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Can Environmental Stewardship be Profitable?

Advancing Solutions for a New Legacy
EPA Hard Rock Mining Conference
April 3 – 5, 2012
Denver, CO

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What You Will Hear

- The legacy of the past
  - Sustaina-what?
- Why Change?
  - Regulatory Drivers
  - Corporate Responsibility
- The new legacy
  - Design for Closure
  - Life-Cycle-Profitability
- How it works

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Legacy of the Past

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The Legacy of the Past

- Narrow profit margins dictated corporate environmental policy
- Low front end costs
- High closure liability

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The Legacy of the Past

- Philosophy of “perpetual care” (containment) vs. real “closure”
- Environmental resource inventory not considered
- The value of natural resources not considered into life-cycle profit analysis
- Plant decommissioning fails to consider value of equipment to support closure activities

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Why Change?

Regulatory Trends

- Permitting requirements trending toward stricter environmental controls
- Closure/Remediation focus on “Source control and Removal”
- Long-term “management” not accepted
- CERCLA Bonding requirements
  - ✓ Requiring “Worst Case” scenarios
  - ✓ Requiring care in perpetuity

BLM NATIONAL SYSTEM OF PUBLIC LANDS

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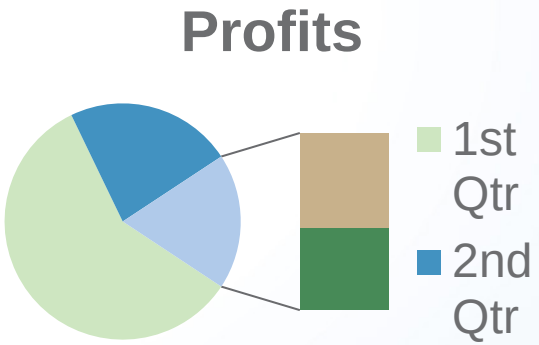
Why Change?

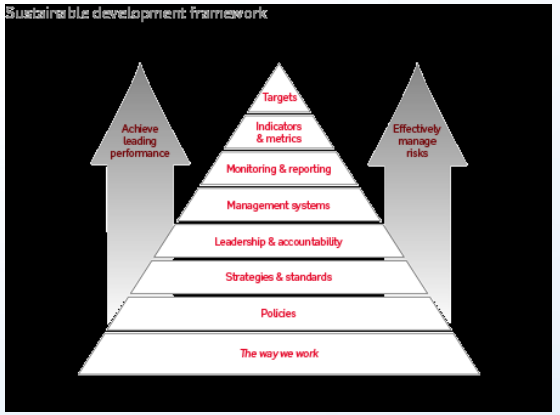
SEC Regulation Trends

- ✓ Environmental liability estimating requirements
- ✓ Liability reporting requirements



Mining Industry Trends

- ✓ Focus toward “responsible mining”
- ✓ Positive public perception
- ✓ Balancing performance with risk
- ✓ Investor pressure to **maximize profits**



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The New Legacy

Environmental Stewardship

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The New Legacy – Think Different

The New

- Philosophy of Life-Cycle accountability
- Mine “conversion” vs. “closure”
- View environmental resources as ASSETS not liabilities
- Integrate effective links between exploration, production, closure, and conversion
- All processes centered around Environmental Stewardship

The Old

- Philosophy of “perpetual care” (containment)
- Environmental resource inventory not considered
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What is Environmental Stewardship?

"***Respect for the environment*** is central to our approach to sustainable development. Wherever possible we prevent, or otherwise minimise, mitigate and remediate, harmful effects of the Group's operations on the environment."
(http://www.riotinto.com/ourapproach/17194_environmental_stewardship)

"…our goal is to ***minimize our environmental footprint*** and safeguard the environment, now and for future generations. Responsible environmental management is central to our success as a leading gold mining company and we seek to continually improve our performance."
(http://www.barrick.com/CorporateResponsibility/Environment/default.aspx)

"Our employees are committed to responsible mining practices that ***protect and enhance air and water quality and biodiversity***. Hecla will continue to be a leader in environmental practices by implementing appropriate ***energy conservation and waste reduction programs***."
(http://www.hecla-mining.com/responsibility/responsibility_stewardship.php)

