

Technology Innovation News Survey

Entries for January 1-15, 2020

Market/Commercialization Information

ENVIRONMENTAL SERVICES IN MAINE

NAVFAC Mid-Atlantic, Naval Facilities Engineering CMD MID LANT, Norfolk, VA.
Contract Opportunities on Beta.Sam.gov, Solicitation NA400820Q2520, 2020

This procurement is set aside for woman-owned small businesses under NAICS code 541380 (Laboratory Testing), small business size standard \$16.5M. This is a new requirement and will be a combination firm-fixed-price and IDIQ service-type contract. Contractor shall provide all labor, management, supervision, tools, material, and equipment required to perform environmental services at PNSY- Kittery, Maine, NSA Cutler - Cutler, Maine, NSA Prospect Harbor - Prospect Harbor, Maine, SERE - Fort Rameley, Maine, and the Adventure Center - Aurora, Maine. The environmental requirements primarily consist of the following services: Water sampling, testing and laboratory services, service orders for inspection, sampling and laboratory analysis of potentially hazardous materials (asbestos, paint, building material, waste materials, heavy metals etc) with the intent of identifying and characterizing the material for management and/or disposal. Period of performance will be determined at the time of award, but it is anticipated to be 1 June 2020 - 31 May 2021 for the base year, with total period of performance not to exceed 60 months. All requests for information are due by 2:00 pm ET on Tuesday, February 18, 2020. The solicitation document is posted in a protected file on beta.sam. Offers are due by March 2, 2020. <https://beta.sam.gov/opp/6E7526C5B70e30e3d41376c1b166a1054a6>

DOE ENVIRONMENTAL MANAGEMENT BUSINESS OPPORTUNITIES FORUM

U.S. DOE, Office of Environmental Management Business Center, Cincinnati, OH.
Contract Opportunities on Beta.Sam.gov, 2020

The next Office of Environmental Management Business Opportunities Forum is scheduled for March 10, 2020, from 10:00 AM to 11:35 AM (Arizona, MT). Topics will include a discussion on status of ongoing and upcoming procurement opportunities. Join DOE-EM at the event to learn the latest news on doing business with the agency. The event will be held in Exhibit Hall 4, Phoenix Convention Center during the Waste Management Conference. Attendees on site must be registered for the conference and be in possession of a conference badge to gain access; however, EM will also be offering free WebEx capability for those not attending the conference. Information on connecting via the web will be sent out prior to the forum to those who register by March 6, 2020. <https://beta.sam.gov/opp/1b10b575598466a3b9726e714eb54746a>

BASE KETCHIKAN HOUSING ENVIRONMENTAL RISK ASSESSMENT

U.S. Coast Guard, Base Ketchikan (00035), Alaska.
Contract Opportunities on Beta.Sam.gov, Solicitation 702045-20-Q-PZR73900, 2020

This requirement is a total small business set-aside under NAICS code 541620. The U.S. Coast Guard has a requirement for Alaska State-certified contractor services to conduct environmental risk assessments at Coast Guard housing sites located in Alaska. Provide all professional services necessary to conduct a thorough risk assessment in accordance with EPA and HUD guidelines for 73 housing units/areas at Juneau, Sitka, Petersburg, and Ketchikan for asbestos-containing materials (ACM), lead-based paint (LBP), and radon. The risk assessments must include an on-site investigation to determine the presence, type, severity, and location of LBP, ACM, and Radon hazards (including lead hazards in paint, dust, and soil) and provide suggested ways to control them. The risk assessments shall be legally performed by a certified risk assessor. The risk assessment shall include the home interior and exterior areas up to the drip line of the home. Quotes are due by 1159 Alaska Time on March 12, 2020. <https://beta.sam.gov/opp/b92b09a3e964c6c37a854bab70e133/view>

