

Technology Innovation News Survey

Entries for December 1-15, 2015

Market/Commercialization Information

2015 TOP MARKETS REPORT — ENVIRONMENTAL TECHNOLOGIES — A MARKET ASSESSMENT TOOL FOR U.S. EXPORTERS

Hinman, M.

U.S. Department of Commerce, International Trade Administration, 76 pp, 2015

Led by the International Trade Administration and U.S. EPA, the U.S. Environmental Export Initiative (EEI) is a government-wide initiative that leverages EPA's regulatory and scientific expertise on solving challenging environmental problems with other government agencies' trade policy, promotion, and finance capabilities. The overarching goal of the EEI is to deliver, within the context of finite government resources, targeted trade promotion and policy programs that enhance the international competitiveness of the U.S. environmental technologies industry. This report supports EEI efforts by identifying and ranking export markets where focusing finite government resources will have the greatest impact in terms of increasing commercial opportunity for U.S. companies. This study distills market forecasts and quantitative assessments into overall market scores that identify and rank export markets relative to three critical traits: (1) markets that are large and growing in absolute terms; (2) those that have a defined and increasing need for imported technology and services; and (3) those where U.S. exports are lower than predicted, based on markets with similar characteristics.

http://trade.gov/topmarkets/pdf/Environmental_Technologies_Top_Markets_Report.pdf

AFICA ENVIRONMENTAL SERVICES & CONSTRUCTION-PACAF (ESC-PACAF)

Department of the Air Force, AFICA - CONUS, Pacific AFB Locations, San Antonio, TX.
Federal Business Opportunities, FBO-5068, Solicitation FA8903-16-R-0006.

This notice constitutes a request for feedback for planning purposes only. The Air Force Installation Contracting Agency (AFICA), Joint Base San Antonio Texas, in support of the Air Force Civil Engineer Center (AFCEC), anticipates contracting with approximately five small business firms to address environmental restoration/remediation needs at Air Force installation locations within the PACAF Region. The NAICS code for this acquisition is 562910 (500 employees or less). The contracts under this small business set-aside are contemplated to be IDIQ with firm-fixed-price and cost-plus-fixed-fee pricing arrangements. Contract Fair Opportunity Selection and Ordering Procedures will be used to compete task orders against the successful offerors. Under a ceiling of \$48.5M, terms include a five-year ordering period plus three additional years for performance completion. Review and response to the DRAFT solicitation via the matrix Excel spreadsheet (both attached to the FedBizOpps notice) is voluntary. Submit all industry feedback by 12:00 noon CT on February 2, 2016. <https://www.fbo.gov/notices/330695246c005979011e0648b0ddd6c>

ELIZABETH MINE SUPERFUND SITE, SOUTH STRAFFORD, VERMONT: PHASE 2 REMEDIAL ACTION, LORD BROOK SOURCE AREAS

U.S. Army Corps of Engineers, USACE District, New England, Concord, MA.
Federal Business Opportunities, FBO-5068, Solicitation W912WJ-16-X-0012.

The U.S. Army Corps of Engineers, New England District is issuing this Sources Sought to determine interest, availability, and capability of 8(a), HUBZone, service-disabled veteran-owned, and small business concerns for an IDIQ contract for remediation services at the Elizabeth Mine Superfund Site, an abandoned copper mine located on privately owned land in Orange County, Vermont. The NAICS code is 562910, with a project cost range of \$10-\$25M. Work will begin in summer 2016 and will extend through 2017. Interested firms are invited to submit a capabilities package by 3:00 PM ET on February 12, 2016. <https://www.fbo.gov/spq/USA/COE/DACA33/W912WJ-16-X-0012/listing.html>

SMALL BUSINESS EVENT: WOMEN OWNED SMALL BUSINESS OUTREACH

Environmental Protection Agency, Office of Small Business Programs, Washington, DC.
Federal Business Opportunities, FBO-5061, Solicitation Women_Owned_Outreach_2016