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Stewardship Elements – A wide range of approaches

Respect for the Environment

- Take inventory
  - ✓ Air, water, land, ecology
- Assess impacts
  - ✓ Resource consumption
  - ✓ Resource modifications
- Operations response
  - ✓ Reduce, reuse, recycle, reclaim
- Closure restoration
  - ✓ Leave no footprint behind

Minimize Environmental Footprint

- Quantify inventory
  - ✓ Develop metrics
- Calculate impacts
  - ✓ Establish performance goals
- Value engineering
  - ✓ Balance performance/risk
- Design operations
  - ✓ Build-operate environmental controls
- Monitor performance
- Reclaim and restore

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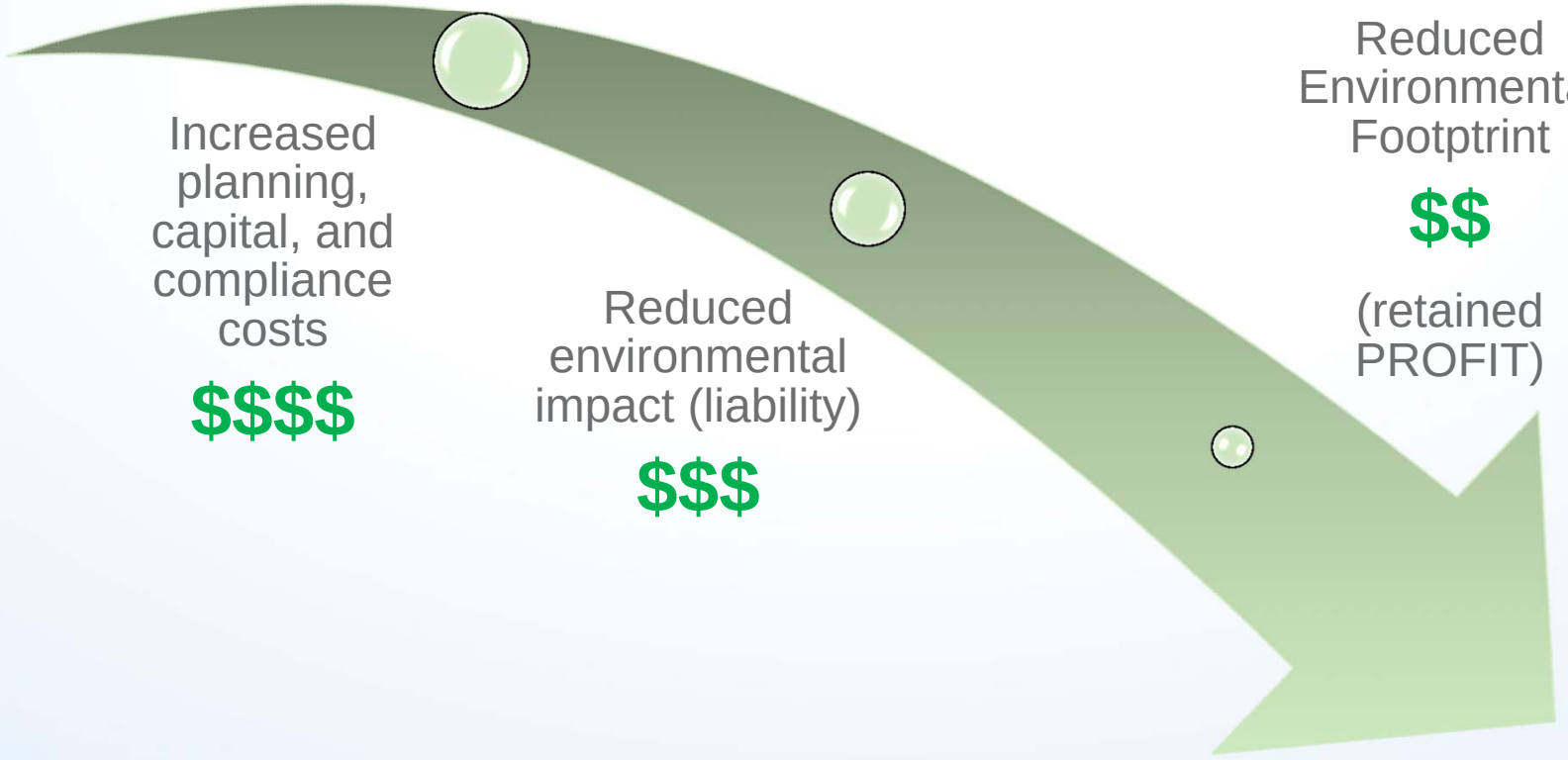
The Opportunities for the Future

