Technology Innovation News Survey

Entries for August 1-15, 2016

Market/Commercialization Information

ENVIRONMENTAL REMEDIATION SERVICES

Naval Facilities Engineering Command, NAVFAC Southwest, Environmental Contract Core.
Federal Business Opportunities, FBO-5409, Solicitation N6247316R2418, 2016

Naval Facilities Engineering Command Southwest is conducting market research to evaluate the interest and availability of potentially qualified small businesses to perform environmental remediation services at various locations in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Guam under NAICS code 562910. Requirements will focus primarily on environmental remediation projects but could involve other environmental work, such as environmental compliance. Award of Task Orders will be on a cost-plus-award-fee basis. The proposed multiple-award remediation contracts will have a one-year base period and four one-year options. The estimated aggregate value of all contracts awarded is about $240M. Submit capabilities packages via email by 2:00 PM PT on October 10, 2016. https://www.fbo.gov/spg/DON/NAVFAC/N68711A6A/N6247316R2418/listing.html

ENVIRONMENTAL ENGINEERING

National Science Foundation Funding Opportunity PD-16-1440, 2016

The goal of the NSF Environmental Engineering program is to support transformative research that applies scientific and engineering principles to avoid or minimize solid, liquid, and gaseous discharges; to identify, evaluate, and monitor the waste assimilative capacity of the natural environment; and to remove or reduce contaminants in polluted air, water, and soils. Major areas of interest include (1) enhancing the availability of high-quality water supplies via the development of innovative biological, chemical and physical treatment; investigating processes that remove and degrade contaminants, remediate contaminated soil and groundwater, and convert wastewaters into water suitable for reuse; and investigating biogeochemical and transport processes driving water quality in the aquatic and subsurface environment; and (2) determining the fate and transport of contaminants of emerging concern in air, water, solid waste, and soils. The duration of unsolicited awards is generally one to three years, and the typical annual award size for the program is around $110,000 per year. The window of opportunity for submitting applications is October 1-20, 2016. http://www.grants.gov/web/grants/view-opportunity.html?oppId=287356

Cleanup News

SUPPLEMENTAL IN-SITU TREATMENT OF SHALLOW GROUNDWATER, 2016 IMPLEMENTATION REPORT, FORMER REMCO HYDRAULICS FACILITY, WILLITS, CALIFORNIA

Willits Environmental Remediation Trust, 107 pp, 2016

Supplemental injection implementation activities were completed during April 18-22, 2016, to continue the in situ reduction of chlorinated VOCs (e.g., 1,1,1,2-tetrachloroethane, 1,1,1-trichloroethane, and others) initiated in 2010 and 2014 by injections of a dilute remedial solution of molasses into the subsurface. Vitamin B12 was added to the remedial solution to provide additional nutrients to stimulate microbial activity in reducing the VOCs. In addition, a buffer solution (sodium bicarbonate) was used to regulate the pH to optimize conditions for VOC degradation by key microorganisms (e.g., *Dehalococcoides* sp.). Multi-depth injections were completed at a total of 41 injection locations within three designated areas on Trust-owned property. The first post-injection groundwater monitoring and sampling event will be conducted in October 2016 and semi-annually thereafter for a total of two years. Hexavalent chromium and 1,4-dioxane are also being addressed at this site. *This report is available with others in an extensive online library of cleanup documents for the Former Remco Hydraulics Facility at* http://www.willitstrust.org/.

