

# Shaping the Future of Gold Refining with Sustainable Leaching using Glycine and Permanganate

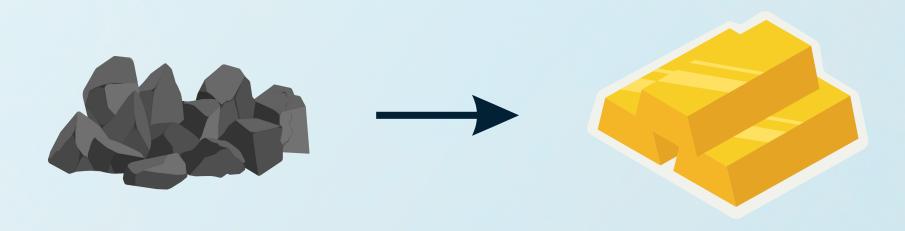
PROCESS OVERVIEW



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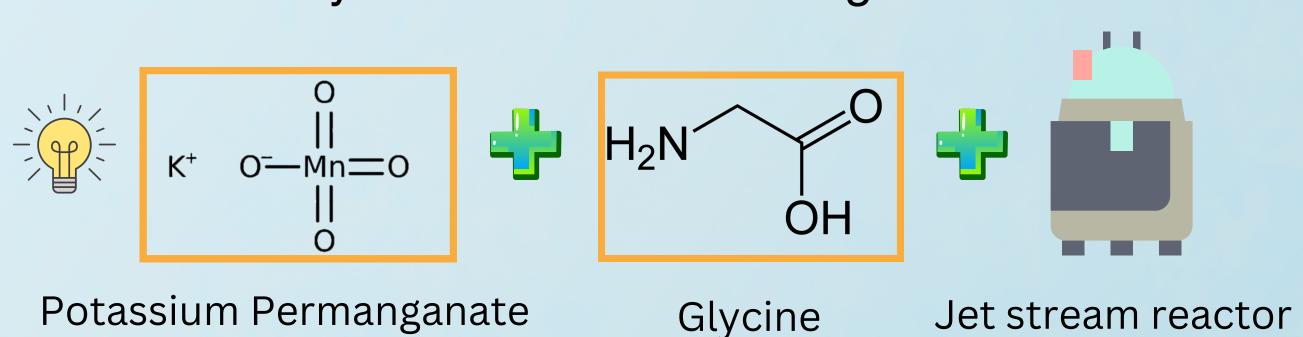
#### INTRODUCTION

- Produce 8.5 tonnes/yr of 24 karat gold
- Plant located in Selwyn Basin of the **Tombstone Gold Belt, Yukon**
- Pyrite ores with Carlin-type deposits are used



## INNOVATION

- Replacement of conventional cyanide leaching with Potassium Permanganate and Glycine.
- Jet stream reactor to increase leaching efficiency and decrease leaching time



# SOCIAL FACTORS

#### **Eliminate Cyanide Spills**

Permanganate and glycine instead of cyanide to reduce environmental impact and public health risk



#### Globally **Export Goods**

To lift Canada's global presence as the 5th biggest producer of gold in the world

## Working Capital 16.3%

# Indirect Costs 16.2%

CRUSHING &

WASHING

Size reduction of

pyrite ores to 0.15

mm

LIQUID-SOLID

EXTRACTION

Gold-glycine

complex separated

from waste slurry

ELECTRO-

WINNING &

REFINING

Refining using the

Miller and Wohlwill

process

NPV

\$76 Million CAD

#### **ANNUAL PROFIT** 2.99 BILLION 247.8 MILLION CAD (YEARS 0-10) 315 MILLION CAD CAPEX **(YEARS 11+) Direct Costs** 67.5%

ECONOMICS

75.7%

11.3% General Expenses 12% OPEX Fixed Charges 0.9% Production Costs \$405 Million CAD

