

2016 One Minnesota Legislative Conference

Mining Panel *Minnesota Mineral Resources*

9 March, 2016
Cowles Auditorium
Humphrey School of Public Affairs
University of Minnesota

Natural Resources
Research Institute
UNIVERSITY OF MINNESOTA DULUTH
Driven to Discover

Key Points

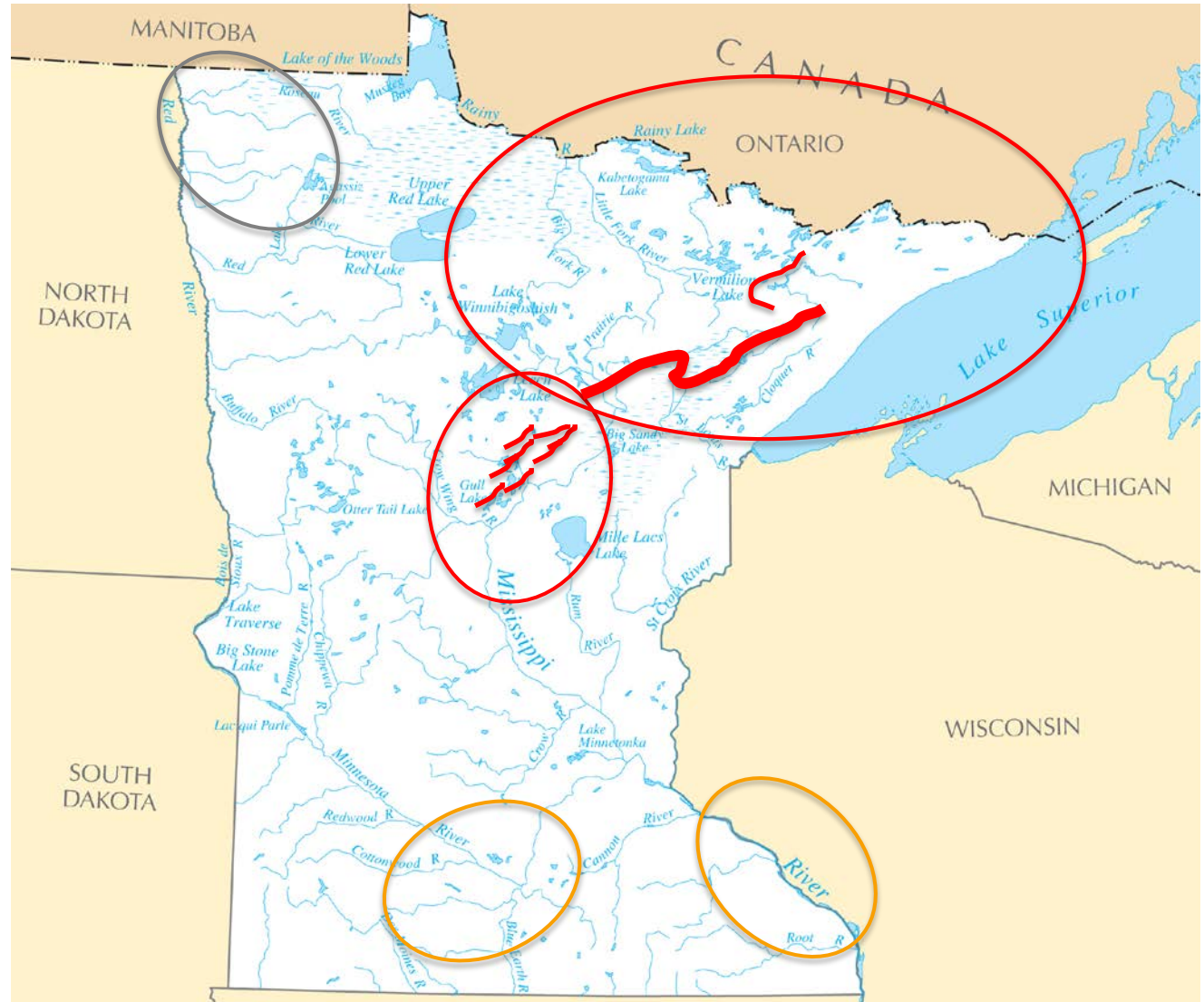
- 1. Minnesota Mining Inflection Point**
- 2. Minnesota's Mineral Portfolio**
- 3. Social License & Industry Best Practices**
- 4. Mining District Concept**
- 5. Opportunities for Minnesota**

