Technology Innovation News Survey

Entries for September 16-30, 2022

Market/Commercialization Information

NORTHEASTERN REGIONAL HW INCINERATION CONTRACT (SOL)
Defense Logistics Agency (DLA) Disposition Service - EBS, Battle Creek, MI
Contract Opportunities on SAM.gov, Solicitation SP450023R0002, 2022

This is a full and open competition under NAICS code 562211. The Defense Logistics Agency (DLA) Disposition Service (DS) requires a contractor to remove incinerable or thermal-treated waste when DS has no other options available to remove the waste to ensure our generators do not need to request extensions to their storage limit. Work will consist of the removal, transportation, incineration or other thermal treatment, and final disposal of containerized RCRA hazardous wastes (HW), non-RCRA wastes, PCB wastes, state-and non-state regulated wastes generated by U.S. Department of Defense (DoD) and U.S. Coast Guard installations located in the 19 contiguous states of Connecticut, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Maine, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, Vermont, Wisconsin, West Virginia, and Washington, DC. The award will be a firm-fixed price indefinite delivery/indefinite quantity (IDIQ) contract with a period of performance of one 18-month Base Period and one 18-month Option Period. Offers are due by 3:00 PM EST on November 28, 2022.
https://sam.gov/opp/6a0380a410b746f29b3e9cef26748692/view

HAZARDOUS WASTE DISPOSAL AND REMOVAL SERVICES AT ABERDEEN PROVING GROUND (APG), MARYLAND (SRCSGT)
U.S. Department of the Army, U.S. Army Contracting Command, Aberdeen Proving Ground, MD
Contract Opportunities on SAM.gov, Solicitation W56ZTN-22-R-0006, 2022

This is a sources sought notice for marketing purposes only under NAICS code 562211. The U.S. Department of the Army, U.S. Army Contracting Command, seeks to identify parties interested in and having the resources capable of supporting the requirement for Hazardous Waste Disposal and Removal Services at Aberdeen Proving Ground (APG), Maryland (MD). The objective of this anticipated contract is to obtain quality services for 1) the packaging, removal, and disposal of hazardous and certain non-hazardous waste; 2) emergency and non-emergency response and remediation services; and 3) transportation of waste from various locations to APG's permitted hazardous waste storage facility, temporary storage building (5110 in Aberdeen area), and/or off-site Treatment Storage Disposal Facilities (TSDFs). Specific performance standards and metrics include: the removal of all waste from APG in twenty-five calendar days (except bulk waste which must be removed in three working days), error-free shipping documents, adequate contractor staffing and training to perform the job per the PWS, and timely submission of invoices and other required documentation. Based on the responses to this sources sought synopsis/market research, this requirement may be set aside for small businesses (in full or in part) or procured through full and open competition. The vehicle for this anticipated contract is a single award indefinite delivery indefinite quality (IDIQ) contract with one base year and four one-year options. There is no solicitation at this time. Capability statements are due by 3:00 PM EDT on October 21, 2022.
https://sam.gov/opp/644861a046a446ab9ff01b4efc5c0db4/view

FY23 GUIDELINES FOR BROWNFIELDS PROGRAM GRANTS
U.S. Environmental Protection Agency, 2022

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofits to prevent, inventory, assess, clean up, and reuse brownfield sites. For the following types of grants, the closing date for applications is November 22, 2022. All anticipated awards are subject to the quality of applications received, availability of funds, and other applicable considerations.

