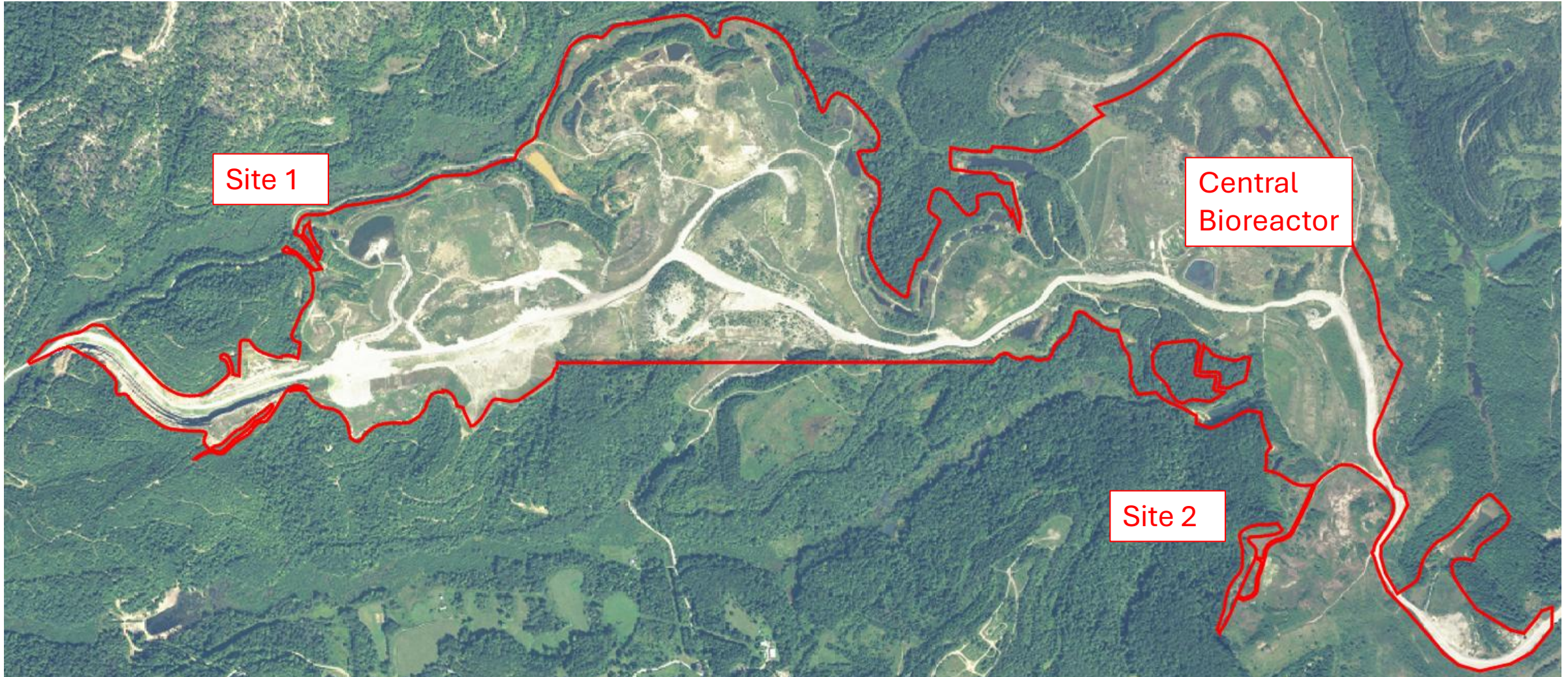


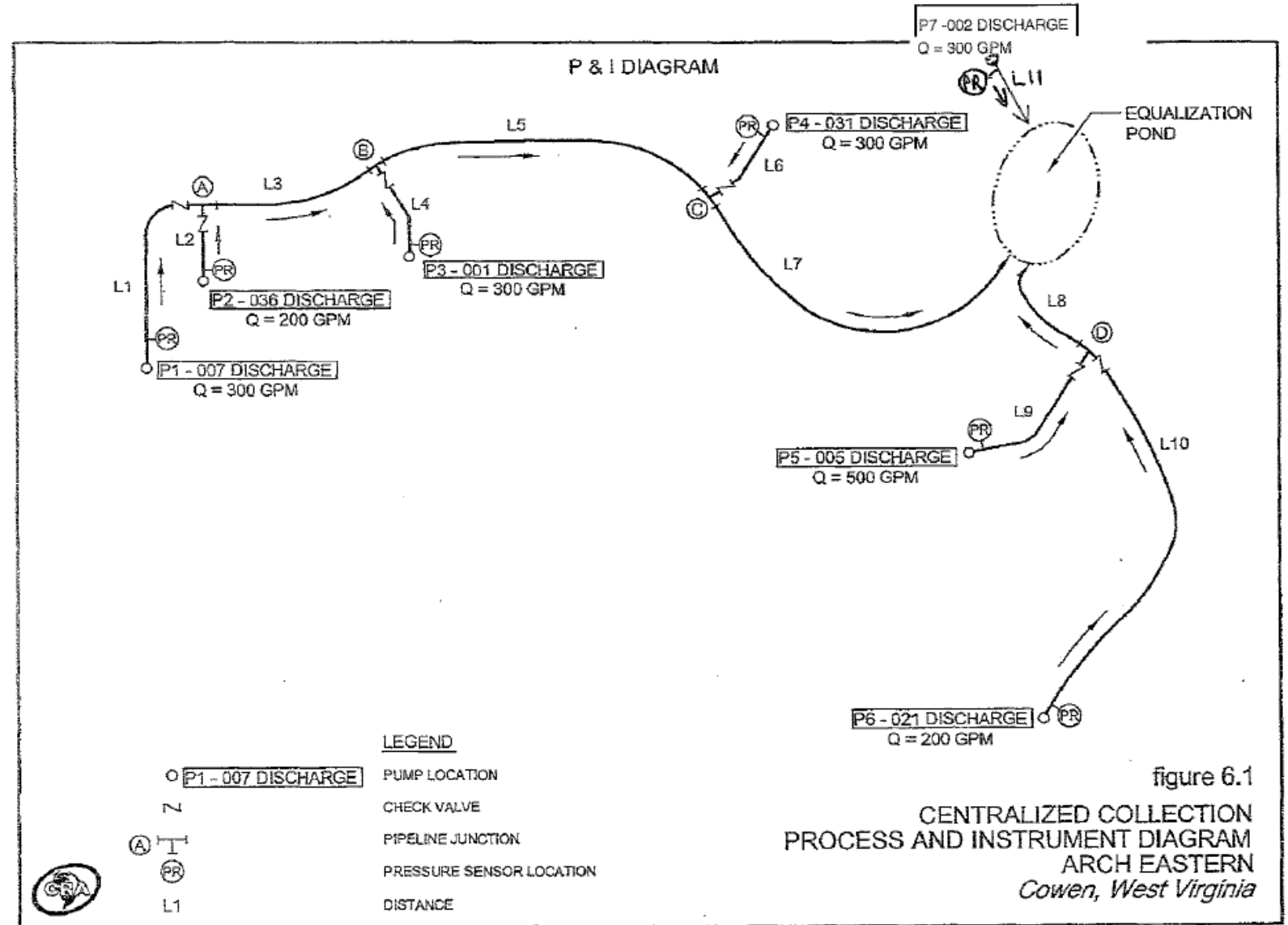
Localized Treatment vs. Central Water Management

Operation One

- Located in Cowen, WV
- Active mining at the Surface Mine ceased in 2012. The finished regrade and drainage was submitted and approved in 2014.

