Entries for May 16-31, 2016

Technology Innovation News Survey

Market/Commercialization Information

REMEDIAL ACTION: MADISON COUNTY MINES SUPERFUND SITE, OU5 CATHERINE MINES & SKAGGS TAILINGS SITES
U.S. EPA, Office of Acquisition Management, Region VII, Lenexa, KS.
Federal Business Opportunities, FBO-3313, Solicitation SOL-R7-16-00012, 2016

EPA Region 7 is seeking the services of an experienced firm to provide remedial action services for OU5-Catherine Mines and Skaggs Tailings subsites. The two mine waste piles will be constructed according to the design and capped with clean soil. Downstream flooding will be remediated where new groundwater will be located downstream in locations where sediment removal is not practical. Remediation will be conducted pursuant to CERCLA and NCP requirements. EPA anticipates issuing an indefinite-delivery requirements-type contract consisting of a one-year base period and one-year option period with an estimated value between $5M to $10M. The Government intends to award a cost-plus-award-fee IDIQ contract for one base year and four one-year option periods as a total maximum value of $6M over the life of the contract. Each contract will include a base period of three years and two one-year options. Firm-fixed-price-type task orders will be issued as needed during the contract ordering period. Selected firms will work on a variety of hazardous waste and other environmental projects, including but not limited to: (1) contaminant soil and groundwater, contaminated sediments, radioactive and mixed wastes, underground storage tanks and fuel systems, and habitat restoration and mitigation. $529,000 will be available for a one-year award made in late summer 2016. The prototype will be considered a deliverable to be retained by BSEE at the end of the contract. Proposals are due by 2:00 PM ET on August 15, 2016.

SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS (SDVOSB) SET-ASIDE IDIQ FOR A-E SERVICES WITHIN THE NORTHERN DIVISION (Mega Phase B)
U.S. Army Corps of Engineers, USEC District, Seattle, WA.
Federal Business Opportunities, FBO-3327, Solicitation W912MW-16-0107, 2016

This announcement constitutes a request for SF330s as a set-aside for service-disabled veteran-owned small businesses (SDVOSB) under NAICS code 541330. The USACE Northern Division (NWD) has a requirement for A-E Hazardous, Toxic, and Radioactive Waste (HTRW)/environmental indefinite-delivery contracts for execution of its environmental mission. The majority of the work will be located in NWD (including Kansas City District, Omaha, and Seattle Districts) with a maximum ordering amount of $6M over the life of the contract. The purpose of this BAA is to fund development and testing of a sensor that can be mounted to an oil recovery skimmer or deployed easily (e.g., from a vessel or via aircraft) in the area of an oil skimming operation to measure the thickness of various crude and refined oils on water and to communicate thickness information wireless in near-real time. The sensor must have the following abilities: (1) measure a wide range of oil thicknesses (e.g., threshold level of 1 mm to 75 mm in 3-5 mm increments); (2) measure multiple types of crude and refined oils; (3) communicate thickness and location data remotely in near-real time; (4) mitigate erroneous readings due to fouling; and (5) withstand environmental conditions, such as exposure to salt water, temperature extremes (-20 to 200 degrees F), and UV. Each proposal also should discuss likely commercial and maintenance costs; sensor lifetime; design for wave conditions; sensor housing or deployment/retrieval; and anticipated technology readiness level at end of prototype test. BSEE anticipates that a total of $515,000 will be available for a one-year award made in late summer 2016. The prototype will be considered a deliverable to be retained by BSEE at the end of the contract. Proposals are due by 2:00 PM ET on July 22, 2016.

