Bunker Hill Superfund Central Treatment Plant

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Background

- Historic mining in the Silver Valley has taken place since late 1800's
- The Central Treatment Plant was constructed in 1974 by Bunker Hill Mine
- In 1983 Bunker Hill was listed on the National Priorities List
- In 1995 EPA took over CTP operations
- In 2021 CTP upgrades/GCS construction was complete and operations and maintenance was transferred from EPA to IDEQ

Location



WASHINGTON

Plant Operations

- IDEQ is in the final year of a 4-year O&M contract with FCI. This contract is currently in the middle of the bidding process and will be awarded by May 2025.
- Very few major issues since assuming operations.
- Under the current contract a crew is onsite daily from 6 a.m.-2 p.m. and staff is on call 24/7/365. Five-man crew plus a process engineer and contract manager.

System Upgrade

- The CTP/GWCS upgrade was complete and transferred to IDEQ October 2021.
- The CTP treats water from the Kellogg Tunnel and the GCS, typical flows range 2,000-3,000 gpm depending on the time of year and runoff conditions.
- The upgraded system has the capacity to treat 8,000 gpm if required.
- The upgraded system was designed to operate as a high-density sludge system.



Process Flow Overview

- pH is adjusted to 9.8 in the Reactor tanks, which are agitated and aerated.
- Material then flows to the clarifier where flocculant is added and is thickened to a target density of 8%.
- The thickened underflow then goes to the thickener for further solid/liquid separation, the target density at the step is 25%.
- Thickened solids are recycled through the process to the reactors or wasted to the SIA.
- Overflow liquid from the clarifier is sent through the filter package to further remove solids before the effluent is released into the river through the outfall dissipator.

Upgraded Plant Layout



CTP Overview



Bunker Hill Mine



BH Mine AMD Characteristics

F Laura	000 0 700 mm
Flow	800 - 6,700 gpm
рН	2.0 - 4.0
Cadmium	0.4 - 2.5 mg/L
Lead	0.8 - 3.0 mg/L
Zinc	200 - 1,400 mg/L
Iron	80 - 900 mg/l
Manganese	30 - 230 mg/L
Lime Demand	4 - 40 lb/ 1,000 gal



Groundwater Collection System



Groundwater Cut-off Wall

- A sub-surface soil bentonite cutoff wall (7,800 linear feet averaging 28 feet deep). The maximum depth is 41 feet deep.
- 1,100 Tons of Bentonite used
- Constructed in fall 2018 with two gaps to allow groundwater flow until extraction wells constructed.
- In 2020 the gaps in the wall were closed and pumping from the extraction wells began.



Extraction Wells

- Nine extraction wells to capture contaminated groundwater from behind the wall.
- Variable frequency drive pumps to allow flexibility in pumping rates.
- Redundant pipelines to convey the groundwater to the CTP for treatment and assure that the flow will not be stopped due to plugging or other issues.
- 3 emergency backup generators



Reactors





Filter Package



New Sludge Impoundment Area



Lined Pond



Optimization

- We continue to look for ways to optimize equipment, time and funds.
- One way we are accomplishing this is by only operating one reactor as practical to reduce power consumption, maintenance as the flows that we are seeing are much lower than the plant capacity.
- Tested lowering pH to reduce operating costs but increasing turbidities and manganese in the effluent proved to be prohibitive.

Plant Performance

Monitoring Period	PARAMETER	Influent Loading			Effluont		
		Kellogg Tunnel (KT)	GWCS	Combined (GWCS + KT)	Loading	Removal Efficiency	
Month		Average	Average	Average	Average	Average	Unit
	Total Suspende						
	Solids (TSS)	1232	106	1338	33.60	97.1	%
	Total Zinc						
	Zn	787	72	859	1.02	99.9	%
Average	Total Lead						
	Pb	7.01	0.04	7.05	0.08	98.8	%
	Total Cadmium						
	Cd	1.52	0.95	2.48	0.03	98.8	%
	Total Phosphor						
		0.17	7.84	8.01	0.19	97.5	%



Plant Performance

- Total water treated in 2024 was 1,085,330,000 gallons.
- Of this 51.5% (558,690,000 gallons) was mine water.
- Total lime consumption in 2024 was 1,171 tons.
- Average pH of mine water is 2-3, groundwater is 5-6 and effluent is 9.
- Total cost of O&M in 2024 ~\$2 million

Upcoming Projects

- The lime silo and control system will need to be updated
- Planning for addition sludge storage
- Clarifier maintenance

Thickener Cleanout



Pigging





Original Sludge Pond