A Mineral-Rich State at an Inflection Point

Legacy Iron
Clay
Sand

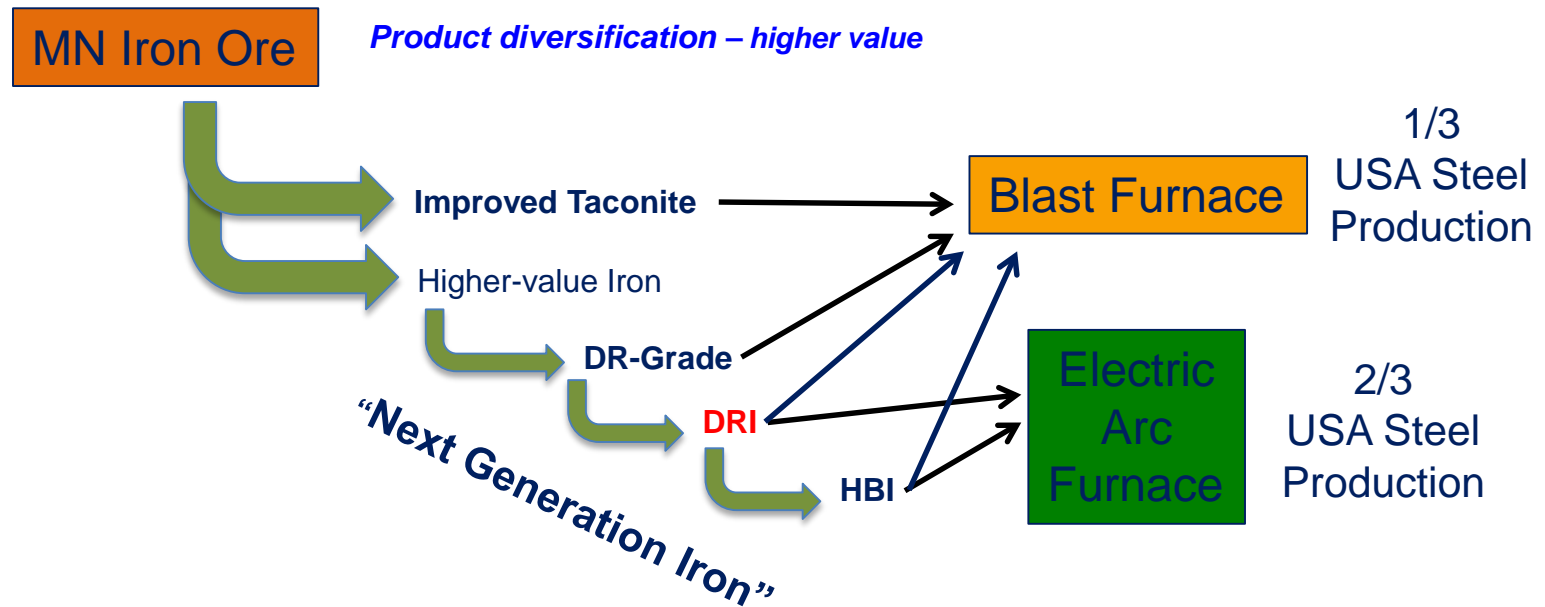


Next Generation Iron
Copper-Nickel
Platinum Group Metals
Ilmenite (Titanium)
Sand, Clay
Other (Gold, Manganese)



The Iron Mining Challenge

- Taconite accesses 1/3 of national steel industry (blast furnace)
- Commodity product at high cost
- MN ore has key benefits (quality, availability)
- Leverage technology to higher value products



Minnesota's Mineral Portfolio

Portfolio – a statewide summary of mineral opportunities; location, quality, quantity; industrial assets & process technologies; economic benefits; environmental impacts; societal choices; long-term risks/benefits.

