

Titles:

Mine Geology Components and Cycles

Mining Innovations

- BMM
- WireLine Probe

May 2021, Esmaeil Rameh

Exploration TO Mine Chain

- ✓ **Resource Model**
- ✓ **Reserve Estimate (Life of Mine or LOM)**
- ✓ **Mine Plan (Long, Mid and Short term)**
- ✓ **Mine Geology & Grade Control, GC Model**
- ✓ **Production**

Mine Geology Components



Standard Operating Procedures

Reconciliation compares resource, reserve, grade control, mined and milled.

$$F1 = \frac{\text{short range model depletions}}{\text{long range model depletions}} \text{ ie } F1 = \frac{\text{GRADE CONTROL (PREDICTION)}}{\text{ORE RESERVE (PREDICTION)}}$$

and

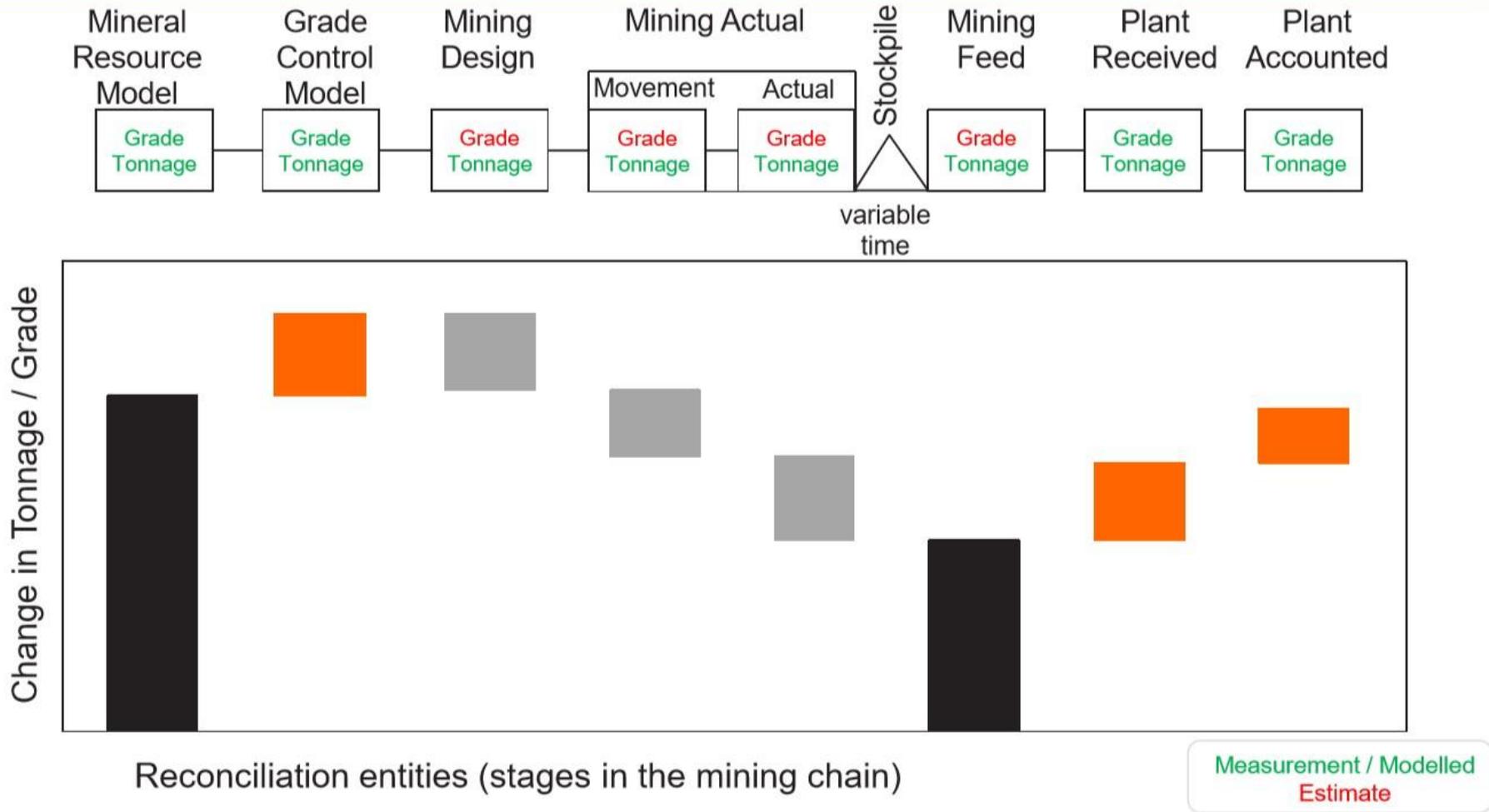
$$F2 = \frac{\text{received at mill}}{\text{delivered to mill}} \text{ ie } F2 = \frac{\text{MILL (PRODUCTION)}}{\text{GRADE CONTROL (PREDICTION)}}$$

and

$$F3 = \frac{\text{received at mill}}{\text{long range model depletions}} \text{ ie } F3 = \frac{\text{MILL (PRODUCTION)}}{\text{ORE RESERVE (PREDICTION)}}$$

then it is now obvious that $F3 = F1 * F2$

Reconciliation Profile



Innovations



Wireline Services

Team of geologists and geophysicists from Gyroscopic survey validation to comprehensive reporting.





