BELT ACID MINE DRAINAGE WATER TREATMENT PLANT

DEQ Montana Department of Environmental Quality

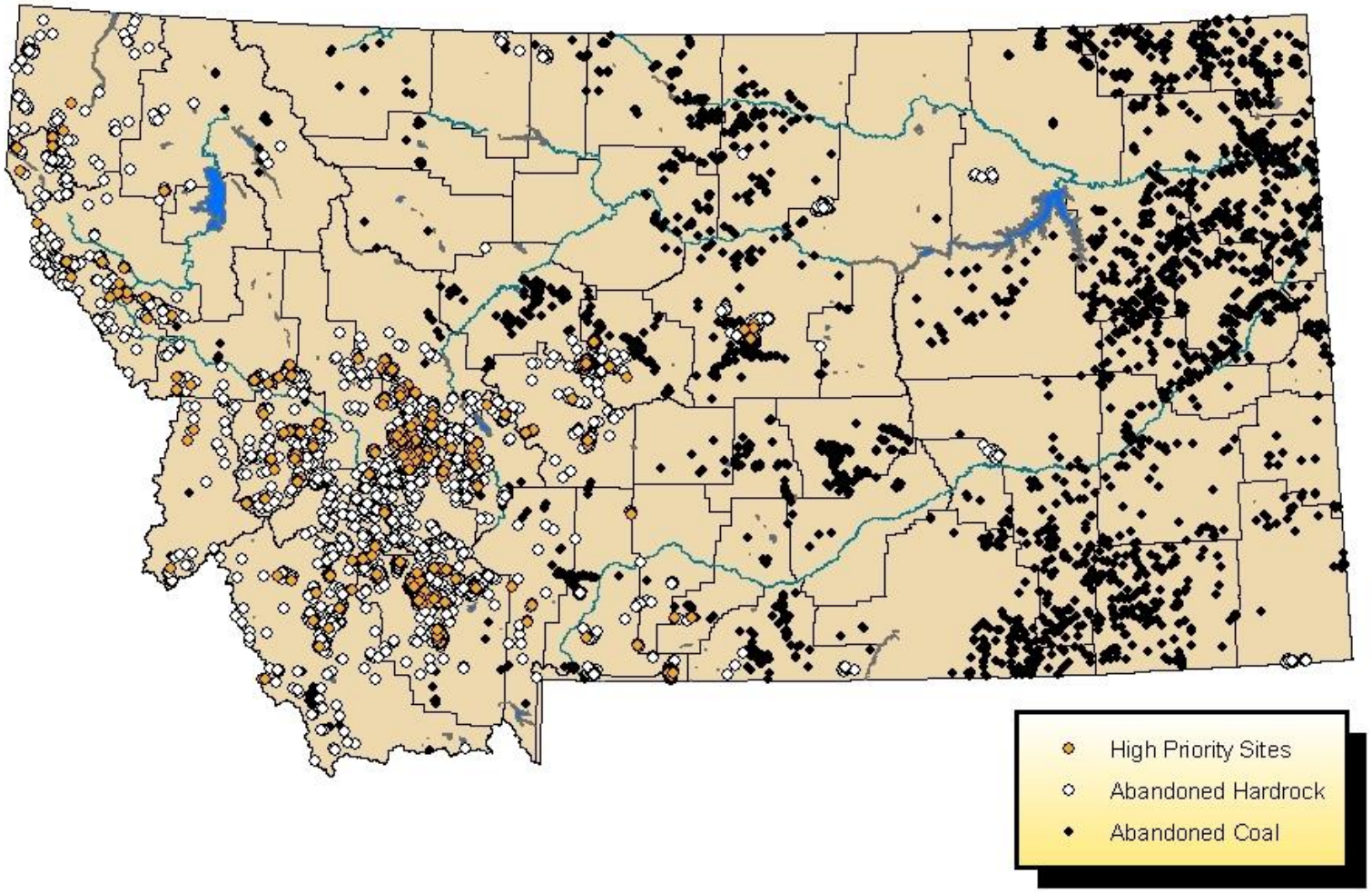
November 22, 2016 Public Meeting

BELT ACID MINE DRAINAGE WATER TREATMENT PLANT

Agenda

- ✓ Abandoned Mine Lands Program
- ✓ Background of Mining in Belt
- ✓ The Problem
- ✓ The Objective for Cleanup
- ✓ Treatment Alternatives Analysis
- ✓ Schedule
- ✓ Questions/Comments and Open House Forum

Abandoned Mines in Montana



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The Montana Abandoned Mine Lands Program

