Technology Innovation News Survey

Entries for October 16-31, 2015

Market/Commercialization Information

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PHASE I SOLICITATION
U.S. Environmental Protection Agency, SOL-NC-16-00001, 2015

EPA has issued a new SBIR Phase I solicitation to develop and commercialize innovative environmental technologies for projects to commence August 1, 2016. Small businesses may apply for Phase I awards up to $100,000 to demonstrate proof of concept in seven topic areas: air and climate, integrated cookstove-heating-electricity generation for small homes, manufacturing, toxic chemicals, water, building materials and homeland security. Specific subtopics include development of lab-on-a-chip sensors for organic pollutants in homes and methods for decontaminating biological agents in railroad and subway cars. Successful Phase I companies are eligible to apply for Phase II funding, up to $300,000 for two years, to further develop and commercialize their technologies. Submit each proposal in its entirety as a single PDF document via FedConnect by 12:00 noon ET on January 7, 2016. Full information is posted on FedConnect at https://www.fedconnect.net/fedconnect2doc=SOL-NC-16-00001&agency=EPA.

SYNOPSIS REQUEST FOR SF330: AE SERVICES MINE CONTRACT
U.S. Environmental Protection Agency, Region IX, San Francisco, CA.
Federal Business Opportunities, FBO-5111, Solicitation SOL-R9-15-00006, 2015

EPA has a requirement for professional AE services to support remedial planning and oversight activities for hard-rock mine sites and mine-related sites in Regions 4, 6, 8, 9, and 10. Hard-rock mine support encompasses non-fuel, metallic, and certain non-metallic mining activities found at existing CERCLA response sites. This contract excludes certain mine types, such as coal, sand and gravel, dimension stone, crushed stone, clay pits, quarries, and salt. EPA is requesting SF 330 submissions for review to enable the development of a short list of selected firms. The selected firms will be invited to participate in oral presentations. EPA will accept only SF330 packages submitted by or before 5 PM PT on January 22, 2016, via FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-R9-15-00006&agency=EPA. The contract will be a fixed-rate, IDIQ, award-term contract with a 3-year base period of performance and award term periods of three years and four years. The total estimated capacity of the proposed contract, including award terms, is $213,831,000, with this capacity to be apportioned between the five EPA Regions. The Government reserves the right to make multiple awards. https://www.fbo.gov/spg/EPA/OAM/RegIX/SOL-R9-15-00006/listing.html

Cleanup News

REMEDIATION WORK PLAN ADDENDUM, INDIANA MACHINE WORKS, 135 EAST HARRISON STREET, MOORESVILLE, INDIANA
Indiana Department of Environmental Management, 315 pp, 2015

This plan proposes a site-specific closure strategy for the main site contaminants—PCE, TCE, cis-1,2-DCE, VC, 1,1,1-TCA, and 1,1-DCA—at Voluntary Remediation Program Site 6051201. Based on the results of a successful in situ chemical reduction (ISCR) pilot test conducted in 2013, full-scale enhanced reductive dechlorination via ISCR is proposed to treat the site's two groundwater plumes. After ISCR pilot treatment, groundwater monitoring results within the MW-14 test area showed concentrations of PCE and TCE below detection limits ₱https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=80014296&dDocName=80014456&allowInterrupt=1
See also the 2014 Updated ISCR Pilot Test Results *report at* https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=45085508&dDocName=69588711&Rendition=web&allowInterrupt=1&noSaveAs=1&fileName=69588711.pdf

CO_2 SPARGING: PHASE 2 FULL-SCALE IMPLEMENTATION AND MONITORING REPORT, LCP CHEMICALS SITE, BRUNSWICK, GA
U.S. EPA Region 4, 200 pp, 2015