1. **EPA-OLEM-OBLR-22-10: FY23 Guidelines for Brownfield Multipurpose (MP) Grants.** EPA anticipates awarding an estimated 17 awards for an estimated $800,000 per grant. https://www.grants.gov/web/grants/view-opportunity.html?oppId=343485
2. **EPA-I-OLEM-OBLR-22-09: FY23 FY23 Guidelines for Brownfields Cleanup Grants.** EPA anticipates awarding an estimated 73 Cleanup Grants for an estimated total of $60 million. https://www.grants.gov/web/grants/view-opportunity.html?oppId=343487
3. **EPA-OLEM-OBLR-22-07: FY23 Guidelines for Brownfield Assessment Grants (Assessment Coalition Grants).** EPA anticipates awarding an estimated 20 Assessment Coalition Grants for an estimated total of $20 million. https://www.grants.gov/web/grants/view-opportunity.html?oppId=343466
4. **EPA-I-OLEM-OBLR-22-06: FY 23 Guidelines for Brownfield Assessment Grants (Community-Wide Assessment Grants for States and Tribes).** EPA anticipates awarding an estimated 17 Community-wide Assessment Grants for States and Tribes for an estimated total of $35 million. https://www.grants.gov/web/grants/view-opportunity.html?oppId=343486
5. **EPA-I-OLEM-OBLR-22-08: EPA-I-OLEM-OBLR-22-08: FY23 Guidelines for Brownfields Revolving Loan Fund Grants.** EPA anticipates awarding an estimated 10 RLF Grants for an estimated total of $10 million. https://www.grants.gov/web/grants/view-opportunity.html?oppId=343467

Cleanup News

AFFF SYSTEM RETROFITS AND ON-SITE TREATMENT OF PFAS-CONTAINING LIQUIDS
Hoye, B. and P. Newman | Great Lakes Virtual PFAS Summit, 6-10 December, virtual, 40 minutes, 2021

Case studies are presented from fire suppression system retrofits that involved treating PFAS-containing waste streams onsite. The first case study involved remediating PFAS following an aqueous film-forming foam at an airport in the northwestern U.S. A 20-gpm containerized system met the primary project objective of producing treated water with combined PFOS+PFOA concentrations below the 70 ng/l Health Advisory Level (HAL). The SORBIX system includes a proprietary pretreatment system to remove incoming particulates, a cartridge filter, granular activated carbon filters, and the SORBIX resin for further pretreatment and conditioning. PFAS removal is accomplished using the SORBIX Ion Exchange (IX) resin in a lead-lag vessel orientation. The entire system sits inside a 40′ container and can be easily relocated as needed. The system treated >165,000 gals with a total influent PFAS concentration of 19 mg/L. The effluent quality was consistently non-detect for six monitored PFAS compounds, readily achieving compliance with the 70 ng/l HAL target. The second case study involved remediating PFAS-contaminated rinsate and foam using a 40-gpm mobile system at Eielson Air Force Base (AFB) in Alaska. The T Series IDW Treatment System is designed as a transportable system containing the SORBIX™ ion exchange resins. The water was successfully treated to below Alaska's Pollutant Discharge Elimination requirements. The system is still in use to address PFAS issues across the base from other contaminated sources, including investigation-derived waste.
https://us06web.zoom.us/rec/play/x_kMC_ehSg4zDbCFVtPZr4i8r9tUmF1H9a0Qliq953K3l0YSe4pM1rGNV2DyQN2OJokLzo_a_v_n0IgO.Swxe4FwoYGBWA5-L?continueMode=true&_x_zm_rtaid=6QGWBbjNQs6lXhotZdeyrQ.1667239310269.d17643a06

NATURAL ATTENUATION PROCESSES CONTROL GROUNDWATER CONTAMINATION IN THE CHERNOBYL EXCLUSION ZONE: EVIDENCE FROM 35 YEARS OF RADIOLOGICAL MONITORING
Bugai, D., S. Kireev, M.A. Hoque, Y. Kubko, and J. Smith.
Scientific Reports 12 18215(2022)