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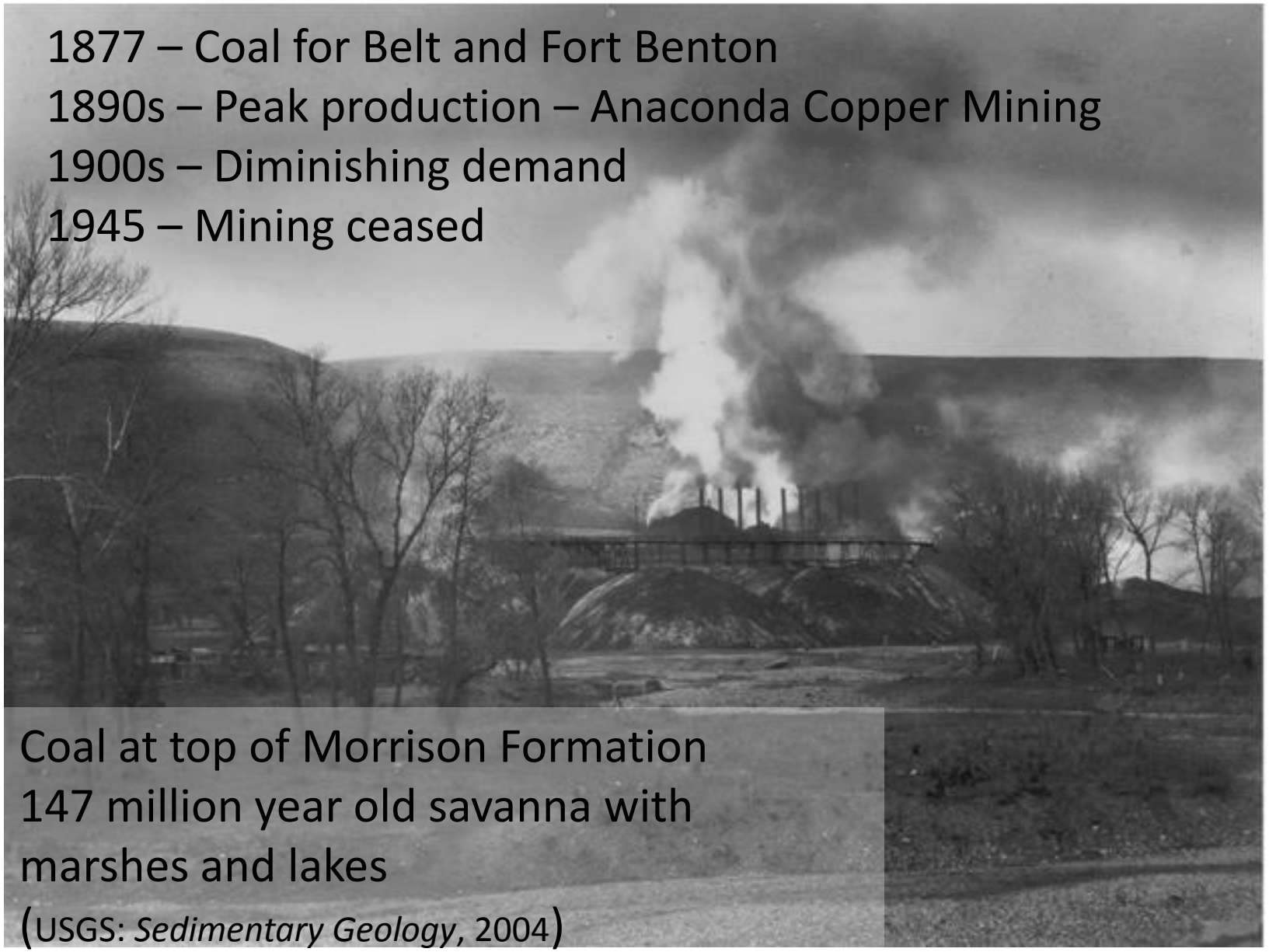
MONTANA
Abandoned Mine Lands