U.S. EPA's Office of Small Business Programs plans to hold a vendor outreach session for woman-owned small business concerns on March 8, 2016, from 10 AM to noon, in Room 1153 at EPA WJC East, 1201 Constitution Ave. NW, Washington, DC. Space is limited; only 2 representatives per firm may attend. Registration to attend the meeting closes March 1, 2016. See the attachment to the FedBizOpps notice for the link to the SurveyMonkey registration page. <https://www.fbo.gov/notices/39ecdf82da806c34554e92da9b9b00cb>

RESEARCH TO ACTION: ASSESSING AND ADDRESSING COMMUNITY EXPOSURES TO ENVIRONMENTAL CONTAMINANTS (R01)

DHHS, National Institutes of Health, Funding Opportunity PA-16-083.

This funding opportunity announcement encourages the submittal of grant applications that use community-engaged research methods to investigate the potential health risks of environmental exposures of concern to the community and to implement an environmental public health action plan based on research findings. The overall goal is to support changes to prevent or reduce exposure to harmful environmental exposures and improve the health of a community. The estimated funding ceiling is \$2.5M. Direct costs must be less than \$500,000 in any year, and need to reflect actual needs of the proposed project. The maximum period is 5 years. The closing date for this opportunity is May 7, 2019.

<http://www.grants.gov/web/grants/view-opportunity.html?oppId=280957>

See additional information, such as standard dates for application, at <http://grants.nih.gov/grants/guide/pa-files/PA-16-083.html>.

Cleanup News

THERMAL EXPERIENCES IN DENMARK

Larsen, T.H.

International Conference: Contaminated Sites Bratislava, 27-29 May 2015, Slovak Republic. 216-219, 2015

Over a 20-year period, about 15 pilot or full-scale cleanups using thermal techniques have been carried out in Denmark. This paper briefly presents experiences and lessons learned from the implementation of these remedies. The three most common methods used are direct steam injection (SI), thermal conductive heating (TCH), and electrical resistance heating (ERH). All three methods have shown strong results with respect to removal rates. SI has been applied successfully in the more permeable sites, whereas TCH and ERH have been applied in subsurfaces of low permeability. The size of the sites has varied from a few hundred cubic meters up to 50,000 m³. Almost all cases targeted chlorinated solvents, removing from 3 up to 1,100 Euros/m³ of treated soil. SI cost less than the other methods; unlike TCH and ERH, it is not patented. See **pages 216-219** in the proceedings at http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/CONFERENCE_PROCEEDINGS.pdf.

DENISON MINE WATER TREATMENT: CHALLENGES AND ADAPTATIONS

Ramsay, K., J. Luchinski, R. Morrell, and I. Ludgate.

6th Mining and the Environment International Conference, Laurentian University, Sudbury, Ontario, Canada, 20-25 June 2015: Conference Abstracts, Vol 2, 2015

As part of the closure of the Denison Mine in Elliot Lake, Ontario, tailings were disposed of subaqueously to prevent acid rock drainage and minimize metals mobilization. This disposal method proved extremely effective for nearly two decades; however, depletion of sulfate over time in the shallow sediment layer and the lack of acid rock drainage from within the tailings pile resulted in a large drop in sulfate in the effluent water from the reservoir. This decline in sulfate levels, compounded by passive basin water-level management, led to an increase in radium concentrations within the basin; as aqueous sulfate concentrations declined, dissolution of barium sulfate (to which radium is associated) increased, such that radium was released from the tailings. To improve the mine effluent quality, a new treatment plant was constructed and water management strategy devised to improve radium treatment. With the installation of a novel siphoning system, peak flow fell from more than 600 L/s to less than 200 L/s. The improved treatment system enabled better reagent addition, resulting in improved effluent water quality. The new system also was integrated into a remote monitoring network, which allowed better site control and reduced operating costs.

