

Technology Innovation News Survey

Entries for April 16-30, 2016

Market/Commercialization Information

CHEMICAL WEAPONS AND EQUIPMENT

Department of the Army, Army Contracting Command (ACC), Rock Island, IL.
Federal Business Opportunities, FBO-5291, Solicitation W52P1J16R0081, 2016

The U.S. Army Chemical Materials Activity has been directed to develop, on an expedited basis, specific projects to destroy chemical warfare materiel (CWM) and miscellaneous CWM disposal. This effort requires the contractor to establish a partnership with one or more commercial hazardous waste treatment, storage, and disposal facilities to transport and dispose of hazardous secondary and neutralized wastes produced from various recovered chemical materiel directorate projects. Projects include explosive destruction system (EDS) missions to destroy mustard-filled munitions at four DoD activities plus two generic EDS deployments and two Single CAIS Accessing and Neutralization System deployments per year (locations to be determined). The solicitation will be issued as an unrestricted, full-and-open competitive, best-value RFP to result in a single-source IDIQ contract award, with a five-year ordering period (fiscal years 2017-2021). Release of the RFP is anticipated on or after June 30, 2016. <https://www.fbo.gov/notices/5d90d7d9442909203328f558a24120a9>

OFFICE OF SITE REMEDIATION ENFORCEMENT-4

U.S. Environmental Protection Agency, Office of Acquisition Management, Washington, DC.
Federal Business Opportunities, FBO-5301, Solicitation SOL-HQ-16-00008, 2016

U.S. EPA is conducting market research to determine if any small businesses possess the qualifications and capabilities under NAICS code 561110 to support EPA's Office of Site Remediation Enforcement, which plans, implements, and enforces programs, strategies, guidance, and regulations under the Agency's statutes to support remediation efforts. Submit capabilities statements by 4:00 PM ET on June 27, 2016. The draft Statement of Work is available only through FedConnect at <https://www.fedconnect.net/FedConnect/?doc=SOL-HQ-16-00008&agency=EPA> [Note: It might be necessary to copy and paste the URL into your browser for direct access.].

SPECIAL NOTICE: NAVAJO NATION AREA URANIUM MINES

U.S. Environmental Protection Agency, Region 9, San Francisco, CA.
Federal Business Opportunities, FBO-5298, Solicitation SOL-R9-16-00002, 2016

To ensure that the formal solicitation for the Navajo Area Uranium Mines: Response, Assessment and Evaluation Services procurement is executed as effectively as possible, EPA is requesting industry feedback on specific draft evaluation criteria (chiefly those relevant to contractor location and training and employment opportunities for Navajo individuals and businesses), which will be used to further refine the evaluation factors. Release of the RFP is anticipated around August 2016. A 5-year IDIQ contract is anticipated, between \$65M and \$100M. Submit responses by 3:00 PM PT on June 24, 2016, via FedConnect at <https://www.fedconnect.net/FedConnect/?doc=SOL-R9-16-00002&agency=EPA> [Note: It might be necessary to copy and paste the URL into your browser for direct access.].

Cleanup News

THERMAL DNAPL SOURCE ZONE TREATMENT IMPACT ON A CVOC PLUME

Heron, G., J. Bierschenk, R. Swift, R. Watson, and M. Kominek.
Groundwater Monitoring & Remediation, Vol 36 No 1, 26-37, 2016

The dissolved-phase PCE plume emanating from the source zone at a site in Endicott, New York, was commingled with a petroleum hydrocarbon plume from an upgradient source of fuel oil. Extraction wells located about 360 m downgradient of the source provided hydraulic containment for the plume. Implementation of in situ thermal desorption (ISTD) in the source area removed ~1,406 kg of PCE in addition to 4,082 kg of commingled petroleum-related compounds. The ISTD treatment reduced the PCE mass discharge into the plume from an estimated 57 kg/yr to 0.07 kg/yr, essentially removing the source term. In the five years following thermal treatment completion in early 2010, the PCE plume has collapsed, and the concentration of degradation products in the PCE-series plume area has declined by two to three orders of magnitude. Anaerobic dechlorination is the suspected dominant mechanism, assisted by the presence of a fuel oil smear zone and a petroleum hydrocarbon plume from a separate source area upgradient of the PCE source. Based on the post-thermal treatment groundwater monitoring data, the hydraulic containment system was downsized in 2014 and discontinued in early 2015. *This paper is **Open Access*** at <http://onlinelibrary.wiley.com/doi/10.1111/gwmr.12148/pdf>.