MUNITIONS RESPONSE ACTION SERVICES VIEQUES, PUERTO RICO
Naval Facilities Engineering Command, NAVFAC Atlantic, Norfolk, VA.
Federal Business Opportunities, FBO-3328, Solicitation N627015R8000, 2016

The purpose of this BAA is to fund development and testing of a sensor that can be mounted to an oil recovery skimmer or deployed easily (e.g., from a vessel or via aircraft) in the area of an oil skimming operation to measure the thickness of various crude and refined oils on water and to communicate thickness information wireless in near-real time. The sensor must have the following abilities: (1) measure a wide range of oil thicknesses (e.g., threshold level of 1 mm to 75 mm in 3-5 mm increments); (2) measure multiple types of crude and refined oils; (3) communicate thickness and location data remotely in near-real time; (4) mitigate erroneous readings due to fouling; and (5) withstand environmental conditions, such as exposure to salt water, temperature extremes (-20 to 200 degrees F), and UV. Each proposal also should discuss likely commercial and maintenance costs; sensor lifetime; design for wave conditions; sensor housing or deployment/retrieval; and anticipated technology readiness level at end of prototype test. BSEE anticipates that a total of $515,000 will be available for a one-year award made in late summer 2016. The prototype will be considered a deliverable to be retained by BSEE at the end of the contract. Proposals are due by 2:00 PM ET on August 15, 2016.

Cleanup News

15 YEARS LATER: TREE-ASSISTED CREOSOTE REMEDIATION AT THE FORMER TENNESSEE RAILROAD RAIL-TIE YARD IN ONEIDA, TENNESSEE
The 17th Railroad Environmental Conference, 27-28 October 2015, Urbana, IL. Abstract only, 2015

Twenty-five years after the discovery of creosote NAPL venting to a surface waterbody at a legacy rail-tie yard (Oneida, Tenn.), no further action is required. Successful on-site remediation was accomplished primarily through bulk contaminant mass removal (~1,147 tons of creosote-impacted soil) and secondarily by attenuating the use of target petroleum hydrocarbons facilitated through processes of rhizodegradation and phytovolatilization. To address recalcitrance, over 1,200 hybrid poplar trees were planted in 1997-1998 for hydraulic control of dissolved-phase constituents and to enhance natural biodegradation. Final performance monitoring was conducted in 2015 to round off a well-documented case study spanning 15 years of applied tree-assisted creosote remediation.

PATHWAY TO CLOSURE AT SITES WITH LNAPL: A CASE STUDY

In the State of Michigan, changes in LNAPL rules have shifted focus away from determining whether or not LNAPL is present to understanding and managing LNAPL risks. A case study outlines site characterization efforts and the development of an effective LNAPL management strategy at an active rail yard in southeast Michigan. The case study is an example of how a technically sound LNAPL conceptual site model may inform LNAPL site management strategies under the new risk-based regulatory rules in Michigan.

Slides: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/46_Harding.pdf
 Longer abstract: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/46_Harding.pdf

Slides: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/53_Smith.pdf
 Longer abstract: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/53_Smith.pdf
The biologically mediated natural source-zone depletion (NSZD) processes that destroy hydrocarbons and alter the composition of soil gas (e.g., consume oxygen and produce carbon dioxide) also release heat and create subsurface temperature anomalies above the natural soil temperature profile. Recent research has focused on measuring temperatureprofile. The project, degradation mechanisms were likely to be the dominant contaminant mass reduction mechanisms rather than mass transfer via volatilization, as is typical for in situ thermal projects. Subsequently, target temperatures in other parts of the treatment area were lowered to temperatures enabling degradation reactions to occur.

**USE OF REACTIVE MINERALS TO REMEDIATE CHLORINATED SOLVENTS IN GROUNDWATER AT A LOCOMOTIVE REPAIR SHOP**


Groundwater beneath a former locomotive repair shop at an active rail yard in Battle Creek, Michigan, is affected by chlorinated aliphatic hydrocarbons (CAHs), including PCE and TCE, at relatively low concentrations (up to ~130 µg/L) but above cleanup criteria. After assessing site sampling data, the contractor performed a 9-month pilot test from August 2013 through April 2014 to determine if reactive minerals could be created artificially with subsequent degradation of CAHs by injecting a labile carbon source (fructose corn syrup) and additional sulfate (magnesium sulfate) into the source area, which already contained significant amounts of iron. A single injection event was performed in August 2013. Pre- and post-injection soil samples were analyzed for CAHs, ferrous and ferric iron, sulfate, sulfide, dissolved gases, dechlorinating bacteria, and functional genes. Pre- and post-injection groundwater samples were analyzed for strong acid soluble iron, acid volatile sulfides, and minerals. The pilot results, performed to assess the potential to create reactive minerals, indicate that conditions for formation of reactive minerals were enhanced and reductive dechlorination was stimulated.