Demonstrations / Feasibility Studies

COST-EFFECTIVE, ULTRA-SENSITIVE GROUNDWATER MONITORING FOR SITE REMEDIATION AND MANAGEMENT: ESTCP COST AND PERFORMANCE REPORT

Halden, R.U. and I.B. Roll. ESTCP Project ER-201122, 81 pp, 2015

The objective of project ER-201122 was to describe the development and demonstration of the In Situ Sampler (IS2), a new tool for monitoring contamination in ground and surface waters. IS2 generates preconcentrated samples, provides time-integrated data, and reduces sample size and handling. The tool does not require calibration because concentration data are derived directly from the mass of analyte taken from the sorbent cartridge and the known volume of water processed. Preconcentration provides significant magnification of analyte concentration, improving reporting limits. This project cost analysis provides an account of the theory, the engineering design process, and the first IS2 field data generated, targeting naphthalene at the former Williams AFB in Mesa, Arizona, and Cr(VI) at NAS North Island. <https://www.serdp-estcp.org/content/download/36801/351726/file/ER-201122-CP.pdf> See additional project information at <https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Monitoring/ER-201122>

RECYCLE AND DISPOSAL OF CONTAMINATED DREDGED SEDIMENTS USING THE PILOT-SCALE HYBRID PROCESS IN DREDGER

Kim, J.-O., S. Kim, and J. Chung.

Environmental Progress & Sustainable Energy, Vol 34 No 2, 476-484, 2015

A pilot-scale plant was installed on a dredger to remove contaminants from dredged sediment and discharge the treated water. The hybrid treatment system comprised a screen, a two-stage hydrocyclone for liquid-solid separation, and either a membrane filtration or a chemical coagulation step to remove the remaining contaminants. To recycle the treated water after removing >90% of particles 18 µm or larger, the inflow velocities of the hydrocyclone in the first and second stages were fixed at 6.5 and 10 m/s, respectively. In addition, a ratio of the depth of the vortex finder to the cylinder section of 1.5 was shown to yield the highest separation rates. Considering operational costs, membrane filtration is recommended over chemical coagulation for the sequential treatment strategy.

MODIFIED FENTON'S REAGENT: EXPLOSIVE ZONE (EX-1) APPLICATION CONTROL AND SAFETY MANAGEMENT

Waska, K., P. Benes, J. Kamas, M. Minarik, L. Hertlova, and O. Snajdar.

Contaminated Sites Bratislava, 27-29 May 2015, Slovak Republic. 65-70, 2015

This paper describes the pilot deployment of in situ chemical oxidation using modified Fenton's reagent (MFR) for BTEX remediation. The study tested possible ways of real-time reaction control and project safety management in the immediate vicinity of an explosive zone (EX-1). The monitored risk factors included the exothermic character of the reaction, the corrosiveness of injected reagent, the groundwater level (with regard to the depth of local industrial utility networks), and the generation of VOCs as pollutant oxidation daughter products. This paper describes the successful decontamination of the target zone and the interaction between injected MFR and selected environmental parameters. A year-long data series depicts the transition of physicochemical parameters from pre-treatment (anaerobic), through treatment (aerobic), to post-treatment (anaerobic) conditions. See **pages 65-70** in the proceedings at http://contaminated-sites.sazp.sk/sites/contaminated-sites.sazp.sk/files/prilohy/CONFERENCE_PROCEEDINGS.pdf.

DRAFT CORRECTIVE MEASURES IMPLEMENTATION, IN-SITU CHEMICAL REDUCTION PILOT TEST: INTERIM RESULTS REPORT, BECKMAN COULTER, INC., 4300 NORTH HARBOR BOULEVARD, FULLERTON, CALIFORNIA