FOLLOW-ON ENVIRONMENTAL A&E SERVICES, FAA-MMAC

Federal Aviation Administration, 69736H Franchise Acquisition Services, Oklahoma City, OK.
Contract Opportunities on Beta.Sam.gov, Solicitation 69736H-20-ENVAE, 2020

This notice constitutes a market survey for a follow-on requirement to perform Environmental Architecture and Engineering Services for the Federal Aviation Administration. This effort is currently under contract. The FAA Mike Monroney Aeronautical Center has a requirement for environmental A&E services under NAICS code 541620 (Environmental Consulting Services), size standard \$16.5M. Prospective activities include field investigations; surveys; production of plans, specifications, studies, calculations & estimates; preparation of worker health and safety, sampling, and other plans; field sampling (including groundwater, soil, sediment, surface water, and air); laboratory analyses, and detailed countermeasure plans; noise evaluations; industrial wastewater pretreatment; air quality (including indoor air quality and air emissions inventories); environmental impact statements under NEPA; environmental site assessments under CERCLA, hazardous material storage and handling; groundwater assessments; SARA Title III program; PCB abatement; pollution prevention opportunity assessment; environmental compliance audits; drinking water quality analysis and treatment; remediation of air, soil, sediment, groundwater and/or surface water contamination, using green and sustainable remediation; and attention to environmental contaminants of emerging concern, including per- and polyfluoroalkyl substances. The FAA contemplates awarding an IDIQ follow-on contract that will include option provisions to renew for four one-year periods. It is anticipated the contract will include time-and-materials type pricing. The survey results will assist the FAA to determine the extent of the requirement that might be set aside for small businesses, socially and economically disadvantaged small businesses, 8(a), service-disabled veteran-owned small businesses, and woman-owned small businesses. Responses to this market survey must be received by 4:00 PM CT on March 13, 2020. <https://beta.sam.gov/opp/3369c37d6f7547728fe6e4741943527f/view>

Cleanup News

SEASON TWO IN SITU TREATMENT COMPLETION REPORT LOCKHEED MARTIN MIDDLE RIVER COMPLEX 2323 EASTERN BOULEVARD MIDDLE RIVER, MARYLAND

Lockheed Martin Corporation, 54 pages, 2018

This completion report summarizes placement of 2,504 tons AquaGate+PAC® (powdered activated carbon) 10% dry weight over 13.7 acres of PCB-contaminated sediment in Dark Head Cove near the Lockheed Martin Complex. Field application was completed from October to December 2017. The report describes construction performed to place the material and summarizes site preparation, the pre-project pilot study, and quality control procedures. Quality control tests and laboratory analytical sampling results for the surficial sediment confirm that the design intent and project objectives were achieved. The activated carbon concentrations currently in Dark Head Cove sediment are considered adequate to reduce PCB concentrations within the pore water, resulting in an overall reduction of bioaccumulation. Long-term monitoring will measure the reduction in bioaccumulation of PCBs by benthic invertebrates and the reduction in sediment pore water concentrations. <https://www.lockheedmartin.com/content/dam/lockheed-martin/documents/medialibrary/middle-river-season2-completion-report2018.pdf>. See presentation for more information: <https://www.battelle.org/newsroom/2018/01/18/lockheed-martin-completes-season-two-of-in-situ-treatment-of-polluted-sediment-in-dark-head-cove/>

LEVERAGING WARM WATER FROM SOURCE AREA THERMAL REMEDY FOR COMBINED BIOTIC AND ABIOTIC DEGRADATION OF PLUME-AREA CVOGS

Bryant, D. | Groundwater Resources Association Remediation Conference: Optimization of Remediation Systems and Long-Term Monitoring, 13-14 November, Santa Ana, CA, 16 slides, 2019