THE ISLAND COPPER PIT LAKE

Wen, M., C. Pelletier, K. Norlund, G. Wolff, and D. Berthelot.
SustainTech 2016, 19 slides, 2016

The flooding of open pits is a key feature of closure plans for many metal mines. Once filled, pit lakes typically discharge to the environment. Pit lake water requiring treatment prior to discharge can represent a significant cost of long-term closure care and maintenance. A plant-based technology is presented that has been used successfully in many industries as a relatively low-cost technique to attenuate contaminants in water. In the context of mine pit lakes, phytoremediation is the biologically mediated removal of contaminants using photosynthesizing organisms to improve water quality. This relatively low-cost treatment option can make it an attractive alternative to conventional lime neutralization for metal contamination resulting from metal leaching and acid rock drainage. Within a pit lake, the greatest opportunity for water remediation is in the limnetic zone, which usually occupies a much greater area and volume than the littoral zone. The plant-based treatment process is based upon two metal attenuation mechanisms: metal adsorption in oxic zone, and metal-sulfide precipitation in the sulfidic zone. This presentation shows how treatment of metal-contaminated pit lake waters at the closed Island Copper Mine has been conducted successfully for more than a decade.
http://www.seima.sk.ca/resources/Documents/SustainTech%202016/SustainTech%202016%20Presentations/SustainTech%20presentation%20Marc%20Wen%202016.pdf

MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

The 2015 Secretary of Defense Environmental Awards, p 9, 2016

The Secretary of Defense recognized the MCB Camp Lejeune team with a 2015 Environmental Restoration award for its progress in investigating and cleaning up over 900 sites to date, including 49 sites during this achievement period. Among other accomplishments, the team decreased VOC concentrations by 75-98% at Site 78 within a hot spot of the 300-acre groundwater plume (petroleum hydrocarbons and dissolved-phase TCE). Because concentrations asymptotically leveled over time (demonstrating a decrease in pump-and-treat effectiveness), MCB Camp Lejeune re-evaluated the site closeout strategy and initiated a treatability study of enhanced reductive dechlorination with bioaugmentation.
http://www.denix.osd.mil/awards/fy14secdef/winners/2015-secretary-of-defense-environmental-awards-brochure/

HOW TO REMEDIATE A LONG-TERM RELEASE OF RESIDUAL PETROLEUM HYDROCARBONS TO GROUNDWATER USING A PERMEABLE ADSORPTION BARRIER, UNION PACIFIC RAILROAD, COLFAX YARD, COLFAX, CA

Hodson, D.J. and J. Skwiot.
RAILTEC: The 17th Railroad Environmental Conference, 27-28 October 2015, Urbana, IL. Abstract only, 2015

The Colfax Railroad Yard site consists of an upper deck, where the railroad and railroad operations are conducted, and a lower deck near a seasonal stream. The lower deck is directly hydrogeologically downgradient of the upper deck. In 2002, Bunker C fuel was observed seeping from the base of the fill between the upper and lower decks. As an interim measure, the railroad installed a passive oil-water separator (OWS) system—an unlined pond with an overflow to a second unlined pond—and rerouted the stream to bypass the seep. In 2008, the OWS system was upgraded to include an unlined collection pond and an Aquip®water treatment system consisting of a carbon filter chamber inside a concrete vault. In 2012, the source of the Bunker C fuel was determined to be a leaking 50,000 gal sump. A permeable absorptive barrier (PAB) wall was constructed to intercept dissolved-phase diesel in the groundwater. The design consists of a 4 ft thick dispersion zone followed by the 2 ft thick PAB (80% sand and 20% granulated activated carbon). Simulations indicated that breakthrough of TPH-d at concentrations >50 µg/L is expected to occur within 50-75 years after wall construction. Construction of the PAB wall was completed in January 2015, incorporating ~40 tons of GAC.
Longer abstract: http://railtec.illinois.edu/RREC/pdf/RREC%202015%20present/47_Hodson.pdf

Demonstrations / Feasibility Studies

COMBINED NANO-BIOTECHNOLOGY FOR IN-SITU REMEDIATION OF MIXED CONTAMINATION OF GROUNDWATER BY HEXAVALENT CHROMIUM AND CHLORINATED SOLVENTS

Nemecek, J., P. Pokorny, O. Lhotsky, V. Knytl, P. Najmanova, J. Steinova, M. Cernik, et al.
Science of the Total Environment 563-564:822-834(2016)

