Technology Innovation News Survey

Entries for April 1-15, 2018

Market/Commercialization Information

FORT VANCOUVER NATIONAL HISTORIC SITE: DU-NE-1 SOIL REMEDIATION

Department of the Interior, National Park Service, Port Angeles, WA.
Federal Business Opportunities, FBO-5912, Solicitation 140P8318Q0058, 2018

The National Park Service intends to issue an RFP for remediation of a targeted lead-contaminated soil removal action at the Decision Unit-Northeast-1 (DU-NE-1) Site and restoration of the site to a natural condition. DU-NE-1 is located at the Fort Vancouver National Historic Site, 612 E. Reserve St, Vancouver, Washington. The contractor will also dispose of 11 steel drums (55-gal type) previously stockpiled with potentially lead-contaminated soil. This project will be solicited and awarded as a 100% small business set-aside, NAICS code 562910 (Remediation Services), size standard 750 employees. A single firm-fixed-price construction contract will be awarded, magnitude of construction between $250,000 and $500,000. The RFP will be issued on FedBizOpps on or after June 8, 2018, with the SF-1442 and all associated attachments posted to FedConnect at https://www.fedconnect.net/FedConnect/?doc=140P8318Q0058&agency=DOI [Note: It might be necessary to copy and paste the URL into your browser for direct access].
https://www.fbo.gov/spg/DOI/NPS/APC-IS/140P8318Q0058/listing.html

SPECIAL NOTICE FOR NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST MULTIPLE AWARD REMEDIAL ACTION CONTRACT (MARAC)

Naval Facilities Engineering Command, NAVFAC Southwest, San Diego.
Federal Business Opportunities, FBO-5912, Solicitation N62473-18-R-2418, 2018

The Naval Facilities Engineering Command Southwest plans to procure a Multiple Award Remedial Action Contract. The requirement is for a cost-type contract for remedial actions (post-ROD stage) at contaminated sites predominately at Navy and Marine Corps installations. Project sites may fall anywhere within the NAVFAC area of responsibility, but most of the work is expected to be performed in California. This requirement will be procured as a total small business set-aside under NAICS code 562910. The anticipated contract term will be for one 24-month base period and one 36-month ordering period, with an aggregate maximum dollar value not to exceed $240M. Release of the solicitation is anticipated in July 2018. https://www.fbo.gov/spg/DON/NAVFAC/N68711A6A/N6247318R2418/listing.html

EMERGENCY AND RAPID RESPONSE SERVICES (ERRS)

U.S. Environmental Protection Agency, Region VII, Lenexa, KS.
Federal Business Opportunities, FBO-5922, 2018

The purpose of the ERRS procurement is to establish separate contracts in EPA Region 7 and EPA Region 9 for fast, responsive environmental cleanup services associated with the release of contaminated materials, hazardous substances, and petroleum products. Environmental cleanup in response to natural and manmade disasters; terrorist activities; weapons of mass destruction; and nuclear, biological, or chemical incidents may also be required. Two different solicitations will be issued. The Region 7 presolicitation synopsis was issued as 68HE0718R0004 at https://www.fbo.gov/spg/EPA/OAM/RegIX/68HE0918R0007/listing.html. The Region 9 presolicitation synopsis was issued as 68HE0918R0013 at https://www.fbo.gov/spg/EPA/OAM/RegIX/68HE0918R0009/listing.html.

