LABORATORY TEST PROGRAM FOR THE RECOVERY OF GOLD USING DST'S CLEVR PROCESS™

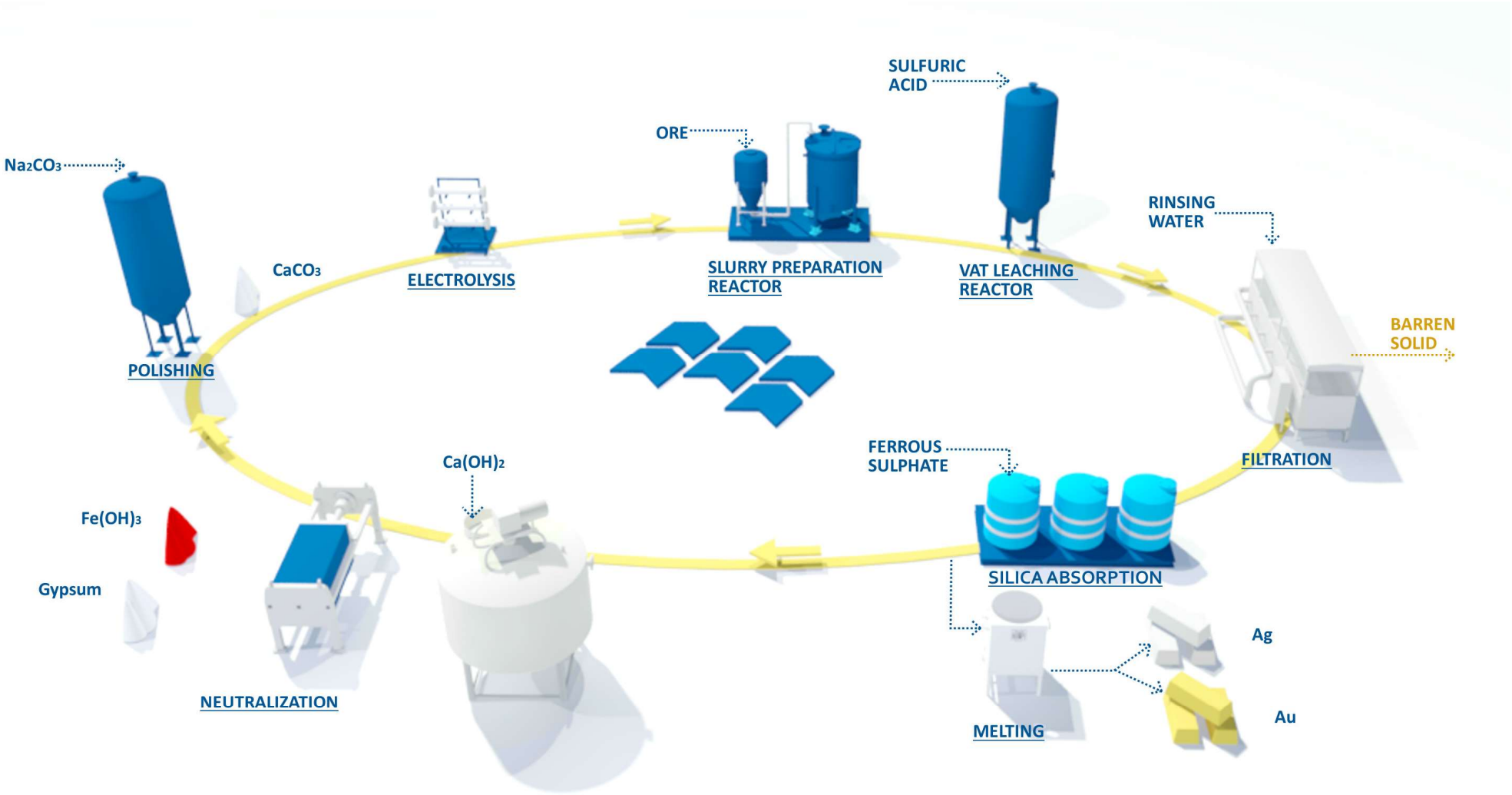
ESGOLD

CLEVR PROCESS™

General Information

Project Title:	LABORATORY TEST PROGRAM FOR THE RECOVERY OF GOLD USING DST'S CLEVR PROCESS™	Date	2025-01
Project Code:	54188		
Project Sponsor:	Jean-Philippe Mai	Client	ESGold Corp.
Project Director:	Joey Isabelle		
Project Manager:	Alexandre Landry		

CLEVR Process – Closed Loop Circuit



DUNDEE SUSTAINABLE TECHNOLOGIES

CLEVR Chemistry Involved

Chlorine, along with a catalytic amount of bromine, are used as oxidizing agents because of the particularly **fast reaction of bromine with gold.**

The capability of chlorine to oxidize bromides to bromine, explains the low concentration of bromide required in the brine.