A 13-month pilot test combined geofixation of Cr(VI) (4.4 to 57 mg/L) and dechlorination of chlorinated ethenes (400 to 6526 µg/L) by the sequential use of nanoscale zero-valent iron (NZVI) particles and in situ biotic reduction supported by whey injection. The NZVI was efficient toward Cr(VI) by itself and completely removed it from the groundwater (LOQ 0.05 mg/L). Subsequent application of whey achieved 97-99% removal of chlorinated ethenes. The persistence of the reducing conditions, even after the depletion of the organic substrates, indicated a complementary relationship between NZVI and the whey phases as the subsequent application of whey partially assisted the microbial regeneration of the spent NZVI by promoting its reduction into Fe(II), which further supported remediation conditions. Results demonstrate the feasibility and high efficiency of the combined nano-biotechnological approach of NZVI and whey applied in situ to remove Cr(VI) and chlorinated ethenes from the site's groundwater.

THREE-YEAR PERFORMANCE OF IN-SITU SOLIDIFIED/STABILISED SOIL USING NOVEL MGO-BEARING BINDERS

Jin, F., F. Wang, and A. Al-Tabbaa.
Chemosphere 144:681-688(2016)

Researchers tested and compared the 3-year performance of a highly contaminated soil treated by in situ solidification/stabilization (SS) using either magnesia (MgO)-bearing binders or portland cement. Although MgO alone provided negligible strength to the soil, it proved superior in immobilizing both organic and inorganic contaminants. Replacing MgO by ground granulated blast-furnace slag significantly enhanced the strength and also performed well in immobilizing contaminants. The addition of an inorgano-organo-clay slightly decreased the strength and permeability of the SS materials but had an inconsistent effect on contaminant immobilization, depending on binder composition. No degradation of the solidified materials was observed after a 3-yr exposure to field conditions, which demonstrated the applicability and the advantages of MgO-bearing binders over portland cement in SS. *This paper is* ***Open Access*** *at* http://www.sciencedirect.com/science/article/pii/S004565351530134X.

FIELD DEMONSTRATION OF PROPANE BIOSPARGING FOR IN SITU REMEDIATION OF N-NITROSODIMETHYLAMINE (NDMA) IN GROUNDWATER

Hatzinger, P.B. and D. Lippincott.
ESTCP Project ER-200828, 205 pp, 2015

Propane gas and oxygen were added to groundwater via sparging to stimulate native microbes to biodegrade NDMA in situ at the Aerojet Superfund site in Rancho Cordova, Calif. Groundwater NDMA concentrations at the test site ranged from ~2,000 to >30,000 ng/L. The biosparging system was operated for a period of 374 days, and full rounds of sampling were conducted on 12 occasions. Data from this field test indicate that propane biosparging can be an effective approach to reduce the concentrations of NDMA in a groundwater aquifer by 3 to 4 orders of magnitude, and that concentrations in the low ng/L range can be achieved with continuous treatment. The groundwater in this region currently is captured by a groundwater extraction and treatment system, and NDMA is removed by UV irradiation. Based on a cost analysis for treatment of a shallow groundwater plume (~10-40 ft bgs) ~400 ft in width, a propane biosparge barrier was estimated to be more cost-effective for NDMA removal than pump and treat with either UV or a fluidized bed bioreactor.
https://www.estcp.com/content/download/40059/384461/file/Final%20Report_V1%20ER-200828%20January%202016.pdf

Research

COUPLING BETWEEN OVERLYING HYDRODYNAMICS, BIOTURBATION, AND BIOGEOCHEMICAL PROCESSES CONTROLS METAL MOBILITY, BIOAVAILABILITY, AND TOXICITY IN SEDIMENTS

Packman, A.I., J.-F. Gaillard, and G.A. Burton, Jr. SERDP Project ER-1745, 120 pp, 2016