Cleanup News

DEL MONTE CORP. (OAHU PLANTATION) KUNIA, HI

U.S. EPA Superfund Website, 2018

The 3,000-acre Del Monte Corp. (Oahu Plantation) site is located in Kunia, Oahu. Del Monte began growing pineapple on the plantation in the 1940s. Fumigants, such as ethylene dibromide (EDB), were used from the early 1940s until 1983 to control nematodes that infest the pineapple root. About 495 gal of EDB was spilled in April 1977, and investigations showed evidence of additional pesticide releases. A total of 18,000 tons of contaminated soil was removed in two short-term removal actions in 1981 and 1983. The remedy for soil (20-100 ft bgs) and shallow groundwater included soil vapor extraction, dual-phase extraction, phytoremediation, a vegetated soil cap, and land use restrictions; the remedy for the basal aquifer called for pump and treat and monitoring wells. The phytoremediation system used koa haole plants in a closed-loop system with no subsurface infiltration or discharge. Lined cells collected excess water in a sump and then recirculated it through a drip irrigation system. A successful pilot study was followed by installation of a full-scale phytoremediation system in 2008. The system had 35 perched groundwater monitoring wells equipped with automatic pneumatic pumps to provide continuous dewatering of the contaminated portions of the aquifer for collection in a 9,000-gal tank. Electronic float switches directed the contaminated water to the treatment cells. The system required only occasional replacement of the drip irrigation lines and trimming of the koa haole trees. The full-scale system treated more than 4.7 million gal of groundwater to concentrations below drinking water standards. https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902876
*** For planning and executing the phytoremediation project, Golder Associates was recognized with the Best in State Gold Award at the Washington American Council of Engineering Companies 2018 Engineering Excellence Awards.
http://www.djc.com/news/co/12107647.html

REMEDIAL ACTION AND GROUNDWATER MONITORING PROGRESS REPORT: R.W. COMMERCIAL PLAZA, 2850 MOUNT PLEASANT STREET, BURLINGTON, IA 52601

Iowa Department of Natural Resources, Document 32978, 878 pp, 2017

Historical remedial activities at this site have included tank removal, soil excavation, and two rounds of substrate injections to promote enhanced reductive dechlorination (ERD) and abiotic chemical reduction using emulsified vegetable oil (EVO) and zero-valent iron in the site's eastern and western areas of concern (AOCs). PCE, TCE, and daughter products cis-DCE and VC are the principal constituents of concern in site groundwater. In 2015, ERD implementation was selected to treat the downgradient portions of the plume while the remedy for the primary source areas was still under review. The initial phase of ERD treatment was implemented in downgradient portions of the western AOC in November 2015, followed by a second phase of ERD treatment in the eastern AOC in 2016 and a third phase in 2017 to expand the ERD treatment area in the western AOC. This report documents the remedial actions conducted at the site from September 2015 through December 2016 and summarizes the results of these actions. The widespread observation of both ethene and ethane within the CVOC plume in areas where ERD treatment was implemented demonstrates that complete degradation of these constituents is ongoing. *Please be advised that the 878-page* ***Document 32978*** *at* https://programs.iowadnr.gov/contaminatedsites/Site/Documents/659 *is slow to load*.

REGULATORY-DIRECTED COMBINED REMEDY APPROACH FOR CHLORINATED VAPOR INTRUSION/MITIGATION AND GROUNDWATER REMEDIATION UNDER A RESIDENTIAL NEIGHBORHOOD

Szocinski, T.R. and D.L. Harn, Jr.
RemTech 2017: Remediation Technologies Symposium. Presentation 53, 32 slides, 2017

In 2009 a state-funded investigation at an industrial plating facility in southwest Michigan identified a shallow quarter-mile long plume of chlorinated VOCs (mainly TCE and daughter products) in groundwater at depths from 2-5 ft. The plume was migrating from the site through a residential area where contaminated groundwater was found within many of the basements and sumps at concentrations as high as 1,500 ppb, posing a potential vapor intrusion (VI) threat. Assessment of the nearby storm water system, which discharged into a river, indicated infiltration of contaminated groundwater. To address the VI concerns, the basement sumps were capped and vented, and a protective coating (Retro-Coat™) was applied to the floor and walls of the residential buildings located within the plume. A multi-phase injection approach for the groundwater plume included electron donor, bioaugmentation culture, and liquid activated carbon (LAC) substrates. Given a groundwater flow >1 ft/d, the design approach consisted of treatment lines spaced ~200 ft apart between residential properties. To protect against further migration of residual VOCs from untreated or not fully treated areas, biobarriers were installed at strategic locations within the residential plume areas. The biobarriers contained a LAC reagent with an electron donor to promote enhanced reductive dechlorination.
Slides: http://www.esaa.org/wp-content/uploads/2017/10/17-Szocinski.pdf **Longer abstract:**
http://www.esaa.org/wp-content/uploads/2017/09/RemTech2017Abstracts-53.pdf

REMOTE NORTHERN AND DRYLAND PHYTOREMEDIATION OF CONTAMINATED SOIL

Murray, E.W., B. Greenberg, B. Poltorak, J. Spies, J. McKeown, K. Cryer, and P. Gerwing.
RemTech 2017: Remediation Technologies Symposium. Presentation 58, 38 slides, 2017