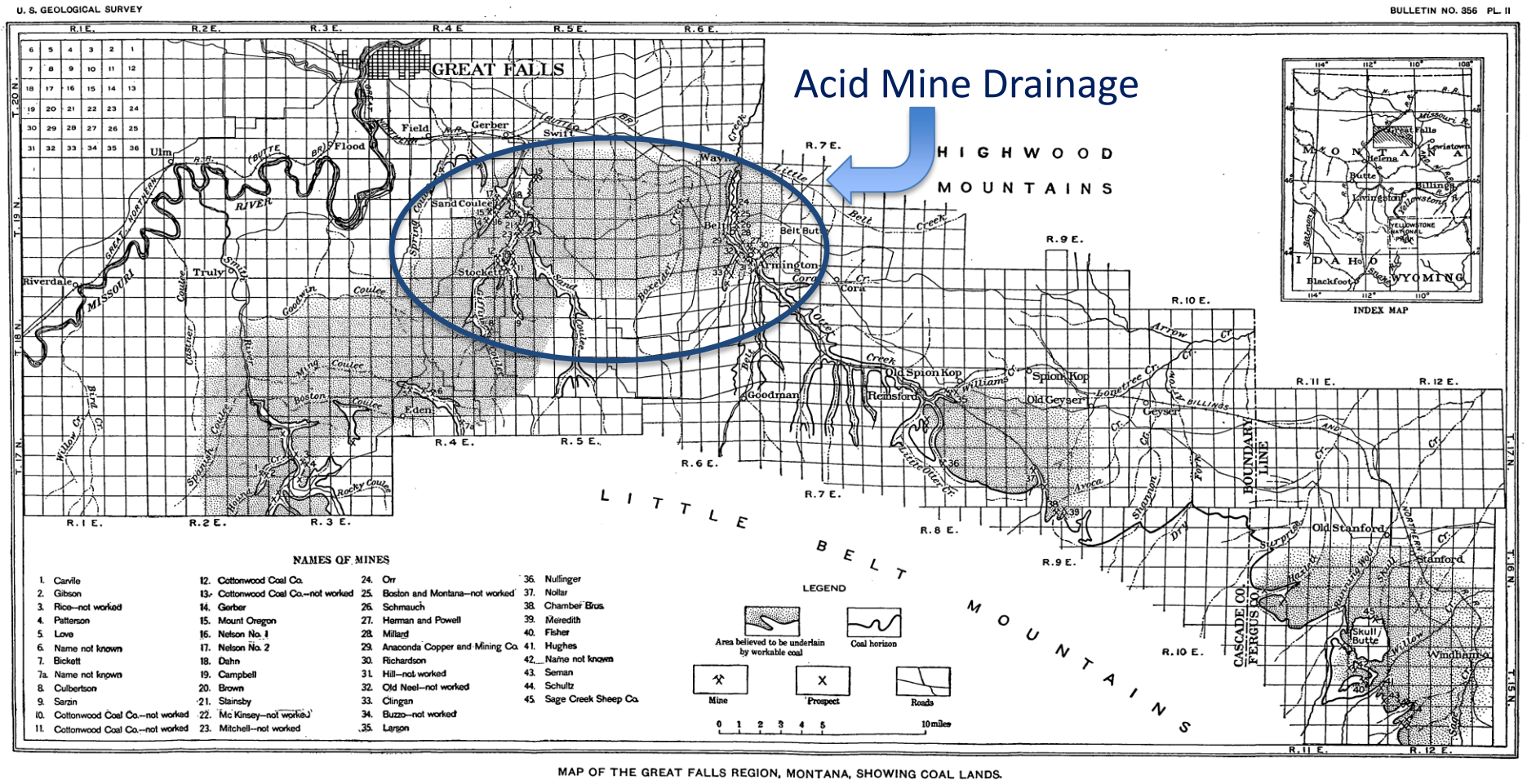
Historical Coal Mining and Coking



1877 – Coal for Belt and Fort Benton
1890s – Peak production – Anaconda Copper Mining
1900s – Diminishing demand
1945 – Mining ceased

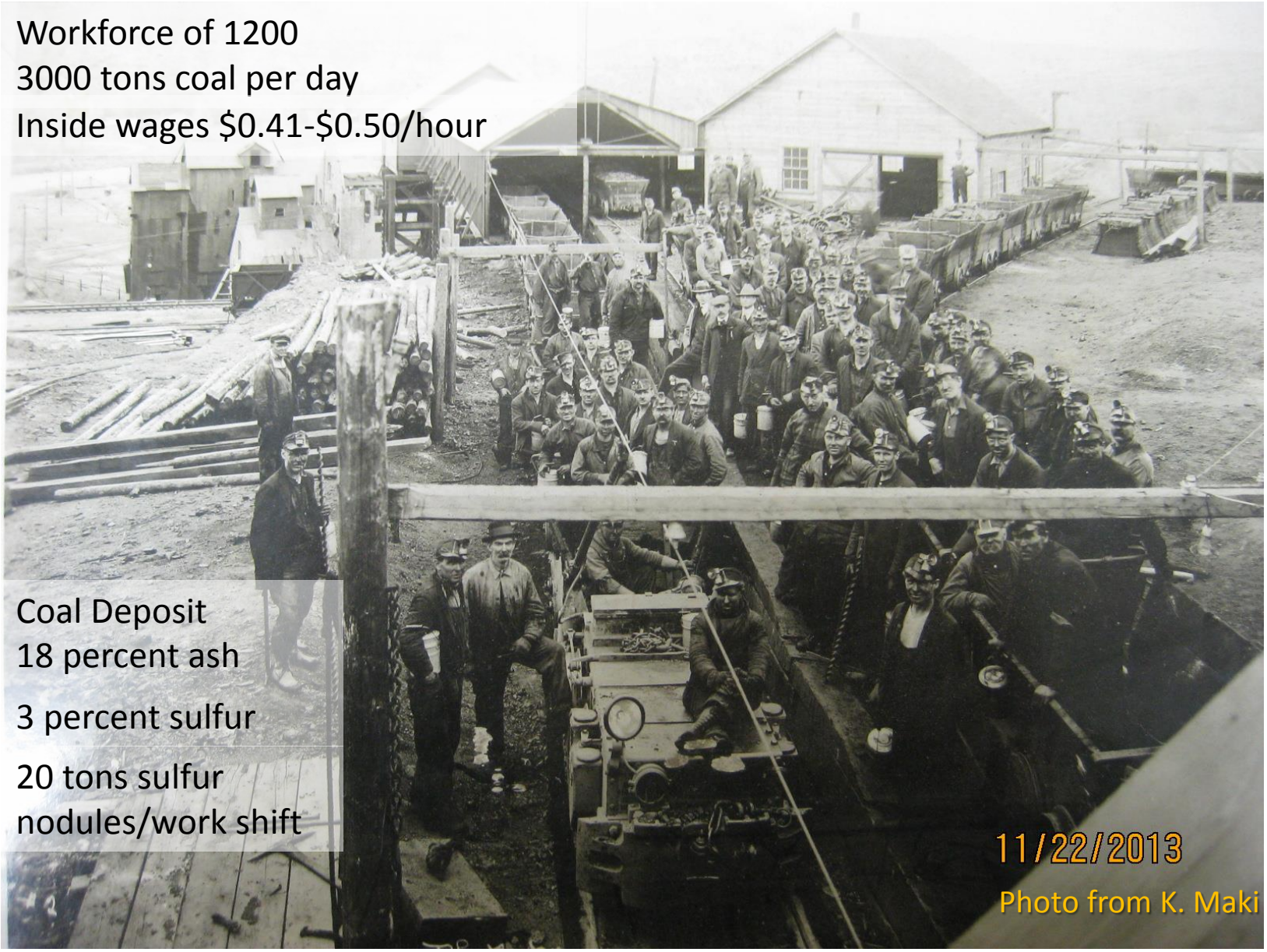
Coal at top of Morrison Formation
147 million year old savanna with marshes and lakes
(USGS: *Sedimentary Geology*, 2004)

Great Falls Coal Field



MAP OF THE GREAT FALLS REGION, MONTANA, SHOWING COAL LANDS.