In lab experiments performed to determine the coupled effects of hydrodynamics, bioturbation, and biogeochemical processes on the transformation, mobility, bioavailability, and toxicity of metals in contaminated sediments, oxidation of surficial sediments liberated metal species that were then mobilized to both porewater and overlying water. Liberation of metals generally increased with hydrodynamic shear on the sediment-water interface, even in some low-permeability sediments. Sediment resuspension transitorily mobilized particulate metals but did not significantly mobilize dissolved metals or increase contaminant bioavailability or toxicity. Bioturbation and bioirrigation by burrowing worms, however, greatly increased sediment heterogeneity, oxygen delivery into sediments, and efflux of metals to both porewater and overlying water. Bioturbation also destabilized sediments, resulting in greater particle resuspension and metals efflux following flow perturbations. Based on these findings, the authors recommend including measurements of the effects of flow forcing and sediment resuspension in concert with biological perturbations during assessments of metals bioavailability and toxicity in contaminated sediments.
https://www.estcp.com/content/download/40096/384816/file/ER-1745%20Final%20Report.pdf

SIMULATION OF DENSE NON-AQUEOUS PHASE LIQUID REMEDIATION THROUGH STEAM-ENHANCED EXTRACTION

Azizan N.A., S.A. Kamaruddin, and S. Chelliapan.
ARPN Journal of Engineering and Applied Sciences 11(6):3731-3739(2016)

Two-dimensional simulations were performed to assess the efficiency of steam-enhanced extraction in remediation of a heterogeneous subsurface contaminated by a PCE spill. Simulations performed at four different steam injection rates showed that increases in injection rate will increase the PCE remediation time. A steam injection rate of 1.0 x 10^{-4} kg/s successfully removed 100% of the PCE. Significant impacts were observed in the difference in remediation time with the increment of ~20 min, 40 min, and 70 min for every 2.0 x 10^{-5} kg/s increment. The dominant mechanisms of PCE removal was physical displacement through vaporization and co-boiling enhanced by steam distillation and steam stripping. The simulation results of steam-enhanced extraction for PCE removal was compared with the surfactant-enhanced method implemented in a prior study. The time required to remove PCE using steam-enhanced extraction was four times faster than the time required to remove PCE using surfactant-enhanced removal. http://www.arpnjournals.org/jeas/research_papers/rp_2016/jeas_0316_3871.pdf

CRITICAL REVIEW OF FACTORS GOVERNING DATA QUALITY OF INTEGRATIVE SAMPLERS EMPLOYED IN ENVIRONMENTAL WATER MONITORING

Roll, I.B. and R.U. Halden. Water Research 94:200-207(2016)

Integrative sampling enables the collection of analyte mass from environmental liquids over extended timeframes from hours to months. While the incentives to complement or replace conventional, time-discrete sampling have been widely discussed, the data quality implications of employing alternative, integrative methods have not yet been systematically studied. A critical analysis of contemporary literature showed the data quality of integrative samplers, whether active-advection or passive-diffusion, to be governed by uncertainty in both sampling rate and analyte recovery. Derivation of two lumped parameters, representing the coefficient of accumulation of a contaminant from an environmental fluid and the coefficient of subsequent recovery of its mass from the sampler, produced a conceptual framework for quantifying error sources in concentration data derived from accumulative samplers. Whereas the precision associated with recovery was found to be fairly consistent across eight passive-diffusion and active-advection devices (averaging 5-16% RSD), active-advection samplers effectively improve precision in sampling rate (analyte uptake), as determined for two active-advection devices (2-7% average RSD) and five passive devices (12-42% average RSD). This paper presents an approach for comparing the data quality implications of integrative sampler design. *See Chapter 2 in I.B. Roll's dissertation for more information*:
https://repository.asu.edu/attachments/164033/content/Roll_asu_0010E_15398.pdf.