In situ CO_2 sparging was implemented to address a subsurface caustic brine pool (CBP) formed during chlor-alkali chemical manufacturing processes at the LCP Chemicals Site. Phase 1 of CO_2 sparging was conducted between October 2013 and February 2014, and Phase 2 was conducted in October 2014 and April 2015. Remedial action objectives include reducing the pH of the CBP to between 10 and 10.5, and reducing CBP density. Although Hg concentrations are not a component of the objectives, the contractor studied sparging performance with respect to reduction of Hg concentrations associated with Phase 2 work as a follow-on to the evidence of sparging results from Phase 1, when 24 out of 27 monitoring points showed a decrease in Hg after sparging. Hg measurements throughout the entire CO_2 sparging program suggest that additional reductions in Hg should occur over time as groundwater remains at neutral pH. http://www2.epa.gov/sites/production/files/2015-07/documents/co2-monitoring-part_1-of_4.pdf
See additional technical information on this cleanup at http://www2.epa.gov/foia/region-4-virtual-reading-room-lcp-chemicals-site-brunswick-ga.

Demonstrations / Feasibility Studies

PILOT STUDY IMPLEMENTATION REPORT, EVANDALE AVENUE SOURCES, MIDDLEFIELD-ELLIS-WHISMAN REGIONAL GROUNDWATER REMEDIATION PROGRAM, MOUNTAIN VIEW, CALIFORNIA
U.S. EPA Region 9, 140 pp, 2015

The scope of work for the in situ chemical oxidation (ISCO) pilot study at the CPT-15 and CPT-21 areas was completed with the installation, development, and baseline sampling of nine temporary performance monitoring wells downgradient of the CPT-15 Area, completion of three ISCO injection events at the CPT-15 Area and two ISCO injection events at the CPT-21 Area, and associated performance monitoring. Monitoring results indicated significant TCE concentration decreases and rapid oxidant consumption immediately after each injection event. Although the injection events were completed as planned, logistical constraints encountered suggest that the pilot scope of work represents the practical extent to which ISCO can be implemented at CPT-15 and 21. Constraints such as the presence of utilities above and below ground, the need to maintain public use of the street, and limited potential for increasing injected volume per day inhibit the expansion of the ISCO injection program within Evandale Avenue. http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dc283e6c5d6056f88257426007417a2/5e789a68c43b116888257ef80079ecdd!OpenDocument
Additional project documents, such as the pilot work plan, are available at http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CAD982463812.

REMEDIATION FOR MERCURY STABILIZATION BY IN-SITU CHEMICAL REDUCTION (ISCR) IN GROUNDWATER (BRAZIL SITE)
Aluani, S.
RE3 Conference and Exposition, 15-17 September, Philadelphia, PA. 21 slides, 2015

Groundwater at an active paper mill in Sao Paulo State (Brazil) is contaminated with mercury at concentrations up to 895 µg/L. The contaminant plume extends over 9,000 m^2 (roughly 124 m x 111 m) to a depth of about 8 m. Remedial activity via injection of EHC-Hg® amendments to effect in situ Hg stabilization is underway to protect a nearby river, based on results of a successful pilot test conducted in 2011. The amendments consist of zero-valent iron and a source of sulfide and phosphorus, which promote mercury precipitation as HgS. The pilot test was conducted in an area measuring 36 m^2 near a monitoring well having a baseline Hg concentration of 420 µg/L. Results after 194 days showed a 92% Hg reduction. Geochemical data showed an increase of pH and a decrease of ORP to around -285 mV, confirming that favorable conditions for Hg stabilization as sulfide salts had been attained. **Slides:** http://www.enviroblend.com/userdata/userfiles/file/RE3%202015/Presentation%20PDFs%20-%2016th/16Sept-2028-230pm-Aluani-Remediation-Mercury-Presentation-RE3-2015.pdf.