Anaconda Belt Mine



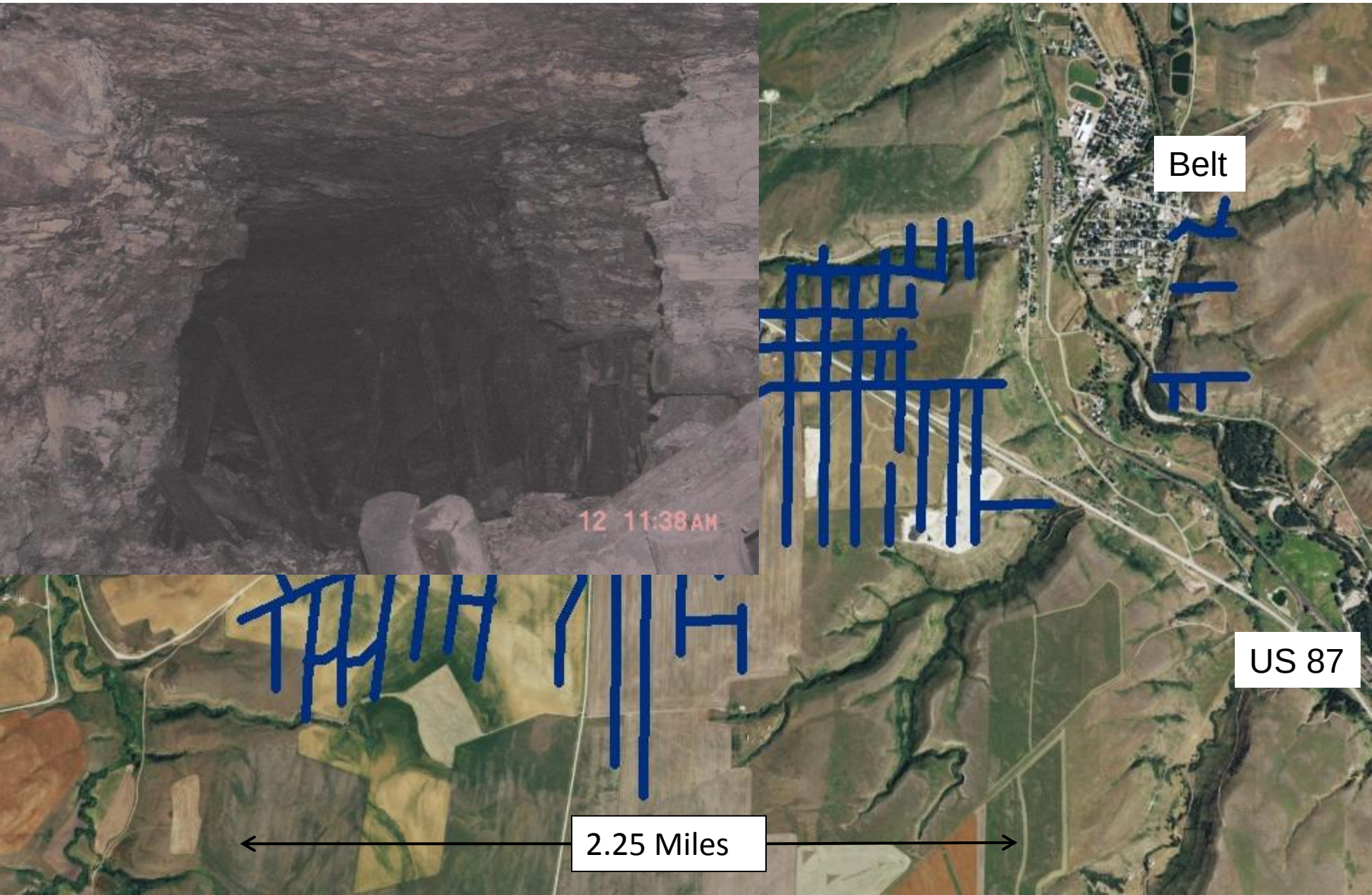
Chemistry Of Pyrite Weathering: The Acid-Forming Process