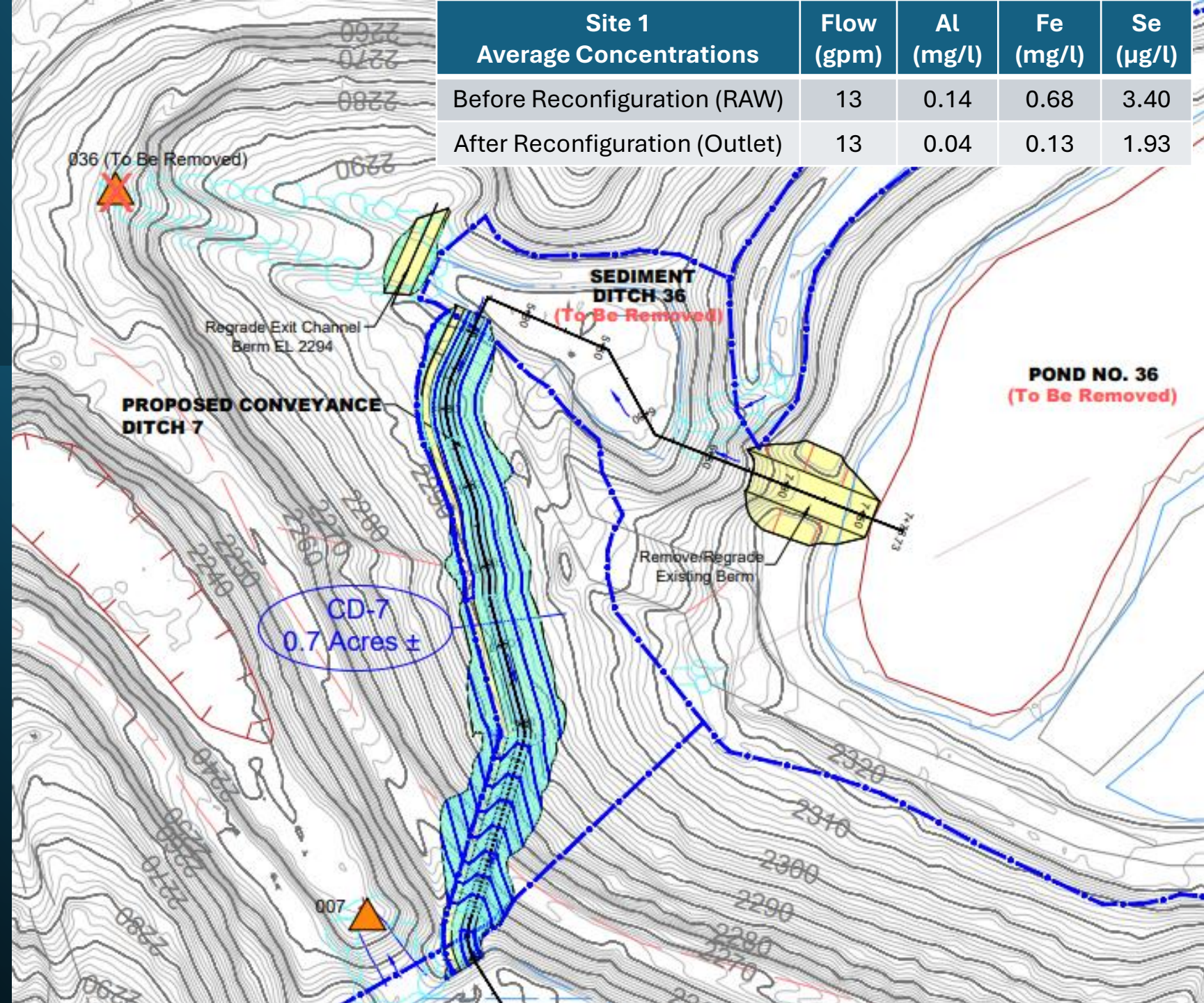


Central Bioreactor and Pumping



Site 1

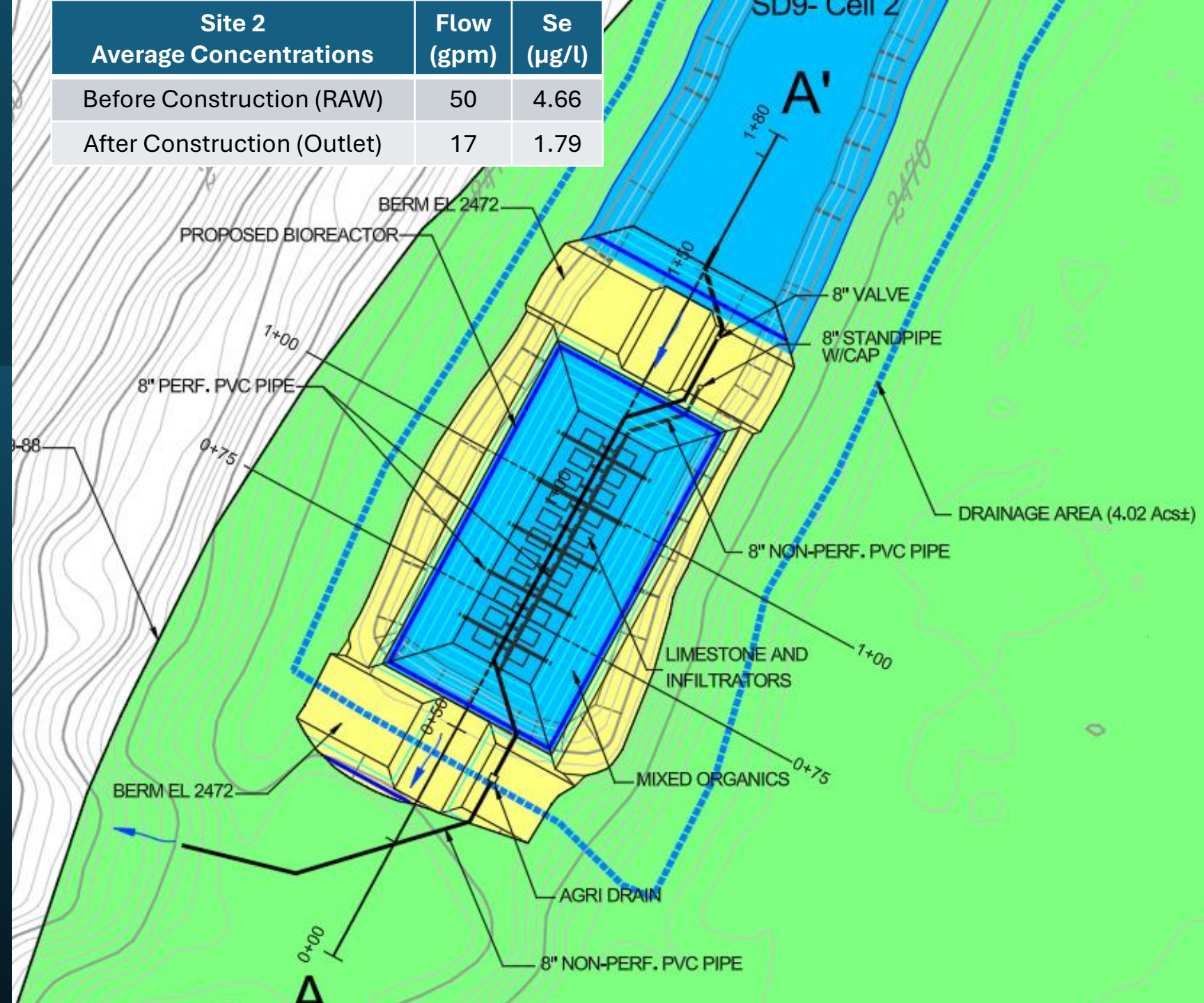
Site 1 Average Concentrations	Flow (gpm)	Al (mg/l)	Fe (mg/l)	Se ($\mu\text{g/l}$)
Before Reconfiguration (RAW)	13	0.14	0.68	3.40
After Reconfiguration (Outlet)	13	0.04	0.13	1.93



