio. Soils requiring removal were contaminated to a depth of 18 ft at initial solvent concentrations of ~500-2,000 mg/kg. For remediation of a total of 20,000 tons of TCE-contaminated soil, chemical oxidants were mixed with the contaminated soil in 6-ft lifts using an excavator and mixing attachments. Mixing operations were conducted in various levels of personal protective equipment (PPE) from Level D PPE to Level B PPE. Vapor-suppressing foam was used as needed based on air monitoring to prevent any impact on neighboring properties. The treatment achieved rapid reductions in TCE concentrations and no rebound was observed within the treatment areas. Confirmatory analysis indicated that TCE concentrations had declined below the Ohio Voluntary Action Program standards for direct contact on commercial and industrial sites. All treated soil was approved for beneficial reuse and was placed in a soil berm on site. **Slides:** http://ipec.utulsa.edu/Conf2016/MANUSCRIPTS/Meese.pdf

CASE STUDY OF APPLICATION OF ORGANOPHILIC CLAY MATERIALS FOR ADSORPTION OF PETROLEUM ALONG BULKHEAD AT PETROLEUM STORAGE FACILITY
Collins, J. and J. Hull.
IPEC 2016: 23rd Annual International Petroleum Environmental Conference, 20 slides, 2016

A petroleum storage facility utilized organophilic clay (organoclay)-based adsorptive material in a permeable reactive barrier (PRB) design to limit migration of residual contaminants from the shore to the adjacent water body. Studies were performed to evaluate both the adsorptive capacity and the permeability of materials that would be placed in the PRB. This presentation provides an overview of organoclay materials and their use in a PRB application where AquaGate+Organoclay™ or other AquaBlok-based products were installed to sequester or limit the potential spread of contaminants.
Slides: http://ipec.utulsa.edu/Conf2016/MANUSCRIPTS/aquablok.pdf

GRAVITY-FEED DELIVERY OF OXIDANT TO A DILUTE PCP PLUME
Byrd, J. and G. Jirak.
Abstracts of the 10th International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Palm Springs, CA; May 2016). Battelle Press, ISBN: 978-0-9964071-1-3, 2016

Groundwater at a former wood preserving facility in Georgia was affected by releases of pentachlorophenol (PCP) from a lumber dip tank at PCP concentrations up to 7,900 µg/L. An in situ chemical oxidation (ISCO) pilot test using 6.5% sodium permanganate was conducted at the site in 2009. Although PCP concentration decreases up to 95% were observed during the test, pressurized injection resulted in slow injection rates and surfacing of oxidant in the pilot area. When similar issues were observed during full-scale ISCO implementation at the site, gravity-fed delivery of oxidant in and around the source area was selected as an alternative delivery method. In March/April 2014, installation of 300 ft of infiltration gallery trenching included perforated pipe (4 inch diameter) placed within 16 inches of number 57 stone. Each trench was installed at the top of the water table in 15-ft segments with a threaded connector on the upgradient end to accept oxidant and a manhole cover on the downgradient end for observation and cleanout (as necessary). Between July and August 2014, 14,250 gal of 5% $NaMnO_4$ was gravity-fed into the infiltration galleries. Contaminant concentration trends in downgradient monitoring wells, which prior to injection showed a steep increasing trend, declined >50%. The impact of oxidant delivery, as evidenced by a 92% decrease in contaminant concentration, was observed 120 ft downgradient from the closest infiltration gallery. Concentration trends in remaining site wells show decreasing trends, with reductions in PCP concentration of up to 95%.

EFFICACY OF CHEMICAL OXIDATION METHODS ON CARBON TETRACHLORIDE AND CHLOROBENZENE AT A LARGE-SCALE SITE
Montoy, J. and K. Wheeler.
Abstracts of the 10th International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Palm Springs, CA; May 2016). Battelle Press, ISBN: 978-0-9964071-1-3, 2016