Summary Reaction For Pyrite Weathering

Pyrite + Oxygen + Water $\rightarrow$ Iron Hydroxide + Sulfuric Acid

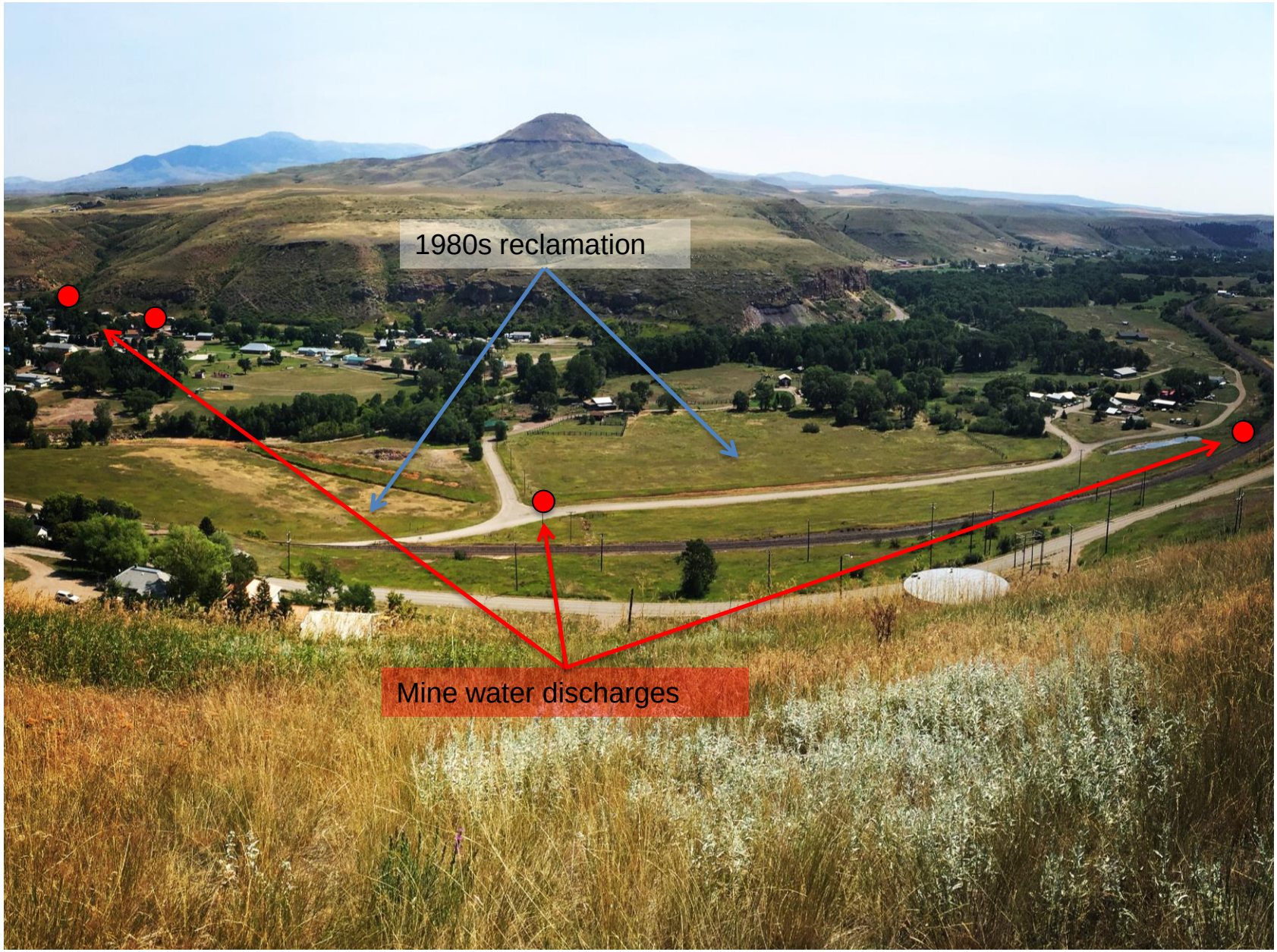
$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \rightarrow Fe(OH)_3 + 2\ H_2SO_4$

Anaconda Belt Mine Workings



Coke Oven Flats Prior to 1980s Reclamation

Current Overview



Belt Creek Water Quality

Upstream of Mine Discharges

Downstream

Clean Water Act Section 303(d)
Waters that are too polluted or otherwise degraded to meet water quality standards

Lower Belt Creek is on Montana's 303(d) list
Project objective to meet water quality standards
Remove from Impaired water body list

Significant metal loading from the mines
Approx. 1000 pounds combined iron and aluminum each day