IRR

48%

Plant Overhead Costs

**PYRITE ORES** 

Mined at existing

mining facility

LEACHING

Extraction of gold from

ores to form gold-

glycine complex

CARBON

ADSORPTION &

**ELUTION** 

Gold-glycine

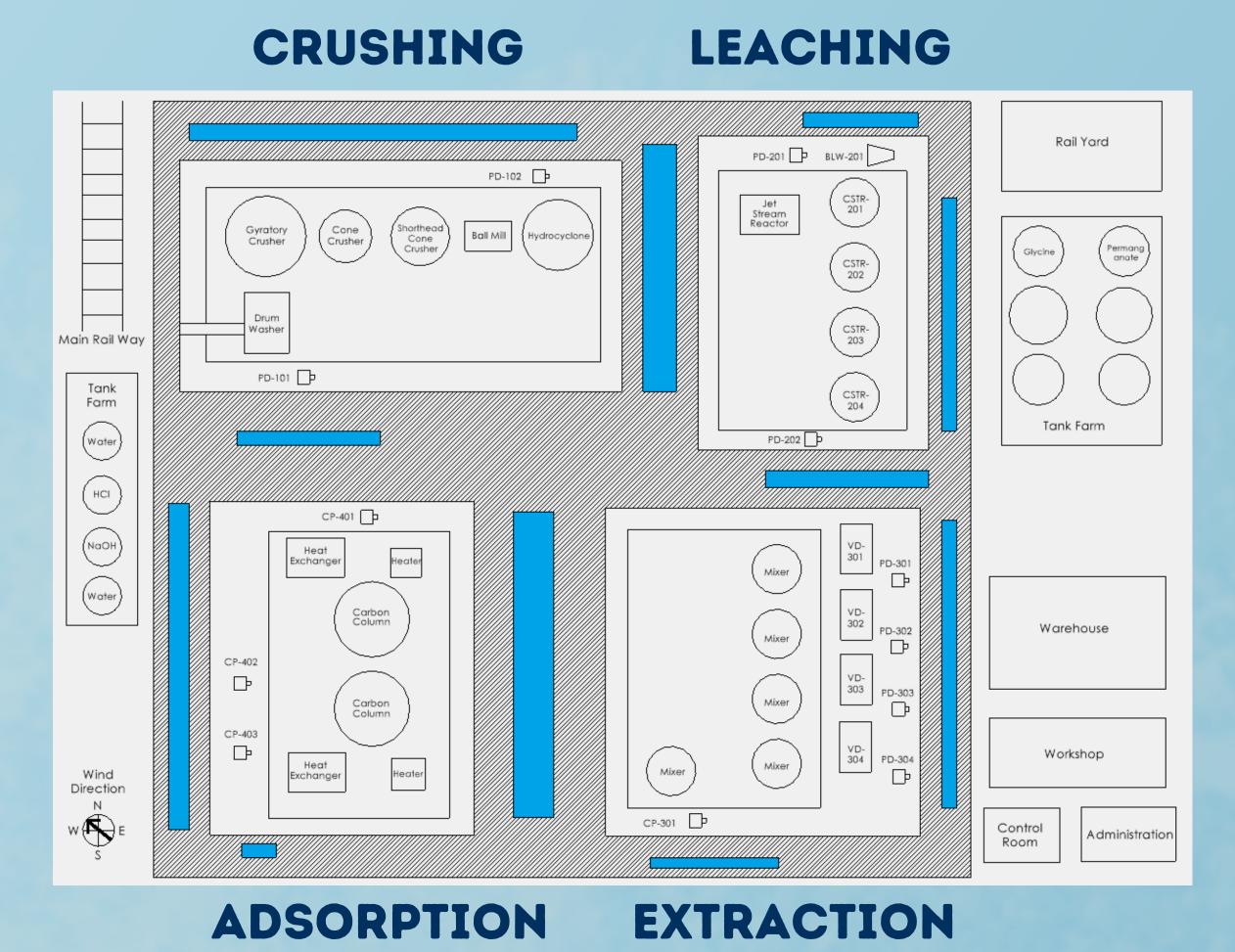
complex washed

and purified

99.999% PURE

GOLD

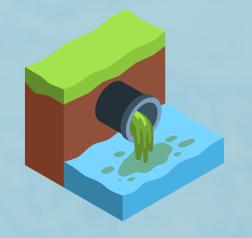
### PLANT LAYOUT



#### **ENVIRONMENT**

#### AIR POLLUTANTS

originate from the leaching process 16.04 tonnes CO2/ year



#### LIQUID & SOLID WASTE

originate from the liquid-solid extraction 9435.5 tonnes of waste/year



#### **FEDERAL ACTS**

Federal Wastewater Systems Effluent Regulation (WSER) Canadian Environmental

Protection Act

(CEPA)

#### PROVINCIAL **ACTS**

Yukon Environment and Socio-Economic Assessment Act (YESAA)

## **PERMITS**

Hazardous Waste Permit Type A Water License



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