FIELD STUDY: BIOVENTING
2014 Year in Review, NASA Santa Susana Field Laboratory, 2015

NASA conducted a bioventing field study in July 2014 in the Bravo Test Stand area of the Santa Susana Field Laboratory site. Three wells and four monitoring points were installed to measure whether injecting air into the ground released contaminants to the surface. Air was injected and then trapped at the surface using a special cover. Results show that mechanically, air travels through the subsurface with little to no leakage occurring. Increased oxygen levels enhance the biological breakdown of hydrocarbons in the shallow bedrock, and NASA was able to raise the oxygen to over 20% at every spot measured. NASA is considering a second phase of bioventing field work to test the success of bioventing near the Bravo Skim Pond where traces of fuel were found in the soil. NASA expects this fuel to be treatable when exposed to oxygen, followed by in situ chemical oxidation.

BEDROCK VAPOR EXTRACTION
2014 Year in Review, NASA Santa Susana Field Laboratory, 2015

A bedrock vapor extraction pilot test was conducted in Area II of the Santa Susana Field Laboratory site to see whether this technology could be implemented in the SSFL bedrock and if so to evaluate its effectiveness in removing VOCs. Field work began in July 2014 with the installation of seven vapor monitoring wells in the Bravo Skim Pond area. In August and September, NASA began testing if air extracted from an existing core hole in the rock could be moved through bedrock. A 50-HP vacuum blower was used at a target depth between 30 ft and 175 ft bgs. The air that was pumped was cleaned aboveground using two 1000-lb vessels of activated carbon. No contaminants were detected after treatment. The pilot test removed ~30 lb of VOCs in the first 13 days. More importantly, vacuum and concentration changes in monitoring wells were observed all around and as far away as 370 ft from the extraction well. Follow-up tests were conducted in October 2014, and final data are being compiled to assess the potential for larger-scale use of this technology at SSFL.

MANGANESE ACTIVATED PERSULFATE (MNAP) FOR THE TREATMENT OF A SOURCE ZONE: AN INNOVATIVE DUAL OXIDANT FORMULATION
Marvin, B., M. O'Neill, C. Schreier, P. Dugan, and K. Frasco.
CleanUp Conference 2015, September 13-16, Melbourne, Australia. Extended abstract, 2015

A novel in situ chemical oxidation (ISCO) method utilizes manganese oxides to activate sodium persulfate (MnAP). In mode of action, MnAP increases manganese oxide content within the target treatment zone via delivery of freshly precipitated manganese oxides from permanganate consumption that then act as activators for persulfate to propagate persulfate radical-based oxidative chemistry. Two laboratory treatability studies of MnAP achieved >99.9% TCE removal at concentrations between 300 and 500 mg/L in both aqueous and solid phases. The treatability data also showed that MnAP can achieve this level of TCE treatment using less of each of the two oxidants compared to single-oxidant approaches using typical permanganate and persulfate formulations. In addition, post-treatment pH was circum-neutral, and the residual sulfate concentrations were lower than the other persulfate activation methods evaluated (matrix, iron, and base activation). A field pilot test of MnAP is underway at the Middlefield-Ellis-Whisman CERCLA site. The use of permanganate to activate persulfate has not been widely explored or utilized in the field, and development of MnAP is ongoing to validate this engineered dual oxidant approach. http://www.cleanup2015.com.au/pdf/351_400/0359.pdf *For additional information, see other Middlefield-Ellis-Whisman project reports at* http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CAD982463812.

COMBINED ABIOTIC AND BIOTIC IN-SITU REDUCTION OF HEXAVALENT CHROMIUM IN GROUNDWATER USING NZVI AND WHEY: A REMEDIAL PILOT TEST
Nemecek, J., P. Pokorny, L. Lacinova, M. Cernik, Z. Masopustova, O. Lhotsky, A. Filipova, and T. Cajthaml.
Journal of Hazardous Materials, Vol 300, 670-679, 2015

A field pilot test combined two Cr(VI) geofixation methods: chemical reduction by nanoscale zero-valent iron (NZVI) and subsequent biotic reduction supported by whey. This approach exploited a rapid decrease in Cr(VI) concentrations by NZVI, which prevented further contaminant migration and facilitated subsequent use of the cheaper biological method. The subsequent application of whey as an organic substrate to promote biotic reduction of Cr(VI) resulted in a further and long-term decrease in the Cr(VI) contents in the groundwater. The effect of biotic reduction was observed after 10 months in a monitoring well located 22 m away from the substrate injection wells. Results indicated a reciprocal effect of both the phases; NZVI that oxidized to Fe(III) during the abiotic phase was then microbially reduced back to Fe(II) and acted as a reducing agent for Cr(VI) even when the microbial density was already low due to the consumed substrate.