HOW EFFECTIVE IS THERMAL REMEDIATION OF DNAPL SOURCE ZONES IN REDUCING GROUNDWATER CONCENTRATIONS?

Baker, R.S., S.G. Nielsen, G. Heron, and N. Ploug.
Groundwater Monitoring & Remediation, Vol 36 No 1, 38-53, 2016

The authors conducted DNAPL source removal using situ thermal remediation (ISTR) at dozens of sites. This paper presents a compilation of cases—10 separate DNAPL source areas at five project sites—where data indicate that a thorough implementation of ISTR in a DNAPL source area can result in the attenuation of the associated dissolved plume, such that in several cases long-standing pump-and-treat systems could be turned off. These findings contrast with assertions that aggressive source remediation may not be justifiable because dissolved plume concentrations will not decline sufficiently. *This paper is **Open Access*** at <http://onlinelibrary.wiley.com/doi/10.1111/gwmr.12149/pdf>.

INDEPENDENT REVIEW OF ELEMENTAL PHOSPHORUS REMEDIATION AT THE EASTERN MICHAUD FLATS FMC OPERABLE UNIT NEAR POCATELLO, IDAHO

Martino, L.E., J.J. Jerden, T.A. Kimmell, and J. Quinn.
ANL/EVS/TM-15/2-125095, 378 pp, 2016

Elemental phosphorus (P₄) was manufactured from phosphate ore at FMC's Pocatello, Idaho, facility, located on privately owned land within the Shoshone-Bannock Tribes' Fort Hall Indian Reservation. The now-closed facility includes disposal sites regulated under RCRA and CERCLA. The Tribes favor permanent removal and/or treatment of P₄. EPA and the Tribes agreed to have Argonne National Laboratory perform an independent review of potential excavation and treatment technologies for the site. This report documents how the independent review was conducted and presents the results. Technologies that could be ready for use in the near term (within 1 yr) include mechanical excavation, containment technologies, off-site incineration, and drying and mechanical mixing under a tent structure. Technologies that could be ready for use in the mid-term (1 to 2 yr) include cutter suction dredging, thermal-hydraulic dredging, and underground pipeline cleaning. Technologies requiring a longer lead time (2 to 5 yr) include on-site incineration, a land disposal restriction waste treatment system, an Albright & Wilson batch mud still, post-treatment on-site disposal, and post-treatment off-site disposal. <http://www.osti.gov/scitech/biblio/1238045>

TREATMENT OF CHLORINATED SOLVENTS IN GROUNDWATER BENEATH AN OCCUPIED BUILDING AT THE YOUNG-RAINEY STAR CENTER, PINELLAS, FL

Daniel, J., S. Surovchak, and C. Tabor.
Waste Management 2016, 6-10 March, Phoenix, Arizona. Paper 16342, 35 pp, 2016

Groundwater contamination from two dissolved-phase plumes originating from chlorinated solvent source areas in the southeastern portion of the Young-Rainey STAR Center in Largo, Florida, has migrated off site, beneath the roadways, and beneath adjacent properties to the south and east. The origin of the contamination appears to be multiple long-term point sources beneath Building 100, an 11-acre building that housed manufacturing facilities during former DOE operations. The site is now owned by Pinellas County. The technical approach consisted of installing horizontal wells outside the building footprint that extend through and around the identified subsurface treatment areas and terminate under the building. Following installation of two wells 350 ft long, two wells 400 ft long, and four wells 450 ft long to intersect the inferred source areas and confirmed contaminant plumes beneath the building, DOE injected emulsified vegetable oil and a microbial culture into the horizontal wells at each of several target areas. This paper describes the details of bioremediation treatment system installation beneath a large, occupied industrial production facility, including lessons learned; technical, logistical, and environmental challenges; community relations; and regulatory relations. <http://www.osti.gov/scitech/biblio/1245981-treatment-chlorinated-solvents-groundwater-beneath-occupied-building-young-rainey-star-center-pinellas-fl>

VAPOR EXTRACTION WELL PERFORMANCE AND RECOMMENDATIONS FOR FUTURE SOIL VAPOR EXTRACTION ACTIVITIES AT THE A-014 OUTFALL

Jackson, D., W. Hyde, R. Walker, B. Riha, J. Ross, and M. Kramer.
SRNL-STI-2015-00235, 65 pp, 2015

The vadose zone near the A-014 Outfall contains residual VOCs that serve as a potential source for groundwater contamination. Since 1995 active soil vapor extraction (SVE) has been an integral part of the site corrective actions. Two separate SVE systems currently are removing contamination in the vapor phase from the subsurface. This report describes performance evaluation of individual wells associated with the systems and provides optimization recommendations.

