# Technology Innovation News Survey

## *Entries for May 16-31, 2024*

### Market/Commercialization Information

**F -- R7 CHEROKEE COUNTY SUPERFUND SITE REMEDIAL ACTION FOR TAR CREEK PILES OPERABLE (PRESOL)**
U.S. Environmental Protection Agency, Region 7, Lenexa, KS
Contract Opportunities on SAM.gov 68HE0724R0027, 2024

When this solicitation is released on or about July 10, 2024, it will be competed as a service-disabled veteran-owned small business set-aside under NAICS code 562910. EPA Region 7's Acquisition Management Branch is seeking the services of an experienced firm to provide remedial action for the mine waste located at the Tar Creek Mine Waste Piles in the Treece subsite, Operable Unit #04 (OU4), of the Cherokee County Superfund Site. The ~1.5 mi2 Treece OU4 subsite has been subdivided into 5 stages for design and remediation purposes. This requirement addresses surficial mine waste areas and underlying contaminated soils. The selected remedy for OU4 consists of excavation, consolidation, and disposal of mine waste and associated soil/sediments contaminated with heavy metals. The remedial action will be conducted for EPA in accordance with CERCLA, the National Contingency Plan, the final plans and specifications developed during the remedial design, and the 1997 ROD and ROD Amendments. Work includes 1) Site Preparation; 2) Mine Waste Removal; 3) Erosion and Sediment Controls; 4) Regrading and Restoration; 5) Revegetation; 6) Fill Mine Shafts, Vent Pipes, Small Subsidence Pits, and Wells; and 7) Surveys. The contractor must comply with all applicable federal, state, and local laws and regulations. Remediation will be conducted pursuant to the CERECLA, as amended by the Superfund Amendments, Reauthorization Action, and National Contingency Plan requirements. EPA anticipates issuing a fixed-unit-price contract consisting of a one-year base period and one one-year option period with an estimated dollar value between $10M - $15M. There is no solicitation at this time.
https://sam.gov/opp/2311a420a2224626832494fb656146da/view

**INDEFINITE DELIVERY/INDEFINITE QUANTITY (IDIQ) SINGLE AWARD TASK ORDER CONTRACTS (SATOCS) FOR RAPID RESPONSE ENVIRONMENTAL SERVICES (SRCSGT)**
U.S. Army Corps of Engineers, Northwestern Division, Omaha District, Omaha, NE
Contract Opportunities on SAM.gov W9128F24SS002, 2024

This is a sources sought notice for marketing research purposes only. The U.S. Army Corps of Engineers is seeking information from interested small business community members as well as large businesses qualified to provide full environmental remediation/restoration services under NAICS code 562910, including incidental construction and other incidental professional type services, to include site characterization and assessment, to federal or federally funded sites. These sites may be affected by the potential release or presence of hazardous toxic or radioactive waste or hazardous or toxic substances. Sites may pose the potential for physical or hazardous risks to protected ecosystems or the restoration of such ecosystems. Project sites may be affected by infectious, biological, or chemical wastes or contamination or the presence, release, or potential release of all controlled substances, including petroleum and petroleum-based products. Select sites may be affected by Ordnance and Explosives, Unexploded Ordnance, or chemical warfare agent(s). Requirements may require compliance with RCRA, CERCLA, and other federal or state regulations. Projects will vary in size, complexity, and location and require a high degree of flexibility and adaptability. Contractors must respond quickly and effectively. The diverse scopes of work are time-sensitive, which necessitates a timely response to mitigate threats to life and property and/or operational impacts to the government. The level of time sensitivity and corresponding response requirements will be determined at the task order level. Most of the work is anticipated to be cost-reimbursement type contracts, thus requiring a sufficient cost accounting system. Task orders for firm-fixed-price may also be utilized depending on the nature of the requirement. All task orders will be coordinated with the geographic Major Subordinate Command and District Offices. Responses are due by 2:00 PM CDT on July 15, 2024. https://sam.gov/opp/89e3a1de0bba4280a536326ab13ca9c8/view