Plant growth-promoting rhizobacteria (PGPR)-enhanced phytoremediation systems (PEPS™) have been implemented for cost-effective removal of petroleum hydrocarbons (PHCs), PAHs, and salt from soils across Canada. PEPS are used to facilitate the growth of abundant root biomass in contaminated soils, which stimulates rhizobacteria growth to facilitate partitioning of contaminants out of the soil, degrade PHCs, and sequester salt in plant foliage. PEPS technologies were first deployed at the Nota Creek C-17 site near Norman Wells, Northwest Territories, in 2008 to treat contamination associated with historical drilling activities. Between 2008 and 2016, surface soils and media excavated from several onsite pits and sumps were stacked in three layers and treated to applicable criteria to remove salt and PHC using PEPS. In 2016/2017, additional contaminated soil was excavated from the sumps and pits to form a fourth treatment layer that will undergo PEPS treatment in future growing seasons. PEPS were also deployed at the site of a former gas plant located northeast of Drumheller to treat PHC-contaminated soils in a one-time biopile soil treatment facility. In the first 2 years of phytoremediation, ~5,000 m^3 of PHC-contaminated soils were successfully treated to applicable criteria.
Slides: http://www.esaa.org/wp-content/uploads/2017/10/17-Murray.pdf **Longer abstract:**
http://www.esaa.org/wp-content/uploads/2017/09/RemTech2017Abstracts-58.pdf

Demonstrations / Feasibility Studies

STATUS UPDATE ON WATER BOARD'S PERCHLORATE INVESTIGATION AND CLEANUP PROJECT AND THE STATUS OF CITY OF BARSTOW'S NITRATE GROUNDWATER CONTAMINATION

California Regional Water Quality Control Board, Lahontan Region, 37 pp, 2018

In late 2010, perchlorate groundwater pollution was detected in a water supply well for the City of Barstow and Marine Corps Logistics Base Nebo. The perchlorate issue arose from illegal disposal of excess perchlorate salts by a defunct pyrotechnical company. Water Board staff recently obtained a $2.67 million grant to address cleanup at the perchlorate source area. The Water Board proposes to construct a pilot-scale soil flushing unit and up to three groundwater extraction wells in a system to capture, treat, and apply treated water to the perchlorate source area and flush perchlorate to groundwater for subsequent capture. Once the pilot-scale treatability study is complete, the Water Board will seek additional funding from the State Water Board for a long-term cleanup project to address the perchlorate source area as well as perchlorate groundwater pollution downgradient of its present location. The perchlorate plume (~2 miles long by 1000 ft wide) is adjacent to and likely commingled with a nitrate plume (~1.75 miles long by 2000 ft wide). To address nitrate and perchlorate in groundwater, the City of Barstow and its contractor applied for and received a $1.7 million dollar grant from the California Energy Commission to install a biofiltration system for contaminant removal.
https://www.waterboards.ca.gov/lahontan/board_info/agenda/2018/jan/item_6_barstow.pdf

GEOPHYSICAL PILOT TEST TECHNICAL MEMORANDUM: NERT REMEDIAL INVESTIGATION — DOWNGRADIENT STUDY AREA, NEVADA ENVIRONMENTAL RESPONSE TRUST SITE, HENDERSON, NEVADA

Nevada Division of Environmental Protection, Las Vegas. 209 pp, 2017

This technical memorandum describes the results of the geophysical pilot test (GPT) conducted for the remedial investigation of the downgradient study area located in Henderson, Nevada. The overall objective of the investigation was to identify subsurface pathways within the downgradient study area through which perchlorate-impacted groundwater enters the Las Vegas Wash (LVW). The location of paleochannels and other potential preferential flow

pathways is important to the understanding of perchlorate mass flux to the LVW outside the study area. While limited geophysical surveys have been conducted in the area, uncertainties remain as to the locations of these channels in the vicinity of the LVW. The GPT consisted of evaluating three geophysical systems, including the feasibility of employing the systems under constrained access conditions, costs, and their effectiveness at identifying the top of the Upper Muddy Creek formation and paleochannel geometry. The GPT results will serve as the basis for the forthcoming plan to select the optimal approach for a full-scale geophysical survey of reaches of interest along the LVW within the downgradient study area.
https://ndep.nv.gov/uploads/env-sitecleanup-active-bmi-nert/geophysical-pilot-test-2017.pdf

