



# BENCH TESTING PROGRAM REDUCES PROJECT COSTS & RISKS



**BROWNFIELDS TO GOLD MINES**

# PRESENTATION OVERVIEW

- Site Overview
- Water Treatment Plant Overview
- Bench Testing Program
- Results
- Full Scale
- Conclusion



Photo Credit: M Turner



# SITE DESCRIPTION



Camp

September 2012

Photo Credit: Chris McCue



# SITE LOCATION



Photo Credit: Hugo Chartier





# MINE CAMP



Kitchen

Sewage  
Treatment

Bunkhouse

Geo office/  
Core shack

Photo Credit: Hugo Chartier



# WATER TREATMENT PLANT





# MINING OPERATION

- Water pumped from blasting face and sumps
- Diverted to main sump
- Pumped from main sump to WTP
- Treated in WTP
- Discharged to creek



Photo Credit: Steph Chua



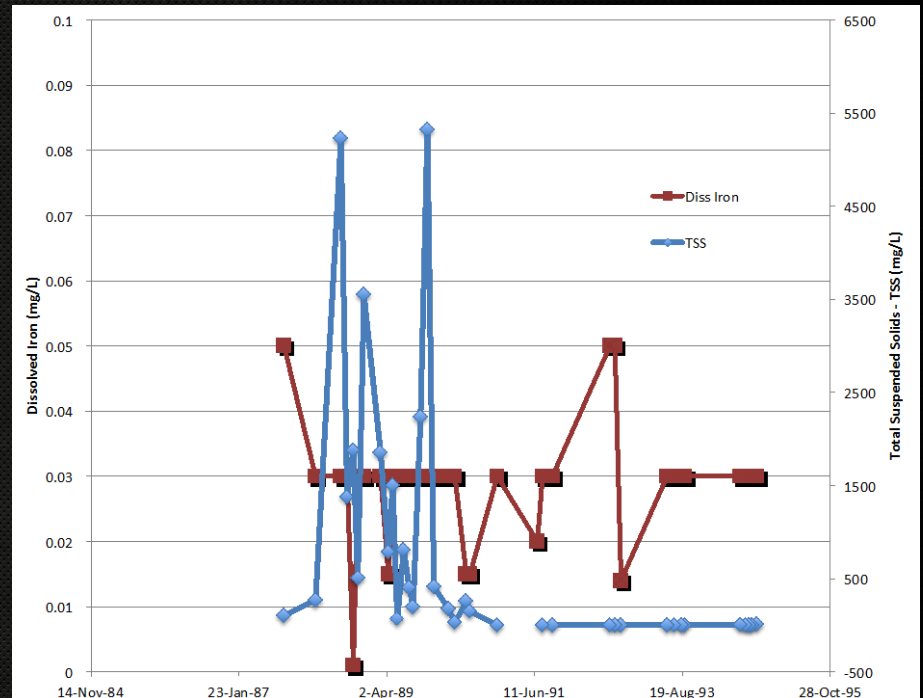
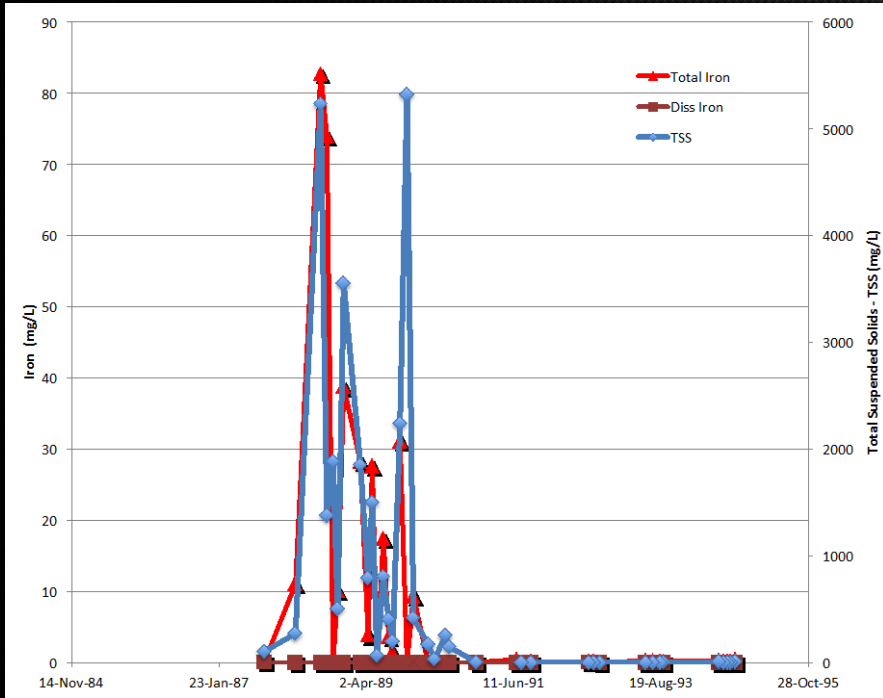
# PARAMETERS OF CONCERN