A NEW APPLICATION OF PASSIVE SAMPLERS AS INDICATORS OF IN SITU BIODEGRADATION PROCESSES

Belles, A., C. Alary, J. Criquet, and G. Billon. Chemosphere 164:347-354(2016)

A method for evaluating the in situ degradation of nitro-PAHs in sediments was adapted from the passive sampler (PS) technique, which commonly uses the dissipation rate of labeled compounds loaded in PS devices to sense the environmental conditions of exposure. In the present study, polymeric PSs (made of polyethylene strips) loaded with a set of labeled PAHs and nitro-PAHs were immersed in sediments (in field and lab conditions) to track the degradation processes. This approach is theoretically based on the fact that a degradation process induces a steeper concentration gradient of the labeled compounds in the surrounding sediment, thereby increasing the compound dissipation rates compared with the dissipation in abiotic conditions. Postulating that the degradation magnitude is the same for the labeled compounds loaded in polyethylene strips and for their native homologs that are potentially present in the sediment, the field degradation of three nitro-PAHs (2-nitro-fluorene, 1-nitro-pyrene, 6-nitro-chrysene) was semi-quantitatively analyzed using the developed method.

CHARACTERISTICS AND INFLUENCING FACTORS OF TETRACHLOROETHYLENE SORPTION-DESORPTION ON SOIL AND ITS COMPONENTS

Qiu, Z., W. Yang, L. He, Z. Zhao, S. Lu, and Q. Sui. Chemosphere 144:895-901(2016)

To investigate the effects of soil structure, soil organic carbon (SOC), minerals, initial PCE concentration (C0), and ionic strength (Ci) on PCE sorption and desorption, six types of soil were adopted as adsorbents: two types of natural untreated soil and four types of soil with most of the soft carbon pre-treated by H_2O_2 or with all SOC removed by 600°C ignition. Results showed that all of the PCE sorption-desorption isotherms were non-linear within the experimental range, and the H_2O_2-treated samples exhibited higher non-linear sorption isotherms than those of the original soils. Both SOC and minerals have impacts on the sorption-desorption of PCE, and the sorption-desorption contribution rate of minerals increased with decreasing SOC content. C0 had almost no influence on sorption to soil minerals, but the contribution rate of minerals decreased with increasing C0 in the desorption stage. As a result of the salting-out effect, PCE sorption capacity was increased by increasing Ci, especially when Ci ≥ 0.1 M. Moreover, desorption increased and hysteresis weakened with increasing Ci, except for the heated samples. In addition, no significant affect of Ci on PCE desorption and no hysteresis was observed in this experimental range for the 600°C-heated samples.

REVERSIBLE AND IRREVERSIBLE SORPTION OF PERFLUORINATED COMPOUNDS (PFCS) BY SEDIMENTS OF AN URBAN RESERVOIR

Chen, H., M. Reinhard, V.T. Nguyen, and K.Y.-H. Gin. Chemosphere 144:1747-1753(2016)

Using bed sediments from an urban reservoir, researchers examined reversible and irreversible sorption to the sediments of different perfluoroalkyl compounds: C4, C6, C8, C9, and C10 perfluoroalkanoate homologs (PFBA, PFHxA, PFOA, PFNA and PFDA, respectively) and PFOS and PFHxS. For strongly sorbing compounds (e.g., PFNA, PFDA and PFOS), sediments acted predominantly as irreversible sinks. Aqueous concentrations of the moderately sorbing compounds (PFOA and PFHxS) were buffered by reversibly sorbing suspended solids. Compounds that did not sorb significantly (e.g., PFBA and PFHxA) are not expected to be influenced by sediment transport. Irreversible sorption could result in consistently higher field-based KD values than lab-based KD values.