- Increased retention time
- Eliminated impounding capacity and removed an outlet

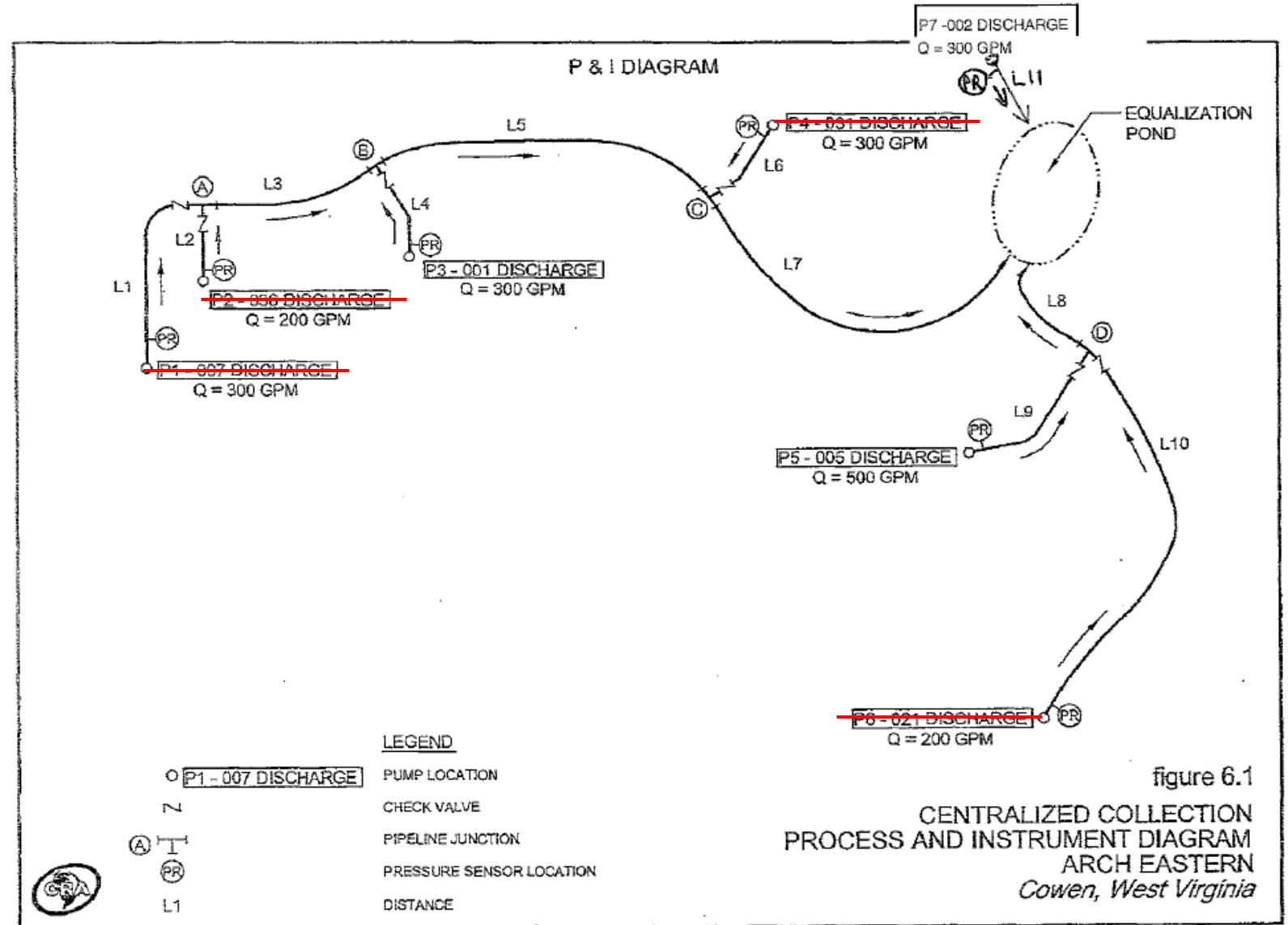
Site 2

Site 2 Average Concentrations	Flow (gpm)	Se ($\mu\text{g/l}$)
Before Construction (RAW)	50	4.66
After Construction (Outlet)	17	1.79