Options to consider include continuation of active extraction, transition to low-energy SVE treatment, and abandonment of non-performing wells. Although permit conditions allowing for the shutdown of the SVE units have been reached (<http://www.osti.gov/scitech/servlets/purl/1182715>)

Demonstrations / Feasibility Studies

IMPLEMENTATION OF ENHANCED ATTENUATION AT THE DOE MOUND SITE OU-1 LANDFILL: ACCELERATING PROGRESS AND REDUCING COSTS

Hooten, G., R. Cato, and B. Looney.
Waste Management 2016, 6-10 March, Phoenix, Arizona. Paper 16270, 33 pp, 2016

At DOE's Mound, Ohio, site, chlorinated VOCs originating from the former solid-waste landfill have affected groundwater in Operable Unit 1 (OU-1). The source materials have been removed from the landfill, and the Mound core team is assessing the feasibility of switching from active pump and treat (P&T) to a passive attenuation-based remedy. The proposed enhanced attenuation (EA) strategy is based on the creation of structured geochemical zones to address residual areas of elevated CVOCs in soil and groundwater while minimizing rebound of groundwater concentrations above regulatory targets and avoiding plume expansion while the P&T system is turned off. To evaluate the EA strategy, DOE is conducting a field demonstration using edible oils to enhance natural biodegradation processes. The EA approach at OU-1 relies on groundwater flow through a succession of anaerobic and aerobic zones. The anaerobic zones stimulate relatively rapid degradation of the original solvent source compounds (PCE and TCE). The surrounding aerobic areas encourage relatively rapid degradation of daughter products (DCE and VC) as well as enhanced cometabolism of TCE resulting from the utilization of methane and other reduced hydrocarbons that are formed and released from the anaerobic zones. <http://www.osti.gov/scitech/biblio/1249196>

IMMOBILIZATION OF PFAS USING ACTIVATED CARBON AND ALUMINUM HYDROXIDE

Birk, G.M.
Emerging Contaminants Summit, March 1-2, 2016, Westminster, Colorado. 36 slides, 2016

Soils contaminated with per- and polyfluoroalkyl substances (PFASs) at two airport fire training grounds in Australia were used in an independent validation of the commercial immobilization product RemBind™, which contains mainly activated carbon and aluminum hydroxide and clay materials. The trials were independently supervised by an external party to ensure a high level of scrutiny. Soils were mixed with 5-20% RemBind (standard grade) or RemBind Plus (high grade), fixed for 48 hours, and then analyzed for 20 PFAS compounds at a commercial laboratory using the Toxicity Characterization Leaching Procedure. Selected samples were further analyzed using U.S. EPA Method 1320 (multiple extraction procedure) as an indication of long-term binding stability. Results showed that RemBind treatment reduced the soil leachability of PFOS from 37 µg/L (site 1) and 341 µg/L (site 2) below 0.3 µg/L. For PFASs in aqueous media, PerfluorAd introduction followed by RemBind polishing provides an innovative treatment process. In pretreatment, liquid PerfluorAd active compound is metered into a stirring tank to precipitate PFASs. Precipitation products are separated from the water as micro-flocs by processes such as sedimentation and filtration. The precipitants can be concentrated to a very high degree, which allows for economical disposal. A downstream RemBind filter treats the residual contaminants. Owing to the significant reduction in the PFAS contaminant load in the PerfluorAd stage (up to 90%) the absorbent filter lifetime is extended significantly.

Presentation slides: http://www.contaminantssummit.com/images/presentations/1_GaryBirk.pdf

PerfluorAd poster: <http://www.umsicht.fraunhofer.de/content/dam/umsicht/de/dokumente/pressemitteilungen/2012/120110-poster-pft-en.pdf>

Research

ELECTRICAL RESISTANCE HEATING OF CLAY LAYERS IN WATER-SATURATED SAND

Martin, E.J., K.G. Mumford, and B.H. Kueper.
Groundwater Monitoring & Remediation, Vol 36 No 1, 54-61, 2016