REMEDIATION OF ARSENIC CONTAMINATED SOIL BY COUPLING OXALATE WASHING WITH SUBSEQUENT ZVI/AIR TREATMENT

Cao, M., Y. Ye, J. Chen, and X. Lu. Chemosphere 144:1313-1318(2016)

Oxalate is biodegradable and widely present in the environment. With addition of 0.1 mol/L oxalate for soil washing under circumneutral condition, 83.7% and 52.6% of arsenic were removed from spiked kaolin and field-contaminated soil, respectively. Higher oxalate adsorption on the field soil was attributed to the higher soil organic matter and clay content. Much more As(III) was oxidized in the presence of oxalate. Arsenic [mainly As(V)] was effectively adsorbed on iron (hydr)oxides with the consumption of oxalate and the increase of pH value. For the field soil washing effluent, about 94.9% of total arsenic was removed after 120 min treatment without pH adjustment. The coupled application of oxalate washing and subsequent ZVI/air treatment provided a low-cost and environmentally benign alternative for remediation of As-contaminated soil.

COMBINING IN SITU CHEMICAL OXIDATION, STABILIZATION, AND ANAEROBIC BIOREMEDIATION IN A SINGLE APPLICATION TO REDUCE CONTAMINANT MASS AND LEACHABILITY IN SOIL

Cassidy, D.P., V.J. Srivastava, F.J. Dombrowski, and J.W. Lingle.
Journal of Hazardous Materials 297:347-355(2015)

Batch reactors were maintained for 32 weeks in the lab to test the potential for an in situ remedy that combined chemical oxidation, stabilization, and anaerobic bioremediation in a single application to address PAHs and BTEX in soil from a manufactured gas plant. Portland cement and slaked lime were used to activate the persulfate and stabilize/encapsulate contaminants not chemically oxidized. Native sulfate-reducing bacteria degraded residual contaminants using the sulfate remaining after persulfate activation. Performance of the combined remedy in reducing contaminant mass and leachability was compared with sodium hydroxide (NaOH)-activated persulfate, stabilization, and sulfate-reducing bioremediation as stand-alone technologies. The stabilization amendments increased pH and temperature sufficiently to activate the persulfate within one week. Activation with both stabilization amendments and NaOH removed between 55-70% of PAH and BTEX, but combined persulfate and stabilization significantly reduced the leachability of residual BTEX and PAH compared with NaOH activation alone. Sulfide, 2-naphthoic acid, and the abundance of subunit A of the dissimilatory sulfite reductase gene were used to monitor native sulfate-reducing bacteria, which although negatively affected by activated persulfate recovered completely within weeks.

ACHIEVING SYNERGY BETWEEN CHEMICAL OXIDATION AND STABILIZATION IN A CONTAMINATED SOIL

Srivastava, V.J., J.M. Hudson, and D.P. Cassidy. Chemosphere 154:590-598(2016)

Eight in situ solidification/stabilization (ISS) amendments were tested to promote in situ chemical oxidation (ISCO) with activated persulfate in a contaminated soil. A 3% (by weight) dose of all ISS amendments selected for this study completely activated a 1.5% dose of persulfate within 3 h by raising temperatures above 30°C (heat activation) and/or increasing pH above 10.5 (alkaline activation). Heat is released by the reaction of CaO with water, and pH increases because this reaction produces Ca(OH)2. Heat activation generates 2 mol of oxidizing radicals per mole of persulfate, whereas alkaline activation releases only one. The relative contribution of heat vs. alkaline activation increased with CaO content of the ISS amendment, which was reflected by enhanced contaminant oxidation with increasing CaO content and confirmed by comparing to controls promoting purely heat or alkaline activation. The test soil was contaminated with BTEX and PAHs, particularly naphthalene. ISS-activated persulfate oxidized between 47-84% of the BTEX/naphthalene, and between 13-33% of the higher molecular weight PAH. ISS-activated persulfate reduced the leachability of BTEX/naphthalene by 76-91% and of the PAHs by 83-96%. Combined ISCO/ISS reduced contaminant leachability far more than ISCO or ISS treatments alone, demonstrating the synergy that is possible with combined remedies. *See more on this study in J.M. Hudson's thesis at* http://scholarworks.wmich.edu/masters_theses/700/.

