

# Henry Knob Former Mine Site



# Mining Webinar Series: Ecological Revitalization at the Henry's Knob Former Mining Site

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## **Eugene Shephard (Amec Foster Wheeler)**

- ▶ Site location and background
- ▶ Site history
- ▶ What got us started towards revitalization?
- ▶ Adaptive Management and Interim Measure Approach

## **Paul Johnstone (Amec Foster Wheeler)**

- ▶ Remedial Investigation Summary (Steps 1, 2, and 3)
- ▶ Acid Rock Drainage vs Acid Mine Drainage and chemical signature of mine impacted water
- ▶ Groundwater Model and Groundwater Monitoring Program

## **Jason Provencher (Amec Foster Wheeler)**

- ▶ Vegetative test plots (Ridge/Furrow and Standard Farming)
- ▶ Vegetative test plot agricultural monitoring results
- ▶ Area of Concern 3 – Vegetative Cover and Stormwater Controls
- ▶ Incorporation of sustainable approach (local sourced materials, native seed blend, pollinator mix)
  - ▶ Area of Concern 1 – Vegetative Cover, Stormwater Controls, and Dam Rehabilitation
  - ▶ Area of Concern 2 – Vegetative Cover, Stormwater Controls, and Dam Rehabilitation
  - ▶ Area of Concern 5– Vegetative Cover, Stormwater Controls, and Dam Rehabilitation

## **Michele Mahoney (USEPA)**

- ▶ Conclusion and Discussion





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# Site Location and Background

