STATEMENT OF WORK

Contract Title: “”

EPRI Project ID:

Background and Objectives

In the US, a common practice at coal-fired steam-electric power plants in the 1960s through the 2000s was to manage coal ash in impoundments, often unlined. This design allowed inorganic elements to leach into groundwater under and around the management units. Recent regulations in the United States now require utilities to close these unlined management units and remediate sites where inorganic elements have leached to groundwater.

There are two methods commonly used to prevent future leaching. The first of these,

closure by removal, has the advantage of permanently removing the source so there is no potential for future leaching. Still, it has the disadvantage of being more geochemically disruptive and taking longer to implement than closure in place. The second is closure in place where the impoundment is dewatered and covered with soil or geosynthetic cap.

This project seeks to evaluate the effect that each of these closure options has on concentrations of the inorganic elements in groundwater. Data collected for this project was measured at 18 impoundments from various locations in the United States. For each impoundment, the date operation ceased, and the dates closure began and completed were summarised. Groundwater data from monitoring wells near the ponds have been compiled before, during, and after the closures to provide a basis for evaluation.

Tasks

1. Consolidate code into Python and separate data cleaning from analysis (50 hours student)
   * 1. Translate Cleaning\_script.R, differences\_relative\_timepoints.Rmd, sample\_density\_ridgeplots.Rmd, well\_trends.Rmd into Python
     2. Combine translated Cleaning\_script.R with AH-1.03-cleaned\_wells\_eda.ipynb into a single notebook or Python script
     3. Identify any cleaning code that may be scripted in other scripts (found in the important\_notebooks folder of the git repo)
2. Evaluate GUI options for later work on new datasets by engineers without Python knowledge (10 hours student)
3. Check different clustering options in comparison to PCA (30 hours Christina or Lea)
4. Extend analytics to include multiple elements (24 hours Christina or Lea)
   * 1. Principal component analysis on all ponds together using pH, specific conductivity, TDS, Fe, Mn. (nb3\_upgradientPonds\_v3.ipynb)
     2. Replace rolling upgradient median with single value upgradient median for each individual chemical at each site (nb3\_upgradientPonds\_v3.ipynb)
     3. Perform “excess” calculation on B, As, Cr, Co, Li, Mo, Se, SO4
5. Use values from #4 to create the comparison by closure type and the individual well/pond graphs (8 hours Christina or Lea)
6. Use the individual well graphs from #5 to run Mann-Kendall and look for trending wells for B, As, Li, Mo, Se (20 hours Christina or Lea)
7. Use results of #6 to recreate the graphs that show the number of trending wells per site, with the closure method being used to group them (8 hours Christina or Lea)
8. Create GUI to include new datasets and visualize results ( 30 hours Christina or Lea)

Deliverables

The non-proprietary results of this work will be incorporated into EPRI R&D Program , and made available to the public, for purchase or otherwise. *[Delete this phrasing for BSA contracts where the results are only available to the funder(s).]*

1. Python-based software available to EPRI engineers
2. Research results for publication

Estimated Period of Performance/Estimated Schedule

**Estimated Period of Performance**

11/1/22-2/15/23

60 hours student

60 hours Christina Lawson

60 hours Lea Boche