FIRST APPLICATION OF THE SUPER OXYGENATED WATER (SOW) TECHNOLOGY IN AUSTRALIA: CASE STUDY FOR SANDY SOILS
Arcidiacono, P., G. Ellis, J. Prowse, and O. King.
CleanUp 2015 Conference, Melbourne, Australia, 13-16 September 2015. CRC CARE: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, TC21, 2015

Super-oxygenated water (SOW) technology implemented via a recirculation loop system in combination with traditional hydraulic control measures was applied for the first time in Australia at a former service station site where petroleum hydrocarbon releases had contaminated the groundwater. The treatment was designed to stimulate biological degradation of groundwater and capillary fringe hydrocarbon impacts. Evidence of significant degradation of petroleum compounds was observed at the end of a 9-week SOW injection trial. Benzene concentrations declined significantly in some downgradient monitoring injections. Future monitoring will assess changes in natural attenuation parameters, microbial populations, and contaminant concentrations. The SOW technology is implemented at the site in a sustainable manner with low power consumption, limited water usage, and no requirements for sewer discharge. http://www.cleanup2015.com.au/pdf/151_200/0194.PDF

Research

TIME-LAPSE ELECTRICAL GEOPHYSICAL MONITORING OF AMENDMENT EMPLACEMENT FOR BIOSTIMULATION
Johnson, T.C., R.J. Versteeg, F.D. Day-Lewis, W. Major, and J.W. Lane.
Groundwater, Vol 53 No 6, 920-932, 2015

Field studies demonstrating the ability of time-lapse electrical resistivity tomography (ERT) to monitor amendment emplacement and behavior were performed during a biostimulation remediation effort conducted at DoD's Reutilization and Marketing Office Yard located in Brandywine, Maryland. Geochemical fluid sampling was used to calibrate a petrophysical relation to predict groundwater indicators of amendment distribution. The petrophysical relations were field validated by comparing predictions to sequestered fluid sample results, thus demonstrating the potential of electrical geophysics for quantitative assessment of amendment-related geochemical properties. Crosshole radar zero-offset profiles and borehole geophysical logging were also performed to augment the data set and validate interpretation. In addition to delineating amendment transport in the first 10 months after emplacement, the time-lapse ERT results show later changes in bulk electrical properties, which were interpreted as mineral precipitation. *Additional information*: http://water.usgs.gov/ogw/bgas/estcp/bioremed-monitor.html.

IMPROVING CHARACTERIZATION OF FRACTURED ROCK USING 3D CROSS-BOREHOLE ELECTRICAL RESISTIVITY TOMOGRAPHY (ERT)
Robinson, Judith L., Ph.D. dissertation, Rutgers, Newark, New Jersey, 163 pp, 2015

Previous work using electrical resistivity tomography (ERT) to map fractures in rock gave limited hydrogeological information due to finite element modeling techniques that were physically inappropriate for fractured rock and to lack of instrumentation to permit imaging of isolated fracture zones. Synthetic and field datasets were used to incorporate field information to yield an improved hydrogeological interpretation. Specifically, model constraints were incorporated in the inversion modeling, and borehole deviations defining these boundaries were explicitly defined in the discretization. Where this information was incorporated, ERT time-lapse changes in conductivity were more focused surrounding fracture locations, and borehole effects were minimized. A rigorous examination of localized effects of deregularization revealed that uncertainty in these boundaries can lead to spurious inversion artifacts. Electrode arrays were designed to include isolation bladders and a water sample/injection line for installation within seven boreholes, which facilitated multiple tracer tests in a fractured mudstone. The spatial scale of this experiment was such that the primary hydrogeological heterogeneity controlling flow and transport was captured, providing unique information relative to that acquired from borehole logging methods alone. https://rucore.libraries.rutgers.edu/rutgers-lib/47707/PDF/1/