2015 Fish, Wildlife & Parks Investigation

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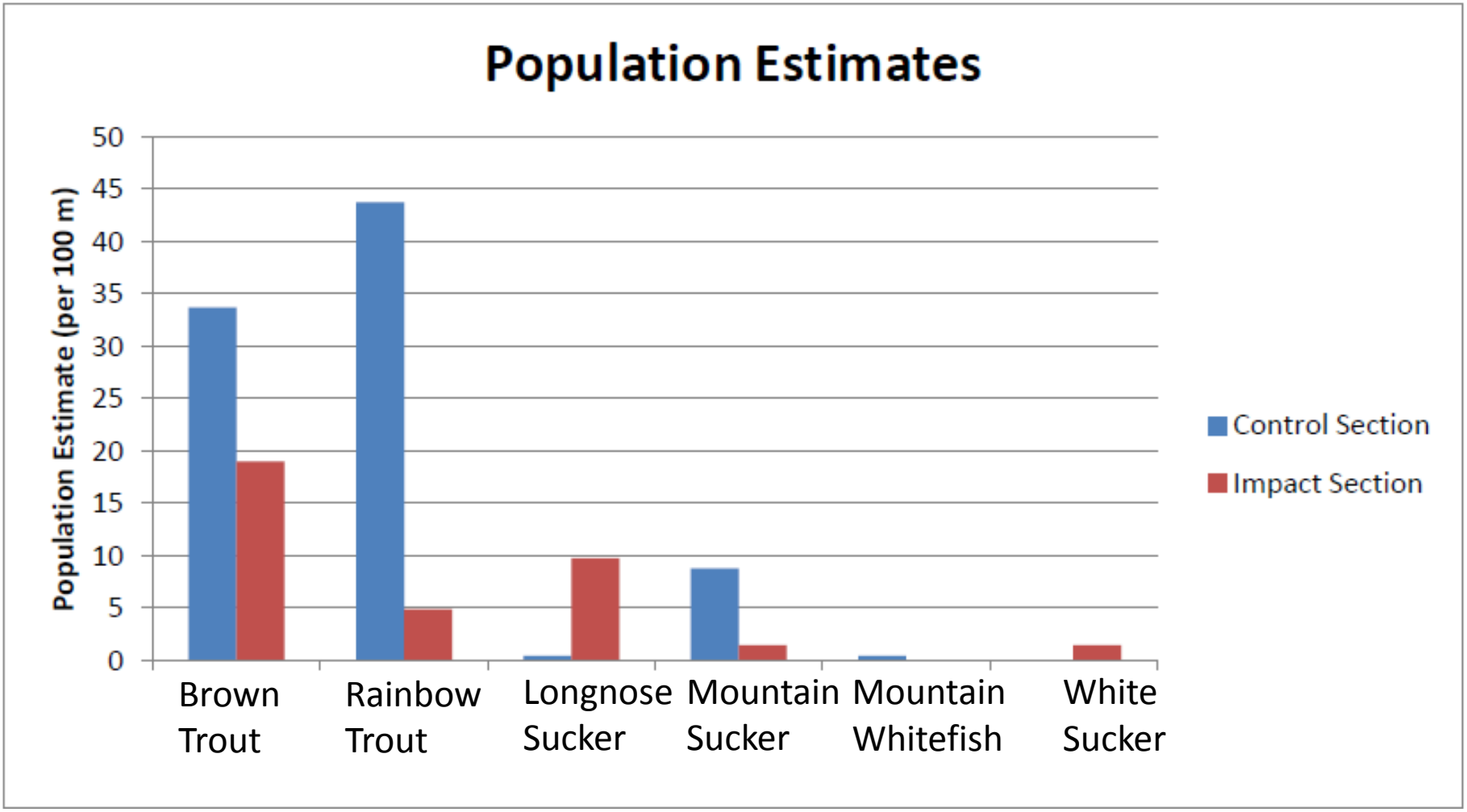

Basic Restoration Alternatives

- Source control
  - Minimize/control the water
  - Reduce the rate of acid generating reactions
- Low intensity treatment: passive treatment
  - Engineered wetlands, bioreactors
- Active treatment with long term operations and maintenance
  - Water treatment plant

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Water Treatment Project Development

- 2010: Creation of water treatment account
- 2011-2012: Water Treatment Assessment
  - Inventory 20+ discharges and prioritize water treatment
  - Belt identified as highest priority
- 2013-2016: Coke Oven Flats Investigation
  - Quantify non-point metal loading to Belt Creek
- 2014-2016: Engineering Evaluation/Cost Analysis
  - Identify preferred treatment approach in Belt and cost

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Montana Water Treatment Plants

Technical Consultations

Office of Surface Mining
Reclamation and Enforcement

Pennsylvania Bureau of
Abandoned Mine Land
Reclamation

~350 chemical water treatment plants treating coal mine discharges in Pennsylvania

Plant optimization
Treatment fund management

2016 Mine Workings Investigation

Ten 300 foot drill holes into mine workings and downhole videotaping
Assess mine openings and extent of flooded workings

Engineering Analyses

GOALS: To determine the best options for water treatment and sludge disposal.

- Steps to choose the best alternative:
  - Define the problem and the project lifetime (100-years).
  - Determine which regulations apply.
  - Identify the best technologies to solve the problems within the regulations (implementability, effectiveness, cost).
  - Compare the alternatives against each other.
  - Pick the best alternatives for treatment and sludge disposal.

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Basic Treatment Alternatives

- Treatment Alternatives:
  - Water-powered CaO addition ($7.2M)
  - **Conventional Lime Treatment**
    - **One Stage ($19.5 M)**
    - Two Stage ($23.1M)
  - Nanofiltration
    - With Brine Evaporator ($253M)
    - With Brine Chemical Treatment ($31.3M)