At a former chemical storage facility in southern New Jersey undergoing redevelopment, a large-scale ozone sparge system was installed in 2011-2012 to treat soil and groundwater affected mainly with chlorobenzene at concentrations indicative of DNAPL in the subsurface. A large hotspot with concentrations of both chlorobenzene and carbon tetrachloride at DNAPL levels near the fringe of the initial ozone sparge area was addressed in 2014 with citric acid-stabilized hydrogen peroxide and iron present in the formation. Although experience at many sites has shown that chlorobenzene is amenable to destruction by oxidation via both ozone and Fenton's reaction, the literature is mixed on the amenability of carbon tetrachloride to destruction by chemical oxidation. Experience at the subject site shows that the combined effects of ozone sparging (i.e., direct oxidation and stripping) can treat carbon tetrachloride effectively at

medium-high concentrations (e.g., 10,000-100,000 µg/L) but have limited effectiveness in areas that exhibit concentrations indicative of DNAPL and high contaminant mass. Similarly, Fenton's application in the mixed-DNAPL plume shows great success in reducing chlorobenzene concentrations but only limited effectiveness on carbon tetrachloride.

SVE SYSTEM: EXTRACTING VAPOURS AND VALUE

Heffernan, M. and J. Hampson.
RemTech 2016: Remediation Technologies Symposium, 12-14 October, Banff, 20 slides, 2016

Following a condensate pipeline release in Alberta, Canada, condensate impacts were identified to a depth of 10 m, with an impacted soil volume of 25,000 m^3. Assessment activities were combined with remedial pilot testing to work toward a defined end point of spill remediation and cost-effective site closure. Following identification of initial site conditions, pilot testing of soil vapor extraction was conducted during the final impact delineation assessment, which was required to receive regulatory buy-in on the remedial option. Following successful pilot tests on shallow and deep impacts, a full-scale treatment system was approved and installed on site in January 2016. System operation is challenged in that (1) water produced by the system during winter months creates freezing issues, which limits valve mobility; and (2) vacuum shut-down on the deep wells in winter months reduces system functionality. The system is removing contaminant mass, but further system optimization is needed.
Longer abstract: http://www.esaa.org/wp-content/uploads/2016/09/RemTech2016Abstracts-60.pdf
Slides: http://www.esaa.org/wp-content/uploads/2016/10/16-Heffernan.pdf

RAPID REMEDIATION OF BUNKER C FUEL OIL CONTAMINATED SOIL BY CHEMICAL OXIDATION AND USE OF SURFACTANTS AND SOLVENTS FORMULATION

Dominguez-Rodriguez, V.I., R.H. Adams, M. Vargas-Almeida, L. Hernandez-Acosta, and R. Viornery-Soto Zueblin.
IPEC 2016: 23rd Annual International Petroleum Environmental Conference, 17 slides, 2016

Expansion of a thermoelectric plant required remediation of areas previously used for fuel storage and transport. Contaminated soil consisted of a silty-sand alluvium overlying calcareous palustrine sediments, up to 7 m deep. After sieving out rubble and clumps of oil-impregnated silty soil, the remainder had concentrations of ~20,000-70,000 mg/kg. The risk-based cleanup goal for this site was slightly >9,000 mg/kg of heavy oil. A combination of Fenton's reagent and subsequent bioremediation in biopiles was selected to treat the soil. Lab study results indicated an optimal concentration of 1.3% (w/w) of H_2O_2 and addition of surfactant/solvent formulation at 1 L/m^3. These treatments reduced the heavy oil concentration by up to 74%. In the field, the reagents were applied by passing the material in treatment through a crusher-mixer attached to an excavator, while the reagent solution was sprayed onto the soil coming out of the mixer. This strategy achieved very efficient mixing and application of the reagents. Additional mixing to complete the bioremediation cycle reduced the heavy oil concentration in the soil to cleanup goals generally in less than weeks. Optimization of the dosage and the use of specialized mixing equipment were essential to achieve these rapid results.
Slides: http://ipec.utulsa.edu/Conf2016/MANUSCRIPTS/Dominguez.pdf
Abstract: http://ipec.utulsa.edu/Conf2016/ABSTRACTS/Dominguez-Rodriguez_40.pdf

WEATHERED CRUDE CONTAMINATED SOIL TREATMENT BY THERMAL TREATMENT SYSTEMS: CASE STUDY

Al-Haid, K., K. Vangala, and M. Al-Khareji.
IPEC 2016: 23rd Annual International Petroleum Environmental Conference, 26 slides, 2016

