GROUNDWATER REPLACEMENT

Groundwater Injury
Butte and Anaconda
Montana v. ARCO
1999 Consent Decree

- Montana Received $144 M in NRD
- $15 M for Assessment and Litigation Costs
- $127 M for damages
- $2 M in real property along Silver Bow Creek
- Plus $86 M for Silver Bow Creek Remedy
Natural Resources that:

- are owned, controlled, managed or held in trust by the State of Montana
- were injured by release of hazardous substances from ARCO or predecessor's mining and mineral processing operations
- were subject of Montana v. ARCO lawsuit

Lost Services:

- physical and biological functions performed by a resource
- includes human use of those functions
Lost Drinking Water Services

7 million gallons/day
73 Large Grants approved for $120 Million

- Anaconda-Deer Lodge = 17 for $23.7 M
- Granite = 9 for $1.2 M
- Missoula = 10 for $7.5 M
- Powell = 14 for $20.8 M
- Butte-Silver Bow = 23 for $66.3 M
Grant Projects in Silver Bow County

- 2001 - 10: Butte Water Lines = $17.4 M
- 2001 - 10: Silver Bow Creek Greenway = $23.6 M
- 2002 - 05: German Gulch Watershed = $926 K
- 2003: Basin Creek Dam = $503 K
- 2003 - 05: Duhame Acquisition = $1.67 M
- 2004: High Service Tank = $1.19 M
- 2004 - 05: Big Butte Acquisition = $688 K
- 2007 - 10: Big Hole Transmission Line = $8.72 M
- 2007: Thompson Park = $988 K
- 2008: Big Hole Dam = $3.71 M
- 2008 - 10: Children’s Fishing Pond = $1.23 M
- 2010: Big Hole Pump Station = $3.50 M

- Water = $35 M in Butte and $14 M in Anaconda
Groundwater = $40 M
- Anaconda-Deer Lodge = $10 M
- Butte-Silver Bow = $30 M

Aquatics = $40 M
- Flow = $20 M
- Tributary Restoration = $20 M

Terrestrial = $18 M

Recreation = $6.5 M
Montana v. ARCO
2008 Consent Decree

Montana Received $72.5 Million in Oct. 2008

- $4.5 M for Assessment and Litigation costs
- $68.0 M for Natural Resource Damages
  - $26.7 M for Clark Fork River
  - 13.3 M for Smelter Hill Uplands
  - $28.0 M for Butte Area One
- Plus $96.5 M for Clark Fork River Remedy
- Total: $169 Million
Figure 2. Butte Area One
<table>
<thead>
<tr>
<th>Project Category</th>
<th>Category Allocation Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper SBC Corridor Restoration</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Mine Cap Improvements/Reveg</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Stream Restoration</td>
<td>4,000,000</td>
</tr>
<tr>
<td>Water System Improvements</td>
<td>10,000,000</td>
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<tr>
<td>Storm Water</td>
<td>0</td>
</tr>
<tr>
<td>Recreation</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Small/Miscellaneous Projects</td>
<td>1,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32,000,000</strong></td>
</tr>
</tbody>
</table>
1890 Sub-division Map of Butte City by Ray and Leonard Engineering
Butte drank from its alluvial aquifer until 1893…

2006 BPSOU ROD: Table 12-11 on page 12-57: “Alluvial groundwater has not been used as municipal source in the past.”
## Water Comparison

### Drinking Water - Berkeley Pit - Parrot Tailings

<table>
<thead>
<tr>
<th>UNITS = (μg/l)</th>
<th>As</th>
<th>Cd</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drinking Water Standard</strong></td>
<td>10</td>
<td>5</td>
<td>1,300</td>
<td>15</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Berkeley Pit Water (3/14/09)</strong></td>
<td>80</td>
<td>1,833</td>
<td>71,174</td>
<td>19</td>
<td>551,154</td>
</tr>
<tr>
<td><strong>Well GS-41S Water (8/17/09)</strong></td>
<td>103</td>
<td>4,060</td>
<td>1,005,218</td>
<td>93</td>
<td>483,891</td>
</tr>
</tbody>
</table>
Butte Groundwater Restoration Plans