**Demonstrations / Feasibility Studies**

A LARGE-SCALE FIELD TRIAL OF THIN-LAYER CAPPING OF PCDD/F-CONTAMINATED SEDIMENTS: SEDIMENT-TO-WATER FLUXES UP TO 5 YEARS POST-AMENDMENT


The longer-term effect (3-5 yr) of thin-layer capping on in situ sediment-to-surface-water fluxes was monitored in a large-scale field trial in the PCDD/F contaminated Grenlandfjords, Norway, in 4 trial plots of 10,000-40,000 m² at 30-100 m water depth. Active caps (2.5 cm thickness) of dredged clean clay amended with powdered activated carbon (PAC) were placed in 4 fjords. The active caps were compared to nonactive crushed limestone caps in one of the fjords (15 cm thickness). Sediment-water PCDD/F fluxes were measured in situ in diffuser chambers. During the first 2 years after thin-layer capping, flux reductions relative to noncapped reference fields were more extensive at the fields capped with nonactive caps (70-90%) than at the ones with PAC-containing caps (50-60%); however, between 3 and 5 years after thin-layer capping, the trend reversed and cap effectiveness in the reducing fluxes increased by 80-90% for the PAC caps and decreased to 20-60% for the nonactive caps. The increasing effectiveness over time of PAC-containing active caps is explained by a combination of slow sediment transfer of PCDD/Fs and bioturbation by benthic organisms. The decreasing effectiveness of nonactive limestone and clay caps is explained by deposition of contaminated particles atop the caps. Present field data indicate that the capping efficiency of thin PAC-enriched caps can improve over time due to slow diffusive PCDD/F transfer from sediment to PAC particles and better mixing of the PAC by bioturbation.

**Research**

SIMULATING THE UNCERTAIN EFFECT OF ACTIVE CARBON CAPPING OF A DIOXIN-POLLUTED NORWEGIAN FJORD


**ESTIMATING NATURAL SOURCE ZONE DEPLETION RATES FROM SUBSURFACE TEMPERATURE DATA**


The longer-term effect of the project, degradation mechanisms were likely to be the dominant contaminant mass reduction mechanisms rather than mass transfer via volatilization, as is typical for in situ thermal projects. Subsequently, target temperatures in other parts of the treatment area were lowered to temperatures enabling degradation reactions to occur.

**RESOURCES**

- [RemTech 2015: Remediation Technologies Symposium, 22 slides, Presentation 54, 2015](http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/51_Smith.pdf)
- [Slides: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/51_Smith.pdf](http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/51_Smith.pdf)
- [Slides: http://railtec.illinois.edu/RREC/pdf/2015%20RREC/52_Smith.pdf](http://railtec.illinois.edu/RREC/pdf/2015%20RREC/52_Smith.pdf)
An updated fugacity-based environmental fate model was set up to simulate the historical fate of PCDD/Fs in the Grenland fjords, Norway. The model was based on site-specific environmental data and used to simulate the effect of capping sediments with active carbon. Great care was taken in quantifying the uncertainty regarding the efficacy of the activated carbon cap to reduce the leaching of contaminants from the capping. The model predicts that by capping selected parts of the fjord, biota will be classified as moderately polluted approximately a decade earlier than a natural remediation scenario. The approach illustrates the importance of incorporating uncertainty in local remediation efforts, as the biotic concentrations scale nonlinearly with remediation effort. [https://starrfett.files.wordpress.com/2015/04/ieam1617.pdf](https://starrfett.files.wordpress.com/2015/04/ieam1617.pdf)

**IDENTIFICATION OF A RUMINOCOCCACEAE SPECIES AS THE METHYL TERT-BUTYL ETHER (MTBE) DEGRADING BACTERIUM IN A METHANOCENIC CONSORTIUM**