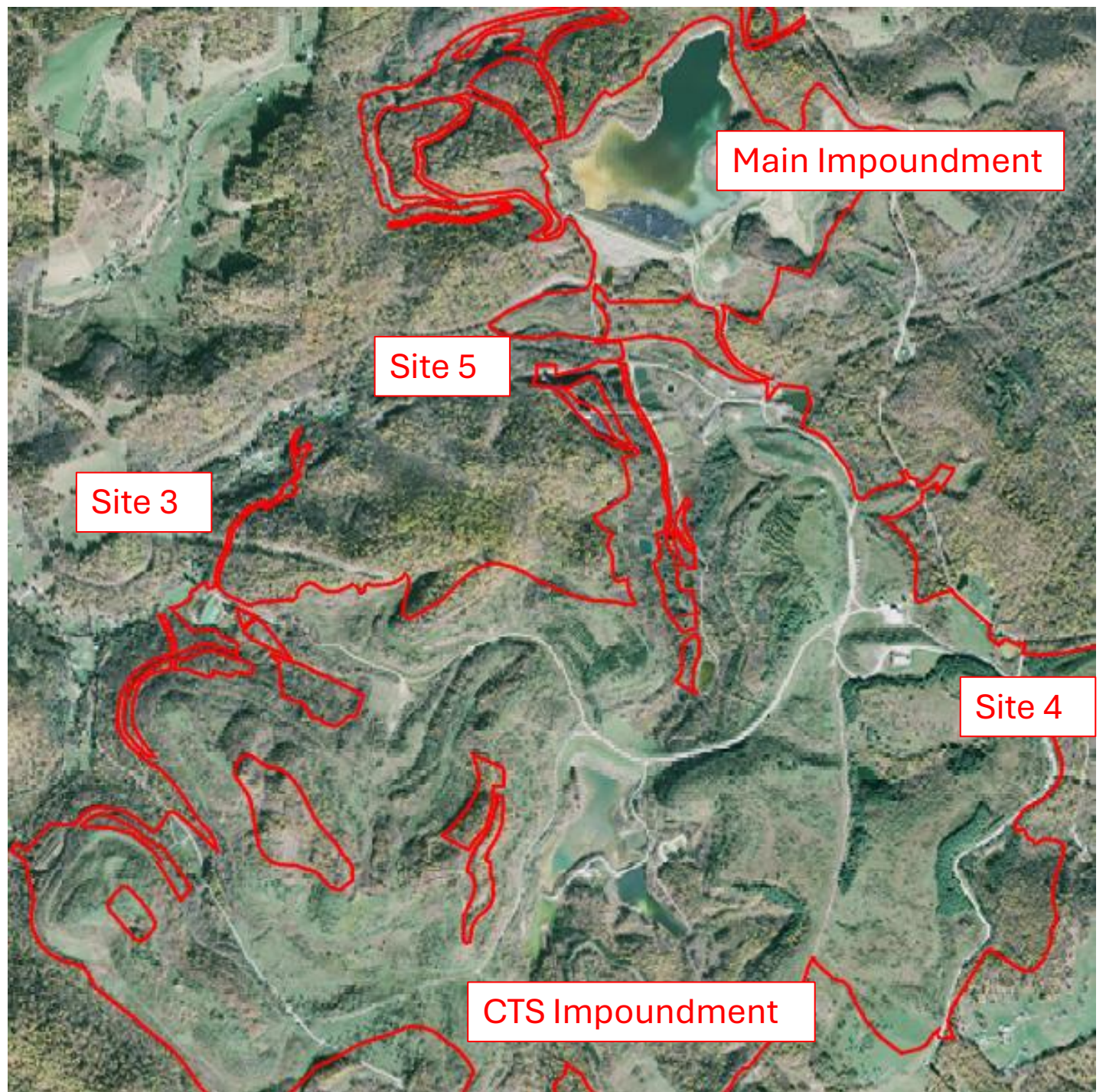
- PTS designed in existing structure

Central Bioreactor and Pumping Reduction



Operation Two

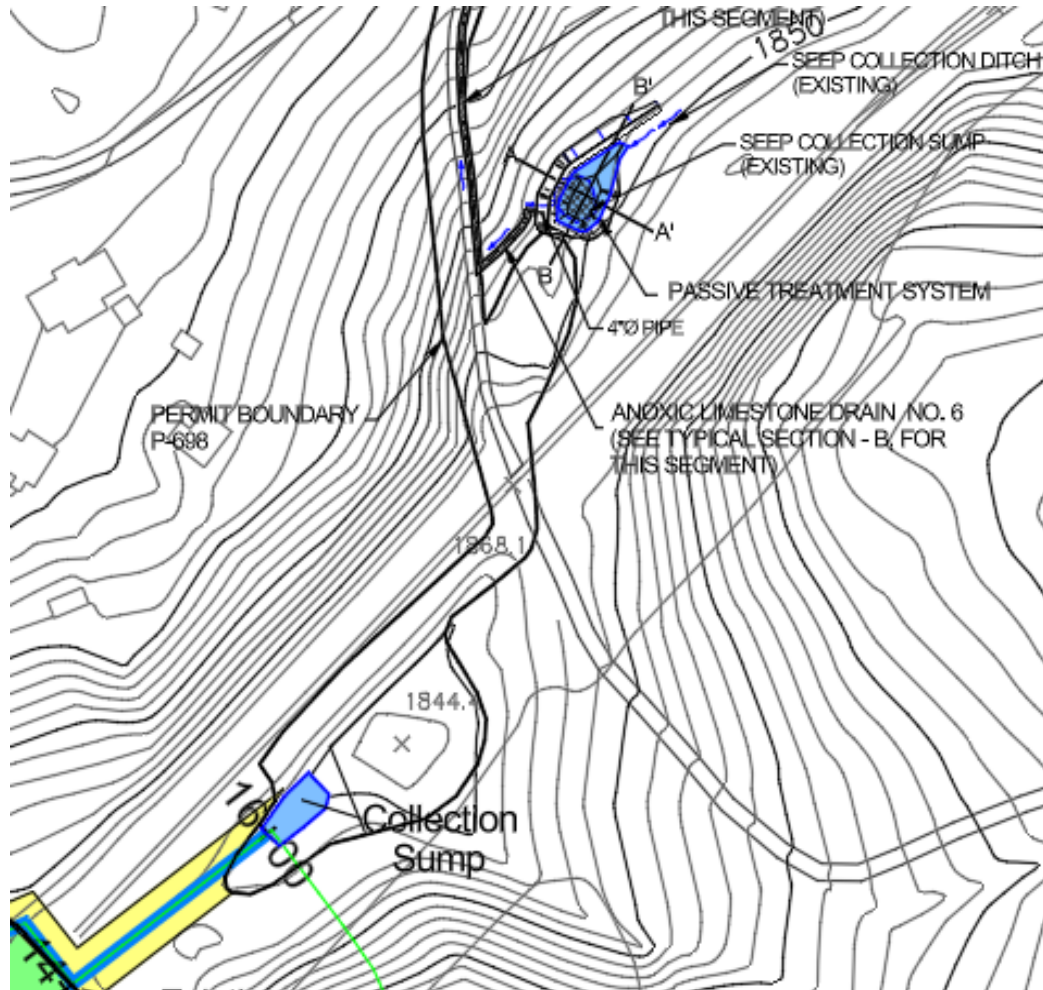
- Located in Tallmansville, WV
- The operation encompasses approx. 971 acres. Facilities on the property have been reclaimed since the mid-1980's. On-going activities on the property are those associated with reclamation maintenance and water treatment activities.