Electrical resistance heating (ERH) experiments performed in a 2-D water-saturated porous medium comprising an electrically conductive, low-permeability clay lens embedded within less electrically conductive, higher permeability silica sand were compared to experiments performed in homogeneous silica sand. All experiments were performed in the absence of a NAPL or dissolved VOC. Temperature monitoring showed preferential heating in the clay lens and higher overall heating rates throughout the test cell compared to the homogeneous sand. Gas production was localized around the sand-clay interface due to high temperature and low capillary displacement pressure. Above the clay lens, unexpected temperature plateaus were observed. Results show that the use of co-boiling plateaus as an indicator of NAPL-water co-boiling could be misleading during applications of ERH at sites containing electrically conductive, low-permeability clay lenses embedded within less electrically conductive, higher-permeability sands. *This paper is Open Access* at <http://onlinelibrary.wiley.com/doi/10.1111/qwmr.12146/pdf>.

MONITORING IN SITU BIODEGRADATION OF MTBE USING MULTIPLE ROUNDS OF COMPOUND-SPECIFIC STABLE CARBON ISOTOPE ANALYSIS

Lu, J., F. Muramoto, P. Philip, and T. Kuder.
Groundwater Monitoring & Remediation, Vol 36 No 1, 62-70, 2016

At a large industrial facility, MTBE released to the subsurface dispersed into existing LNAPL in the first aquifer, where the LNAPL served as a continuous source of MTBE in groundwater. Results from compound-specific isotope analysis conducted on MTBE and TBA in groundwater samples collected in 2008, 2011, and 2013 from wells located along and off the center line of the MTBE plume demonstrated the onset and progress of MTBE biodegradation between 2008 and 2013. The TBA observed in 2008 appears to be derived only in part from MTBE transformation while a significant portion of TBA might be contributed directly from LNAPL sources. In 2011 to 2013, the dominant source of TBA in the mid-gradient plume was MTBE transformation. Contribution from an offsite LNAPL source, particularly to the downgradient area of the plume, is possible but could not be unequivocally confirmed. The time series provided direct evidence for MTBE biodegradation and valuable insight on TBA source. *This paper is Open Access* at <http://onlinelibrary.wiley.com/doi/10.1111/qwmr.12142/pdf>.

USING TRACERS TO QUANTIFY DRILLING WATER INFLUENCE AND OBTAIN REPRESENTATIVE GROUNDWATER SAMPLES

McCaughy, M.C., C.E. Divine, M.J. Gefell, and S. McGrane.
Groundwater Monitoring & Remediation, Vol 36 No 1, 71-78, 2016

A practical field method uses applied tracers to determine how much purging is required to collect representative groundwater samples after the introduction of drilling water during borehole advancement. In general, the approach involves adding a tracer of known concentration to the drilling water and then measuring the tracer in the purge water until the tracer concentration declines to a defined target level. If necessary, the dilution effects of residual drilling water can be quantified, and the measured contaminant concentration can be corrected based on the measured tracer concentration. A project example demonstrates that this method is straightforward and reliable and that applied tracers can be used to quantify the influence of residual drilling water on formation water quality while also ensuring that purge times and volumes are not unnecessarily large. *This paper is Open Access* at <http://onlinelibrary.wiley.com/doi/10.1111/qwmr.12135/pdf>.

THIXOTROPIC GEL FOR VADOSE ZONE REMEDIATION

Riha, B.D. and B.B. Looney; Assigned to Savannah River Nuclear Solutions, LLC, Aiken, SC.
U.S. Patent 9,168,574, 27 Oct 2015

A thixotropic gel suitable for use in subsurface bioremediation is described along with a process for using the gel. The thixotropic gel serves as a non-migrating injectable substrate that can provide belowground barrier properties. In addition, the gel components provide for a favorable environment in which certain contaminants are preferentially sequestered in the gel and subsequently remediated by either indigenous or introduced microorganisms. <http://www.osti.gov/scitech/biblio/1224455-thixotropic-gel-vadose-zone-remediation>

NEGATIVE BIAS AND INCREASED VARIABILITY IN VOC CONCENTRATIONS USING THE HYDRASLEEVE IN MONITORING WELLS

McHugh, T.E., P.R. Kulkarni, L.M. Beckley, C.J. Newell, and M. Zumbro.
Groundwater Monitoring & Remediation, Vol 36 No 1, 79-87, 2016

The HydraSleeve is a sampling device for collecting groundwater from the screened interval of a monitoring well without purging. The device uses a check valve to take in water over the first 3-5 ft of an upward pulling motion. If the check valve does not perform as expected, then the HydraSleeve has the potential to collect water from an incorrect depth interval, possibly above the screened interval of the well. In a comparative evaluation of VOC results from groundwater samples collected with the HydraSleeve sampler versus other monitoring well sampling methods, lower VOC concentration results were observed at all three test sites for samples collected using the HydraSleeve. At two of the three sites, the low concentration sample results were associated most strongly with monitoring wells with >10 ft of water above the screened interval. In addition to lower VOC concentrations, the monitoring records obtained using the HydraSleeve were more variable compared to monitoring records obtained using purge sampling methods, a characteristic that would make it more difficult to determine the long-term concentration trend in the well. *This paper is Open Access* at <http://onlinelibrary.wiley.com/doi/10.1111/qwmr.12141/pdf>.