Research to identify the organisms that actively degrade MTBE was conducted using an anaerobic methanogenic culture enriched with MTBE as the sole carbon source from New Jersey Arthur Kill intertidal salt marsh. The cultures were analyzed using stable isotope probing (SIP) combined with terminal restriction fragment length polymorphism, high-throughput sequencing, and clone library analysis of bacterial 16S rRNA genes. The sequence data indicated a predominance of phylotypes belonging to the Ruminococcaceae in the methanogenic cultures. SIP experiments also showed sequential incorporation of C-13-labeled MTBE by the bacterial community with a bacterium most closely related to *Saccharofermentans acetigenes*. Identification of the microorganisms responsible for the activity will improve general understanding of anaerobic MTBE degradation processes in the field and determine biomarkers for monitoring natural attenuation. Earlier work on this research is available in W. Sun’s dissertation at [https://etd.lib.msu.edu/islandora/object/etd%3A1224/datastream/Ob/view](https://etd.lib.msu.edu/islandora/object/etd%3A1224/datastream/Ob/view).

**IMAGING PATHWAYS IN FRACTURED ROCK USING THREE-DIMENSIONAL ELECTRICAL RESISTIVITY TOMOGRAPHY**


Researchers used 3-D cross-borehole electrical resistivity tomography (ERT) in a 9 m (diameter) x 15 m well field to capture high-resolution flow and transport processes in a fractured mudstone contaminated by chlorinated solvents, primarily TCE. Conductive (sodium bromide) and resistive (deionized water) injections were monitored in seven boreholes. Electrode arrays with isolation packers and sample samplers were designed to enable acquisition of ERT measurements during designed tracer injections. Fracture zone locations and hydraulic pathways inferred from hydraulic head drawdown data were compared with electrical conductivity distributions from ERT measurements. Static ERT imaging has limited resolution to decipher individual fractures; however, these images showed alternative conductive and resistive zones, consistent with alternating laminated and massive mudstone units at the site. Tracer evolution and migration was clearly revealed in time-lapse ERT images and supported by in situ borehole vertical conductivity profiles collected during the pulsed tracer test. While water samples provided important local information at the extraction borehole, ERT delineated tracer migration over spatial scales, capturing the primary hydrogeological heterogeneity controlling flow and transport. The fate of the tracer injections at this scale could not have been quantified using borehole logging and/or borehole sampling methods alone. For additional information, see J. Robinson's Ph.D. thesis at [https://rucore.libraries.rutgers.edu/rutgers-lib/47707/](https://rucore.libraries.rutgers.edu/rutgers-lib/47707/) and a conference paper at [http://www.ncas.rutgers.edu/advancing-electrical-geophysical-characterization-dnapl-contaminated-fractured-rock-aquifers-may-201](http://www.ncas.rutgers.edu/advancing-electrical-geophysical-characterization-dnapl-contaminated-fractured-rock-aquifers-may-201).
Industrial & Engineering Chemistry Research, Vol 54 No 40, 9813-9823, 2015

For treating PCE-contaminated groundwater, small particle sizes and full-scale granular activated carbon (GAC) were tested in a fixed-bed column packed with GAC. Adsorption capacity decreased with increasing particle size in the presence of natural organic matter. Columns running in dynamic mode, PCE in-feed were used to test three operating conditions. Sampling along the columns was used to monitor PCE concentration in the liquid phase at different column lengths, yielding a large data set for a mathematical model based on mass balance of PCE to predict the adsorption dynamics under various operating conditions. The model was reliable and accurate over the whole data set. The fixed-bed performance was evaluated in terms of operation time, total volume of decontaminated water, and degree of GAC utilization.