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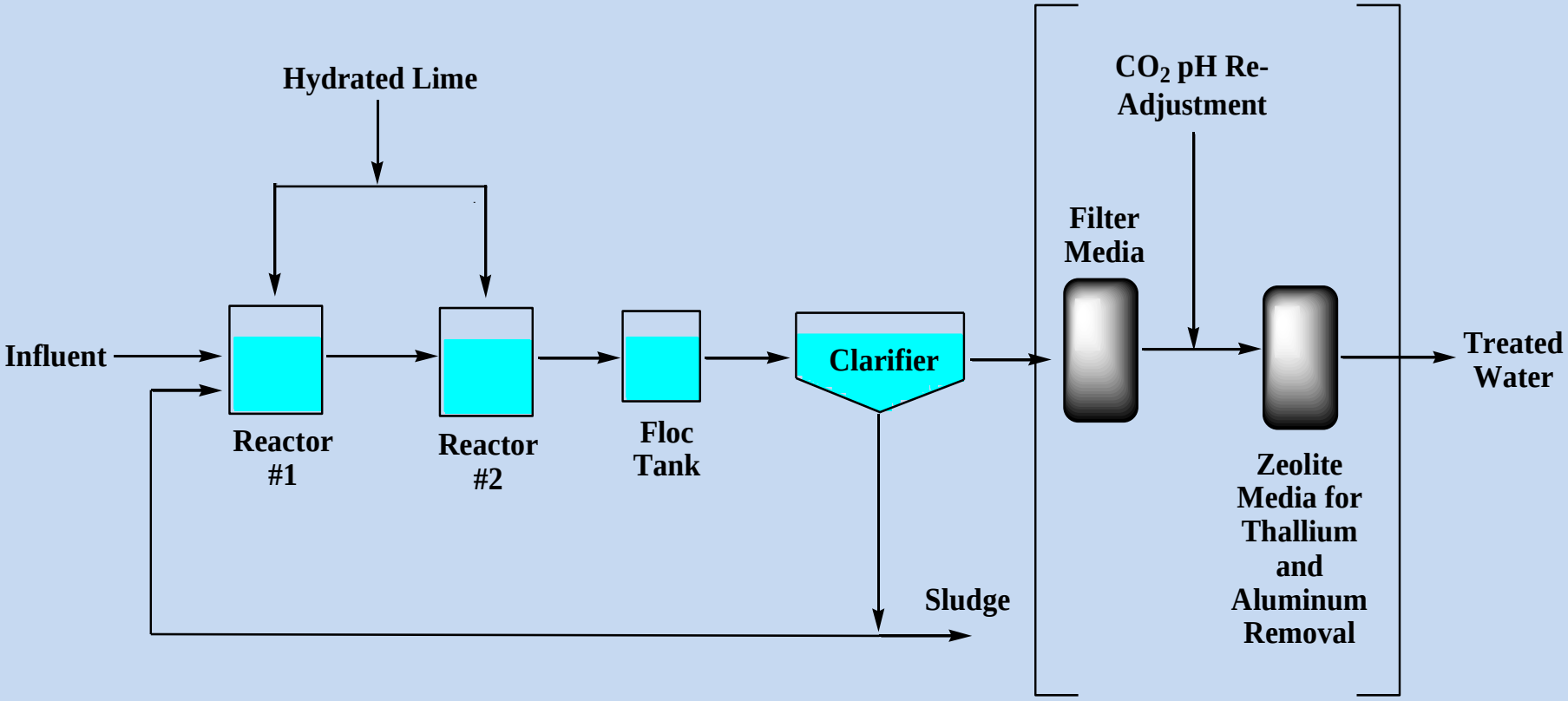
Selected: Conventional Lime Treatment



May be implemented if necessary

Conventional Lime Treatment Plant

Landusky Treatment Facility

Zortman-Landusky Swift Gulch Treatment Facility

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Basic Disposal Alternatives

- Off-Site Disposal ($1.6M at current disposal rates)
  - Filter press and truck to:
    - High Plains Landfill; or
    - Other area landfills
  - **On-Site Disposal**
    - **Construct pipeline and inject sludge into mine workings ($1.4M)**
    - Filter press sludge and disposal at DEQ-property disposal area by truck ($1.6M)

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Selected Disposal: Sludge Injection

- ***WHAT IS IT?***

  The process pumps sludge from the treatment plant through a pipeline directly into the underground mine workings pool. Typically used in eastern coal mine areas.

- This requires investigation of the workings to determine mine pool location and suitability.
- Estimated to be the cheapest alternative if viable ($1.4M).
- Does not use up landfill space.
- Does not require trucking sludge waste through town.

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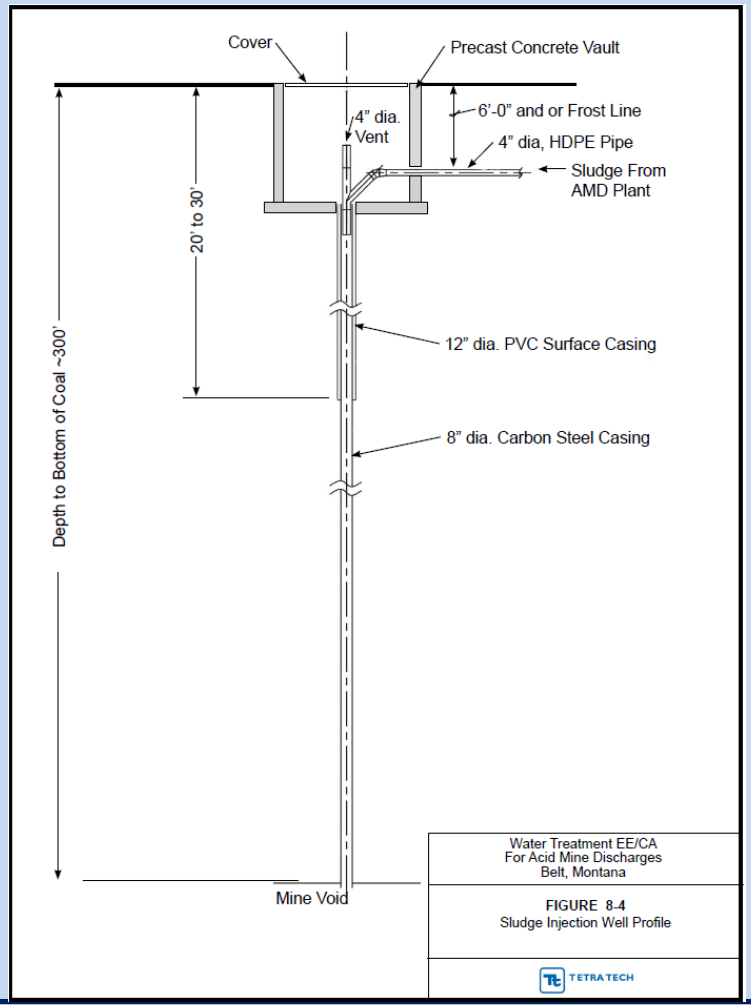
Sludge Injection

