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# Anchor Hill Pit Transfer System

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# Anchor Hill Pit Transfer System



Jake Oliver and Justin Marsh  
SeaMont Engineering  
April 25th, 2019



# Introduction

- ↳ Gilt Edge Mine in Lawrence County, South Dakota
- ↳ EPA declared Superfund Site
- ↳ Anchor Hill Pit
  - ↳ Located in the Gilt Edge Mine
  - ↳ Contains Acid Rock Drainage (ARD) from mine tailings
  - ↳ Contaminated water presents threat of seepage into groundwater
- ↳ Goal of the project: Water Transfer System
  - ↳ Be able to reduce the amount of contaminated water in the pit
  - ↳ Transfer water to the nearby water treatment plant for redistribution into the environment

# Existing Project Conditions and Facilities



# Available and Gathered Data and Information

- ↓ CDM Smith Memorandum
- ↓ EPA Third Five-Year Review Report
- ↓ CDM Federal Programs Remedial Action Contracts
  - ↪ Soil Borrow Investigation
  - ↪ Rock Borrow Area Investigation
- ↓ Topographical plan in AutoCAD from Tetra Tech

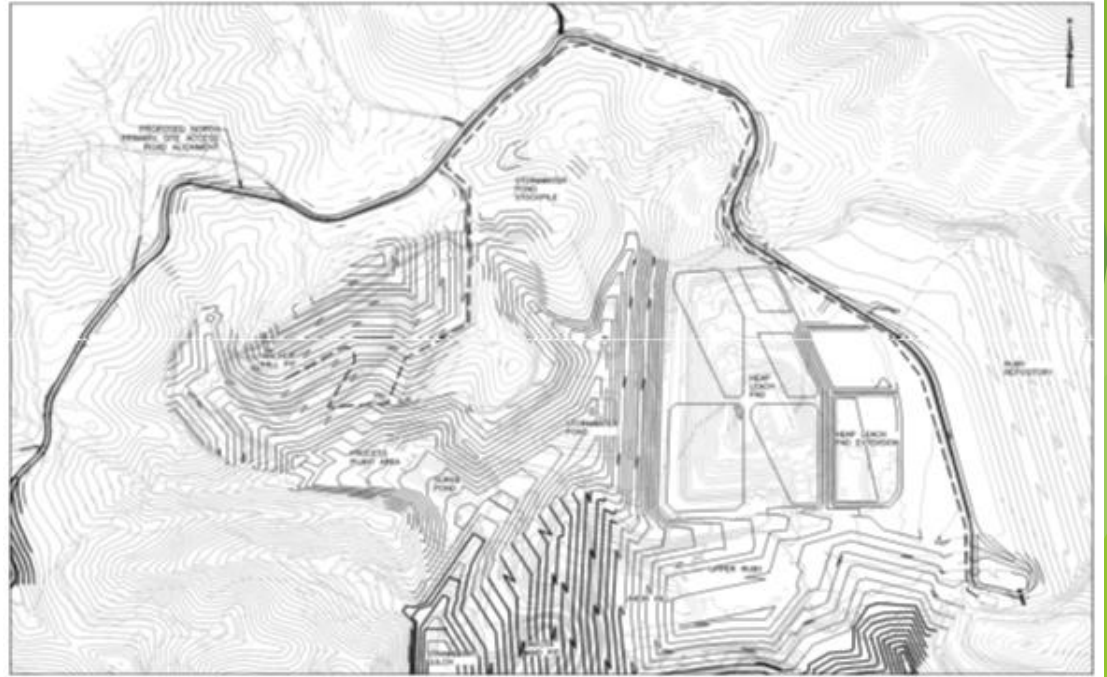


# Design Criteria

- ↳ EPA Goals
  - ↳ Prevent exposure of humans and environment to contaminants
  - ↳ Reduce ARD water flow
  - ↳ Treat ARD contaminated water to reduce toxicity
  - ↳ Integrate water treatment with overall reclamation activities
- ↳ CDM Smith Memorandum
  - ↳ Pipeline
    - ↳ Flow rate: Between 100 and 350 gpm
    - ↳ Velocity rate: Between 1 and 5 ft/s
  - ↳ Pump and pipeline material must resist acidity of water
  - ↳ Barge must support pump and withstand weather conditions
  - ↳ Pipe Bedding must stabilize pipeline