California Department of Toxic Substances Control, 466 pp, 2015

This report presents the interim results of ISCR pilot testing at the Beckman Coulter site, including results of post-injection groundwater monitoring conducted on April 20, 2015, 38 days after completion of the amendment injection phase of the ISCR pilot test. The Ferox™ pneumatic emplacement process was used to inject Ferox™-Flow microscale zero-valent iron into Zone C in the 15-ft depth interval extending from about 42 to 57 ft bgs where the highest concentrations of VOCs occur in groundwater beneath the site. The ISCR pilot test obtained sufficient data to evaluate (i) the radius of influence for emplacement of ISCR amendment, and (ii) the effectiveness of the emplaced ISCR amendment in reducing the mass of VOCs, principally TCE, that occur in groundwater beneath the site. http://www.envirostor.dtsc.ca.gov/public/final_documents2.asp?global_id=80001536&doc_id=60393498

PROGRESS TOWARD OPERABLE UNIT 1 GROUNDWATER CLEANUP AT THE MOUND, OHIO, SITE U.S. DOE, Office of Legacy Management, 2 July 2015

Groundwater pump and treat (P&T) is the current remedy for controlling contamination from residual VOCs in OU-1. A field demonstration is addressing VOC-contaminated groundwater using a two-part deployment: (1) injection of neat (pure) vegetable oil at the water table beneath areas with the highest residual VOC concentrations in soil, and (2) injection of emulsified vegetable oil (EVO) in the areas with highest VOC concentrations in the groundwater plume. A total of 198,263 gal of emulsion (EVO blended with water) was injected into the aquifer between August 25 and September 22, 2014. The EVO blend was ~45% soybean oil with surfactants and amendments (lactate, yeast extract, and vitamin B-12) blended with treated water obtained from the P&T system at a ratio of 50:1 (water to EVO). A total of 4,590 gallons of neat oil was deployed into the vadose zone under gravity flow between September 22 and December 7, 2014. To date, VOC data and geochemical indicators—as well as microbial type and abundance—indicate the formation of discrete zones conducive to the reduction dechlorination of PCE and TCE. The field demonstration will continue for 3 years. When the regulators agree that deployment of EVO has created and maintained structured geochemical zones resulting in the reductive dechlorination of PCE and TCE, DOE likely will propose to change the remedy to MNA. <http://energy.gov/lm/articles/progress-toward-operable-unit-1-groundwater-cleanup-mound-ohio-site>

Research

ARSENIC CYCLING IN HYDROCARBON PLUMES: SECONDARY EFFECTS OF NATURAL ATTENUATION

Cozzarelli, I.M., M.E. Schreiber, M.L. Erickson, and B.A. Ziegler.
Groundwater, Vol 54 No 1, 35-45, 2015

At hydrocarbon spill sites, natural attenuation (NA) relies on biodegradation of hydrocarbons coupled with reduction of electron acceptors, including solid-phase ferric iron (Fe(III)). Because arsenic (As) adsorbs to Fe-hydroxides, a potential secondary effect of hydrocarbon NA coupled with Fe(III) reduction is a release of naturally occurring As to groundwater. In a long-term study of anaerobic biodegradation of hydrocarbons coupled to Fe(III) reduction at a crude-oil-contaminated aquifer near Bemidji, Minnesota, groundwater samples collected at the site annually from 2009 to 2013 showed As concentrations in groundwater in the plume reached 230 µg/L, whereas groundwater outside the plume contained This paper is **Open Access** at <http://onlinelibrary.wiley.com/doi/10.1111/gwat.12316/pdf>

PHYTOREMEDIATION OF EXPLOSIVE-CONTAMINATED SOILS

Kiiskila, J.D., P. Das, D. Sarkar, and R. Datta.
Current Pollution Reports, Vol 1 No 1, 23-34, 2015

A considerable amount of information on phytotoxicity and metabolism of TNT and RDX in plants and microorganisms has been collected over the past few decades. This review identifies phytoremediation species that show promise for application to TNT and RDX contamination. Among the plant species that have shown efficient TNT uptake, only a few have been found—i.e., Eurasian water milfoil (*Myriophyllum spicatum*) and vetiver grass (*Chrysopogon zizanioides*)—that can do so in a variety of environments. For RDX, reed canary grass, fox sedge, and rice show promise, although degradation of RDX in the plant tissue is limited. <http://link.springer.com/content/pdf/10.1007%2Fs40726-015-0003-3.pdf>