Groundwater measurements covering key aquifers collected from the Chernobyl Exclusion Zone (CEZ) are presented and analyzed over 35 years since the accident. The CEZ contains most radionuclides released by the accident in nuclear fuel particle form. The data shows that ^{90}Sr remains mobile in the subsurface environment, while groundwater concentrations of ^{137}Cs, Pu isotopes, and ^{241}Am are relatively low, and are not a radiological concern. During the last two decades, ^{90}Sr and ^{137}Cs levels have declined or remained stable in most monitoring locations. This is due to natural attenuation driven by gradual exhaustion of the fuel particle source, geochemical evolution of groundwater downstream from waste dumps, and radionuclide retention in surface soil due to absorption and bio-cycling. Decommissioning of the cooling pond and construction of the 'New safe confinement' over Unit 4 (damaged reactor) also favored better groundwater protection close to the Chernobyl plant site. Data from confined and unconfined aquifers and rivers showed low radiological risks from groundwater contamination outside the CEZ and to on-site "self-settlers." Though several groundwater contamination hot spots remain in the vicinity of Unit 4, "Red Forest" waste trenches and surface water bodies with contaminated bottom sediments, the findings support a monitored natural attenuation approach to groundwater management in the CEZ.
https://www.nature.com/articles/s41598-022-22842-5.pdf

EVALUATION OF 1,4-DIOXANE ATTENUATION PROCESSES AT THE GELMAN SITE, MICHIGAN, USA
Jackson, L.E., W.M. Robertson, M. Rohrssen, A. Chappaz, and L.D. Lemke.
Science of The Total Environment 823:153634(2022)

A release of 1,4-dioxane produced a series of contaminant plumes that migrated up to 3 km through a heterogenous glacial aquifer system at the Gelman site in Washtenaw County, Michigan. An analysis of 1,4-dioxane concentrations in the Eastern Area of the site between 2011 and 2017 documented a mass balance deficit of 2,200 kg of 1-4 dioxane; >2,100 kg was remediated. Five mechanisms were evaluated to account for the mass deficiency: sorption, matrix diffusion, biodegradation, surface discharge, and bypass of the existing monitoring well network. An estimate of the mass of 1,4-dioxane sorbed to aquifer and aquitard materials and the mass of 1,4-dioxane diffused into low permeability zones was calculated. Decreasing aqueous concentrations across most contaminated areas between 2011 and 2017 are expected to induce desorption and back diffusion. Surface water discharge to a storm drain in the downgradient portion of the site was analyzed using concentration measurements and stream gage data. Results suggest that the 1,4-dioxane mass entering the drain was insufficient to account for the mass deficiency. Although available geochemical measurements indicate predominantly anaerobic aquifer conditions at the site, biodegradation of 1,4-dioxane was estimated using first-order decay rate constants from other sites where conditions may be more favorable. Biodegradation could explain some but not all of the missing mass. Bypass of the downgradient monitoring well network is the best explanation for the 1,4-dioxane mass deficit. This conclusion is supported by documented flow path complexity through the aquifer system and the sparse density of monitoring wells in the downgradient Eastern Area. These findings underscore the importance of characterizing aquifer heterogeneity when modeling and remediating persistent groundwater contaminants such as 1,4-dioxane.

Demonstrations / Feasibility Studies

GROUNDWATER SAMPLING FOR 1,4-DIOXANE, PFAS, AND METALS USING THE DUALMEMBRANE PASSIVE DIFFUSION BAG SAMPLER
Andrew, A. and B. Varhol. | 29th Annual David S. Snipes/Clemson Hydrogeology Symposium, 21 October, Clemson, SC, 17 minutes, 2021

EPA Region 6, USGS, and private consultants worked to develop and test a Dual-Membrane Passive Diffusion Bag (DMPDB) sampler. The DMPDB sampler utilizes two semi-permeable membranes aligned in series around a perforated tube to form a single tubular sample chamber. The sampler is submerged within the saturated zone of a monitoring well screen until it reaches chemical equilibrium and applies the same principle as standard passive diffusion samplers widely used for VOCs. The construction of the DMPDB significantly extends the range of compounds that can be sampled using passive diffusion. Results of bench and field-scale testing indicate that the DMPDB sampler would provide a more efficient, lower-cost method for groundwater sampling with analytical result accuracy equal to or exceeding other sampling methods such as bailing, low-flow, and grab sampling. https://clemson.app.box.com/s/dmck2528clod6q7gevrxfiyg0qq5b6v1/file/906261467913