**FY25 BROWNFIELDS JOB TRAINING GRANTS**
Environmental Protection Agency, Funding Opportunity EPA-I-OLEM-OBLR-24-02, 2024

This funding opportunity is available through EPA's Office of Brownfields and Land Revitalization (OBLR). This notice announces the availability of funds and solicits applications from eligible entities and nonprofit organizations to deliver Brownfields Job Training programs that recruit, train, and retain a local, skilled workforce by prioritizing unemployed and under-employed residents to obtain the skills and credentials needed for pathways into full-time employment in various aspects of hazardous and solid waste management and within the larger environmental field, including sustainable cleanup and reuse, and chemical safety. This program is being funded by the Infrastructure Investment and Jobs Act, Public Law 117-58 (the "Bipartisan Infrastructure Law"). The total funding available under this competitive opportunity is ~$14,000,000, subject to availability of funds, quality of applications received, and other applicable considerations for FY25. EPA anticipates awarding approximately 20 Brownfields Job Training grants. Applicants may apply for up to $500,000 of EPA funds. (Applicants may also request an amount that is less than $500,000.) The closing date and time for receipt of applications is August 15, 2024, 11:59 PM ET.
https://www.grants.gov/search-results-detail/354298

### Cleanup News

**PRACTICAL APPLICATION FOR LEGACY ACID MINE DRAINAGE (AMD) PREVENTION AND TREATMENT TECHNOLOGIES IN KARST-DOMINATED REGIONS: A CASE STUDY**
Li, X., H. Ren, Z. Xu, G. Chen, S. Zhang, L. Zhang, and Y. Sun.
Journal of Contaminant Hydrology 258:104238(2024)

This article proposes a contaminant migration prevention technical framework covering four comprehensive processes to avert the unwise decisions of "pollution first before treatment" during pre-mining, mid-mining, and post-mining activities. It describes the formation mechanism of spring pollution, engineering remediation processes, and effects of contamination treatment in Longdong Spring. In 2018, Longdong Spring water had Fe (33.83 mg/L) and Mn (3.60 mg/L), exceeding Chinese surface water standards by 112 and 36 times, respectively. After grout blocking, in situ treatment and wetland remediation, Fe decreased to ≤ 4.5 mg/L. Spring water pollution days decreased from 320 in 2018 to 42 days following treatment. Two years after wetland remediation, Fe was < 0.03 mg/L, meeting the Chinese water quality standard. *See the introduction and section snippets at*
https://www.sciencedirect.com/science/article/abs/pii/S0169772223001080?via%3Dihub

**THE BANNING/WEST NEWTON COAL LOGISTICS COAL REFUSE PILE RECLAMATION PROJECT ROSTRAVER TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA**
Cavazza, E.E. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 3 pp, 2024

Three reclamation alternatives were evaluated for the Banning/West Newton Coal Logistics (Banning/WNCL) Coal Refuse Pile Reclamation Project. The site was originally part of the Banning #4 underground mine and coal preparation facility that mined the Pittsburgh Coal Seam. The primary goal of the project is to ameliorate public health and safety hazards associated with the coal refuse pile, including unstable coarse refuse embankments and three slurry impoundments. A summary of the reclamation alternatives evaluated and the pros and cons of each alternative are described. Based on the alternatives analysis, the planned reclamation strategy is to excavate the fine coal refuse (FCR) and sludge in the slurry impoundments and mix it with appropriate amounts of coarse coal refuse and an additive to dry and stabilize the material. Once stabilized, the admixture will be incorporated back into the pile during grading. Specific project objectives include decertifying onsite jurisdictional dams; demolishing the remaining mine buildings ; regrading the site to stable slopes, site revegetation, mitigating acid mine drainage to the extent practicable, and maximizing the surface area at the top of the regraded/reclaimed refuse pile to facilitate the planned solar development.
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Cavazza_76.pdf
***Slides:***
https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-d-830-cavazza-_banning_wncl_coal_refuse_pile_reclamation_project_04-23-2024.pdf