Four large in situ thermal desorption units were deployed for treatment of hydrocarbon-contaminated soils resulting from legacy operational practices in the upstream oil and gas industry of Kuwait. Thermal desorption is a separation process during which organic contaminants are separated from the contaminated soil through direct or indirect application of heat followed by treatment of the exhaust gas stream to prevent emissions of the volatilized contaminants to the atmosphere. Although the deployed thermal desorption units were able to treat the hydrocarbon contamination to the desired stringent specifications, challenges had to be overcome in terms of treating soil laden with high carbon characteristics (asphaltenes, wax, and resins), achievement of design capacity, higher than anticipated fuel consumption, extra segregation and treatment of feedstock, alteration of temperature settings, and discharge system treatment. Modifications had to be made to the installed facility in addition to feedstock alteration to achieve the desired output. **Slides:** http://ipec.utulsa.edu/Conf2016/MANUSCRIPTS/Al-Haid.pdf

Demonstrations / Feasibility Studies

SUCCESSFUL ON-SITE TREATABILITY STUDY EVALUATING FEASIBILITY OF BIOSTIMULATION TO ENHANCE MICROBIAL DEGRADATION OF 1,3,5-TRIMETHYLBENZENE UNDER ANAEROBIC CONDITIONS

Armstrong, K.C., C. Cason, and J. Straus.
IPEC 2016: 23rd Annual International Petroleum Environmental Conference, 30 slides, 2016

At a bulk fuel supply facility, 1,3,5-TMB was detected in groundwater at levels above the 0.07 mg/L Colorado standard and was estimated to extend 270 ft downgradient from the source area, 60 ft laterally and with a 15 ft vertical thickness. Within the plume 1,3,5-TMB ranged from 0.37 mg/L to 0.75 mg/L. A field treatability study was conducted in September 2015 to determine the feasibility of biostimulation and to evaluate the efficacy of TPHenhanced™ to promote 1,3,5-TMB degradation under anaerobic conditions. The additive was deployed via direct push in three injection nodes at 15-30 ft bgs with 2-ft injection intervals for layered amendment distribution. Each node received ~160 lb of stimulant with 230 gal water. Baseline 1,3,5-TMB concentration at source averaged 0.71 mg/L from October 2014 to June 2015; fell 49.2% by January 2016 with increases in concentrations of dissolved Fe (+1,081%), Mg (+1,356%), and a 72% decrease in nitrates; and increased 55.2% by April 2016 with complete depletion of nitrates and slight decreases in dissolved Fe and Mg. At all three nodes ORP values declined, ranging from -142.5 mV to -211.9 mV while pH remained neutral and DO values decreased to **Longer abstract:**
http://ipec.utulsa.edu/Conf2016/ABSTRACTS/Armstrong_successful_55.pdf
Slides: http://ipec.utulsa.edu/Conf2016/MANUSCRIPTS/Armstrong_VOCRemediation.pdf

ZERO-VALENT IRON FOR THE IN SITU REMEDIATION OF ANTARCTIC CONTAMINATED SITES

Statham, Thomas M., Ph.D. thesis, University of Melbourne, Australia. 266 pp, 2015

Based on lab treatability results, a media sequence for the treatment of both hydrocarbon and heavy metal contamination was installed within an existing permeable reactive barrier (PRB) at Casey Station, Antarctica. Results

from two seasons of monitoring indicate that the media achieved a greater chemical phosphorus removal capacity when compared to previous Antarctic PRB designs; however, non-ideal flow was observed during the second season. Geophysical studies and an excavator-based subsurface site assessment were conducted to continue the development of a conceptual site model for the contaminated Wilkes Tip Site in Antarctica. The potential remediation directions of this site are discussed. http://hdl.handle.net/11343/51012

CHELANT-BASED SOIL WASHING FOR METAL CONTAMINATED SOILS: PILOT/DEMONSTRATIONAL REMEDIATION PLANT

Finzgar, N., D. Lestan, and M. Gerl.
Proceedings: International Conference — Contaminated Sites 2016, pp 114-116, 2016