MICROBIOLOGICAL-ENHANCED MIXING ACROSS SCALES DURING IN-SITU BIOREDUCTION OF METALS AND RADIONUCLIDES AT

DEPARTMENT OF ENERGY SITES

Valocchi, A., C. Werth, W.-T. Liu, R. Sanford, and K. Nakshatrala.
DOE-Illinois-SC0006771, 14 pp, 2015

Metal bioreduction strategies require manipulation of the subsurface, usually through injection of electron donor, which mixes at varying scales with the contaminant to stimulate metal-reducing bacteria. Mixing limitations of substrates at all scales can affect biological growth and activity for U(VI) reduction. A growing body of literature suggests that reaction could be enhanced by cell-to-cell interaction occurring over length scales extending tens to thousands of microns. This project investigated two potential mechanisms of enhanced electron transfer: (1) the formation of single- or multiple-species biofilms that transport electrons via direct electrical connection such as conductive pili (i.e., nanowires) through biofilms to where the electron acceptor is available, and (2) through diffusion of electron carriers from syntrophic bacteria to dissimilatory metal-reducing bacteria. The specific objectives were to (i) quantify the extent and rate that electrons are transported between microorganisms in physical mixing zones between an electron donor and electron acceptor (e.g., U(IV)), (ii) quantify the extent that biomass growth and reaction are enhanced by interspecies electron transport, and (iii) integrate mixing across scales in an integrated numerical model to quantify these mechanisms on overall U(VI) reduction rates. The work included development of new computational frameworks for combining continuum and pore-scale models. <http://www.osti.gov/scitech/biblio/1223732>

SORPTION OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ON FILTER MEDIA: IMPLICATIONS FOR PHASE PARTITIONING STUDIES

Chandramouli, B., J.P. Benskin, M.C. Hamilton, and J.R. Cosgrove.
Environmental Toxicology and Chemistry, Vol 34 No 1, 30-36, 2015

Sorption of aqueous-phase PFASs on filtration media may lead to underestimation of PFAS concentrations in the aqueous phase. Researchers investigated the sorption of different PFASs on filtration media at 3 concentration levels, on 4 types of filter media, and in 4 matrices. Glass fiber filtration showed the least sorption, whereas polytetrafluoroethylene filters had the most sorption (up to 98%). Analyte concentration had no significant effect. Sorption was generally consistent across matrix types except for samples affected by aqueous film-forming foam deployment, which displayed high sorption of PFOS on nylon filters. Sorption usually increased with an increasing number of carbon or fluorine atoms and was most pronounced for perfluoroalkyl phosphonic acids (PFPIAs) and polyfluoroalkyl phosphate diesters (diPAPs) (30-75% sorption). Overall, glass fiber filters are recommended over nylon filters in environmental samples when phase separation is required. Matrix-specific testing is also recommended to account for unpredictable effects prior to selecting filtration media for PFAS removal. <http://adamcbowen.com/axyscorp/documents/2015/07/chandramouli-eta-al-etc-2015-pfc-filtration.pdf>

HEAT-ACTIVATED PERSULFATE OXIDATION OF PFOA, 6:2 FLUOROTELOMER SULFONATE, AND PFOS UNDER CONDITIONS SUITABLE FOR IN-SITU GROUNDWATER REMEDIATION

Park, S., L.S. Lee, V.F. Medina, A. Zull, and S. Waisner.
Chemosphere, 145, 376-383, 2016