2012 Master Plan for $6 M:

- Complete Big Hole Transmission Line

2013 Master Plan for $24.1 M:

- Basin Creek Water Treatment Plant = $20 M + $10 M BAO
- Telemetry and Controls = $467 K
- CO2 Feed at Big Hole WTP = $182 K
- VFD and Soft Starts at Big Hole WTP = $275 K
- Basin Creek-Colorado Hill Pump Station = $1.59 M
- Water Meters = $1.59 M
- 6 Other Components if funds available = $8.3 M
Old Big Hole Dam and Pump Station
OKAY,
so, what happened in Butte, America?
Mining, right...
Lots and Lots and Lots of Mining.
Did Butte Really Want a BIG Hole in Its Back Yard?

Protest, Power, and the Pit

Vincent Ciabattari, a retired machinist for the Anaconda Company, sat in his disintegrating neighborhood talking with an out-of-town reporter. It was early 1974, and the reporter wanted to hear about Ciabattari’s experience living in one of the old ethnic communities being devoured by the Berkeley Pit. Like Meaderville, McQueen, and Finn Town before it, Ciabattari’s working-class community of East Butte was facing mine expansion, which brought blasting noise, waste dumps, and dust-kicking trucks right next to Ciabattari’s small house. The reporter described the East Butte neighborhood as “a moribund suburban wasteland.” Of the 1,160 families who had lived in the area just a few years before, Ciabattari was one of only 70 who hadn’t yet sold homes to the Anaconda Company. Although the company had given those working-class residents what many considered to be a “fair deal,” Ciabattari still wondered why they had accepted Anaconda’s offers. Why had they left their tight-knit group of friends and family, losing both their Catholic church and school? “The way this community was, you’d think the people would have got together and fought. People said they’d fight, but then they jumped,” Ciabattari mused.

Children playing in Walkerville among cracks caused by excavation of the Alice Pit in 1900.
Open Pit Dilemma: Counterbalance?

CORPORATE VIEW

• Lots of low grade ore left (2/3)
• Lower cost of production
• More Production (1950: 7,960 vs 1960: 8,430)
• Safer than underground (2500 deaths UG vs 5 in Berkeley)

UNION VIEW

• it will reduce # of jobs (1950: 4,586 1960: 2,159 1980: 1,200 Now: 350)
• required less skill
• pay lower wages

Community View

 It will eat our neighborhoods
 But what would the “Mining City” be without mining?
 What would a “company town” be without a company?
BERKELEY PIT WILL START ABOUT HERE
Why at the Berkeley Mine?

Butte, Montana, Richest Hill on Earth

Mine levels from ACM maps, elevation reference point based upon Alice Mine:
- Orange: 0 to 900 feet
- Green: 1000 to 1900 feet
- Red: 2000 to 2900 feet
- Pink: 3000 to 3900 feet
- Cyan: 4000 to 5100 feet

Berkeley Pit

Outer Camp Mines

Montana Tech

Orphan Girl

World Museum of Mining

West Camp Mines

Montana Bureau of Mines and Geology
Starting in about 1955
Late 1970’s
Butte Cold War Joke: Why was Butte a good place to be if the USSR ever attacked the USA?
Berkeley Pit/Butte Hill Cross Section
WHY DID THEY STOP MINING IN THE BERKELEY PIT?

- Production slowed as pit got deeper
- Higher Arsenic concentration
- Copper Prices

So, plan was to:
- Expand Berkeley Pit to the West
- Block cave under Berkeley
- And start mining in Continental Pit
Why did they turn off the pumps?

- Economics: price of copper crashed
  - $10,000,000 per year to run pumps

- Flooding: preserves underground workings

- Reduce Acid-Generating Reaction:
  - Mineral + Water + Atmosphere
Figure 2. The U.S. Producer Price of Copper Deflated by the CPI from 1870 to 2000 with 1950 = 100
Pumps turned off
Earth Day (April 22) 1982
Approx. 5410' level

Fall 2002 water level 5225'
2010 — white dot on north shore is pump house
THERE ARE NO "RE-DO’S" FOR THE BERKELEY PIT

... so now what?
“Pump and Treat” in “perpetuity”

Horseshoe Bend Water Treatment Plant