A warm-water plume generated downgradient from a thermal treatment area was leveraged for synergistic biotic and abiotic remediation of a 1,600 ft TCE plume that migrated 2,000 ft downgradient in an urban area. Two permeable reactive treatment zones were constructed via direct push injection of zero-valent iron and fermentable carbon immediately downgradient of the source area. The amendments enhanced biodegradation and provided an abiotic degradation mechanism if groundwater becomes too warm for microbial activity. VOC and stable isotope data confirm nearly 100% degradation in the upgradient barrier and in the deep zone in the downgradient barrier, and 75% degradation in the shallow zone of the downgradient barrier. Source area groundwater temperature still measured 60°C after >1 year of remediation. <https://www.grac.org/media/files/files/b6461ed8bryant.pdf>

INFLUENCE OF SULFATE REDUCTION AND BIOGENIC REACTIVE MINERALS ON LONG-TERM PRB PERFORMANCE IN A SULFATE RICH, HIGH FLOW AQUIFER

Valkenburg, J. and J. Molin. | 48th Annual Environmental Show of the South, 15-17 May, Chattanooga, TN, 30 slides, 2019

High groundwater flow velocity caused a carbon tetrachloride (CT) groundwater plume to migrate ~2,600 ft and discharge into a creek. A permeable reactive barrier (PRB) was installed in 2005 by injecting EH® ISCR Reagent slurry to passively treat CT. The presentation reviews geochemical parameter response and CT removal rates over time and compares them with theoretical calculations using site-specific data. Total organic carbon was monitored as a reagent indicator while oxidation-reduction potential, dissolved oxygen, nitrate, and sulfate were monitored to assess redox conditions. CT removal rates peaked 16 months after installation at >99% removal. Two years after installation, removal rates decreased to ~95% and have stabilized for >10 years. Theoretical calculations suggested that ZVI would be consumed after 2.7 years from infowing sulfate. However, geochemical data suggest that ZVI by itself is not supporting significant sulfate reduction. The probable explanation for the long PRB life is the formation of reduced iron sulfide minerals that acts as a zone of abiotic reductive treatment. The presentation assesses long-term performance and changes to geochemical parameters since installation. <https://www.grac.org/content/dam/grac/documents/2019/05/15/15-valkenburg.pdf> More information <http://www.perspectivesinremediation.com/studies/case-studies/2019/05/15/15-valkenburg/>

USE OF INNOVATIVE IN-SITU REMEDIATION STRATEGIES TO ACHIEVE CLEANUP OF A COMPLEX SITE

Cronk, G. | Groundwater Resources Association Remediation Conference: Optimization of Remediation Systems and Long-Term Monitoring, 13-14 November, Santa Ana, CA, 17 slides, 2019

Multiple in situ remediation technologies were implemented over 25 years at a large, complex groundwater site in Los Angeles County that allowed for more rapid and cost-effective remediation. Two distinct but overlapping plumes of benzene and chlorinated compounds plus 1,4-dioxane required continuous implementation of new remediation technologies over time. Treatment of the two plumes has been ongoing since 1995 through a combination of pump and treat, soil vapor extraction, in situ chemical oxidation (ISCO), and monitored natural attenuation (MNA). ISCO was implemented via direct push injections of hydrogen peroxide and later with sodium persulfate and achieved nearly complete removal of benzene <https://www.grac.org/media/files/files/47014fd6/cronk.pdf>

Demonstrations / Feasibility Studies

COMBINATION OF NZVI AND DC FOR THE IN-SITU REMEDIATION OF CHLORINATED ETHENES: AN ENVIRONMENTAL AND ECONOMIC CASE STUDY

Cernikova, M., J. Nosek, and M. Cernik.
Chemosphere 245:125576(2020)

An application of nano zero-valent iron (nZVI) reinforced with a direct current (DC) electric field was tested on a former industrial site in the Czech Republic to significantly increase remediation efficiency. Long-term monitoring was conducted to demonstrate the technology's efficiency. A 12 m x 9 m polygon was defined around well 154 where contamination was predominantly composed of DCE (7,300 µg/L) and a total concentration of chlorinated ethenes (8,880 µg/L). During the first stage, 49 kg of nZVI was injected and monitored for two years. Subsequently, the electrodes were installed, and for three years, the synergistic action of nZVI within an applied DC field was monitored. Based on 32 monitoring campaigns performed over the six years, the combined method was compared with an application of the only nZVI in technical, environmental and economic terms. Technically, the method requires annual reinstallation of anodes as a result of their oxidative disintegration. Environmentally, the method provides significantly improved chlorinated ethane reduction, remediation of low permeable zones, and extended efficiency. Economically, the method is five times cheaper when compared to the nZVI used alone.