- Total Suspended Solids
  - Total Metals
    - Dissolved Metals: Aluminum and Iron
      - Nitrogen: Ammonia, Nitrite and Nitrate
        - Sulfate



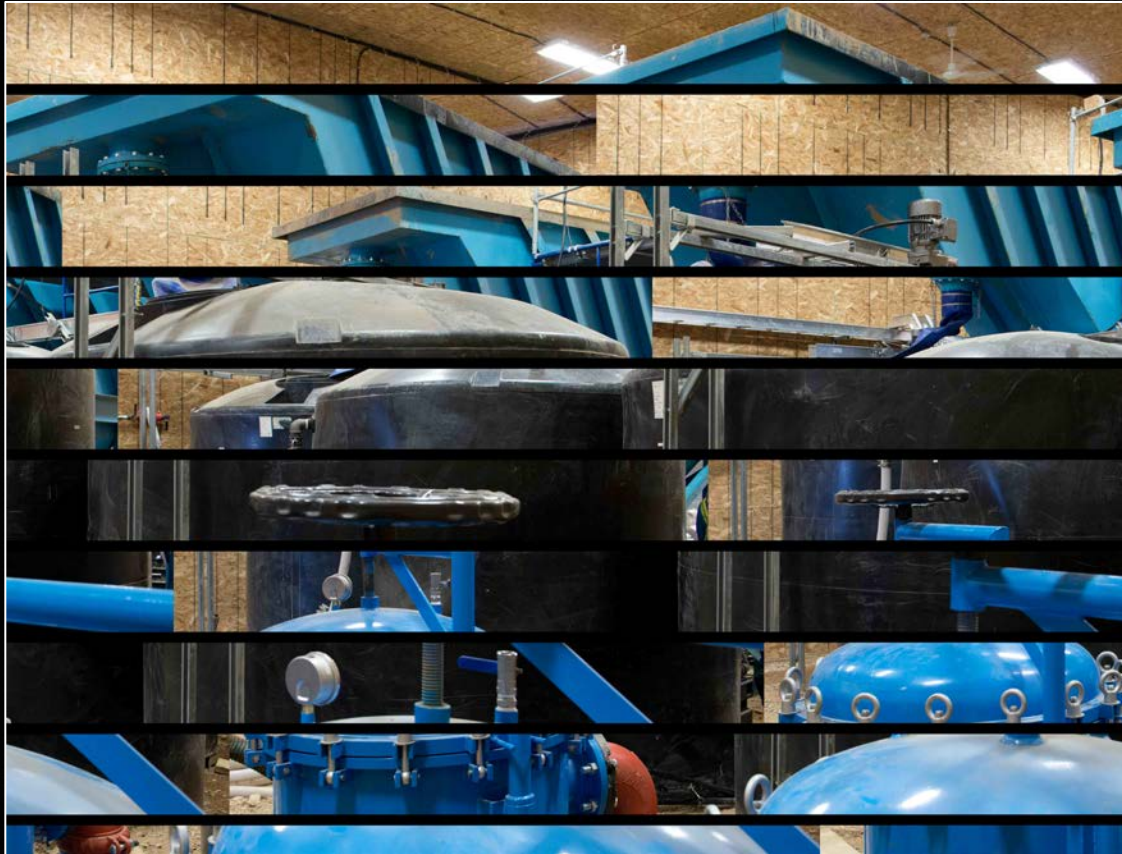


# HISTORICAL WATER QUALITY





# WATER TREATMENT PLANT OVERVIEW





# BENCH TESTING PROGRAM

## FLOCCULANTS

- Increase the size of suspended particles in the water column
- Enhanced settling
- Remove charged particles that remain in suspension

## COAGULANTS

- Aid to break colloidal suspension and emulsion



# DECISION CRITERIA

- Ability to remove Total Suspended Solids and Total Metals
- Toxicity of the chemical to receiving environment