Iron

- Reserves to participate into the future
- Need to address cost, product mix, enhanced value

Copper-Nickel (PGM – platinum group metals)

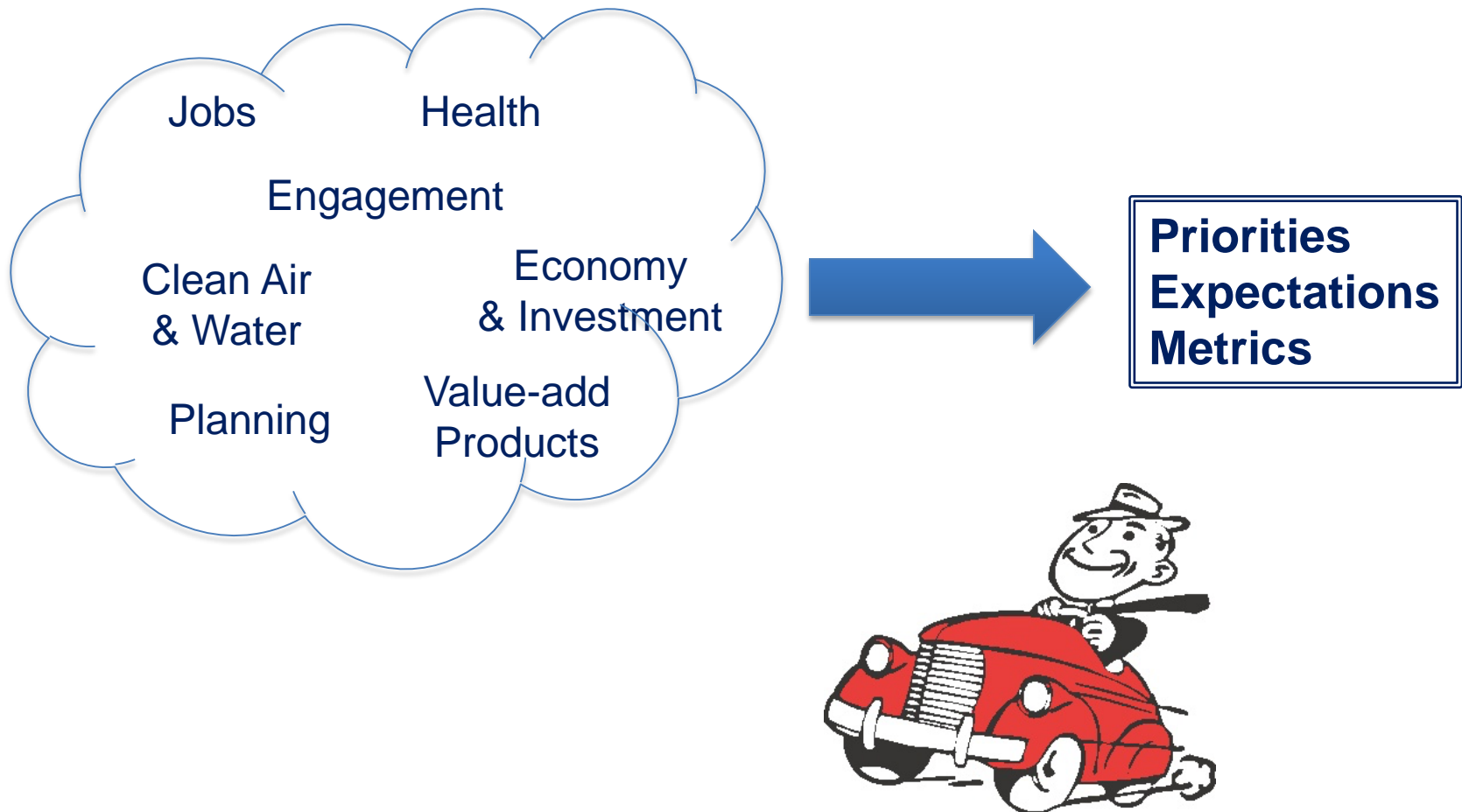
- 0.5wt% copper >> equivalent content 2%, accounting for nickel, PGM metals
- Ore body very large & consistent >> low process variability expected
- Higher levels of sulfide minerals vs. legacy iron mining >> higher risk
- Unique MN buffering capacity
- Water quality management concerns