INJECTION COMPLETION REPORT FORMER ATLAS "D" MISSILE SITE 4 F.E. WARREN AIR FORCE BASE, WYOMING
URS for the United States Army Corps of Engineers, 646 pp, 2021

The F.E. Warren Air Force Base Former Atlas "D" Missile Site 4 (Site 4) housed three Atlas "D" missiles in three Launch and Service Buildings (LSBs). The source area is the one-square-mile area around the former missile site (Area A). Other areas downgradient of Area A also contain contamination., including the Transition Area, where the plume transitions from the White River Formation to the Ogallala Formation; Area B, including the Borie Well Field; and the Expanded Study Area. A pilot study with two in situ remediation technologies was conducted at Area A. In situ treatments via injection of potassium permanganate ($KMnO_4$) and zero-valent iron (ZVI) were selected to test remediation of source area contamination at LSB#1 and LSB#2, respectively. ZVI was injected at LSB#2 in two different areas using pneumatic and hydraulic injection methods to evaluate the effectiveness of each. Pneumatic injection had the most success and was subsequently used to inject $KMnO_4$ at LSB#1. Data collected during the pilot study will be used during the feasibility study screening of technologies and to evaluate the full-scale application of injections to remediate TCE contamination. The Injection Completion Report documents the activities and procedures completed, including pneumatic injection of ZVI, hydraulic injection of ZVI, and pneumatic injection of $KMnO_4$.
https://www.mediafire.com/file/o562ysuf1n8d0b8/FEW4_Final_Injection+Completion+Report.pdf/file All site documents: https://www.atlassite4.com/site-reports/usace-final-reports/

MULTIPLE LINES OF EVIDENCE FOR ESTIMATING NSZD RATES OVERLYING A SHALLOW LNAPL SOURCE ZONE
Wozney, A., I. Hers, K. Stevenson, C. Campbell, N. Nickerson, and C. Gosse.
Groundwater Monitoring & Remediation 42(3):86-104(2022)

An applied research and development program was conducted at a former refinery site over 4 years to study quantitative technologies for evaluating natural source zone depletion (NSZD) of petroleum hydrocarbon LNAPL present within a shallow soil zone. Discrete CO_2 efflux measurements from dynamic closed chambers were compared with estimates obtained using static traps and continuous monitoring using forced diffusion technology. Thermistor strings along a transect were used to monitor hourly thermal gradients and assess NSZD rates using the temperature gradient method. Discrete soil-gas data were used to quantify the vertical oxygen gradient to estimate NSZD rates using the concentration gradient method (CGM). Results of discrete and continuous monitoring methods provided monthly NSZD rate estimates that ranged seasonally from 80-1300 gal/acre/year using radiocarbon corrected CO2 efflux method for decane ($C_{10}H_{22}$) equivalent, 120 to 1600 gal/acre/year using CGM (for wet to dry conditions) and 400-2000 gal/acre/year using the temperature gradient method. Both seasonal temperature and precipitation fluctuations contributed to variability in rates.

PILOT STUDY COMPARISON OF REGENERABLE AND EMERGING SINGLE-USE ANION EXCHANGE RESINS FOR TREATMENT OF GROUNDWATER CONTAMINATED BY PER- AND POLYFLUOROALKYL SUBSTANCES (PFASS)
Ellis, A.C., C.J. Liu, Y. Fang, T.H. Boyer, C.E. Schaefer, C.P.Higgins, and T.J. Strathmann.
Water Research 223:119019(2022)