ELECTRICAL RESISTIVITY TOMOGRAPHY FOR MAPPING SUBSURFACE REMEDIATION
Power, Christopher Anthony, Ph.D. thesis, University of Western Ontario, 254 pp, 2014

This study evaluated the potential of time-lapse electrical resistivity tomography (ERT) for mapping DNAPL mass reduction during remediation. A new numerical model was developed to explore this potential at the field scale, generating realistic DNAPL scenarios and predicting the response of an ERT survey. Central to the model was the development of a novel linkage between hydrogeological and geoelectrical properties. A lab experiment was conducted that demonstrated, for

the first time, the effectiveness of 4D (three spatial dimensions plus time) ERT applied at the surface for mapping an evolving DNAPL distribution. Independent simulation of the experiment demonstrated the reliability of the DNAPL-ERT model for simulating real systems. The numerical model was then used to explore the 4D surface ERT approach at field scale for monitoring a range of realistic DNAPL remediation scenarios. The approach showed excellent potential for mapping shallow DNAPL changes, but deeper changes were not as well resolved. To overcome this limitation, a new surface-to-horizontal borehole (S2HB) ERT configuration was proposed and demonstrated by using the numerical model to compare surface ERT to S2HB ERT for a realistic, field-scale DNAPL scenario with remediation at depth. A second lab experiment then demonstrated that this new configuration better resolves changes in DNAPL distribution relative to surface ERT, particularly at depth. Independent simulation of the experiment showed that S2HB ERT is modeled reliably. http://ir.lib.uwo.ca/etd/2078/

BACK DIFFUSION FROM THIN LOW PERMEABILITY ZONES

Yang, M., M.D. Annable, and J.W. Jawitz.
Environmental Science & Technology, Vol 49, 415-422, 2015

Aquitards can serve as long-term contaminant sources to aquifers when contaminant mass diffuses from the aquitard following aquifer source mass depletion. This study describes analytical and experimental approaches to understand reactive and nonreactive solute transport in a thin aquitard bounded by an adjacent aquifer. Lab results showed that solutes with low retardation accumulated more stored mass with greater penetration distance compared to high-retardation solutes; however, because the duration of mass release was much longer, high-retardation solutes had a greater long-term back diffusion risk. The error associated with applying a semi-infinite domain analytical solution to a finite diffusion domain increases as a function of the system relative diffusion length scale, suggesting that the solutions using image sources should be applied in cases with rapid solute diffusion and/or thin clay layers.

IMPACT OF CLAY-DNAPL INTERACTIONS ON THE TRANSPORT OF CHLORINATED SOLVENTS IN LOW PERMEABILITY SUBSURFACE ZONES

Ayral, Derya, Ph.D. dissertation, University of Michigan, 176 pp, 2015

Measurements made in silt and silt-clay mixtures revealed that the diffusion coefficient for TCE in a silt-clay mixture was at least two to four fold smaller than predictions used in field studies. Calculations based on the measurements obtained in this research suggest an even greater discrepancy between the amount of mass storage in low permeability layers and what can be attributed to diffusion. It was postulated that direct contact between the waste and the layers altered the structure of the clay and consequently the transport properties. Measurements using X-ray diffraction showed that contact with chlorinated field waste decreased the basal spacing of water-saturated smectites from 19 angstroms to 15 angstroms within weeks, accompanied by cracks with apertures as large as 1 mm. Even minimal cracking could easily account for the enhanced mass storage observed in the field. In an investigation of the mechanism of basal spacing decrease that involved a nonionic and an anionic surfactant and a chlorinated solvent, sorption measurements showed enhanced synergistic sorption of the surfactants in the presence of the solvent, while FTIR spectroscopy suggested a partial displacement of water from the interlayer space. Based on the accumulated evidence, it was hypothesized that the nonionic surfactant sorbs in the interlayer space, displacing some of the interlayer water. The anionic surfactant interacts with the nonionic surfactant through their hydrophobic moieties and enhances the dehydration of the interlayer space via its anhydrous nature. http://deepblue.lib.umich.edu/bitstream/handle/2027.42/111396/ayrald_1.pdf