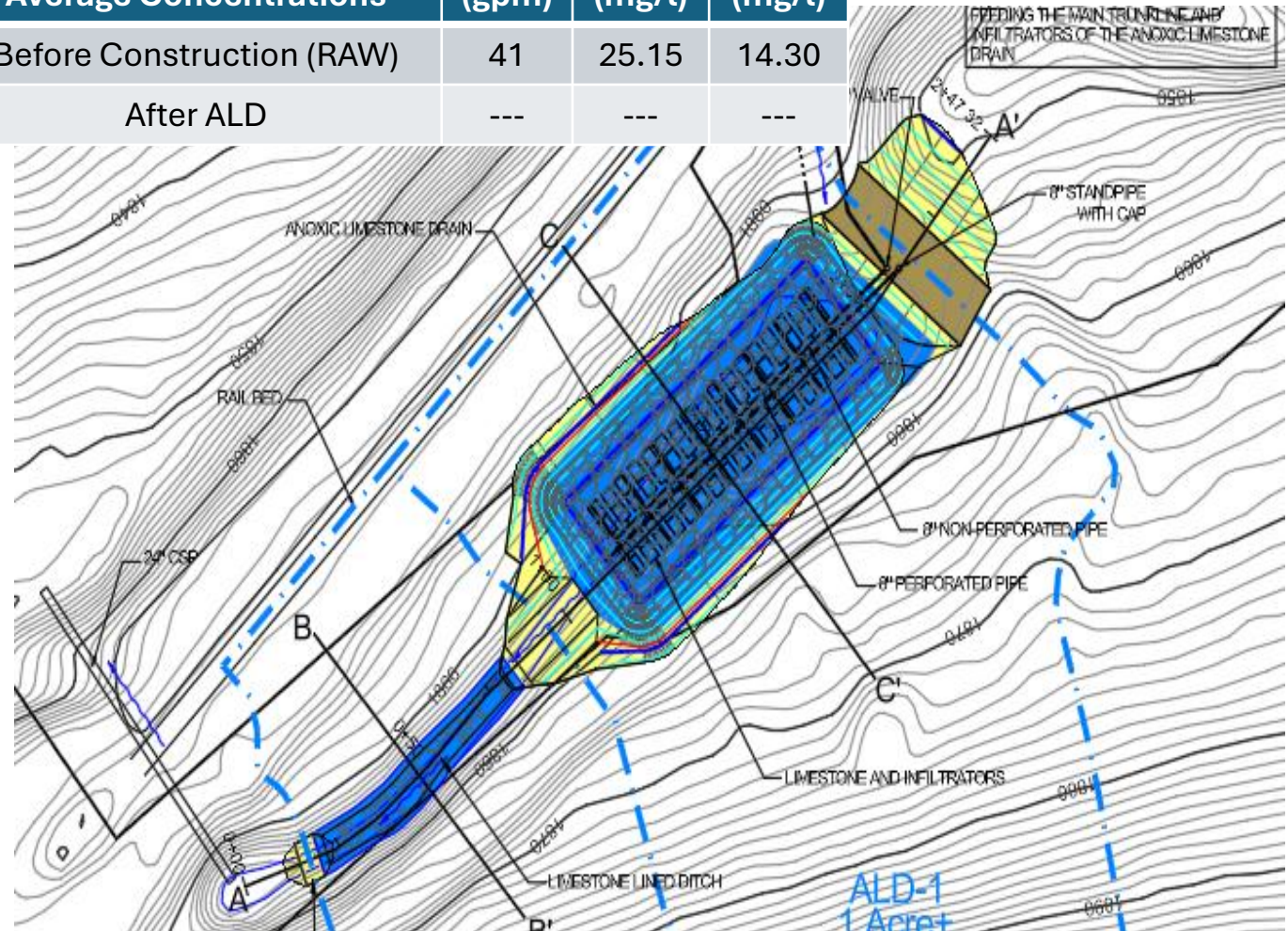
Site 3

A Passive Treatment System was designed in 2015.

In 2025, an Anoxic Limestone Drain was designed in the existing ditch