**THE BARNES & TUCKER #20 MINE DRAINAGE TREATMENT FACILITY: OPTIMIZATION CASE STUDY IN CONSIDERATION OF VARIABLE FLOW AND WATER CHEMISTRY**
Shultz, B.R., R.L. Beam, D. Baker, R. Rummel, and S. Fisanick. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 5 pp, 2024

The Barnes & Tucker #20 (B&T #20) mine drainage treatment facility, in operation since 1966, has been treating the mine water from the B&T #20 mine pool using evolving treatment methodologies based on more recent understandings of the varying mine water quantity and quality. Incorporating more recent technologies to maximize retention time, more efficiently add alkaline chemicals when necessary, and relying on more "passive" techniques to remediate the mine water when possible, allowing for reduced treatment costs and more effective treatment within the system that could potentially accommodate an additional upstream mine drainage source, known as Victor #10. The combined passive/active treatment approach, which leverages the additional B&T #20 system capacity, would result in substantial watershed improvement at lower operating costs compared to constructing a new system.
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Shultz_577.pdf
***Slides:*** https://wvmdtaskforce.com/wp-content/uploads/2024/05/1500-1525-monday-d-300-shultz.pdf

**CROSSVILLE COAL PASSIVE TREATMENT SYSTEM – REDESIGN OF A NON-FUNCTIONING IRON AND MANGANESE TREATMENT SYSTEM**
Smith, W., A. Ramsey, and R. Mann. I Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 5 pp, 2024

Unanticipated acid mine drainage (AMD) discharges from the Crossville Coal surface mine were treated using an anoxic limestone drain (ALD), treatment ponds, and manganese removal beds. Failure of the ALD resulted in manganese removal beds being plugged with iron precipitate, requiring the discharges to be pumped to additional treatment structures for chemical treatment to comply with effluent limits. These measures resulted in substantially increased treatment costs and repeated permit violations. As a result, OSMRE took control of the site, redesigning the treatment system to take advantage of existing structures, emphasizing a long-term passive treatment solution. The characteristics of the AMD discharges

include low dissolved oxygen (< l mg/L), ~50 mg/L alkalinity, and Fe and Mn concentrations of ~30 mg/L and 18 mg/L, respectively. OSMRE's goal was to replace the failed passive treatment system with a permanent solution to treat the AMD discharges without using chemicals or electricity. The passive treatment system redesign included large ponds, waterfalls, and shallow sinuous ditches to increase dissolved oxygen and release carbon dioxide. The surface runoff flow patterns from the contributing watershed were also redesigned to minimize surface runoff entering the system and infiltration into the spoils. The existing manganese removal bed was redesigned using AMDTreat, and the limestone was replaced, with the used rock being recycled to line newly constructed ditches.
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Smith_588.pdf
***Slides:*** https://wvmdtaskforce.com/wp-content/uploads/2024/05/thursday-a-100-smith.pdf

## Demonstrations / Feasibility Studies

### FARO MINE LANDFORM, COVER AND REVEGETATION PILOT : YUKON
Domitter, G.; J. Markiewicz, M. Grohmann, B. Weinrauch, D. Christensen, M. Clark, E. Larssen, and Rp. Luedke. l British Columbia Mine Reclamation Symposium, 18-21 September, Prince George, British Columbia, 18 pp, 2023

Cover system field trials were constructed for the Landform, Cover, and Revegetation Pilot (LCRP) of the Faro Mine Remediation Project. The LCRP comprised two primary areas: the Mine Area involved constructing cover system field trial panels for varying depths and placement methodologies (loading, hauling, and placing borrow materials on previously graded waste rock landforms) to assess cover system material, revegetation options, and implementation methods; and the Tailings Area involved placing geotechnical trial fills on the tailings to test field-scale performance. Work also included an onsite borrow development and construction of lined surface water and sediment monitoring ponds. During the project, materials were extracted from borrows with a comprehensive material sampling program to build a database of necessary material characterization to inform the ongoing design and remediation of Faro Mine. A total of 15 cover trial panels were constructed at the Mine Area to test material types, cover thicknesses, and placement methods, and consisted of both plateau (5% slope) and (33% slope) panels. The panels will be continuously monitored, to inform the final cover system. A total of six trial pads of varying thicknesses were constructed in the Tailings Area to assess the performance of the future tailings landform. https://open.library.ubc.ca/media/download/pdf/59367/1.0437480/3