ENGINEERED IN SITU BIOGEOCHEMICAL TRANSFORMATION AS A SECONDARY TREATMENT FOLLOWING ISCO - A FIELD TEST

Nemecek, J., M. Nechanicka, R. Spanek, F. Eichler, J. Zeman, and M. Cernik.
Chemosphere 237:124460(2019)

In this field study, in situ biogeochemical transformation was used as a secondary treatment to reduce sulfate created during in situ chemical oxidation (ISCO) and produce iron sulfides to abiotically degrade chlorinated ethenes. Hydrochemical and molecular tools, solid-phase analysis, and geochemical modeling were used to assess the method. Following a neutralization and bioaugmentation, favorable conditions for iron- and sulfate-reducers were created, resulting in an increase in their relative abundance. The abundance of dechlorinating bacteria (*Dehalococcoides mccartyi*, *Dehalobacter* sp. and *Desulfotomobacter* spp.) remained low throughout the process. The activity of iron- and sulfate-reducers was further stimulated through application of magnetite plus starch and microiron plus starch, resulting in an increase in ferrous iron concentration (from <limit of quantification [LOQ] to 337 mg/l), a decrease in sulfate concentration by 74-95% and production of hydrogen sulfide (from <LOQ to 25.9 mg/l). At the same time, a gradual revival of dechlorinators and an increase in ethene concentration was observed. Tetrachloroethene and TCE concentrations decreased by 98.5-99.98% and 75.4-98.5%, respectively. A decline in chlorine number indicated that biological dechlorination contributed to CVOC removal.

MICROBIAL COMMUNITY CHANGES IN A CHLORINATED SOLVENTS POLLUTED AQUIFER OVER THE FIELD SCALE TREATMENT WITH POLY-3-HYDROXYBUTYRATE AS AMENDMENT

Matturo, B., L. Piarro, E. Frascadore, M.P. Papini, and S. Rossetti
Frontiers in Microbiology 9:1664

A pilot-scale plant uses poly-3-hydroxybutyrate (PHB) reactors as a slow-release source of electron donors to stimulate native organohalide-respiring bacteria (OHRB) growth to bioremediate chlorinated solvent-contaminated groundwater. Groundwater circulation wells were used to pump water into the PHB reactor before reintroducing the low permeability zones of the aquifer. The coupling of the biological treatment with groundwater recirculation allowed reductions in contamination level and remediation time by efficiently stimulating the growth of autochthonous OHRB and enhancing the mobilization of the pollutants. Quantitative PCR performed along the external treatment unit showed that the PHB reactor may efficiently act as an external incubator to growing *Dehalococcoides mccartyi*. The slow-release source of electron donors for the bioremediation process allowed the establishment of a stable population of *D. mccartyi*, mainly carrying *bvCA* and *vcrA* genes which are implicated in the metabolic conversion of vinyl chloride to harmless ethane. Next-generation sequencing was performed to analyze the phylogenetic diversity of the groundwater microbiome before and after the bioremediation treatment and allowed the identification of the microorganisms working closely with organohalide-respiring bacteria. <https://www.frontiersin.org/articles/10.3389/fmicb.2018.01664/full>

IN SITU GAS THERMAL REMEDIATION OF A RELOCATED COKE PLANT: A PILOT STUDY

Ding, N., Y. Ren, B. Xu, N. Wang, and X. Wang.
Fresenius Environmental Bulletin Vol. 28 No. 10:7163-7169(2019)