An 8-month pilot study was conducted to compare regenerable and emerging single-use anion exchange resins (AERs) to treat PFAS at an aqueous film-forming foam (AFFF)-impacted source zone. Two regenerable (Purolite A860 and A520E) and three single-use (Purolite PFA694E, Calgon CalRes 2301, and Dowex PSR2+) AERs were tested in parallel. Single-use AERs significantly outperformed regenerable resins, particularly for treatment of long-chain PFCAs and PFSAs. No detectable concentrations of ≥C7 PFCAs or PFSAs were observed within 150,000 bed volumes (BVs) after treatment with the single-use resins (2-min empty bed contact time [EBCT]). Analysis of effluent samples following 30-sec EBCT treatment showed that even the shortest-chain PFSAs do not reach 50% breakthrough within the first 350,000 BVs, though differences in short-chain PFCA removal were less dramatic. The regenerable polyacrylic A860 resin performed very poorly compared to all polystyrene resins, with >90% breakthrough of all PFASs occurring within 10,000 BVs. The greater affinity of polystyrene resins is attributed to increased hydrophobic interactions and electrostatic ion exchange. Analysis of breakthrough profiles reveals empirical correlation with ion exchange affinity coefficients ($logK_{ex}$) measured in batch experiments. Postmortem analysis of PFASs extracted from spent resins revealed chromatographic elution behavior and competition among PFASs for adsorption to the resins. PFSAs and long-chain PFCAs were preferentially adsorbed to earlier sections in the AER columns. Short-chain PFCAs were competitively displaced towards the later sections of the columns and into the effluent, consistent with effluent concentrations of the latter structures exceeding influent values. Results provide insights into the mechanisms that govern PFAS adsorption to AERs in real multisolute groundwater matrices and support findings from other diverse sites regarding PFAS affinity, elution behavior, and competition for exchange sites.

Research

OCCURRENCE OF PER- AND POLYFLUOROALKYL SUBSTANCES AND INORGANIC ANALYTES IN GROUNDWATER AND SURFACE WATER USED AS SOURCES FOR PUBLIC WATER SUPPLY IN WEST VIRGINIA
McAdoo, M.A., G.T. Connock, and T. Messinger. U.S. Geological Survey Scientific Investigations Report 2022-5067, 52 pp, 2022

In 2019, the West Virginia Legislature passed a resolution to understand the occurrence and distribution of PFAS contamination throughout the State's rivers, lakes, and groundwater aquifers. Raw-water samples were collected at 279 public-water systems including all community water systems, daycares, and schools that operate their own water systems. Raw source water was sampled for both groundwater and surface-water sites at the first available tap in the public-water system before any treatment. Parameters collected during sampling included pH, specific conductance, water temperature, dissolved oxygen, turbidity, and alkalinity. PFAS was analyzed at all 279 sites, major ions and trace elements were analyzed at 272 sites, and nutrients were analyzed at 270 sites. At least 1 PFAS was detected at 24% of the sites, 47 of which were in groundwater and 20 in surface-water sources. Five sites located in highly susceptible karst and alluvial groundwater aquifers exceeded EPA's health advisory for combined PFOS and PFOA concentrations of 70 ng/L. Higher PFAS concentrations were more commonly found in groundwater than in surface-water sources. High concentrations and PFAS detections were generally concentrated in the Ohio River Valley and West Virginia's eastern panhandle. PFAS was rarely detected in groundwater sites in fractured rock aquifers. Abandoned underground coal-mine aquifers in the Appalachian Plateaus Physiographic Province had very little PFAS detected. Additional studies may be needed to understand exposure to private homeowners with domestic-water sources, variability of PFAS concentrations over time, and PFAS in finished drinking water as evaluated by current and future drinking water regulations. https://pubs.usgs.gov/sir/2022/5067/sir20225067.pdf

TREATMENT OF PFAS RESIDUALS USING A MEMBRANE DISTILLATION CRYSTALLIZER
Huggett, E., M. Nadagouda, C. Patterson, T. Lee, T. Speth, and H. Salih.
ACS Fall Meeting,12-26 August, Chicago, IL, 20 slides, 2022.