Project Description (Part 1)

Context

DST was approached to discuss and evaluate the technical feasibility of integrating its CLEVR Process™ for the recovery of gold on dedicated ESGold's Montauban Project material.

At this stage, limited detailed material characterisation information has been shared on the Project's targeted ore material originating from the Montauban current or developing operations. However, it is known that the material consists of legacy tailings present on the Montauban site and contains substantial amount of precious metals.

ESGold is undertaking the task to ensure proper remediation of the site and recover valuable metals. Therefore, the gold mining company is interested in DST's proprietary CLEVR process for process optimization and as a green alternative to cyanide in gold recovery.

DST proposes to conduct preliminary laboratory tests on representative Project sample to test and evaluate the performances of the CLEVR Process, as an alternative to cyanidation.

The objective is to provide the technical benchmarks on the applicability of the CLEVR process on the Project. In addition, CLEVR may increase the achievable gold recoveries and positively improve the environmental, and ESG, performances of the Project.

Project Description (Part 2)

Approach, Methodology, Objectives

- Conduct preliminary laboratory test work, including analytical & physical characterisation and precious metal leaching on ore material from the Project;
- Proceed to remove sulphides from the Project material via an oxidative thermal pre-treatment prior to CLEVR;
- Define the achievable gold recoveries using DST's CLEVR Process;
- Determine the applicability and develop the gold recoveries using DST's CLEVR Process™ on Project material at the laboratory scale; and
- Produce a technical report incorporating and presenting the preliminary laboratory test work data.

The objectives of these campaign will include, but will not be limited to, the following:

- Ore preparation
- Ore analytical characterization
- Sulphides removal (oxidative thermal pre-treatment)
- Metal recovery test tests for gold extraction using the CLEVR Process
- Solid residue analytical characterization

Deliverables

The main deliverable will be a technical report presenting:

Laboratory campaign material characterisation and test results, and;
Laboratory campaign precious metal extraction test results.

Excluded Items:

For future work (if applicable):

- Optimization, at laboratory scale, for detail numeric process models
- Process Development (METSIM)
- Engineering
- CAPEX/OPEX

Database to be used:

- DST CLEVR Process database
- Data provided by ESGold

Sample Reception & Preparation

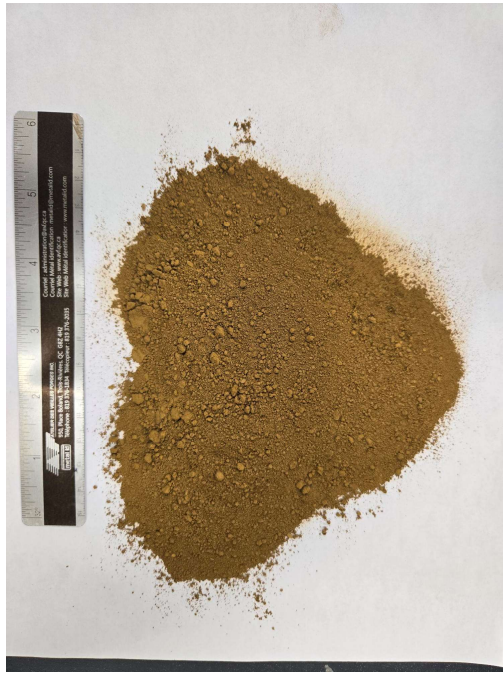
Reception:

- One sample of 15-20 kg was received at DST's facilities on December 2nd, 2024
- Photo (right) show the sample container as received by DST

Preparation:

- The whole sample was sent to an external laboratory for sample preparation:
  I. Sample Drying
  II. Crushing
  III. Pulverising to a P90 of 200 mesh
  IV. Final PSD determination

Project sample as received



Project Material after prep.