Three soils—a calcareous and 2 acidic—containing 1028, 862, and 926 mg/kg Pb, respectively, were washed with 60-100 mmol/kg EDTA in a series of 30 batches (50 kg/batch). The technology features novel reaction of alkaline substitution, precipitation and adsorption of toxic metals on polysaccharides, and chelant acidic precipitation for (on average) 83% EDTA and complete process waters recycle (no wastewater generated). The pH gradient was imposed by $Ca(OH)_2$ and H_2SO_4. Excess reagent was removed with remediated soil as inert $CaSO_4$ to prevent saltification of recycled process waters. Washing removed 60, 78 and 71% of Pb from the three soils, respectively, and reduced Pb bioaccessibility into a simulated human gastro-intestinal phase by 5.0, 7.7, and 8.1 times, respectively. The solid wastes from the process amounted to 10.8 kg/t of soil and a material/energy cost of remediation up to € 20.6/t. Construction of a plant to demonstrate the proposed soil washing technology began in 2015 in Meza Valley, Slovenia. The plant will have a capacity of 6 tons of contaminated soil per day. *See **pages 114-116** in the proceedings at* http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/Conference_Proceedings_ICCS_Final.pdf.

TRAIN TECHNOLOGY: AN IRON-BASED MICROBIAL REMEDIATION AND EXAMPLE OF CONBINED TREATMENT APPROACH

Spacek, P., J. Mikes, and A.B. Laish.
Proceedings: International Conference — Contaminated Sites 2016, pp 121-125, 2016

The TRAIN remediation technology uses anaerobic microorganisms in fixed film on iron particles to treat groundwater contaminated with volatile chlorinated ethenes. Iron particles are prepared in the working vessel by direct oxidation by aerated water. After oxygen removal, this solution is transferred into the anaerobic reactor and colonized by an iron-reducing bacterial inoculum, which is added under intact (oxygen-free) conditions. Contaminated water is treated by particle suspension, which enters into the special application well from an anaerobic reactor. The TRAIN skid-mounted construction allows easy transportation and field manipulation. At a site affected by PCE and daughter products, a typical development of chlorinated hydrocarbons treatment (DCE stall) appeared following excavation of the center of the contaminated unsaturated zone, implementation of pump and treat, and application of lactic acid. At that point the TRAIN technology was applied at pilot scale. This paper briefly describes the results. *See **pages 121-125** in the proceedings at* http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/Conference_Proceedings_ICCS_Final.pdf.

COST-BENEFIT CALCULATION OF PHYTOREMEDIATION TECHNOLOGY FOR HEAVY-METAL-CONTAMINATED SOIL

Wan, X., M. Lei, and T. Chen.
Science of the Total Environment 563-564:796-802(2016)

A two-year phytoremediation field project to address As-, Cd-, and Pb-contaminated soil was implemented to determine the essential parameters for soil remediation. Results showed highly efficient heavy metal removal. The total cost of phytoremediation was US $75,375.2/hm^2 or US $37.7/m^3, with initial capital and operating costs accounting for 46.02% and 53.98%, respectively. Costs for infrastructure (i.e., roads, bridges, and culverts) and fertilizer were highest. The cost of phytoremediation was lower than the estimated values of other remediation technologies, and phytoremediation benefits are expected to offset the project costs in less than seven years.

Research

COMPOSITION AND DISSOLUTION OF A MIGRATORY, WEATHERED COAL TAR CREOSOTE DNAPL

Scherr, K.E., V. Vasilieva, W. Lantschbauer, and M. Nahold.
Frontiers in Environmental Science 4(61):2016

Researchers investigated the composition and dissolution of a migrated, aged creosote DNAPL and corresponding experimental and groundwater profiles using comprehensive 2D gas chromatography (GCxGC-MS). Low molecular weight compounds were found to be prevalent even after decades of weathering, with naphthalene (8% by mass) representing the most abundant identified compound, contrary to the expected preferential depletion of hydrophilic compounds. Reference DNAPL values were used to model aqueous solubilities for selected compounds. While lab and modeled DNAPL dissolution behavior agree well, field data suggest the presence of specific interfacial in situ processes that significantly affect dissolution processes. Based on aqueous GCxGC-MS profiles over the DNAPL, a hypothetical interfacial in situ film was calculated to be composed primarily of phenanthrene with minor contribution by naphthalene, possibly forming a viscous barrier for the dissolution of lower molecular weight PAH.
http://journal.frontiersin.org/article/10.3389/fenvs.2016.00061/pdf