Ilmenite (Titanium-iron oxide ore)

- Low overburden, confined ore bodies, reduced sulfide content
- High value product

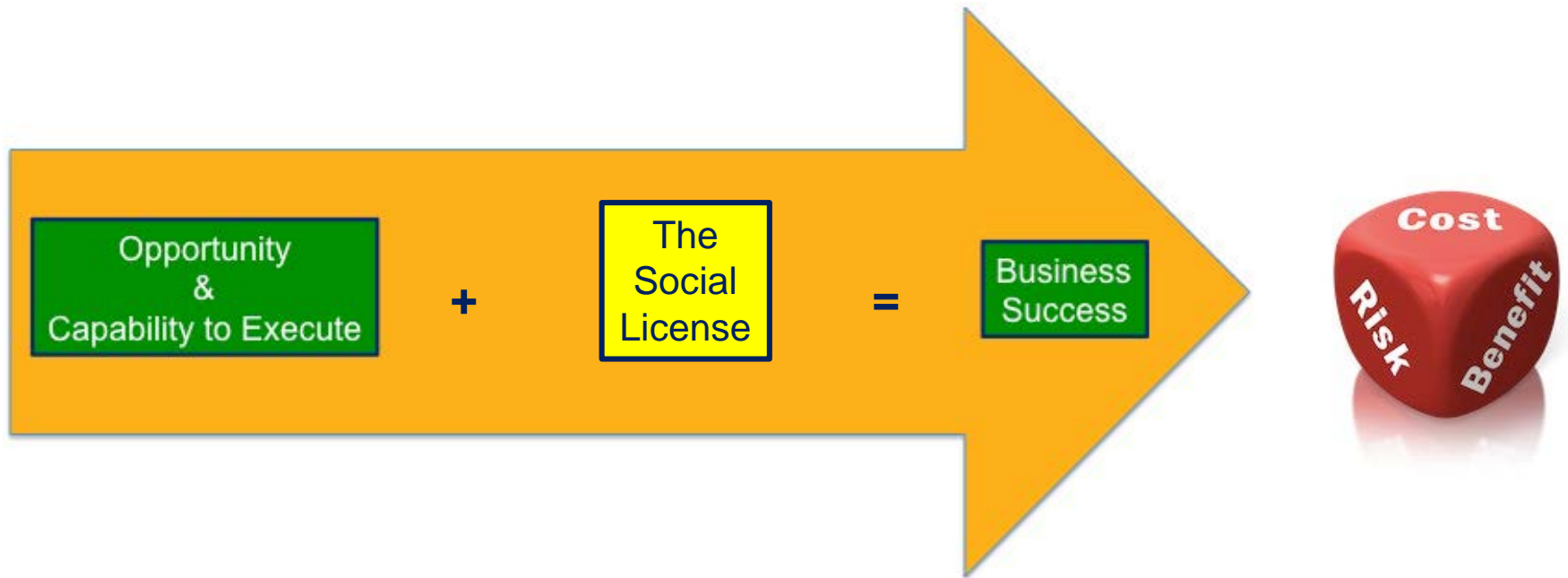
Minnesota's Vision

What is the vision for the next 20, 50, 100 years?
How will MN stakeholders define success?