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Image from Google Earth Pro

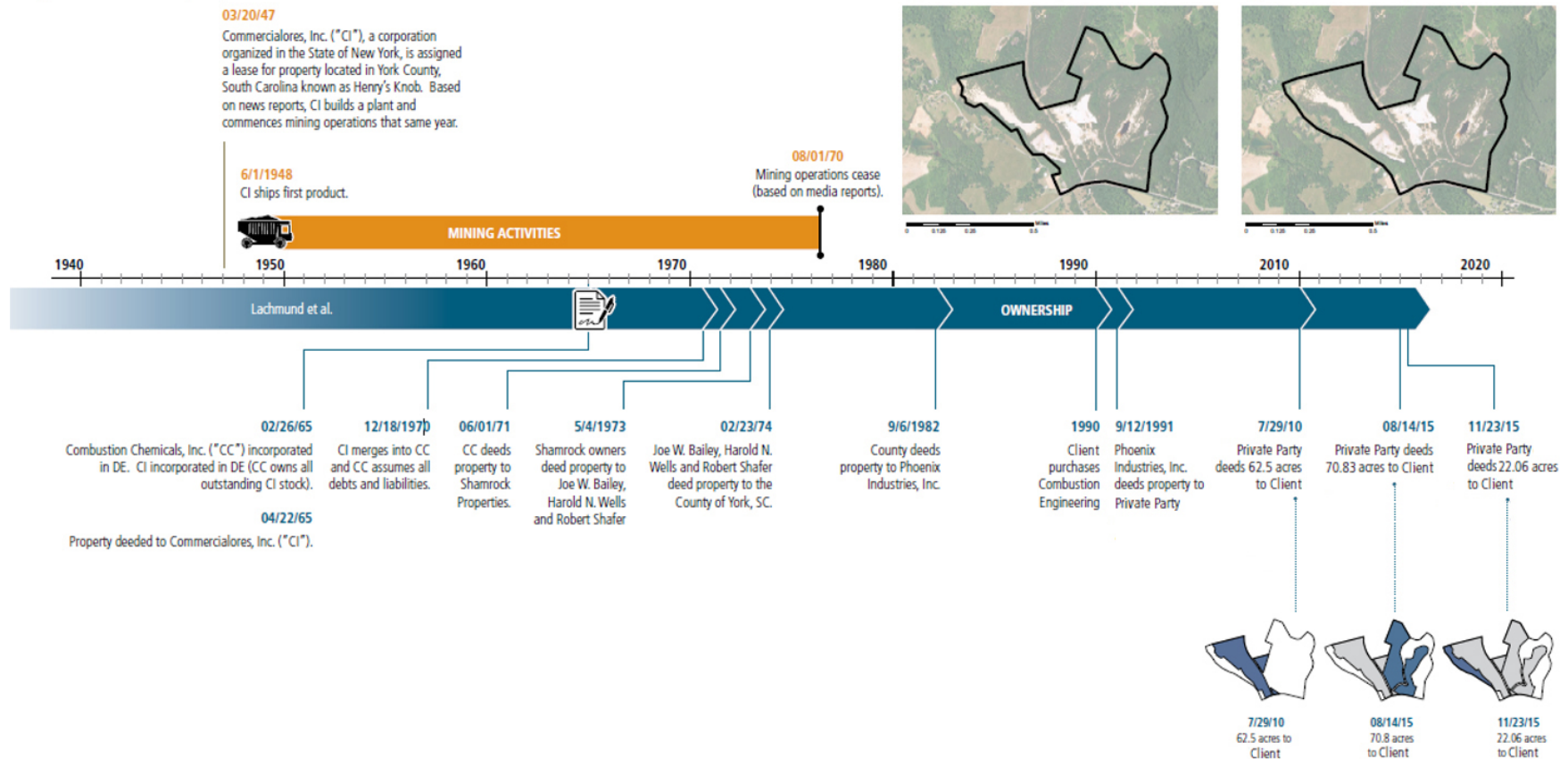
# Site Location and Background

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- ▶ Located near the town of Clover in York County, South Carolina
- ▶ Approximately 185 acres
- ▶ 1947 to 1970 Commercial ores, Inc. operated an open pit kyanite mine
- ▶ Kyanite is an aluminum silicon oxide used in the manufacture of high-alumina brick and other high-temperature, refractory materials
- ▶ Deposit is one of several similar mineralized areas contained within Kings Mountain Belt
- ▶ Areas of Concern (AOCs) identified under the Remedial Investigation:
  - ▶ AOC #1 West Tailings Ponds
  - ▶ AOC #2 North Tailings Ponds
  - ▶ AOC #3 Former Mill Operations Buildings
  - ▶ AOC #4 Mine Pit Pond
  - ▶ AOC #5 East Tailings Ponds
  - ▶ AOC #6 South Fork of Crowders Creek
  - ▶ AOC #7 Random Dumping Areas
  - ▶ AOC #8 Waste Rock Area (North Side),
  - ▶ AOC #9 Waste Rock Area (South Side), and
  - ▶ AOC #10 Site Groundwater

