B.2. Geochemical Assessment of The Silver Standard Mine

by
Bruce Mattson
Lorax Environmental Services Ltd.

and
Max Holtby
Silver Standard Resources Inc.
Geochemical Assessment of The Silver Standard Mine

B.C. Metal Leaching and ARD Workshop

Presented by:
Bruce Mattson, M.Sc., P.Geo
Lorax Environmental Services Ltd.

And
Max H. Holtby
Silver Standard Resources Inc.

Outline

• The Problem and Approach
• Silver Standard Mine Site Description
• Contols on Underground Water Quality
• Tailings Characteristics and Water Quality
• Conclusions
The Problem/Approach

- The Problem
  - Historic Mine Workings and Environmental Legacy
  - Discontinuous Records

- The Approach
  - Available Data
  - Geochemical Modelling
  - Define Controls on Reactivity and Metal Release
  - Explore Closure Options (i.e., Flooding, etc.)

[Map of location]
Zinc, Cadmium and Sulphate Concentration
In Underground Workings

Sample Location

- Zn
- Cd
- SO4
Shake Flask Extraction - Soluble Metal Release

Profile Location

Soluble Metal Release (g/L)

- ▲ SO4
- ■ Zn
- ○ As

Upper  Slightly  Unoxidized  Mill Area
Temporal Distribution of Zinc at the Weir and Adit

Zinc Loading at Stations 1 (Weir) and 6 (1300 Level Adit)
Temporal Distribution of Sulphate at the Weir and Adit
Saturation Index Values of Zinc and Cadmium Carbonate Minerals in Weir and Adit Drainage Water

<table>
<thead>
<tr>
<th>Phase</th>
<th>Weir - Oct 98</th>
<th>Adit - Oct 98</th>
<th>Adit - May 99</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZnCO₃ H₂O</td>
<td>-0.32</td>
<td>-0.10</td>
<td>-0.14</td>
</tr>
<tr>
<td>CdCO₃</td>
<td>-0.44</td>
<td>-0.10</td>
<td>-0.12</td>
</tr>
</tbody>
</table>

Alkalinity and Zinc Concentrations at Stations 1 (Weir)
Closure Options

- **Issues** - low NPR Tailings
  - elevated metal content in adit drainage

- Flood Main Tailings

- Excavate Mill Area Tailings
Conclusions

- Secondary Mineral Solubility Controls Metals in Underground
- Mill Tailings Influence Surface Waters
- Metals Removed Downstream
- Implement Closure Option to improve long term water quality