The “Social License”

The trust and permission of the public given to industry that grants the “right to operate”.



MN ore deposits are uniquely geographic; the Social License is statewide

Social License Depends on Industry Best Practices



Marine Stewardship Council
Certified sustainable seafood



FAIRTRADE
INTERNATIONAL

Market-driven virtuous cycle



Consumer value

Best practices
&
transparent reporting



3rd party validation
&
certification



Mining Industry Best Practices

ICMM

International Council
on Mining & Metals

ICMM Framework for Sustainable Mining



NIMA

THE AMERICAN RESOURCE

National Mining Association

Hardrock Mining and Beneficiation
Environmental Management System Guide



Towards Sustainable Mining
Vers le développement minier durable



The International Council on Mining and Metals 10 Principles:

01. Implement and maintain ethical business practices and sound systems of corporate governance.
02. Integrate sustainable development considerations within the corporate decision-making process.
03. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.
04. Implement risk management strategies based on valid data and sound science.
05. Seek continual improvement of our health and safety performance.
06. Seek continual improvement of our environmental performance.
07. Contribute to conservation of biodiversity and integrated approaches to land use planning.
08. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.
09. Contribute to the social, economic and institutional development of the communities in which we operate.
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

Engagement Example: The Eagle Mine, Marquette, MI

Lundin Mining, Corp.

Community Capacity
Building:

Eagle Emerging
Entrepreneur Fund

Accelerate UP

CEMP
Community Environmental
Monitoring Program

2015 WORK PLAN for the COMMUNITY ENVIRONMENTAL MONITORING PROGRAM of the Eagle Mine



Submitted by



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Eagle Mine - Community Environmental Monitoring Program

September 2014
Eagle Mine Site - WTP Effluent Monitoring

PARAMETER	BOD (mg/l)	Total Aluminum (mg/l)	Total Antimony (mg/l)	Total Arsenic (mg/l)	Total Arsenic (mg/l)	Total Barium (mg/l)	Total Beryllium (mg/l)	Total Boron (mg/l)	Total Cadmium (mg/l)	Total Cadmium (mg/l)	Total Chromium (mg/l)	Total Cobalt (mg/l)	Total Copper (mg/l)	Total Copper (mg/l)	Total Fluoride (mg/l)	Total Lead (mg/l)	Total Lithium (mg/l)	Total Manganese (mg/l)	Total Mercury (mg/l)	Total Molybdenum (mg/l)
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CEMP Monitoring Report

RE: SWP Monitoring Confirms Elevated Sulfate Levels Within Temporary Development Rock Storage Area (TDRSA) Trending Down

Type of Monitoring - Permit Verification or Additional: Verification - Mine Permit MP012007

30**	<2.0			<1.0	<1.0			<20	<0.2	<0.2			<1.0	<1.0					<0.0005	
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* Monthly composite parameters collected.