1DTEMPPRO V2: NEW FEATURES FOR INFERRING GROUNDWATER/SURFACE-WATER EXCHANGE
Groundwater Monitoring & Remediation, Vol 54 No 4, 434-439, 2016

A new version of the computer program 1DTempPro extends the original code to include new capabilities (1) automated parameter estimation, (2) layer heterogeneity, and (3) time-varying specific discharge. The code serves as an interface to the U.S. Geological Survey model VS2DH and supports analysis of vertical 1-D temperature profiles under saturated flow conditions to assess groundwater/surface-water exchange and estimate hydraulic conductivity for cases where hydraulic head is known. Additional information at http://water.usgs.gov/cgw/bgas/1dtempre/.

GROUNDWATER GEOCHEMICAL AND SELECTED VOLATILE ORGANIC COMPOUND DATA, OPERABLE UNIT 1, NAVAL UNDERSEA WARFARE CENTER, DIVISION KEYPORT, WASHINGTON, JULY 2015
Huffman, R.L.
U.S. Geological Survey Data Series 998, 64 pp, 2016

This report presents groundwater geochemical and selected CVOC data collected at Operable Unit 1 by USGS during July 2015 in support of long-term monitoring for natural attenuation. Concentrations of redox-sensitive constituents measured at all wells and piezometers were consistent with those measured in previous years, with dissolved oxygen concentrations all above 8 mg/L.

ASSESSING ATMOSPHERIC CONCENTRATION OF POLYCHLORINATED BIPHENYLS (PCBS) BY EVERGREEN RHODODENDRON MAXIMUM NEXT TO A CONTAMINATED STREAM
Viet D. Dang, David Walters, Cindy M. Lee
Environmental Toxicology and Chemistry, [Online publication ahead of print] 2016

Scientists used Rhododendron maximum (rhododendron) growing next to a contaminated stream to assess atmospheric PCBs. The study area was located in a rural setting ~2 km downstream of a former Sangamo-Weston (S-W) facility. Leaves from the same mature shrubs were collected in late fall 2010 and in winter and spring 2011. PCBs were detected in the collected leaves, suggesting that rhododendrons can be used as air passive samplers in rural areas where active sampling is impractical. Estimated S-W PCNs (147 congeners) concentrations in the atmosphere decreased from fall 2010 to spring 2011, with concentration means at 3990, 2850, and 931 pg/m³ in fall 2010, winter 2011, and spring 2011, respectively. These results indicate that the atmospheric concentrations at this location continue to be high despite termination of active discharge from the former S-W plant. Leaves had a consistent pattern of high concentrations of tetra- and penta-CBs similar to the congener distribution in polyethylene passive samplers deployed in the water column, suggesting that volatilized PCBs from the stream were the primary source of contaminants in rhododendron leaves. See additional information on this study in V. Dang’s dissertation at http://eprints.clemson.edu/all_dissertations/8897.

HEAVY METAL DISTRIBUTION IN A SEDIMENT PHYTOREMEDIATION SYSTEM AT PILOT SCALE
Doni, S., C. Macci, E. Peruzzi, R. Iannelli, and G. Masiando.
Ecological Engineering, Vol 81, 146-157, 2015

In a study of phytoremediation for the decontamination of contaminated dredged marine sediments, researchers investigated the synergic action of different plant species and compost in removing heavy metals (Cd, Ni, Zn, Pb, and Cu) and total petroleum hydrocarbons. A complete picture of metals flux was obtained by investigating metal mass-balance in the treated sediments. Metal distribution in the sediment phases was not uniform, and each metal predominated in different fractions. Cd, Zn, and Cu were the metals most easily translocated in both aboveground plant tissues and roots, confirming their higher bioavailability for the plants. At the end of the study, mass balance results showed high metal content remained in the sediment. The greatest contribution in metal containment was attributed to phytostabilization at rhizosphere level followed by gravel and sand absorption. The capacity of the rhizosphere to precipitate heavy metals could be considered as an alternative option for reducing metal bioavailability and consequently sediment toxicity.

PERFORMANCE OF ROSE SCENTED GERANIUM (PELARGONIUM GRAVEOLENS) IN HEAVY METAL POLLUTED SOIL VIS-A-VIS PHYTOACCUMULATION OF METALS
Chand, S., G. Singh, and D.D. Patra.