FOSSIL ROOTLET BIOPORES AS CONDUITS FOR CONTAMINANT TRANSPORT THROUGH CLAY HORIZONS: A CASE STUDY OF DNAPL BEHAVIOR IN SEVERN ALLUVIUM, UK

Emanuel, D. and D.J. Sapsford.
Environmental Earth Science 75:972(2016)

Several DNAPL-contaminated sites are found around the Severn Estuary (UK) where a combination of detailed observations, core dissections, and physicochemical characterization of alluvial clay-silt horizons revealed the presence of fossil rootlet biopores that act and have the potential to act as conduits for contaminant migration through up to 13 m of clay-silt. The biopores penetrate the low permeability ($K \sim 10^{-10}$ m/s) clay-silt matrix throughout its entire depth (up to 13 m) and provide a preferential transport pathway for DNAPLs from near surface to the underlying aquifer, with particularly high concentrations measured in the biopores themselves. The DNAPL contamination below and throughout the Severn alluvial clay-silt horizons demonstrates the flaw in the assumption that these horizons act as an

effective seal that protects underlying aquifers from severe pollution from the legacy sites around the Severn and points to the failure of current protocols for the sampling of clay horizons for hydraulic conductivity assessments, given that current methods can destroy delicate in situ biopore structures. https://core.ac.uk/download/pdf/42534531.pdf

EFFECTS OF OXIDANTS ON IN SITU TREATMENT OF A DNAPL SOURCE BY NANOSCALE ZERO-VALENT IRON: A FIELD STUDY

Ahn, J.Y., C. Kim, H.S. Kim, K.Y. Hwang, and I. Hwang.
Water Research 107:57-65(2016)

The efficiency of a nanoscale zero-valent iron (NZVI)-based treatment process was evaluated for a contaminated aquifer in which TCE DNAPL was present. The study further investigated the effects of nitrate, dissolved oxygen (DO), and TCE on the NZVI reactivity and lifetime. Injection of 30 kg of NZVI into the site successfully removed 95.7% of TCE in the groundwater within the first 60 days without producing chlorinated intermediates. The chloride balance analysis estimated TCE removal of 2214 g and confirmed the presence of DNAPL TCE. The oxidation of NZVI particles by nitrate, DO, and TCE consumed 29.5%, 13.5%, and 14.3% of the Fe^0 initially present, respectively, over 60 days. The reactive lifetime of NZVI at the site was found to be at least 103 days, based on the monitoring of TCE, DO, and nitrate concentrations, oxidation-reduction potential, and the residual Fe^0 content of the NZVI particles. Solid samples retrieved from the site on day 165 still contained substantial amounts of Fe^0, occupying up to 21.9% of the total mass, and retained considerable reactivities towards TCE. Results indicate that NZVI particles aged more than 5 months at the site potentially can be reused for TCE reduction even after extensive corrosion of the elemental iron has occurred.

COMBINATION OF ZERO-VALENT IRON AND ANAEROBIC MICROORGANISMS IMMOBILIZED IN LUFFA SPONGE FOR DEGRADING 1,1,1-TRICHLOROETHANE AND THE RELEVANT MICROBIAL COMMUNITY ANALYSIS

Wang, W. and Y. Wu.
Applied Microbiology and Biotechnology [Epub ahead of print] (2016)