DETERMINATION OF THE BIOLOGICALLY RELEVANT SAMPLING DEPTH FOR TERRESTRIAL AND AQUATIC ECOLOGICAL RISK ASSESSMENTS

Kravitz, M. and R.H. Anderson.
EPA 600-R-15-176, ERASC-015F, 75 pp, 2015

Based upon an extensive review of ecological literature, this report attempts to provide defensible approximations for identification of the depth of the biotic zone in soils and sediments. Actual sampling depths may be modified by the assessor based on the purpose of the assessment. The primary audience for this document is Superfund staff and contractors and ecological risk assessors. The methods used in this study differ somewhat between Part 1 (Terrestrial Biotic Zone) and Part 2 (Aquatic Biotic Zone). In Part 1, biological activity was quantified in forests and grasslands as a function of depth across selected metrics. In Part 2, the reviewers based the biotic zone(s) in various habitats on the 80th percentile of abundance or on biomass depth distributions. <http://cfpub.epa.gov/ncea/erasc/recordisplay.cfm?deid=310058>

THE FISHRAND SPATIALLY-EXPLICIT BIOACCUMULATION MODEL

von Stackelberg, K., M.A. Williams, and M.S. Johnson.
ESTCP Project ER-200917, 241 pp, 2014

Predictive models are required to evaluate the impact of potential contaminated sediment management alternatives. This project demonstrated the application at two Army sites of a probabilistic, spatially explicit, and dynamic bioaccumulation model, referred to as FishRand. Those results were compared to the currently accepted practice of a deterministic application and a probabilistic but not spatially explicit application. An application was developed for total PCBs, two individual PCB congeners, and three homologue groups at one site, and for DDT, DDE, and DDD at the other site. Since completion of this effort, the model has been updated to provide direct linkage to GIS files (go to

<http://el.erdc.usace.army.mil/trophictrace/> for the latest version of the model).
<https://www.serdp-estcp.org/content/download/35617/341516/file/ER-200917-FR%20-%20FishRand.pdf>
See more project reports at
<https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Risk-Assessment/ER-200917>.

REMEDICATION OF DDT AND ITS METABOLITES IN CONTAMINATED SEDIMENT

Chattopadhyay, S. and D. Chattopadhyay.
Current Pollution Reports, Vol 1 No 4, 248-264, 2015

Sediment characteristics, positioning, and overlying water column must be considered relevant to the release and transport of DDT and its degradation products (DDTR) when evaluating appropriate remediation options. DDTR and other co-contaminants are not necessarily fixed permanently in the sediments. Changes in geochemical and physical parameters (e.g., ORP or anoxic environment, seepage, water table fluctuation) can mobilize these species. Remobilization processes can include the diffusion of DDTR into the water body due to concentration gradients, oxidation of anoxic sediments by bioturbation, or resuspension caused by flooding. DDTR can be transformed or partially degraded in sediments under appropriate environmental conditions; however, the degradation products often are as toxic and persistent as the original pesticides or chlorinated organics. The authors review five technologies that have been applied to remediate DDT-contaminated sediments: dredging, sediment washing, phytoremediation, in situ capping, and natural attenuation <http://link.springer.com/content/pdf/10.1007%2Fs40726-015-0023-z.pdf>

REMEDICATION OF DDTR CONTAMINATED SOIL BY THE COMBINATION OF SOLVENT EXTRACTION AND CATALYTIC HYDRODECHLORINATION

Ma, X., Y. Luan, S. Liu, Y. Liu, and C. Xia.
RSC Advances, Issue 53, 42597-42602, 2015

A new approach to remediation of DDT and its metabolites (DDTR) in contaminated soil is based on successive steps of solvent extraction, followed by catalytic hydrodechlorination (HDC). Solvent extraction was applied first to extract DDTR from contaminated soil at ambient temperature and pressure, and then catalytic HDC over a Pd/C catalyst was introduced to treat the extract from DDTR-contaminated soil. GC-MS analytical results demonstrated that the combined technique treated DDTR-contaminated soil effectively and reduced its toxicity.