Better planning => increased project life-cycle profits



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How It Works

Environmental Stewardship

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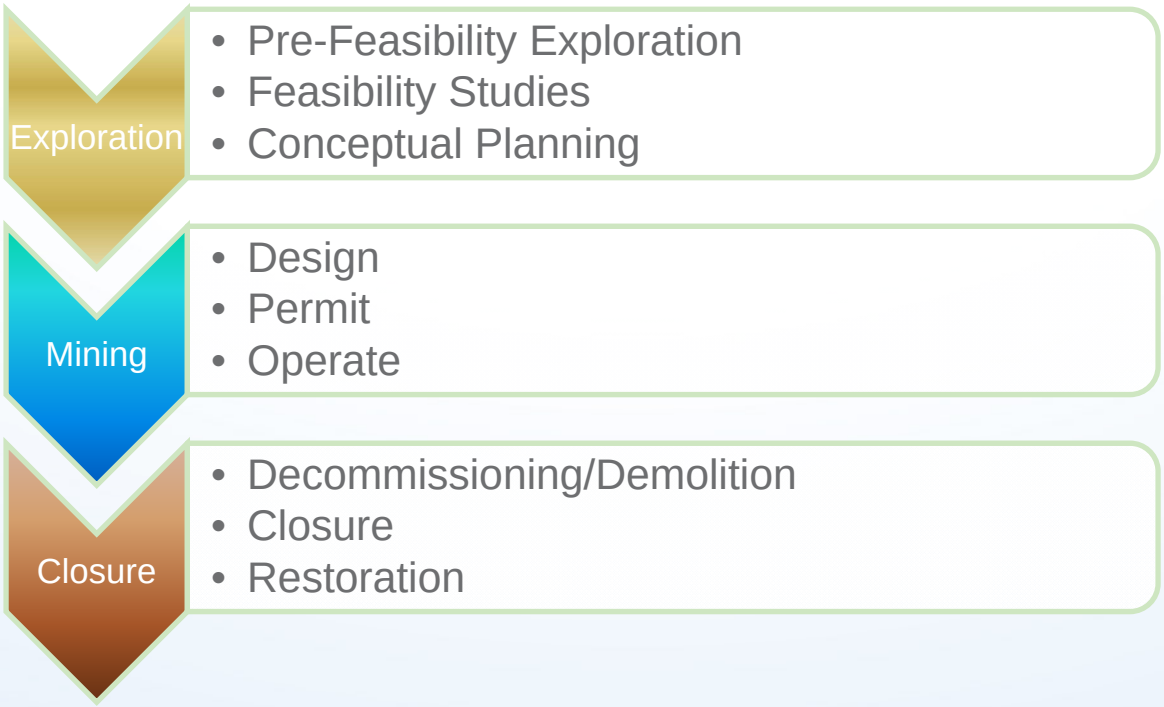
The Old Legacy

- Key to success is taking a ***Life-Cycle Perspective*** of all elements of environmental stewardship.
- ***Traditional Approach:***



The New Legacy - Think Different

State of the practice Approach:

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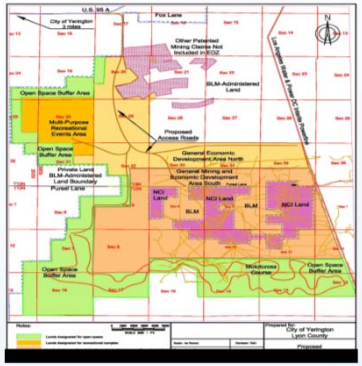
How it Works