Research

EXTENDING THE APPLICABILITY OF COMPOUND-SPECIFIC ISOTOPE ANALYSIS TO LOW CONCENTRATIONS OF 1,4-DIOXANE

Bennett, P.
SERDP Project ER-2535, 53 pp, 2017

The project objective was to develop a reliable method to perform compound-specific isotope analysis (CSIA) on low aqueous concentrations (1 µg/L) of 1,4-dioxane in groundwater and then apply it to investigate 1,4-dioxane biodegradation. Researchers determined that 0.5 grams of a synthetic carbonaceous sorbent, when added to a 40 mL vial containing aqueous 1,4-dioxane in the 10 to 100 µg/L range, could adsorb > 99% of the 1,4-dioxane from solution. The 1,4-dioxane was recovered from the dried solid sorbent by thermal desorption into a gas chromatograph with isotope ratio mass spectrometry. The method was applied successfully to samples at concentrations in the 1 µg/L range. It is anticipated that the CSIA method will be applied to demonstrate the biodegradation of 1,4-dioxane in the 1-100 µg/L range.
https://www.serdp-estcp.org/content/download/47014/440610/file/ER-2535%20Final%20Report.pdf

APPLICATION OF PASSIVE SORBENT TUBE AND CANISTER SAMPLERS FOR VOLATILE ORGANIC COMPOUNDS AT REFINERY FENCELINE LOCATIONS IN WHITING, INDIANA

Mukerjee, S., L. Smith, M. Caudill, K. Oliver, W. Whipple, D. Whitaker, and T. Cousett.
Journal of the Air & Waste Management Association 68(2):170-175(2018)

Select VOCs in ambient air were measured at fenceline locations using modified EPA Method 325 A/B with passive tubes and EPA Compendium Method TO-15 with canister samplers. One-week, time-integrated samplers were deployed for eight weeks with tubes and canister samplers deployed in duplicate. Good precision was obtained from the duplicate tubes (

TEMPORARY VS. PERMANENT SUB-SLAB PORTS: A COMPARATIVE PERFORMANCE STUDY

Zimmerman, J.H., C. Lutes, B. Cosky, B. Schumacher, D. Salkie, and R. Truesdale.
Soil and Sediment Contamination: An International Journal 26(3):294-307(2017)

In an investigation of the performance of permanent versus temporary sub-slab sampling ports (SSPs) for vapor intrusion (VI) determination in an unoccupied house, VOC and radon concentrations measured simultaneously in soil gas using collocated temporary and permanent ports appeared to be independent of the type of port. Variability between collocated temporary and permanent ports was much less than the spatial variability between port locations. The agreement of the majority of VOC and radon concentrations—0-36% relative percent difference and 2-19% relative standard deviation, respectively—of each SSP type was achieved even though the clay portion of the seal of the temporary ports was visibly desiccated and cracked. The temporary SSP desiccation and cracking were not as detrimental to port seal performance as would have been expected, which suggests that the Teflon tape portion of the seals served an important function. The temporary sub-slab sampling ports provided data equivalent to that collected from a permanent sub-slab sampling port; however, only one type of seal material was tested in one location; the seals were installed by experts with rigorous quality control; and thus, these results may not apply to all types of temporary seals and all building foundations.

CONSTRUCTED FLOATING WETLANDS: A REVIEW OF RESEARCH, DESIGN, OPERATION AND MANAGEMENT ASPECTS, AND DATA META-ANALYSIS

Pavlineri, N., N.Th. Skoulikidis, and V.A. Tsihrintzis.
Chemical Engineering Journal 308:1120-1132(2017)

This paper summarizes recent information on constructed floating wetlands (CFWs) based upon a review of current literature. Issues discussed include applications, construction materials, vegetation species, mechanisms for pollutant removal, and management strategies. https://apirs.plants.ifas.ufl.edu/site/assets/files/372369/372369.pdf

TREATMENT OF WATER CONTAMINATED BY VOLATILE ORGANIC COMPOUNDS IN HYDROPONIC ROOT MATS

Chen, Z., N. Reiche, J. Vymazal, and P. Kuschk.
Ecological Engineering 98:339-345(2017)