# Henry Knob Ownership History

Figure 3-7 Timeline of Ownership and Operation



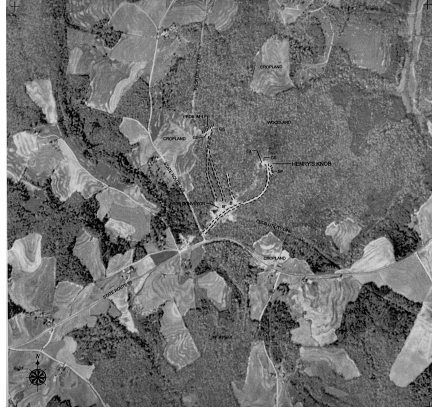


# Henry Knob Development History

**1941**



**1949**



**1954**



**1959**



**1964**



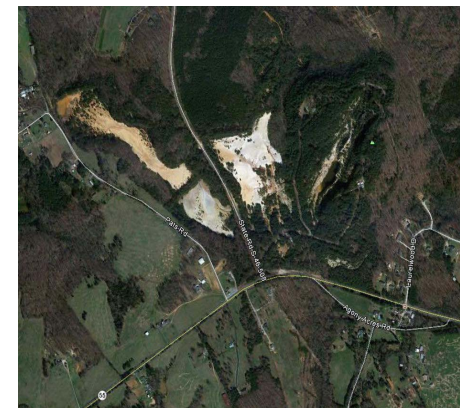
**1970**



**1981**

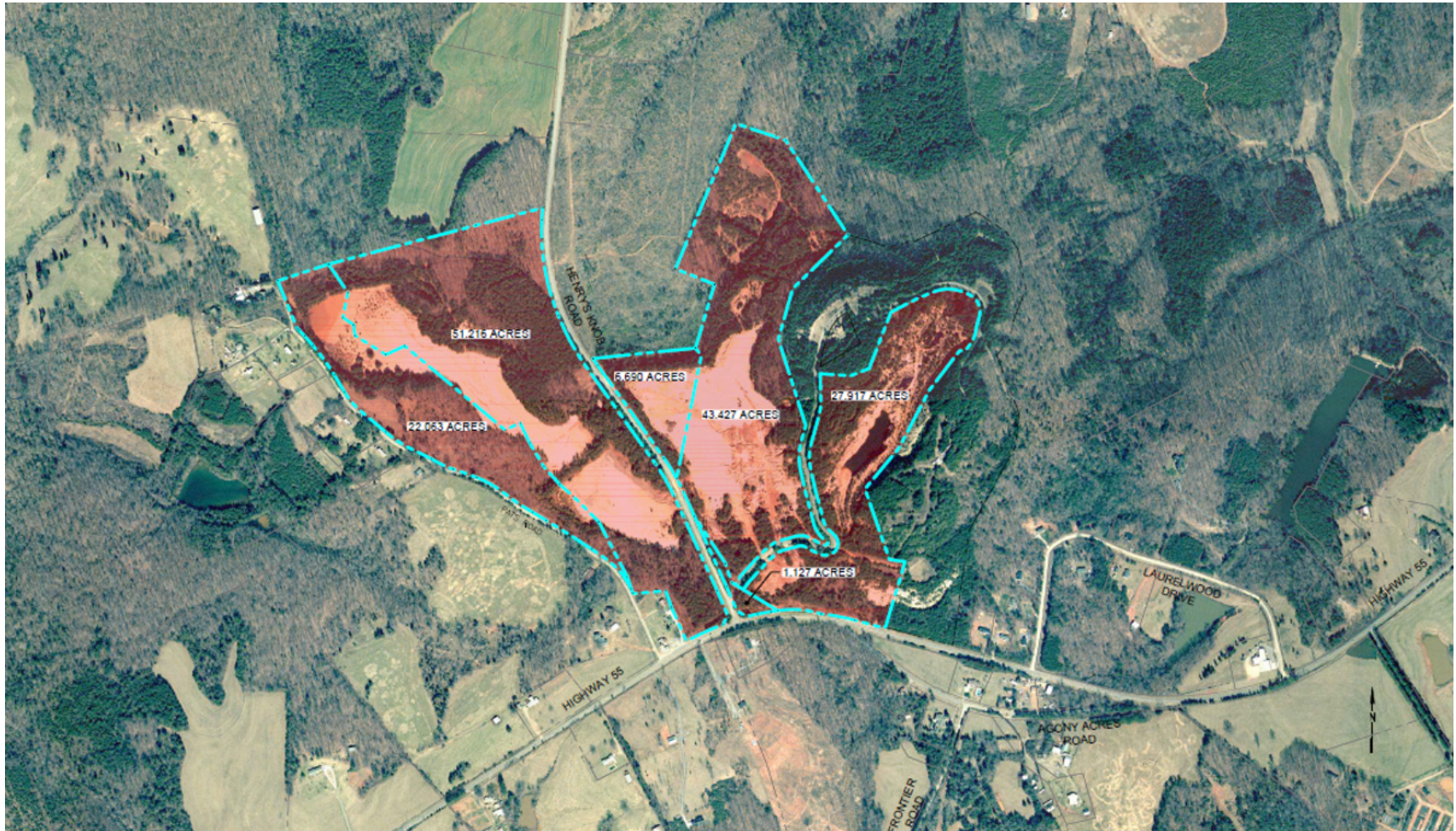


**2012**



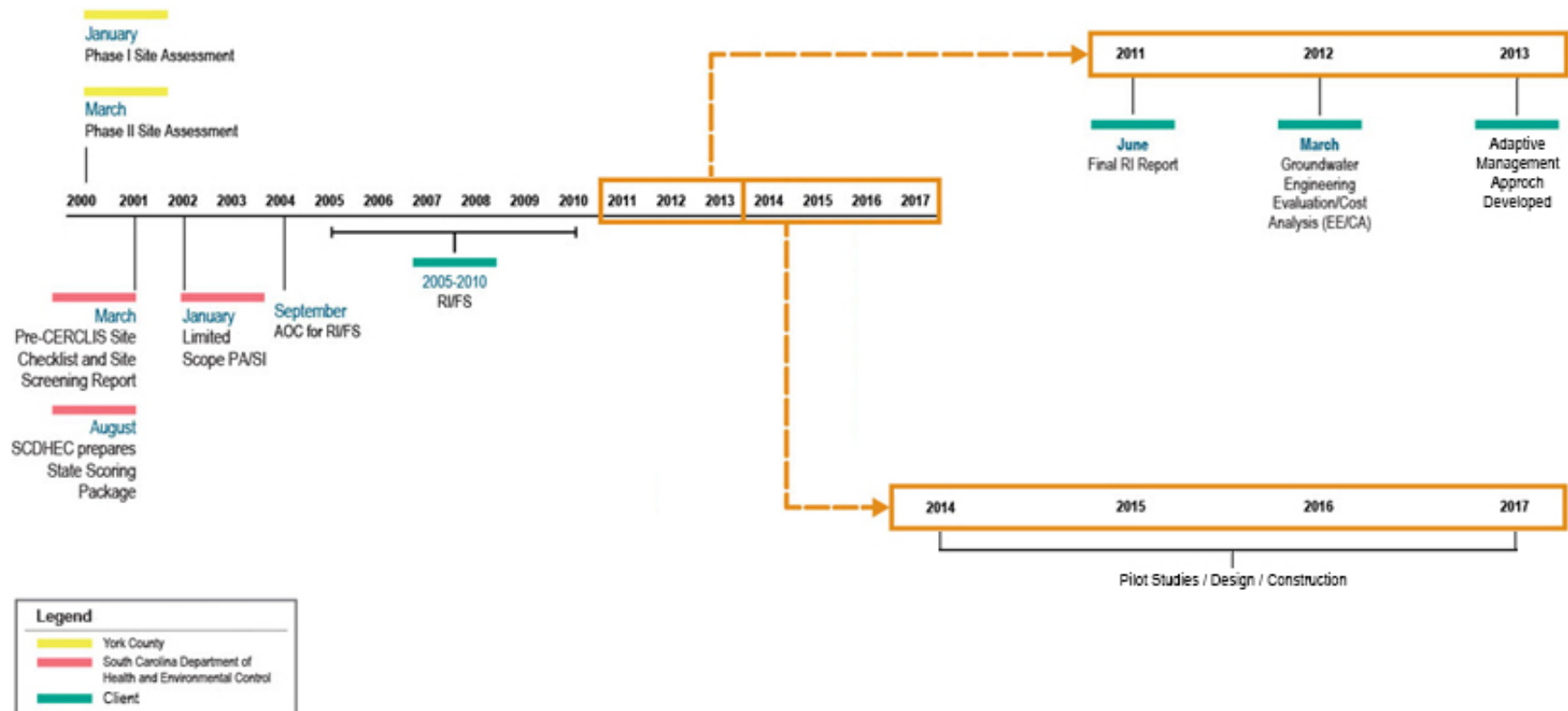


# Henry Knob Client Owned Property



# Henry Knob Regulatory History

Figure 3-9 Regulatory Timeline - (parties indicated with color coding)





# What got us started toward revitalization?

- ▶ Large-scale erosion of tailings
- ▶ Breaches of impoundment dams allowing transport of tailings
- ▶ Stability concerns associated with impoundment dams
- ▶ Site was an eyesore in the community







