



Shamokin Creek, Shamokin PA

Photo credit: Shamokin Creek Restoration Alliance, with permission of Larry Deklinski, local photographer/reporter

Region 3 ROAR Research Project:

Sampling for Critical Rare Earth Metals (CREMs) in acid mine drainage (AMD) and coal refuse in Appalachian Communities with Environmental Justice concerns to inform long term mine pool treatment and land reclamation.

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Key Questions & Answers

What are CREMs?

Critical Rare Earth Metals (CREMs) are a set of seventeen chemical elements in the periodic table known as Rare Earth Elements (REE), specifically the fifteen lanthanides, as well as scandium and yttrium. The EPA considers these seventeen metals to be critical (i.e., CREM) due to their national strategic importance.

What is the potential relationship between looking for CREMs and improving water quality in Shamokin Creek?

This research proposal involves the identification and quantification of potential CREMs in AMD and related sources, that could potentially benefit these communities through the selection/development of a permanent treatment system for the mine pool.

Do we know if CREMs are there?

The USGS (Chuck Cravotta) & Bucknell University (Carl Kirby) sampled AMD sources in the watershed in 1999-2000, which was published in a report in 2004. They analyzed for rare earth element (REYs) concentrations, and this sampling effort is proposed to build on that effort, particularly with data indicating how stable the known quantities of CREMs may be over time in the mine pool (then versus now). There is very little information on quantities of CREMs in associated treatment wastes/sludges and coal refuse materials, so we also propose to sample some of these materials in the watershed.

EPA's Research Objectives

- **Determine if AMD mine pool waters and coarse refuse materials have concentrations of CREMs at a marketable concentrations** and without interfering constituents (TOC, suspended solids, etc.) to serve as a reliable source of CREM for extraction.
- Qualitatively **determine mitigation strategies** involving lowering the existing AMD mine pool areas that could be associated with CREM source identification and recovery methodologies that can lessen the environmental impact that the legacy of coal mining has caused to adjacent communities.
- **Develop best practices** for evaluation of AMD for CREMs content and extraction, and for working with communities that have been impacted by AMD and residuals of coal mining operations to develop permanent treatment solutions that improve their communities.

What is Going to Happen and When?

- Done: A near-final draft of the ROAR Project Management Plan (PMP) is due to EPA Regional Science Liaison (RSL) for review by June 16, 2023
- Community involvement process initiated in June 2023 through SCRA and FAR community meetings, and schedule updates to public during process
- Final, signed PMPs are completed by July 21, 2023, and the following plans prepared:
 - Quality assurance project plan (QAPP)
 - Health & safety plan
- Sampling of mine pool, AMD and solids/sludges/refuse materials Late fall 2023 or Early Spring 2024
- Preliminary results of the sampling effort may be available in January/February 2024 if sampling is performed in late fall of 2023.
- Update for Shamokin community on findings, which include USGS/OSMRE software evaluations for best treatment technology and anticipated long term operations and maintenance (O&M) costs.

How can EPA support local community stakeholders participation this project?

A central component of this project will be the development of a process for meaningful involvement of the surrounding communities with EJ concerns, through all phases of project development and implementation, and this project could be a model for AMD treatment/CREMs extraction projects throughout Region 3 and other Regions affected by AMD.

- How would you like to be involved?
- Who else should we reach out to?
- What is the best way to get you regular updates?

Community Considerations/Potential Impacts

- Lowering of the deep mine pool will increase availability of anthracite coal reserves. And, as further research is conducted on whether coal refuse materials contain quantities of CREMs, this may incentivize re-mining and reclamation efforts (so more mining in the watershed is possible).
- Question remains as to who owns the CREMs
 - Recent example: WVU lobbied state legislature to pass law indicating that whoever extracts the CREMs from AMD treatment owns it.
- Solids samples of coal mining waste for purposes of this study will preferably be sampled on land owned by Shamokin Borough;
 - all data from this sampling effort will be shared on a public database maintained by DOE, and EPA will utilize tools developed by USGS and OSMRE to evaluate the best type of treatment for AMD and the long-term operations and treatment costs that can be anticipated from the preferred treatment.
- This can be a boost for SCRA and others' work on AMD remediation.