### STUDY ON THE REMEDIATION OF URANIUM-CONTAMINATED SOILS BY COMPOUND LEACHING: SCREENING OF LEACHING AGENTS AND A PILOT-SCALE APPLICATION
Han, J., J. Zou, X. Li, A. Ding, Z. Shang, H. Sun, L. Chen, Z. He, Q. Li, H. Fan, and J. Dou.
Journal of Cleaner Production 450:141918(2024)

A soil slurry reactor was used to evaluate chemical leaching to remediate uranium-contaminated soils and analyze possible uranium removal mechanisms through lab-scale and pilot-scale trials. A lab-scale trial comparing different reagents and operating methods revealed that removal of total uranium from contaminated soil could reach 91.18% under optimal conditions using $FeCl_3$, OA, $NaClO_2$, and HEDP as eluents. Based on these results, a pilot-scale trial was conducted near a uranium mining area. Soil leaching remediation was conducted in two 3 m>sup>3 soil-slurry reactors to verify the practicality of the leaching technology and examine the functionality of the remediated soil. Results showed that the rate of uranium removal from contaminated soil by the chemical leaching method was > 80%. FTIR, XRF, and enzyme activity analysis proved that remediation restored the original soil function and reduced the ecological risk, indicating that the chemical leaching technology was environmentally friendly and economical. *See introduction and section snippets at* https://sciencedirect.com/science/article/abs/pii/S0959652624013660

### ONGOING CASE STUDY, BERRY BRANCH SELENIUM PILOT TREATMENT SYSTEM USING SULFUR MODIFIED IRON, FORMER HOBET SURFACE MINE SITE, LINCOLN COUNTY, WEST VIRGINIA
Doss, R.B. l Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 4 pp, 2024

The Berry Branch pilot system was constructed to treat selenium (Se) discharges at the former Hobet coal mine in the Mud River watershed using sulfur-modified iron (SMI) technology. The system utilizes sulfur-modified catalytic zero-valent iron particles as an adsorptive medium to reduce selenite and selenate to elemental selenium. Influent averaged 25.6 µg/L Se in the first 4½ months of operation. Depending upon flow rates and SMI media depletion, the % reduction in Se concentrations at the immediate discharge averaged 49.7% to 97.3%. Se not fully removed at immediate discharge appears to be bound to iron (Fe) released from the system. Fe from the SMI media is oxidized and precipitated in post-treatment settling basins, where Se concentrations are further reduced. Post-settling Se effluent concentrations at the NPDES outlet have averaged ~1.0 µg/L, well below the state water quality standard (5 µg/L). Results show SMI's potential to effectively treat Se. However, the life of SMI media will need to be extended, potentially with pre-treatment to lower influent oxygen reduction potential (ORP) and better influent pH management. The system will be operated for 12 to 18 months using different source waters exhibiting higher and lower Se concentrations. Future studies will focus on replenishing SMI media to study system effectiveness and media life using different influent water sources; attempting to extend SMI media life by pre-treating to lower influent ORP and better control of influent pH before entering the SMI vessels; analytically determining the extent to which Se is bound to Fe discharge from the system and the extent that Se concentrations can be further reduced by post-treatment settling and precipitation; performing economic evaluation of capital and operating costs; and estimating capital and operating costs to scale the system to be able to treat larger throughput volumes.
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Doss_145.pdf
***Slides:*** https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-d-830-doss-berry-branch-case-study_rb-doss.pdf