IMPROVEMENT, VERIFICATION, AND REFINEMENT OF SPATIALLY EXPLICIT EXPOSURE MODELS IN RISK ASSESSMENT: SPATIALLY EXPLICIT EXPOSURE MODEL (SEEM) DEMONSTRATION

Wickwire, T., M.J. Quinn, M.A. Williams, and M.A. Johnson.
ESTCP Project ER-200917, 68 pp, 2014

This study examined the value of spatial models with respect to improving the assessment of small mammal exposures in the environment, and aimed to overcome the disconnect that exists when applying spatial considerations between site-wide averages and an assessment that captures exposures based on species-specific habitat preferences. SEEM model outputs were compared to deterministic risk calculations and directly measured blood-lead based risk calculations to determine if SEEM increased the reliability of exposure assessment. For small mammals with comparatively small foraging areas, SEEM was no more predictive than site-wide average-based risk calculations. Results emphasized that if habitat is not heterogeneous at ecologically relevant scales, then SEEM cannot improve risk estimates. The larger part of this ESTCP project accomplished the goals of generating greater awareness of the value of spatial models and of training risk assessors and managers on using SEEM. The model was updated in the course of this project. <https://www.serdp-estcp.org/content/download/35574/341208/file/ER-200917-FR.pdf>
See more project reports at
<https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Risk-Assessment/ER-200917>.

EFFECT OF *MISCANTHUS* CULTIVATION ON METAL FRACTIONATION AND HUMAN BIOACCESSIBILITY IN METAL-CONTAMINATED SOILS: COMPARISON BETWEEN GREENHOUSE AND FIELD EXPERIMENTS

Pelfrene, A., A. Kleckerova, B. Pourrut, F. Nsanganwimana, F. Douay, and C. Waterlot.
Environmental Science and Pollution Research International, Vol 22 No 4, 3043-3054, 2015

Miscanthus x giganteus efficiency in phytostabilizing metals on three contaminated agricultural sites was evaluated after short-term exposure under greenhouse conditions and after long-term exposure under field conditions. Particular attention was paid to the influence of *Miscanthus* cultivation on (1) Cd, Pb, and Zn fractionation using sequential extractions and (2) metal bioaccessibility using an in vitro gastrointestinal digestion test. Data gave evidence of different behaviors between the greenhouse and the field; metal redistribution in soils induced by *Miscanthus* culture, more specifically under field conditions; higher environmental availability for Cd than for Pb and Zn in both conditions; and overall a higher bioaccessible fraction for Pb (about 80%) and Cd (65-77%) than for Zn (36-52%) in the gastric phase, with a sharp decrease in the intestinal phase (18-35% for Cd, 5-30% for Pb, and 36-52% for Zn). Compared to uncultured soils, phytostabilization using *Miscanthus* culture provided evidence for substantial effects on oral bioaccessibility of Cd, Pb, and Zn. See additional information from the PHYTENER project in F. Nsanganwimana's Ph.D. thesis at <https://ori-nuxeo.univ-lille1.fr/nuxeo/site/esupversions/c345fdb0-9952-4cd2-833b-7c6e049bea55>. Although a portion of the thesis is in French, several of the chapters are English-language manuscripts of papers published or submitted to peer-reviewed journals.