# Design Constraints

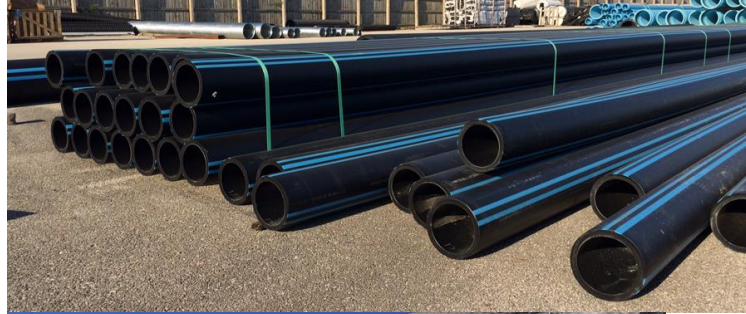
- ↵ Construction must be done outside of winter months
- ↵ Burial depth below frostline of 48 in
- ↵ Predetermined pipe pathline





# Summary of Preliminary Design Analysis (Alternatives)

- ↳ Pipe Materials
  - ↳ HDPE
  - ↳ Stainless Steel
- ↳ Pump Type
  - ↳ Positive Displacement
  - ↳ Centrifugal
- ↳ Excavation and Backfill
  - ↳ Haul in backfill
  - ↳ Procure onsite





# Recommended Alternative Description

- ↳ Pipe Material: HDPE
  - ↳ Cost effective
  - ↳ Flexible
  - ↳ Easy to install
  - ↳ Tough (resistant to corrosion)
  - ↳ Long life
- ↳ PumpType: Centrifugal
  - ↳ Self-priming
- ↳ Excavation and Backfill: Procurement Onsite
  - ↳ Cost effective
  - ↳ Time efficient
  - ↳ Satisfies soil requirements

# Recommended Alternative Technical Evaluation and Cost Estimate

## ↳ Technical Analysis

### ↳ Design head for pump

- ↳ Bernoulli's Equation:  $h_p = 412$  ft,  $P = 178$  psi, 36.5 HP
- ↳ Hazen-Williams for friction loss ( $C=120$ )
- ↳ Minor losses for valves, tees, elbows, and entry and exit

### ↳ Thrust Block for 90° elbow

- ↳ 5042 lb of pressure
- ↳ 29 psi used for safe bearing capacity
- ↳  $1.2 \text{ ft}^2$  required area for thrust block

## ↳ Total Cost of Project: \$544,400

# Environmental and Societal Impacts

- ↓ ARD contaminated water is a growing potential threat to environment and humans in the surrounding area
- ↓ Short Term Impact
  - ↪ Local wildlife disrupted
  - ↪ Potential for contamination due to machinery
- ↓ Long Term Impact
  - ↪ Minimization of ARD contaminated water onsite
  - ↪ Clean water for residence and environment downstream of the mine site

# Required Permitting

- ↴ EPA Superfund Site: No permitting needed



# Sustainability Evaluation

- ↳ Backfill
  - ↳ Native soil from excavation will be utilized
- ↳ Pipe Bedding
  - ↳ Rock Borrow Investigation
  - ↳ Will be procured onsite
- ↳ Pipe material
  - ↳ HDPE has an estimated life of over 50
  - ↳ Has potential to be made of recycled material

# Conclusion

## ↓ Project Highlights:

- ← Reduction of contaminated water in the Anchor Hill Pit
- ← Reduce potential for contaminated seepage to affect clean groundwater
- ← Fulfill EPA Superfund goals by cleaning up Gilt Edge Mine
- ← Install an underground transfer system that will allow reclamation operations to continue on the mine
- ← Clean water distributed back into the environment for wildlife and people

## ↓ Questions?