Anion exchange resins (AXR) regeneration waste brines were treated using membrane distillation (MD), which removes water from the waste brine to further concentrate salts beyond their saturation limit. This process separates salts as crystals and produces highly-concentrated PFAS solutions at smaller volumes that can then be treated by incineration or other end-of-life destruction techniques. A model short-chain PFAS compound, PFPeA, at a concentration of 10 mg/L in the presence and absence of ion exchange resin regeneration brine (100 g/L NaCl) was tested using four commercially available membranes (unlaminated polytetrafluoroethylene [PTFE], polypropylene laminated PTFE, polyether ether ketone [PEEK], and polyvinylidene difluoride [PVDF] hydrophobic membranes). For each test, a new membrane with an area of 140 m2 was used with a constant permeate temperature of 20°C (cold) and varying feed temperatures of 50 and 60°C (hot). The conductivities of the feed and permeate, the PFAS, salts concentrations, and water flux were measured. The interaction of PFPeA with the different membranes, such as membrane fouling due to PFPeA adsorption, was also investigated. The unlaminated and laminated (with polyether) PTFE membranes performed best in treating the PFPeA-contaminated brine. At the same experimental conditions, the water flux through the unlaminated PTFE membrane was 50% higher than the flux through the PEEK membrane and 25% higher than the PVDF and laminated PTFE membranes. The laminated and unlaminated PTFE membranes achieved the highest rejection of NaCl and PFPeA (>99.7%) compared to 95% and 97% obtained by the PEEK and the PVDF membranes. The laminated PTFE membrane showed higher stability and mechanical strength than the other membranes. In contrast, the PEEK and PVDF membranes were proven to be very fragile.

https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=355551&Lab=CESER&simplesearch=0&showcriteria=2&sortby=pubDate&timstype=&datebeginpublishedpresented=06/15/2019&searchall=remediation

VARIATION IN NATURAL ATTENUATION RATES OF POLYCHLORINATED BIPHENYLS (PCBS) IN FISH FROM STREAMS AND RESERVOIRS IN EAST TENNESSEE OBSERVED OVER A 35-YEAR PERIOD
Matson, P.G., L.M. Stevenson, R.A. Efroymson, R.T. Jett, M.W. Jones, M.J. Peterson, and T.J. Mathews. I Journal of Hazardous Materials 438:129427(2022)

This study presents long-term trends in PCB bioaccumulation in fish found in lower-order tributaries on the Oak Ridge Reservation, an impacted U.S. DoE property in East Tennessee, and an adjacent large reservoir system composed of portions of the Clinch and Tennessee rivers. The reservoir system has experienced no direct PCB mitigation activities and the study served as an opportunity to explore potential natural attenuation of PCBs within a large lotic ecosystem. Attenuation rates ranged from 0% to 8%/yr in minnows and sunfish at stream sites and 5.4-11.3%/yr in catfish at reservoir sites. These rates are comparable to findings from similar studies in other regions, suggesting consistency in responses since PCB production was banned in 1979. Results suggest that PCB sources from discharge outfalls are important locally but are not primarily responsible for sustaining PCB contamination in downstream reservoirs.

PROCESS TO SEPARATE PER- AND POLYFLUOROALKYL SUBSTANCES FROM WATER USING COLLOIDAL GAS APHRONS
Kulkarni, P.R., D. Aranzales, H. Javed, T.M. Holsen, N.W. Johnson, S.D. Richardson, S.M, Thagard, and C.J. Newell. I Remediation 32(3):167-176(2022)

A new method to concentrate PFAS relies on colloidal gas aphrons (CGAs), unusual microstructures composed of water, multilayers of surfactants, and air, that can be used for separation via electrostatic and hydrophobic sorption. CGAs successfully removed ionic dyes (as PFAS surrogates) (81%-91%), as well as ultra-short and short-chain PFAS (60%-90%) and PFOA (88%) within 10 min. However, poor PFOS removal (0%) was observed within 10 min of treatment. Compared to bubbling with nitrogen alone and nitrogen with cetrimonium bromide (CTAB) in bulk solution, CGAs demonstrate significantly higher removal of perfluorobutanoic acid, a short-chain PFAS (0% for N_2, 11% for N_2 + CTAB, and 90% for CGAs). Results suggest that CGAs may serve as a promising new separation and concentration technology to remove a suite of PFAS from water, particularly for difficult-to-remove short-chain compounds.