MICROCOSM TESTS FOR NATURAL ATTENUATION, BIOSTIMULATION, AND BIOAUGMENTATION OF SOILS CONTAMINATED WITH PCBS, DIOXINS, PAHS, AND PETROLEUM HYDROCARBONS

Billings, M., Y. Nelson, C. Kitts, and K. Roberts.
Third International Symposium on Bioremediation and Sustainable Remediation Technologies, 18-21 May 2015, Miami, Florida. Battelle Press, Abstract only, 2015

DOE funded a project to (1) estimate potential biodegradation rates of diverse contaminants of interest in Santa Susana Field Laboratory soils via natural attenuation and (2) determine the potential for successful biostimulation and bioaugmentation in a microcosm study. Several types of soil microcosms were established in which dioxin and TPH concentrations decreased slightly, but none of the other COI concentrations declined significantly over 244 days of incubation. *For additional information on this study, see M. Billings' Master's thesis at* http://digitalcommons.calpoly.edu/theses/1319/

PARTICLE TRANSPORT OF RADIONUCLIDES FOLLOWING A RADIOLOGICAL EVENT: A LITERATURE REVIEW AND SUMMARY

Lee, S.D., T. Boe, and C. Hayes.
EPA 600-R-15-127, 43 pp, 2015

This paper compares different type of nuclear incidents and their derived contaminants to better understand radiological dispersal and how it might interact with urban environments. This review provides an overview and analysis of the current state of knowledge related to radiological sources with reference to particle transport, contrasts the behavior of radionuclides in urban and rural environments, and explores the current state of radiological transport models. The review concludes by identifying knowledge gaps and research needs to improve response and recovery capabilities following a radiological dispersion incident. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100N8QX.txt

RAPID AND EFFECTIVE DECONTAMINATION OF CHLOROPHENOL-CONTAMINATED SOIL BY SORPTION INTO COMMERCIAL POLYMERS: CONCEPT DEMONSTRATION AND PROCESS MODELING

Tomei, M.C., D. Mosca Angelucci, N. Ademollo, and A.J. Daugulis.
Journal of Environmental Management, Vol 150, 81-91, 2015

In an investigation of solid-phase extraction performed with commercial polymer beads to treat soil contaminated by chlorophenols (4-chlorophenol, 2,4-dichlorophenol, and PCP) as single compounds and in a mixture, soil-water-polymer partition tests were conducted to determine the relative affinities of single compounds in soil-water and polymer-water pairs. Subsequent soil extraction tests were performed with Hytrel 8206, the polymer showing the highest affinity for the tested chlorophenols. Increased moisture content (up to 100%) improved the extraction efficiency for all three compounds. Extraction tests at this upper level of moisture content showed removal efficiencies ≥70% for all the compounds and their ternary mixture for 24 h of contact time. A dynamic model based on the simplified approach of "lumped parameters" for the mass transfer coefficients provided very good predictions of the experimental data for the absorptive removal of contaminants from soil at different individual solute levels. http://www.chemeng.queensu.ca/people/Faculty/AndrewDaugulis/files/Soil%20Modeling%202015.pdf

ON-SITE AND IN SITU REMEDIATION TECHNOLOGIES APPLICABLE TO PETROLEUM HYDROCARBON CONTAMINATED SITES IN THE ANTARCTIC AND ARCTIC