The effect of heavy metal toxicity on growth, herb, oil yield and quality, and metal accumulation was investigated in rose-scented geranium (Pelargonium graveolens) grown in heavy metal-enriched soils. Four heavy metals (Cd, Ni, Cr, and Pb) each at two levels (10 and 20 mg/kg soil) were tested on geranium. Results indicated that Cr concentration in soil at 20 mg/kg reduced leaves, stem, and root yield by 70, 83, and 45%, respectively, over control. Cr-stressed soil had a significant effect on root growth. Nickel, Cr, and Cd concentration and accumulation in plants increased with higher application of these metals. Cr, Ni, and Cd uptake was observed to be higher in leaves than in stem and roots. Essential oil constituents generally were not affected significantly by heavy metals, although Pb at 10 and 20 ppm significantly increased the content of citronellol, and Ni at 20 ppm increased the content of geraniol. Given the higher accumulation of toxic metals by geranium and the minimal impact of heavy metals on essential oil quality, geranium can be commercially cultivated in heavy metal contaminated soil for production of high-value essential oil.

PHYTOREMEDIATION POTENTIAL OF CADMIUM-CONTAMINATED SOIL BY EUCALYPTUS GLOBULUS UNDER DIFFERENT COPPICE SYSTEMS
Luo, J., S. Qi, L. Peng, and X. Xie.

The phytoremediation potential of Eucalyptus globulus in Cd-contaminated soil was evaluated through two different harvest methods. Although replanting is more expensive than coppicing and produces less aboveground biomass, more Cd was removed from the soil with lower operational costs. Despite the higher cost of replanting, when phytoremediation efficiency and total duration are considered, replanting is recommended as an appropriate method for decreasing the phytoremediation time frame.

General News

THE CLEAN WATER ACT AND SEDIMENT REMEDIATION: USING THE DATA QUALITY OBJECTIVES PROCESS TO HELP ASSURE THAT
REMEDIED SEDIMENT SITES ARE NOT RE-CONTAMINATED
Association of State and Territorial Solid Waste Management Officials (ASTSWMO), 23 pp, 2016

This paper suggests a planning method to help identify possible sources of pollutants that might prevent a site from reaching remedial cleanup levels or remedial action objectives, or that might recontaminate the site following a successful remedial action. Coordination between the Clean Water Act and CERCLA programs regarding single outfalls, storm water, combined sewer outfalls, and watershed management issues that affect a contaminated sediment site can yield more efficient, effective, and sustainable remedies.


SUPERFUND STATE CONTRACTS — A REFERENCE FOR STATES AND TERRITORIES: HOW TO GET THE MOST OUT OF YOUR SUPERFUND STATE CONTRACT
Association of State and Territorial Solid Waste Management Officials (ASTSWMO), 36 pp, 2016

This paper is intended to help states recognize and understand decision points relevant to Superfund state contracts and provide some implementation strategies to assist with successful site cleanup. Prepared by the ASTSWMO Remedial Action Focus Group, the paper discusses statement of work, funding, state assurances, institutional controls, transition to O&M, and other considerations.


FROM BIOAVAILABILITY SCIENCE TO REGULATION OF ORGANIC CHEMICALS
Environmental Science & Technology, Vol 49 No 17, 10255-10264, 2015

This article discusses bioavailability concepts and methods as well as possible pathways for the implementation of bioavailability into risk assessment and regulation. The authors also offer a simple, pragmatic, and justifiable approach for use within retrospective and prospective risk assessment. Downloaded from UvA-DARE, the institutional repository of the University of Amsterdam (UvA), http://hdl.handle.net/11245/2.170806.

ABSTRACT BOOK: SETAC EUROPE 25TH ANNUAL MEETING, 3-7 MAY 2015, BARCELONA, SPAIN
Society of Environmental Toxicology and Chemistry Europe (SETAC Europe), 525 pp, 2015

The theme of the 25th annual SETAC meeting was "environmental protection in a multi-stressed world: challenges for science, industry and regulators." This book comprises the abstracts of the presentations for the platform and poster sessions of the 2015 meeting.


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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