BEHAVIOUR OF MERCURY FROM HAZARDOUS SOLID WASTE GENERATED BY CHLOR-ALKALI CUBAN INDUSTRY: REMEDIATION PROPOSAL AT PILOT SCALE

Busto, Y., E.W. Palacios, F.M.G. Tack, L.M. Peralta, X. Cabrera, and L.M. Rios.
Chemical Engineering Transactions, Vol 45, 751-756, 2015

A remediation process is proposed based on thermal technology to treat high mercury-containing waste from chlor-alkali plants. This paper describes the design of a proposed pilot system for the Cuban chlor-alkali Elpidio Sosa-ELQUI plant. With a treatment capacity of 960 tons of waste per year, the pilot system is able annually to recover 639 kg of metallic mercury and treat 479 tons of waste that can be sold for other uses. A cost-benefit assessment is provided of treatment goals. <http://www.aidic.it/cet/15/45/126.pdf>

RELATING SUBSURFACE TEMPERATURE CHANGES TO MICROBIAL ACTIVITY AT A CRUDE OIL-CONTAMINATED SITE

Warren, E. and B.A. Bekins.

Journal of Contaminant Hydrology, Vol 182, 183-193, 2015

Crude oil at a spill site near Bemidji, Minnesota, has been undergoing aerobic and anaerobic biodegradation for over 30 years, creating a 150-200 m plume of primary and secondary contaminants. Microbial degradation generates heat, which should be measurable under the right conditions. To measure this heat, thermistors were installed in wells in the saturated zone and in water-filled monitoring tubes in the unsaturated zone. In the saturated zone, a thermal groundwater plume originates near the residual oil body with temperatures ranging from 2.9°C above background near the oil to 1.2°C downgradient. Temperatures in the unsaturated zone above the oil body were up to 2.7°C above background temperatures. Previous work at this site has shown that methane produced during oil biodegradation migrates upward and is oxidized in a methanotrophic zone midway between the water table and the surface. The temperature increases result primarily from aerobic methane oxidation in the unsaturated zone above the oil. While temperature may be useful as a low-cost measure of activity, care is required to account for the correct heat-generating reactions, other heat sources, and the effects of focused recharge.

EVALUATING TRANSPORT AND ATTENUATION OF INORGANIC CONTAMINANTS IN THE VADOSE ZONE FOR AQUEOUS WASTE DISPOSAL SITES

Truex, M.J., M. Ostrom, and G.D. Tartakovsky.

PNNL-24731, 100 pp, 2015

This report discusses an approach for evaluating vadose zone transport and attenuation of aqueous wastes containing inorganic (non-volatile) contaminants disposed of directly to the ground and their effect on the underlying groundwater. The approach provides a structured method for (1) estimating transport of contaminants through the vadose zone and the resulting temporal profile of groundwater contaminant concentrations and (2) presenting and explaining the results of the transport analysis in the context of the site-specific waste disposal conditions and site properties, including heterogeneities and other complexities. The document includes considerations related to identifying appropriate monitoring to verify the estimated contaminant transport and associated predictions of groundwater contaminant concentrations. While primarily intended for evaluating contaminant transport under natural attenuation conditions, the approach also can be applied to identify mitigation approaches in the vadose zone that would reduce the temporal profile of contaminant concentrations in groundwater, if needed.

http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24731.pdf

IMPROVING UNDERSTANDING OF THE FATE AND TRANSPORT OF MUNITIONS CONSTITUENTS TO ENHANCE SUSTAINABILITY OF OPERATIONAL RANGES

Allen, H., D. Di Toro, D.T.F. Kuo, et al.

SERDP Project ER-1688, 221 pp, 2015

The project team generated data and developed a model for the kinetics of adsorption and desorption of 2,4-dinitrotoluene and nitroglycerin to and from the nitrocellulose matrix itself. In addition to developing a model for the partitioning of RDX, HMX, TNT, nitroglycerin, 2,4-dinitrotoluene, nitroguanadine, and mixtures of these munitions constituents to soils of varying physical and chemical characteristics, they also developed and used a chemical probe to determine the magnitude of clay mineral binding sites and ascertained the soil composition responsible for irreversible binding. They modeled the results using polyparameter partitioning models, and the models for irreversible bonding used soils typical of those found at operational ranges, spanning a variety of properties. For initial validation of the models developed in this project, model results were compared to those determined in soil column studies.