Site 3 Average Concentrations	Flow (gpm)	Al (mg/l)	Fe (mg/l)
Before Construction (RAW)	41	25.15	14.30
After ALD	---	---	---

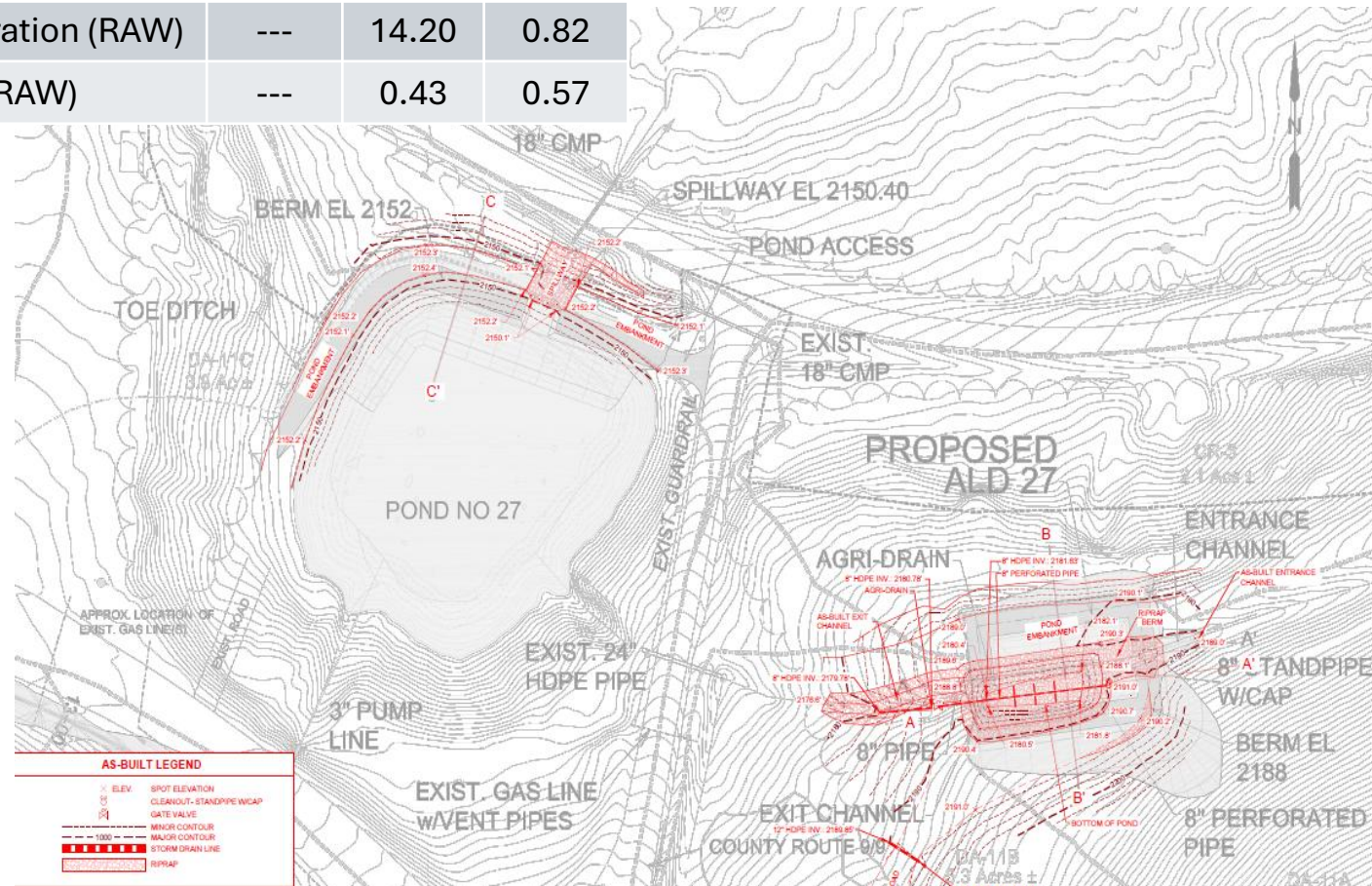
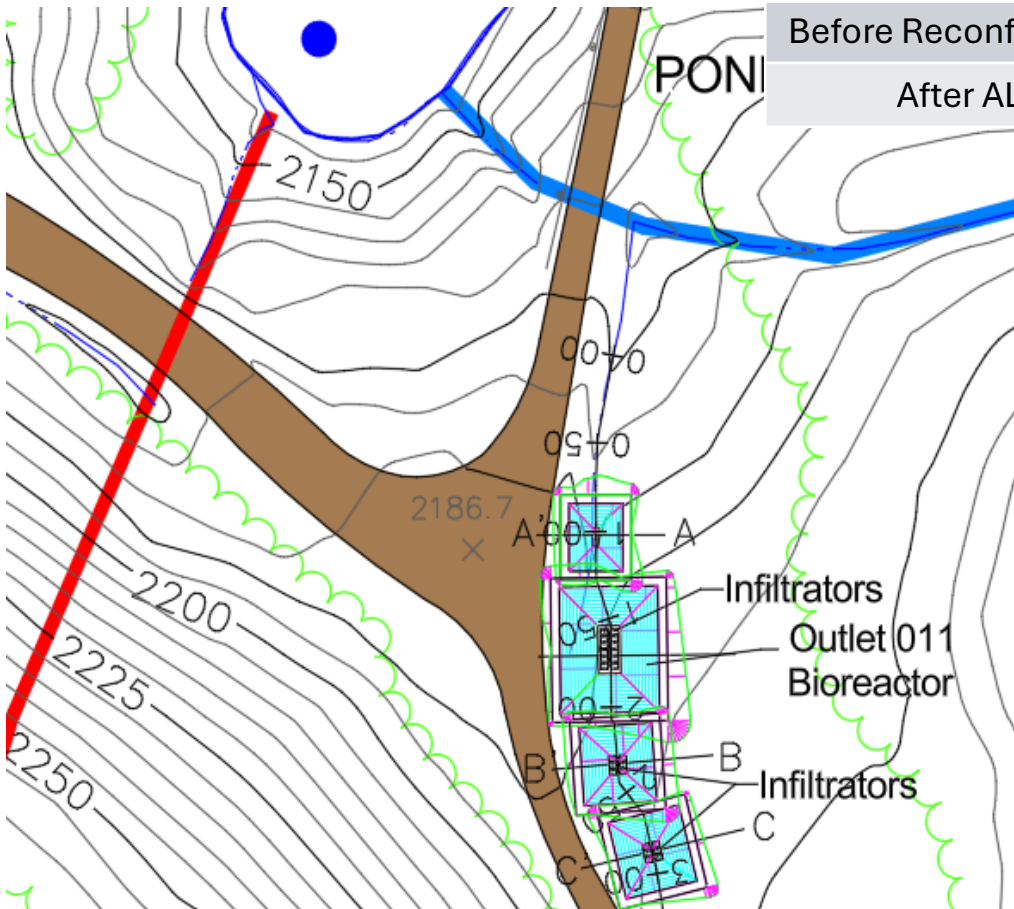