IN SITU EQUILIBRIUM POLYETHYLENE PASSIVE SAMPLING OF SOIL GAS VOC CONCENTRATIONS: MODELING, PARAMETER DETERMINATIONS, AND LABORATORY TESTING
Gschwend, P., J. MacFarlane, D. Jensen, J. Soo, G. Saparbaiuly, R. Borrelli, F. Vago, A. Oldani, L. Zaninetta, I. Verginelli, and R. Baciocchi.
Environmental Science & Technology 56(12):7810-7819(2022)

A study evaluated using low-density polyethylene (PE) sheets as equilibrium passive soil gas samplers to quantify VOCs such as BTEX and chlorinated solvents (e.g., TCE and PCE) in unsaturated subsurface environments through modeling and benchtop testing. Two methods were devised to quantify VOCs in PE. Key chemical properties, including PE-water (K_{PEW}) and PE-air (K_{PEa}) partition coefficients and diffusivities in the PE (D_{pe}), were determined. K_{PEW}, K_{PEa}, and D_{pe} values were consistent with extrapolations of data based on larger compounds. The parameter values were used to estimate field equilibration times of < 1 day for such VOCs when using 70-100 µm thick PE sheets. Benchtop batch tests showed concentrations in soil air deduced from PE were consistent with concentrations deduced by analyzing either water or headspace gases recovered from the same tests. Thus, PE-based measurements may overcome inaccuracies from using total soil concentrations and equilibrium partitioning models that may overestimate vapor phase concentrations up to 2 orders of magnitude.

OPERATIONAL PARAMETERS OPTIMIZATION FOR REMEDIATION OF CRUDE OIL-POLLUTED WATER IN FLOATING TREATMENT WETLANDS USING RESPONSE SURFACE METHODOLOGY
Rehman, K., M. Arslan, J.A. Müller, M. Saeed, S. Anwar, E. Islam, A. Imran, I. Amin, T. Mustafa, S. Iqbal, and M. Afzal. I Scientific Reports 12:4566 (2022)

In this study, the response surface methodology (RSM) was used to optimize a floating treatment wetland's (FTWs) operational parameter to remediate crude oil-contaminated water. The central composite design of RSM was applied to generate the experimental layout for testing the effect of the variables hydrocarbon, nutrient, and surfactant concentrations, aeration, and retention time on hydrocarbon removal in 50 different FTW test systems planted with the common reed, *Phragmites australis*. Results were used to formulate a mathematical model in which the computational data strongly correlated with the experimental results. The operational parameters were further optimized via modeling prediction plus experimental validation in test FTW systems. In the FTW with optimized parameters, there was a 95% attenuation of the hydrocarbon concentration, close to the 98% attenuation predicted by the model. The approach showed that RSM is a useful strategy to design FTW experiments and optimize operational parameters. https://www.nature.com/articles/s41598-022-08517-1.pdf

General News

ADAPTIVE SITE MANAGEMENT STRATEGIES FOR THE HANFORD CENTRAL PLATEAU GROUNDWATER
Demirkanli, I. and V. Freedman. Pacific Northwest National Laboratory, Report PNNL-32055, 49 pp, 2021

Adaptive site management (ASM) may expedite cleanup for the Hanford Central Plateau area through a planned and systematic approach to reduce uncertainty with targeted characterization activities while continuing remediation activities that advance cleanup for key risk-driving contaminants. The 200 West Pump-and-Treat (P&T) system is a core component of cleanup. Even with an active P&T remedy, uncertainty exists regarding plume distributions, total mass in the aquifer, and currently known continuing sources. Additional uncertainty is associated with multiple contaminant source locations in the vadose zone that can potentially create new groundwater plumes without source control measures. These uncertainties must be addressed in the conceptual site model (CSM) to support effective and efficient site progress toward cleanup goal(s). Other nontechnical factors that may warrant an ASM approach are associated with the formation of operable units (OUs) used to manage the cleanup. Three remaining groundwater OUs only have interim action records of decision. Nine vadose zone source area OUs are also in the early stages of the remedial investigation and feasibility study process, with pending characterization and technology identification activities. A set of proposed site objectives including the selection of interim objectives and a long-term adaptive management plan, are provided as an initial consideration/example and basis to discuss ASM implementation. The document also identifies initial technical considerations to develop an ASM framework for cleanup decisions. These considerations are intended to facilitate more specific decisions, such as objectives, near- and long-term actions, and performance metrics, to develop an overall approach that maintains protectiveness but recognizes the uncertainty, long timeframe, and technical challenges that need to be considered in selecting, implementing, and managing remediation. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-32055.pdf