<https://www.serdp-estcp.org/content/download/37110/354223/file/ER-1688-FR.pdf>

DISSOLVED GAS EXOLUTION TO ENHANCE GAS PRODUCTION AND TRANSPORT DURING BENCH-SCALE ELECTRICAL RESISTANCE HEATING

Hegele, P.R. and K.G. Mumford.

Advances in Water Resources, Vol 79, 153-161, 2015

Condensation of VOCs in colder zones can be detrimental to the performance of in situ thermal treatment for remediation of chlorinated solvent (e.g., TCE) source zones. A novel method to increase gas production and limit convective heat loss in more permeable, potentially colder zones is based upon the injection and liberation of dissolved gas from solution during heating. Dissolved CO₂ solutions were used to facilitate gas production during heating in lab experiments of electrical resistance heating for groundwater remediation. Exsolution of CO₂ produced discontinuous gas flow at lower temperatures. At elevated but sub-boiling temperatures, maximum exsolved gas saturations were attained, and could be sustained when the CO₂ solution was injected during heating rather than emplaced prior to heating. This gas saturation was estimated to decrease groundwater relative permeability. For additional information, see P. Hegele's Master's thesis at <https://space.library.queensu.ca/handle/1974/8674>.

General News

ENGINEERING ISSUE: CHALLENGES IN BULK SOIL SAMPLING AND ANALYSIS FOR VAPOR INTRUSION SCREENING OF SOIL

Dawson, H., T. McAlary, C. Lutes, and D. Carr.

EPA 600-R-14-277, 14 pp, 2014

This engineering issue paper discusses the benefits and limitations of using bulk soil samples to assess vapor intrusion (VI) risks from soil containing VOCs. Analyses of factors controlling the VOC concentration distribution in soil and the sensitivity of current laboratory methods are used to show that while bulk soil sampling and analysis may help delineate source areas and determine the gross mass of contamination present in a source area, they cannot adequately assess potential VI exposures for most VOCs in undisturbed soil or in soil remaining after excavation. To address this information gap, this paper also describes alternatives for monitoring soil VOCs and for enhancing remedies at sites where excavation is being considered or used for VOC-contaminated soil.

<http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100NDQL.TXT>

PERMITTING OF LANDFILL BIOREACTOR OPERATIONS: TEN YEARS AFTER THE RD&D RULE

U.S. EPA, National Risk Management Research Laboratory, Cincinnati, OH.
EPA 600-R-14-335, 60 pp, 2014

To formally promote innovative landfill technologies, including adoption of alternative cover systems and bioreactor technology, EPA published the Research, Development, and Demonstration (RD&D) Permit Rule on March 22, 2004. The Rule allows Subtitle D landfills a variance option for adding bulk free liquids if a demonstration can be made that such a variance will not increase risk to human health and the environment relative to standard permit conditions for the landfill. Prior to promulgation of the Rule, about 20 full-scale bioreactor landfill projects were underway in North America, including one in Canada. By March 2014, 40 bioreactor projects were reported. Wisconsin features the largest number of projects at 13. Only 16 of 50 states had adopted the Rule in 2014, with a further seven reportedly in the process of Rule adoption. <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100NDOZ.TXT>

PERFORMANCE ASSESSMENT FOR PUMP-AND-TREAT CLOSURE OR TRANSITION

Truex, M.J., C.D. Johnson, D. Becker, M.H. Lee, and M.J. Nimmons.
PNNL-24696, 118 pp, 2015

This document outlines a structured approach for assessing pump-and-treat (P&T) performance to support a decision to optimize, transition, or close a P&T remedy. Case studies are provided to augment descriptions of decision elements and illustrate each type of outcome identified in the performance assessment approach. The document provides references to resources for tools and other technical guidance relevant to conducting the P&T assessment. http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-24696.pdf

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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