Varieties

Directional Surveying:

Accurately survey the path of drill hole in any direction, utilizing a range of North Seeking Gyroscopic and magnetometer survey tools.

Borehole Visualization:

Measure geotechnical and structural information directly from the borehole face. All data extracted is oriented and recorded in millimeter resolution via:

- Acoustic Tele viewer
- Optical Tele viewer
- Video inspection

Physical Rock Properties:

Take a direct measurement of rock properties in-situ. Accurately calibrated and corrected data allows surface geophysical data to be constrained, delineation of ore bodies and alteration mapping to be carried out quickly from existing boreholes. Groundwater Characterization Employing a range of techniques to acquire information relating to the location, quality and measurement of groundwater. This includes:

- Flow meters
- Casing and screen inspections
- Nuclear Magnetic Resonance (NMR)
- Fluid conductivity
- In-situ fluid sampling



Innovations

- Geo positioning
- Indicator Minerals
- Centimeter Precision Satellite
- Multipara meter Probe
- Mobile Lab
- 3D Geological Models
- Core Orientation (CORIENTR)
- Mobile Drill
- ROBOMAP
- Truck Tracking
- Road Trains
- Fatigue Measurement watch
- Tele Mining
- BMM
- Wire Line Probe



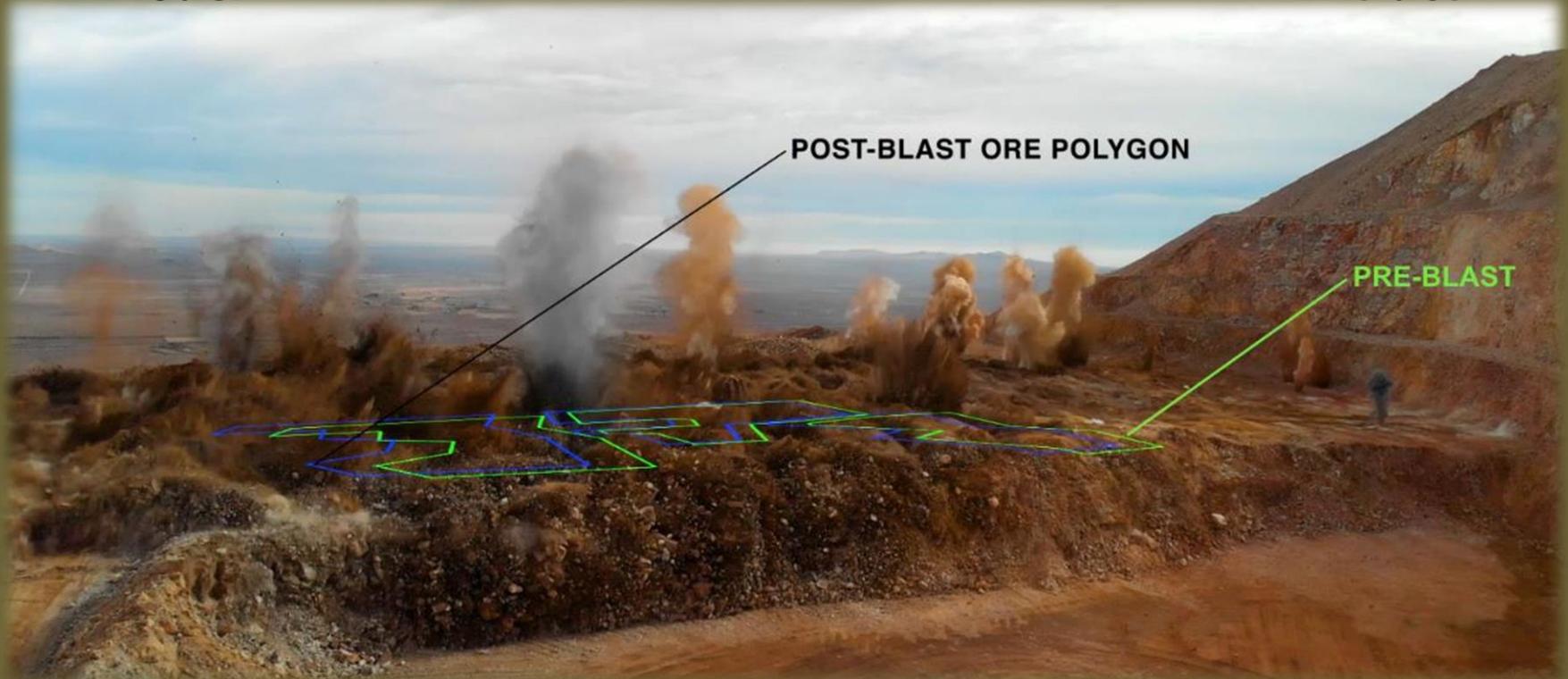
BMM Tools



BMM Technology

Grade Control
Drill
Sample Assay
Model

Production
Excavate
Haul Crush/Grind
Extract



- Ore Loss
- Dilution



Thank you

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**May 2021
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