### PILOT PLANT TESTING TO DETERMINE THE PROCESS IMPLICATIONS OF TREATING NET ALKALINE MINE WATER USING THE HIGH DENSITY SLUDGE PROCESS
Cox, M., C. Dale, C. Satterley, R. Coulton, R.D. Coulton, and R. Morgan. l Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 6 pp, 2024

The Old Fordell Adit in Dalkeith, Scotland, discharges near neutral, net-alkaline mine water into the River South Esk, causing discoloration, water pollution, and iron ochre deposition on the river bed. The high-density sludge process was selected to treat the discharge. A pilot plant trial was incorporated into the design stage to improve understanding of how $CO_2$ stripping, reagent consumption, and precipitate generation would influence the scheme's design and equipment selection. An optimum degassing ratio of 3:1 achieved a 40-50% decrease in dissolved $CO_2$. Iron removal > 99.1%, was achieved over the pH range studied. Trial results allowed the equipment to be correctly sized and specified for construction. It also provided a set of operational parameters that will be used for plant commissioning.
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Cox_85.pdf
***Slides:*** https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-a-1015-cox.pdf

## Research

### FEASIBILITY OF THE SCALE-UP OF A SEMI-PASSIVE BIOLOGICAL SULFATE REDUCTION PROCESS TREATING HIGH SULFATE MINE-INFLUENCED WATER
du Preez, K. and M. Marumo. l Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 6 pp, 2024

The cloSURE® technology is a low-cost, low-maintenance technology designed to treat small AMD point sources in remote locations and produce irrigation-quality water for reuse in irrigated agriculture. The process employs biological sulfate reduction to remove sulfate, increase pH, and remove metals, followed by biological sulfide oxidation for sulfur recovery. The feasibility of scaling up the two-stage integrated process and identifying potential areas of improvement that could be incorporated for commercial-scale plants to treat high sulfate mine waters in a South African context was investigated. Lab-scale test work was conducted in 1 m columns, and pilot-scale test work involved 5 $m^3$ reactors. Both systems were packed with an organic mix of woodchips, hay, and cow manure. A mine water sample with a sulfate concentration of 3,900 mg/L and low pH was supplemented as a source of liquid organic carbon to maintain performance of the sulfate-reducing reactors. The performance and chemistry of both phases were measured by tracking the sulfate reduction rates, pH levels, sulfide concentrations, and metal concentrations in the treated water. Data was compared to understand the effect of scale-up on performance. Results showed reduction of sulfate by > 90% in both test work phases. The pH of the treated water was above 7.1, and metals were within the required ranges for water reuse in irrigation, based on the South African Water Quality Guidelines for Irrigation. https://www.imwa.info/docs/imwa_2024/IMWA2024_duPreez_157.pdf

### IDENTIFICATION OF GRASS SPECIES CANDIDATES FOR PHYTOSTABILIZATION AND ENHANCED METAL(LOID)S IMMOBILISATION USING COST-EFFECTIVE AMENDMENTS ON SULFIDIC MINE TAILINGS
Xie, L. and D. van Zyl.
International Journal of Mining, Reclamation and Environment 37(7)(2023)

A greenhouse study explored cost-effective amendments to immobilize metal(loids) and identified grass species candidates for phytostabilization. The research found that (1) wheatgrass ( *Pascopyrum*) and ryegrass (*Lolium multiflorum*) are suitable candidates for phytostabilization; and (2) it is cost-effective to reuse wastes of bauxite residue and compost to promote phytostabilization effectiveness. Compost should be carefully evaluated for phytostabilizing Zn in tailings since the Accumulation Factor and Translocation Factor of all selected species are >1.