MICROELECTRODE GEOCHEMICAL OBSERVATORY FOR IN SITU MONITORING OF METALS CONCENTRATION AND MOBILITY IN CONTAMINATED SEDIMENTS

Ruiz, N.E., R. Fimmen, Y.-P. Chiu, J. Voyles, A. Dindal, B. Yates, and V. Lal.
ESTCP Project ER-201128, 64 pp, 2013 [Posted by ESTCP in August 2016]

The project objective was to demonstrate and validate the Analytical Instrument Systems Inc. microelectrode geochemical observatory (MGO) for long-term monitoring of metals in contaminated sediments, including a lab phase and a pre-field deployment at Old Woman Creek (OWC) in Huron, Ohio. It became clear early on that adapting this open-water technology for sediments application remains a challenge. Gold-mercury amalgam electrodes, built following a design from literature, were able to detect Fe, Mn, and reduced sulfur compounds, but not the site target metals: As, Cd, Cu, Pb, Hg, and Zn. Five-mm gold electrodes also fabricated following procedures from literature produced calibration curves for Cu, Pb, and Zn in standard solutions and for Pb and Zn in site porewater. Attempts to ruggedize the gold electrode proved futile as the gold wire was exceptionally fragile. Because OWC sediments contain mainly Mn and Fe, the MGO was deployed with the amalgam electrode. After a few days, the MGO began shutting down intermittently. The electrode fouled over a few weeks and produced incoherent, noisy scans. Further work is needed to design a rugged electrode that will support a field-deployable probe with the required functionality across a broad range of metals.
https://www.estcp.com/content/download/40012/384063/file/ER-201128%20Final%20Report.pdf

INFLUENCE OF COUPLING EROSION AND HYDROLOGY ON THE LONG-TERM PERFORMANCE OF ENGINEERED SURFACE BARRIERS

Smith, C.L. and C.H. Benson. NUREG/CR-7200, 193 pp, 2016

Design strategies for barriers over waste disposal facilities were evaluated by conducting long-term (1000-yr) parametric simulations with landform evolution and hydrologic models to couple the effects of erosion and hydrology. The most significant differences in maximum erosion depths were attributed to climate and vegetation. In simulations with a rip-rap or gravel admixture surface, ~4 m greater maximum erosion depth was estimated in semi-arid climates compared to humid climates. Vegetation decreased erosion by 1.5 m in the semi-arid climate and by 4 m in the humid climate. Vegetation also increased the amount of evapotranspiration that occurred, decreasing water percolation into the waste. Humid climates had the least erosion when terraced slopes were utilized. Overall, a rip-rap surface layer prevented erosion most effectively for any type of topography, climate, or cover type, although covers with a riprap surface had higher percolation rates. In contrast, a gravel admixture surface had slightly greater erosion but was more effective in limiting percolation.http://www.nrc.gov/docs/ML1612/ML16125A124.pdf

MERCURY REMEDIATION TECHNOLOGY DEVELOPMENT FOR LOWER EAST FORK POPLAR CREEK: FY 2015 PROGRESS REPORT

Peterson, M.J., S.C. Brooks, T.J. Mathews, et al. ORNL/TM-2016/48, 88 pp, 2016

This document presents results from characterization and experimental studies conducted in FY 2015 in support of developing new options for mercury (Hg) remediation. Task 1, Soil and Groundwater Source Control, focuses on addressing downstream Hg sources to the creek (especially floodplain and bank soils) and groundwater. Task 2, Surface Water and Sediment Manipulation, centers on potential manipulation of in-stream processes, including the many water and sediment chemistry factors that affect Hg methylation. Task 3, Ecological Manipulation, investigates methods to manipulate the food chain at both lower and higher levels of organization to decrease Hg concentrations in fish. Together, the three study tasks focus on manipulating the key factors that affect Hg concentrations in fish: the amount of inorganic Hg available to an ecosystem, the conversion of inorganic Hg to methylmercury (MeHg), and the bioaccumulation of MeHg via the food web. http://www.osti.gov/scitech/servlets/purl/1255676