NATURAL SOURCE ZONE DEPLETION (NSZD): FROM PROCESS UNDERSTANDING TO EFFECTIVE IMPLEMENTATION AT LNAPL-IMPACTED SITES
Smith, J.W.N., G.B. Davis, G.E. DeVaull, S. Garg, C.J. Newell, and M.O. Rivett.
Quarterly Journal of Engineering Geology and Hydrogeology 55(4): qjegh2021-166(2022)

This paper summarizes the proceedings of a Special Session on natural source zone depletion (NSZD) research at the June 2021 virtual AquaConSoil conference. Investigations have focused on a range of hydrocarbon products, such as gasoline, diesel, jet fuel, and crude oil. Key NSZD processes include aerobic biodegradation, fermentation and methanogenesis of LNAPL constituents, dissolution of LNAPL constituents into groundwater and volatilization of LNAPL constituents into the unsaturated zone. Methanogenesis of organic materials has long been recognized in municipal landfills and natural anoxic environments, such as peat and wetlands. Recognition of similar processes in light non-aqueous phase liquid (LNAPL) source zones in the past decade and high rates of aerobic biodegradation observed in unsaturated zones above LNAPL-impacted areas has significantly revised the conceptual model of LNAPL source zone behavior and persistence. Several NSZD monitoring approaches have been developed and are being applied in field studies. While the quantitative NSZD rates derived can vary between techniques, they all demonstrate that NSZD LNAPL removal can exceed that delivered by engineered LNAPL recovery techniques, particularly for mature LNAPL bodies. https://www.lyellcollection.org/doi/pdf/10.1144/qjegh2021-166

THERMOREACT® - AN INNOVATIVE REMEDIATION PRODUCT FOR IN-SITU NEUTRALIZATION OF HALOGENS, SULPHUR, PHOSPHORUS AND MERCURY DURING THERMAL DESORPTION
Depasse, Y., A. Jorden, H. Saadaoui, and J. Haemers.
Proceedings of the 8th World Congress on New Technologies (NewTech'22), 3-5 August, Prague, Czech Republic, 2022

Thermoreact is an innovative product that can replace conventional gravel around vapor tubes during thermal remediation. The product allows for in-situ neutralization of the vapors before exiting the soil pack, reducing the treatment requirements and saving substantial treatment costs overall. Its composition is a function of the pollutants present in the soil to obtain the best neutralization reaction while keeping permeability at the required level for proper vapor extraction. The neutralization products are inert minerals that can remain in the soil, making in situ thermal desorption a truly zero-waste treatment for additional contaminants than is currently the case. Results of various tests and cases where in situ thermal desorption was adapted to use Thermoreact instead of conventional gravel are presented. https://avestia.com/NewTech2022_Proceedings/files/paper/ICFPR/ICFPR_099.pdf

SITE ASSESSMENT II: HIGH RESOLUTION SITE CHARACTERIZATION
Johnson, W., M. Junker, and C. White.
2022 NEIWPCC National Tanks Conference, Site Assessment II: High Resolution Site Characterization Session, 13 September, 68 minutes, 2022

This session of the National Tanks Conference provides case studies highlighting site characterization methods to refine conceptual site models. The case studies feature technologies and techniques to apply scale-appropriate investigations, measurements, and sample density to define contaminant context and distribution with greater certainty to provide and support more effective site cleanup and lessons learned. https://www.youtube.com/watch?v=yr3w49BHYds

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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