### METAL POLLUTION AND MINING IN THE IBERIAN PYRITE BELT: NEW REMEDIATION TECHNOLOGIES TO IMPROVE THE ECOSYSTEM SERVICES OF THE RIVER BASINS
Bonnail, E., S. Vera, J. Blasco, M. Conradi, and T. Ángel DelValls.
Water 15(7):1302(2023)

This study demonstrates the feasibility and effectiveness of two technologies to recover ecosystems affected by acid mine drainage (AMD) in the Odiel-Tinto River basin in the Iberian Pyrite Belt. The study compiles the results of dispersed alkaline substrate (DAS) passive remediation and a new disruptive technology, Adiabatic Sonic Evaporation and Crystallization (ASE&C), that purifies the contaminated water to obtain high-quality water and metal conglomerates. Both improve the general quality of the ecosystem, including biodiversity, by eliminating > 90% of the contaminants from AMD and mine water. The removal of contaminants, enhancement of AMD treatment efficiency, and offset operating costs were compared and analyzed for the different uses of the decontaminated effluents, including an old tailing pond failure. The removal efficiency was significant using both technologies, although the passive DAS did not reach the

international benchmark for some compounds (such as Fe, sulfates, and Mn). ASE&C obtained distilled water fulfilling all the international benchmarks with conductivity values < 120 µS/cm. Both technologies are eco-friendly and cost-effective by generating valuable by-products such as fresh water and metal conglomerates as potentially commercial products while remediating aquatic ecosystems impacted by mining activities. *This article is* ***Open Access*** *at* https://www.mdpi.com/2073-4441/15/7/1302?utm_campaign=releaseissue_waterutm_medium=emailutm_source=releaseissueutm_term=titlelink13.

**USE OF A WASTE-DERIVED LINDE TYPE-A IMMOBILIZED IN AGAROSE FOR THE REMEDIATION OF WATER IMPACTED BY COAL ACID MINE DRAINAGE AT PILOT SCALE**
Luiz Chostak, C., A. Lopez-Delgado, I. Padilla, F.R. Lapolli, and M.A. Lobo-Recio
Materials 16(11):4038(2023)

A pilot device containing slices of the sorbent material [agarose [AG] (1.5%)-LTA (8%)] was developed and used in a treatment system for AMD-impacted water under an upward continuous flow. High removal of $Fe^{2+}$ (93.45%), $Mn^{2+}$ (91.62%), and $Al^{3+}$ (96.56%) were achieved, transforming river water heavily contaminated by metallic ions into water suitable for non-potable use, according to Brazilian and/or Food and Agriculture Organization standards. Breakthrough curves were constructed to calculate the corresponding maximum adsorption capacities (mg/g) ($Fe^{2+}$, 17.42; $Mn^{2+}$, 1.38; $Al^{3+}$, 15.20). The Thomas mathematical model was well fitted to the experimental data, indicating the participation of an ion-exchange mechanism in the removal of the metallic ions. The pilot-scale process studied, in addition to being highly efficient in removing metal ions at toxic levels in AMD-impacted water, is linked to sustainability and circular economy concepts due to the use of a synthetic zeolite derived from hazardous aluminum waste as an adsorbent material. *This article is* ***Open Access*** *at* https://www.mdpi.com/1996-1944/16/11/4038.

**SINGLE-WELL PUSH–PULL TRACER TEST ANALYSES TO DETERMINE AQUIFER REACTIVE TRANSPORT PARAMETERS AT A FORMER URANIUM MILL SITE (GRAND JUNCTION, COLORADO)**
Johnson, R.H., C.J. Paradis, R.D. Kent, A.D. Tigar, and P.W. Reimus. Minerals 13(2):228(2023)

Previous investigations determined several potential ongoing secondary uranium sources at a former uranium mill site where tailings were removed, including locations with uranium sorbed to organic carbon, uranium in the unsaturated zone, and uranium associated with gypsum. To better understand uranium mobility controls, four single-well push-pull tests (with a drift phase) were completed to derive aquifer flow and contaminant transport parameters to include in a future sitewide reactive transport model. Dispersion was removed from the resulting data to determine possible reactions before conducting reactive transport simulations. These initial analyses indicated the potential need to include cation exchange, uranium sorption, and gypsum dissolution. A reactive transport model using multiple layers to account for partially penetrating wells was completed using the PHT-USG reactive transport modeling code and calibrated using PEST. The model results quantified the hydraulic conductivity and dispersion parameters using the injected tracer concentrations. Uranium sorption, cation exchange, and gypsum dissolution parameters were quantified by comparing the simulated versus observed geochemistry. All simulations required some cation exchange and calcite equilibrium, and one simulation required gypsum dissolution to improve the model fit for calcium and sulfate. Uranium sorption parameters were not strongly influenced by the other parameter values but were highly influenced by uranium concentrations during the drift phase, with possible kinetic rate limitations. The final uranium sorption parameters were within the range of values determined from prior column testing. *This article is* ***Open Access*** *at* https://www.mdpi.com/2075-163X/13/2/228.