In situ gas thermal remediation (GTR) was used in a pilot study to remediate benzo(a)anthracene (BaA)-contaminated soil at a relocated coke plant in Beijing, China. Before GTR, the concentrations of BaA at 0.5 m, 3 m, and 5 m below ground were 79.7, 65.3, and 82.7 mg/kg. The 10 m x 10 m pilot site was heated by 22 heating wells over 55 days. Soil temperatures were closely monitored by 5 monitoring wells, and soil vapor was continuously extracted at -10 kPa. After GTR treatment, BaA concentrations at all sampling points and depths were below the remedial target of 6.2 mg/kg. Cavities found in two locations negatively affected temperature rising until they were filled up with concrete. The soil temperature in the center of the site reached >300°C, which was higher than temperatures at other monitoring points but lower than the boiling point of BaA (475°C). Removal was successful due to a negative-pressure vapor extraction system which enabled BaA partitioning into the vapor phase at a much lower temperature, especially with prolonged heating time. View the October issue, pages 7163-7169, at: https://www.pwt-pair.de/download_feb_2019/

Research

HIDDEN BENEFITS AND SCALABILITY OPPORTUNITIES FOR SUSTAINABLE REMEDIATION AT HYDROCARBON-IMPACTED SITES

Shihoran N. | Groundwater Resources Association Remediation Conference: Optimization of Remediation Systems and Long-Term Monitoring, 13-14 November, Santa Ana, CA, 16 slides, 2019

A study was conducted to document the tangible and intangible benefits of incorporating sustainable approaches to remediation activities and identify opportunities for scaling sustainable remediation approaches to different types of hydrocarbon impacted sites. A framework was applied to a set of Chevron environmental projects to identify and evaluate aspects of sustainable remediation. Sustainable remediation practices were implemented for a variety of reasons including lowering environmental footprints and improving remediation efficiency, field worker safety, community relations, and overall cost-effectiveness of the project. Results demonstrated that sustainable remediation can be implemented across a wide variety of remediation phases as well as sites of different sizes and risk profiles. Sustainable practices and benefits may be hidden or overlooked; developing a framework was key to identifying sustainability aspects. The presentation compiles data from several upstream and downstream sites where sustainable remediation practices were implemented, reveals hidden benefits of sustainable remediation that are not commonly documented, and identifies opportunities presented by implementing sustainable remediation at small sites to scale it to larger projects. <https://www.grac.org/media/files/files/6418f433shoran.pdf>

A CRITICAL ANALYSIS OF PUBLISHED DATA TO DISCERN THE ROLE OF SOIL AND SEDIMENT PROPERTIES IN DETERMINING SORPTION OF PER AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Li, Y., D.P. Oliver, and R.S. Kookana.
The Science of the Total Environment, 08 Feb 2018, 628-629:110-120

Data published in peer-reviewed literature on sorption of PFASs were reviewed to evaluate the role of organic carbon (OC) and other properties on PFAS sorption in soils or sediments. PFOA and PFOS represented the largest data sets and showed very weak correlations between the sorption coefficient K_d and OC alone ($R^2=0.05-0.07$). When only laboratory-derived K_d values of PFASs and OC were analyzed, the R^2 values increased for PFOA ($R^2=0.24$, $n=42$), PFOS ($R^2=0.38$, $n=69$), PFNA ($R^2=0.77$, $n=12$), and PFDA ($R^2=0.78$, $n=13$). Relationships were heavily skewed by one or two high OC values. Similarly, there was no significant relationship between K_d values and pH for PFOS ($R^2=0.06$) and PFOA ($R^2=0.07$) across a range of environmental pH values. Multiple regression models better explained the sorption behavior of several PFASs as opposed to a single soil or sediment property. Regressions of OC and pH together explained a significant proportion of the variation in K_d values for 9 out of 14 PFASs and 8 of these regressions had ≥ 10 data points. More data and studies with a thorough characterization of soils or sediments are required to better understand their role in PFAS sorption.