- Type and amount of equipment required for administering and dosing the chemicals
- Ease of use



Photo Credit: McCue



# DECISION CRITERIA

- Availability of the chemicals
- Ease of transportation and on site storage
- Concentration and total volume required
- Cost





# BENCH TEST APPROACH

## PROGRAM ONE

84 TESTS

8 BULK WATER SAMPLES

24 CHEMICAL PRODUCTS

## PROGRAM TWO

120 TESTS

8 BULK WATER SAMPLES

3 **NEW** CHEMICAL PRODUCTS



# BENCH TEST METHOD

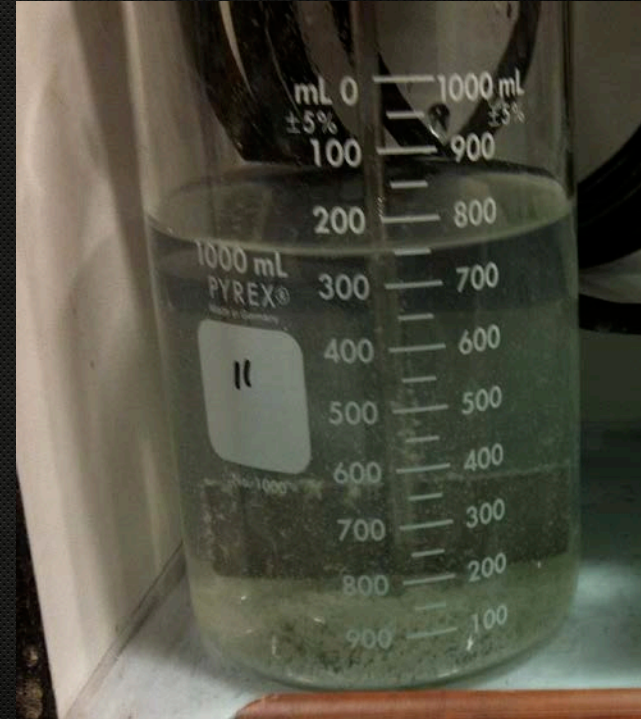
- Test mix techniques and times
- Test varying water turbidity over fixed dosage