**OPTICAL IN SITU MONITORING OF ACID MINE DRAINAGE REMEDIATION: LABORATORY AND MODEL INVESTIGATION**
Reub, M., S.E. Oswald, M. Munz, and M.U. Kumke. | Groundwater Monitoring & Remediation [Published online 7 June 2023 before print]

The performance of a permeable reactive barrier (PRB) material under different boundary conditions (pH, flow velocity, and sulfate concentration) was investigated in column experiments applying in situ optical sensing methods for pH and oxygen detection. The reactive material consisted of organic components (compost, wood, and coconut shell) mixed with calcium carbonate and fine gravel. The input concentrations were ~1,000 mg/L for iron and 3,000 mg/L for sulfate, and the pH was 6.2. The remediation efficiency was 14.6% (iron) and 15.2% (sulfate) but was expected to increase when moving to a field-site PRB with greater thickness. Removal of iron and sulfate was influenced by decreasing the flow velocity and increasing the sulfate input concentration and the pH. In a 47-day experiment with low pH boundary conditions (pH = 2.2), calcium carbonate neutralized acidity in the PRB. The modeling program MIN3P was used to simulate the lab experiments to help design parameters, such as the residence time in the PRB, needed for ~100% remediation efficiency. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12590

## General News

**REVITALIZING CONTAMINATED LANDS: A STATE-OF-THE-ART REVIEW ON THE REMEDIATION OF MINE-TAILINGS USING PHYTOREMEDIATION AND GENOMIC APPROACHES**
Hassan, S., S.S. Bhadwal, M. Khan c, Sabreena, K.-U. Nissa, R.A. Shah, H.M. Bhat, S.A. Bhat, I.M. Lone, and B.A. Ganai. | Chemosphere 356:141889(2024)

This review explores the growing prominence of phytoremediation and metagenomics as ecologically sustainable techniques for rehabilitating mine tailings. The study envisages that plant species, such as *Solidago chilensis*, *Festuca arundinacea*, *Lolium perenne*, *Polygonum capitatum*, *Pennisetum purpureum*, *Maireana brevifolia*, and *Prosopis tamarugo* could be utilized to remediate mine tailings. A critical evaluation of the organic and inorganic amendments that optimize conditions for the remediation of mine tailings is also provided. By delving into the multifaceted dimensions of phytoremediation and genomics for mine tailings, this study contributes to the ongoing efforts to revitalize contaminated lands for a sustainable and environmentally friendly future.

**DATASHED: AN ONLINE TOOL FOR MANAGING AMD TREATMENT SYSTEMS AND RESTORATION OF IMPACTED WATERSHEDS**
Denholm, C., S. Busler, and N. Lamagna. | Proceedings of the West Virginia Mine Drainage Task Force Symposium and 15th International Mine Water Association Congress, 22-26 April, 4 pp, 2024