A combination of zero-valent iron (ZVI) and immobilized microorganisms was investigated as a potential means to accelerate biodegradation of 1,1,1-TCA DNAPL. Experimental results using microorganisms immobilized on a high-density luffa sponge (HDLS) demonstrated that (1) the supernatant liquid microorganisms were the optimal immobilized microorganisms for HDLS and (2) the combination of ZVI and immobilized microorganisms accelerated 1,1,1-TCA transformation. Furthermore, anaerobic microorganisms in long-term remediation produced reductant H_2S, which was beneficial to ZVI treatment zones. Further study of the microbial community showed that the majority of sulfate-reducing bacteria (SRB) adapted well to the process of 1,1,1-TCA cometabolic dechlorination. *Desulfobulbus* and *Desulfococcus* potentially were the special SRB that contributed most significantly to TCA cometabolism. 1,1,1-TCA also induced the generation of new SRB and stimulated the growth of a majority of dominating methanogens that then played a constructive role in accelerating the dechlorination of 1,1,1-TCA, reducing sulfate, and improving the production of CH_4. A tentative reaction mechanism for Fe^0 biodegradation of 1,1,1-TCA is proposed.

DEVELOPING PERENNIAL PHYTOTECHNOLOGY FOR CONTAMINATED MILITARY SITE: CASE OF KAMENETZ-PODILSKY, UKRAINE

Pidlisnyuk, V., T. Stefanovska, J. Troegl, and P. Shapoval.
Proceedings: International Conference — Contaminated Sites 2016, pp 126-130 + 20 slides, 2016

A greenhouse experiment of growing *Miscanthus x giganteus* (a large perennial grass hybrid) in soil from a contaminated military site in Kamenetz-Podilsky, Ukraine, was performed in 2014-2015 to monitor the translocation of metals (Ti, Fe, Mn, Zn, Pb, As) to the plant tissues and observe the effects on plant growth. Despite high metal concentrations in the soil, no growth inhibition was observed, and metal concentrations in the aboveground parts were minor. Results of the 2-yr study confirmed the high adaptability of the plants to grow on the metal-contaminated soils at biomass levels that make their use as biofuel an attractive and cost-effective option. *See* ***pages 126-130*** *in the proceedings at*
http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/Conference_Proceedings_ICCS_Final.pdf.
Slides: http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/30_ICCS2016_Pidlisnyuk.pdf

BIOREMEDIATION OF PCB-CONTAMINATED RIVER SEDIMENTS: ROLE OF AUTOCHTHONOUS BACTERIA AND EFFICACY OF BIOAUGMENTATION ON CONTAMINANT BIODEGRADATION

Dercova, K., H. Horvathova, K. Sendecka, and K. Laszlova.
Conference Proceedings: International Conference — Contaminated Sites 2016, pp 150-152, 2016

PCB biodegradation was studied in contaminated sediment sampled from a canal located in the eastern part of Slovakia. The canal is part of the facility of a former producer of commercial PCB products (Delor 103, Delor 106, and Hydelor), and the area around the canal and the Michalovce district in particular are among to the most heavily PCB-contaminated areas in the world. Contaminated sediment was chosen for aerobic degradation using bioaugmentation performed by inoculation of sediment by isolated bacterial strains able to degrade PCBs. In a previous study, bphA gene (chromosomal DNA) was detected in the strains used. The objective of this study was to assess bioaugmentation prospects using the individual bacterial strains isolated from the autochthonous microflora present in the contaminated sediments and three consortia artificially combined in the lab; determine biodegradation kinetics; and evaluate the ecotoxicity of the treated and non-treated sediments. *See* ***pages 150-152*** *in the proceedings at*
http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/Conference_Proceedings_ICCS_Final.pdf.

REDUCTION, ADSORPTION, AND PRECIPITATION OF HEAVY METALS IN GROUNDWATER BY A REAGENT BASED ON ELEMENTAL IRON, IRON SULPHIDES AND RELATED REACTIVE MINERALS

Seech, A. and M. Mueller.
Proceedings: International Conference — Contaminated Sites 2016, pp 92-95 (paper) + 23 slides, 2016

MetaFix® technology represents an entirely new family of reagents for treatment of soil, sediment, industrial wastes, and groundwater contaminated with heavy metals. The treatment mechanisms are based on iron, iron sulfides, and other iron-bearing minerals, and therefore result in heavy metal precipitates that include sulfide and/or iron. Performance data showing reductions in leaching of As, Hg, and Pb are presented. *See* ***pages 92-95*** *in the proceedings at*

http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/Conference_Proceedings_ICCS_Final.pdf.
Slides: http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/21_ICCS2016_Mueller.pdf