PFOA oxidation (0.121-6.04 μM) by heat-activated persulfate was evaluated at 20-60°C with 4.2-84 mM peroxydisulfate ion ($\text{S}_2\text{O}_8^{2-}$) and in the presence of soluble fuel components to assess feasibility for in situ remediation of groundwater. 6:2 Fluorotelomer sulfonic acid/sulfonate (6:2 FTSA) and PFOS persulfate oxidation was also evaluated in a subset of conditions given their co-occurrence at many sites. PFOA pseudo-first-order transformation rates (k_1 , PFOA) increased with increasing temperature (half-lives from 0.1 to 7 d for 60-30°C) sequentially "unzipping" CF_2 groups to shorter-chain perfluoroalkyl carboxylic acids and F^- . At 50°C, a 5-fold increase in $\text{S}_2\text{O}_8^{2-}$ led to a 5-fold increase in k_1 , PFOA after which self-scavenging by sulfate radicals decreased the relative rate of increase with more $\text{S}_2\text{O}_8^{2-}$. BTEX did not affect k_1 , PFOA even at 40 times higher molar concentrations than PFOA. The effectiveness of heat-activated persulfate ion on PFOA oxidation was reduced in soil slurry; hence, repeated persulfate injections are required to achieve complete oxidation in the field. PFOS, however, remained unaltered even at higher activation temperatures, thus limiting the use of heat-activated persulfate alone for perfluoroalkyl substances removal in the field.

NZVI INJECTION INTO VARIABLY SATURATED SOILS: FIELD AND MODELING STUDY

Chowdhury, A.I.A., M.M. Krol, C.M. Kocur, H.K. Boparai, K.P. Weber, B.E. Sleep, and D.M. O'Carroll.
Journal of Contaminant Hydrology, Vol 183, 16-28, 2015

A field test was combined with numerical modeling to examine nanoscale zero-valent iron (NZVI) reactivity and transport properties in variably saturated soils. The field test consisted of 142 L of carboxymethyl cellulose (CMC)-stabilized monometallic NZVI synthesized on site and injected into a variably saturated zone. Sample analysis showed that CMC-stabilized monometallic NZVI was able to decrease TCE concentrations in groundwater by more than 99% from historical concentrations. A 3-D, 3-phase, finite-difference numerical simulator (CompSim) was used to further investigate NZVI and polymer transport at the variably saturated site. The model accurately predicted the field-observed head data without parameter fitting, estimated the mass of NZVI delivered to the saturated and unsaturated zones, and distinguished the NZVI phase (i.e., aqueous or attached). In simulations, the injected slurry migrated radially outward from the injection well, indicating NZVI transport was governed by injection velocity and viscosity of the injected solution. In different injection scenarios, simulations showed that injection of a higher NZVI volume delivered more Fe particles at a given distance, although travel distance was not proportional to increase in volume.

HORIZONTAL ARRANGEMENT OF ANODES OF MICROBIAL FUEL CELLS ENHANCES REMEDIATION OF PETROLEUM HYDROCARBON-CONTAMINATED SOIL

Zhang, Y., X. Wang, X. Li, L. Cheng, L. Wan, and Q. Zhou.
Environmental Science and Pollution Research, Vol 22 No 3, 2335-2341, 2015

In a study of in situ bioremediation of hydrocarbon-contaminated soil, anodes arranged two different ways (horizontal or vertical) were compared in microbial fuel cells (MFCs). Charge outputs as high as 833 and 762 coulombs were achieved in reactors with anodes horizontally arranged (HA) and vertically arranged (VA), respectively. The HA system removed up to 12.5% TPH in 135 days, which was 50.6% higher than in the VA system (8.3%) and 95.3% higher than in the disconnected control (6.4%). Hydrocarbon fingerprint analysis showed that the degradation rates of both alkanes and PAHs in HA were higher than those in VA, possibly owing to lower mass transport resistance in the HA. Soil pH increased from 8.26 to 9.12 in HA and from 8.26 to 8.64 in VA, while conductivity decreased from 1.99 to 1.54 mS/cm in HA and from 1.99 to 1.46 mS/cm in VA with TPH removal.

ARSENIC, ANTIMONY AND SELENIUM REMOVAL FROM MINE WATER BY ANAEROBIC BIOREACTORS AT LABORATORY SCALE

Janin, A., I. Ness, and S. Wilbur.
Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. 84 pp, 2015