Scientists investigated the treatment of VOC-contaminated water in hydroponic root mats (HRMs) under pilot-scale conditions near a former industrial area in Leuna (Saxony-Anhalt, Germany). Floating hydroponic root mats (FHRM) and hydroponic root mat filter (HRMF) mesocosms were established to receive groundwater contaminated mainly with benzene and MTBE. Both systems exhibited similar MTBE removal performance during two years of operation, but seasonal variation was observed for benzene removal, with almost complete removal of benzene during summer in both systems. The floating system exhibited higher benzene removal efficiency than the filter system, especially during the second year of operation. Overall MTBE mean removal efficiency was 32% compared to 61% benzene removal. Emission rates of benzene and MTBE in the floating system accounted for 3% and 30.8% of the total benzene and MTBE removal, respectively, but only 2.3% and 8.3% in the filter system.

COMPARISON OF PLANTS WITH C3 AND C4 CARBON FIXATION PATHWAYS FOR REMEDIATION OF POLYCYCLIC AROMATIC HYDROCARBON CONTAMINATED SOILS

Sivaram, A.K., P. Logeshwaran, S.R. Subashchandrabose, R. Lockington, R. Naidu, and M. Megharaj.
Scientific Reports 8(1):2100(2018)

Researchers evaluated the potential applicability of plants with C3 and C4 carbon fixation pathways for the phytoremediation of soil affected by recalcitrant high-molecular-weight (HMW) PAHs. Results from a 60- and 120-d greenhouse study showed higher degradation of HMW PAHs in soil grown with C4 plants compared to C3 plants. No PAHs were detected in the maize cobs, sunflower, wallaby, and Sudan grass seeds at the end of the experiment. Study results revealed a substantial difference in the microbial populations between planted and unplanted soils, which in turn facilitated PAH degradation. https://www.nature.com/articles/s41598-018-20317-0

IMPACT OF PLANT PHOTOSYSTEMS IN THE REMEDIATION OF BENZO[A]PYRENE AND PYRENE SPIKED SOILS

Sivaram, A.K., P. Logeshwaran, R. Lockington, R. Naidu, and M. Megharaj.
Chemosphere 193:625-634(2018)

A glasshouse experiment was conducted to investigate the phytoremediation potential of 14 different plant species belonging to C3 and C4 carbon fixation pathways for soils spiked with PAHs, such as benzo[a]pyrene (B[a]P) and pyrene (PYR). The investigators measured the changes in morphological, physiological, and biochemical parameters and the bioaccumulation and biodegradation ability of the plants in soils spiked with 48 and 194 mg/kg of B[a]P and PYR, respectively. The percent removal efficacy of B[a]P and PYR by the tested plant species over a period of 50 d ranged from 6-26% and 14-40%, respectively. Sudan grass (C4), vetiver (C4), maize (C4), and sunflower (C3) achieved the maximum removal of both B[a]P and PYR. Accumulated root and shoot concentration of PYR was higher in both C3 and C4 plant species compared to B[a]P. Overall results indicated that C4 plants were more efficient than their C3 counterparts in terms of PAH degradation ability.

CONTROLLED-RELEASE OXYGEN NANOCOMPOSITE FOR BIOREMEDIATION OF BENZENE CONTAMINATED GROUNDWATER

Mosmeri, H., S. Tasharrofi, E. Alaie, and S.S. Hassani.
New Polymer Nanocomposites for Environmental Remediation. Elsevier, ISBN: 978-0-12-811033-1, Chapter 23:601-622(2018)

The authors investigated the application of a controlled-release oxygen nanocomposite in a permeable reactive barrier configuration for groundwater remediation. Introducing a new class of oxygen-releasing compounds that encapsulate with natural polymers, this chapter discusses the synthesis of slow oxygen-releasing polymer nanocomposites (ORPNCs) as efficient materials for remediation of benzene-contaminated groundwater. ORPNC oxygen-releasing properties and benzene removal potential were studied in batch and continuous experiments. *See this source volume's table of contents and other chapter abstracts at* https://www.sciencedirect.com/science/book/9780128110331.