ALD-1
1 Acre-ft

Site 4

Average Aluminum and Iron Concentrations

Site 4 Average Concentrations	Flow (gpm)	Al (mg/l)	Fe (mg/l)
Before Reconfiguration (RAW)	---	14.20	0.82
After ALD (RAW)	---	0.43	0.57



AS-BUILT LEGEND

Symbol: Spot Elevation	Spot Elevation
Symbol: Clearout-Standpipe w/cap	Clearout-Standpipe w/cap
Symbol: Gate Valve	Gate Valve
Symbol: Minor Contour	Minor Contour
Symbol: Major Contour	Major Contour
Symbol: Storm Drain Line	Storm Drain Line
Symbol: R/RPAP	R/RPAP

Site 5

Average Aluminum and Iron Concentrations



Summary

Operation One

- Eliminated two outlets
- Eliminated pumping at four sites
- Reduced chemical costs by 40%

Operation Two

- Eliminated one outlet
- Reduced pumping at three sites
- Reduced chemical costs by 20%

Summary

Localized Water Treatment

PROS

- Minimizes maintenance of pumps
- Reduces perpetual costs
- Reduces liability of pumping and pump line malfunction

CONS

- Can be expensive to design and construct
- Structure Maintenance
- Additional monitoring of functionality of system

Centralized Water Management

PROS

- Reduces possible non-compliant discharge
- Reduces monitoring individual systems
- Smaller footprint

CONS

- Continuous Monitoring of Pumps and Pump Lines
- Continuous Maintenance of Pumps and Pump Lines
- Electric and Fuel Costs

Any Questions???