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# AOC 1 Pre-Revitalization







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# AOC 2 Pre-Revitalization







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## AOC 3 Pre-Revitalization







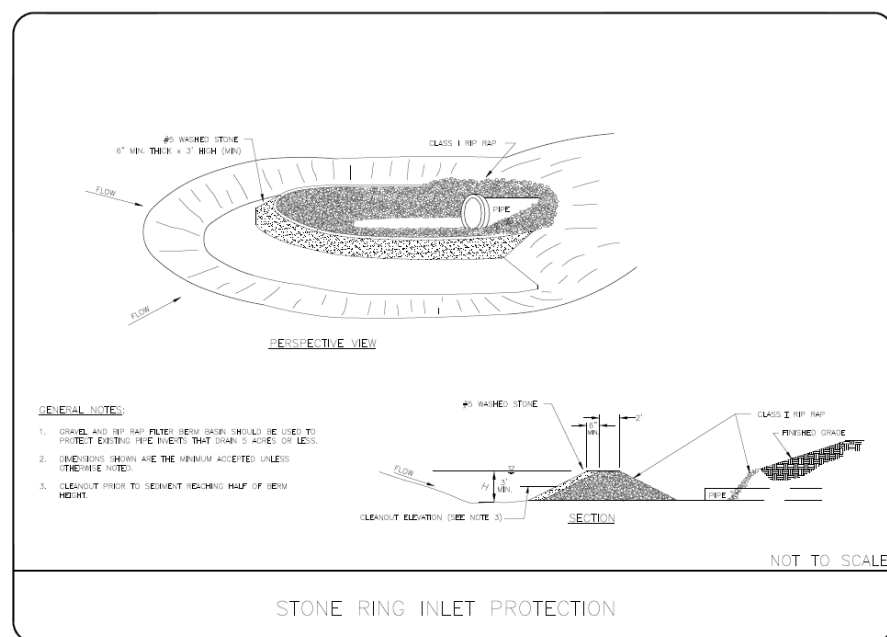
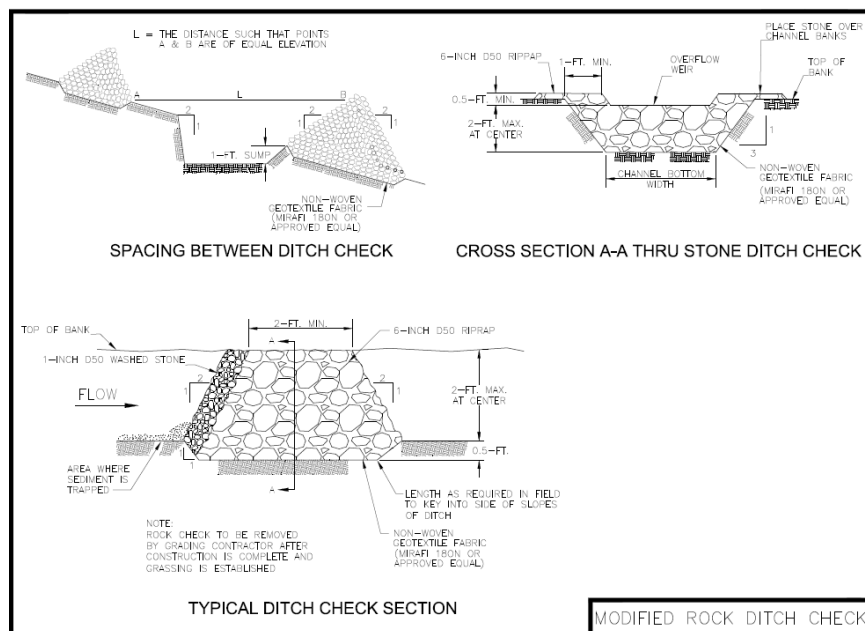
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# AOC 5 Pre-Revitalization



# Erosion – Temporary Mitigation

- ▶ Mitigate the erosion of tailings
- ▶ Installation of 50 rock check dams on AOC 5 to mitigate transport of materials from flanks of Henry Knob
- ▶ Total length of check dams approximately 1100 LF
- ▶ Accumulated sediment removed and placed on AOC 5 on an as needed basis (typically 2 time per year)