SUSTAINABLE REMEDIATION OF DIESEL-CONTAMINATED SOIL BY LOW-TEMPERATURE THERMAL TREATMENT: IMPROVED ENERGY EFFICIENCY AND SOIL REUSABILITY

J. Ren, X. Song, and D. Ding. | *Chemosphere* 241:124952(2020)

Low-temperature thermal treatment (LTTT) was used as an energy-efficient technique to remediate diesel-contaminated soil. The study investigated the impacts of LTTT on the physicochemical and ecological properties of soils to evaluate the reusability of heated soil. Heating at 250°C for 10 min reduced total petroleum hydrocarbon concentration from 6,271 mg/kg to 359 mg/kg, which is lower than the Chinese risk screening level of 826 mg/kg. After LTTT, most soil physicochemical properties were nearly unchanged, and the NO_3^- -N and NH_4^+ -N contents increased. LTTT-remediated soil was favorable to germinate and grow wheat. The microbial community changed substantially but recovered after being mixed with uncontaminated soil. Pyrolysis was the dominant mechanism of diesel removal. A biochar-like pyrolytic carbon was formed, which improved the soil reusability.

ENHANCED ELECTROKINETIC REMEDIATION OF MULTI-CONTAMINATED DREDGED SEDIMENTS AND INDUCED EFFECT ON THEIR TOXICITY

Benamar, A., Y. Tian, F. Portet-Koltalo, M.T. Ammani, N. Giusti-Petruccianni Y. Song, et al.

Chemosphere 228:744-755(2019)

Lab studies investigated EK efficiency on the mobility and the removal of metals, PAHs and PCBs from dredged sediments using a mixture of chelating agents and surfactants. Results showed that increasing chelating agent concentration was favorable for both metal and PAH removal. Applying a periodic voltage gradient associated with a low concentration of additives provided the best removal of Zn, Cd, and Pb, and 16 priority PAHs. Fresh harbor sediment was highly resistant to metals and organics mobilization and transport due to aged contamination, a high buffering capacity, a very low hydraulic permeability, and high organic matter content. However, experiments performed on aged sediments provided better removal results and involved low organic matter and carbonates content. The efficiency of the EK process was also assessed by measuring the acute toxicity of the EK-treated sediment on the copepod *Eurytemora affinis* exposed to sediment elutriates.

IMPACT OF FIXED NITROGEN AVAILABILITY ON DEHALOCOCCOIDES MCCARTYI REDUCTIVE DECHLORINATION ACTIVITY

Kaya, D., B.V. Kjellerup, K. Chourey, R.L. Hettich, D.M. Taggart, and F.E. Löffler.

Environmental Science & Technology 53(24):14548-14558(2019)

The effect of NH_4^+ availability on *Dehalococcoides mccartyi* (Dhc) growth and reductive dechlorination was tested on enrichment cultures derived from chlorinated ethene-impacted groundwater (PW4) and river sediment (TC). Compared to incubations without NH_4^+ , PW4 cultures increased cDCE-to-ethene dechlorination rates ($20.6 \pm 1.6 \mu\text{M Cl}^-/\text{d}$ vs $3.8 \pm 0.5 \mu\text{M Cl}^-/\text{d}$), and the total number of Dhc 16S rRNA genes copies ($(1.8 \pm 0.9) \times 10^8/\text{mL}$ versus $(4.1 \pm 0.8) \times 10^7/\text{mL}$). In TC cultures, NH_4^+ also stimulated cDCE-to-ethene dechlorination and Dhc growth. qPCR revealed that Cornell-type Dhc capable of N_2 fixation dominated PW4 cultures without NH_4^+ , but their relative abundance decreased in cultures with NH_4^+ amendment. *Pimelias*-type Dhc incapable of N_2 fixation were responsible for cDCE dechlorination in TC cultures, and diazotrophic community members met their fixed N requirement in the medium without NH_4^+ . Quantitative assessment of Dhc nitrogenase genes, transcripts, and proteomics data linked Cornell-type Dhc nifD and nifK expression with fixed N limitation. NH_4^+ additions also demonstrated positive effects on Dhc in situ dechlorination activity in the vicinity of well PW4. Findings demonstrated that biostimulation with NH_4^+ can enhance Dhc reductive dechlorination rates but a "do nothing" approach that relies on indigenous diazotrophs can achieve similar dechlorination endpoints and avoids the potential for stalled dechlorination due to inhibitory levels of NH_4^+ or transformation products.