REMEDIATION OF HEAVY HYDROCARBON IMPACTED SOIL USING BIOPOLYMER AND POLYSTYRENE FOAM BEADS

Wilton, N., B.A. Lyon-Marion, R. Kamath, K. McVey, K.D. Pennell, and A. Robbat Jr.
Journal of Hazardous Materials 349:153-159(2018)

A two-phase recovery system for the remediation of heavy hydrocarbon impacted soils relies on (1) a plant-based biopolymer that releases hydrocarbons from soil and (2) polystyrene foam beads that recover them from solids and water. The efficiency of the process was demonstrated by comparisons with control experiments, where water, biopolymer, or beads alone yielded TPH reductions of 25%, 52%, and 58%, respectively, compared to 94% when 1.25?mL of 1% biopolymer and 15?mg beads per gram of soil were agitated for 30?min. Reductions in TPH content were substantial regardless of soil fraction, with removals of 97%, 91%, and 75% from sand, silt, and clay size fractions, respectively. Treatment efficiency was independent of carbon number (C13 to C43) as demonstrated by reductions in both diesel fuel (C13-C28) and residual-range organics (C25-C43) of ~90%. The remediation process is both efficient and sustainable because the reusable biopolymer is sourced from renewable crops, and the polystyrene beads are obtained from recycled materials. *Additional background on this technology is available in N. Wilton's dissertation at* https://dl.tufts.edu/catalog/tufts:22468.

ENHANCED SOIL WASHING FOR THE REMEDIATION OF A BROWNFIELD POLLUTED BY PYRITE ASH

Fedje, K.K., C. Sierra, and J.R. Gallego.
Soil and Sediment Contamination: An International Journal 26(4):377-390(2017)

Soil from an abandoned/disused fertilizer plant polluted with pyrite ash containing heavy metal(loid)s (As, Cu, Pb, and Zn) was treated by physical and chemical washing. Exhaustive characterization of the soil-pollutant interaction determined the chemical nature (complex oxyhydroxides), potential mobility and bioavailability of the pollutants (very low), and the grain size fractions of preferential accumulation (silt-clay fraction comprised > 60% of the material and revealed > 2 ppm of Cu, Zn and Pb). Soil/ash samples were subjected to chemical washing trials, including leaching with 2 M HCl, 2 M NaOH, and acidic process water (pH around 0). The fraction below 63 µm was mechanically separated and exposed to chloridizing roasting with NaCl plus water leaching, which proved the most effective of all the procedures tested, particularly with regard to Cu and Zn recovery (up to 40% and 34%, respectively).

ASSESSMENT OF FLUSHING METHODS FOR THE REMOVAL OF HEAVY CHLORINATED COMPOUNDS DNAPL IN AN ALLUVIAL AQUIFER

Maire, J., A. Joubert, D. Kaifas, T. Invernizzi, J. Marduel, S. Colombano, D. Cazaux, et al.
Science of the Total Environment 612:1149-1158(2018)

Immiscible mobilization and foam flushing were assessed as low surfactant-consuming technologies for enhanced recovery of DNAPL residual at a site contaminated by heavy chlorinated compounds. Preliminary experiments in well-controlled conditions demonstrated the phenomena involved in these remediation technologies and their limitations. The investigators characterized the technologies according to their surfactant consumption (per kg of DNAPL recovered) and the final DNAPL saturation reached. Surfactant foam flushing (SFF) produced lower DNAPL

saturation than immiscible mobilization, thanks to its higher viscosity; however, SFF efficiency was strongly correlated to the pressure gradient used during injection, and that was limited by risks of soil fracturing. The two technologies were tested in field cells (10 m x 10 m x 10 m) delimited by cement/bentonite walls anchored in the clayey substratum. Field results suggest modeling of flushing fluid propagation as a next step to design efficient set-ups for recovering the displaced DNAPL.