# Erosion – Temporary Mitigation

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# Henry Knob

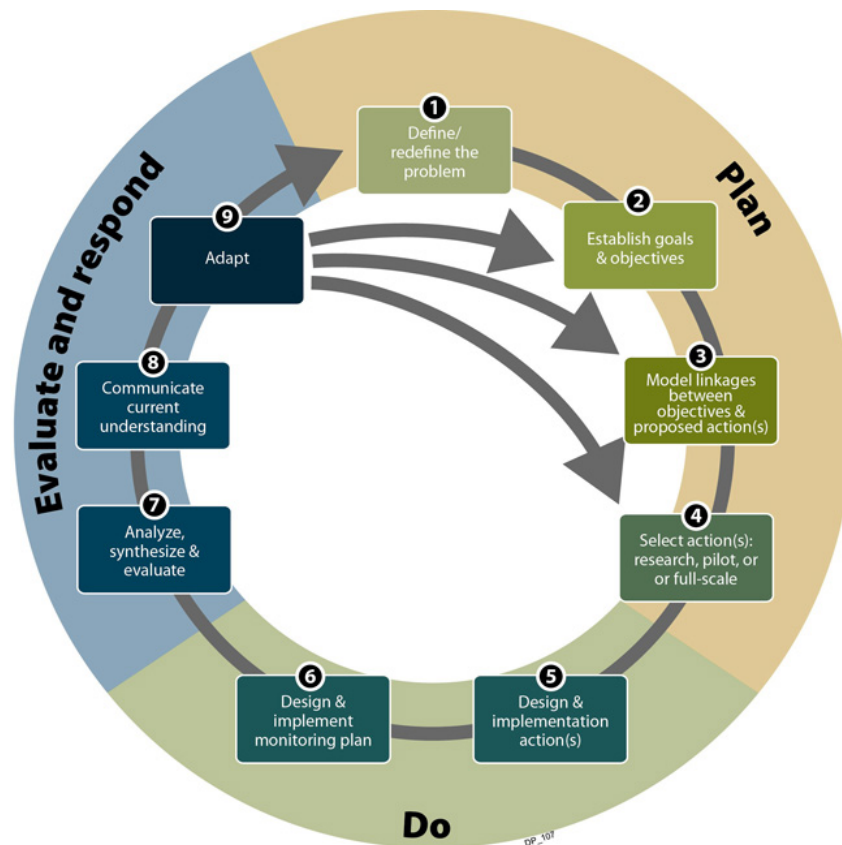
## Adaptive Management Approach

### USEPA Description:

Adaptive management is an approach to natural resource management that emphasizes learning through management where knowledge is incomplete, and when, despite inherent uncertainty, managers and policymakers must act. Unlike a traditional trial and error approach, adaptive management has explicit structure, including a careful elucidation of goals, identification of alternative management objectives and hypotheses of causation, and procedures for the collection of data followed by evaluation and reiteration. The process is iterative, and serves to reduce uncertainty, build knowledge and improve management over time in a goal-oriented and structured process.

### Site Application:

An “adaptive management” approach wherein media-specific remedies are implemented in steps and evaluated. Since 2014 site work has been focused on rehabilitation of the tailings areas (AOCs 1, 2, 3, and 5) as the first step in the “adaptive management” approach.





# Interim Measure Approach

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## Key Phrase from AOC allowed Interim Measures Prior to FS

N. Any interim removal or remedial measures (herein “Interim Measures”) conducted by Respondent during the course of the implementation of this AOC including the removal of any soil debris or other material or substance from the Site shall be subject to EPA approval and oversight pursuant to the terms and conditions of the AOC. Such Interim Measures shall be set forth in the RI/FS Work Plan, or an appropriate amendment thereto, and such Work Plan or amendment thereto shall be approved by EPA before Respondent can begin implementation of the proposed Interim Measures.

With respect to any Interim Measures proposed by Respondent under this AOC, Respondent shall also provide EPA (in the Work Plan or an amendment thereto) with a proposal for Site control upon completion of the measure consistent with Section § 300.415(k) of the NCP. Upon EPA approval, Respondent shall implement such control and shall provide EPA with documentation of all Site control arrangements.