SEQUENTIAL COUPLING OF BIO-AUGMENTED PERMEABLE REACTIVE BARRIERS FOR REMEDIATION OF 1,1,1-TRICHLOROETHANE CONTAMINATED GROUNDWATER

Wang W. and Y. Wu. | *Environmental Science and Pollution Research* 26(12):12042-12054

The ability of high-density luffa sponge (HDLS) immobilized microorganisms coupled with permeable reactive barriers (IM Bio-PRBs) were compared to intimate coupling of free microorganisms and permeable reactive barriers (FM Bio-PRBs) to remediate 1,1,1-TCA-contaminated groundwater. IM Bio-PRB performance was superior in removing and preventing the transport of 1,1,1-TCA and inorganic ions (NO_3^- , PO_4^{3-} , and SO_4^{2-}) which contributed to faster microorganism growth in the upgradient aquifer. This played a constructive role in reducing the processing load of the following zero-valent iron PRBs and the negative effect of free microorganism cells and inorganic ions on Bio-PRB permeability. In addition, IM Bio-PRBs were more conducive to accelerate the removal of 1,1,1-TCA in long-term remediation and 1,1,1-TCA residual concentration levels lower than the safety standard of 0.2 mg/L. The change of terminal byproducts of contaminated groundwater in Bio-PRBs showed that 1,1,1-TCA could be effectively dechlorinated and mineralized in Bio-PRBs. The reductant H_2S was much more produced and utilized in IM Bio-PRBs. Taken together, sequentially coupled IM Bio-PRBs had a better overall performance, and its service life could be prolonged. It was a different design and idea to update conventional PRB remediation technology and theory.

CR(VI) ADSORPTION ON ENGINEERED IRON OXIDE NANOPARTICLES: EXPLORING COMPLEXATION PROCESSES AND WATER CHEMISTRY

Pan, Z., X. Zhu, A. Satpathy, W. Li, J.D. Fortner, and D.E. Giammar.

Environmental Science & Technology 53(20):11913-11921

Cr(VI) adsorption affinity to 8 nm surface-functionalized superparamagnetic magnetite nanoparticles was measured for surface coatings with trimethyloctadecylammonium bromide (CTAB) and stearic acid (SA) functional groups. Cr(VI) adsorbed more strongly to the CTAB coating than to SA-coated materials due to electrostatic interactions between positively charged CTAB and anionic Cr(VI) species. Cr(VI) adsorption by CTAB- and SA-coated materials increased with decreasing pH (4.5-10), which could be simulated by a surface complexation model. Cr(VI) removal performance by the nanocomposite was evaluated for two realistic drinking water compositions. The co-occurrence of divalent cations (Ca^{2+} and Mg^{2+}) and Cr(VI) resulted in decreased Cr(VI) adsorption as particles were destabilized. This led to aggregation and lower effective surface area, confirming the importance of the overall water composition on the performance of novel engineered nanomaterials for water treatment applications.