Step 1: Develop a Vision

- ✓ Environmental resource assessment
- ✓ Mining vision
- ✓ Closure, restoration, “End-State Vision”



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How it Works

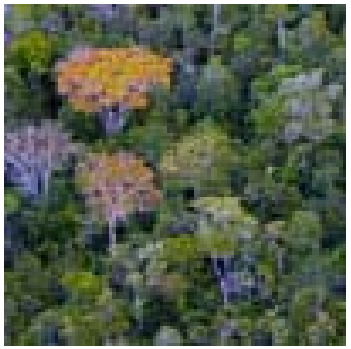
Step 2: Identify critical mining operation facilities

- ✓ Waste rock dump
- ✓ Tailings pond
- ✓ Heap leach pad
- ✓ Process water treatment system
- ✓ Process water disposal pond
- ✓ Storm water runoff management pond
- ✓ Ore conveyance system

How it Works

Step 3: Identify/Quantify environmental impacts

- ✓ Greenhouse gas emissions
- ✓ Wastewater discharges
- ✓ Sensitive species
- ✓ Stormwater runoff
- ✓ Groundwater resources



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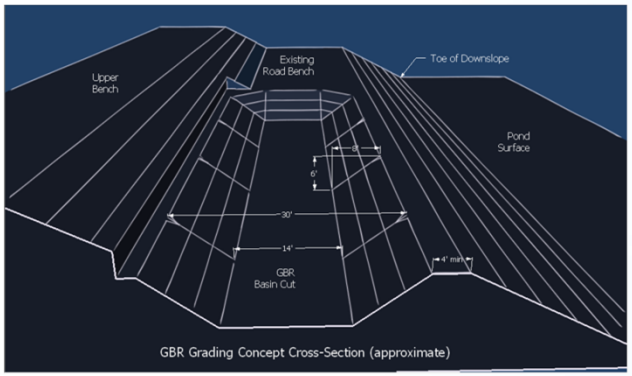
How it Works

Step 4a: Operations "Design for Closure"

- ✓ Integrate environmental controls
- ✓ Compliance with permit conditions
- ✓ Minimize releases to environment
- ✓ Minimize waste generation
- ✓ Maximize reuse and recycling



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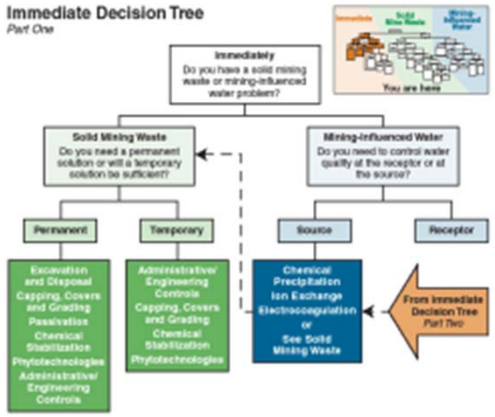
How it Works