Camenzuli, D. and B.L. Freidman.
Polar Research, Vol 34, Paper 24492, 2015

This paper reviews six technologies currently being adapted or developed for the remediation of petroleum hydrocarbon-contaminated sites in the Antarctic and Arctic—bioremediation, landfarming, biopiles, phytoremediation, electrokinetic remediation, and permeable reactive barriers—and discusses their advantages, limitations, and potential for the long-term management of contaminated soil and groundwater at extremely cold sites.
http://www.polarresearch.net/index.php/polar/article/view/24492

CONTAMINATED SOIL CONTAINING LEAD TREATMENT BY STABILIZATION/ SOLIDIFICATION TECHNIQUE

Hanif, M.N.S.M., S.A.A. Tajudin, A.A. Kadir, A. Madun, M.A.M. Azmi, and N.S. Nordin.
IIES 2014: International Integrated Engineering Summit, 1-4 December, Universiti Tun Hussein Onn Malaysia, Johor. 5 pp, 2014

In an investigation of the performance of stabilization/solidification (SS) for remediation of lead-contaminated clay soil, cockleshell powders at different percentages (2.5%, 5%, and 7.5%) were added as partial replacement for cement. Results of Toxicity Characteristics Leaching Procedure tests conducted to determine treatment effectiveness showed a 99% Pb reduction after SS. http://eprints.uthm.edu.my/6574/

THERMO-DESORPTION: A VALID TOOL FOR MERCURY SPECIATION IN SOILS AND SEDIMENTS?

Reis, A.T., J.P. Coelho, I. Rucandio, C.M. Davidson, A.C. Duarte, and E. Pereira.
Geoderma, Vols 237-238, 98-104, 2015

Mercury (Hg) speciation by thermo-desorption is considered an alternative to laborious sequential chemical procedures, and its popularity has increased in recent years. This work describes steps taken to improve the information obtained by Hg speciation through thermo-desorption, specifically to improve peak resolution and increase the number of species that can be identified. The thermo-desorption behavior of Hg bound to iron oxides was characterized as well as a new Hg-humic acid synthetic standard material. An evaluation of the effects of sample pretreatment and storage on Hg speciation showed that sieving to 0 could no longer be identified in the samples.
https://pure.strath.ac.uk/portal/files/42075066/Reis_etal_Geoderma_2015_Thermo_desorption_a_valid_tool_for_mercury_speciation_in_soils.pdf

PYROLYTIC TREATMENT AND FERTILITY ENHANCEMENT OF SOILS CONTAMINATED WITH HEAVY HYDROCARBONS

Vidonish, J.E., K. Zygourakis, C.A. Masiello, X. Gao, J. Mathieu, and P.J.J. Alvarez.
Environmental Science & Technology (Web publication prior to print, 18 Aug 2015)

Pyrolysis of contaminated soils at 420°C converted recalcitrant heavy hydrocarbons into char (a carbonaceous material like petroleum coke) and enhanced soil fertility. Pyrolytic treatment reduced total petroleum hydrocarbons to below regulatory standards (typically Arabidopsis thaliana and *Lactuca sativa* (80-900% heavier) in pyrolyzed soils than in contaminated or incinerated soils. Elemental analysis showed that pyrolyzed soils contained more carbon than incinerated soils (1.4-3.2% versus 0.3-0.4%). The stark color differences between pyrolyzed and incinerated soils suggest that the carbonaceous material produced via pyrolysis was dispersed in the form of a layer coating the soil particles. If used as a thermal treatment for rapid remediation of soil containing weathered oil, results suggest that soil pyrolysis has the potential to improve soil fertility and enhance revegetation. *Additional information*:
http://www.futurity.org/soil-pyrolysis-oil-spills-987452-2/

FACTORS AFFECTING GAS MIGRATION AND CONTAMINANT REDISTRIBUTION IN HETEROGENEOUS POROUS MEDIA SUBJECT TO ELECTRICAL RESISTANCE HEATING

Munholland, J.L., K.G. Mumford, and B.H. Kueper.
Journal of Contaminant Hydrology, Vol 184, 14-24, 2016