REMEDIATION OF PETROLEUM IMPACTED SOILS WITH ELECTRON BEAM IRRADIATION

Lassalle, J., D. Staack, T. Thompson, M. Martinez, H.R. Damarla, P. Bireta, G. Sabadell, at al.
ICARST 2017: International Conference on Applications of Radiation Science and Technology, 24-28 April, 2017, Vienna, Austria: Programme & Book of Abstracts. 21 slides, 2017

Heavy hydrocarbons (HH, C12-C40) pose a significant remediation challenge because they are recalcitrant and relatively immobile in soils. Electron beam technology has the potential to both crack and polymerize hydrocarbons at lower temperatures than similar energetic methods for HH remediation, such as thermal desorption and pyrolysis, but the technology still must be proven fast, efficient, and economical at large scales to be commercially viable. The present research has several objectives: show reduction in mass of heavy hydrocarbons in soil for proof of concept; assess impact of testing parameters (e.g., radiation dose); and design an experimental setup to evaluate soil treatment, in both batch and continuous configurations. Samples with initial HH contamination ranging from 2-10% (w/w) were irradiated with an 18 kW, 10 MeV RF LINAC in various configurations, including stationary and moving soil containers for irradiation of samples ranging in size from 100 g to 3 kg. Tests showed effective HH mass reduction, which resulted in TPH reduction (**Slides:**
https://media.superevent.com/documents/20170428/dea6e37b14694b2b820a45bba6f3d185/d.-staack.pdf

TREATMENT OF ORGANIC POLLUTANTS BASED ON PCB IN THE RIVER SEDIMENT BY ELECTRON BEAM

Fulop, M., A. Sagatova, D. Siplak, K. Conka, P. Hybler, and L. Darazova.
ICARST 2017: International Conference on Applications of Radiation Science and Technology, 24-28 April, 2017, Vienna, Austria: Programme & Book of Abstracts. Poster, 2017

Different techniques for removing PCBs from heavily contaminated sediments in Channel Strazske have been evaluated, but none so far has met the requirements of the district authority: a) mobile and easily relocatable treatment equipment; b) easily automated with negligible secondary waste generation, few catalysts, and no PCB burning; and c) non-prohibitive capital and operating costs. In a test of electron beam (EB) degradation of PCBs in sediments (not yet used commercially), scientists considered a relocatable electron accelerator for on-site EB processing in a shielded environment corresponding to electron accelerator parameters and dimensions. The EB method demonstrated that ionizing radiation produced by high-energy electron beams is very effective in transforming PCBs into less problematic species with minimum catalysts. Various combinations of isopropanol, K_2CO_3, and $CuSO_4$ were tested to evaluate the effect of chemical pretreatment of sediments for increasing the efficiency of radiochemical reaction. EB PCB degradation efficiency was greater at 3:6 MeV electron energy compared to 5 MeV. An accelerator based on DC transformer 50{60 Hz had an advantage in its reliability (availability) as well as factors such as capital cost. The irradiation facility with electron accelerator can be transported directly to the cleanup site. This PCB radiation degradation method is environmentally friendly, and treated sediments are recyclable as building gravel/sand. https://www.iaea.org/sites/default/files/icarst-2017/pa1/Marko%20FULOP.pdf

IN-SITU IMMOBILIZATION OF ARSENIC IN THE SUBSURFACE USING FERROUS CHLORIDE

Roemer, Micha Erhard, Master's thesis, University of Manitoba, Winnipeg. 85 pp, 2017

At a military site in Northern Germany, the aquifer is contaminated by high quantities of arsenic (As) from chemical warfare agents and their degradation products at As concentrations up to 9 mg/L. An in situ arsenic remediation strategy using bivalent ferrous chloride was evaluated in a field trial that spanned almost two yr. The pilot plant immobilized a total of 2.3 kg of As. The objective of this follow-on study was to design a reactive transport model for the As immobilization field trial that would provide a quantitative framework to evaluate As fate in the aquifer system and indicate the effectiveness of the remediation technology.
https://mspace.lib.umanitoba.ca/bitstream/handle/1993/32620/roemer_micha.pdf

REMEDIAL TECHNOLOGY FACT SHEET: ACTIVATED CARBON-BASED TECHNOLOGY FOR IN SITU SUBSURFACE REMEDIATION

EPA 542-F-18-001, 9 pp, 2018

This fact sheet presents an emerging remedial technology that applies a combination of activated carbon (AC) and chemical and/or biological amendments for in situ remediation of soil and groundwater contaminated by organic contaminants, primarily petroleum hydrocarbons and chlorinated solvents. With the development of several commercially available AC-based products, this remedial technology has been applied with increasing frequency at contaminated sites across the country, including numerous leaking underground storage tank and dry cleaner sites. It also has been recently applied at several Superfund sites and at federal facilities that are not on the National Priorities List. This fact sheet provides information to practitioners and regulators for a better understanding of the science and current practice of AC-based remedial technologies for in situ applications.
https://semspub.epa.gov/src/document/HQ/100001159