2012 Water Treatability Assessment

Precipitated metals, calcite, gypsum, unreacted lime



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Project Cost Breakdown

Total 100-Year Cost: $19.5M

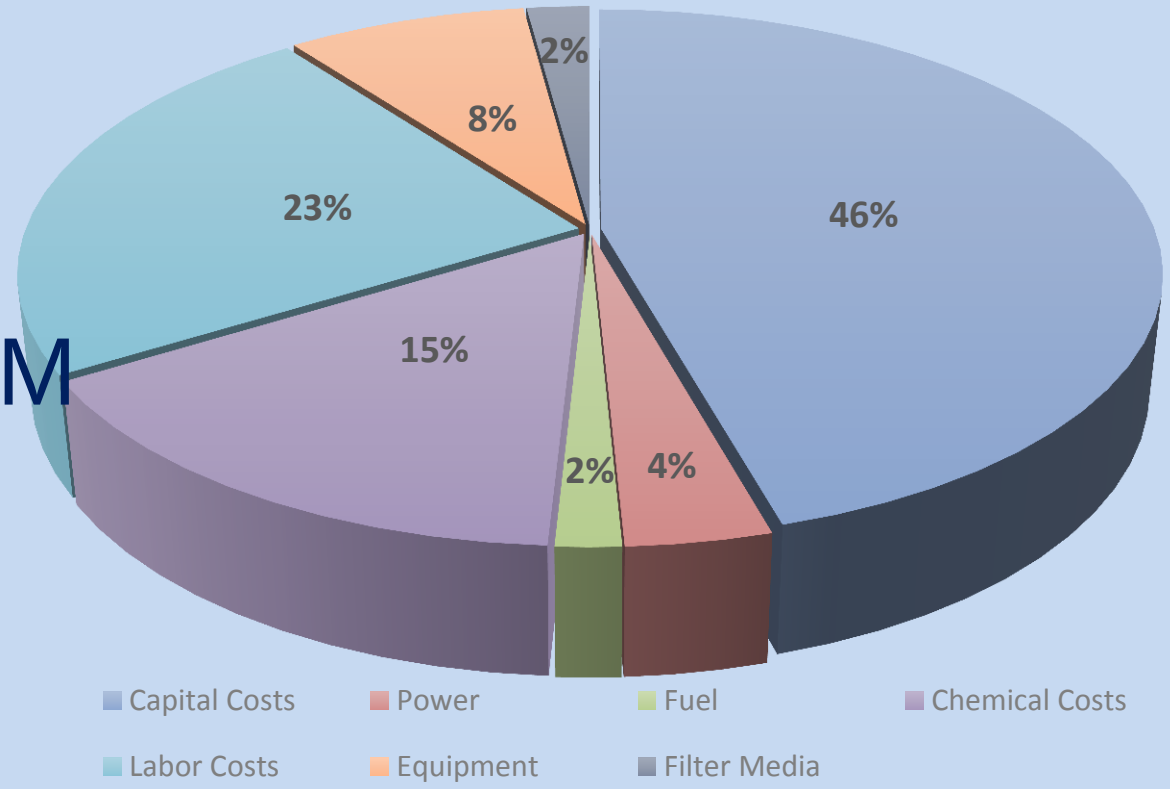
Capital: $9M

Labor: $4.6M

Chemical: $3M

Equipment: $1.6M

Other: $1.4M



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Proposed Facility Footprint

What's the Project Goal?

- **The goal is to return Belt Creek to year-round beneficial uses. These beneficial uses include:**
  - Fishery
  - Wildlife habitat
  - Recreational area for residents and tourists

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What Happens Now?

- **To-Do List:**
  - Determine if treatment plant can be built on mine waste at Coke Oven Flats.
  - Evaluate the metals loading in Belt Creek from Coke Oven Flats.
  - Determine if we can inject sludge into the mine pool.
  - Design the treatment plant and pipelines.
  - Build it all.

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Where Are We?

- **So Far:**
  - Geotechnical Investigation Complete – we can build here.
  - Loading Analysis Complete – Loading from Coke Oven Flats is minor.
  - Mine Workings Investigation is almost complete.
  - Currently evaluating use of French Coulee wetlands for a solids settling pond.
  - Preparing for treatability studies.

What's the Schedule?

- Public Comment closes January 2, 2017.
- Design begins in 2017.
- Bidding in late 2017.
- Construction begins in late 2017 or early 2018.
- Plant is operational by 2019.

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Questions

DEQ Belt Internet Page
http://deq.mt.gov/Land/abandonedmines/currentprojects/belt
- Final Draft EE/CA and previous reports
- Underground mine video
- Fact Sheet

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