Lab experiments were completed in a 2D flow cell to investigate gas production and migration during the application of electrical resistance heating (ERH) for DNAPL removal. Experiments consisted of heating water in homogeneous silica sand and heating 270 mL of TCE and chloroform DNAPL pools in heterogeneous silica sands, both under flowing groundwater conditions. Results of experiments performed in homogeneous sand subject to different groundwater flow rates showed that high groundwater velocities can limit subsurface heating rates. In the DNAPL pool experiments, temperatures increased to achieve DNAPL-water co-boiling and produced gas that migrated vertically, entered a coarse sand lens, and subsequently migrated laterally beneath an overlying capillary barrier to outside the heated treatment zone, where 31-56% of the original DNAPL condensed back into a DNAPL phase. These findings demonstrate that layered heterogeneity potentially can facilitate the transport of contaminants outside the treatment zone by mobilization and condensation of gas phases during ERH applications, thus underscoring the need for vapor-phase recovery and/or control mechanisms below the water table during application of ERH in heterogeneous porous media during the co-boiling stage, which occurs prior to reaching the boiling point of water. *See details in J. Munholland's Master's thesis at*
https://qspace.library.queensu.ca/handle/1974/12718

ASSESSMENT OF MITIGATION SYSTEMS ON VAPOR INTRUSION: TEMPORAL TRENDS, ATTENUATION FACTORS, AND CONTAMINANT MIGRATION ROUTES UNDER MITIGATED AND NON-MITIGATED CONDITIONS

Truesdale, R., C. Lutes, B. Cosky, B. Munoz, R. Norberg, H. Hayes, and B. Hartman.
EPA 600-R-13-241, 608 pp, 2015

In 2011, researchers began an investigation into the general principles of how vapors enter into a single residence study site, a highly instrumented pre-1920 residential duplex located in Indianapolis, Indiana. This report, the second in a series of reports based on that research, examines the efficiency of a subslab depressurization system to prevent and remove radon and VOCs with reference to (a) subsurface conditions that influence the movement of VOCs and radon into the home; (b) system effects on VOC and radon concentrations; and (c) the influence of a winter capping event on vapor movement into the home. http://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=524629

SIMPLE, EFFICIENT, AND RAPID METHODS TO DETERMINE THE POTENTIAL FOR VAPOR INTRUSION INTO THE HOME: TEMPORAL TRENDS, VAPOR INTRUSION FORECASTING, SAMPLING STRATEGIES, AND CONTAMINANT MIGRATION ROUTES

Truesdale, R., C. Lutes, B. Cosky, N. Weinberg, M. Bartee, B. Munoz, R. Norberg, and H. Hayes.
EPA 600-R-15-070, 332, 2015

Researchers began an investigation in 2011 into the general principles of how vapors enter into a single residence, a highly instrumented pre-1920 residential duplex located in Indianapolis, Indiana. This report, the third in a series of reports based on that research, examines the use of radon and other variables, such as weather data changes in temperature and differential pressure between indoors and outdoors, as potential low-cost, easily monitored indicators of when to sample for vapor intrusion events and when to turn on the mitigation system to reduce vapor intrusion exposure to residents. Select data trends through the years of study at this site are also presented.
http://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=525450

General News

AN UPDATED LOOK AT PCBS

Miller, G., T. McLennand, K. O'Brien, N. Holm, and E. Meschewski.
Prairie Research Institute, University of Illinois at Urbana-Champaign, 32 pp, 2015

A literature review of current scientific research and regulatory practices in Illinois related to PCBs was undertaken to assess the potential impact of the proposed landfill disposal of PCB-containing waste on the health, safety, and property of state residents. Appendix A offers a review of current PCB-related regulatory practices and their relation to the present scientific understanding of PCBs in the environment, and Appendix B contains a review of remediation technologies for PCBs and manufactured gas plant wastes. http://prairie.illinois.edu/pdf-files/PCBreport_PrairieResearchInstitute_2015.pdf