BIOELECTROCHEMICAL CHROMIUM(VI) REMOVAL IN PLANT-MICROBIAL FUEL CELLS

Habibul, N., Y. Hu, Y.-K. Wang, W. Chen, H.-Q. Yu, and G.-P. Sheng.
Environmental Science & Technology 50(7):3882-3889(2016)

The plant-microbial fuel cell (PMFC) is a renewable and sustainable energy technology that generates electricity with living plants. In this study, researchers evaluated the potential for Cr(VI) removal using PMFC at various initial Cr(VI) concentrations. Long-term operation of the PMFC showed that the system was stable and sustainable for Cr(VI) removal. The mass balance results and XPS analytical results show that only a small amount of soluble Cr(III) remained in the PMFC and that most Cr(III) precipitated in the form of $Cr(OH)_3(s)$ or was adsorbed onto the electrodes. PMFC experiments without acetate addition also showed that plants can provide carbon source for MFC through root exudates. Bioelectrochemical reduction of Cr(VI) was the main mechanism for Cr(VI) removal.

General News

NORDROCS 2016: THE 6th JOINT NORDIC MEETING ON REMEDIATION OF CONTAMINATED SITES — SHORT PAPERS AND ABSTRACTS

NORDROCS Organizing Committee, 191 pp, 2016

The 2016 Nordic meeting was held September 5-8 at Aalto University, Espoo, Finland. The overall object of the meeting was to share and discuss the way the Nordic countries manage contaminated land. The Nordic countries have large natural and demographic variations, which has led to differences in approach and focus of the efforts to remediate contaminated sites. These different experiences in environmental remediation give meeting participants a great opportunity to learn from one another.
http://nordrocs.org/wp-content/uploads/2016/09/kompendium08282016.pdf

THE RATIONALE FOR SIMPLE APPROACHES FOR SUSTAINABILITY ASSESSMENT AND MANAGEMENT IN CONTAMINATED LAND PRACTICE

Bardos, R.P., B.D. Bone, R. Boyle, F. Evans, N.D. Harries, T. Howard, and J.W.N. Smith.
Science of the Total Environment 563-564:755-768(2016)

This paper provides the rationale for and an outline of recently published Sustainable Remediation Forum in the UK (SuRF-UK) guidance on preparing for and framing sustainability assessments; carrying out qualitative sustainability assessments; and simple good management practices to improve sustainability across contaminated land management activities. *This paper is **Open Access** at* http://www.sciencedirect.com/science/article/pii/S004896971531158X.

IP 2016: 4th INTERNATIONAL WORKSHOP ON INDUCED POLARIZATION — ABSTRACTS

Aarhus University, HydroGeophysics Group, 2016

The Hydrogeophysics Group at Aarhus University hosted the 4th International Workshop on Induced Polarization on June 6-8, 2016, in Aarhus, Denmark. The aim of the fourth workshop was to narrow the gap between theory, lab findings in controlled environments, and field studies, including IP use at contaminated sites. The proceedings have been made available in the form of extended abstracts and selected posters and slide presentations.
http://hgg.au.dk/ip2016/abstracts-presentations-posters/

GUIDANCE ON ASSESSING THE IMPACTS OF CEMETERIES ON GROUNDWATER

Scottish Environment Protection Agency, LUPS GU32, 15 pp, 2015

The degradation of human corpses normally takes 10-12 years. It is estimated that more than half the pollutant load leaches within the first year and that the load then halves again in each successive year. The degradation process rate is mainly dependent on microbial decay, which is influenced by soil conditions, depth of burial, and coffin construction. About half of all human burials involve some embalming using formaldehyde, which is a biocide and a polluting substance. This guide aims to assist developers and local authorities [in Scotland] in assessing potential sites and informing best site design. A phased methodology for site assessment is outlined that is proportionate to the level of risk, and the outputs of which can be used to inform planning decisions.
http://www.sepa.org.uk/media/143364/lups-gu32-guidance-on-assessing-the-impacts-of-cemetries-on-groundwater.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.

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.