ELECTROKINETIC DELIVERY OF PERSULFATE TO REMEDIATE PCBS POLLUTED SOILS: EFFECT OF DIFFERENT ACTIVATION METHODS

Fan, G., L. Cang, H.I. Gomes, and D. Zhou. Chemosphere 144:138-147(2016)

Electrokinetic remediation (EK) can be used to transport persulfate in low-permeability soil. In this study, different activation methods—zero-valent iron (ZVI), citric acid-chelated Fe^{2+}, iron electrode, alkaline pH, and peroxide—were evaluated to enhance the activity of EK-delivered persulfate in PCB-contaminated soil. All the activators and the persulfate were added in the anolyte. The addition of activators accelerated persulfate decomposition, thereby decreasing soil pH. The mass of persulfate delivered into the soil declined with continuous persulfate decomposition by activation. PCBs removal efficiency in soil followed the activation order of alkaline (40.5%) > peroxide (35.6%) > citric acid-chelated Fe^{2+} (34.1%) > ZVI (32.4%) > no activation (30.8%) > iron electrode (30.5%). The activation effect was highly dependent on the ratio of activator and persulfate. https://hydra.hull.ac.uk/assets/hull:11582/content

General News

CLEANING UP BROWNFIELDS UNDER STATE RESPONSE PROGRAMS: GETTING TO "NO FURTHER ACTION"

U.S. EPA, Office of Brownfields and Land Revitalization.
EPA 560-K-16-002, 132 pp, 2016

This report provides information on certain aspects of state response programs available to owners and prospective purchasers of brownfields. It is a guide for owners of brownfield properties on the general requirements for entering a brownfield into a state cleanup program and the process for attaining a state decision or certification of the need for "no further action" under each state response program. This report is a central source of information regarding the process available in each state for attaining a state decision or certification of the need for no further action under each state response program. The report summarizes information gathered from state response program contacts and state response program websites.
https://www.epa.gov/brownfields/cleaning-brownfields-under-state-response-programs-getting-no-further-action

HEALTH-BASED MAXIMUM CONTAMINANT LEVEL SUPPORT DOCUMENT: PERFLUOROOCTANOIC ACID (PFOA) — PUBLIC REVIEW DRAFT

Gleason, J.S., K.R. Cooper, J.B. Klotz, G.B. Post, and G. Van Orden.
New Jersey Drinking Water Quality Institute, Health Effects Subcommittee, 475 pp, 2016

A health-based maximum contaminant level for PFOA (also referred to as C8) of 14 ng/L was developed by the New Jersey Health Effects Subcommittee using a risk assessment approach intended to protect for chronic (lifetime) drinking water exposure. http://www.nj.gov/dep/watersupply/pdf/pfoa-hb--mcl-public-review-draftwithappendices.pdf *See additional material on this topic at* http://www.nj.gov/dep/watersupply/g_boards_dwqi.html.

CONTAMINATED SEDIMENTS IN FRESHWATER SYSTEMS

Spellman, F.R.
CRC Press, Boca Raton, FL. ISBN: 9781498775175, 373 pp, 2016

Assessment of freshwater sediments can determine whether chemical concentrations are sufficient to cause adverse effects on aquatic organisms or organisms higher in the food chain, including humans. This book presents methods for assessing sediments and includes an integration of physical, chemical, and biological information. It examines the elements of quality assurance and control programs, considerations for the conduct of field surveys, screening-level analyses, chemical analyses, toxicity tests for assessing biological impacts, assessments of benthic invertebrate community structure, surveys of fish tumors and abnormalities, and data presentation and interpretation techniques.

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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