New Luika Project Sample Characterisation

Characterisation Methods

- **Ag, Au**: Fire Assay / ICP-OES
- (Note on Ag: retesting was undertaken following lower than expected levels. Similar levels detected on second round – may be related to detection limits on DST analytical equipment)
- **Metals Analysis**: Aqua Regia Digestion / ICP-OES
- **Al, Ca, Fe, Mg, Si**: Sodium Alkaline Fusion / ICP-OES

Elements	Units	EGO-01
Ag	g/t	760
Au	**g/t**	**3.69**
Al	% wt.	0.35
As	mg/kg	≤ 40
Ca	% wt.	0.18
Cd	mg/kg	≤ 40
Co	mg/kg	30
Cr	mg/kg	≤ 40
Cu	mg/kg	1,260
Fe	% wt.	33.9
Mg	% wt.	0.29
Mn	mg/kg	60
Mo	mg/kg	≤ 60
Ni	mg/kg	≤ 80
Pb	mg/kg	22,250
Sb	mg/kg	420
Se	mg/kg	≤ 80
Si	% wt.	2.30
Zn	mg/kg	4,870

New Luika Project Sample Characterisation

Characterisation Methods

- Total Sulphur Analysis: LECO
- Total Carbon Analysis : LECO
- Specific Surface Area: BET N_2 adsorption
- Particle Size Distribution: MicroTrak

Parameters	Units	EGO-01
S_t	**% wt.**	**29.6**
S^{2-}/S^0	**% wt.**	**29.0**
C_t	% wt.	TBD
BET	m^2/g	TBD
P90	mesh	200

Thermal Pre-treatment - Oxidation

- Thermal oxidation treatment was performed in a tubular Lindberg furnace.
- Oxidation treatment was conducted in 2 batches (roughly 100-150 g per batch) on the sample after sample preparation.

Oxidation Treatment Parameters	
Feed Material	Tailings
Residence time (h)	2
Gaz injection	None
Temperature Range (°C)	550-600
Maximum material temperature (°C)	600

Before (top) / after (bottom) oxidation

Lindberg Furnace

Sample	Mass loss (%)	Concentration (% wt.)			Removal %	
		Au	S^{2-}/S^0	S_t	S^{2-}/S^0	S_t
EGO-01	---	3.69	29.0	29.6	---	---
EGO-01-OX	36.8	6.02	0.48	2.82	99.0	94.0

Precious Metal Leaching by CLEVR Process

CLEVR Conditions		
Solid %	% wt.	25
[NaOCl]	% wt.	4
[NaCl]	g/L	70
[NaBr]	g/L	10
pH	---	≤ 1
Temperature	°C	Room T
ORP	mV (as Ag/AgCl)	≥ 900
Duration	h	1

Direct CLEVR leaching tests were performed on the sulphide-free material.

Sample	pH	ORP (mV; as Ag/AgCl)	[Au] – Feed (g/t)	[Au] – Residual (g/t)	Au Extraction (%)
EGO-01-OX	6.4 → 1.0	1,160	6.0	≤ 0.6	**≥ 90.9**

Legend: Initial → Final

Conclusions & Recommendations

Conclusion

➢ Sample Characterisation

- Au content of the Project sample material was 3.69 g/t
- Total sulfur content was 29.6 % wt.
- P90 after sample preparation was around 200 mesh.

➢ Thermal pre-treatment (Oxidation)

- Successful removal of sulphides (29.0 → 0.48 %wt.)
- Mass loss of 36.8 %
- [Au] after oxidation = 6.01 g/t

➢ Gold Leaching – CLEVR Process

- Gold extraction with the CLEVR Process™ was above 90.9 %. (Residue characterisation under LOD for Au)
- Test performed at 25 % solid with a short reaction time of 1h.

Recommendations

➢ Laboratory optimization – Gold Leaching - CLEVR Process

- Solid % (increase to 35 %, 40 %, 45 %)
- Particle size distribution
- Reaction time (decrease to 30 min)
- NaOCl concentration (decrease to 2 % wt.)

➢ Engineering

- Generation of flowsheets
- METSIM modeling & mass, water and energy balance
- OPEX/CAPEX evaluation