During summer 2014, four bioreactors in columns (some containing wood chips) were built in the Yukon Research Centre lab and operated for five months to treat both synthetic influent and leachate collected at the Eagle Gold site. Phase 1: The bioreactors were operated with uncontrolled temperature until the bioreactors froze solid. Phase 2: The bioreactors were thawed at a stable temperature of 6°C. Phase 3: The bioreactors were operated and monitored at 6°C. Metal-metalloid concentrations declined significantly in all the bioreactors even when influent concentration was high. Although As reduction was efficient, it did not quite bring the concentrations below the discharge limit threshold of 0.15 $\mu\text{g/L}$. Introduction of drainage produced on site removed 38% As, 90% Se, and 95% Sb. Using highly contaminated drainage with an average of 5 mg/L As, 0.5 mg/L Se, and 0.03 mg/L Sb, removal efficiencies were recorded as >87%, >99%, and >85%, respectively. This project is one of very few studies reported in the literature that demonstrates antimony removal from water by an anaerobic bioreactor. Incorporation of 20% spruce chips in the bioreactor substrate improved As removal in the first phase of the study and helped mitigate the impact of freeze-thaw on As, Sb, and Se removal. The solid substrate possibly protected or favored biofilm growth as well as providing a surface onto which As could adsorb. http://yukoncollege.yk.ca/search/downloads/arsenic_antimony_and_selenium_removal_from_mine_water_report

EVIDENCE OF 1,4-DIOXANE ATTENUATION AT GROUNDWATER SITES CONTAMINATED WITH CHLORINATED SOLVENTS AND 1,4-DIOXANE

Adamson, D., R. Anderson, S. Mahendra, and C. Newell.
Environmental Science & Technology, Vol 49 No 11, 6510-6518, 2015

A comprehensive evaluation of California state (GeoTracker) and Air Force monitoring records provided significant evidence of 1,4-dioxane attenuation at field sites. Temporal changes in the site-wide maximum concentrations were used to estimate source attenuation rates at the GeoTracker sites (median length of monitoring period = 6.8 yr). Although attenuation could not be established at all sites, statistically significant positive attenuation rates were confirmed at 22 sites. At sites where dioxane and chlorinated solvents were present, the median value of all statistically significant dioxane source attenuation rates was lower than TCA but similar to 1,1-DCE and TCE. Dioxane attenuation rates were positively correlated with rates for 1,1-DCE and TCE but not TCA. This set of sites gave little evidence that chlorinated solvent remedial efforts (e.g., chemical oxidation, enhanced bioremediation) affected dioxane attenuation. Attenuation rates based on well-specific records from the Air Force data set confirmed significant dioxane attenuation (131 of 441 wells) at a similar frequency and extent (median equivalent half-life = 48 months) as observed at the California sites. Linear discriminant analysis established a positive correlation between dioxane attenuation and increasing concentrations of dissolved oxygen, while the same analysis found a negative correlation with metals and CVOC concentrations. The evidence of dioxane attenuation documented here suggests that natural attenuation might be used to manage some but not necessarily all dioxane-affected sites.

IMPLICATIONS OF MATRIX DIFFUSION ON 1,4-DIOXANE PERSISTENCE AT CONTAMINATED GROUNDWATER SITES

Adamson, D.T., P.C. de Blanc, S.K. Farhat, and C.J. Newell.
Science of the Total Environment, Vol 562, 98-107, 2016

In a study of the extent to which 1,4-dioxane's persistence was subject to diffusion of mass into and out of lower-permeability zones relative to co-released

chlorinated solvents, two release scenarios were evaluated within a 2-layer aquifer system using an analytical modeling approach. The first scenario simulated a dioxane and 1,1,1-TCA source zone where spent solvent was released. The period when dioxane was actively loading the low-permeability layer within the source zone was estimated to be presentation slides: http://www.contaminantssummit.com/images/presentations/3_DavidAdamson.pdf

COMPARISON OF PHYTOSCREENING AND DIRECT-PUSH-BASED SITE INVESTIGATION AT A RURAL MEGASITE CONTAMINATED WITH CHLORINATED ETHENES

Rein, A., O. Holm, S. Trapp, S. Popp-Hofmann, M. Bittens, C. Leven, and P. Dietrich.
Groundwater Monitoring & Remediation, Vol 35 No 4, 45-56, 2015

The relative effectiveness of rapid, reasonably priced screening techniques—direct push (DP)-based groundwater sampling and tree-core sampling—was compared at a rural megasite contaminated with chlorinated hydrocarbons. Unexpected pollution hot spots were identified using both of these methods. Tree coring even enabled delineation of the contaminant plume flowing into an adjacent wetland, which was inaccessible to DP units. Both methods agreed well in revealing the spatial pattern of contamination. The correlation between groundwater concentrations and equivalent concentrations in wood was linear and highly significant for TCE, whereas correlation was less obvious for its metabolite cis-DCE, but still significant. Tree coring is recommended for initial screening in combination with DP sampling to retrieve quantitative data on groundwater pollutants for early assessment of contamination, with subsequent placement of monitoring wells for long-term monitoring.