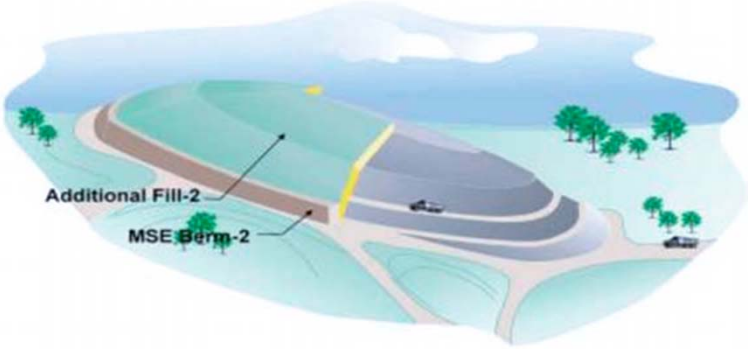
Step 4b: Value engineering

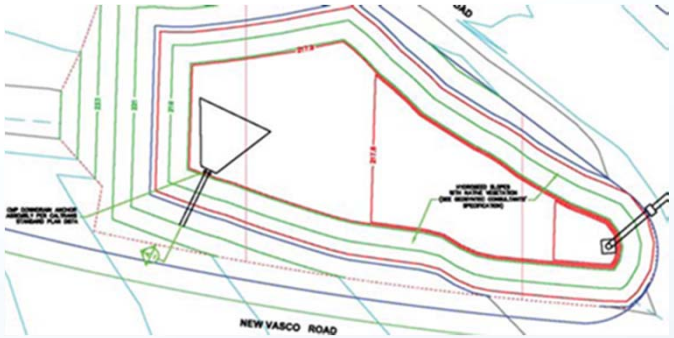
- ✓ Reduce overall environmental resource damage, closure cost, and toxic tort liability
- ✓ Maximize resource reuse/recycling
- ✓ Water recycling-reduce reliance on groundwater
- ✓ Recycle-reuse waste rock overburden
- ✓ Minimize generation of hazardous waste
- ✓ Material management
- ✓ Protect groundwater resources
- ✓ Coordinate transition from operation to conversion
- ✓ Maximize value of deployed assets



Step 5: Develop Closure Plan and Cost Estimate

- ✓ Realistic Case scenario vs. worst case scenario
- ✓ Integrate operational controls with closure elements
- ✓ More robust environmental program results in lower closure cost; reduced toxic tort liability
- ✓ Compatible with long term benefits





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Resources and Tools

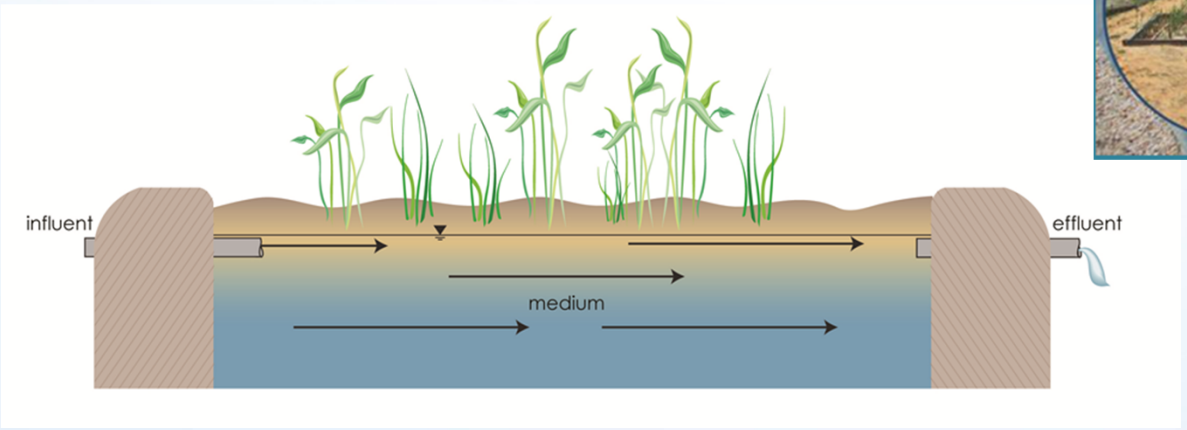
Properly designed impoundments

- Reduces releases to the environment
  - ✓ Groundwater remediation cost lower
  - ✓ Less loss of product
- Reduces operational costs
  - ✓ Fewer emergency responses
- Facilitates closure
  - ✓ Integrated design

Resources and Tools

Surface Water Management

- Emphasize in-situ and natural processes
  - ✓ Constructed wetlands
  - ✓ Flow through gravel bed reactors
- Treat at source not property line
  - ✓ Reduces impact zone
- Capture, recycle, reuse



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Resources and Tools

Water treatment and recycling

- Develop water management plan
  - ✓ Identify needs and resources
  - ✓ Groundwater supply
  - ✓ Surface water supply
  - ✓ ***Waste water recycling***
- Water treatment technologies
  - ✓ State of the art treatment technologies
  - ✓ Minimize operational requirements
  - ✓ Minimize waste by products

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Conclusions

Environmental Stewardship

- Reduced closure cost and bonding
- Reduced toxic tort exposure
- Better governmental and public relations
- INCREASED PROFITS

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