General News

STATISTICAL SOFTWARE PROUCL 5.1.00 FOR ENVIRONMENTAL APPLICATIONS FOR DATA SETS WITH AND WITHOUT NONDETECT OBSERVATIONS

U.S. EPA Software Download, 2020

ProUCL version 5.1.002 (5.1) is the latest update of the ProUCL statistical software package for analysis of environmental data sets with and without non-detect (ND) observations. ProUCL version 5.1 is a comprehensive statistical software package with statistical methods and graphical tools to address many environmental sampling and statistical issues. In ProUCL 5.1, some enhancements have been made in the Trend Analysis option of the Statistical Test module. ProUCL 5.1 computes and outputs results for the non-parametric T-S trend line which may be helpful to compute a prediction band around the T-S trend line. In addition to generating Q-Q plots based upon detected observations, the Goodness of Fit Tests option of the Statistical Tests module of ProUCL 5.1 generates censored probability plots for data sets with NDs. Some changes have been made in the decision table used to make suggestions for UCL selection based upon a gamma distribution. <https://www.epa.gov/land-research/proucl-software>.

TEN YEARS LATER: THE PROGRESS AND FUTURE OF INTEGRATING SUSTAINABLE PRINCIPLES, PRACTICES, AND METRICS INTO REMEDIATION PROJECTS

Favara, P., D. Raymond, M. Ambrusch, A. Libera, G. Wolf, J.A. Simon, B. Maco, et al.

Remediation 29:5-30(2019)

The 2009 Sustainable Remediation Forum white paper "Integrating Sustainable Principles, Practices, and Metrics into Remediation Projects" is revisited to assess sustainable remediation progress over the last 10 years, primarily in the U.S. The current state of sustainable remediation includes published literature, current practices and resources, applications, room for improvement, international progress, the virtuous cycle that applying sustainable remediation creates, and the status of the objectives cited in the 2009 white paper. The paper explores how sustainable remediation may evolve over the next 10 years and focuses on the events and drivers that can be significant in the pace of further development. While the industry has made significant progress in developing the practice of sustainable remediation and has implemented it successfully into hundreds of projects, an opportunity exists to implement the tenets of sustainable remediation on many more projects and explore new frontiers to help improve the communication, integration, and derived benefits from implementing sustainable remediation into future remediation projects.

PHYSICO-CHEMICAL PROCESSES FOR THE TREATMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS): A REVIEW

Nzeribe, B.N., M. Criml, S.M. Thagard, and T.M. Holsen

Critical Reviews in Environmental Science and Technology 49(10):866-915(2019)

Available physicochemical treatment techniques for PFAS were evaluated and compared to provide a comparative assessment based on effectiveness (extent of degradation and defluorination) and efficiency (rate, cost, and energy use). The review revealed that electrochemical oxidation, advanced reduction processes (ARPs) and plasma-based technology exhibited the best potential for overall process efficiency. Sonolysis and heat-activated persulfate had the highest energy demand, while photochemical oxidation was the most ineffective method.

PERFORMANCE AND ECONOMIC COMPARISON OF PRB TYPES IN HETEROGENEOUS AQUIFERS

Elder, C.R. and C.H. Benson

Environmental Geotechnics 6(4):214-224

Performance and cost were compared for horizontal permeable reactive barriers (HRBs), funnel and gate permeable reactive barriers (FGPRBs), and caisson permeable reactive barriers (CPRBs) in heterogeneous aquifers to achieve the same goal (90% effluent concentrations).

PHYTOREMEDIATION: ENVIRONMENTALLY SUSTAINABLE WAY FOR RECLAMATION OF HEAVY METAL POLLUTED SOILS

Ashraf, S., Q. Ali, Z.A. Zahir, S. Ashraf, H.N. Asghar

Ecotoxicology and Environmental Safety 174:714-727(2019)

Recent literature was gathered to review the sources, hazardous effects of toxic heavy metals, and environmentally-sustainable phytoremediation technique for heavy metal-polluted soils to offer widespread applicability of the technology. The review discusses different strategies to enhance the bioavailability of heavy metals in the soil. Phytoremediation of heavy metal-contaminated soils is a reliable tool to make land resources accessible for crop production.

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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