TREE CORING AS A COMPLEMENT TO SOIL GAS SCREENING TO LOCATE PCE AND TCE SOURCE ZONES AND HOT SPOTS

Algreen, M., S. Trapp, P.R. Jensen, and M.M. Broholm.
Groundwater Monitoring & Remediation, Vol 35 No 4, 57-66, 2015

Tree coring and soil gas sampling were applied and compared at two forested sites contaminated with PCE or TCE to evaluate their ability to locate source zones and contaminant hot spots. One test site represented a relatively homogeneous sandy soil and aquifer, and the other a more heterogeneous geology with both sandy and less permeable clay till layers overlying a chalk aquifer. Both methods were found useful as screening tools to locate hot spots of PCE and TCE in the shallow subsurface. Tree coring was found to be particularly beneficial as a complement to soil gas sampling at sites with low permeable soils and where contamination was located in the capillary rise or shallow groundwater. The shorter time required for tree coring reduced its costs compared to those of soil gas sampling but with lower sensitivity and precision. Combining the two methods can help to focus subsequent investigations.

General News

SCREENING OF THE BACTERIAL REDUCTIVE DECHLORINATION POTENTIAL OF CHLORINATED ETHENES IN CONTAMINATED AQUIFERS: A TECHNICAL ASSISTANCE MANUAL FOR ASSESSMENT OF NATURAL ATTENUATION OF CHLOROETHENES-CONTAMINATED SITES

Tarnawski, S.-E., P. Rossi, and C. Holliger.
Swiss Federal Office for Environment, 86 pp, 2016

The approach proposed in this guide to evaluate dechlorination processes in the saturated zone of contaminated sites examines aquifers as a coherent and dynamic assembly comprising a biotic and an abiotic part. The original contribution of this methodology is the use of statistics derived from numerical ecology tools for analysis of the physicochemistry and bacteriological status of a contaminated aquifer. This guide details the proposed approach.
http://infoscience.epfl.ch/record/213613/files/Manual_BioremediationPotentialAssessment_ChlorinatedEthenes_Final_March2016.pdf

MAKING STRIDES IN THE MANAGEMENT OF "EMERGING CONTAMINANTS"

Suthersan, S., J. Quinnan, J. Horst, I. Ross, E. Kalve, C. Bell, and T. Pancras.
Groundwater Monitoring & Remediation, Vol 36 No 1, 15-25, 2016

1,4-Dioxane and per- and polyfluoroalkyl substances (PFASs) are truly emerging in the United States as EPA works to establish a consensus on toxicology and states begin to prepare to adopt cleanup standards. The better known PFAS compound, PFOS, has been identified internationally as a persistent organic pollutant (POP) and its production is severely restricted by the Stockholm Convention. PFOA (also known as C8) is currently under consideration to be classed as a POP. Analytical methods, toxicology, and treatment technologies are evolving in parallel for both, but stakeholders face much uncertainty as they prepare to manage their liabilities. The paper summarizes current remediation options for dioxane and PFASs in a table. Commercial technologies for PFASs include RemBind™ and MatCARE™ (both available) and ScisoR® (still at lab scale). <http://onlinelibrary.wiley.com/doi/10.1111/gwrmr.12143/pdf>

AN ANALYSIS OF UST SYSTEM INFRASTRUCTURE IN SELECT STATES

Association of State and Territorial Solid Waste Management Official (ASTSWMO) Aging Tanks Workgroup, Tanks Subcommittee, 40 pp, 2015

To analyze whether aging UST infrastructure poses a higher risk of leaks, thus creating higher risks for state tank funds and private insurers and ultimately higher costs for tank owners/operators, the Tanks Subcommittee reviewed UST system data from eight participating states, information on potential fuel leak risk factors, state policies and initiatives for mitigating aging tank risks, and state fund and financial insurance considerations. This report also highlights examples of equipment problems observed on UST systems previously storing motor fuels after changing to storing biofuel blends or ultra-low-sulfur diesel, although the root cause of each problem was not documented.
<http://www.astswmo.org/files/policies/Tanks/2015-10-ASTSWMOAgingTanks%20Report-Final.pdf>

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

Mention of non-EPA documents, presentations, or papers does not constitute a U.S. EPA endorsement of their contents, only an acknowledgment that they exist and may be relevant to the Technology Innovation News Survey audience.