** Weekly composite parameters collected.

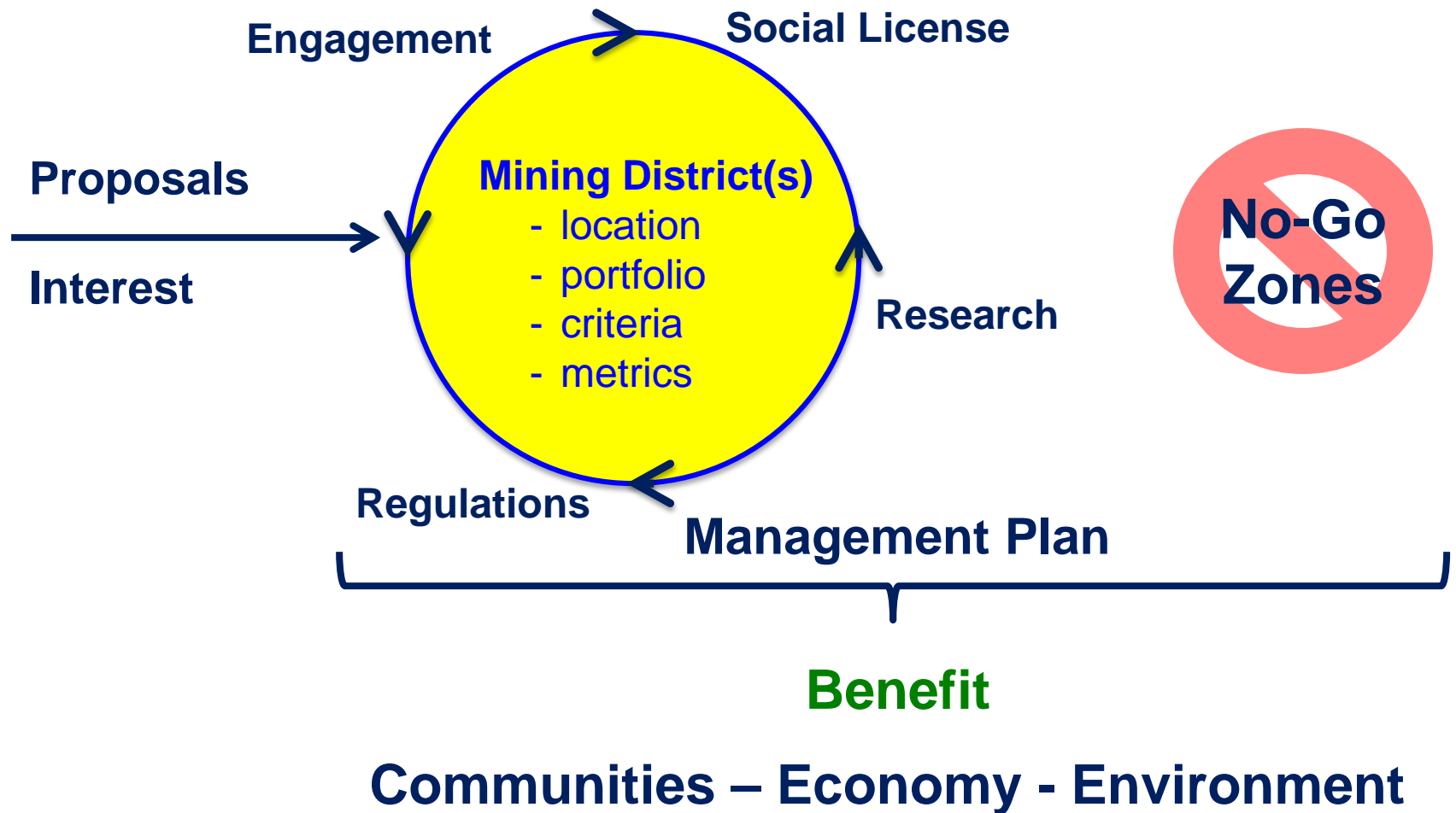
Results reported on September 30th for Stage U parameters (arsenic, cadmium, copper, selenium, silver) are average monthly concentrations.

Days in which effluent was not discharged, but influent was noted, all water was recirculated in the system.

Virtuous Cycle - Mining



Framework Concept: MN Mining District Development Plan



MN Opportunities

Mineral and other Natural Resource Opportunities

- Diversified offering
- Higher value products
- Keep more \$ in MN

Mining District as Industry Differentiator

- Clearly defined expectations
- Streamlined process
- Evolving regulatory structure; grows with knowledge
- Shared understanding of social license
- Stable, differentiated mining district
- **Certified as responsibly sourced; “Minnesota-Mined”**
- Global supply chain review

TIMING

- Current economic pressure low for new metals
- Time to prepare for new era; Plan for Success

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