Datashed is a free-to-use, GIS-enabled database that functions as a maintenance and data management tool. The website can store information on individual projects and overall watershed restoration efforts, including water quality data, maps, engineering design and as-built drawings, reports, operation & maintenance plans, treatment technologies, photographs, and sampling point locations. It contains project details and data collected by scientists, engineers, government agencies, volunteers, and other interested participants to compile information on over 400 restoration and treatment projects across Pennsylvania. About 360 of the projects consist of AMD passive treatment systems that collectively discharge into over 100 streams. One prominent feature on Datashed that is site-specific is the Water Quality Report, which provides water quality data for parameters integral in AMD assessments, including flow, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), temperature, conductivity, alkalinity, acidity, metal concentrations (total and dissolved iron, manganese, and aluminum), sulfate concentrations, and total suspended solids (TSS).
***Paper:*** https://www.imwa.info/docs/imwa_2024/IMWA2024_Denholm_126.pdf
***Slides:*** https://wvmdtaskforce.com/wp-content/uploads/2024/05/tuesday-d-1015-denholm-datashed.pdf
***Datashed tool:*** https://www.datashed.org/

**RECENT ADVANCES IN ACID MINE DRAINAGE TREATMENT THROUGH HYBRID TECHNOLOGY: COMPREHENSIVE REVIEW OF SCIENTIFIC LITERATURE**
Wibowo, Y.G., H. Safitri, K. Khairurrijal, T. Taher, L. Ode Arham, Jarwinda, A. Jasipto, M.A. Danasla, R. Fadhilah, E.K. Army, H.Z. Hakim, A.T. Yuliansyah, and H.T.B.M. Petrus.
Environmental Nanotechnology, Monitoring & Management 21:100945(2024)

The paper extensively examines the physicochemical characteristics of AMD, elucidating both individual treatment methods and the emerging field of hybrid treatment approaches. Mapping and PRISMA 2020 methodologies were employed to provide a thorough and comprehensive analysis of the available literature. Performance evaluations of each method were conducted, shedding light on the existing challenges and future research prospects in this domain. Findings offer valuable insights into the development of efficient and sustainable treatment strategies for AMD. *Read the introduction and section snippets at* https://www.sciencedirect.com/science/article/abs/pii/S2215153224000333.

**IMPROVING ACID MINE DRAINAGE TREATMENT BY COMBINING TREATMENT TECHNOLOGIES: A REVIEW**
Mosai, A.K., G. Ndlovu, and H. Tutu. | Science of The Total Environment 919:170806(2024)

This review discusses AMD treatment technologies and the possible alignment in tandem with the different treatment technologies. The alignment was based on the target species of each technology and AMD composition. The choice of which technologies to combine depends on AMD quality and the desired quality of the effluent, based on end use (e.g., drinking, industrial, irrigation, or release into the environment). AMD treatment technologies targeting metals can be combined with membrane and/or ettringite precipitation technologies focusing on removing sulfates. Other technologies can be added to deal with the secondary waste products (e.g., sludge and brines) from the treatment processes. Some technologies, such as ion exchange and adsorption, can be added to target specific valuable elements in AMD. These combinations can potentially result in effective AMD treatment and minimum waste production, which are not easily achievable with an individual technology.

**REVITALIZING CONTAMINATED LANDS: A STATE-OF-THE-ART REVIEW ON THE REMEDIATION OF MINE-TAILINGS USING PHYTOREMEDIATION AND GENOMIC APPROACHES**
Hassan, S., S.S. Bhadwal, M. Khan c, Sabreena, K.-U. Nissa, R.A. Shah, H.M. Bhat, S.A. Bhat, I.M. Lone, and B.A. Ganai. | Chemosphere 356:141889(2024)

A review explores the growing prominence of phytoremediation and metagenomics as ecologically sustainable techniques to rehabilitate mine tailings. It envisages that plant species, such as *Solidago chilensis*, *Festuca arundinacea*, *Lolium perenne*, *Polygonum capitatum*, *Pennisetum purpureum*, *Maireana brevifolia*, *Prosopis tamarugo*, could be utilized to remediate mine tailings and evaluates organic and inorganic amendments that optimize conditions for the remediation of mine tailings. The review focuses on exploring environmental genomics to characterize microbial communities in mining sites. This study contributes to the ongoing efforts to revitalize contaminated lands for a sustainable and environmentally friendly future by delving into the multifaceted dimensions of phytoremediation and genomics for mine tailings.

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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