# BENCH TEST METHOD

- Test dosages over fixed water
- Test durability of flocculent

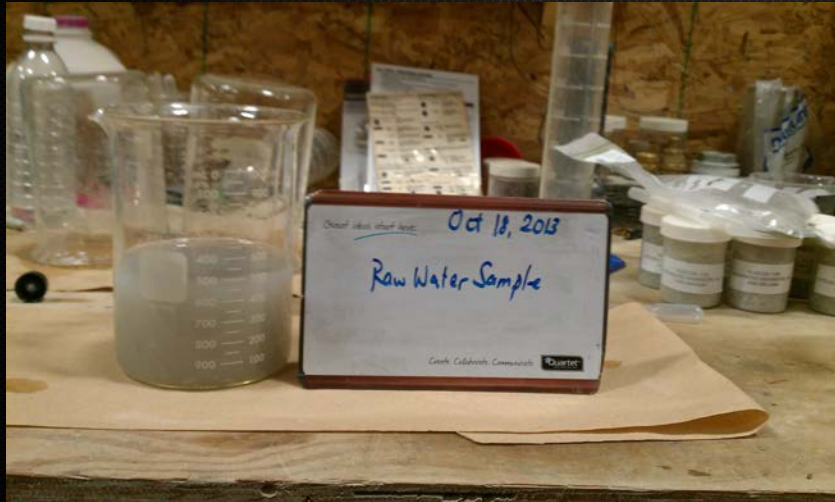




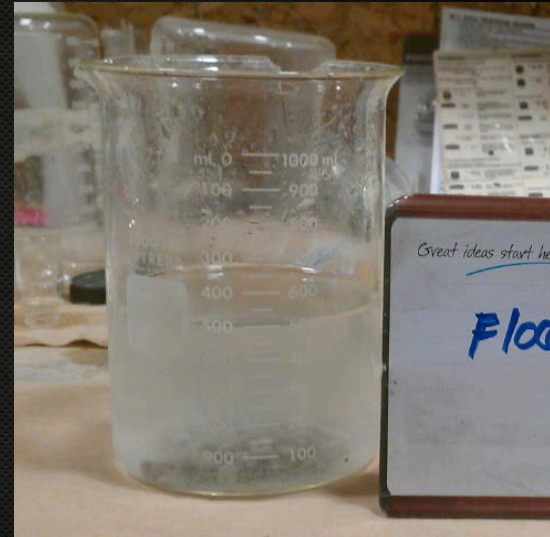


# PERFORMANCE CRITERIA

1. Time of reaction
2. Size of floc
3. Settling time
4. Clarity

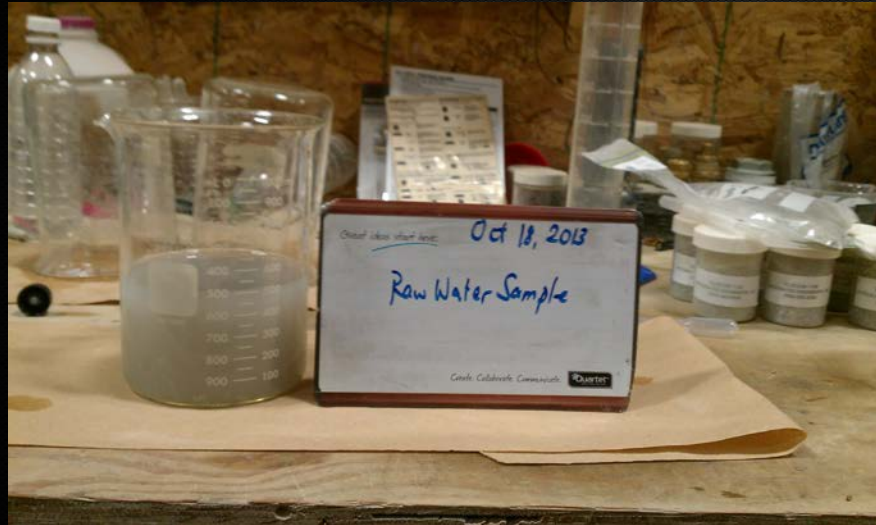


Raw Water Sample

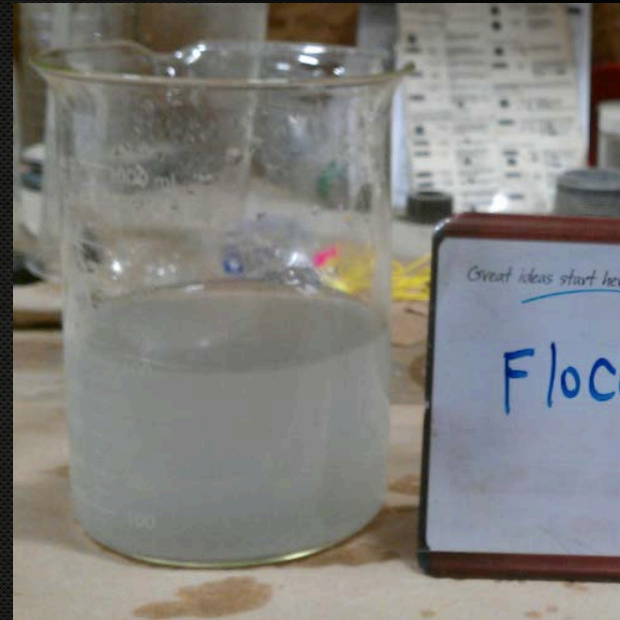


Chemical A





Raw Water Sample



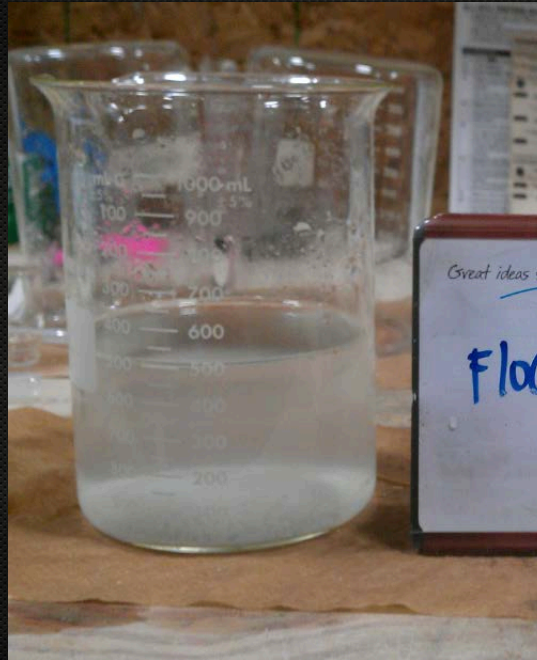
Chemical B



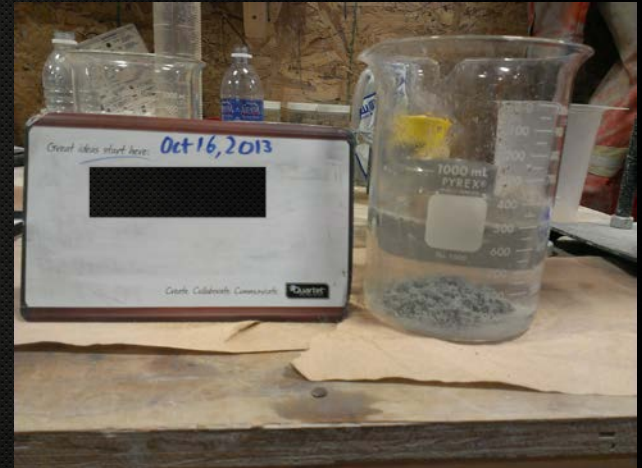
# FLOC FORMATION



Goop



Pin Floc



Good sized Floc



# SCALING UP





# SYSTEM OPERATION ISSUES

- Large swings in inlet turbidity
- Floating floc in clarifier
- Sludge quality
- Changes in water chemistry



# OTHER TESTS

## FREE AND TOTAL DRAINAGE TESTS





# OTHER TESTS

# DRILL ADDITIVES



**DRILL MUD**



**DRILL GREASE**



**DRILL WASH**



# CONCLUSION

## REDUCED COSTS

- Optimize chemical program
- Optimize plant operation
- Increase plant reliability
- Reduce mining downtime

## REDUCED RISKS

- Met performance treatment objectives by reducing TSS and total metals by up to 99%
- Performed effectively under a variety of inlet conditions
- Met site constraints
  - Ease of transport
  - Ease of use (Health & Safety)
  - Low toxicity to the environment



THANK YOU FOR LISTENING!

QUESTIONS?



Photo Credit: Steph Chua



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