EVALUATION OF EOC REMOVAL PROCESSES DURING ARTIFICIAL RECHARGE THROUGH A REACTIVE BARRIER

Valhondo, C., L. Martinez-Landa, J. Carrera, C. Ayora, K. Noedler, and T. Licha.
Science of the Total Environment 612:985-994(2018)

A reactive barrier consisting of vegetable compost, iron oxide, and clay was installed in an infiltration basin to enhance the removal of emerging organic compounds (EOCs) in the recharge water. First-order degradation rates and retardation factors were jointly estimated for 10 compounds using a multilayer reactive transport model. Reactive transport parameters were automatically calibrated against the concentration of 10 EOCs measured at nine monitoring points. The degradation rate of each compound was estimated for three zones defined according to the redox state, and retardation coefficients were estimated in two zones defined according to the organic matter content. The fastest

degradation rates were obtained for the reactive barrier, and the estimated values were similar to or higher than those estimated in column and/or field experiments for most of the compounds (8/10). Estimated retardation coefficients in the reactive barrier were higher than in the rest of the aquifer in most cases (8/10) and higher than values estimated in previous studies. *See additional information in Chapter 5 of C. Valhondo's thesis at* https://upcommons.upc.edu/bitstream/handle/2117/107938/TCVG1de1.pdf.

General News

VISL: WHAT'S NEW (FEBRUARY 2018)

The Vapor Intrusion Screening Level (VISL) calculator, which was previously available as an Excel spreadsheet, is now available as an online calculator. The VISL uses the same database as the Regional Screening Levels (RSLs) for toxicity values and physiochemical parameters and will be automatically updated during the semi-annual RSL updates. **VISL:** https://www.epa.gov/vaporintrusion/visl-whats-new-february-2018 **RSLs:** https://www.epa.gov/risk/regional-screening-levels-rsls

ADSORPTION-BASED TREATMENT SYSTEMS FOR REMOVING CHEMICAL VAPORS FROM INDOOR AIR

Schumacher, B., J.H. Zimmerman, R. Truesdale, K. Owen, C. Lutes, M. Novak, & K. Hallberg.
EPA 600-R-17-276, 117 pp, 2017

This Engineering Issue Paper summarizes the state of the science on selecting and using air treatment units (ATUs) to remove VOCs from indoor air and keep VOC concentrations below specified limits. Following a discussion of ATU system basics and what factors influence their effectiveness, the paper provides information on how to select, install, operate, and monitor VOC ATUs to meet indoor air quality objectives. Appendices A and B list commercially available air cleaning equipment. https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=532560

IN SITU TREATMENT PERFORMANCE MONITORING: ISSUES AND BEST PRACTICES

EPA 542-F-18-002, 15 pp, 2018

The purpose of this issue paper is to describe how in situ treatment technologies might affect sampling and analysis results used to monitor treatment performance as well as to offer best practices to identify and mitigate issues that might affect sampling or analysis. Eight potential sampling or analytical issues associated with groundwater monitoring are described for sites where in situ treatment technologies were applied. These issues are grouped under three topic areas: Issues related to monitoring wells (Section 2); Representativeness of monitoring wells (Section 3); and Post-sampling artifacts (Section 4). https://semspub.epa.gov/src/document/HQ/100001169.

POST-CLOSURE PERFORMANCE OF LINER SYSTEMS AT RCRA SUBTITLE C LANDFILLS

U.S. EPA, National Risk Management Research Laboratory.
EPA 600-R-17-205, 326 pp, 2017

In 2016 EPA issued *Guidelines for Evaluating the Post-Closure Care Period for Hazardous Waste Disposal Facilities under Subtitle C of RCRA*. To obtain information for this new report, investigators evaluated the field performance of engineered double-liner systems based on data from nine Subtitle C landfills sites that had completed several years of post-closure care (PCC). The aim of the study was to facilitate discussion and decision-making processes by illustrating what data are needed, highlighting categories of useful data that are typically lacking, and recommending techniques and tools to complement EPA's 2016 guidelines. This report does not address policy issues or provide generic answers to defining conditions for ending PCC. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100TMR3.txt

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